



FINAL REPORT

Fall Population Survey of Woodland Caribou in the Thutade – Upper Finlay River Area of North-central British Columbia

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INTRODUCTION

Purpose in Relation to Outcomes

Woodland caribou (*Rangifer tarandus caribou*) in British Columbia (BC) occur in 52 herds that have been identified, delineated spatially, and monitored on a somewhat regular basis (McNay and Hamilton 2010). However, there are still areas remaining where caribou are of an unknown status or considered to be of “trace occurrence”. One of the most significant areas of trace occurrence is in north-central BC east of Thutade Lake and along the headwaters of the Finlay River (Heard and Vagt 1998, McNay and Hamilton 2010). Although caribou have been hunted by First Nations in this area for decades (McKay 1997), the caribou that occur there have not been identified as a specific herd nor have they been associated with any other previously delineated herd; hence, there is little documentation of the range used or of the status of the caribou population in the area.

The purpose of the work reported here was to conduct an extensive population survey to allow for improved baseline delineation of range used by caribou and an improved baseline tally of caribou numbers. Outcomes of this information include a more explicit rationale for conservation measures provided by the provincial government and First Nations as well as an expression of baseline conditions for use by industrial proponents seeking to develop natural resources in the area. Our objectives therefore were to:

1. Briefly review historic surveys of caribou populations in the area;
2. Conduct a classified total count of caribou and general observations of other ungulates by:
 - a. Recording the location, number, age class, and sex of all caribou observed and
 - b. Recording the location, number, age class, and sex of other species (particularly, mountain goat (*Oreamnus americanus*), stone sheep (*Ovis dalli* ssp. *stonei*) and moose (*Alces alces*)).

Rationale

Since 1999, Government and forest licensees based in the Mackenzie TSA have invested greatly (> \$7 million) in the development of information for the purposes of improving conservation of caribou and their habitat in north-central BC. The work has led to large sets of collected data on habitats and habitat use by caribou, moose, and wolves and comprehensive modeling of seasonal range values for caribou (McNay 2011). The study reported here helps close a gap where information on caribou was historically lacking; the gap having been recognized previously as a priority for management action (McNay and Hamilton 2010). The caribou in the study area have been identified as a valued ecosystem component by Tse Keh Nay First Nations (a collaborative planning team consisting of the Tsay Keh Dene, Takla Lake First Nations, and Kwadacha communities). Caribou are also recognized as a species of concern by the Council on the Status of Endangered Wildlife in Canada (COSEWIC, Thomas and Gray 2002).

STUDY AREAS

The delineated caribou herd areas adjacent to the trace occurrence zone are: the Frog herd to the north, the Rabbit and Gataga herds to the north-east, the Finlay herd to the east, the Chase herd to the south, and the Spatsizi herd to the west (Figure 1) (Heard and Vagt 1998, McNay and Hamilton 2010). The study area is in the general vicinity of Thutade and Amazay Lakes and the Kemess North proposed mine site in north-central BC and north and east as far the current boundary of the Frog caribou herd in the upper Finlay River area overlapping the Muskwa-Kechika Management Area. Hence, the study was considered to occur in, and was named as, the Thutade – Upper Finlay River (TUFR) area. The area is situated within the Cassiar Ranges Ecosection and the Southern Boreal Plateau Ecosection of the Boreal Mountains and Plateaus Ecoregion.

