Mountain Goat Survey Ragged Range area, Southern Mackenzie Mountains, August 2011

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2012

Manuscript Report No. 212

ABSTRACT

We conducted an aerial survey for mountain goat (*Oreamnos americanus*) in the Ragged Range area of the southern Mackenzie Mountains from 22-24 August 2011. The area surveyed covered *ca.* 1,700 km^2 and was bounded by 62^o 16'N and 61^o 45'N to the north and south and 127^o 20'W and 128^o 20'W to the east and west. We classified goats into four sex/age classes: kids, yearlings, nannies, and billies; some goats were not classified, they were not young of the year. We used a global positioning system (GPS) to track the survey flight paths and record the locations of all wildlife seen. We observed 278 mountain goats, 124 billies, 80 nannies, 50 kids and 6 yearlings; 18 goats were unclassified. We estimated 62.5 kids/100 nannies, 155 billies/100 nannies, and 18percent kids. Other wildlife observed during the survey included 62 Dall's sheep (*Ovis dalli*), five northern mountain caribou (Rangifer tarandus caribou), two moose (*Alces alces gigas*), two beavers (*Castor canadensis*), two trumpeter swans (*Cygnus buccinator*), one wolverine (*Gulo gulo*), and one golden eagle (*Aquila chrysaetos*). The survey results provide increasing evidence that the number of mountain goats inhabiting the southern Mackenzie Mountains is far greater than that estimated by Veitch et al. (2002).

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INTRODUCTION

Mountain goats (*Oreamnos americanus*) are resident in the southern Mackenzie Mountains of the Northwest and Yukon Territories. Veitch et al. (2002) estimated a goat population of 768-989 distributed over a range of *ca.* 12,500 km^2 in the Mackenzie Mountains. This estimate was based upon interviews with the licence holders of the eight members of the Association of Mackenzie Mountain Outfitters (AMMO), whom operate exclusive hunting zones in the Mackenzie Mountains (Figure 1), and staff from Nahanni National Park Reserve (NNPR). The only previous estimate for the Mackenzie Mountains (Johnson 1977) was 400+ mountain goats. This estimate was provided by Simmons based on limited work by Simmons and others in the late 1960s to mid-1970s and was not based on any structured surveys (Simmons 1968).

The only aerial survey for mountain goats was conducted in July 1983, in the Logan Mountains area of the Northwest and Yukon Territories (Figure 2). A total of 70 goats including 15 kids were observed in the 448 km^2 survey area; 25 adults and 5 kids in the Northwest Territories portion of the survey and 30 adults and 10 kids in the Yukon Territory portion (report on file with ENR).

Hunting pressure on mountain goats is very low and almost exclusively by non-resident hunters guided by AMMO members. Since the closure of the Tungsten mine in 1987 there has been no reported resident harvest of goats and there is no record of any subsistence

harvest by hunters in the Dehcho, Sahtu, or Gwich'in areas (Veitch et al. 2002). Each of the eight outfitters in the Mackenzie Mountains has the exclusive privilege to provide services within their zone. This enhances their ability to practice sustainable harvest through annual allocation of the harvest effort (Larter and Allaire 2011). Based upon observations by outfitters and their clients (during the early 2000s), it was believed that the number of mountain goats was greater than that estimated by Veitch et al. (2002). The annual harvest of mountain goats was five (range one to nine) from 1991-2001, but from 2002-2010 had increased to 13 (range 5 to 21). Outfitters began to utilize aircraft that permitted them to access some of the more high elevation and rugged parts of their zones which had previously not been scouted for harvestable wildlife (Larter and Allaire 2011). An aerial survey was conducted in the Flat River area in September 2004 to better assess mountain goat numbers. Unfortunately, inclement weather greatly reduced the area of mountain goat range surveyed from *ca.* 1,000 km^2 to *ca.* 400 km^2 (Figure 2; Larter 2004). An attempt was made in September 2006 to survey additional areas of mountain goat range north of the Flat River area. An area of *ca.* 387 km^2 was surveyed and 88 mountain goats were observed: 38 billies, 27 nannies, 19 kids and 4 yearlings (Figure 2; N. Larter unpublished data).

Mountain goats have been observed in five of the eight outfitter zones (Veitch et al. 2002) but only harvested from three: Ram Head (S/OT/03), South Nahanni (D/OT/01), and Nahanni Butte (D/OT/02) (Figure 1). The majority of the harvest, and a substantial proportion of the population, occurs in the South Nahanni and Nahanni Butte outfitting

zones. ENR and AMMO members continue to have an interest in acquiring more information to better assess the status of mountain goat populations in the Mackenzie Mountains, especially with the recent increased trends in harvest. Voluntary hunter observations of mountain goats are provided by outfitters annually to ENR; from 2002-2010 an average of 235 goat observations have been made annually with an average of 63.3 kids and 65.0 billies per 100 nannies estimated. However, aerial surveys have only been conducted in limited areas of the Nahanni Butte (D/OT/02) outfitting zone.

