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Inventory of Woodland Caribou on the Wolverine Mountain Range, March 1996

M. D. Wood
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1.0 INTRODUCTION

In 1991, the Peace/Williston Fish and Wildlife Compensation Program (PWFWCP) initiated a three year study of woodland caribou *(Rangifer tarandus caribou)* in the Omineca Mountains west of the Williston Reservoir with the capture and radio-collaring of 20 caribou (Phase 1). The primary objectives of Phase 1 were to determine the seasonal habitat use, seasonal movements, and mortality rates of these caribou (Wood 1996). Phase 1 revealed that two distinct caribou populations resided in the Omineca Mountains, west of the reservoir: the Wolverine Caribou Herd (WCH) in the south, and the Chase Caribou Herd (CCH) in the north (Figure 1). Phase 2 of the Omineca Caribou Study was initiated in 1994, and focused on the seasonal use of forested habitats by radio-collared caribou in the WCH (Terry and Wood in prep).

The population of caribou in the WCH has been previously estimated at between 200-250 animals, based on surveys conducted in 1989 (Hatler 1989) and 1993 (Wood 1996). However, there were no radio-collared caribou in the WCH prior to 1991 to provide a sightability correction factor for the 1989 survey, and poor weather conditions during the 1993 survey prevented access to much of the primary winter range. Thus, an inventory of caribou in the WCH wintering in the alpine of the Wolverine Mountain Range was conducted in March 1996.

The objectives of this survey were:

1) To estimate the number of caribou in the alpine on the Wolverine Range using radio-collared animals to correct for sightability bias (mark/resight population estimation).
2) To estimate the number of caribou in the entire WCH.
3) To determine the age/sex composition of the segment of the herd wintering in the alpine on the Wolverine Range.

2.0 SURVEY AREA AND WEATHER CONDITIONS

The Wolverine Mountain Range is approximately 50 km long, and parallels the western shore of the Williston Reservoir in north-central B.C. (Figure 1). The range lies within the Southern Omineca Mountains and Manson Plateau ecosections of the Omineca Mountains ecoregion (Demarchi 1995), on the lee side of the Omineca Mountains. It is characterized by gently rounded windswept terrain with low to moderate slopes; some areas of steeper cliff terrain also exist. Many long ridges branch out to the east and west from the height of land, most with

extensive south facing slopes. The Engelmann Spruce-Subalpine Fir (ESSFmv3) biogeoclimatic zone between 1,100 - 1,500 m grades into parkland or scrub subzones at upper elevations, and is replaced by Alpine Tundra (ATn) over 1,500 m (DeLong et al. 1994).

Weather conditions on 18 March 1996 were sunny and clear, with some high, light haze in the afternoon. Winds were light to moderate from the west, and mid-morning temperatures ranged from -3°C to -5°C at 1,525 m to 1,800 m elevation. Snow coverage was near 100% with few windswept areas in the alpine; over four days had elapsed since the last snowfall.

3.0 METHODS

3.1 Survey Methods and Timing

The survey was conducted between 1015 and 1705 hrs on 18 March 1996 with a Bell 206 helicopter chartered from Northern Mountain Helicopters (Prince George, BC), with pilot Greg Altoft and a three-person crew. The inventory followed standard RIC methodology (RIC 1997) and involved a thorough search of all alpine and subalpine areas of the Wolverine Mountain Range. Where the distance from subalpine to height of land was such that animals at either extreme could be missed, two to three passes at different contour intervals were warranted. The survey was broken into four intervals (Table 1, Appendix A) requiring 5 hours of helicopter time excluding re-fueling and ferry time; the total helicopter time was 8.3 hours including the latter.

Table 1. Survey times and locations on the Wolverine Mountain Range.

Survey Interval	Area Surveyed	Survey Times	Total Heli Hrs
1	Far south end to south of Mt Porter	10:15 am- 12:15 pm	2.0
2	South of Mt. Porter to north of Mt Porter	1:05 pm - 1:55 pm	0.9
3	Far north end to middle of north end	2:15 pm - 3:05 pm	0.8
4	Middle of north end to north of Mt. Porter	3:45 pm -5:05 pm	1.3
TOTAL			5

