MOUNTAIN GOAT SURVEY
FLAT RIVER AREA,
WESTERN MACKENZIE MOUNTAINS,
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ABSTRACT

We conducted an aerial survey for mountain goat (*Oreamnos americanus*) along the Flat River, western Mackenzie Mountains in September 2004 to document goat numbers and distribution. Goats were classified from the air into four sex/age classes: kids, yearlings, nannies, and billies. We used a handheld global positioning system to track the survey flight paths and record the locations of all wildlife seen. We had planned to survey three areas in the vicinity of the Flat River, north of Seaplane Lake, covering a total area of *ca*. 1000 km^2. Unfortunately, inclement weather limited the survey to an area of mountains (*ca*. 400 km^2) on the western side of the Flat River valley and to areas mostly below 2000 m elevation because of snow cover. We observed 90 mountain goat, 31 billies, 28 nannies, 20 kids and 7 yearlings; 4 goats were unclassified. We estimated 71.4 kids/100 nannies, 25.0 yearlings/100 nannies, and 111 billies/100 nannies. Other wildlife observed during the survey included 2 Dall's sheep (*Ovis dalli*), and 20 moose (*Alces alces gigas*).

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INTRODUCTION

There has been limited and sporadic work done with mountain goats (*Oreamnos americanus*) in the Northwest Territories (Johnson 1977; Veitch et al. 2002). A single aerial survey of mountain goats was conducted, in July 1983, in the Logan Mountains area of the Yukon Territory and Northwest Territories (Fig. 1). A total of 70 goats including 15 kids were observed; 25 adults and 5 kids in the Northwest Territories portion of the survey and 30 adults and 10 kids in the Yukon Territory portion of the survey (report on file with RWED).

A recent publication on the status of mountain goats in the Northwest Territories estimated that goats occupied a range of *ca*. 12,500 km^2 in the Mackenzie Mountains and estimated a population of 768-989 animals (Veitch et al. 2002). These estimates were based upon interviews with the licence holders of the 8 members of the Association of Mackenzie Mountain Outfitters, whom operate exclusive hunting zones in the Mackenzie Mountains (Fig. 2), and staff from Nahanni National Park Reserve. Based on their information at least some mountain goats were resident in 5 of the 8 outfitter zones; Ram Head (S/OT/03), NWT (S/OT/04), Redstone (S/OT/05), South Nahanni (D/OT/01), and Nahanni Butte (D/OT/02) and in Nahanni National Park Reserve. The majority (43-47%) of the estimated mountain goat population of the Northwest Territories resided within the boundaries of the Nahanni Butte outfitting zone (D/0T/02).

Mountain goats are harvested by both non-resident and resident hunters, however hunting pressure is low; 56 mountain goat billies have been harvested by non-resident hunters from 1991 through 2003 (Veitch et al. 2002; Larter and Allaire 2004). Up until 2001, the

