MACKENZIE MOUNTAIN NON-RESIDENT AND NON-RESIDENT ALIEN HUNTER HARVEST SUMMARY 2006

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ABSTRACT

Each of the 8 licensed outfitters, and Renewable Resource Officers from the Sahtu and Dehcho Regions, with the Department of Environment and Natural Resources (ENR), collected data on big game harvest in the Mackenzie Mountains during the 2006 hunting season. Harvest data and observations of wildlife from non-resident and non-resident alien hunters (collectively called 'non-resident' for this report) were recorded. For 2006, 407 hunters bought non-resident licences. This is the greatest number of licences sold to non-resident hunters since 1991 (range 321-394 from 1991-2005). Hunters (n=319) from outside Canada (non-resident aliens) were primarily from the USA (n=254) and comprised 78% of the outfitted hunters; 21 of the 48 European hunters were from Germany. There were 88 (22%) Canadian hunters with residency outside the Northwest Territories (NWT). Of the 407 non-resident licence holders, 376 came to the NWT and most spent at least some time hunting. Of 276 tags purchased for Dall's sheep, 208 rams were harvested (including 10 by resident hunters). The average annual harvest of rams is 198 over the past 16 years. The mean (±SD) age of harvested rams was 10.4 $\pm$ 2.0 years; the 19th consecutive year the average age of harvested rams from the Mackenzie Mountains has been 9.5 years or older. Hunters reported seeing an average of 9.9 legal rams (horns at least ¾ curl) per hunt and observed an estimated 53.4 lambs and 95.7 rams per 100 ewes, respectively. This is third consecutive year with ram:ewe ratios > 90:100. Of 274 tags purchased for mountain woodland caribou, 188 bull caribou were harvested. This is the greatest harvest since 1993. Hunters observed an estimated 42.8 caribou calves, and 37.1 bulls per 100 adult female caribou, respectively. Of the 112 tags purchased for moose, 72 bull moose were harvested. This is the second highest harvest of moose recorded since 1991 (range 32-74). However, this was also the year with the greatest number of licences sold. Hunters observed an estimated 32.8 moose calves, and 136.6 bulls per 100 adult female moose, respectively. Of the 21 tags purchased for mountain goat, 12 goats were harvested; 9 billies, 2 nannies and 1 unknown. The latter fell down a cliffside and was unretrievable. This is the second highest harvest of mountain goats recorded from 1991-2005 The mean age, determined by horn annuli, of 10 goats harvested was 9.6 years (range 4.5-15.5 years). Hunters observed an estimated 61.5 goat kids and 51.4 billies per 100 adult nannies. Twenty-three wolves were harvested from 201 tags purchased, the greatest harvest of wolves recorded. During 1991-2005 mean annual wolf harvest was 13 (range 7-18). One wolverine was harvested from 108 tags purchased. The 25 wolverines observed by hunters in 2006 was similar to the number observed in 2005, 2004 and during 1995-1999. The observations included family groups of wolverines. No black bears were harvested from 3 tags purchased; none have been harvested in 11 years. There has been no grizzly bear hunting season for non-residents since 1982. Hunter satisfaction remains high; 96% of respondents (n=230) rated their experience as either excellent (80%) or very good (16%). A number of hunters made specific comments about the high quality hunting experience and the abundance of wildlife in the Mackenzie Mountains; 23% were repeat clients returning for their 2nd to 18th hunt in the Mackenzie Mountains, and 89% indicated they would like to return in future years. Unfortunately the percentage of Voluntary Hunter Observation Forms returned was 64%, similar to that in 2005. At least 2954 kg of wild game meat,

mostly moose and caribou, was reported distributed locally in 2006. Replacement cost of meat from local northern retailers is estimated conservatively at about $59,080.

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INTRODUCTION

The 140 000 km^2 (54 000 mi^2; 34.6 million acres) area of the Mackenzie Mountains in the western Northwest Territories (NWT) were first opened to non-subsistence hunters in 1965 (Simmons 1968). Since then, the Mackenzies have become world-renowned for providing a high quality wilderness hunting experience, particularly for Dall's sheep (Veitch and Simmons 1999). In return, non-resident hunters and outfitters in the Mackenzie Mountains provide an estimated $1.8 million annually to individuals, businesses, and governments in the NWT (EXCELeration Corp. 2000). The outfitted hunting industry in the Mackenzie Mountains also provides employment for 100 to 120 outfitters, guides, pilots, camp cooks, camp helpers, and horse wranglers (Kelly Hougen, President, Association of Mackenzie Mountain Outfitters personal communication). Additionally, fresh meat from many of the harvested animals is provided to a number of local communities including Tulita, Fort Good Hope, and Norman Wells in the Sahtu and Nahanni Butte, Fort Liard and Fort Simpson in the Dehcho. This meat is distributed among local elders and residents and to health/long term care facilities.

Eight outfitters are currently licenced by the Government of the Northwest Territories (GNWT) to provide big game outfitting services within the Mackenzie Mountains (Fig. 1; Appendix 1). No hunting is permitted within the boundaries of Nahanni National Park Reserve in the southern half of the range, except for subsistence harvest by NWT General Hunting Licence holders. Under the terms of the NWT *Wildlife Act*, each licenced outfitter has the exclusive privilege to provide services within their zone, which enhances the outfitters' ability to practice sustainable harvest through annual allocation of the harvest effort.

The hunting licence year in the NWT runs from 01 July to 30 June and those who desire to hunt big game within the NWT must annually obtain a big game hunting licence and must be at least 16 years old (Department of Environment and Natural Resources 2006). There are four classes of licenced big game hunters in the NWT:

1) *General* – subsistence harvesters, primarily aboriginal people.
2) *Resident* - Canadian citizens or landed immigrants who have been living in the NWT for at least two consecutive years prior to application for the licence;

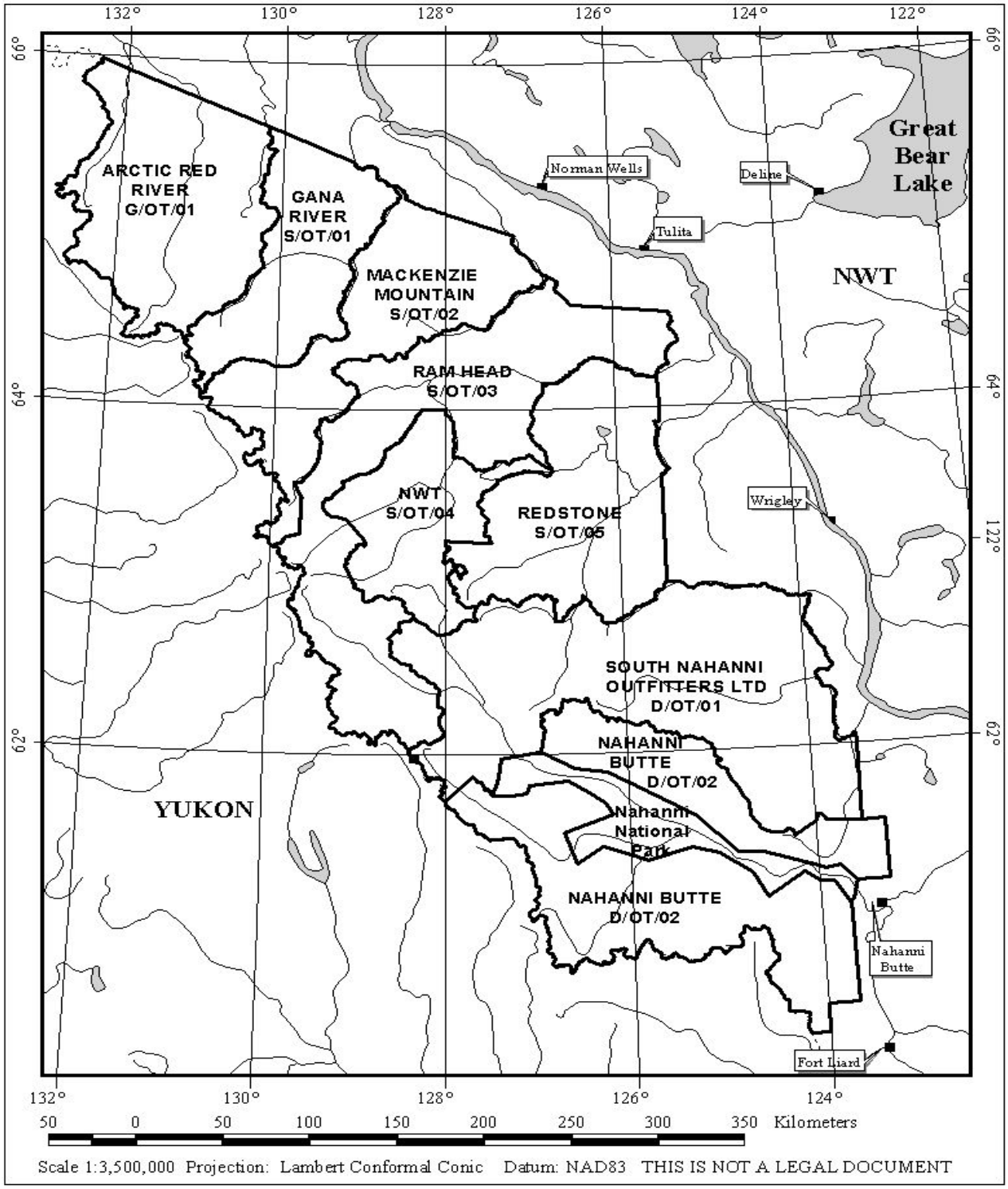


Figure 1. Outfitting zones in the Mackenzie Mountains, Northwest Territories – 2006.

