SHEEP SURVEYS OF THE LIARD RANGE, NAHANNI RANGE AND RAM PLATEAU IN THE MACKENZIE MOUNTAINS, AUGUST 2003

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ABSTRACT

We conducted aerial surveys for Dall's sheep (*Ovis dalli dalli*) in the Liard Range, the Nahanni Range and the Ram Plateau of the Mackenzie Mountains in August 2003 to document sheep distribution and lamb crop. Sheep were classified from the air into four sex/age classes: lambs, yearlings, ewes, and rams. We used digital photographs taken of all groups to verify sex/age classifications. We used a handheld global positioning system to track the survey flight paths and record the locations of all wildlife seen. We classified 122, 68, and 15 Dall's sheep in the Liard Range, Nahanni Range, and Ram Plateau, respectively. We estimated the number of lambs per 100 ewes at 59.6, 45.0, and 60.0 for the Liard Range, Nahanni Range, and Ram Plateau, respectively. Pooled across the 3 areas, we estimated 53.6 lambs per 100 ewes. We estimated the number of rams per 100 ewes at 69.2, 22.5, and 120.0 for the Liard Range, Nahanni Range, and Ram Plateau, respectively. Pooled across the 3 areas, we estimated 52.6 rams per 100 ewes. Other wildlife observed during the surveys included 5 mountain goats (*Oreamnos americanus*), 5 black bears (*Ursus americanus*), 2 grizzly bears (*Urctos arctos*), 2 moose (*Alces alces*), 1 bison (*Bison bison athabascae*), and 1 golden eagle (*Áquila chrysáetos*). We also observed a group of 12 Dall's sheep rams on the upper Kotaneelee range.

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INTRODUCTION

Historically, limited research has been conducted on Dall's sheep in the Northwest Territories (Veitch et al. 1998). The most extensive sheep research was conducted by the Canadian Wildlife Service from 1966-1974 when seasonal range use, distribution and demography were reported (Simmons 1982a, 1982b; Simmons et al. 1984). In the 1980s there were some limited surveys conducted by the Government of the Northwest Territories to document numbers, distribution, and provide estimates of productivity (Ferguson et al. 1985, Case 1989). The non-resident Dall's sheep harvest of the Mackenzie Mountains has been monitored since 1965 (Latour and MacLean 1994, Larter and Allaire 2003). Since 1995, the observations of non-resident hunters have been collected on a voluntary basis, and these data have been used to estimate demographic measures of the Mackenzie Mountain Dall's sheep population (Larter and Allaire 2003). Since 1997, annual classification surveys have been conducted in the Katherine Creek and Palmer Lake areas of the Sahtu (Alasdair Veitch, personal communication).

Reports from the Nahanni Butte Outfitters (Zone D/0T/02; Fig. 1) in the southern portion of the Mackenzie Mountains indicated that the lamb crop in 2003 was substantially higher than crops observed in previous years (Cam Lancaster, personal communication). Nahanni Butte Outfitters expressed concern that EnCana Corporation's proposed Fort Liard Regional Gravity Survey would adversely affect lamb survival. The proposed gravity survey area of *ca.* 5400 km^2, located in the southern portion of the Mackenzie Mountains of SW Northwest Territories and SE Yukon Territory, covered an extensive portion of their outfitting zone and was originally scheduled to begin in June 2003.