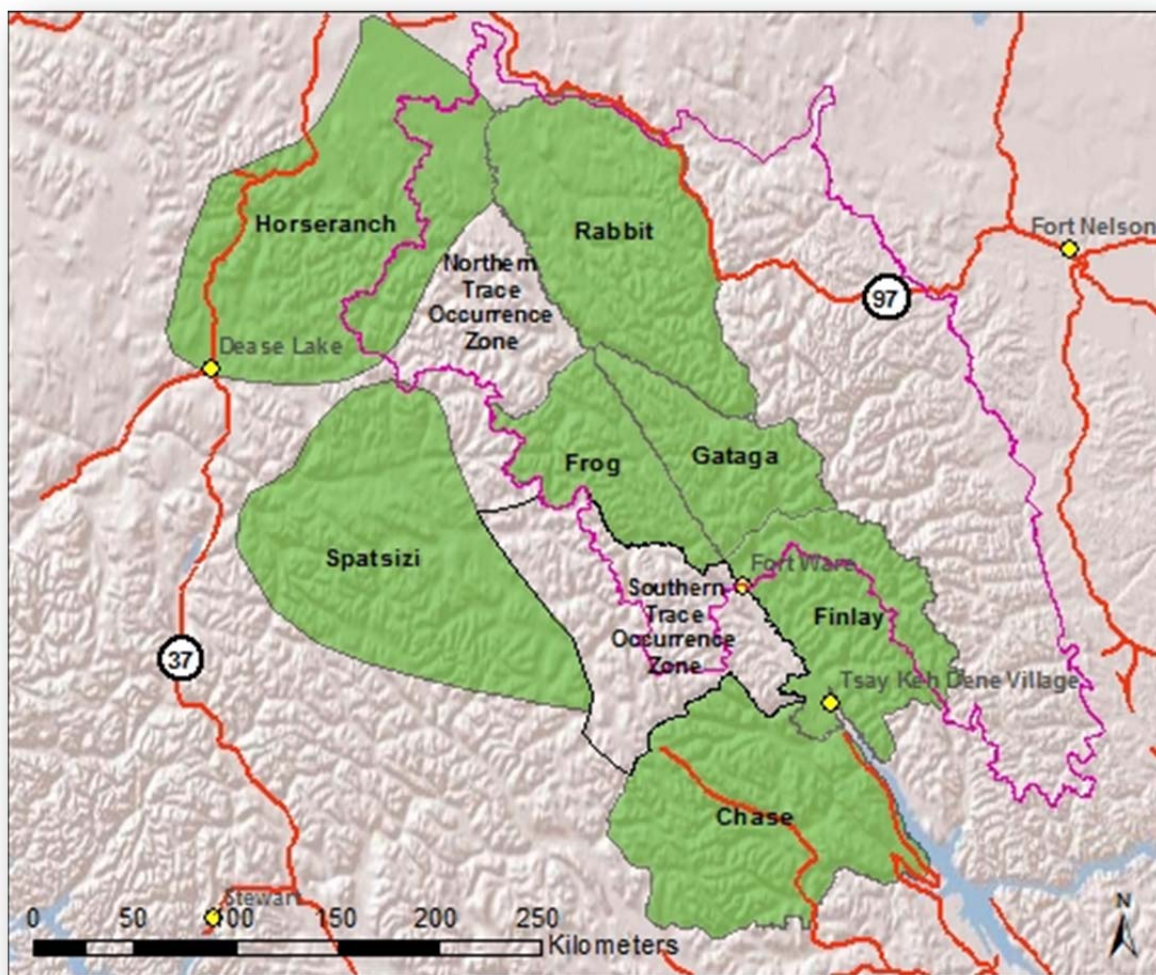


Figure 1. Location of the Thutade – Upper Finlay River study area (i.e., the southern trace occurrence zone) in north-central British Columbia. Purple boundary is the Muskwa Kechika Management Area.

The Cassiar Ranges Ecosection is comprised of rugged mountainous terrain, while the Southern Boreal Plateau Ecosection consists of several deeply incised plateaus with extensive rolling alpine and willow/birch habitats (Demarchi 1996). Biogeoclimatic units in the area are the Spruce-Willow-Birch (SWBmk and mks) in the valley bottoms ranging from approximately 1100 m elevation up to 1300 m where the Alpine-Tundra (ATun) begins and rises to over 2200 m elevation (Meidinger and Pojar 1991). Forest types are dominated by subalpine-fir (*Abies lasiocarpa*) at higher elevations but consist of relatively even distribution of sub-alpine fir, lodgepolepine (*Pinus contorta*), and white spruce (*Picea glauca*) at lower elevations¹. Large portions of the landscape (greater than 35%) are non-forested alpine areas.

METHODS

Historic Surveys

As a protocol for quality assurance in wildlife inventory programs, all previous data collected in the area were compiled and reviewed. Locations of previous caribou sighting were plotted and used by the navigator during the survey. I also used these data to help set context for the results of the survey reported here.