3) *Non-resident* - Canadian citizens or landed immigrants who live outside the NWT, or have not resided in the NWT for a full two years prior to application for the licence.
4) *Non-resident Alien* - an individual who is neither an NWT resident nor a non-resident.

Both non-residents and non-resident alien hunters must use the services of an outfitter and must be accompanied by a licenced guide at all times while hunting big game. For simplification in this report, we call both non-resident and non-resident alien hunting licence holders 'non-residents' and combine their harvest statistics. The data from 10 resident hunters, who harvested Dall's sheep in the Mackenzie Mountains without a guide, have been included in the number of sheep harvested and the age and horn length measurements in this report as indicated.

Individual non-resident hunters are annually restricted to one each of the following big game species (Appendix 2): Dall's sheep (male with at least ¾ curl horns), mountain woodland caribou (either sex), moose (either sex), mountain goat (either sex), wolf (either sex), wolverine (either sex), and black bear (adult not accompanied by a cub or cubs). Although non-resident hunters are allowed to hunt female moose and caribou they prefer to hunt males for their trophy antlers. Non-resident hunting for grizzly bears was closed in 1982 as a result of concerns about over-harvest (Miller et al. 1982; Latour and MacLean 1994). There are currently no restrictions on the total number of each big game species that an outfitter can take within the zone for which they are licenced.

Wildlife management within the Mackenzie Mountains is the responsibility of a variety of government agencies and boards set up as a result of comprehensive land claim agreements. The Nahanni National Park Reserve (4766 km^2) in the south Mackenzie Mountains is managed by Parks Canada – an agency of the Canadian federal government. Under the terms of the Sahtu Dene and Metis Comprehensive Land Claim Agreement (signed in 1993) and the Gwich'in Comprehensive Land Claim Agreement (signed in 1992), primary responsibility for wildlife management within the two settlement areas lies with the Sahtu Renewable Resources Board (SRRB) and the Gwich'in Renewable Resource Board (GRRB), respectively. Approximately 68 000 km^2 of the central and northern Mackenzie Mountains are within the Sahtu Settlement Area

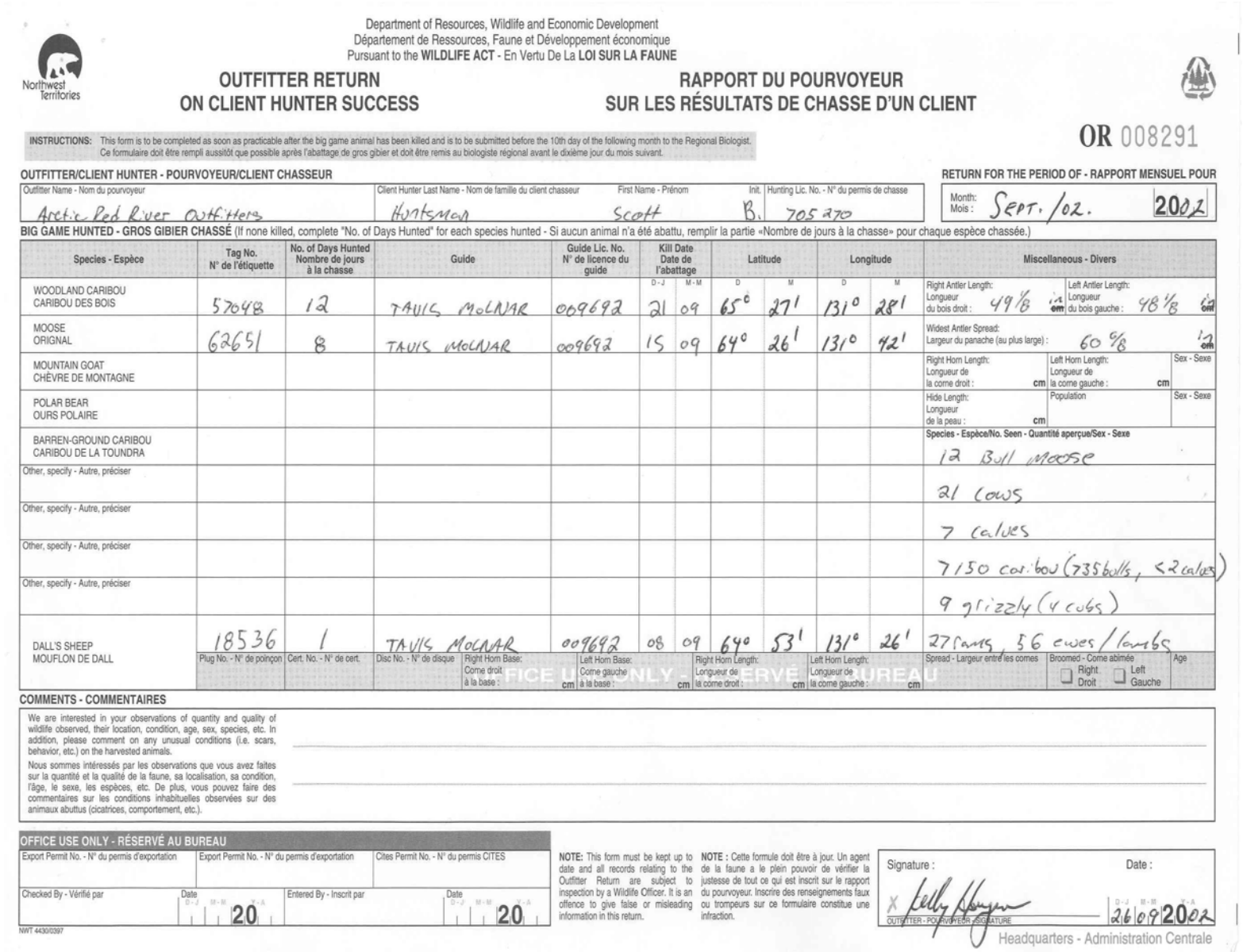
and 8300 km^2 are within the Gwich'in Settlement Area, which encompasses the extreme north end of the range. However, the GNWT maintains ultimate jurisdiction for management of wildlife and wildlife habitat within each of the claim areas. The Department of Environment and Natural Resources (ENR) of the GNWT is responsible for licencing outfitters, guides, and hunters and for annually monitoring non-resident big game harvest in the Mackenzie Mountains. Under the terms of the Dehcho First Nations Interim Measures Agreement (signed in 2001), ENR has primary responsibility for wildlife management within the Dehcho region (approximately 59 000 km^2) of the southern half of the Mackenzie Mountains.

Each year ENR, under provisions in the GNWT's *Wildlife Business Regulations*, requires that outfitters submit an Outfitter Return on Client Hunter Success form for each person that purchased a NWT non-resident big game hunting licence (Fig. 2). These are known as outfitter return forms and they must be submitted whether or not a client actually hunted, and whether or not any game was harvested. The outfitter return forms allow us to quantify harvest by non-resident hunters to help biologists with the Gwich'in Renewable Resource Board, Sahtu Renewable Resource Board and ENR to ensure that the harvest of each species is within sustainable limits.

In 1995, the then Department of Resources Wildlife and Economic Development requested that all non-resident hunters also fill out a voluntarily questionnaire. The questionnaire has been revised through the years to include different questions pertaining to wildlife observations, the quality of the hunting experience, the quality of services related to hunter travel, and provide an opportunity for specific comments by the hunter. One key component of the questionnaire that has remained throughout pertained to reporting the different types and numbers of wildlife seen during their hunts. These data have been recorded and the questionnaire forms have been and will be referred to as hunter observation forms in this report. Government Territories

This is the twelfth consecutive year that a summary of the data collected by ENR on non-resident hunters in the Mackenzie Mountains has been made. In the text of this document, data for 1995 are found in Veitch and Popko (1996), for 1996 in Veitch and Popko (1997), for 1997 in Veitch and Simmons (1998), for 1998 in Veitch et al. 2000b, for 1999 and 2000 in Veitch and Simmons (2000a;b respectively), for 2001 by Veitch and Simmons (unpublished data), for 2002, 2003, 2004 and 2005 in Larter and Allaire

(2003; 2004; 2005a 2006 respectively). Additionally, Latour and MacLean (1994) summarized data for 1979 to 1990. This report compiles the harvest data collected during the 2006 hunting season and compares it with available data collected since 1995, and earlier when available.



Department of Resources, Wildlife and Economic Development
Département de Ressources, Faune et Développement économique
Pursuant to the **WILDLIFE ACT** - En Vertu De La **LOI SUR LA FAUNE**

Northwest Territories

OUTFITTER RETURN ON CLIENT HUNTER SUCCESS

RAPPORT DU POURVOYEUR SUR LES RÉSULTATS DE CHASSE D'UN CLIENT

OR 008291

INSTRUCTIONS: This form is to be completed as soon as practicable after the big game animal has been killed and is to be submitted before the 10th day of the following month to the Regional Biologist.
Ce formulaire doit être rempli aussitôt que possible après l'abattage de gros gibier et doit être remis au biologiste régional avant le dixième jour du mois suivant.