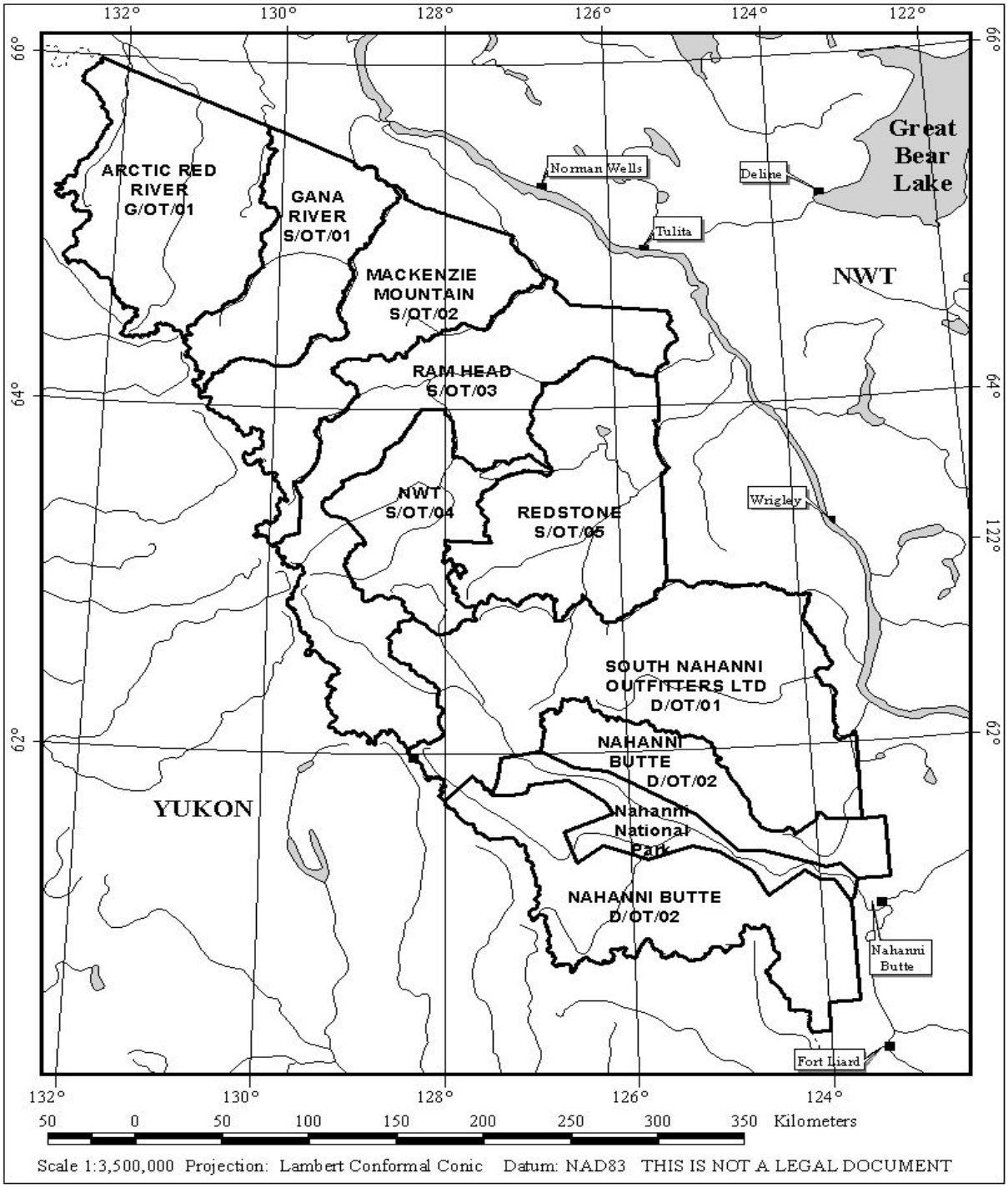

Figure 1. The outfitting zones of the Mackenzie Mountains, Northwest Territories.

Frid (2003) documented flight responses of Dall's sheep in response to aircraft distance, elevation in relation to sheep, and direct line of sight between the sheep and aircraft. Flight responses were reduced as elevation in relation to sheep decreased and the line of sight was disrupted.

In August we conducted aerial surveys for Dall's sheep in the Liard Range, Nahanni Range and the Ram Plateau. We wanted to fly these surveys following Frid's (2003) suggestions, and to document the distribution of sheep and the lamb crop over as much of the sheep range in Dehcho region as possible to: 1) see if the reported high lamb crop was limited to one range or another, and 2) use distribution information in discussions with industry conducting the Fort Liard Regional Gravity Survey in order to reduce possible impacts of their survey on the sheep population.

STUDY AREA

The study area is located in the southeast portion of the Mackenzie Mountains. The areas surveyed include the Ram Plateau, the Liard and Nahanni Ranges (Fig. 2). The area contains a wide variety of habitat types because of its complexity of geographical formations, which are a result of deformation and uplift, and wide variations in altitude and soil conditions (Simmons 1982a, 1982b). Currently, Dall's sheep populations in the area surveyed remain relatively isolated, as there is a limited degree of man-made disturbance.

Alpine areas are the most important areas for Dall's sheep use. Alpine areas vary widely between mountain ranges. The Liard Range is essentially a single jagged mountain range that is adjacent to the Liard River. The terrain rapidly drops on either side of the range into deep valleys. The east side is generally steeper with numerous cliffs protruding from it. The west side slopes into the Kotaneelee Valley, with deep ravines that occur along the length of the range (Case 1989). The west side of the range is generally better for locating sheep due to the availability of more vegetation (Clay Lancaster personal communication).