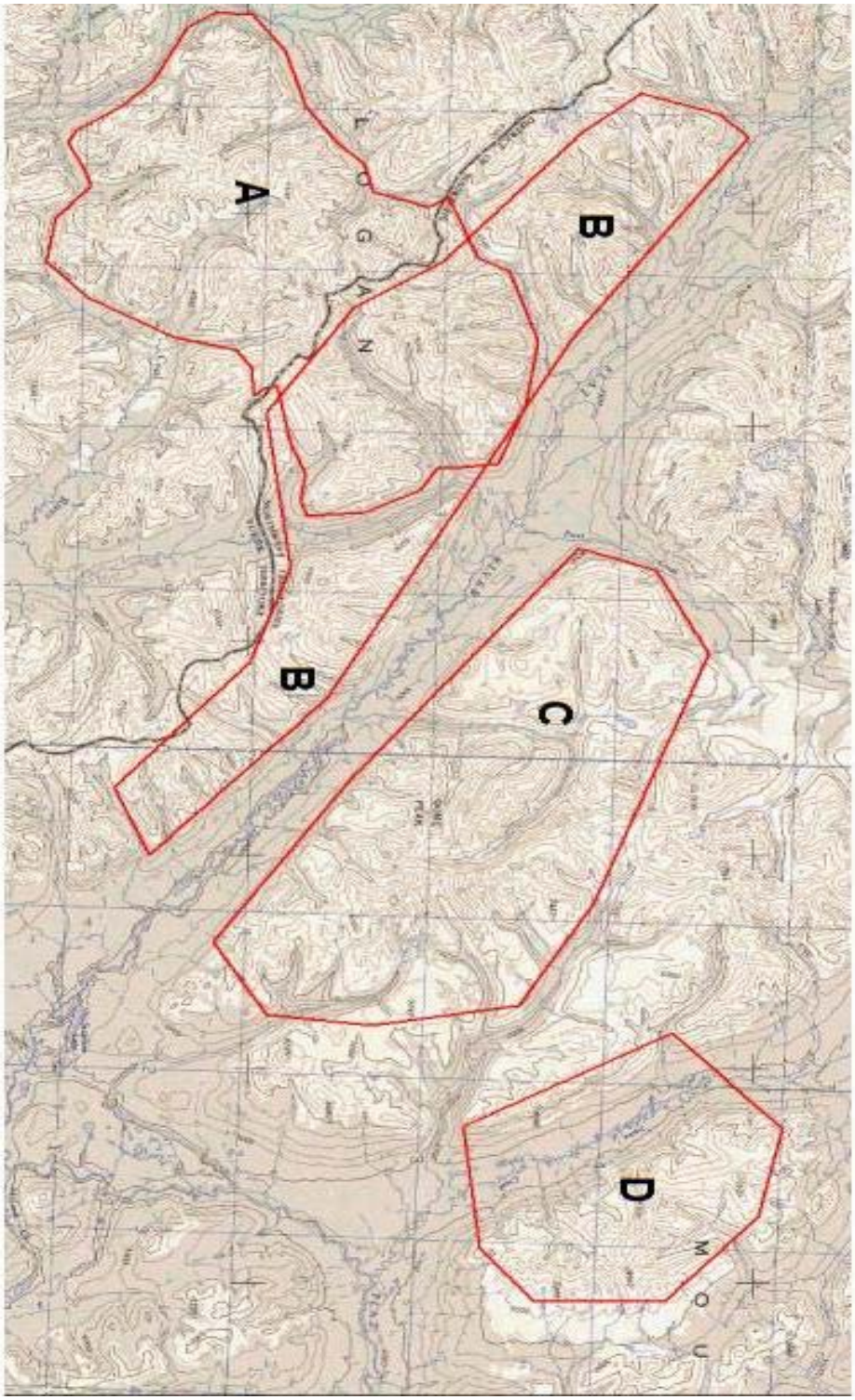

Figure 1. The area surveyed in 1983 (A) and the proposed survey area for 2004 (B-D).