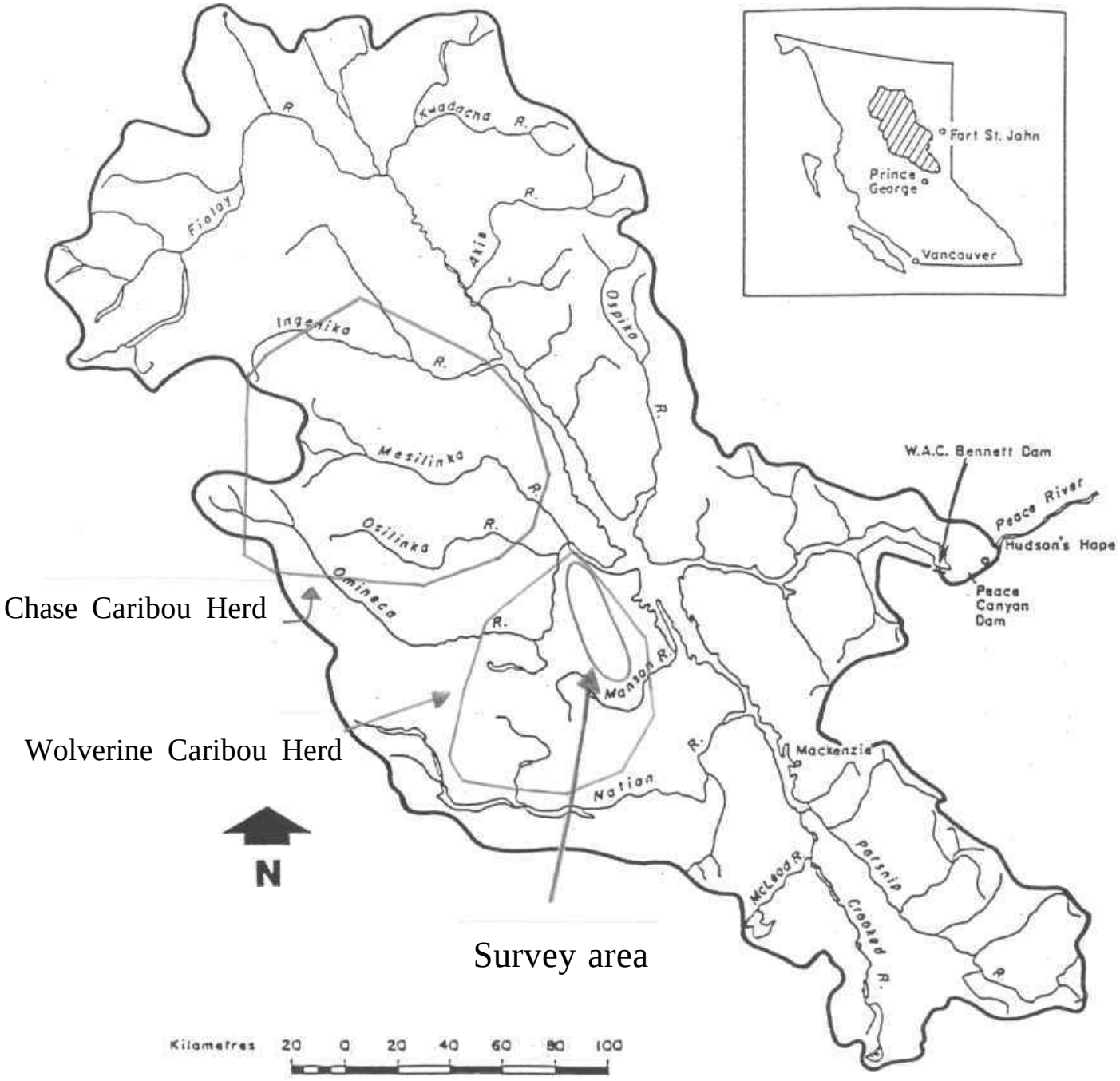

Figure 1. Location of the Chase and Wolverine Caribou Herds, and the Wolverine Mountain Range survey area, within the Williston Reservoir Watershed, north-central B.C.

The navigator (Mari Wood, Senior Wildlife Biologist, PWFWCP), searched for, counted and classified animals, and recorded the flightline and animal locations on 1:250,000 topographic maps. The two rear seat observers (Fraser Corbould, Wildlife Biologist, and Randy Zemlak, Fish Technician, PWFWCP) also searched for and classified animals. F. Corbould recorded all observations on survey forms, and R. Zemlak recorded position coordinates for each group of caribou located, using the on-board Global Positioning System (GPS) unit. Where multiple groups of caribou were located within close proximity (e.g., 100-400 m apart), only one GPS location for the groups was obtained. Each caribou was classified as male or female, and as an adult or calf (Level 2 classification, RIC 1996). Females were identified based on the presence of a black vulval patch, and males by the lack thereof. Presence/absence of antlers on both males and females was recorded.

Radio-collars observed on individual caribou were also noted. Conventional collars (Lotek LMRT-4) were distinguished from Global Positioning System (GPS) collars (Lotek GPS-1000) by color and size (conventional collars were white with small battery packs; GPS collars were grey with larger battery packs). Radio-frequencies of conventional collars were identified at the time of observation using a Telonics TR-2/TS-1 receiver/scanner unit. Frequencies of GPS collars were determined following the survey, from position coordinates obtained from all the satellite units for the survey date.