Protocols for Data Collection

Survey techniques and data collection protocols adhered to BC Resource Inventory Standards Committee guidelines for aerial ungulate inventories (British Columbia Ministry of Sustainable Resource Management (BC MSRM 2002). The survey was conducted using a Bell 206 outfitted with bubble windows allowing for increased potential to observe animals. The helicopter pilot was experienced with flying in rugged mountainous terrain, knew the area well, and had conducted the majority of the wildlife surveys in the regional area over the past 20 years. The crew members accompanying the pilots consisted of one navigator and two observers. To ensure efficient sampling, the pilot took a direct flight approach towards and through areas delineated as most likely to contain high-value caribou range. This was facilitated using real-time flight tracking based on digital resultant maps of both high- and low-elevation winter range that had been previously constructed with modeling methods similar to those described by McNay et al. (2006). In general, the specific range attributes searched included:

- Low-elevation winter range characterized by pine forests with terrestrial forage lichen (usually *Cladina* spp. or *Cladonia* spp.) in the forest understory;
- High-elevation winter range characterized by rolling exposed alpine; and,
- High elevation open sub-alpine fir forests.

Before the survey was conducted, priority areas were delineated and the study area was stratified into survey units. The units were generally constructed such that individual polygons of high-elevation habitat were enclosed and grouped so that the entire unit

¹ Province of BC, Vegetation Resources Information (VRI) home page at <http://www.for.gov.bc.ca/hts/vri/index.html> , cover types evaluated using VRI from Land and Resource Data Warehouse (LRDW) found at <http://www.lrdw.ca/> .

could be completed on one tank (or less) of heli fuel. Boundaries of the units tended to follow rivers or other topographic features allowing for such delineation.

The survey was undertaken according to level two classifications standards (BC MSRM 2002). During the survey, if multiple groups of animals were encountered in relatively close proximity to each other they were considered separate groups if they were >150 m apart, occurred in different habitats, or displayed different group characteristics or behaviours. Meta data collected for each animal observation included: project name, study area, crew name, survey and census type, date, general location, and general weather conditions. Detailed information for each observation was made on: animal identification if marked, species, observation time, group number, group size, gender (if possible), age class, activities, location type, UTM co-ordinates, habitat type, approximate sinking depth in snow (if present), snow cover, and other marked animals in the group (if present).

The navigator used a laptop computer with ArcView® (Environmental Systems Research Institute, Redlands, California) and DNR Garmin² to navigate during the survey and record the flight path. Aircraft speed was held between 60-160 km/h depending on relative visibility and the type of terrain encountered. Height-above-ground ranged from 50-200 m depending on openness, tree density, and safety considerations. During the aerial survey digital photographs were taken and subsequently cross referenced with spatial data (such as GPS locations or UTM coordinates) to provide a geo-referenced perspective of range conditions that were encountered.

Protocols for Data Management

All data forms were previously approved by the Ministry of Environment and resulting digital data sets were produced in a format, and with appropriate codes, suitable for incorporation into the Wildlife Species Inventory³ (WSI) database.

Collected data were managed digitally and original data sheets archived for safety purposes. Observations were entered into a relational database (Wildlife Information Management System: WIMS, Terra Cognita Software Systems Inc., Prince George, BC) and analyses were conducted using standard statistical techniques (Zar 1984) available in the SAS statistical package (SAS Institute Inc., Cary, NC). Digital data have been backed-up, archived for safety against accidental data loss, and provided on digital media to the client.

RESULTS

Historic Surveys

Reconnaissance-level surveys were conducted in parts of the trace occurrence zone in 1990, 1991, 2003, 2007, and 2009 (Figure 2). All but the surveys in 2009 were

² <http://www.dnr.state.mn.us/mis/gis/tools/arcview/extensions/DNRGarmin/DNRGarmin.html>

