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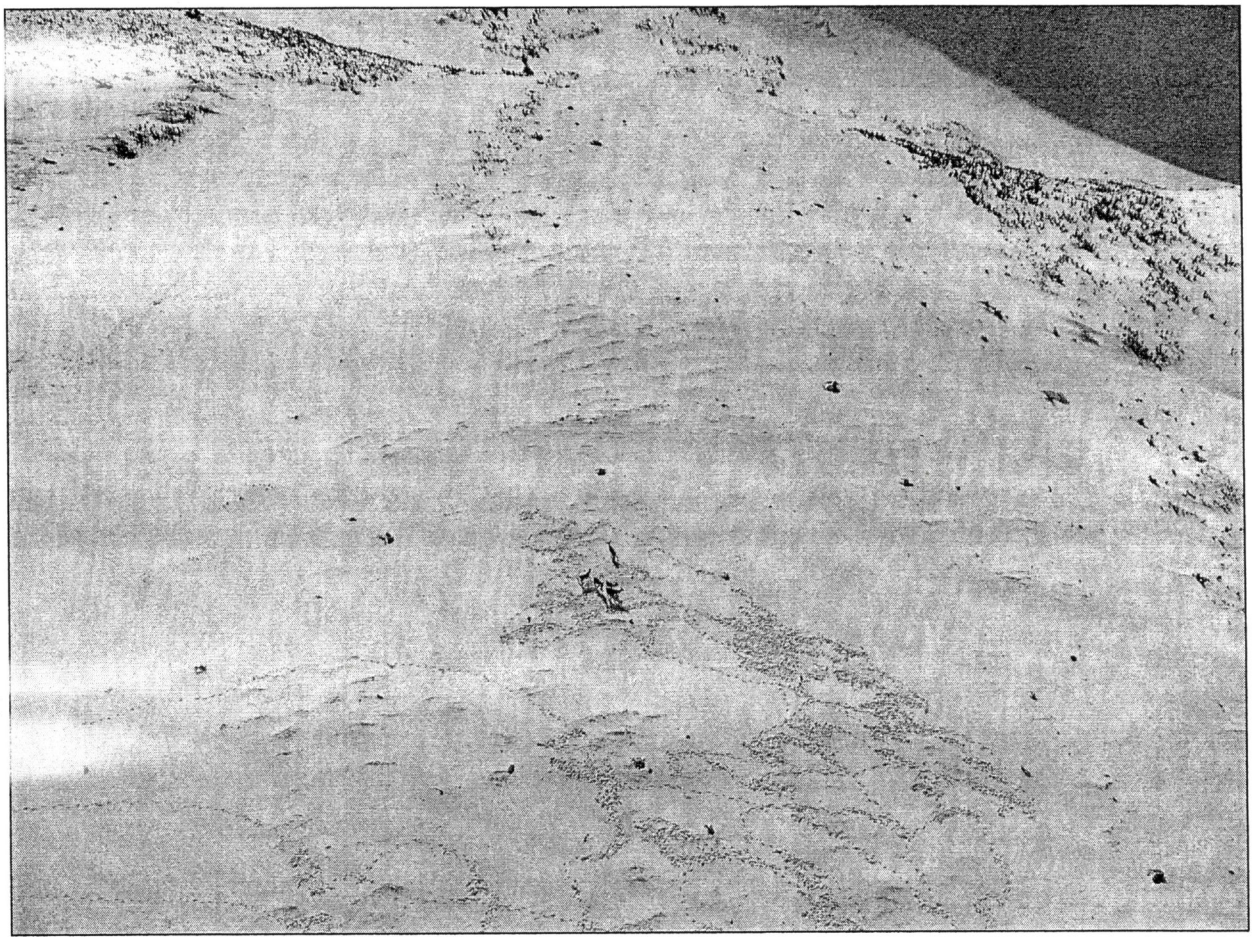
B-41

Population Status of Threatened Caribou Herds in the Central Rockies Ecoregion of British Columbia, 2011



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Introduction

Woodland caribou (*Rangifer tarandus caribou*) herds living in the Central Rockies Ecoregion of British Columbia are part of the Nationally Threatened caribou population in the Southern Mountains National Ecological Area. Several herds or sub-populations occur within the Central Rocky Mountains Ecoregion, including:

i) Quintette
ii) Bearhole-Redwillow
iii) Narraway
iv) Moberly
v) Burnt-Pine
vi) Kennedy Siding
vii) Scott
viii) Hart Ranges
ix) Graham

Radio-telemetry work over the past decade has greatly improved our understanding of the distribution, seasonal movements and habitat use of these herds (Figure 1).

In this report, we provide a summary of calf recruitment counts and adult mortality estimates, as well as recent population counts, for five of the nine herds. Recent information on the population status of the Hart Ranges herd is reported in Heard *et al.* (2010) and Gillingham *et al.* (2011). Population information for the Narraway herd is reported in Alberta Sustainable Resource Development and Alberta Conservation Association (2010). The most recent census and population information for the Graham herd (located north of the Peace Arm of the Williston Reservoir) is reported in Culling & Culling (2009). There is little information available on the population status of the Scott herd, although the provincial population estimate for that herd is 60 animals.

Calf recruitment surveys were conducted on an annual basis beginning in March 2003 for the Quintette, Moberly, Burnt-Pine and Kennedy Siding herds, and March 2007 for the Bearhole-Redwillow herd. Calf recruitment surveys consisted of locating radio-collared individuals from a helicopter and counting the number of adults and calves in each group. Additional incidental sightings of caribou groups were also included.

Adult mortality was determined annually (01 April to 31 March) for radio-collared caribou during these same years. Adult mortality was calculated by dividing the number of caribou that died by the number of caribou that were monitored for the entire year (±30 days to accommodate irregularities in capture and drop-off schedules). We attempted to determine the cause of death for caribou when the collars were recovered, but because telemetry flights occurred only monthly for much of the study period, evidence of cause of death at mortality sites was often minimal and inconclusive.