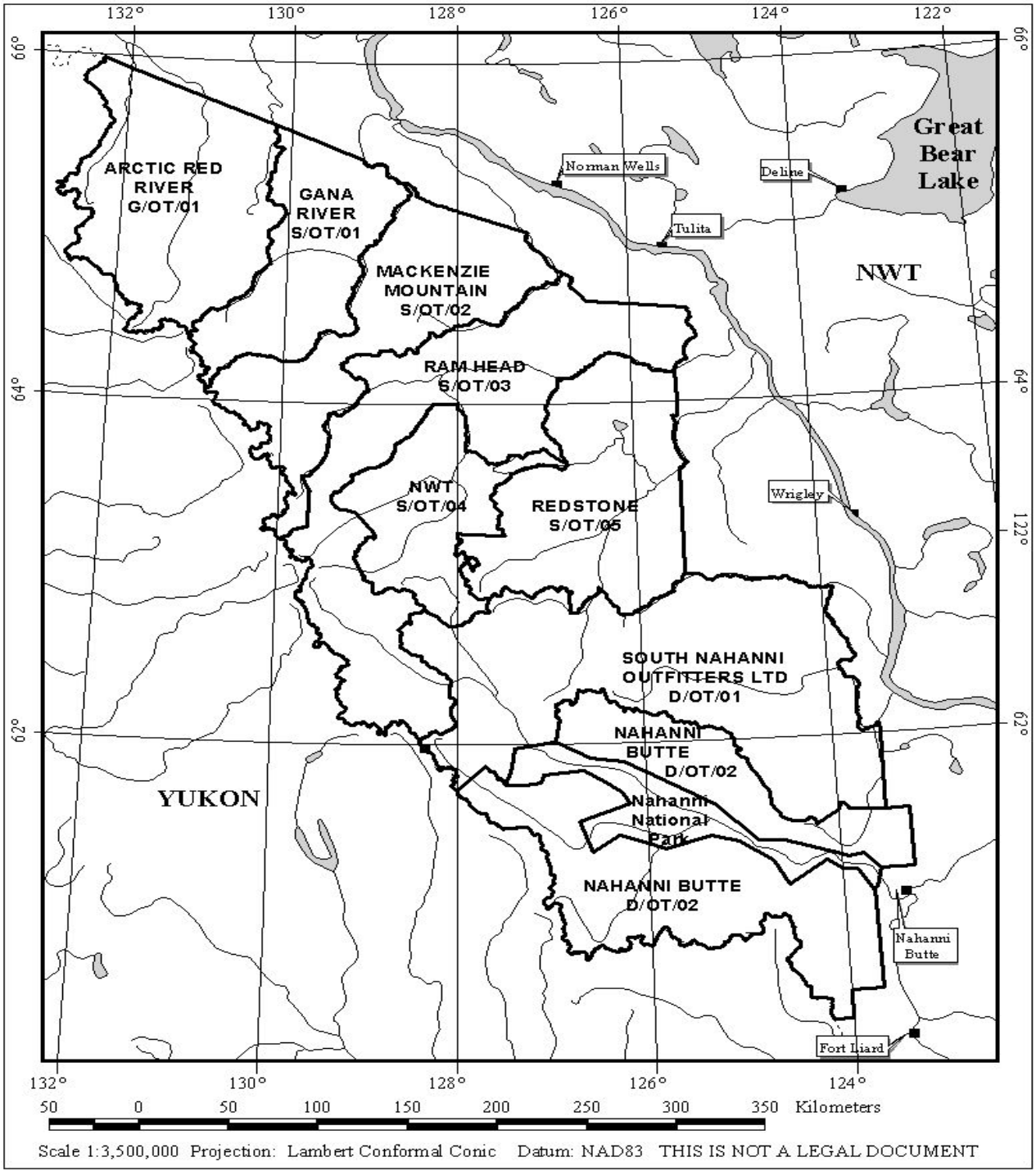

Figure 2. The 8 outfitting zones in the Mackenzie Mountains

majority of these goats were harvested in the Ram Head outfitter zone with the remaining goats harvested in the South Nahanni and Nahanni Butte outfitter zones (Fig. 2). Since 2001, goats have only been harvested in the latter 2 outfitter zones (Larter and Allaire 2004). There has been no reported resident harvest of goats and there is no record of any subsistence harvest by hunters in the Deh Cho, Sahtu, or Gwich'in areas since the closure of the Tungsten mine in 1987 (Veitch et al. 2002).

The Department of Resources, Wildlife & Economic Development (RWED) has solicited voluntary wildlife observation forms from the outfitters and their clients since 1995 and has been publishing the results in their annual Mackenzie Mountain Harvest Study reports (eg. Larter and Allaire 2004). Observations by the clients and guides of the Nahanni Butte Outfitters during the 2003 and 2004 hunting season indicated that there were substantial numbers of mountain goats in and around the Flat River valley mostly to the north of Seaplane Lake (Cam and Clay Lancaster personal communication). Because the goats in this area are believed to represent a substantial proportion of the mountain goat population of the Northwest Territories (Veitch et al. 2002) and are now subject to some annual harvesting pressure, the Nahanni Butte Outfitters and the Deh Cho RWED office were interested in conducting an aerial survey to try and get an estimate of both numbers and the sex/age composition of mountain goats in this area. Additionally, because of the paucity of information on mountain goats in the Deh Cho, a survey would provide some useful information for the Deh Cho land use planning process. The Nahanni Butte Outfitters offered to provide the Deh Cho Regional Biologist with helicopter time near the end of their hunting season so that an aerial survey could be conducted along the Flat River valley north of Seaplane Lake. This report documents the survey findings.