During the 2011 hunting season, South Nahanni outfitters (D/OT/01), invited ENR to participate in wildlife inventory flights of some of the more isolated parts of their zone. Some of these flights included areas of known mountain goat distribution and permitted the opportunity to survey mountain goats resident in previously unsurveyed areas of the Mackenzie Mountains. This report documents the findings.

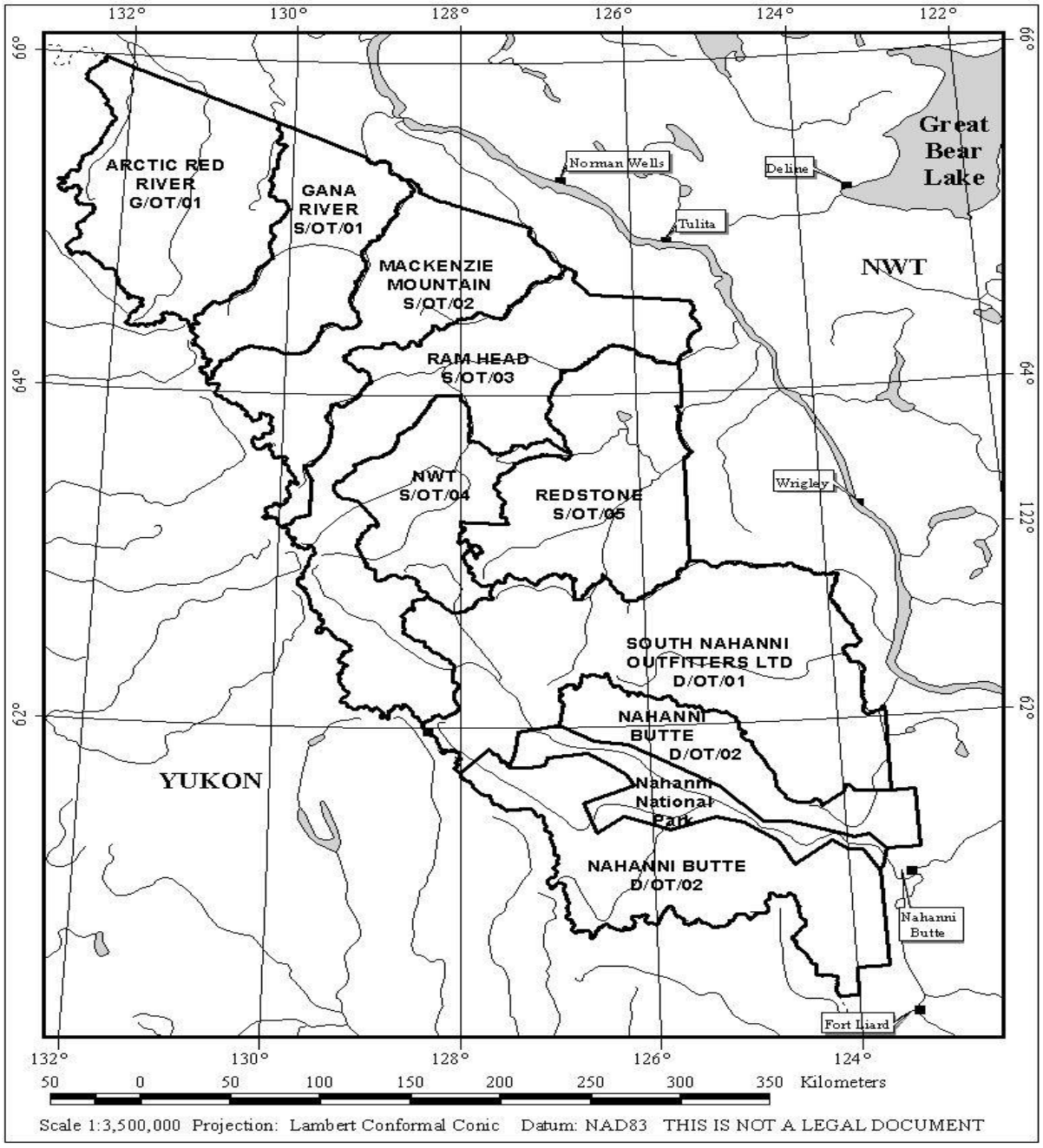

Figure 1: The eight outfitting zones in the Mackenzie Mountains.