3.2 Data Analyses

3.2.1 Population Size and Density Estimation

To estimate the number of caribou wintering on the Wolverine Range I used the proportion of radio-collared caribou observed during the survey of those known to be in the alpine on the Wolverine Range on the day of the survey as a sightability correction factor, applying it to the total count using the modified Lincoln-Petersen mark-recapture estimator (White and Garrott 1990, eqn 10.1, pg 256).

$$N = \frac{(C+1)(M+1)}{(R+1)} - 1$$

where:

N = population estimate for Wolverine Range
C = total number of caribou observed in the survey area
M=number of collared caribou on Wolverine Range
R = number of collared caribou observed in the survey area

To estimate the population size of the entire WCH, I used a simple ratio estimator procedure, extrapolating the proportion of collared caribou in the WCH observed on the survey to estimate the number of animals which were not in the census zone. This is based on the assumption that each radio-collared caribou is an independent and unbiased sample, and is therefore representative of the population.

$$\frac{R}{M_H} = \frac{C}{N_H} \quad \text{thus,} \quad N_H = \frac{CM_H}{R}$$

where:

N_H = population estimate of WCH
C = total number of caribou observed in the survey area
M_H=number of collared caribou in the WCH
R = number of collared caribou observed in the survey area

$$SE(ratio) = \sqrt{\frac{pq}{n}}$$

where:

SE(ratio) = standard error of the ratio
$p = R/M_H$
q = l-p
$n = M_H$

95% upper and lower confidence intervals for the popn estimate N_H:

$$UCL = \frac{N}{p + (t_{df,.05})(SEratio)} \qquad LCL = \frac{N}{p - (t_{df,.05})(SEratio)}$$

The proportion of all conventional radio-collared caribou in the search area on the day of the survey was determined by two fixed-wing radio-tracking flights conducted on 7 and 17 March 1996. The proportion of caribou with GPS collars in the search area was determined from the satellite position coordinates of all GPS collars in the WCH on 18 March 1996.

I estimated caribou density by dividing the population estimate for the WCH by the size of the WCH's multi-annual herd home range. The herd's home range was estimated using the 100% Minimum Convex Polygon (MCP) method in RangesV home range program (Kenward and Hodder 1996), and was based on six years of radio-telemetry locations collected between April 1991 and March 1997 (M. Wood, PWFWCP, unpublished data).

3.2.2 Typical Group Size

The typical group size (TGS) of woodland caribou groups observed on the survey was calculated by summing the number of animals that each individual caribou was found with, and dividing by the total number seen on the survey:

$$TGS = \Sigma G_i^2 / \Sigma G_i \qquad \text{where } G_i \text{ is the size of the } i\text{th group}$$

Typical group size is the size of group in which the average animal finds itself, and is a more accurate measure of the behaviour of individuals than is the frequency of groups as measured by the mean (Jarman 1974). In some cases, one map location was used to identify multiple groups of caribou that were in close proximity to each other (i.e., between 100-400 metres apart). However, the TGS was calculated using each of the individual groups of caribou observed, regardless of map location.

4.0 RESULTS

We observed 204 woodland caribou including 13 radio-collared caribou on the survey (Figure 2, Table 2, Appendix B). The caribou were distributed along the length of the Wolverine Range, primarily near the height of land and along the ridges on the east side of the range. Few caribou were observed on the western ridges. The sex and age composition of the 204 caribou observed was skewed towards adults, with only 21 calves observed (Table 3). The typical group size (TGS) of caribou observed on this March survey was 7.1 animals (n=204, 42 groups).

At the time of the survey, there were 23 radio-collared caribou in the WCH: 17 with conventional radio-collars, and 6 with GPS collars. Two fixed-wing radio-tracking flights conducted prior to the inventory confirmed all 17 conventional collars were working. An additional radio-collared bull located March 7 was found dead on the subsequent April 11 tracking flight; as the day of death was unknown and may have been prior to this survey, it was excluded from the analyses. The 17 collared animals were located on the Wolverine Range (10 animals in alpine, and 1 in timbered habitat), Germansen Range (alpine 4), Jackfish Hill (timber 1), and Mt. Gillis (alpine 1); the latter 3 areas are all to the south or southwest of the Wolverine Range. Position coordinates obtained from the 6 GPS collars for 18 March 1996 revealed 4