STUDY AREA

The survey area is located in the far western portion of the Mackenzie Mountains along the Flat River valley, adjacent to the Northwest Territories-Yukon Territory boarder (Fig. 1). The Mackenzie Mountains are irregular mountain masses comprised primarily of limestone, dolomite and shale that have been heavily eroded and produced extensive unstable rubble slopes with numerous cliffs and steep canyons (Simmons 1982). In this rugged, remote area the mountains rise to as much as 2500 m from the 700-900 m Flat River valley floor, but generally the mountain tops average *ca*. 2100 m in elevation. The more vegetated subalpine areas are generally found below *ca*. 1800 m. The Flat River runs in a northwesterly to southeasterly direction, with tributary streams coming in from the north and south. Mountain goats are the predominant wildlife in these mountainous areas while moose frequent the valleys. Dall's sheep (*Ovis dalli*) and mountain caribou (*Rangifer tarandus caribou*) (especially during August) are also commonly found in the area. Wolves (*Canis lupus*), and grizzly bears (*Ursus arctos*), frequent the study area (Clay Lancaster personal communication).

METHODS

The survey was conducted with an R-44 Robertson helicopter. We employed a spaghetti type survey method, flying up and down alpine valleys thoroughly searching peaks, ridgelines, cliff faces, and cirque basins (Fig. 3). We covered an area of the mountains, to the west of the Flat River and north of Seaplane Lake, which the outfitters had previously determined as prime mountain goat range (Fig. 1 area B). Part of this survey area overlapped the area flown on the only other previous survey in 1983 (Fig. 1 area A). Heavy snow cover, from the 2000 m elevation, limited the possibility of observing goats and consequently the aircraft generally flew at less than the 2000 m elevation so that we could concentrate our efforts below that elevation.

The flight path was tracked using a Garmin GPSmap76S global positioning system which collected a location every 5 seconds. The location of wildlife was entered as a waypoint into a Garmin 12XL. The flight track and all waypoints were downloaded into a computer using Ozi Explorer 3.9 software for data analysis. We planned to take digital photographs of any large groups in order to verify sex and age classifications, however no large groups were observed during the survey.

Observations were made by the pilot (Barry Scott), rear-seat observer and sex/age classifier (Clay Lancaster), and observer/recorder (NL). The rear-seat observer used 10x32 binoculars to assist in sex/age classifications. The survey data were entered into an excel spreadsheet so ratios of kids: 100 nannies, yearlings:100 nannies, and billies:100 nannies could be calculated.