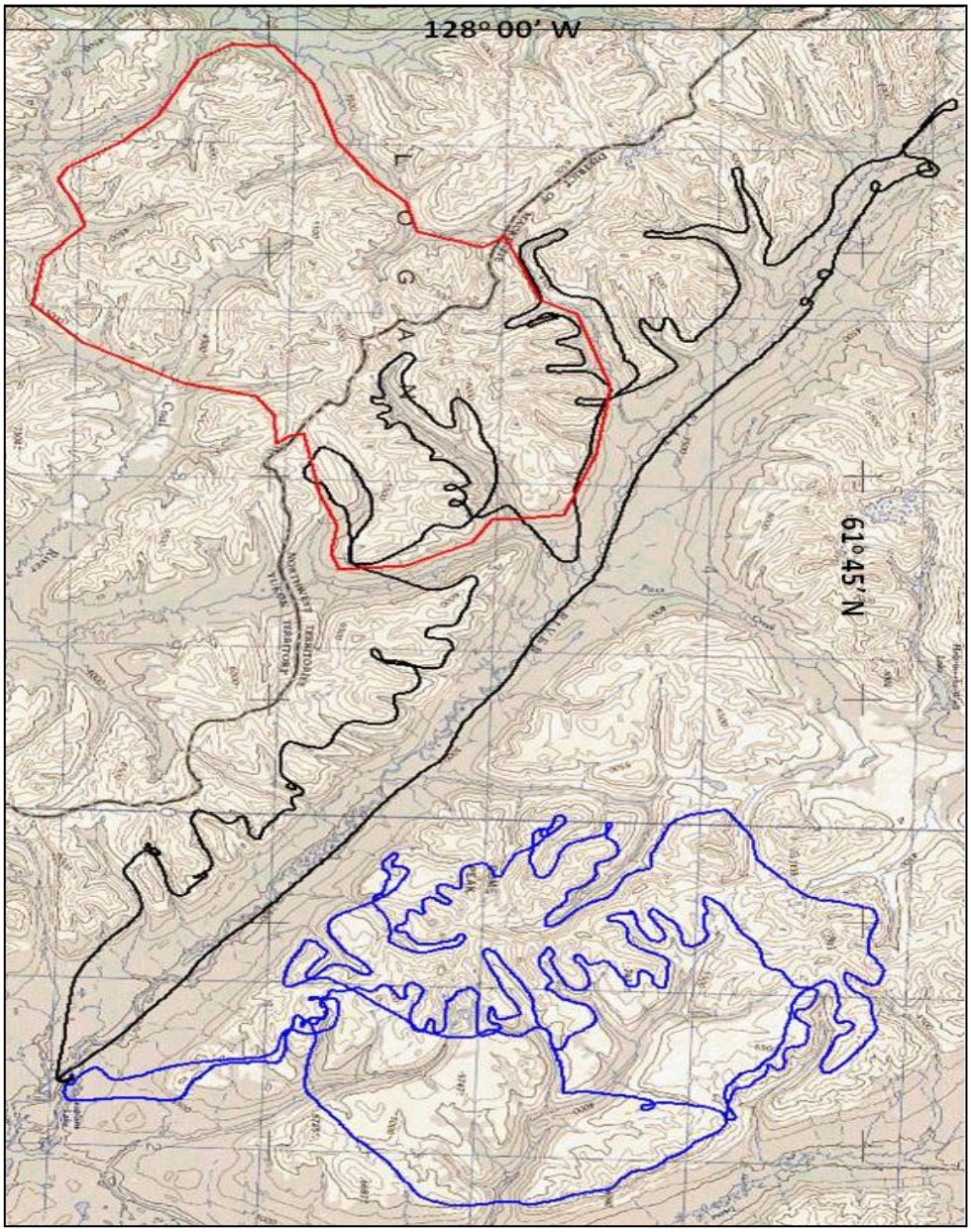

Figure 2: The 1983 mountain goat survey area (in red), and the 2004 and 2006 mountain goat survey flight lines (in black and blue, respectively).

STUDY AREA

The survey area is found in the central portion of the southern Mackenzie Mountains bounded by 62° 16'N and 61° 45'N to the north and south and 127° 20'W and 128° 20'W to the east and west. It covered *ca.* 1,700km^2, which was much of the Ragged Range, between the Flat and North Nahanni river valleys bisected by the Rabbitkettle River (Figure 3). The southwestern edge of the survey area was adjacent to the northwestern edge of the 2004 survey area of the Flat River valley (Larter 2004).

The Mackenzie Mountains are irregular mountain masses consisting primarily of limestone, dolomite and shale that have been heavily eroded and produced extensive unstable rubble slopes with numerous sheer cliffs and steep canyons (Simmons 1982). In this rugged remote area, the Ragged Range mountains rise as much as 2,000m from the Rabbitkettle River valley floor to an elevation of *ca.* 2,800m, but generally the mountain tops average 2,100-2,200m in elevation. These highest peaks in the Northwest Territories contain extensive glaciers (Figure 3). They were formed 110 million years ago when molten igneous rock was injected into the earth's crust from the underlying mantle, pushing up sedimentary rock from below as it cooled. The upper layers of sedimentary rock eroded over time exposing the hard granite of the Ragged Range (www.pc.gc.ca).