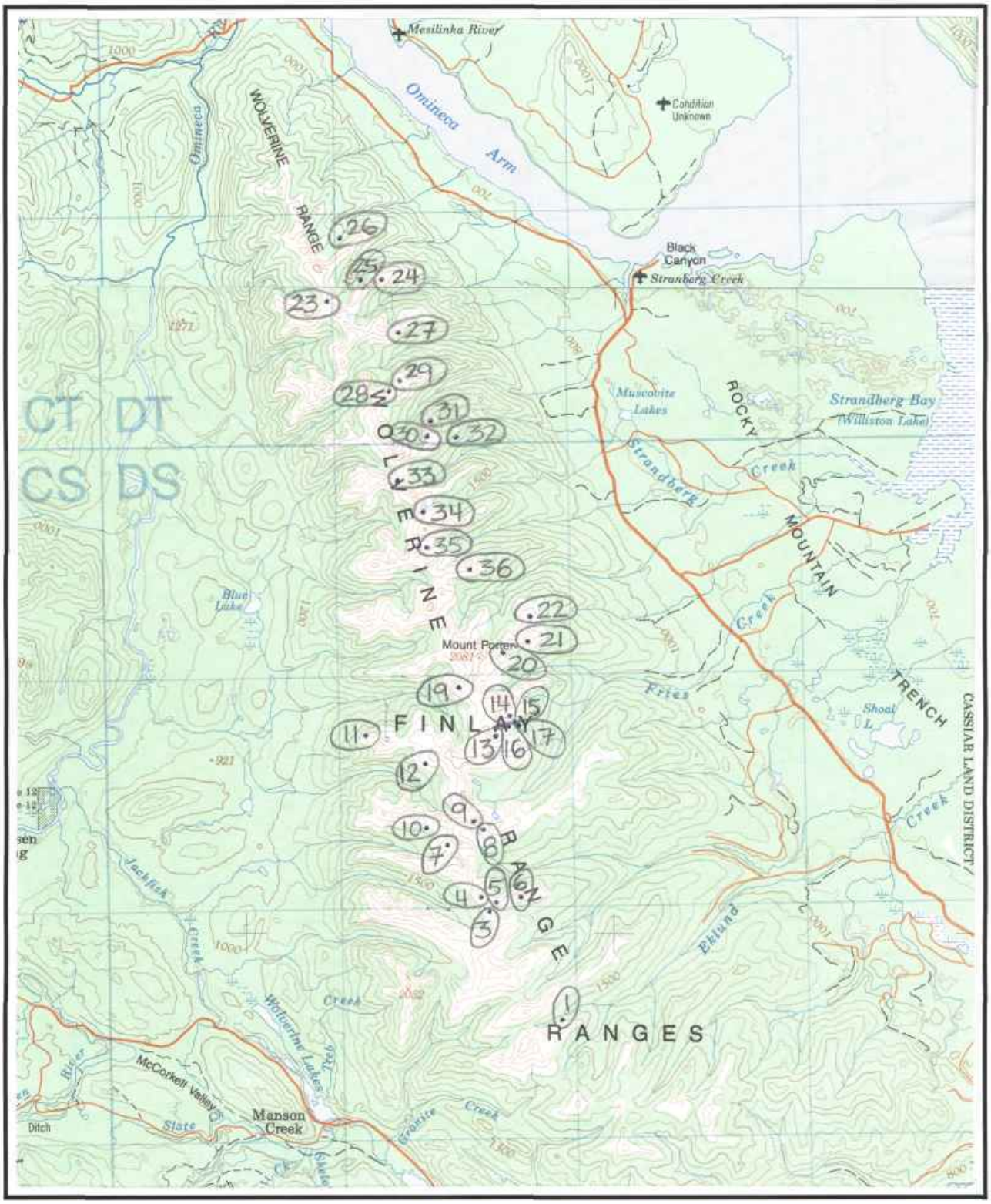

Figure 2. Location of caribou groups observed on the Wolverine Mountain Range, 16 March 1996.

Table 2. Locations' and classifications[2] of woodland caribou groups observed on 16 March 1996 on the Wolverine Mountain Range.

Group#	Location	AdM	AdF	Cm	Cf	Cuc	TOTAL	Collar Observed[3]
1	South End	1					1	
3	Jackfish/Eklund	4					4	F#180
4	Jackfish/Eklund	1	2		2		5	
5	Jackfish/Eklund	3					3	
6	Jackfish/Eklund	3	1				4	
7	Jackfish/Eklund	1	2	1	1		5	
8	Jackfish/Eklund	5					5	
9	Jackfish/Eklund	1	2		1		4	
10	Jackfish/Eklund	1	1	1			3	
11	S. Blue	4					4	
12	S. Blue	1	2	1	1		5	
13	Fries	2	2				4	F #464, F #970
14	Fries		5				5	F #912
15	Fries	3	4		2		9	F #921
16	Fries	1	4		1		6	F #121
17	Fries	2	2				4	
19	Mt. Porter	1	1				2	
20a	Mt. Porter	1	2				3	
20b	Mt. Porter	2	2				4	
21a	Mt. Porter	1	5				6	
21b	Mt. Porter	6					6	
21c	Mt. Porter		1				1	
22a	Mt. Porter	1	3				4	F #1930
22b	Mt. Porter		1				1	
22c	Mt. Porter	2	3				5	
22d	Mt. Porter	1	2				3	
22e	Mt. Porter	2	3		1		6	
Subtotal	SOUTH END	50	50	3	9	0	112	
23	North End		6				6	
24	North End	2	7				9	
25	North End	3					3	
26	North End	2					2	M#544
27	North End	3	15	1		1	20	F#131,F#1900
28	Strandberg		3				3	
29	Strandberg		5		1		6	F #110
30	Strandberg	2	6	1	1		10	F #753
31	Strandberg	3					3	M#650
32	Strandberg		1				1	
33a	Blue/Strandberg	1	2				3	
33b	Blue/Strandberg		6			1	7	F #761
34	Blue/Strandberg	7	4				11	
35	Blue/Strandberg		3		1		4	
36	Blue/Strandberg	1	1	1	1		4	
Subtotal	NORTH END	24	59	3	4	2	92	
TOTAL		74	109	6	13	2	204	