A population census was conducted for the Quintette and Burnt-Pine herds in March 2008 (Seip & Jones 2008), and for the Moberly, Burnt-Pine and Kennedy Siding herds in March and

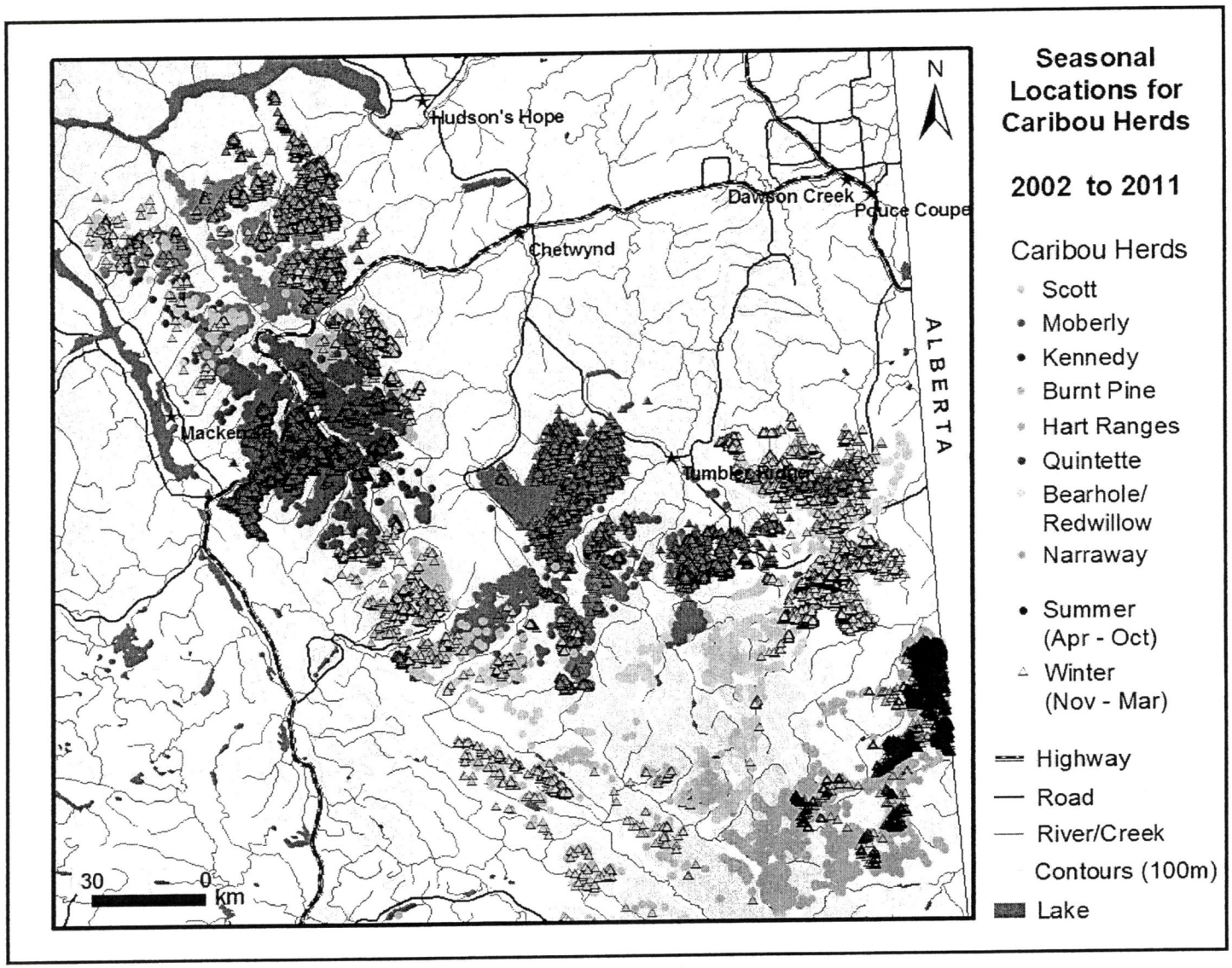

Figure 1. Radio-telemetry and GPS-collar locations of caribou herds in the Central Rockies Ecoregion of British Columbia, May 2002 to March 2011. Hart Ranges, Narraway and Scott herds were not included in the population demographic surveys for this report.

April 2011. Each population census was conducted by aerially searching (from a Bell 206 helicopter) for caribou tracks and caribou in the subalpine and alpine zones of the core winter range of each herd. Core winter range was previously determined and defined as areas that were most likely to be selected by caribou in winter based on radio-telemetry and caribou habitat modelling (Jones *et al.* 2007, Jones 2008). When a group of caribou was located, we counted the number of adults and calves, and then used radio-telemetry to determine if any collared caribou were present within the group. After we had completed surveying an area, we used radio-telemetry to locate any caribou we had missed, and counted the adults and calves within those groups. We used the proportion of radio-collared caribou that were located visually during the survey (without the use of radio-telemetry) to correct for sightablility. The 95% confidence interval for this estimate was calculated using the program Noremark (White 1996). The radio-collared caribou that had to be located using radio-telemetry were included to provide a minimum population count for the herd as well as calf recruitment data.

Quintette

In winter, Quintette caribou live primarily on windswept alpine ridges in the eastern foothills of the Rocky Mountains, west of the town of Tumbler Ridge (Figure 2). The Quintette herd population census was conducted on March 25, 2008. The census area included the Mt. Babcock/Quintette mountain complex south of the Murray River, the windwept alpine terrain between the Murray and Wolverine Rivers, and the Mt. Spieker/Mt. Collier complex north of the Wolverine River (Figure 2). We terminated the census at the top ends of watersheds near the height of the Rockies where the topography becomes very rugged and is seldom used by caribou in winter. We did not survey Bullmoose Mountain because previous surveys (Seip 2002), and telemetry data collected prior to the census, indicated that caribou rarely use that area.