The more vegetated subalpine areas are generally found below *ca.* 1,800m. Mountain goats are the predominant wildlife in these mountainous areas while moose (*Alces alces gigas*)

frequent the valleys. Dall's sheep (*Ovis dalli*) and mountain caribou (*Rangifer tarandus caribou*) (especially during August and September) are also commonly found in the area. Wolves (*Canis lupus*), and grizzly bears (*Ursus arctos*) are rarely seen in the rugged vertically rocky centre of the survey area but are more frequently found in the rolling subalpine, river valleys, and high country where vegetation is still present (Werner Aschbacher and Sunje Petersen personal communication).

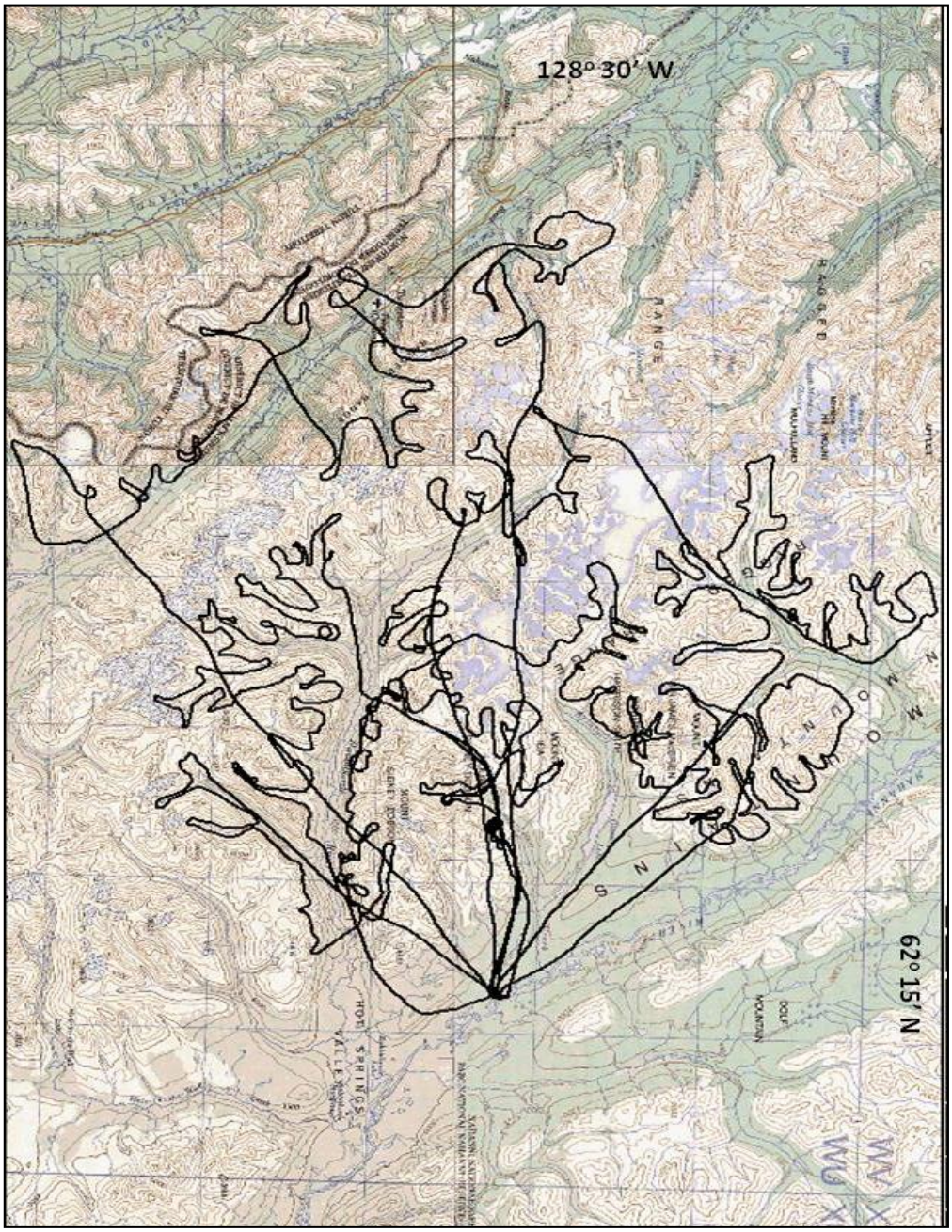

Figure 3: The flight lines of the 2011 survey for mountain goats.

METHODS

The survey was conducted with a Bell 206B helicopter. We employed a spaghetti type survey method, flying up and down alpine valleys thoroughly searching peaks, ridge lines, cliff faces, and cirque basins (Figure 3). Flights either originated or terminated from a spike camp located on the western bank of the South Nahanni River *ca.* 10km northwest of Rabbitkettle Lake. The camp was adjacent to an area previously determined as one of the prime mountain goat ranges in zone in D/OT/01 (Figure 4).