³ See <http://www.env.gov.bc.ca/wildlife/wsi/index.htm>

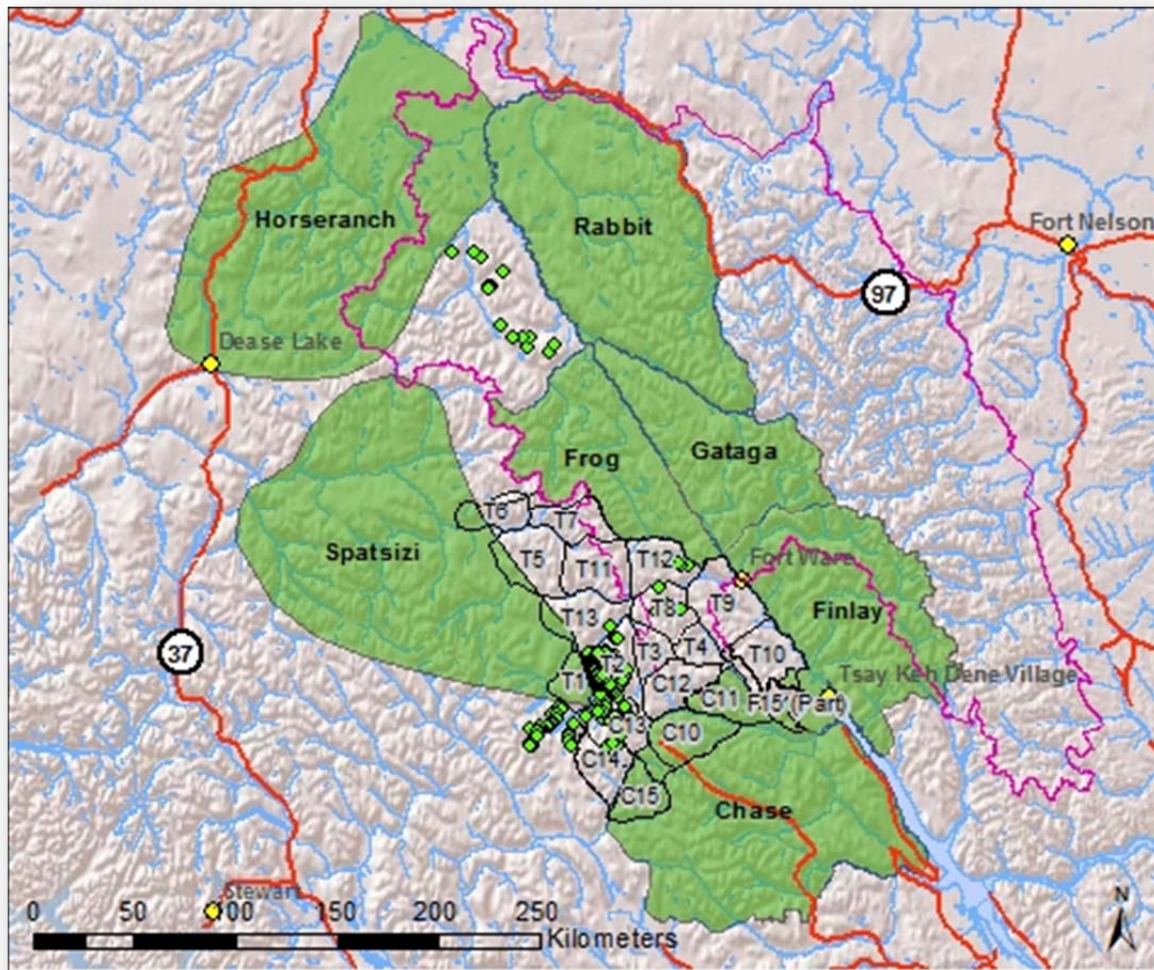


Figure 2. Distribution of caribou (green symbols) observed during reconnaissance-level surveys conducted from 1990 to 2009, in and around the Thutade – Upper Finlay River study area in north-central British Columbia. Purple boundary is the Muskwa Kechika Management Area.

restricted in extent and associated with assessment of potential impacts from a copper/gold mine in the south eastern part of the study area. The surveys in 2009 occurred in the northern and south western parts of the trace occurrence zone. In that year observations of caribou were made coincidentally as part of a sheep population survey (Pers. Comm.; Conrad Thiessen, BC Ministry of Environment, Fort St. John; February 11, 2011) and as part of an exploratory search for caribou (MacDonald et al. 2009).

I estimated that a minimum of 301 caribou were likely to have been observed in the trace occurrence zone over the years during which reconnaissance surveys were conducted (Table 1):

- 80 caribou in 2009 in survey unit T12 (MacDonald et al. 2009);

- 125 caribou in 2009 north of the study area (Unpubl. Data; Conrad Thiessen, BC Ministry of Environment, Fort St. John; BC);
- 48 caribou in 1991 in unit T2 (Unpubl. Data; Chris Ritchie, BC Ministry of Environment, Prince George; BC);
- 41 caribou in 1991 west of the study area (Unpubl. Data; Chris Ritchie, BC Ministry of Environment, Prince George; BC); and
- 7 caribou in 1990 in survey unit C13 (Unpubl. Data; Chris Ritchie, BC Ministry of Environment, Prince George; BC).