There were 14 radio-collared caribou in the census area at the time of the census. We located and counted 95 caribou without using telemetry to find them (Table 1). These caribou included eight of the 14 radio-collared caribou (57%). Thus, assuming we saw 57% of the total population, the estimated population size was 166 caribou, with a 95% confidence interval of 99-218 (White 1996). When we used radio-telemetry to locate the remaining collars, we counted an additional 78 caribou for a total minimum count of 173. Thus, we concluded that the population estimate for the Quintette herd in 2008 ranged between 173-218 caribou.

On average (2003 to 2011), calves comprised 20% of the Quintette population (Table 2). Over the past nine years, seven collared caribou died during 75 caribou years of monitoring, for an annual adult mortality rate of 9%. The low mortality rate, in combination with the relatively high calf recruitment rate, is indicative of a caribou population that is increasing (Bergerud 1988, Seip & Cichowski 1996).

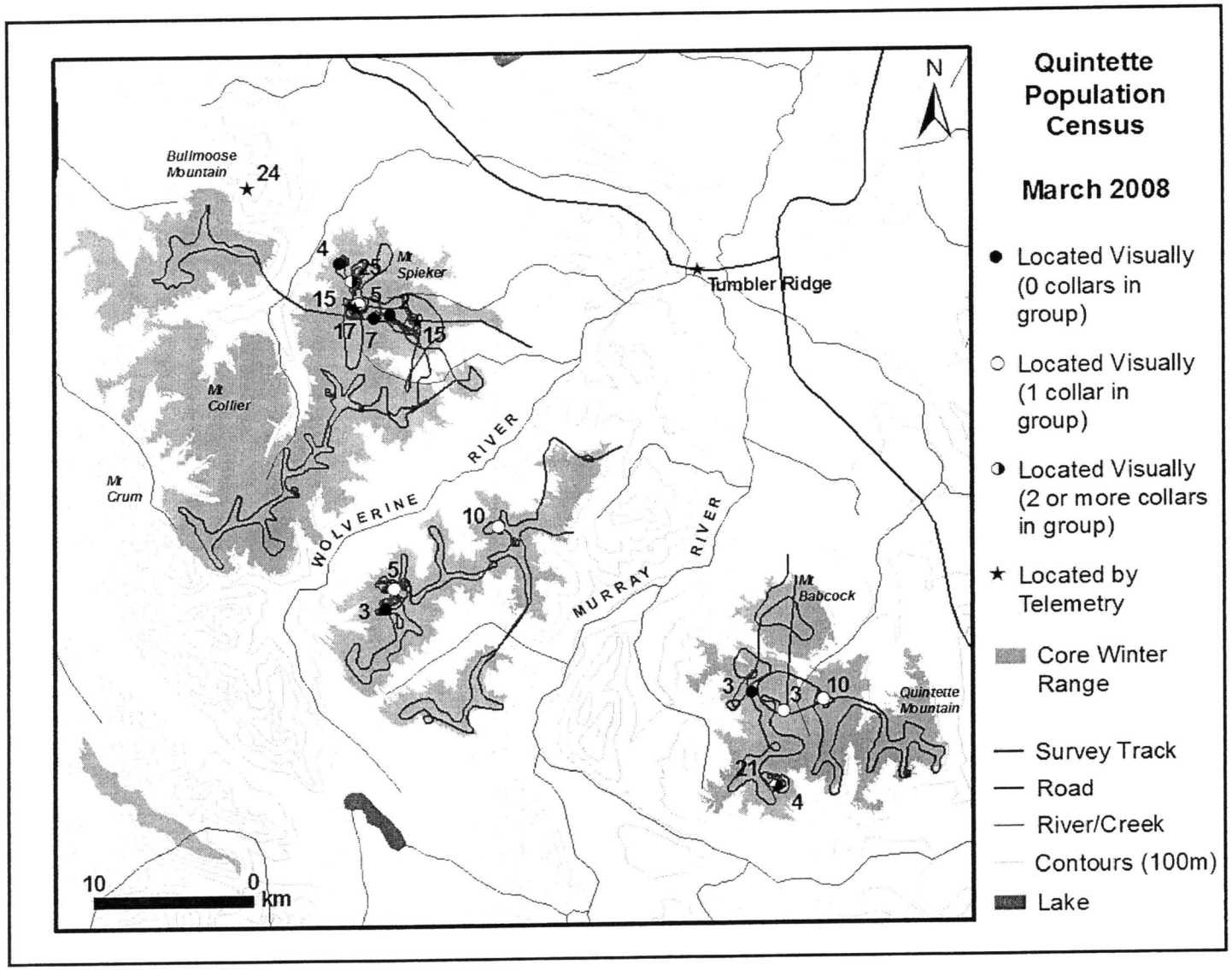

Figure 2. Quintette population census, March 2008. Locations are separated by method of locating caribou (with or without telemetry), and number of collars in group. Number of caribou in each group is shown next to the location symbol.

Table 1. Quintette population census data, March 2008. Location type was defined as "visual" if caribou were located without using telemetry, and "telemetry" if caribou were located using telemetry.

Location Type	Number of Collared Caribou in Group	General Area	Number of Adults	Number of Calves	Total Number of Caribou
Visual	0	Wolverine River	3	0	3
Visual	0	Quintette Mountain	2	1	3
Visual	0	Mt. Spieker	3	1	4
Visual	0	Mt. Spieker	5	2	7
Visual	0	Mt. Spieker	1	1	2
Subtotal	**0**		**14**	**5**	**19**
Visual	1	Wolverine River	3	2	5
Visual	1	Wolverine River	8	2	10
Visual	2	Quintette Mountain	18	3	21
Visual	1	Quintette Mountain	7	3	10
Visual	1	Mt. Spieker	4	1	5
Visual	2	Mt. Spieker	23	2	25
Subtotal	**8**		**63**	**13**	**76**
Telemetry	1	Quintette Mountain	4	0	4
Telemetry	1	Quintette Mountain	3	0	3
Telemetry	1	Bullmoose Mountain	21	3	24
Telemetry	1	Mt. Spieker	13	2	15
Telemetry	1	Mt. Spieker	16	1	17
Telemetry	1	Mt. Spieker	13	2	15
Subtotal	**6**		**70**	**8**	**78**
Total	**14**		**147**	**26**	**173**

Table 2. Calf recruitment and adult mortality for Quintette caribou, March 2003 to March 2011. Caribou were only included in adult mortality calculations if monitored for an entire year (±30 days to accommodate irregularities in capture and drop-off schedules).