OUTFITTER/CLIENT HUNTER - POURVOYEUR/CLIENT CHASSEUR

Outfitter Name - Nom du pourvoyeur	Client Hunter Last Name - Nom de famille du client chasseur	First Name - Prénom	Init.	Hunting Lic. No. - N° du permis de chasse
Arctic Red River Outfitters	Huntsman	Scott	B.	705 270

RETURN FOR THE PERIOD OF - RAPPORT MENSUEL POUR

Month: Mois : Sept. /02. 2002

BIG GAME HUNTED - GROS GIBIER CHASSÉ (If none killed, complete "No. of Days Hunted" for each species hunted - Si aucun animal n'a été abattu, remplir la partie «Nombre de jours à la chasse» pour chaque espèce chassée.)

Species - Espèce	Tag No. N° de l'étiquette	No. of Days Hunted Nombre de jours à la chasse	Guide	Guide Lic. No. N° de licence du guide	Kill Date Date de l'abattage D-J	Kill Date M-M	Latitude D	Latitude M	Longitude D	Longitude M	Miscellaneous - Divers
WOODLAND CARIBOU CARIBOU DES BOIS	57048	12	TAVIS MOLNAR	009692	21	09	65°	27'	131°	28'	Right Antler Length: Longueur du bois droit : 49 1/8 in cm; Left Antler Length: Longueur du bois gauche : 48 1/8 in cm
MOOSE ORIGNAL	62651	8	TAVIS MOLNAR	009692	15	09	64°	26'	131°	42'	Widest Antler Spread: Largeur du panache (au plus large) : 60 5/8 in cm
MOUNTAIN GOAT CHÈVRE DE MONTAGNE											Right Horn Length: Longueur de la corne droit : cm; Left Horn Length: Longueur de la corne gauche : cm; Sex - Sexe
POLAR BEAR OURS POLAIRE											Hide Length: Longueur de la peau : cm; Population; Sex - Sexe
BARREN-GROUND CARIBOU CARIBOU DE LA TOUNDRA											Species - Espèce/No. Seen - Quantité aperçue/Sex - Sexe: 12 Bull Moose
Other, specify - Autre, préciser											21 cows
Other, specify - Autre, préciser											7 calves
Other, specify - Autre, préciser											7150 caribou (735 bulls, <2 calves)
Other, specify - Autre, préciser											9 grizzly (4 cubs)
DALL'S SHEEP MOUFLON DE DALL	18536	1	TAVIS MOLNAR	009692	08	09	64°	53'	131°	26'	27 rams, 56 ewes/lambs

Plug No. - N° de poinçon	Cert. No. - N° de cert.	Disc No. - N° de disque	Right Horn Base: Corne droit à la base : cm	Left Horn Base: Corne gauche à la base : cm	Right Horn Length: Longueur de la corne droit : cm	Left Horn Length: Longueur de la corne gauche : cm	Spread - Largeur entre les cornes	Broomed - Corne abimée Right Droit / Left Gauche	Age

OFFICE USE ONLY - RÉSERVÉ AU BUREAU

COMMENTS - COMMENTAIRES

We are interested in your observations of quantity and quality of wildlife observed, their location, condition, age, sex, species, etc. In addition, please comment on any unusual conditions (i.e. scars, behavior, etc.) on the harvested animals.

Nous sommes intéressés par les observations que vous avez faites sur la quantité et la qualité de la faune, sa localisation, sa condition, l'âge, le sexe, les espèces, etc. De plus, vous pouvez faire des commentaires sur les conditions inhabituelles observées sur des animaux abattus (cicatrices, comportement, etc.).

Export Permit No. - N° du permis d'exportation	Export Permit No. - N° du permis d'exportation	Cites Permit No. - N° du permis CITES

Checked By - Vérifié par	Date D-J M-M 20 A	Entered By - Inscrit par	Date D-J M-M 20 A

NWT 4430/0397

NOTE: This form must be kept up to date and all records relating to the Outfitter Return are subject to inspection by a Wildlife Officer. It is an offence to give false or misleading information in this return.

NOTE : Cette formule doit être à jour. Un agent de la faune a le plein pouvoir de vérifier la justesse de tout ce qui est inscrit sur le rapport du pourvoyeur. Inscrire des renseignements faux ou trompeurs sur ce formulaire constitue une infraction.

Signature : X Kelly Hougen — OUTFITTER - POURVOYEUR SIGNATURE

Date : 26/09/2002 (D-J M-M A)

Headquarters - Administration Centrale

Figure 2. Example of a Mackenzie Mountain Outfitter Hunt Report Form.

METHODS

Prior to the start of the 2006 hunting season, each outfitter in the Mackenzie Mountains received sufficient copies of the outfitter return and hunter observation forms for all their clients for the year. The *Wildlife Business Regulations* require outfitter returns to be returned by the tenth day of the month following the month of the hunt – e.g., for a hunter that was in the field in July, a form must be submitted by the 10th of August. Those forms were submitted to the senior biologist in either the Sahtu or the Dehcho, whether or not a client actually hunted and whether or not harvest occurred. In co-operation with ENR Renewable Resource Officers and the outfitters, persistent attempts were made to obtain outfitter return forms for every non-resident that held a big game hunting licence through a Mackenzie Mountain outfitter in 2006.

Data from both the outfitter return forms and hunter observation forms were entered into *Excel 2000* (Microsoft Corporation, Seattle, WA) spreadsheets. Data were cross-checked with the records of sequentially numbered, unique identifier plugs inserted in the horns of legally harvested rams, found in the License Information System-IntraNet (LISIN) data management system maintained by ENR offices across the Northwest Territories, and also with GNWT wildlife *Export Permit* forms to ensure that all data were verified and that the spreadsheets contained all appropriate available data required for the analyses.

We distributed new hunter observation forms in 2006 for consistency and we recorded all observations directly from these hunter observation forms. If we did not receive a hunter observation form, but wildlife observation data were recorded on the outfitter return form, we used these wildlife observation data. If observation information differed between the hunter observation form and the outfitter return form for the same client we used the data from the hunter observation form. Occasionally we received identical observation data from forms of different hunters. These hunters had had the same guides and lengths of hunts and obviously had hunted together. We recorded forms with data that had been provided, but for the wildlife observation analyses only one set of these observations was used.

All descriptive statistical analyses were performed using *Excel 2000* (Microsoft Corporation, Seattle, WA). We present means ± standard deviation. Some statistical analyses were performed using Minitab 7.2 software (Minitab Inc, 1989).

RESULTS AND DISCUSSION

Hunters

Big game hunting licences for the Mackenzie Mountains were bought by 407 non-resident hunters in 2006 (Table 1). This is the greatest number of licenses sold since 1991 (Fig.3). Of those, 376 came to the NWT and spent some time hunting; 31 either cancelled their hunts, decided not to hunt for themselves but participated with other hunters they knew, or decided not to hunt due to unforeseen complications after arriving in the NWT. A majority of these were guides, who purchase licences every year but rarely have the opportunity to hunt themselves. In 2006, licence sales to non-resident Canadians increased to 22% of the total non-resident licences from 17% in 2005 and 14% in 2004. We presume that the continued strengthening of the Canadian dollar during this time is a major contributing factor to the increased number of Canadian sport hunters. Guided hunts are marketed in American dollars. The number of foreign non-resident hunters in 2006 was slightly lower than in 2005 (319 vs 330). However for a third year there was an increase in the number of hunters from countries other than the United States, mostly Europeans and South Americans, which is responsible for some of the increase (Table 1). The recent change in ownership of South Nahanni Outfitters (D/OT/01) has resulted in an increased number of European and South American clients. Also, the American dollar has not fared as well against foreign currencies in recent years, which may make hunts more attractive to foreign clients.

We received all but 3 mandatory Outfitter Return forms for the 407 people that purchased non-resident licences. Voluntary Hunter Observation Report forms were received from 239 (64%) of the 376 that did at least some hunting in 2006 (Table 2). After consensus by outfitters at the 2003 annual general meeting of the Association of Mackenzie Mountain Outfitters to increase the number of Voluntary Hunter Observation Forms returned, the 64% return remains a bit disappointing. Most outfitters have

endeavoured to have these forms completed and submitted but unfortunately two zones with fairly large clientele continue to lag behind in providing returns; we received only 1 of 53 forms from zone S/OT/03 and 17 of 65 forms from zone S/OT/02 in 2006. In order to be able to generalize the observations we receive over the entire Mackenzie Mountains it is vital that we have good representation from all outfitting zones**;** these 2 outfitter zones have the greatest north to south areas of all the zones.

It is obvious that non-residents immensely enjoy their hunting experience in the Mackenzie Mountains (Table 3) – in 2006, 96% of respondents rated their experience as either excellent (80%) or very good (16%).

Table 1. Province of country of origin for the 407 non-residents who purchased licences for hunting in the Mackenzie Mountains, 2006.

Canada		United States		Europe		Other	
Yukon	3	Eastern States[1]	113	Spain	14	Mexico	11
British Columbia	37			Germany	21	Chile	5
Alberta	38	Western States[2]	141	Austria	3	Australia	1
Saskatchewan	6			Belgium	2		
Manitoba	0			Switzerland	3		
Ontario/ Quebec	4			Czech Republic	1		
Atlantic Provinces	0			Italy	3		
				Sweden	1		
Total	88		254		48		17

[1] AL, AR, CT, DE, DC, FL, GA, IL, IN, IA, KY, LA, ME, MD, MA, MI, MN, MS, MO, NH, NJ, NY, NC, OH, PA, RI, SC, TN, VT, VA, WV, WI

[2] AK, AZ, CA, CO, HI, ID, KS, MT, NE, NV, NM, ND, OK, OR, SD, TX, UT, WA, WY

Table 2. Percent of Mackenzie Mountain outfitter and non-resident hunter forms submitted, 1995-2006.