[1] General location on Wolverine Mountain Range using identifiable geographic areas of the range, or creeks draining the west and east sides of the range respectively for reference

2 Ad = adult, C = calf, M/m = male, F/f = female, uc = unclassified

[3] Sex is followed by last three digits of radio-collar frequency; GPS collars are #970, #1900, #1930

Table 3. Sex and age composition of woodland caribou observed on 18 March 1996 on the Wolverine Mountain Range.

Bulls	Cows	Calves	TOTAL	Bulls: 100 Cows	%Bulls[1]	Calves: 100 Cows	%Calves[2]
74	109	21	204	67:100	40%	19:100	10%

[1] %Bulls = % bulls in adult population (n=183).
[2] %Calves = % calves in entire population (n=204).

caribou were on the Wolverine Range (alpine 3, timber 1), while 2 were on the Germansen Range (alpine 1, timber 1).

Thus, of the 15 collared caribou on the Wolverine Range, 13 were in the alpine within the survey area, while 2 were in the adjacent timber. Conventional-collared bull #544 was located in the subalpine timber with the use of radio-telemetry equipment at the end of the survey, while position coordinates obtained from the GPS collar of cow #1920 indicated it to be at 1,300 m, in the timber east of Mt. Porter on the survey date.

Sightability in the alpine on 18 March 1996 was excellent, and all 13 collared caribou known to be in the alpine on the Wolverine Range at the time of the survey were sighted. This rendered the Lincoln-Petersen estimator unnecessary, and resulted in a population estimate of 204 caribou for the Wolverine Mountain Range. Estimating the population size of the entire WCH based on extrapolation of the proportion of collared animals observed on the survey, resulted in an estimate of 361 caribou. Applying 95% confidence intervals (d.f.=22), the WCH population is estimated at between 262 and 580 caribou.

The multi-annual home range of the WCH calculated from six years of radio-telemetry locations is 4,933 km^2 (M. Wood, PWFWCP, unpublished data). Based on the population estimate of 361 animals, the density of caribou within the WCH is 0.07 caribou/km^2.

5.0 DISCUSSION

5.1 Population Size and Density

The population of caribou in the WCH was previously estimated at a minimum of 200 animals based on two surveys conducted in 1989 and 1993 (Wood 1996). The 1989 survey of the Wolverine Range located 214 caribou (Hatler 1989); because no radio-collared animals were present in the WCH prior to 1991, a population estimate corrected for sightability could not be calculated. Poor weather conditions prevailed during the 1993 survey of the Wolverine Range, and only 66 caribou were observed. None of the 12 radio-collared animals present in the WCH were sighted. Although only the Wolverine Range itself was surveyed in March 1996, the favourable weather conditions and availability of radio-collared animals helped us to obtain a slightly more accurate population estimate for the WCH.

The density estimate of 0.07 caribou/km^2 for the WCH is comparable to the mean density calculated by Bergerud (1992) for 24 caribou populations throughout North America where caribou co-exist with wolves of 0.06 km^2. Seip and Cichowski (1996) reported densities between 0.03 and 0.05 caribou/km^2 for 4 woodland caribou herds in B.C. that space out in alpine/subalpine during summer (as the WCH does), and densities of 0.15 to 0.21 caribou/km^2 for the Itcha-Ilgatchuz and Spatzizi herds that aggregate during summer on alpine plateaus.

5.2 Population Composition

The winter calf/cow ratio for woodland caribou observed on this survey was 19 calves per 100 cows (Table 3), the same as that observed in 1993 (Wood 1996) but lower than that observed in 1989 (26 calves: 100 cows; Hatler 1989). As a proportion of the population, the number of calves we observed was 10% (n=204), compared to 12% in 1993 (n=66) and 16% in 1989 (n=214). The proportion of calves observed in other caribou populations within the Williston Reservoir watershed in the mid 1990s ranged between 9% and 17% (with the lowest proportions also observed in 1996): Chase Herd - 17% in 1993 (Wood 1996); Muskwa Ranges - 12% in 1994 (Wood 1994); Misinchinka Ranges - 10% in 1996 (Hengeveld and Wood 1998); and South Peace Arm - 14% in 1995 (Wood 1995), and 9% in 1996 (Wood and Hengeveld 1998). Fall calf recruitment ranged between 10-13% for four other caribou herds in northern British Columbia between 1976 and 1983 (Bergerud and Elliott 1986). Woodland caribou herds are thought to increase when the recruitment of yearlings into the population exceeds 12-15% (Bergerud 1988),

while populations with calf recruitment of 10-12% in March show little change (Bergerud 1974, Bergerud and Elliott 1986).