The Nahanni Range is similar to the Liard Range in topography. The east side is very steep but the west side is more intricate than the Liard Range. The Nahanni Range ravines are more irregularly spaced than the Liard Range. The limestone geology of the Nahanni Range has resulted in an abundance of caves in the range, some of which are very large and deep. Case (1989) describes a cave that extended 40-45m inside from its mouth. Sheep are often associated with these caves, using them both for shelter and for protection from predators (Clay Lancaster personal communication). This association with caves causes some

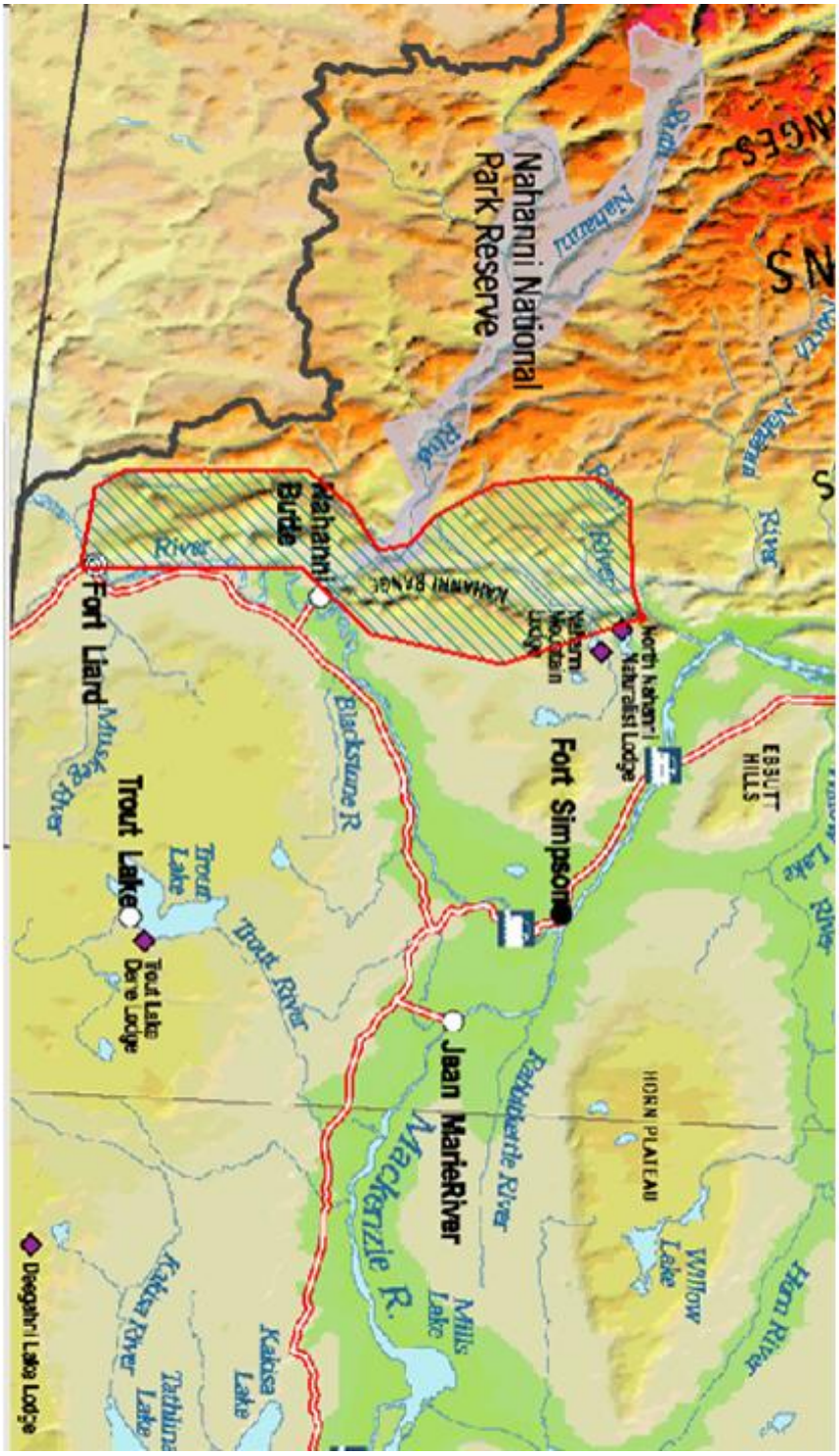

Figure 2. General surveyed areas are indicated by cross-hatching.

sheep to be lost from the sight of aerial surveyors. There are two large lakes that bisect the northern end of the Nahanni Range: Little Doctor and Cli Lakes. Sheep are rarely found north of Little Doctor Lake.