Form Type	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995
Outfitter Return (mandatory)	99	100	99	98	95	92	96	96	97	98	100	98
Hunter Observation (voluntary)	64	65	74	60	59	57	53	51	60	50	71	80

Voluntary client comments made specific mention of the high quality of hunts (n=54), and the abundance of animals (n=29). It was the first time hunting in the Mackenzie Mountains for 173 of 230 (75%) respondents. The 54 repeat hunters had hunted from 1-18 times previously. Of the 223 respondents regarding their plans to return to the Mackenzies to hunt in the future, 89% indicated they would like to return. The majority of older forms that did not collect information on repeat hunts and plans to return have been taken out of circulation, therefore we feel the numbers reported this year are more representative than in previous reports. We are making every effort to ensure that only the updated voluntary hunter observation forms are provided to outfitters and their hunters.

Since providing voluntary hunter observation forms we have consistently had comments about grizzly bears in the Mackenzie Mountains. Many comments have reflected a general dissatisfaction at the inability to hunt grizzly bears and about problems encountered with bears in and around camps. This year was no different (Appendices 3 and 4). There were continued hunter comments about high wolf numbers in 2006. Comments of high wolf numbers were not made by hunters until 2000. Most reports about wolves were from zones G/OT/01, S/OT/01 and S/OT/05.

Table 3. Satisfaction ratings for non-resident hunters in the Mackenzie Mountains, 1996-2006.

Rating	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996
Number of Hunters Reporting	230	256	229	191	193	191	158	157	202	144	224
Excellent	80%	90%	84%	82%	82%	75%	76%	73%	80%	78%	77%
Very Good	16%	7%	10%	15%	15%	16%	17%	20%	17%	17%	17%
Good	3%	2%	5%	3%	3%	6%	6%	5%	2%	3%	2%
Fair	1%	0%	0%	0%	0%	1%	0%	1%	1%	1%	3%
Poor	0%	0%	1%	0%	0%	1%	1%	2%	0%	1%	1%

This year, 79 Association of Mackenzie Mountain Outfitters meat forms were voluntarily submitted to ENR by some of the outfitters (D/OT/02, S/OT/03 and S/OT/05); a similar number of submissions as in previous years. These forms record the amount of meat (Dall's sheep, mountain caribou, moose, and mountain goat) taken from harvested animals and how the meat was utilized/distributed. Other outfitting zones do distribute meat to local communities, but unfortunately the meat forms from outfitters in the Sahtu do not always get turned in and/or forwarded to the Dehcho ENR office (K. Hougen personal communication). We are trying to ensure that forms are available, get completed and submitted by the outfitters, and are forwarded because the distribution of wild meat by the outfitters is often a topic of heated local debate, and the collection of completed meat forms lets us quantify meat distribution to local communities. The provision of wild game meat by outfitters is an important and appreciated local benefit.

Generally the majority of meat from harvested Dall's sheep and mountain goats is utilized in the outfitter camps. Nonetheless, at least 464 kg (1020 pounds) from 28 harvested Dall's sheep and 93 kg (205 pounds) from 5 harvested mountain goats, was distributed locally. Mountain caribou and moose meat is also utilized in the camps, however a portion of the harvested mountain caribou and moose meat was distributed

locally: at least 1010 kg (2222 pounds) from 20 mountain caribou and at least 1386 kg (3050 pounds) from 8 moose. Conservatively, the purchase of approximately 2954 kg (6497 pounds) of meat at retail outlets in local northern communities would cost a minimum of $59,080.

Once every 5 years the Department of Industry, Tourism, and Investment conducts an exit survey to determine where visitors to the Northwest Territories come from, their demographics, spending, and travel habits. This is done in the form of a detailed questionnaire. In 2006 the exit survey was included in the package of outfitter return and voluntary hunter observation forms provided to each outfitter for their clients. The inclusion of a second voluntary questionnaire was the source of discussion for outfitters, guides, and clients alike, with the most vocal complaining about all of the paperwork that had to be filled out. However, it did not appear to have affected the rate of return of voluntary hunter observation forms in 2006.

Dall's Sheep (*Ovis dalli dalli*)

Dall's sheep is one of the most desired species sought by non-resident hunters in the Mackenzie Mountains. Tags to hunt Dall's sheep were purchased by 276 (68%) non-resident hunters in 2006, identical to the 11-year average (Table 4). At least 75% of sheep tag holders pursued Dall's sheep and harvested 208 rams (including 10 resident hunters). The 2006 harvest was similar to the average number of 198 sheep harvested in the Mackenzie Mountains (1991-2006) (Fig. 3; Appendix 5). The mean (± SD) length of a sheep hunt in was 4.1 $\pm$ 2.7 days, similar to hunt lengths from 1997 to 2005 (Table 5), but less than the 5.3 day average from 1979-1990 (Latour and MacLean 1994). Outfitted hunts in the Mackenzie Mountains are generally booked for 10 days; when hunters fill their sheep tag, any remaining time on the hunt is typically spent in pursuit of other big game species for which tags are held, or in hunting small game.

Harvest by non-residents comprises at least 90% of the total annual harvest of Dall's sheep in the Mackenzie Mountains and takes only 0.8 to 1.5% of the estimated 14 000 to 26 000 Dall's sheep in the Mackenzie Mountains (Veitch et al. 2000a). Therefore, the current non-resident harvest level appears well within sustainable limits, provided that hunting pressure is geographically distributed across each of the zones. In the Yukon Territory - where harvest is managed by a full curl rule - thinhorn sheep

managers have set the sustainable harvest at 4% of the non-lamb population (Yukon Renewable Resources 1996). In those areas of the Yukon where the management objective is to increase population size, harvest is limited to 2% of the total population.

There has been remarkable consistency in the mean outside contour length of the right horns from rams harvested by non-residents from 1972-2006, mean 89.1 ± 1.8 cm (SD) (Appendix 5; Table 6), which is surprising given the increase in average age of harvested sheep during that same period. We expected to see more broomed, or broken, horn tips on older animals, since horn breakage generally occurs as a result of fights between rival males (Geist 1993).

In 2006, brooming was noted on 32% of left and 30% of right horns from plugged trophies, similar to the 31% and 32% average of left and right horns reported over the past 10 years. One hundred and twenty-two (59%) of 208 harvested rams were at least 10-years-old. The mean age (± SD) of harvested rams was 10.4 ± 2.0 years (range 6.5 to 15.5 years; Table 7). This is the nineteenth consecutive year where the reported mean age of harvested rams has been 9.5 years or older (Appendix 5). The 6.5 year-old male sheep harvested this year was accidentally killed while hunting for another ram; the bullet went through that ram and killed younger sheep, which was a ¾ curl.

Table 4. Tags for big game species purchased by non-resident hunters with outfitters in the Mackenzie Mountains, 1995-2006.

Species	2006 407 hunters		2005 394 hunters		2004 337 hunters		2003 347 hunters		2002 329 hunters		2001 339 hunters		2000 332 hunters		1999 321 hunters		1998 345 hunters		1997 352 hunters		1996 387 hunters		1995 343 hunters	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Dall's Sheep	276	68	246	62	229	68	257	74	218	66	220	65	231	70	227	71	246	71	252	72	252	65	218	64
Mountain Caribou	274	67	285	72	243	72	247	71	229	69	201	59	206	62	181	56	223	65	260	74	274	71	233	68
Moose	112	28	101	26	84	25	85	24	68	21	65	19	69	21	63	20	69	20	73	21	74	18	70	20
Mountain Goat	21	5	40	10	24	7	18	5	18	5	12	4	12	4	6	2	23	7	30	8	14	4	16	5
Wolf	201	49	214	51	166	49	207	60	159	48	137	40	155	47	89	28	165	48	209	59	193	50	72	21
Wolverine	108	27	154	39	89	26	141	40	97	29	83	25	85	26	65	20	99	29	135	38	114	30	35	10
Black Bear	3	1	40	10	8	2	9	3	3	1	0	0	6	2	2	<1	2	<1	8	2	0	0	0	0