The bull/cow ratio of 67:100 we observed during the 1996 survey (Table 3) was almost double that observed on both the 1989 and 1993 surveys of 35:100 (Hatler 1989, Wood 1996). High bull/cow ratios have been observed during other winter caribou surveys in the Williston Reservoir watershed: Muskwa Ranges - 102:100 in 1994 (Wood 1994); South Peace Arm - 86:100 in 1995 (Wood 1995); and Misinchinka Ranges - 113:100 in 1996 (Hengeveld and Wood 1998). The bull/cow ratio of ten other caribou herds examined throughout northern British Columbia in the 1970s ranged from 35 to 50 bulls: 100 cows (Bergerud 1980). We observed comparable bull/cow ratios in the Wolverine and Chase Herds in late winter (February/March) 1993 (35:100 and 48:100 respectively; Wood 1996). The proportion of males we observed in the adult population during this survey was 40% (Table 3); Bergerud (1980) reported a mean of 36% for 22 caribou populations throughout North America.

Adult sex ratios in N.A. caribou are usually weighted to females, due primarily to the differential mortality of males, and the greater longevity of females. Low numbers of males in a population may be a result of heavy predation, hunting pressure, winter starvation (males enter the winter in poorer physical condition than females), and/or chronic poor recruitment (Bergerud 1980). If calf recruitment is good and the population has a younger age structure, the resulting higher number of young males in the population will increase the ratio of adult males to females (Bergerud 1980). For four herds in BC with calf recruitment >10%, the adult sex ratio was 49 bulls per 100 cows, while six herds with calf recruitment <10% showed bull/cow ratios of 33:100 (Bergerud 1978). This relationship between high adult mortality and low calf survival, is suggested to be a result of increased predation (Bergerud 1978).

The moderately high bull:cow ratio of 67:100 coupled with the relatively low calf recruitment (10%) we observed during this survey, does not fit the typical relationship observed in caribou populations. I suggest that some cow/calf groups may have been wintering on ranges other than the Wolverine Range, and were therefore missed on the survey. This is supported by the distribution of radio-collared caribou: only 11 of the 19 (58%) collared females were on the Wolverine Range at the time of the survey, while 3 of the 4 (75%) collared males were using the range during winter. If a significant proportion of the cow/calf groups are missed during a survey, the resulting herd composition would be fewer calves, and a higher proportion of bulls in the adult ratio, as we observed during this survey. Spatial segregation of the sexes on winter

ranges has also been observed in several other woodland caribou herds (R. Farnell, Yukon Government Renewable Resources Dept., personal communication). Counts of the Finlayson and other Yukon caribou herds during the rut when caribou are more homogeneously mixed, resulted in higher proportions of bulls observed than on late winter range surveys when caribou were found to be spatially segregated (Yukon Renewable Resources Branch, Whitehorse, YK, unpublished data). Due to the sexual segregation of caribou in late winter in many Yukon woodland caribou herds, biologists there have ceased conducting sample counts in March; only surveys of the entire population or range are conducted at that time of year (R. Farnell, Yukon Government Renewable Resources Dept., personal communication). The lowest calf proportions observed in caribou populations in the Williston watershed were all recorded in 1996 in three different areas (9-10%). Snow depths during the winter of 1996 were noted to be higher than normal in all areas surveyed in the Williston watershed (Ministry of Environment, Lands and Parks, 1996), which may also have influenced the distribution of different age and sex classes of wintering caribou.

5.3 Typical Group Size

This TGS of 7.1 animals observed on this survey was smaller than those observed during February WCH winter range surveys conducted in 1989 (TGS=14.3, n=214, 20 groups; Hatler 1989), and 1993 (TGS=11.2, n=66, 9 groups; Wood 1996). Typical group sizes of radio-collared animals in both the WCH and CCH combined were found to more than double in size between February and March in both 1992 and 1993, from 7.8 ± 3.8 (n=12) to 18.5 ± 9.7 (n=6), and from 7.3 ± 4.5 (n=7) to 17.6 ± 12.6 (n=14) respectively (Wood 1996). In Wood (1996), I suggested there may be a correlation between the larger group sizes observed in March, and the increasing snow depths and densities through late winter. Deeper and/or denser snow may force caribou to concentrate in areas where forage is more accessible, and to increase foraging efficiency (i.e., more animals can dig larger feeding craters). Denser snowpacks also make travel easier for wolves and other predators, and the congregation of caribou into larger groups may be a defence against predation through an increased number of animals (more shared risk) and increased vigilance.