The Ram Plateau is quite different from either the Liard or Nahanni Ranges. It is a gently rolling plateau with low growth vegetation dominated by ericaceous shrubs, dwarf birch (*Betula glandulosa*), and subalpine fir (*Abies lasiocarpa*). At higher elevations it is virtually treeless, while at lower elevations black spruce (*Picea mariana*), willow (*Salix* spp.), and red osier dogwood (*Cornus stolonifera*) are abundant (Daniel Allaire personal communication). The Ram River borders the northern portion of the plateau. The valleys on the northern portion of the Ram Plateau are steep, sheer, and rugged providing habitat more suitable for the mountain goats that are resident there. As one moves toward the south and east, the terrain becomes more rolling and the ravines shallower. The eastern and southern portions of the plateaus are used by moose (*Alces alces*) and woodland caribou (*Rangifer tarandus caribou*). There is a single narrow (10m wide), high elevation pass between the east and west sides of the Ram Plateau. The west side of the Ram Plateau is more suitable habitat for Dall's sheep. Like the Nahanni Range, this side of the plateau has an abundance of caves.

METHODS

The surveys were conducted by A-star helicopter. We used a spaghetti type survey technique, with the flight path sweeping from one side of the range apex to the other, keeping a height of at least *ca.* 100-150m over the terrain. We believed this flight pattern would be the most efficient way to cover the ranges, reduce the probability of counting sheep herds twice, and limit animal stress. All flight paths were tracked using a Garmin 12XL global positioning system (GPS) that recorded the location of the helicopter every 15 seconds.

The crew consisted of a pilot, observer/recorder, and observer. We recorded waypoints for all wildlife observed with the Garmin 12XL. We classified sheep, with the help of 7X35 binoculars, into ewes, lambs, yearlings, and rams based upon size and horn characteristics. We took photos of all groups of sheep with a digital camera equipped with 7X digital zoom. We verified our classifications from these digital images. For larger groups it was often necessary to circle once to ensure adequate photo coverage. If circling was required, we maintained or increased the altitude of the helicopter above the terrain.

We mapped all survey tracks and observation waypoints using Ozi Explorer 3.9 software. Flight lines and observation waypoints from previous surveys (Case 1989) were digitized using the same software so that comparisons could be made. All classification data were entered into Microsoft Excel spreadsheets to calculate numbers of lambs and rams per 100 ewes. Survey flights were conducted on 14 August for the Liard Range, 24 August for the Nahanni Range, and 28 August for the Ram Plateau. This was the first time a Dall's sheep survey had been conducted on the Ram Plateau.

RESULTS

Survey results are summarized in Table 1. We observed and classified 122 Dall's sheep on the Liard Range, and estimated 59.6 lambs and 69.2 rams per 100 ewes. Two grizzly bears, 2 black bears, 2 moose and 1 bison were also observed. A group of 12 Dall's sheep rams was observed on the upper Kotaneelee range while commuting to the Liard Range survey. We observed and classified 68 Dall's sheep on the Nahanni Range, and estimated 45.0 lambs and 22.5 rams per 100 ewes. One black bear and a golden eagle were also observed. We observed and classified 15 Dall's sheep in the Ram Plateau, and estimated 60.0 lambs and 120.0 rams per 100 ewes. Five Mountain goats and 2 black bears were also observed.

Flight lines and locations of Dall's sheep observed in the 3 areas are shown (Fig. 3-5).

Location	Ewes	Lambs	Yearlings	Rams	Total	Lamb/100 Ewes	Ram/100 Ewes
Liard	52	31	3	36	122	59.6	69.2
Nahanni	40	18	1	9	68	45.0	22.5
Ram Plateau	5	3	1	6	15	60.0	120.0
Kotaneelee[1]	0	0	0	12	12	n/a	n/a
Total	97	52	5	63	217	53.6	52.6

Table 1. Dall's sheep observations broken down by sex/age class and survey area, and the estimated number of lambs and rams per 100 ewes. [1] The Kotaneelee Range was not surveyed, however Dall's sheep were observed while commuting across part of the range.