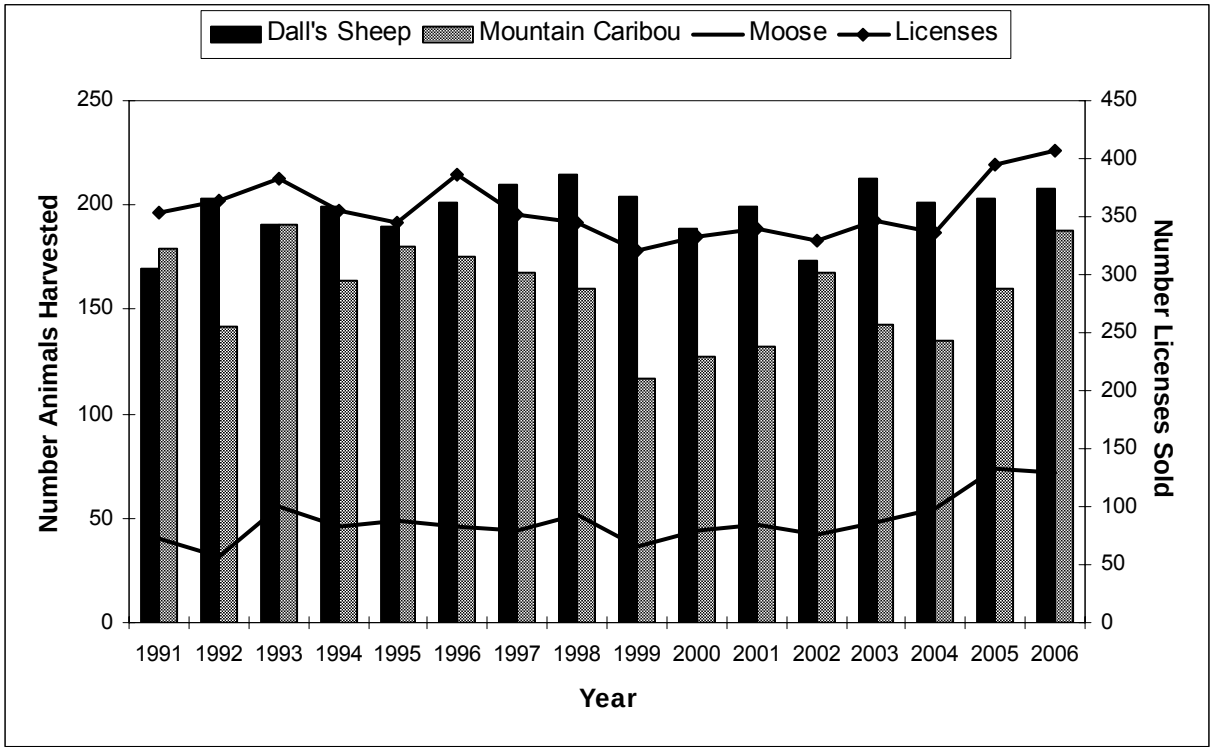


Figure 3. The number of Dall's sheep, mountain caribou, and moose harvested in the Mackenzie Mountains by non-resident hunters, and the number of non-resident licences sold during 1991-2006.

Table 5. Mean length (± SD) and range (in days) of Dall's sheep hunts where at least one day was spent hunting from 1997-2006.

	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997
Number of reports	214	190	167	189	174	176	198	201	224	216
Mean hunt length	4.1 ± 2.7	4.1 ± 2.6	4.0 ± 2.9	3.8 ± 2.9	4.7 ± 2.7	4.8 ± 3.0	4.6 ± 2.7	4.7 ± 3.1	4.4 ± 2.8	4.3 ± 2.6
Range	1-12	1-14	1-17	1-12	1-12	1-15	1-15	1-16	1-15	1-12

Table 6. Horn measurements of Dall's sheep rams harvested in the Mackenzie Mountains, 2006.

	Left Horn Contour Length		Right Horn Contour Length		Left Horn Base Circumference		Right Horn Base Circumference		Tip to Tip Spread	
	cm	in	cm	in	cm	in	cm	in	cm	in
Mean	89.2	35.1	88.5	34.8	32.7	12.9	32.7	12.9	59.2	23.3
Standard Deviation	7.60	3.0	7.66	3.0	1.92	0.76	1.92	0.76	8.05	3.2
Maximum	106.7	42.0	108.0	42.5	36.5	14.4	39.0	15.4	93.5	36.8
Minimum	69.0	27.2	67.0	26.4	26.4	10.4	26.5	10.4	37.0	14.6

From hunters' classifications of sheep observed during their hunts in 2006 we calculated an estimated 53.4 lambs per 100 ewes. This is similar to the mean of 55 lambs per 100 ewes reported over the past 11 years (Table 8; Appendix 6). For the Richardson Mountains of the northern Yukon and NWT, Nagy and Carey (1991) suggest an August ratio of 43 lambs per 100 ewes would have allowed for their observed 10.5% average annual rate of increase from 1986 to 1991. Subsequent to a decline in this unhunted population from 1997-2003, Nagy et al. (in prep.) reported 28 lambs per 100 'nursery sheep' in August 2003. Jorgenson (1992) summarized 17 years of lamb:ewe classification data for a population of bighorn sheep in west-central Alberta and found a mean of 43 lambs per 100 ewes in September (range 25 to 54).

Differences in adult sex ratios among populations may result from differences in hunting pressure, differences in survival of males and females from birth to adulthood, or both (Nichols and Bunnell 1999). However, since the ratio of rams to ewes is almost never equal in wild populations of mountain sheep, even where they are unhunted, it is clear that there is a different natural mortality rate for the two sexes. Geist (1971) suggested that this difference is a result of injuries and stress accumulated by males during the breeding season. The 95.7:100 ram to ewe ratio (ram:ewe) estimated from hunters' observations in 2006 is similar to that reported in 2004 and 2005 but higher than that reported from 1995-2003 (Appendix 6). In 2004, 2005 and 2006 there were more rams with <¾ curl than rams with >¾ curl observed, and the lamb:100 ewes

recorded in 2002 was high in the southern Mackenzie Mountains (Larter and Allaire 2005b). Strong cohorts of juvenile rams may be a factor in the recent higher ram:ewe ratios reported.

Table 7. Age-structure of Dall's sheep rams harvested by non-resident and resident (n=10) hunters in the Mackenzie Mountains, 1995-2006.

	2006		2005		2004		2003		2002		2001		2000		1999		1998		1997		1996		1995	
Age	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
3.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.5	0	0.0
4.5	0	0.0	1	0.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
5.5	0	0.0	0	0.0	1	0.5	1	0.5	0	0.0	0	0.0	0	0.0	0	0.0	1	0.5	0	0.0	1	0.5	1	0.5
6.5	1	0.5	1	0.5	3	1.5	8	3.8	2	1.2	4	2.2	3	1.6	1	0.5	4	2.0	1	0.5	5	2.5	4	2.1
7.5	8	3.8	11	5.6	14	7.0	12	5.7	6	3.6	15	8.2	16	8.5	13	7.1	9	4.3	12	5.8	21	10.5	16	8.5
8.5	26	13.9	24	12.2	41	20.0	43	20.5	44	26.5	33	18.0	39	20.8	23	12.6	39	18.8	39	18.8	47	23.5	49	25.9
9.5	49	25.5	54	27.6	49	24.5	72	34.3	43	25.9	41	22.4	40	21.2	49	26.8	45	21.7	52	25.1	56	28.0	51	27.0
10.5	54	26.4	47	24.0	43	21.5	45	21.4	39	23.5	45	24.6	41	21.8	47	25.7	63	30.4	58	28.0	36	18.0	34	18.0
11.5	36	17.8	39	19.9	27	13.2	11	5.2	16	9.6	29	15.9	28	14.9	29	15.8	30	14.5	24	11.6	26	13.0	14	7.4
12.5	23	12.0	13	6.6	16	7.8	12	5.7	9	5.4	11	6.0	14	7.5	15	8.2	12	5.8	15	7.2	6	3.0	14	7.4
13.5	6	2.9	5	2.6	3	1.5	2	1.0	6	3.6	10	5.5	3	1.6	6	3.3	2	1.0	4	1.9	1	0.5	5	2.6
14.5	1	0.5	1	0.5	3	1.5	3	1.4	1	0.6	0	0.0	3	1.6	0	0.0	1	0.5	2	1.0	0	0.0	1	0.5
15.5	2	1.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.5	0	0.0	1	0.5	0	0.0	0	0.0	0	0.0
16.5	0	0.0	0	0.0	0	0.0	1	0.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
>10y	122		105		92		74		71		95		90		97		109		102		69		68	
%>10	59.2		53.6		46.0		35.2		42.7		51.0		47.9		53.0		52.6		49.5		34.5		36.0	
>12y	32		19		22		18		16		21		21		21		16		21		7		20	
%>12	15.5		9.7		11.0		8.6		9.6		11.2		11.2		11.4		7.7		10.1		3.5		10.6	

Table 8. Observations of Dall's sheep reported by non-resident hunters in the Mackenzie Mountains, 2006.

	Number of Hunters Reporting	Number Observed	Mean Number Observed/hunter	Percent of Sheep Classified
Rams	181	3841	21.2	38.4
Ewes[1]	182	4012	22.0	40.1
Lambs	181	2143	11.8	21.4

[1] includes females >1-yr-old, yearlings, and younger rams. Also called 'nursery sheep'.

In the Yukon, mid to late June annual aerial surveys to count and classify sheep from 1973 to 1998 reported a mean of 48 rams (range 28 to 74) per 100 'nursery sheep' (Jean Carey, Yukon Dept. of Renewable Resources unpublished data). For the unhunted Richardson Mountains herd (Yukon-Northwest Territories), Nagy et al. (in prep.) reported 41 rams per 100 'nursery sheep' in 2003 following a decline from peak population size in 1997. In Alaska, ram:ewe for two unhunted herds in Denali and Gates of the Arctic National Parks typically averaged 60-67:100 (Nichols and Bunnell 1999). In more heavily hunted Alaskan herds, ram:ewe ranged from 33:100 (heavily hunted) to 87:100 (lightly hunted). The ram:ewe ratios reported for the Mackenzie Mountains since 1995 (Appendix 6) suggests that the harvest of rams in the Mackenzie Mountains is sustainable at current levels.

In 2006, hunters observed similar numbers of rams (3841) to previous years (Tables 8, 9). They observed slightly fewer legal (>¾ curl) rams (n=1769) than rams with <¾ curl (n=2019) during their hunts (the curl of 53 rams couldn't be determined). The mean number of legal rams observed per hunt was 9.9 (Table 9).

Table 9. Classification of Dall's sheep rams observed by non-resident hunters in the Mackenzie Mountains, 1995 - 2006.