We tried to conduct flights in the morning to early afternoon or early evening when goats were more active and/or lighting enhanced sightability (Larter and Allaire 2011; Werner Aschbacher and Sunje Petersen personal communication). No flights were made during the heat of the day. Flight duration was generally two hours or less because aircraft weight was a safety concern. Flights had four people on board and we could not fully fuel the aircraft. Shorter duration flights reduced observer fatigue (Table 1).

We used a Garmin GPSmap76S global positioning system set on the automatic tracking functioning to track the survey flightline. All locations of wildlife were entered as individual waypoints into a Garmin 12XL. Flightline waypoints were downloaded into a computer using Ozi Explorer 3.95 software for mapping and analysis. Observations were made by the pilot (David Hiltenkamp), front-seat observer and sex/age classifier (Werner Aschbacher), rear-seat observer behind the pilot (Sunny Aschbacher), and rear-seat observer/recorder

(NL). The front- and rear-seat observers used 10x32 binoculars to assist in sex/age classifications. Survey data were entered into an excel spreadsheet so ratios of kids:100 nannies, yearlings:100 nannies, and billies:100 nannies could be calculated.

Table 1: Survey leg distance flown (km), duration (hours), time of day flown, and date.

	Distance (km)	Duration (h)	Time (2400)	Date
Leg 1	212	2:00	1947-2147	22 August
Leg 2	187	1:44	0819-1003	23 August
Leg 3	134	1:17	1012-1129	23 August
Leg 4	129	1:11	1256-1407	23 August
Leg 5	268	2:10	1936-2146	23 August
Leg 6	277	1:57	0836-1033	24 August