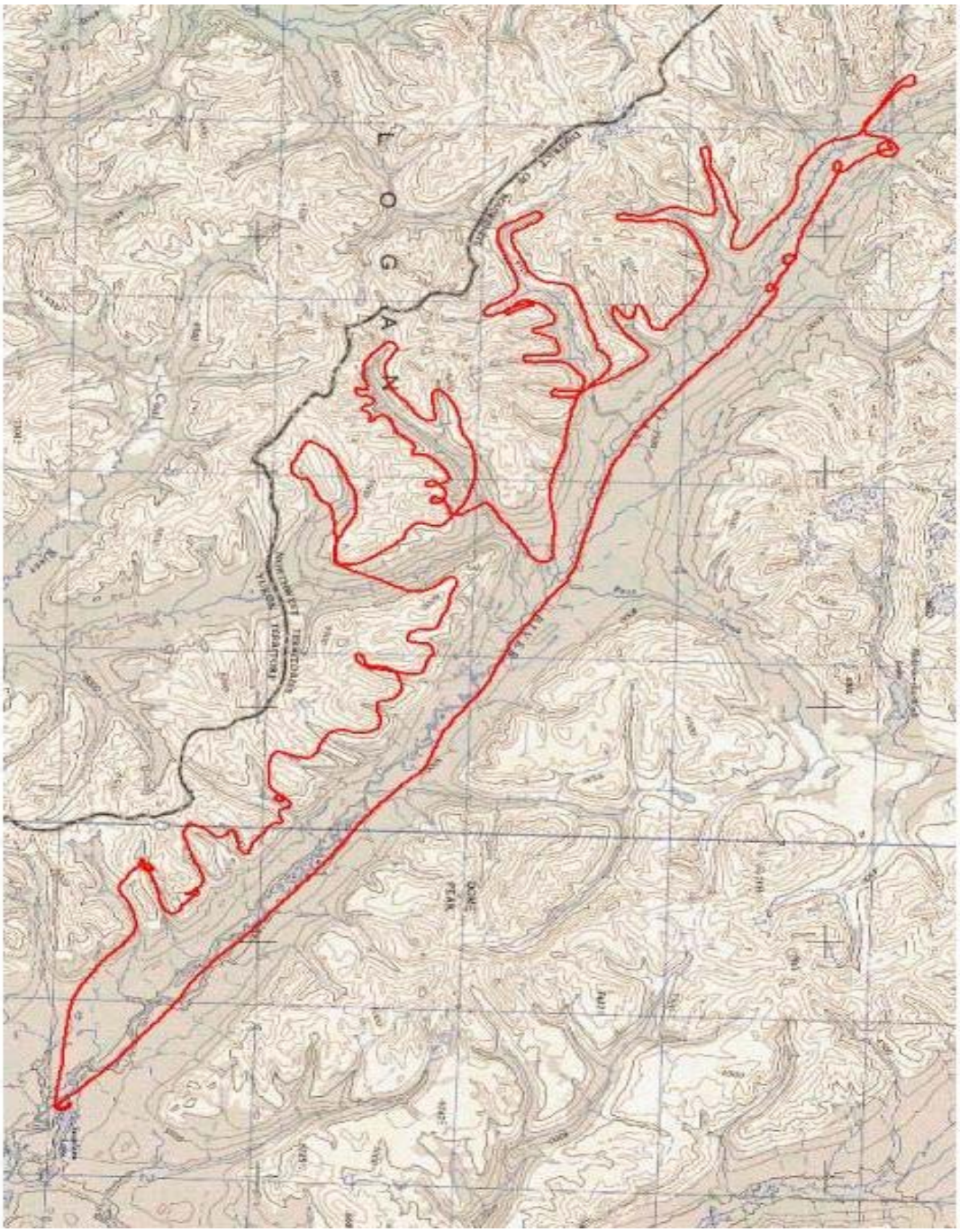

Figure 3. The flight line of the 2004 survey.

RESULTS

The survey was conducted in the early evening (1845 to 2050 hours) of 14 September 2004. This was the only time during a 6-day period when the weather permitted any attempt of surveying the mountainous terrain. The survey flight originated from Seaplane Lake (61^{o} 25'N x 126^{o} 49'W) and lasted a total of 2:05 of which 1:34, covering a flight line of 234 km, was spent surveying for goats in mountain habitat. We had hoped to survey additional mountain goat range to the east of Flat River (Fig. 1, areas C and D) but inclement weather did not permit surveying these areas. Areas B, C, and D represented 419 km^2, 429 km^2, and 206 km^2, respectively. Area A, flown in 1983 represented 448 km^2.

Although it was relatively cloudless, sunny and $+12^{o}C$ at the start of the survey, this did not provide for ideal survey conditions. The bright sunlight and limited cloud cover, combined with the freshly fallen snow at the 2000 m level, made observing animals above that elevation very difficult. Animals found below that elevation were generally easy to observe and classify and search efforts were more concentrated on these lower elevations.

We observed a total of 90 mountain goats and were unable to classify only 4 animals (Fig. 4). We classified 31 billies, 28 nannies, 20 kids, and 7 yearlings. We estimated 71.4 kids:100 nannies, 25.0 yearlings:100 nannies, and 111 billies:100 nannies. We also observed 2 ram Dall's sheep in the mountains and 20 moose on the return leg down the Flat River to Seaplane Lake (Appendix 1).