	2006		2005		2004		2003		2002		2001	
Ram Class	Horn >¾ curl	Horn <¾ curl	Horn >¾ curl	Horn <¾ curl	Horn >¾ curl	Horn <¾ curl	Horn >¾ curl	Horn <¾ curl	Horn >¾ curl	Horn <¾ curl	Horn >¾ curl	Horn <¾ curl
Number of hunters Reporting	180	171	186	182	188	183	127	121	148	133	186	174
Number of rams Classified	1769	2019	1787	1899	2185	2324	1662	1654	1720	1720	1812	1765
Percent of rams classified	46.7	53.3	48.5	51.5	48.5	51.5	50.1	49.9	50.0	50.0	50.7	49.3
Mean number of rams observed/hunt	9.9	12.0	9.6	10.4	11.6	12.7	11.9	11.9	11.6	12.9	9.7	10.1

	2000		1999		1998		1997		1996		1995	
Ram Class	Horn >¾ curl	Horn <¾ curl	Horn >¾ curl	Horn <¾ curl	Horn >¾ curl	Horn <¾ curl	Horn >¾ curl	Horn <¾ curl	Horn >¾ curl	Horn <¾ curl	Horn >¾ curl	Horn <¾ curl
Number of hunters Reporting	151	147	144	138	177	177	205	205	172	174	181	180
Number of rams Classified	1351	1717	1579	1756	1848	1924	1538	1586	1713	1699	2070	1645
Percent of rams classified	44.0	56.0	47.3	52.7	49.0	51.0	49.2	50.8	50.2	49.8	55.7	44.3
Mean number of rams observed/hunt	8.9	11.7	11.0	12.7	10.4	11.3	7.5	7.7	10.0	9.8	11.4	9.1

Mountain Caribou (*Rangifer tarandus caribou*)

Mountain caribou are another of the more desired species sought by non-resident hunters. Tags were purchased by 274 (67%) of non-resident hunters (Table 4), and at least 62% of tag holders hunted caribou harvesting 188 bulls. This is the greatest harvest since 1993. The mean annual harvest from 1991-2006 was 156 (Fig. 3; Appendix 7). The mean (±SD) length of a mountain caribou hunt, determined from the 171 reports where hunters spent at least 1 day hunting, was 4.29 ± 3.11 days (range 1-14 days). This is similar to the mean annual hunt lengths from 2000-2005 (Table 10).

Table 10. Mean length (± SD) and range (in days) of mountain caribou hunts where at least one day was spent hunting from 2000-2006.

	2006	2005	2004	2003	2002	2001	2000
Number reports	171	191	120	172	181	178	141
Mean hunt length	4.3 ± 3.1	3.7 ± 3.8	4.9 ± 3.9	3.8 ± 2.8	3.6 ± 2.7	4.3 ± 3.2	4.0 ± 2.7
Range	1-14	1-32	1-34	1-14	1-12	1-15	1-12

In 2006, 124 (66%) successful hunters reported antler lengths, a similar percentage as in previous years. This year, as in other years, there was substantial variation in antler lengths, range 68.6-141.0 cm. The maximum left and right antler lengths reported were 141.0 and 137.2 cm respectively (Table 11). The maximum antler length recorded by Boone and Crockett for mountain woodland caribou in North America is 158.5 cm (62.4 in) for a caribou taken from the Mackenzie Mountains in 1978 (Byers and Bettas 1999). Fourteen of the top 50 mountain woodland caribou recorded in the 12th edition of the Boone and Crockett Club record book are from the Mackenzie Mountains; the highest scoring antlers hold 7th place (Boone and Crockett Club on-line trophy database accessed 2007).

From hunters' classifications of mountain caribou observed during their hunts, we calculated ratios of 42.8 calves and 37.1 bulls per 100 adult females (cows); bulls

comprised 20.6% of all caribou classified (Table 12). These ratios are the same as the mean ratios determined from observations during 1995-2006 (Appendix 6).

Table 11. Antler measurements of mountain caribou bulls harvested by non-resident hunters in the Mackenzie Mountains, 2006.

	Contour Length	
	Left Antler	Right Antler
Number Measured	124	124
Mean (cm)	117.7	116.9
Mean (in)	46.3	46.0
Standard Deviation (cm)	12.6	13.6
Standard Deviation (in)	5.0	5.4
Maximum (cm)	137.2	141.0
Maximum (in)	54.0	55.5
Minimum (cm)	71.1	68.6
Minimum (in)	28.0	27.0

Table 12. Observations of mountain caribou reported by non-resident hunters in the Mackenzie Mountains, 2006.

Sex/Age Class	Number of Hunters Reporting	Number Observed	Mean Number Observed/hunter	Percent of Total Classified
Bulls	192	3976	20.7	20.6
Cows	179	10723	59.9	55.6
Calves	150	4588	30.6	23.8

Over the past 5 years bulls have comprised *ca.* 22% of the observed mountain caribou in the Mackenzie Mountains. This is a consistently lower percentage than the cumulative 39% average adult bull component reported by Bergerud (1978) in his summary of 8 North American caribou populations that were either non-hunted or hunted non-selectively (i.e., both males and females included in the harvest). Veitch et al. (2000c) classified 2659 of an estimated 5000 caribou in the central Mackenzie Mountains in August 1999 and reported only 25% of those animals were classified as males. Surveys made on the rutting grounds of the South Nahanni caribou herd provided in 1995, 1996, and 1997 reported 24, 28, and 20% of animals classified as males ≥1-year-old (Gullickson and Manseau 2000) and in 2001 reported 27% bulls (Gunn et al. 2002). Therefore, further investigation is warranted to determine the reason for the consistently lower bull:cow ratios reported for caribou in the Mackenzie Mountains.

In their 2002 assessment, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designated the boreal population of woodland caribou as "threatened" and the Northern Mountain population of woodland caribou as "special concern". These two populations of woodland caribou were subsequently listed under the federal *Species at Risk Act* in 2004 and 2005 respectively. Caribou of the Mackenzie Mountains are part of the Northern Mountain population of woodland caribou. In order to be more specific and to avoid confusion this report has adopted and will continue to use "mountain caribou" when referring to caribou from the Mackenzie Mountains.

Caribou in the Mackenzie Mountains are estimated to number between 13 000 and 18 000 from at least 3 separate herds shared between the Yukon and Northwest Territories: Bonnet Plume herd (5000 estimated), the greater Redstone herd (5-10 000 estimated), and the greater Nahanni herd (2-3000 estimated) (Yukon Renewable Resources 1996; J. Adamczewski personal communication; M. O'Donoghue personal communication; A. Veitch personal communication). They are subjected to an annual bull-selective non-resident harvest averaging only 158 animals per year (1991-2006). The resident harvest of mountain caribou in the Mackenzie Mountains also tends to be bull-selective (but not restricted to bulls) and is generally light (i.e., 30 animals/year);

subsistence harvest includes both males and females, with the proportion of each dependent on the time of year that animals are harvested (J. Snortland unpublished data; K. Davidge personal communication). Subsistence harvesters in the Mackenzie Mountains include residents of both the NWT and Yukon Territory; harvest is not generally reported.

Studies on the Redstone herd of mountain caribou were initiated in March 2002, with 10 female caribou being equipped with satellite radio collars as part of a study of caribou in the central and north-central Mackenzie Mountains initiated by the Sahtu Renewable Resources Board (Creighton 2006; Olsen 2000; 2001; Olsen et al. 2001). Satellite radio collars were deployed on 9 adult female caribou during March 2000 and October 2001 by the Yukon Department of the Environment (J. Adamczewski personal communication). These animals were believed to be part of the greater Nahanni herd. In October 2004, 18 female caribou were equipped with satellite collars along the Yukon-Northwest Territories border. These caribou were also believed to be from the greater Nahanni herds, however 3 animals were determined to be from the Finlayson herd. This is a co-operative study between the Yukon Territorial Government, Parks Canada (Nahanni National Park) and the Wildlife Conservation Society (Weaver 2006).

Alaska-Yukon Moose (*Alces alces gigas*)

Moose in the Mackenzie Mountains belong to the Alaska-Yukon subspecies of moose (also known as tundra moose) that occur across Alaska, the Yukon, extreme northern British Columbia, and the Mackenzie Mountains, with the Mackenzies representing the eastern limit of the subspecies' range. This is the largest of the four subspecies of moose that occur in North America (Bubenik 1997). Tags to hunt moose were purchased by 28% (n=112) of non-resident hunters in 2006, the greatest number and highest percentage of hunters recorded (Table 4). At least 64% of tag holders hunted moose and harvested 72 bulls. The number of moose harvested in 2006 was down slightly from 2005 but greater than the mean annual harvest of 49 from 1991-2006 (Fig. 3; Appendix 7). The mean (± SD) length of a moose hunt, determined from the 72 reports where hunters spent at least 1 day hunting, was 3.6 $\pm$ 2.7 days (range 1-11 days), similar to what was reported for previous years (Table 13).

Table 13. Mean length (± SD) and range (in days) of moose hunts where at least one day was spent hunting from 2000-2006.