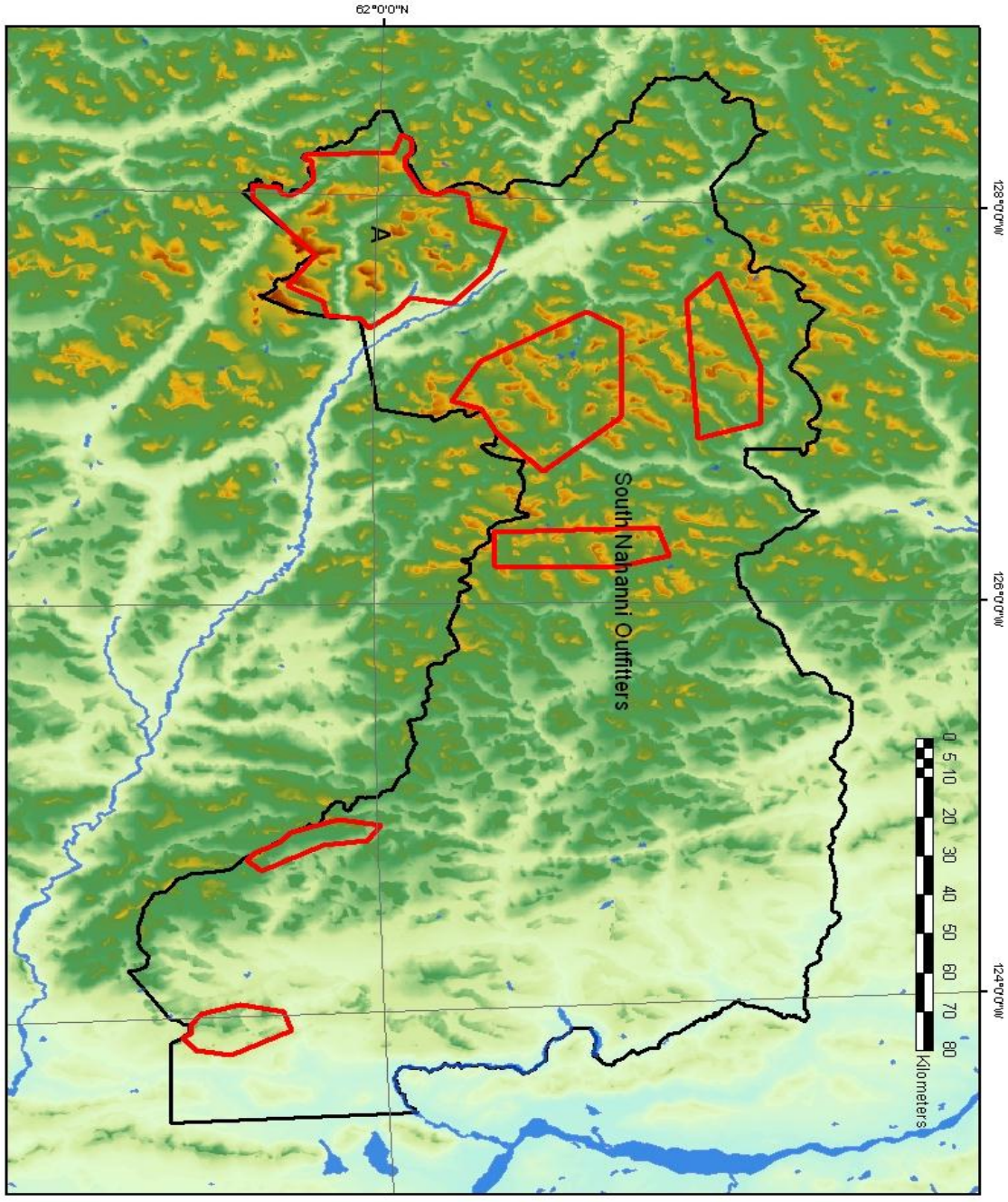

Figure 4: Areas within zone D/OT/01 where mountain goats are known to be resident. A indicates area surveyed for this report.

RESULTS

In total six survey flights were conducted during 22-24 August, 2011. All flights were conducted in the morning (between 0800-1200hrs), early afternoon (between 1200-1400hrs), or early evening (between 1900-2200hrs). The average flight duration was 1:44 hours (range 1:11-2:10) covering an average flight line of 202km (range 129 - 277km) (Table 1). These flights thoroughly covered a survey area of *ca.* 1,700 km^2.

Weather conditions for all survey legs were generally good to excellent with clear skies and very little wind. Early morning and early evening lighting were ideal for making mountain goats stand out against the varied terrain. We had the occasional isolated rain or snow squall, but generally these occurred as we neared or traversed the more glaciated parts of the survey area. Bright sunlight and ground snow conditions were not an issue.

We observed 144 groups of mountain goats totalling 278 individuals being unable to classify only 18 animals (Figure 5). We classified 124 billies, 80 nannies, 50 kids, and 6 yearlings. We estimated 62.5 kids:100 nannies, and 155 billies:100 nannies. The majority of the unclassified goats were observed at the latter stages of a survey flight distant from the aircraft, when low fuel reserve on board was a concern. We also observed 62 Dall's sheep, five northern mountain caribou, two moose, two beavers (Castor canadensis), two trumpeter swans (Cygnus buccinators), one wolverine (Gulo gulo), and one golden eagle (Aquila chrysaetos).