Of that total, 135 caribou would have been within three of the survey units designated for the 2010 survey: 7 in C13, 48 in T02, and 80 in T12.

Table 1. Number of caribou observed during reconnaissance-level surveys conducted from 1990 to 2009, in and around the Thutade – Upper Finlay River study area in north-central British Columbia.

Source	Year	Month	Total Caribou	Maximum Daily Total Caribou	Survey Unit	Comment
MacDonald	2009	Apr	80 ^a	80	T12	same day; spatially distinct
Thiessen	2009	Feb-Mar	125 ^a	50	north	5 different days; spatially distinct
McNay	2009	Mar	22 ^b	22	C11	Same day; spatially distinct
Turney	2007	Jun	52	8	T02	11 different days; spatially indistinct
Turney	2005	Feb	15	15	T02	same day; estimated from tracks
Turney	2005	Apr	15	15	T02	3 days; estimated from tracks
Turney	2003	Sep	17	9	T02	3 days; estimated from tracks
Ritchie	1991	Sep	5	5	C13	same day; spatially distinct
			48 ^a	48	T02	same day; spatially distinct
			41 ^a	41	west	same day; spatially distinct
Ritchie	1990	Oct	7 ^a	7	C13	same day; spatially distinct
			15	15	T02	same day; spatially distinct

a – used as an estimate of the minimum number of caribou occupying the specific survey unit. See Figure 2 for survey unit locations.

b – not used towards the estimate of total caribou in the “trace occurrence” zone since the unit is wholly within the Chase herd area (see Figure 2).

2010 Survey

The 2010 survey was conducted in 11 of the 22 predetermined survey units; four of which could be only partially sampled due to poor weather conditions (i.e., C15, C11, T04, and T08) (Figure 3). The remaining units were not surveyed due to insufficient funds. Caribou were observed in all units surveyed except three (i.e., C11, T04, and T08) of the four partially surveyed units, although fresh caribou tracks were observed in T04 (Figure 3). Furthermore, in a previous survey, 22 caribou were observed in C11 (Table 1) leaving only T08 as the only survey unit having no recorded observations of caribou.