	2006	2005	2004	2003	2002	2001	2000
Number reports	72	85	49	60	46	42	48
Mean hunt length	3.6 ± 2.7	4.4 ± 3.1	4.8 ± 3.3	3.9 ± 2.8	3.6 ± 2.6	3.7 ± 2.9	4.4 ± 2.7
Range	1-11	1-14	1-12	1-14	1-12	1-12	1-12

The mean (± SD) tip-to-tip spread of measured antlers from bull moose harvested by non-resident hunters in 2006 was 141.3 ± 14.4 cm (55.6 ± 5.7 in., n=56). This is similar to that recorded for previous years (Table 14). However, this year's maximum recorded antler spread was only 170.0 cm (66.9 in.), substantially less than the maximum recorded antler spread of 218.4 cm (86 in.) for a record Alaska-Yukon moose taken in the NWT in 2006. This moose has currently not been officially recorded by Boone and Crockett. Two moose taken from the Mackenzie Mountains are in the top 20 Alaska-Yukon moose recorded in the record book of the Boone and Crockett Club and hold places 11 and 15 (Byers and Bettas 1999); the rest of the top 20 were all taken in Alaska.

Table 14. The yearly mean and range in measured bull moose tip-to-tip antler spread (cm).

	2006	2005	2004	2003	2002	2001	2000	1999
Measured (n)	56	53	38	34	32	32	34	26
Average spread	141.3	146.5	150.3	150.0	149.3	144.3	147.0	144.2
Range	107-170	122-218	127-174	107-165	103-178	113-165	127-179	109-166

From hunters' observations of moose during hunts we calculated ratios of 32.8 calves:100 adult females (cows) and 136.6 bulls:100 cows (Table 15; Appendix 6). This is the sixth time in the past 12 years when moose calf:cow ratio has been ≥30:100. The ratio still remains lower than the 40-60:100 that is generally documented during

early to mid-winter aerial surveys for northwestern moose (*Alces alces andersoni*) along the Mackenzie River in the vicinity of the communities of Fort Good Hope (MacLean 1994a), Norman Wells (Veitch et al. 1996), and Tulita (MacLean 1994b) (Appendix 6). However, these surveys are conducted after the major fall subsistence harvest and variable female harvest can certainly impact the interpretation of cow:calf ratios. No research has been done on moose in the Mackenzie Mountains; therefore, we have no explanation for the apparent discrepancy in calf production, survival, or both between the mountains and the river valley. A survey of moose in the Norman Wells study area in January 2001 estimated a calf:cow ratio of 18:100 (ENR, Norman Wells unpublished data), and an aerial survey of the Mackenzie River Valley and vicinity in the Dehcho Region south from the Blackwater River to

Table 15. Observations of moose reported by non-resident hunters in the Mackenzie Mountains, 2006.

Age/Sex class	Number of Hunters Reporting	Number Observed	Mean Number Observed/Hunter	Percent of Total Classified
Bulls	94	362	3.9	50.7
Cows	77	265	3.4	37.1
Calves	43	87	2.0	12.2

Jean Marie River conducted in November 2003 estimated 32:100 (N. Larter unpublished data), indicating that low calf:cow ratios may not be restricted to the Mackenzie Mountains and that more study is required to determine the cause(s). A program has recently been established in the Mackenzie and Liard River Valleys of the Dehcho to document calf:cow ratios annually in November (ENR, Fort Simpson unpublished data).

The bull:cow ratio of 137:100 was the highest reported for the Mackenzie Mountains, range 76-129:100 from 1995-2005 (Appendix 6). Bull:cow ratios from the Mackenzie Mountains continue to be generally higher than the range of 27-105:100

reported in the Yukon (R. Ward cited in Schwartz 1997) and from heavily harvested populations in Alaska of 16:100 (Schwartz et al. 1992) and Norway of average 46:100, range (25-69:100) (Solberg et al. 2002). There has been concern that low bull:cow ratios could influence conception dates, pregnancy rates and newborn sex ratios (Bishop and Rausch 1974; Crête et al. 1981; Solberg et al. 2002) and that management strategies should maintain a high bull:cow ratio (Bubenik 1972). Studies on tundra moose in Alaska have not found evidence that moose populations with low bull:cow ratios have reduced reproductive rates (Schwartz et al 1992); populations with a more skewed sex ratio had a relative rate of population increase greater than populations without a skewed sex ratio (Van Ballenberghe 1983). However, a recent study of 8 heavily harvested moose populations in Norway indicated a relationship between declining recruitment rate and skewed adult sex ratio (Solberg et al. 2002). Based upon hunter observations since 1995, there is no indication of any decreasing trend in the bull:cow ratio of moose in the Mackenzie Mountains hence the adult sex ratios are not a factor in the low calf:cow ratios reported. The reported sex ratios may have an inherent bias towards a greater number of bulls if harvesters consistently spend more time searching for moose in areas frequented more by large males than females.

Mountain Goat (*Oreamnos americanus*)

Sales of mountain goat tags show more annual fluctuation than for any other ungulate species harvested by non-resident hunters in the Mackenzie Mountains, range 6-40(1991-2005; Table 4) with a mean annual harvest of 5 goats (range 1-18) over the same time (Appendix 7). In 2006, mountain goat tags were purchased by 21 (5%) of non-resident hunters. A total of 12 goats were harvested; 9 billies, 2 nannies and 1 of unknown sex (Table 4). The latter animal fell down a cliffside after being shot and rappelling attempts to retrieve it were unsuccessful. This was the second highest harvest of mountain goats from 1991-2006. The mean (± SD) length of a goat hunt, determined from the 12 reports where hunters spent at least 1 day hunting, was 2.8 $\pm$ 1.5 days (range 2-6 days), somewhat lower than in the previous two years (Table 16).

Table 16. Mean length (± SD) and range (in days) of goat hunts where at least one day was spent hunting from 2000-2006.

	2006	2005	2004	2003	2002	2001	2000
Number reports	12	18	8	6	4	2	1
Mean hunt length	2.8 ± 1.5	3.8 ± 2.8	3.9 ± 1.6	3.0 ± 2.6	2.8 ± 1.9	1.5 ± 0.7	3.0
Range	2-6	1-14	2-6	1-8	1-5	1-2	3

Mountain goats are known to inhabit 5 of the 8 outfitting zones in the Mackenzie Mountains, occurring almost exclusively below 63^{o} 00' N (Veitch et al. 2002). They are most numerous in high relief terrain along the Yukon-Northwest Territories border between 61^{o} 00' and 62^{o} 00' N. However, since 1995, we have received hunter observations or harvest reports of goats from only 4 of those outfitter zones - D/OT/01, D/OT/02, S/OT/03, and S/OT/04 (see Fig. 1). In 2006, observations of mountain goats by hunters came from just 2 of those zones D/OT/01 (n=69), and D/OT/02 (n=176), all of the mountain goats were harvested in these zones. We estimated 61.5 kids and 51.4 billies per 100 nannies based upon this year's hunter observations.

In 2005 we started to estimate the age of harvested goats based upon counting horn annuli and have tried to age as many harvested goats as possible. Of the 18 goat (15 billies and 3 nannies) ages we have to date the range has been from 2.5 to 15.5 years with half aged <8 years and half aged >8 years. Of the 10 goats (8 billies and 2 nannies) aged in 2006, 4 (3 billies and 1 nanny) were aged >12 years. The largest horns from a mountain goat taken in 2006 were 20.9 cm (left) and 20.4 cm (right). No mountain goats from the NWT are listed in the 11th edition of the Boone and Crockett Club record book (Byers and Bettas 1999).

There is some evidence that goat numbers and distribution have been increasing in zone D/OT/02 in the southern Mackenzie Mountains (Larter 2004; unpublished data; C. and C. Lancaster personal communication). Although the 39.3

kids and 57.3 billes per 100 nannies reported from hunter observations in this zone is lower than that reported over the last 2 years, and lower than that reported from hunter observations in zone D/OT/01, in 2006 there continued to be more goats observed and billies were observed in places they had not been seen previously in zone D/OT/02 (C. Lancaster personal communication).

In a 2.5 hour rotary-winged survey of zone D/OT/02 on 11 September, 88 goats were observed (38 billies, 27 nannies, 19 kids, and 4 yearlings), producing estimates of 140.8 billies and 70.4 kids per 100 nannies (N. Larter unpublished data). This survey was conducted in an area that could not be surveyed during a 2004 aerial survey and provided similar numbers of goats and ratio estimates as the 111 billies and 71.4 kids per 100 nannies from that 2004 survey (Larter 2004). These observations support the contention of increasing goat numbers and distribution.

Wolf (*Canis lupus*)

Wolf tags were purchased by 49% of non-resident hunters in 2006 (Table 4) with 23 wolves harvested (Appendix 7). This is the most wolves that have been harvested annually since 1991: mean 13, range 7-19, during 1991-2005. The number of wolves observed in 2006 (n=202) was similar to observations in previous years (Table 17). Seven percent of responding hunters indicated that they believed wolf numbers were high, up from the previous 3 years but similar to that reported for 2000 and 2002. 2000 was the first year that hunters had commented on wolf numbers in the wildlife observation forms.

The number of hunters reporting since 2001 has been consistently higher than in previous years. This we attribute to a change in how we defined hunter reporting. For data collected after 2001, we assumed that all returned observation forms where there was a blank, a zero, or a dash in the box indicating the number of wolves observed was a report of no wolves being observed. When looking at the forms this seemed like a reasonable assumption. This assumption may well be invalid for previous years' data and would bias the post 2001 values to be higher than the previous years.

Table 17. Observations of wolves reported by non-resident hunters in the Mackenzie Mountains, 1995-2006.