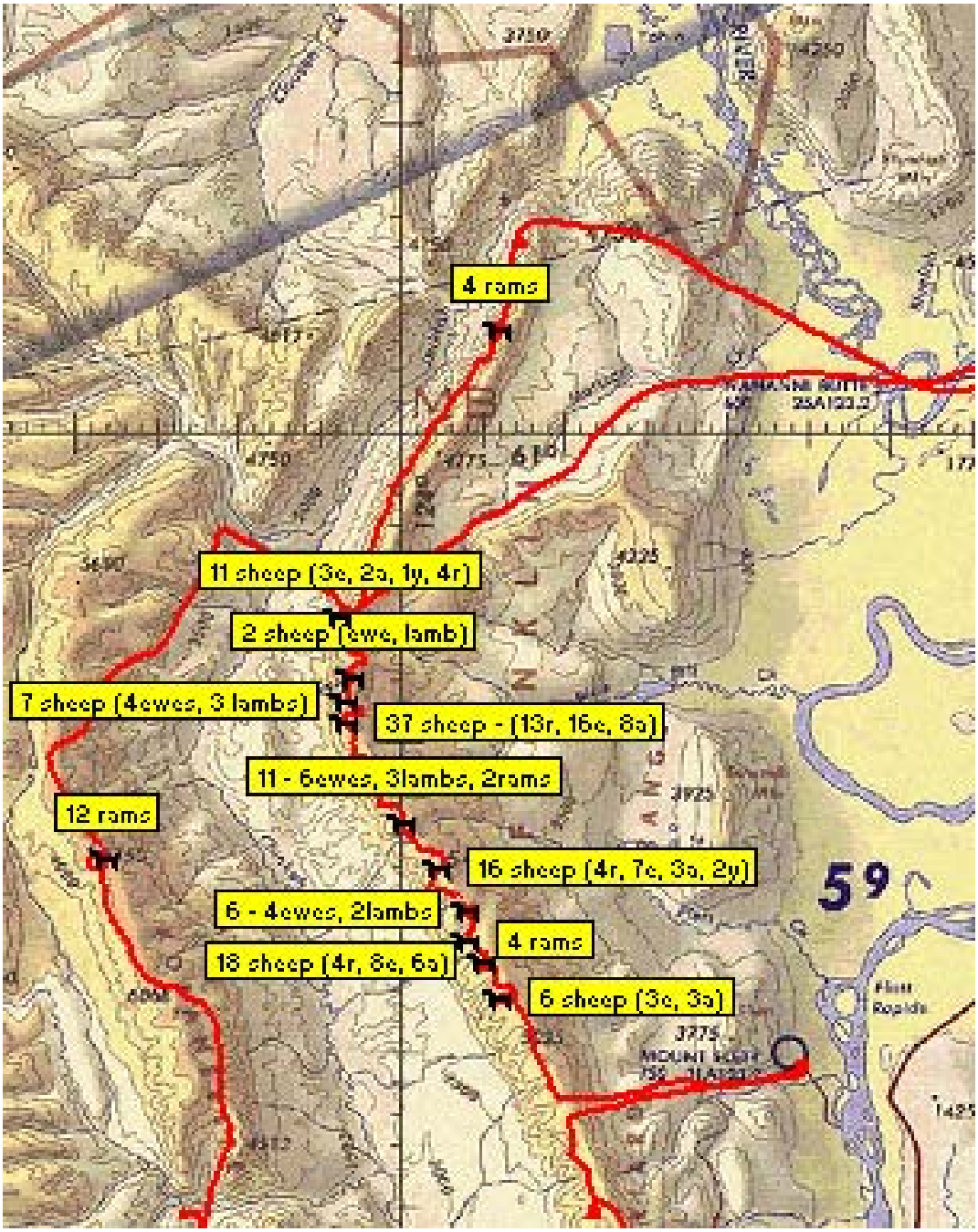

Figure 3. Liard Range flight lines and Dall's sheep locations, 14 August 2003.