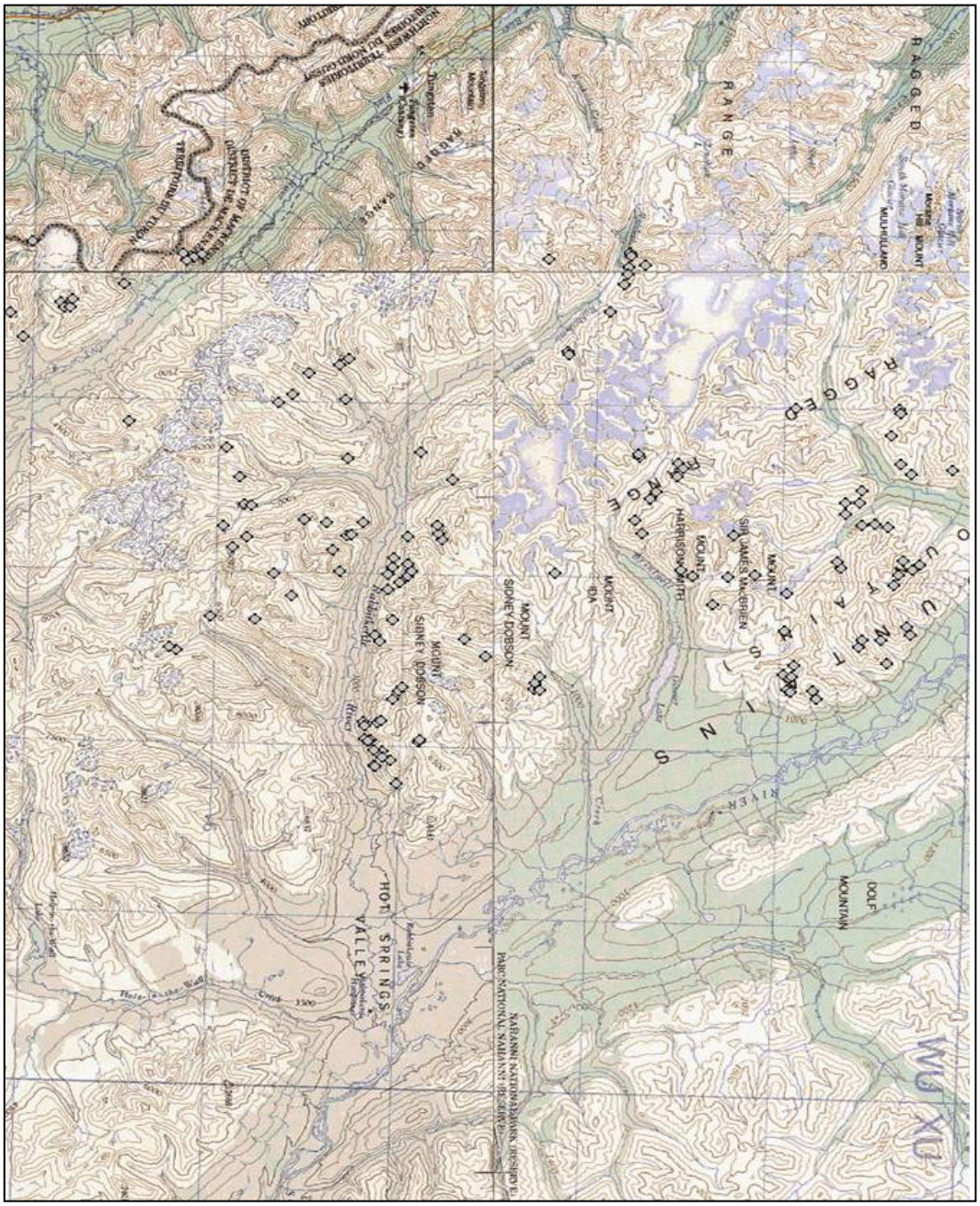

Figure 5: The locations of the 144 groups of mountain goats observed during the survey 22-24 August, 2011.

DISCUSSION

For 2001, Veitch et al. (2002) estimated the Northwest Territories mountain goat population was 768-989 of which 116-130 were estimated to reside within an 8,500 km^2 area of the South Nahanni (D/OT/01) outfitter zone. These estimates were based upon limited observations and anecdotal information from AMMO licence holders at the time.

The area we surveyed covered one of the largest areas within zone D/OT/01 known to have resident mountain goats. However, there are at least 5 other areas to the east of the South Nahanni River in the Backbone and Thundercloud ranges, the Tundra Ridge, and Ram Plateau areas where mountain goats also reside (Figure 4). Our observations of 278 mountain goats in this one area alone indicate a more than doubling of the previous estimate for the entire zone. Even with the generally excellent survey conditions, sightability can be a significant factor in counting mountain goats. Aerial surveys undercount the number of animals present. Studies with surveys where goat populations were marked show a mean sightability of 70% (range 55-84% per individual survey) (Cichowski et al. 1994; Gonzalez-Voyer et al. 2001).

It is curious why the density estimate for this zone was ten-fold lower than the two other zones (D/OT/02 and S/OT/03) in the core of the range (Veitch et al. 2002). Part of the low density estimate for D/OT/01 is likely because the licence holder at that time did very little goat hunting and any mountain goat hunting was done in the more accessible areas of the

zone. They did not use rotary aircraft and therefore had likely never been in the more inaccessible areas where mountain goats were resident. In 2004 the current owner/operators took over D/OT/01. In addition to guiding hunts for wildlife in their zone they also bring in heli-hikers. Over the past 3-4 years they have used an aircraft to inventory their zone for various opportunities for heli-hikers by flying into some of the most remote and inaccessible areas of the zone. Each year they flew into new remote areas they found mountain goats (Werner Aschbacher and Sunje Petersen personal communication). Given what was observed during this survey of one of the five areas with resident mountain goats in zone D/OT/01, the estimate generated in 2001 was vastly underestimated. The current estimated density for the survey area is 16.4/100 km^2, ten-fold higher than estimated for this zone by Veitch et al. (2002) but strikingly similar to what was estimated for zones D/OT/02 and S/OT/03, which are adjacent and in the perceived core of mountain goat range in the Mackenzie Mountains.

The 62.5 kids:100 nannies estimated from this survey is similar to the mean 63.3 kids:100 nannies reported from hunter observations throughout the Mackenzie Mountains between 2002-2010 (range 54.3-78.3; Larter and Allaire 2011). The surveys in different areas of D/OT/02 in 2004 and 2006 provided estimates of 71.4 and 70.4 kids:100 nannies, respectively. Between 2005 and 2008 percent kids ranged from 6.5-19.6 for surveys of different mountain goat populations in Alaska (White and Barton 2009). Similarly, mountain goat surveys in the East Kootenays of British Columbia report percent kids which

ranged from *ca.* 5-39% from 1977 to 2005 (Poole 2006). This survey reports 18.0 percent kids which is similar to the maximum reported for mountain goat populations in Alaska and falls within the range reported for mountain goats in British Columbia.

Given the terrain in this survey area there would be very little predator mortality of young other than from eagles. There is evidence of both grizzly and black bear mortality in areas closer to the treeline. Grizzly bears, cougars, wolves and wolverines are predators of mountain goats in Alaska and British Columbia (Poole 2006; White and Barton 2009). Falls are another likely cause of mortality and are probably skewed towards younger animals.