The observed typical group sizes of 7.1 animals on this survey, and of 5.2 animals (n=60, 15 groups) and 7.4 animals (n=181, 32 groups) on surveys of two other caribou herds in March 1996 in the Williston Reservoir watershed (Hengeveld and Wood 1998, Wood and Hengeveld 1998, respectively) were much lower than those observed for radio-collared animals during the March

surveys in previous years (Wood 1996). Snow depths in March 1996 were actually noted to be higher than normal in all areas of the watershed (BC Environment 1996), suggesting that group sizes may not be linked solely to snow depths. Other weather variables can also play important roles: persistent winds scouring alpine slopes can substantially reduce snowpack, rendering formation of larger groups of animals unnecessary.

6.0 RECOMMENDATIONS

To obtain a more accurate population estimate, and to support or refute the hypothesis that some cow/calf groups in the WCH may be spatially segregated from barren cows and adult bulls during winter, additional surveys should be conducted over the winter of 98/99 while radio-collared individuals are still available for mark-resight population estimation. Two surveys should be conducted within the winter of 98/99: a fall rut survey in mid-October, followed by a late winter range survey in early March. All alpine winter ranges within the home range of the WCH should be surveyed, rather than just the Wolverine Range.

Conventional Collars Available for Mark-Resight:

Nine collared caribou were still alive with functioning collars at the end of Phase 2 of the WCH study in March 1997. Forecasting to October 1998, two of these collars will be 6.5 years old, two will be 4.5 years old, and the remaining five will be 2.5 - 3 years old. Lotek LRMT-4 radio-collars have an estimated battery life of 4 years; during the Omineca Caribou Study we found that where caribou outlived their collars, collar life ranged from 3.75 to over 5 years (two caribou had collars still functioning after 5 years at the end of the study). Excluding any mortalities, at least 2, and probably 4 of the 9 radio-collars will likely not be working by October 1998; the remaining 5 collars should still be working in March 1999. In addition, 7 radio-collars placed on WCH caribou in 1997 as part of a different project should still be operational (excluding mortalites) in October 1998 and March 1999.

GPS Collars Available for Mark-Resight:

Eight GPS collars on caribou in the WCH were operational as of February 1998. Four additional animals will be fitted with collars in 1998, thus 12 GPS collars are expected to be operational over the winter of 1998/99.

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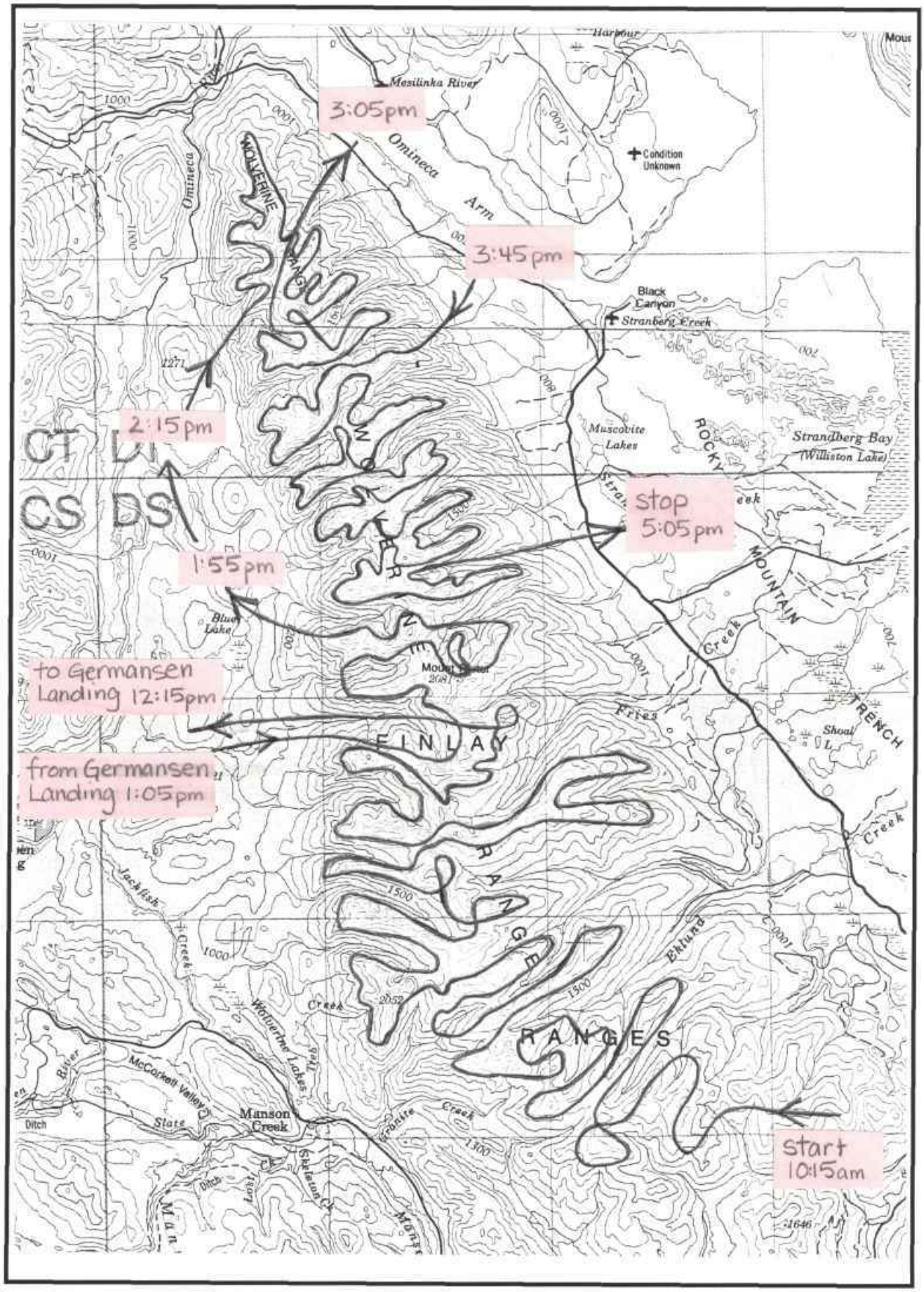
APPENDIX A: SURVEY FLIGHT LINE