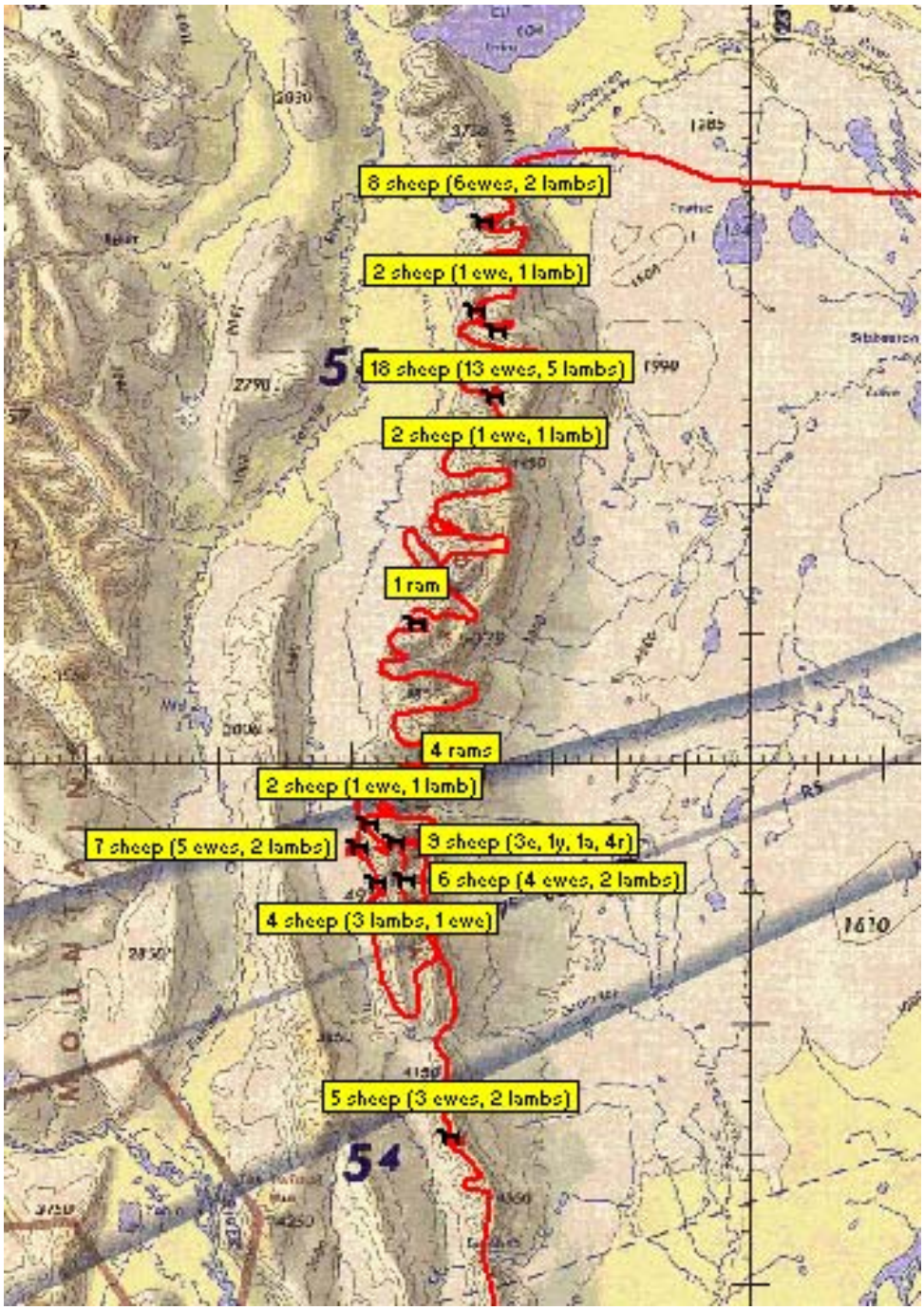

Figure 4. Nahanni Range flight lines and Dall's sheep locations, 24 August 2003.