	Calf Recruitment				**Adult Mortality**		
Year	No. Calves	No. Adults	Total	Percent Calves	No. Collared Caribou	No. Mortalities	Percent Mortality
2003	13	45	58	22	2	1	50
2004	16	81	97	16	3	0	0
2005	8	55	63	13	8	0	0
2006	13	83	96	14	9	0	0
2007	13	92	105	12	8	0	0
2008	26	147	173	15	17	2	12
2009	9	66	75	12	8	2	25
2010	17	63	80	21	10	1	10
2011	17	88	105	16	10	1	10
Total	**132**	**720**	**852**		**75**	**7**	
Average				**20**			**9**

Bearhole-Redwillow

The Bearhole-Redwillow caribou winter in low-elevation boreal forests, east of the town of Tumbler Ridge, near Bearhole Lake and the Redwillow River (Figure 3). There is some movement between these caribou and the Quintette herd.

Bearhole-Redwillow caribou live in forested habitat during the winter making them very difficult to locate during aerial surveys. Consequently, the population counts for this herd are limited to counting caribou associated with radio-collared caribou in the herd. Because the number of radio-collared caribou in the herd varied among years, it was not possible to compare the population counts. The largest minimum population count was 49 caribou recorded in 2008 (Table 3).

Annual calf recruitment and adult mortality estimates for the Bearhole-Redwillow caribou generally show a very low calf survival combined with high adult mortality, with the exception of estimates for 2011 (Table 4). On average, however, the population demographics for Bearhole-Redwillow caribou indicate that this herd is likely declining (Table 3).

Moberly

The Moberly caribou live in the mountains north of the Pine River and south of the Peace Arm of the Williston Reservoir (Figure 4). The Moberly herd population census was conducted on April 07, 2011. The census area encompassed alpine and subalpine areas within the core winter range of the Moberly herd (Figure 4). A survey track was not recorded during this census. There were seven radio-collared caribou in the census area at the time of the census. We saw all seven radio-collared caribou without using telemetry to find them. We also saw three additional groups of non-collared caribou (Table 5). A total of 35 caribou were counted during the census (Table 4). Given the 100% sightability of the collared caribou, the population estimate is 35 animals.

This population appears to be experiencing a major decline. In 1995, 191 caribou were counted in this herd (TERA 1997). In 2009, the minimum population count was 48 (Table 5).

On average (2003 to 2011), calves comprised 15% of the Moberly population (Table 5). Over the past nine years, nine collared caribou have died during 37 caribou years of monitoring, for an annual adult mortality rate of 24%. The high mortality rate, in combination with the calf recruitment rate, is indicative of a caribou population that is declining (Bergerud 1988, Seip & Cichowski 1996).

Burnt-Pine

The Burnt-Pine herd was censused on March 26, 2008. The census area included the subalpine and alpine areas of Mt. Le Hudette, Mt. Stephenson, and Howling Wolf Peak (Figure 5). There was one radio-collared caribou in the census area at the time of the census. We located