APPENDIX B: DETAILED SURVEY DATA

GRP#	TOTAL#	M	F	YRm	YRf	Cm	Cf	Cuc	LAT		LONG			COMMENTS
1	1	1							55	43.05	124	17.06		
2	0													1 male mountain goat observed
3	4	4							55	45.50	124	20.10		1 M collared, # 180
4	5	1	2				2		55	45.90	124	20.50		
5	3	3							55	45.70	124	19.90		
6	4	3	1						55	45.90	124	18.90		1M, 1F w/antlers
7	5	1	2			1	1		55	47.10	124	21.90		1M w/antlers
8	5	5							55	47.50	124	20.40		1 M w/antlers
9	4	1	2				1		55	47.60	124	20.80		1 F w/antlers
10	3	1	1			1			55	47.50	124	22.80		m calf w/antlers
11	4	4							55	49.60	124	25.20		1 M w/antlers
12	5	1	1		1	1	1		55	49.00	124	22.80		1M, 1F w/antlers
13	4	2	2						55	49.60	124	19.90		2F collared: GPS and # 464, 1M w/antlers
14	5		5						55	50.10	124	19.40		1F collared, # 912, groups 14-16 first seen in group 12+
15	9	3	4				2		55	50.00	124	19.30		1F collared, #921
16	6	1	4				1		55	49.90	124	19.50		1F collared, no signal, must be #121, all adults w/antlers
17	4	2	2						55	49.90	124	19.10		
18	0													group counted twice - same as #14
19	2	1	1						55	50.70	124	21.40		
20	3	1	2						55	51.60	124	19.70		1 M w/antlers
	4	2	2						55	51.60	124	19.70		1M, 1F w/antlers
21	6	1	5						55	51.90	124	18.60		1M w/antlers
	6	6							55	51.90	124	18.60		
	1		1						55	51.90	124	18.60		
22	4	1	3						55	52.40	124	18.50		1F w/ GPS collar
	1		1						55	52.40	124	18.50		
	5	2	3						55	52.40	124	18.50		
	3	1	2						55	52.40	124	18.50		
	6	2	3				1		55	52.40	124	18.50		
23	6		6						55	59.70	124	26.90		4F w/antlers
24	9	2	6		1				56	0.20	124	24.70		
25	3	3							56	0.20	124	25.50		no antlers
26	2	2							56	1.25	124	26.50		1M collared, # 544, in trees, needed receiver to locate
27	20	3	15			1		1	55	59.03	124	23.90		2F collared, GPS (loose) and # 131
28	3		3						55	57.70	124	24.20		
29	6		5				1		55	57.90	124	23.80		1F collared# 110
30	10	2	6			1	1		55	56.60	124	22.80		1F collared #753
31	3	3							55	57.00	124	22.50		1M collared #650
32	1		1						55	56.60	124	21.70		
33	3	1	2						55	55.50	124	23.90		
	7		6					1	55	55.50	124	23.90		1F collared #761
34	11	7	4						55	54.80	124	22.90		
35	4		3				1		55	54.00	124	2.70		
36	4		1	1		1	1		55	53.50	124	21.00		F w/brown spot on neck 5"diam.
TOTAL	204	73	107	1	2	6	13	2						