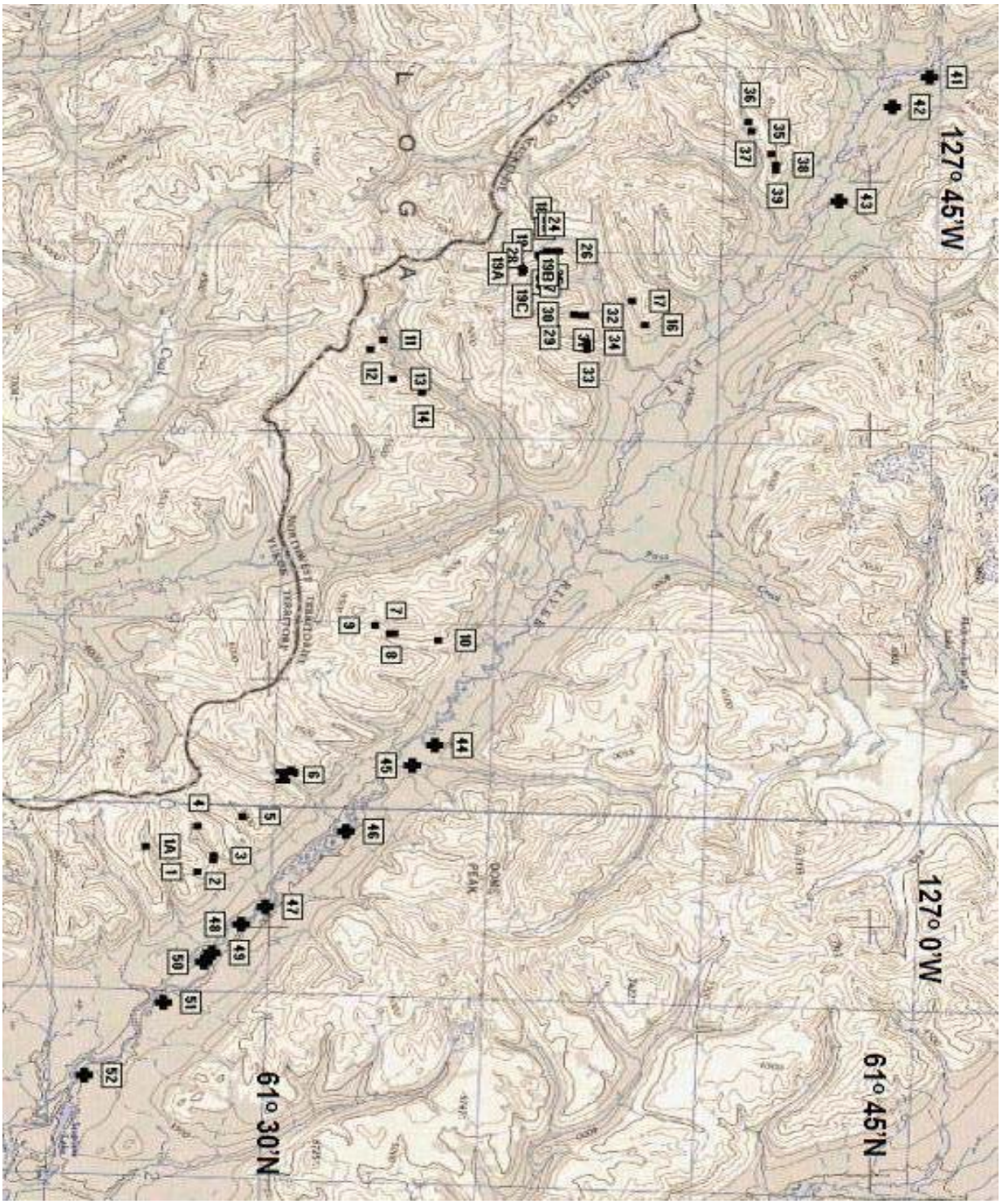

Figure 4. The locations and waypoints of all groups of animals observed in the survey. Goats – closed squares, moose - crosses, Dall's sheep - animal icon.

DISCUSSION

For 2001, Veitch et al. (2002) estimated the Northwest Territories mountain goat population was 768-989 of which 351-424 were estimated to reside in the Nahanni Butte (D/OT/02) outfitter zone of the Deh Cho. These estimates were based upon limited observations and anecdotal information. Based upon reports of the Nahhani Butte Outfitters we suspected that the number of goats in this area was near the upper bound of the estimate generated by Veitch et al. (2002). Unfortunately, we were unable to thoroughly survey the entire area where mountain goats are reportedly concentrated, and survey conditions were not ideal. However, our results indicated that there was a very healthy kid crop, that there had been an increase in number and the area occupied by goats when compared to the results of the 1983 survey, and that the estimated upper bound of 424 goats generated by Veitch et al. (2002) for 2001 was quite conceivable.