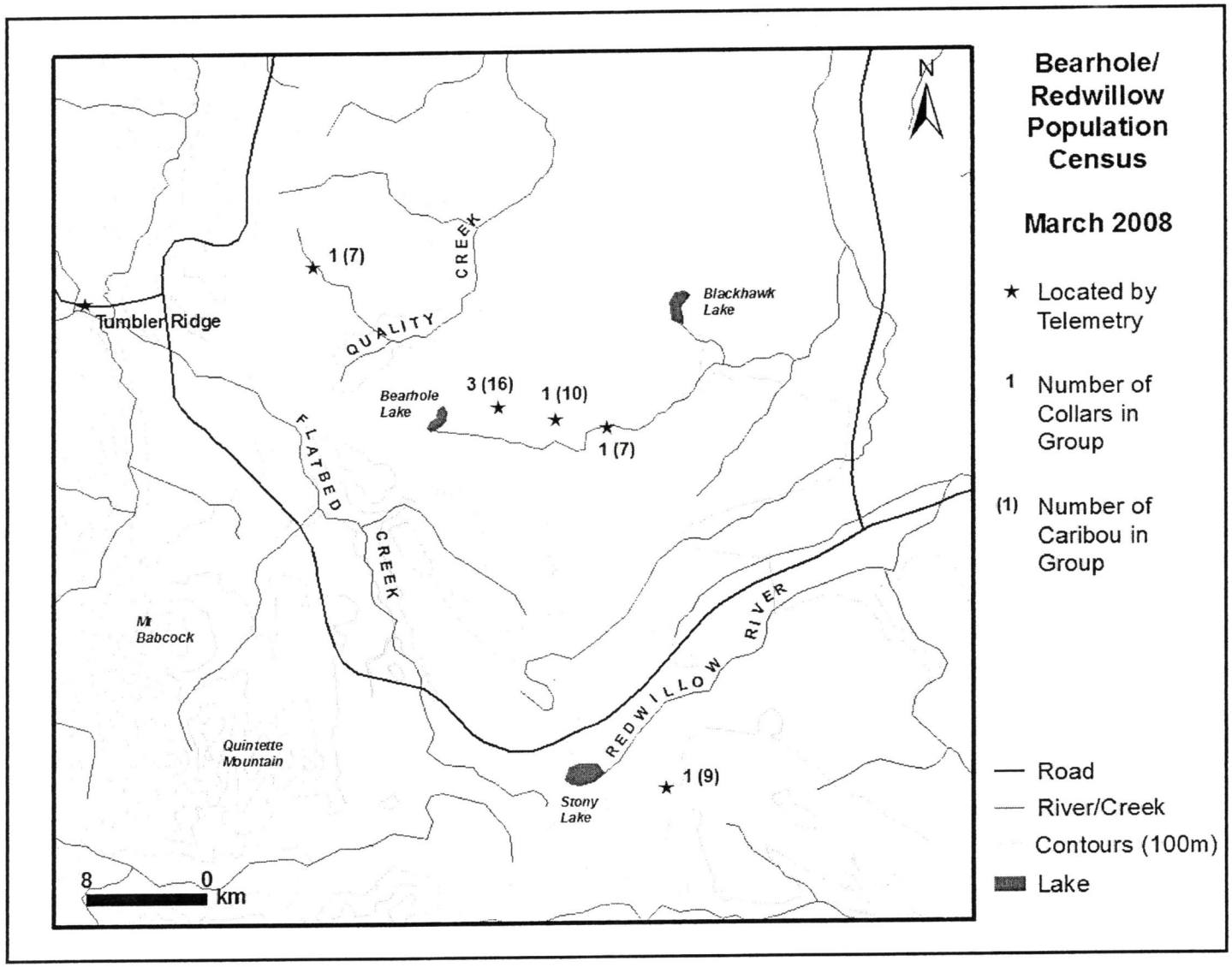

Figure 3. Bearhole-Redwillow population census, March 2008. All caribou were located by telemetry.

Table 3. Calf recruitment and adult mortality for Bearhole-Redwillow caribou, March 2007 to March 2011. Caribou were only included in adult mortality calculations if monitored for an entire year (±30 days to accommodate irregularities in capture and drop-off schedules).

	Calf Recruitment				Adult Mortality		
Year	No. Calves	No. Adults	Total	Percent Calves	No. Collared Caribou	No. Mortalities	Percent Mortality
2007	1	12	13	8	0		
2008	3	46	49	6	5	2	40
2009					6	1	17
2010	1	33	34	3	3	2	67
2011	6	22	28	21	6	0	0
Total	**11**	**113**	**124**		**20**	**5**	
Average				**18**			**25**

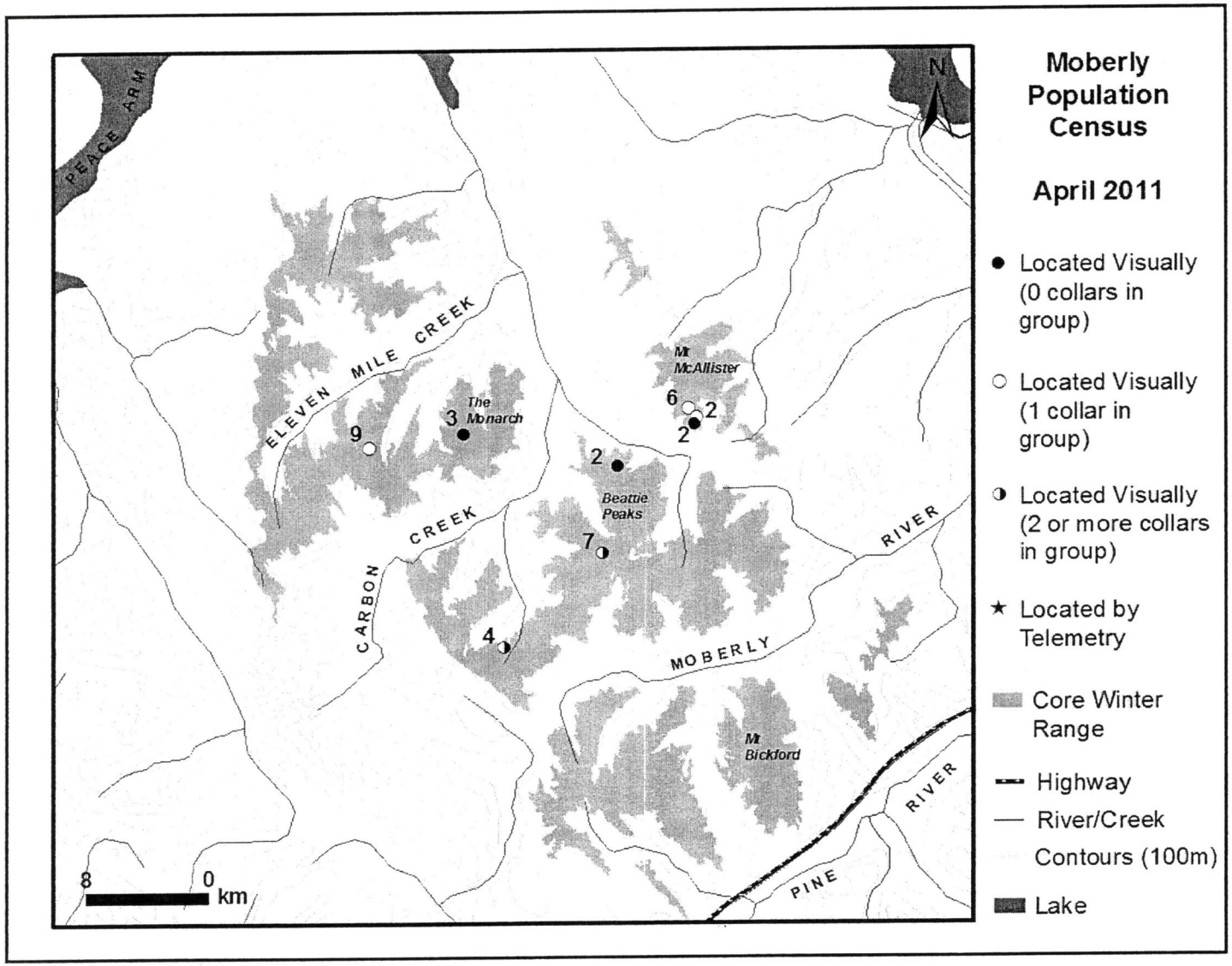

Figure 4. Moberly population census, April 2011. Locations are separated by method of locating caribou (with or without telemetry), and number of collars in group. Number of caribou in each group is shown next to the location symbol.

Table 4. Moberly population census data, April 2011. Location type was defined as "visual" if caribou were located without using telemetry, and "telemetry" if caribou were located using telemetry.