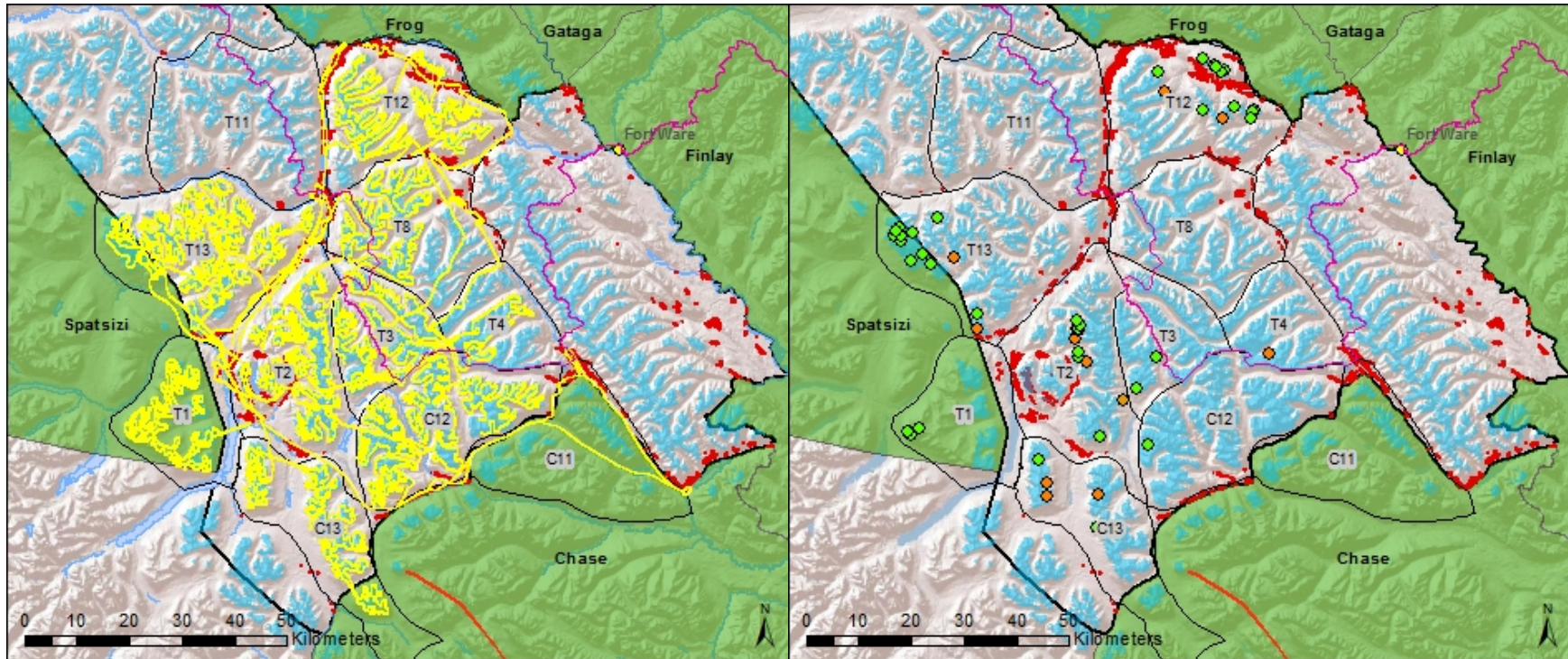


Figure 3. Flight lines (A) and the location of caribou (green dots) or caribou tracks (orange dots) (B) observed during an aerial survey conducted in and around the Thutade – Upper Finlay River study area in north-central British Columbia, October 2010. Purple boundary is the Muskwa Kechika Management Area.

In total, 470 caribou were observed during the survey, 60 of which were calf caribou; 13% of the observed population. 216 of the observed caribou were within the trace occurrence zone and the remaining caribou were within either the Chase or Spatsizi herd areas (i.e., 13 in C15, 22 in T01, and 232 of the 246 in T13). In most cases, the number of caribou found in 2010 exceeded the number of caribou observed in survey units where there had been a previous reconnaissance-level survey conducted; the exception being C13 (compare Table 1 and **Error! Not a valid bookmark self-reference.**). Caribou densities within the trace occurrence zone ranged from a low of 5/1000km² in C13, to a high of 127/1000km² in T12. The average density of caribou observed within the trace occurrence zone was 42/1000km².

Table 2. Number and density of caribou observed during an aerial survey conducted in and around the Thutade – Upper Finlay River study area in north-central British Columbia, October 2010.

Survey Unit	Area km ²	Total Caribou in Unit	Density #/1000km ²	Total Caribou in Zone	Density in Zone #/1000km ²	Number of Calves	Calves as % of Total
C11 [^]	679	0	NA	0	NA	0	
C12	686	16	23	16	23	2	0.13
C13 [^]	613	3	5	3	5	1	0.33
C15 [^]	550	13	NA	13	NA	0	0.00
T01 [^]	478	22	46	0	0	3	0.14
T02	732	64	87	64	87	16	0.25
T03	391	14	36	14	36	3	0.21
T04 [*]	333	0	NA	0	NA	0	
T08 [*]	637	0	NA	0	NA	0	
T12	727	92	127	92	127	11	0.12
T13 [^]	875	246	281	14	16	24	0.10
Total	6701	470	Average 86	216	Average 42	60	0.13

[^]Polygon partially or wholly outside trace occurrence zone (figures 2 and 3)

^{*}Polygon partially sampled due to poor weather (figure 3)

Photo record

Selected photos from the inventory are provided in Appendix A.

DISCUSSION AND MANAGEMENT IMPLICATIONS

The observations collected here demonstrate a spatial connection at least between the Spatsizi and Chase caribou herds during the fall season. Survey units T1, T13, T02, T03, C12, C13, C11, and C15 are all known to be occupied by caribou. However, although C10 was not surveyed in this project, it has been flown at least twice with no caribou observed; albeit those surveys were conducted in late winter (Unpubl. Data, Wildlife Infometrics Inc., Mackenzie, BC). Also, even though 22 caribou have been known to use C11, it has been surveyed at least two other times in late winter when no caribou have been observed (Unpubl. Data, Wildlife Infometrics Inc., Mackenzie, BC). Caribou that use the area to the south of these units usually travel southeast to their winter range (McNay et al. 2009). We are not aware of seasonal movement patterns within the Spatsizi herd or how these patterns in either herd dictate how caribou use the study area.