The 71.4 kids/100 nannies estimated from the survey is high and could have been affected by the limited number of nanny groups that we observed. However, Larter and Allaire (2004) estimated 55.2 and 61.5 kids:100 nannies in 2002 and 2003, respectively, based upon voluntary hunter observation records from this outfitting zone. All of these recent estimates are substantially higher than those generated from the 1983 survey which estimated 27.3 kids:100 adults over the entire area, but only 20 kids:100 adults for the area surveyed in the Northwest Territories. In the northeast corner of Yellowstone National Park, where mountain goats are considered an introduced exotic, and it is claimed that populations are increasing near the intrinsic rate of increase (Lemke 2004; Caughley and Birch 1971), recruitment ratios (reported as kids/100 older goats) have been highly variable ranging from 13-48/100. Even given the

inclusion of at least some adult males in these ratios, the levels still fall short of the ones we report for kids:100 adult female goats from this survey and estimated by hunter observations for 2002 and 2003 for the same general area. There are no comparable data available on yearlings:100 nannies.

Possibly over the past few years conditions have been such to permit high production and survival of mountain goat kids. There has certainly been evidence of recent successive years of high Dall's sheep lamb crops (Larter and Allaire unpublished data; Clay and Cam Lancaster personal communication; Dallas Gertner personal communication) and a noticeably high mountain caribou calf crop this year (Dallas Gertner personal communication).

We saw the highest density of goats in the same area as that reported in the 1983 survey (Fig. 4), but numbers were greater; 30 goats (25 adults and 5 kids) were observed in 1983 while 43 goats (33 adults and 10 kids) were seen in 2004 even under less than ideal survey conditions. In 1983 no goats were observed in mountains to the southeast of this relatively high density area, and the survey did not cover mountains to the northwest. This year goats were observed on mountains to the northwest and southeast of the relatively high density area.

Sightability, or the lack thereof, can be a significant factor in counting mountain goats. Aerial surveys undercount the number of animals present. Based upon marked goat populations, sightability of individual surveys ranged from 55-84%, mean 70% (Cichowski et al. 1994; Gonzalez-Voyer et al. 2001). Although we do not have a description of the survey conditions in July, 1983 one can certainly expect complete snow cover from the *ca.* 2000 m elevation and up was lacking. The ratio of 111 billies:100 nannies that we reported certainly implies that we missed a number of nanny groups during the survey. Comparable ratios based upon hunter observations in the same outfitting zone were 75.9:100 and 70.5:100 for 2002 and

2003, respectively (Larter and Allaire 2004). Also the largest nanny group observed was 7 animals. During August, nanny groups numbering 15-20 individuals were commonly seen in the survey area (Clay Lancaster and Scott Ebert personal communication).

Based upon the sizes of the 3 areas we had hoped to survey and the snow covered parts of area B (Fig. 1), we estimate that we were able to survey approximately 30% of the prime mountain goat habitat in the area. By observing 90 goats in this area and incorporating the average 70% sightability factor for goat surveys (Cichowski et al. 1994; Gonzalez-Voyer et al. 2001) one would derive a population estimate for areas A, B, and C of 429 animals. This estimate is virtually identical to the upper end of the estimated 351-424 goats derived by Veitch et al. (2002). With a non-resident harvest in the area ranging from 1-4 billies annually since 2001, and no resident or subsistence harvest, it is unlikely that harvest is currently having much of an impact on goat numbers.

If the opportunity arises to conduct future aerial surveys to better assess numbers, it is certainly recommended that the surveys be conducted in August prior to the onset of snow at upper elevations. This is also a time when animals have been found in large groups, are more easily observed, and there is a much greater probability of surveying all of the areas determined to be prime mountain goat range.

ACKNOWLEDGMENTS

I am indebted to the operators of the Nahanni Butte Outfitters for providing the helicopter support, lodging, and accommodations for the author. This survey would not have occurred without the interest and cooperation of the operators and their guides. I thank Cam and Clay Lancaster for providing RWED with information on goat distribution and abundance throughout their outfitting zone. Barry Scott provided skilful piloting of the helicopter during the survey and flights in and out of Seaplane Lake. Clay Lancaster classified goats into their various sex and age classes during the survey.