Location Type	Number of Collared Caribou in Group	General Area	Number of Adults	Number of Calves	Total Number of Caribou
Visual	0	Mt. McAllister	2	0	2
Visual	0	The Monarch	3	0	3
Visual	0	Beattie Peaks	2	0	2
Subtotal	**0**		**7**	**0**	**7**
Visual	1	Mt. McAllister	5	1	6
Visual	2	Carbon Creek	4	0	4
Visual	1	The Monarch	9	0	9
Visual	1	Mt. McAllister	2	0	2
Visual	2	Beattie Peaks	6	1	7
Subtotal	**7**		**26**	**2**	**28**
Total			**33**	**2**	**35**

Table 5. Calf recruitment and adult mortality for Moberly caribou, March 2003 to March 2011. Caribou were only included in adult mortality calculations if monitored for an entire year (±30 days to accommodate irregularities in capture and drop-off schedules).

	Calf Recruitment				**Adult Mortality**		
Year	No. Calves	No. Adults	Total	Percent Calves	No. Collared Caribou	No. Mortalities	Percent Mortality
2003	4	25	29	14	2	0	0
2004	3	16	19	16	6	0	0
2005	10	31	41	24	6	0	0
2006	1	4	5	20	4	1	25
2007	1	8	9	11	4	2	50
2008	8	34	42	19	4	2	50
2009	6	42	48	13	3	2	67
2010	2	21	23	9	5	1	20
2011	2	33	35	6	3	1	33
Total	**37**	**214**	**251**		**37**	**9**	
Average				**15**			**24**

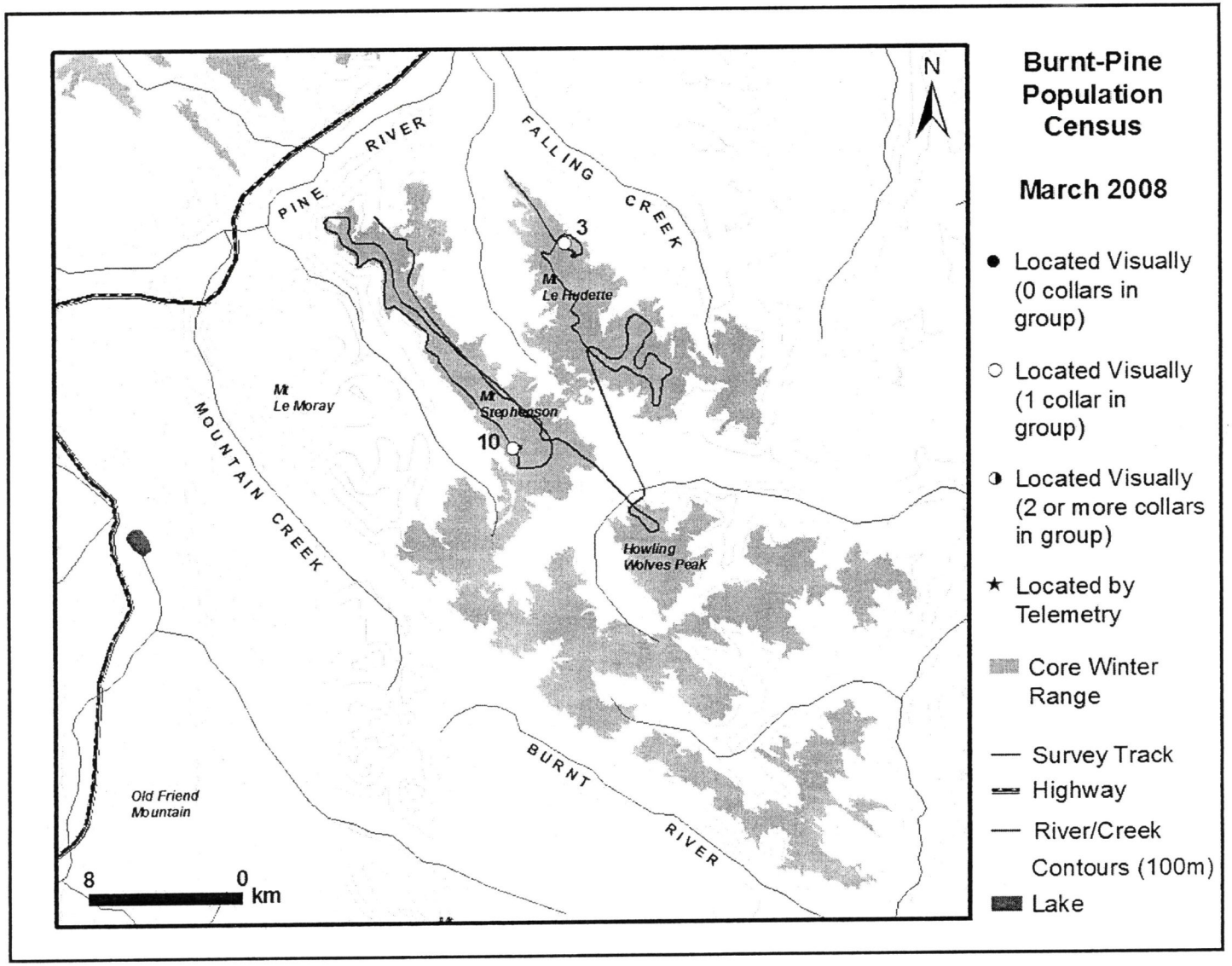

Figure 5. Burnt-Pine population census, March 2008. Locations are separated by method of locating caribou (with or without telemetry), and number of collars in group. Number of caribou in each group is shown next to each location symbol.

and counted the group of caribou containing the radio-collared caribou without using telemetry to find them (Table 6). We also located one additional group of non-collared caribou. A total of 13 caribou were counted during the census (Table 6).

In 2010, 19 caribou were located in the Burnt-Pine area (Table 7), but 13 of those were in a group with a radio-collared caribou from Kennedy Siding. The collared animal returned to the Kennedy Siding area soon after. If all of those caribou were from the Kennedy Siding herd, the number of Burnt-Pine caribou in 2010 would be only six. In March 2011, the same area was searched and only five caribou were found.