The 155.0 billies:100 nannies estimated from this survey is higher than the 110.7 and 140.7 billies:100 nannies reported from the 2004 and 2006 surveys in D/OT/02. The aerial survey estimates are substantially higher than the estimate derived from hunter observations from 2002-2010 (mean 65.0, range 50.4-97.1). This difference is not surprising as hunters spend time focusing on a billy harvest in a localized area. They would not be able to access the amount of mountain goat range covered in an aerial survey. Billies seem to be widely dispersed throughout potential mountain goat range in both D/OT/01 and D/OT/02 (Werner Aschbacher personal communication; Clay Lancaster personal communication). We classified fewer yearlings in this survey (7.5:100 nannies) than classified during surveys in zone D/OT/02 in 2004 (15.0:100 nannies) and 2006 (25.0:100 nannies). It is likely that some yearlings were misclassified in nursery groups as nannies or young bilies.

Based upon this survey and others (Larter 2004; N. Larter unpublished data) the estimated number of mountain goats in the Mackenzie Mountains is substantially greater than that estimated in 2001 by Veitch et al. (2002). The number of mountain goats annually harvested in the Mackenzie Mountains has increased in recent years. This increase has paralleled the increased use of more remote and previously inaccessible areas by aircraft. Mountain goats continue to be found in remote areas once they have been surveyed. The average age (based upon horn annuli) of 88 mountain goat harvested during 2003-2010 is 8.2 years old, with animals of 15 years being harvested. This compares favourably to the average age of <4 years (range 1-16 years) for 206 female and 690 male mountain goats harvested in the Kootenay Region of British Columbia from 2001-2005 (Poole 2006).

ACKNOWLEDGMENTS

I am indebted to Werner Aschbacher and Sunje Petersen, owners/operators of South Nahanni Outfitters for inviting me to participate in their wildlife inventory flights. They provided lodging, helicopter support, and an abundance of detailed knowledge of the area as well as their great observing skills to do a thorough search for mountain goats in an extremely rugged and isolated part of their outfitting zone. David Hiltenkamp of Heli Dynamics Ltd., provided skilful piloting. Stuart Taylor, from Wolverine Air, and Kevin Smit, from Simpson Air are acknowledged for getting the author and supplies in and out of the narrow gravel bar adjacent to the spike camp. Danny and Daniel Allaire assisted with report figures.

PERSONAL COMMUNICATIONS

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Clay Lancaster, Nahanni Butte Outfitters, Charlie Lake, BC

Sunje Petersen, South Nahanni Outfitters, Whitehorse, YT

REFERENCES

Cichowski, D.B., Hass, D. and Schultze, G. 1994. A method used for estimating mountain goat numbers in the Babine Mountains Recreation Area, British Columbia. Proceedings of the Biennial Symposium of the Northern Wild Sheep and Goat Council 6: 56-64.

Gonzalez-Voyer, A., Festa-Bianchet, M. and Smith, K.G. 2001. Efficiency of aerial surveys of mountain goats. Wildlife Society Bulletin 29: 140-144.

http://www.pc.gc.ca/pn-np/nt/nahanni/natcul/natcul1c.aspx

Johnson, R.L. 1977. Distribution, abundance, and management of mountain goats in the Yukon. First International Mountain Goat Symposium. 11pp.

Larter, N.C. 2004. Mountain goat survey Flat River area, Western Mackenzie Mountains, September 2004., Resources, Wildlife & Economic Development, Manuscript Rep. No. 157, Yellowknife, NT. 16pp.

Larter, N.C. and Allaire, D.G. 2011. Mackenzie Mountain non-resident and non-resident alien hunter harvest summary 2010. Environment and Natural Resources Manuscript Report 211, Yellowknife, NT. 83pp.

Poole, K.G. 2006. A population review of mountain goats in the Kootenay Region. Report prepared for BC Ministtry of Environment, Nelson, BC. 32pp.

Simmons, N. M. 1968. Big game in the Mackenzie Mountains, Northwest Territories. pp. 35-40 in Transactions of 32nd Federal-Provincial Wildlife Conference, Whitehorse, YT

Simmons, N. 1982. Seasonal ranges of Dall's sheep, Mackenzie Mountains, Northwest Territories. Arctic 35: 512-518.

Veitch, A., Simmons, E., Promislow, M., Tate, D., Sallow, M. and Popko, R. 2002. The status of mountain goats in Canada's Northwest Territories. Northern Wild Sheep and Goat Council 13: 49-62.

White, K.S and Barten. N.L. 2009. Mountain goat assessment and monitoring along Juneau access road corridor and near Kensington Mine, Southeast Alaska. Annual Progress Report, ADF&G, Div. Wildlife Conservation, Juneau, AK. 16pp.