PERSONAL COMMUNICATIONS

Scott Ebert, Nahanni Butte Outfitters, Hudson Hope, BC

Dallas Gertner, Redstone Trophy Hunts Ltd., Pink Mountain, BC

Cam Lancaster, Nahanni Butte Outfitters, Hudson Hope, BC

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

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APPENDIX I

The animals observed at each of the waypoints on the map, see Figure 2.

Waypoint #	Latitude	Longitude	Species	Classification
1A	61 26.946	127 4.891	Mt. Goat	Billy
1	61 28.244	127 3.349	Mt. Goat	Billy
2	61 28.652	127 4.109	Mt. Goat	Billy
3	61 28.660	127 4.367	Mt. Goat	Billy
4	61 28.254	127 6.114	Mt. Goat	3 Billies
5	61 29.390	127 6.682	Mt. Goat	Nanny, Kid
6	61 30.463	127 9.241	Dall's Sheep	2 Rams
7	61 33.182	127 17.786	Mt. Goat	Nanny, Kid
8	61 33.060	127 17.769	Mt. Goat	2 Billies, Yearling
9	61 32.705	127 18.300	Mt. Goat	Nanny, Kid
10	61 34.272	127 17.357	Mt. Goat	2 Nannies, Kid, Yearling
11	61 32.882	127 35.501	Mt. Goat	3 Nannies, 2 Kids, 2 Yearlings
12	61 32.576	127 34.972	Mt. Goat	2 Nannies, 2 Kids
13	61 33.144	127 33.186	Mt. Goat	2 Billies, Yearling
14	61 33.853	127 32.371	Mt. Goat	Nanny, Kid
16	61 39.431	127 36.442	Mt. Goat	2 Billies
17	61 39.137	127 37.885	Mt. Goat	Billiy
18	61 36.816	127 41.898	Mt. Goat	Nanny, Kid, Yearling
19	61 36.328	127 39.984	Mt. Goat	2 Nannies, Kid
19A	61 36.363	127 39.860	Mt. Goat	3 Billies
19B	61 36.398	127 39.736	Mt. Goat	Billy
19C	61 36.374	127 39.538	Mt. Goat	Billy
20	61 36.816	127 40.552	Mt. Goat	2 Billies
21	61 36.896	127 40.715	Mt. Goat	2 Nannies, Kid
22	61 36.977	127 40.837	Mt. Goat	2 Nannies, 2 Kids
23	61 37.058	127 40.878	Mt. Goat	4 Nannies, 2 Kids
24	61 37.119	127 40.918	Mt. Goat	Nanny, Kid, Yearling
25	61 37.220	127 40.878	Mt. Goat	Billy
26	61 37.301	127 40.878	Mt. Goat	2 Billies
27	61 37.018	127 40.390	Mt. Goat	Billy
28	61 36.775	127 40.634	Mt. Goat	Unknown
29	61 37.018	127 37.259	Mt. Goat	Nanny, Kid, Unknown
30	61 37.685	127 37.015	Mt. Goat	Billy
31	61 37.867	127 36.974	Mt. Goat	Billy
32	61 37.948	127 36.974	Mt. Goat	Nanny, Kid
33	61 38.009	127 34.900	Mt. Goat	Billy
34	61 38.009	127 35.307	Mt. Goat	Billy
35	61 42.114	127 48.116	Mt. Goat	Unknown

Waypoint #	Latitude	Longitude	Species	Classification
36	61 42.053	127 48.685	Mt. Goat	Unknown
37	61 42.600	127 46.774	Mt. Goat	3 Nannies, Kid
38	61 42.741	127 46.082	Mt. Goat	Billy
39	61 42.741	127 45.757	Mt. Goat	Billy
41	61 46.583	127 51.388	Moose	Bull, Cow
42	61 45.622	127 49.572	Moose	Bull, 2 Cows
43	61 44.286	127 43.871	Moose	Bull
44	61 34.192	127 11.026	Moose	Cow
45	61 33.615	127 9.788	Moose	Cow
46	61 31.952	127 5.829	Moose	2 Cows, Calf
47	61 29.921	127 1.251	Moose	Cow, Calf
48	61 29.351	127 0.245	Moose	Bull
49	61 28.588	126 58.476	Moose	Cow, Calf
50	61 28.403	126 57.970	Moose	Cow
51	61 27.400	126 55.466	Moose	Cow
52	61 25.419	126 51.078	Moose	Cow, Calf