On average (2003 to 2011), calves comprised 9% of the Burnt-Pine population (Table 7). Over the past nine years, two collared caribou have died during 13 caribou years of monitoring, for an annual adult mortality rate of 15%. The mortality rate, in combination with the low calf recruitment rate, is indicative of a caribou population that is declining (Bergerud 1988, Seip & Cichowski 1996). Calf recruitment surveys indicate that there has been no calf recruitment into this population for the last three years (Table 7).

Kennedy Siding

Kennedy Siding caribou spend early winter in low-elevation pine forests and migrate northeast to subalpine and alpine areas between the Parsnip and Burnt Rivers in late winter (Figure 6). The Kennedy Siding herd was censused on March 17, 2011. The census area included alpine and subalpine areas in the Missinchinka River, Colbourne Creek and Reynolds Creek watersheds (Figure 6).

There were 10 radio-collared caribou in the census area at the time of the census. We located and counted 26 caribou without using telemetry to find them (Table 8). These caribou included six of the 10 radio-collared caribou (60%). Thus, assuming we saw 60% of the total population, the estimated population size is 43 caribou, with a 95% confidence interval of 26-57 (White 1996). When we used radio-telemetry to locate the remaining collars, we counted an additional 18 caribou for a total minimum count of 44. Thus, we concluded that the population estimate for the Kennedy Siding herd ranged between 44-57 caribou. This population estimate is about half of the 99-119 caribou estimated in the herd in 2002 (Seip 2002). There were at least 120 caribou in the population in 2007 (Table 9).

During early winter in 2009/10 and 2010/11, caribou were counted from the ground when they were using the low-elevation winter range that was accessible by road. The proportion of radio-collared animals present in the total count was used to generate a population estimate. In 2009/10, 10 of the 58 (17%) caribou that were counted had collars. Given that there were 15 radio-collared caribou in the population, the population estimate was 87 caribou. During early winter in 2010/11, 10 of the 47 (21%) caribou that were counted had collars. Given that there were 10 radio-collared caribou in the population, the population estimate was 47 caribou in the herd. These results corroborate the aerial census data that suggest the population declined by half from 2002 to 2011. Ground census results suggest, however, that most of this decline may have occurred during 2010, a year of very high adult mortality and low calf survival (Table 9).

Table 6. Burnt-Pine population census data, March 2008. Location type was defined as "visual" if caribou were located without using telemetry, and "telemetry" if caribou were located using telemetry.

Location Type	Number of Collared Caribou in Group	General Area	Number of Adults	Number of Calves	Total Number of Caribou
Visual	0	Mt. Le Hudette	3	0	3
Visual	1	Mt. Stephenson	8	2	10
Total			**11**	**2**	**13**

Table 7. Calf recruitment and adult mortality for Burnt-Pine caribou, March 2003 to March 2011. Caribou were only included in adult mortality calculations if monitored for an entire year (±30 days to accommodate irregularities in capture and drop-off schedules).

	Calf Recruitment				**Adult Mortality**		
Year	No. Calves	No. Adults	Total	Percent Calves	No. Collared Caribou	No. Mortalities	Percent Mortality
2003	2	14	16	13	0		
2004	2	12	14	14	2	1	50
2005	1	8	9	11	2	0	0
2006	2	15	17	12	2	0	0
2007	-	-	-	-	1	0	0
2008	2	11	13	15	1	0	0
2009	0	11	11	0	1	0	0
2010	0	19	19	0	3	0	0
2011	0	5	5	0	1	1	100
Total	**9**	**95**	**104**		**13**	**2**	
Average				**9**			**15**