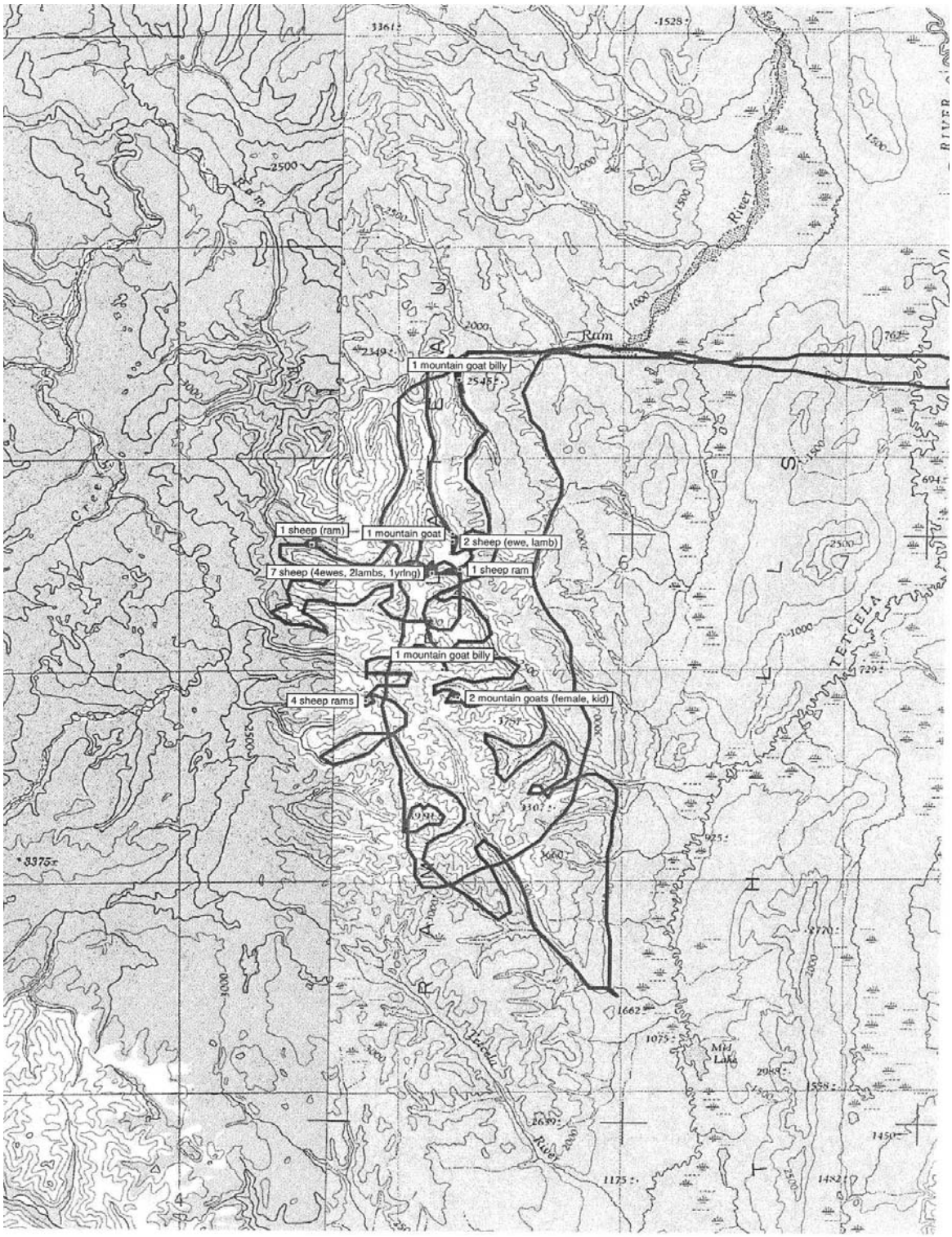

Figure 5. Ram Plateau flight lines with Dall's sheep and mountain goat locations, 28 August 2003.

DISCUSSION

The numbers of lambs per 100 ewes we report (45-60) are not outstanding compared to the results of surveys elsewhere in the Mackenzie Mountains (Table 2). However, all of these surveys were conducted in mid-June, shortly after lambing, when the number of lambs per 100 ewes is highest. Lamb numbers drop over the course of the summer due to mortality.

Location	Lambs/100 nursery sheep	Year(s)	Reference
Kotaneelee Range	66	1984	Ferguson et al. 1985
Liard Range	60	1980	Case 1989
Palmer Lake	64.1 (range 17-94)[1]	1997-2003	Veitch and Popko unpublished data
Katherine Creek	69.9 (range 52-83)[1]	1997-2003	Veitch and Popko unpublished data

Table 2. The number of lambs per 100 nursery sheep reported previously in various areas of the Mackenzie Mountains. [1] A mean number of lambs per 100 ewes reported over 6-year period.

The number of lambs per 100 ewes calculated from non-resident hunter observations, pooled across the Mackenzie Mountains from 1995 to 2003, ranged from 44-60, averaged 56 and was 50 in 2003 (Larter and Allaire 2004). These data are based upon hunter observations pooled from July through early September. Our surveys were flown in mid-late August. One August 2003 survey of an un-hunted sheep population in the Richardson Mountains reported 28 lambs per 100 nursery sheep (John Nagy unpublished data cited in Larter and Allaire 2004).