T12 would at first appear to be an extension of the Frog herd area because no caribou were found within T08, the western part of T12, and the eastern part of T13 indicating a potential segregation between the Frog and the Chase and Spatsizi herds. Conversely, the survey units in which no caribou were observed could be used during summer months by caribou from one herd or another or by caribou that are independent of the currently delineated herds.

A total of 216 caribou were observed in the trace occurrence zone; 27 of the 52 herds in BC (52%) have fewer caribou (McNay and Hamilton 2010) yet caribou in the trace occurrence zone have no formal delineation hence no formal conservation measures. In addition, the average density (#/1000km²) of caribou observed in the trace occurrence zone was 42; 28 of BC's 52 caribou herds have the same or lower density (McNay and Hamilton 2010). Without understanding movement patterns or delineating herd boundaries for these animals, we cannot make conclusive statements about baseline ecological conditions or the need for conservation measures. Mining activity in the area has been intensive in the last 2 decades, there is currently an initiative to expand mining at Kemess, and it is unclear what potential risk this may pose to caribou in the study area. The data and information gathered in this survey indicate the significance of caribou in the area to the provincial population of caribou and hence a clear need for further work to appropriately delineate herd areas within which these caribou and their habitat can be properly managed.

LITERATURE CITED

- BC MSRM (Ministry of Sustainable Resource Management). 2002. Aerial-based Inventory Methods for Selected Ungulates: Bison, Mountain Goat, Mountain Sheep, Moose, Elk, Deer and Caribou. Standards for Components of British Columbia's Biodiversity No. 32. Version 2. BC Resources Inventory Committee, Ministry of Sustainable Resource Management, Victoria, British Columbia, Canada. 91 pp.
- Demarchi, D. A. 1996. An introduction to the ecoregions of British Columbia. BC Ministry of Environment, Lands and Parks. Victoria, BC.
- Heard, D.C. and K.L. Vagt. 1998. Caribou in British Columbia: a 1996 status report. *Rangifer*, Special Issue No. 10:117-123.
- McKay, B. 1997. Valleau Creek caribou study. Unpubl. Ms., British Columbia Ministry of Water, Land, and Air Protection, Prince George, B.C. 26pp.
- McNay, R.S. 2011. An expert-based modeling approach to inform strategic and operational land management decisions for the recovery of woodland caribou. Pp. 131-152 In Perera, A.H., D.A. Drew, and C. Johnson (Eds.) *Expert knowledge and its application in landscape ecology*. Springer, New York.
- R.S. McNay, R. Sulyma, and L. Giguere. 2009. Abundance and distribution of woodland caribou in the Wolverine and Chase recovery plan areas. Wildlife Infometrics Inc. Report No. 319. Wildlife Infometrics Inc., Mackenzie, British Columbia, Canada.
- McNay, R.S., B.G. Marcot, V. Brumovsky, and R. Ellis. 2006. A Bayesian approach to evaluating habitat suitability for woodland caribou in north-central British Columbia. *Can. J. For. Res.* 36:3117-3133.
- Meidinger, D., and J. Pojar. 1991. *Ecosystems of British Columbia*. BC Ministry Of Forests. Special Report Series 6. Victoria BC.
- Thomas, D. C., and D. R. Gray. 2002. Update COSEWIC status report on the woodland caribou *Rangifer tarandus caribou* in Canada. Pages 1-98 in COSEWIC assessment and update status report on the woodland caribou *Rangifer tarandus caribou* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa, ON.
- Zar, J. H. 1984. *Biostatistical analysis*. 2nd edition. Prentice-hall, Englewood Cliffs, New Jersey.

APPENDIX A. SELECTED PHOTOGRAPHS FROM THE SURVEY



T01 – windswept ridge typical of high-value winter range.



T02 – Thutade Lake looking south, Amazay Lake is in the foreground.



T13 - Remains of a hunter harvested caribou bull.



T13 – A group of caribou on high-valued winter range.



T02 – Looking north across the Finlay River into T13.



T08 – Steep mountains typical of lower value winter range.



Near the convergence of T08, T12, and T09 showing high-value, low-elevation winter range