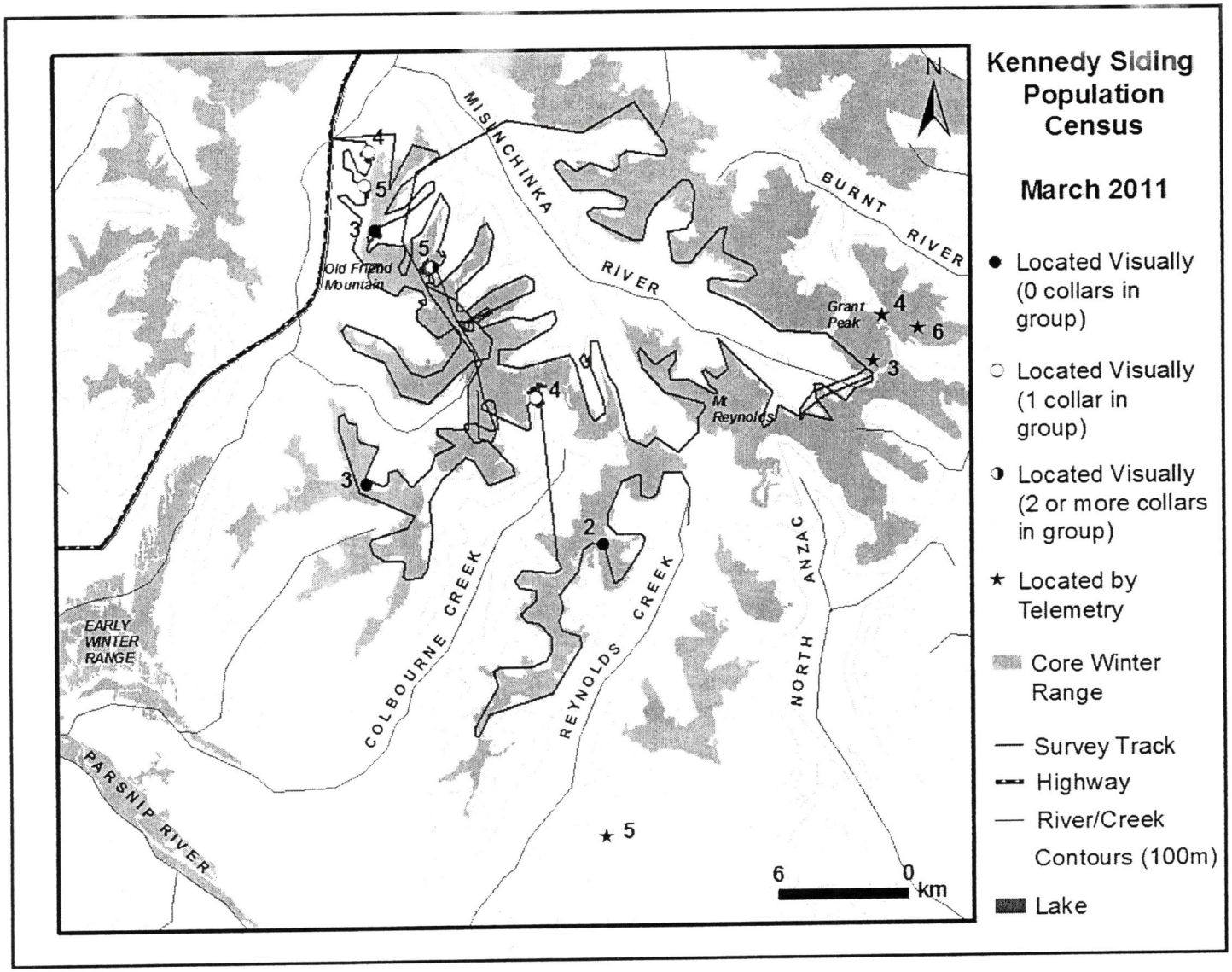

Figure 6. Kennedy Siding population census, March 2011. Locations are separated by method of locating caribou (with or without telemetry), and number of collars in group. Number of caribou in each group is shown next to the location symbol.

Table 8. Kennedy Siding population census data, March 2011. Location type was defined as "visual" if caribou were located without using telemetry, and "telemetry" if caribou were located using telemetry.

Location Type	Number of Collared Caribou in Group	General Area	Number of Adults	Number of Calves	Total Number of Caribou
Visual	0	Reynolds Creek	2	0	2
Visual	0	Colbourne Creek	3	0	3
Visual	0	Old Friend Mountain	3	0	3
Subtotal	**0**		**8**	**0**	**8**
Visual	1	Old Friend Mountain	5	0	5
Visual	1	Colbourne Creek	3	1	4
Visual	1	Old Friend Mountain	5	0	5
Visual	3	Old Friend Mountain	3	1	4
Subtotal	**6**		**16**	**2**	**18**
Telemetry	1	Grant Peak	6	0	6
Telemetry	1	Reynolds Creek	5	0	5
Telemetry	1	Grant Peak	4	0	4
Telemetry	1	Grant Peak	3	0	3
Subtotal	**4**		**18**	**0**	**18**
Total	**10**		**42**	**2**	**44**

Table 9. Calf recruitment and adult mortality for Kennedy Siding caribou, March 2003 to March 2011. Caribou were only included in adult mortality calculations if monitored for an entire year (±30 days to accommodate irregularities in capture and drop-off schedules).

	Calf Recruitment				**Adult Mortality**		
Year	No. Calves	No. Adults	Total	Percent Calves	No. Collared Caribou	No. Mortalities	Percent Mortality
2003	9	34	43	21	2	0	0
2004	9	51	60	15	5	1	20
2005	4	48	52	8	9	2	22
2006	16	75	91	18	6	0	0
2007	17	103	120	14	12	1	8
2008	-	-	-	-	9	2	22
2009	4	56	60	7	17	2	12
2010	3	25	28	11	15	2	13
2011	2	42	44	5	14	4	29
Total	**64**	**434**	**498**		**89**	**14**	
Average				**13**			**16**

On average (2003 to 2011), calves comprised 13% of the Kennedy Siding population (Table 9). Over the past nine years, 14 collared caribou have died during 89 caribou years of monitoring, for an annual adult mortality rate of 16%. The mortality rate, in combination with the calf recruitment rate, is indicative of a caribou population that is declining (Bergerud 1988, Seip & Cichowski 1996).

Summary

Population parameters are summarized in Table 10. With the exception of the Quintette herd, calf recruitment and adult mortality rates indicated that all the caribou herds are declining. This conclusion is supported by population census data for the Moberly, Burnt-Pine and Kennedy Siding herds. The Scott herd is adjacent to the Kennedy Siding and Moberly herds, so is likely to be experiencing a similar population trend. The Narraway herd is also declining (Alberta Sustainable Resource Development and Alberta Conservation Association 2010), but the Hart Ranges herd has been stable over recent years (Heard *et al.* 2010). The Graham herd has experienced a major decline since the 1980's, but may have been stable over the past decade (Culling & Culling 2009).

Wolf predation is the suspected cause of death for 40.5% of the 37 adult mortalities (Table 11). The rate of wolf predation, however, is likely higher as some portion of the unknown predator and unknown cause categories are also likely due to wolf predation.

Table 10. Summary of population parameters for caribou herds in the Central Rockies Ecoregion of British Columbia.

Herd	Average Percent Calves	Average Adult Mortality Rate	Population Estimate (Year)	Population Estimate Method	Trend
Quintette	20	9	173-218 (2008)	Mark-Resight	Increasing
Bearhole-Redwillow	18	25	49 (2008)	Minimum Count	Declining
Moberly	15	24	35 (2011)	Mark-Resight	Declining
Burnt-Pine	9	15	5 (2011)	Aerial Survey	Declining
Kennedy Siding	13	16	44-57 (2011)	Mark-Resight	Declining

Table 11. Causes of adult mortality for caribou herds in the Central Rockies Ecoregion of British Columbia.

Herd	Accident	Wolf	Bear	Wolverine	Unknown Predator	Unknown	Total
Quintette	0	2	1	1	1	2	7
Bearhole-Redwillow	0	2	0	0	0	3	5
Moberly	1	3	0	0	2	3	9
Burnt-Pine	0	1	0	0	0	1	2
Kennedy Siding	1	7	1	1	3	1	14
Total	**2**	**15**	**2**	**2**	**6**	**10**	**37**

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