Case (1989) (pp. 19) reported 21-37 lambs per 100 nursery sheep from June surveys of the southern Mackenzie Mountains during 1986-88. This was believed to be more in the "normal" range, versus the 60 reported for 1984. Based upon outfitter observations, and our survey results, the prevalence of lambs we reported in the Liard Range, from mid-late August 2003, is high. The 45 lambs per 100 ewes reported for the Nahanni Range is lower than the

59.6 of the Liard range. This may be a result of sheep using caves and not being observed, but the ratio is still substantially higher than the only previously reported "underestimate" of 7 lambs per 100 nursery sheep in the Nahanni Range (Case 1989). Our observations indicate a large number of calves entering fall 2003.

Veitch and Popko (unpublished data) reported the mean number of rams per 100 ewes as 61.4 (range 33-80) for the Palmer Lake area and 63.8 (range 38-82) for the Katherine Creek area in the central Mackenzie Mountains from 1997-2003. The number of rams per 100 ewes reported for the Liard Range is similar, 69.2, and based upon a similar number of individuals classified. For the Nahanni Range we reported 22.5 rams per 100 ewes, and for the Ram Plateau we reported 120.0 rams per 100 ewes, however sample sizes are lower. The number of individuals classified was 68 for the Nahanni Range and 15 for the Ram Plateau. The number of rams per 100 ewes calculated from non-resident hunter observations, pooled across the Mackenzie Mountains from 1995 to 2003, has ranged from 55-90 and averaged 83 (Larter and Allaire 2004). These data are based upon observations from July through early September, and are from areas where sport hunters have historically expected to find rams. Therefore, these numbers may be biased to the high side. No comparative data exists from previous surveys of the Liard or Nahanni Ranges (Case 1989).

The overall distribution of sheep, and areas where nursery groups predominated, was generally similar to that reported for surveys of the Liard and Nahanni Ranges in the 1980s by Case (1989). However, we did not observe sheep quite as far south on either range, nor did we observe nursery groups of as many individuals as did Case (1989). Case (1989) observed 3 groups of over 30 individuals in surveys conducted immediately after lambing in June. We

observed 1 group of over 30 individuals in surveys conducted in mid-late August. Lamb mortality, and shifts in distribution, could have affected our results. The Ram Plateau has never been surveyed before. We observed only 15 sheep in 5 groups in this relatively geographically isolated plateau. Five mountain goats were also observed on the Ram Plateau.

The results of the Liard and Nahanni Range surveys had immediate practical applicability. We used the sheep distribution to direct the timing of the Fort Liard Gravity Survey being conducted for the EnCana Corporation by Excel Geophysics. We delineated areas with concentrations of sheep nursery groups in consultation with survey personnel. The EnCana survey avoided these areas, and a buffer around them, until mid-September. We also delineated areas of known ram concentrations outside of our survey area based upon information provided by local outfitters (Clay and Cam Lancaster personal communication). These areas were surveyed during the last half of September to mitigate post-rut stress.

EnCana Corporation provided NCL with the opportunity to participate in a practice flight prior to the start of the Gravity Survey so that he could understand the survey methodology. NCL provided input to survey personnel on how and where to be on the lookout for various wildlife species, and how to limit or reduce possible harassment. EnCana Corporation provided the Dehcho Regional Biologist with weekly updates indicating the areas of the gravity survey that had been completed, and the locations of wildlife observed.

ACKNOWLEDGMENTS

We thank Fire Operations for providing the helicopter support that made these surveys possible. Peter Newman and Dawson Somerville provided skilful helicopter piloting. We would like to thank the operators and guides of the Nahanni Butte Outfitters for providing us with information about the current year's lamb crop and sheep distribution prior to our surveys. We thank employees of EnCana Corporation and Excel Geophysics Inc. for their willingness to listen to our concerns regarding wildlife harassment and the disruption of sport hunting operations. We acknowledge their modifications of the proposed survey timing to mitigate potential wildlife harassment, and thank them for providing us with continual survey updates, and the locations of all wildlife observed during their Gravity Survey. We thank Alasdair Veitch, Manager of Wildlife Management in the Sahtu, for providing us with comparative data.

PERSONAL COMMUNICATIONS

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Clay Lancaster, Nahanni Butte Outfitters, Hudson Hope, BC.

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