	2006[1]	2005[1]	2004[1]	2003[1]	2002[1]	2001	2000	1999	1998	1997	1996	1995
Number hunters reporting	239	254	244	203	197	142	116	103	148	141	76	119
Number wolves observed	202	245	317	200	249	215	228	142	148	200	186	269
Mean observed/hunter	0.8	1.0	1.3	1.0	1.3	1.5	2.0	1.4	1.0	1.4	2.4	2.3
Number hunters seeing ≥1	84	76	81	74	69	65	61	40	57	76	26	26

[1] Change in reporting since 2002 may have resulted in the number of hunters reporting for 1995-2001 being artificially low, see text.

Wolverine (*Gulo gulo*)

Wolverine tags were purchased by 27% (n=108) of non-resident hunters (Table 4). At least 28% (n=30) of tag holders actively hunted wolverines, but only 1 was harvested in 2006. Hunters reported spending from 1-14 days actively hunting wolverine (mean ± SD of 5.2 ± 3.3 days). Hunters reported 25 observations of wolverines. Observations were reported from 6 of the 8 outfitter zones (Fig. 4) and included those of family groups. Historically, wolverine observations have been mostly of solitary animals with few family groups being observed. The number of animals observed this year has returned to levels reported from 1996-1999 and since 2004, being greater than that observed during 2000-2003 (Table 18; Fig. 4). More than half of the observations came from 2 zones D/OT/01 and D/OT/02.

There are no relationships between the number of wolverine observed/year and annual harvest or tags purchased/year that explain annual differences in wolverine observation (Table 18). Wolverines occur throughout the Mackenzie Mountains, but

sightings are considered rare. Most wolverine observations are made in hunting zones D/OT/01, D/OT/02, S/OT/01, and S/OT/04.

Table 18. The number of reported observations of wolverine, the number of wolverine harvested, the number of hunters with wolverine tags, the percentage of total hunters with wolverine tags, and the total number of hunting tags purchased for 1995-2006.

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Reported Observed	21	34	36	34	30	11	9	9	12	30	28	25
Number Harvested	1	4	1	0	3	0	2	1	0	0	1	1
No. Wolverine Tags	35	114	135	99	65	78	83	97	141	89	154	108
% Wolverine Tags	11	29	38	29	20	23	26	29	40	26	39	27
Total Hunting Tags	333	387	352	345	321	332	344	338	347	337	394	407

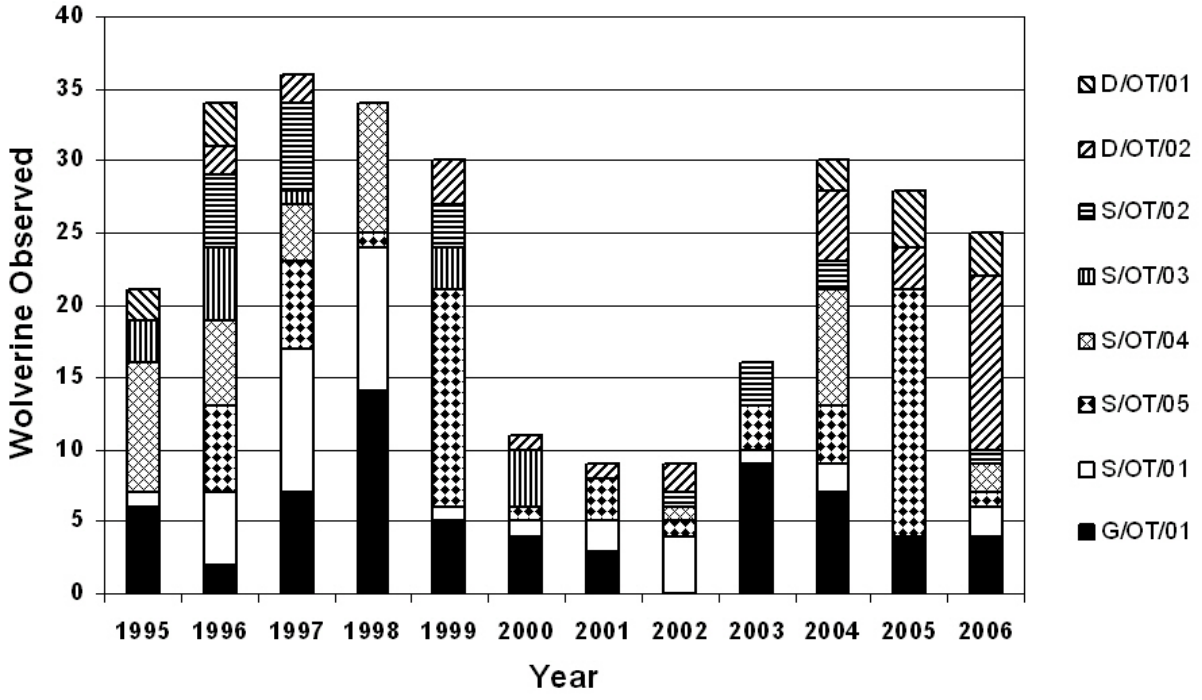


Figure 4. The number of wolverines observed by hunters from 1995-2006, and the outfitter zones where the observations occurred. Data are based upon voluntary hunter observation forms.

Black Bear (*Ursus americanus*)

Only 3 non-resident hunters purchased black bear tags in 2006. No black bears were harvested as has been the case for the past 11 years. Black bears are relatively rarely seen in the Mackenzie Mountains and in most years are reported only from south of 63^{o} 00 N. In 2006, 29 black bears (27 adults and 2 cubs) were observed based upon returned (n=239) voluntary observation forms. Bears were observed in outfitter zones D/OT/01 (3 adults), D/OT/02 (23 adults and 2 cubs) and S/OT/05 (1 adult) (Table 19). As with the other post 2001 carnivore data, we assumed that all returned observation forms where blanks, zeroes, or dashes occurred in the boxes indicating the number of carnivores observed was a report of no carnivores being observed. This assumption is likely invalid for previous years' data and likely inflates the 2002 through 2006 values relative to 1996-2001 values.

Table 19. Observations of black bear reported by non-resident hunters in the Mackenzie Mountains, 1995-2006.

	2006[1]		2005[1]		2004[1]		2003[1]		2002[1]		2001	
	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult
Total # Observed	2	27	4	21	1	23	3	34	3	17	0	7
% of Total Observed	7	93	16	84	4	96	8	92	15	85	0	100
No. Hunters Reporting	239	239	256	256	229	229	191	191	199	199	127	130
No. Hunters Saw at Least 1	1	14	3	18	1	19	2	21	2	14	1	7
Maximum # Observed	2	11	2	2	1	3	2	7	2	3	0	1

	2000		1999		1998		1997		1996		1995[2]
	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	All Bears
Total # Observed	2	15	4	7	0	15	2	3	1	10	11
% of Total Observed	12	88	36	64	0	100	40	60	9	99	nil
No. Hunters Reporting	88	93	87	89	121	124	96	96	6	14	44
No. Hunters Saw at Least 1	1	10	2	6	0	8	2	3	1	9	9
Maximum # Observed	2	3	2	2	0	3	1	1	1	2	2

[1] Change in reporting for 2002 may have resulted in artificially lower numbers of hunters reporting for 1995-2001, see text.

[2] All bears not separated out by cubs and adults.

Grizzly Bear (*Ursus arctos*)

The Mackenzie Mountains have been closed to non-residents for hunting grizzly bears since 1982 and resident hunters have been restricted to one bear per lifetime since the same year (Veitch 1999). It is clear from the comments made by hunters on voluntary observation forms that, despite the lack of hunting opportunities, grizzly bears remain a subject of considerable interest for non-resident hunters and their guides in the Mackenzie Mountains (Appendices 3 and 4). Consistent with the past 8 years, this year hunters reported loss of meat, capes, food, and equipment to grizzly bears, a perception that there were too many grizzly bears, and several implicated grizzly bears as the principal reason for low numbers of moose and caribou calves. Moose calf numbers, based upon hunter observations, are generally lower in the Mackenzie Mountains than those reported in the Mackenzie valley and predation by grizzly bears could be a potential cause as has been demonstrated elsewhere (Ballard 1992). However, hunter observations of caribou calves would tend to refute grizzly bear predation as major impact on caribou calf numbers. A frequent comment of guided hunters is that bears have lost their fear of humans because of a lack of hunting and a concern that this was a human safety issue. Although there have been no documented injuries from grizzly bear attacks in the Mackenzie Mountains since the closure of the non-resident grizzly bear hunting season (Veitch 1999), there were 2 separate incidents in 2006 in the southern Mackenzie Mountains when grizzlies claimed meat from a moose kill while guides were in the vicinity. In both instances the guide had to shoot the bear at close quarters (C. Lafferty personal communication). Generally there has been at least 1 nuisance grizzly bear killed annually since 1993, but most of the 46 nuisance grizzly bear kills have occurred in the Sahtu (n=42), with only 4 in the Dehcho (ENR Norman Wells and Fort Simpson unpublished data).

While the mean number of adult grizzly bears observed by hunters has remained relatively stable from 1996-2006 (mean=308), the cub to adult ratio calculated from the hunter observations peaked in 2000 with cubs comprising 29% of all bears observed, declined to a low of 12% in 2003, and continues to increase through 2006 (Fig. 5; Table 20). Because cub grizzlies in the Mackenzie Mountains tend to stay with their mothers for 3 years (Miller et al. 1982), reported observations of

'cubs' refers to cubs-of-the-year, yearlings, and 2-year-old bears. Miller et al. (1982) documented a low reproductive rate for female grizzly bears in Mackenzie Mountains, with no sows less than 8-years-old producing cubs, an average inter- litter

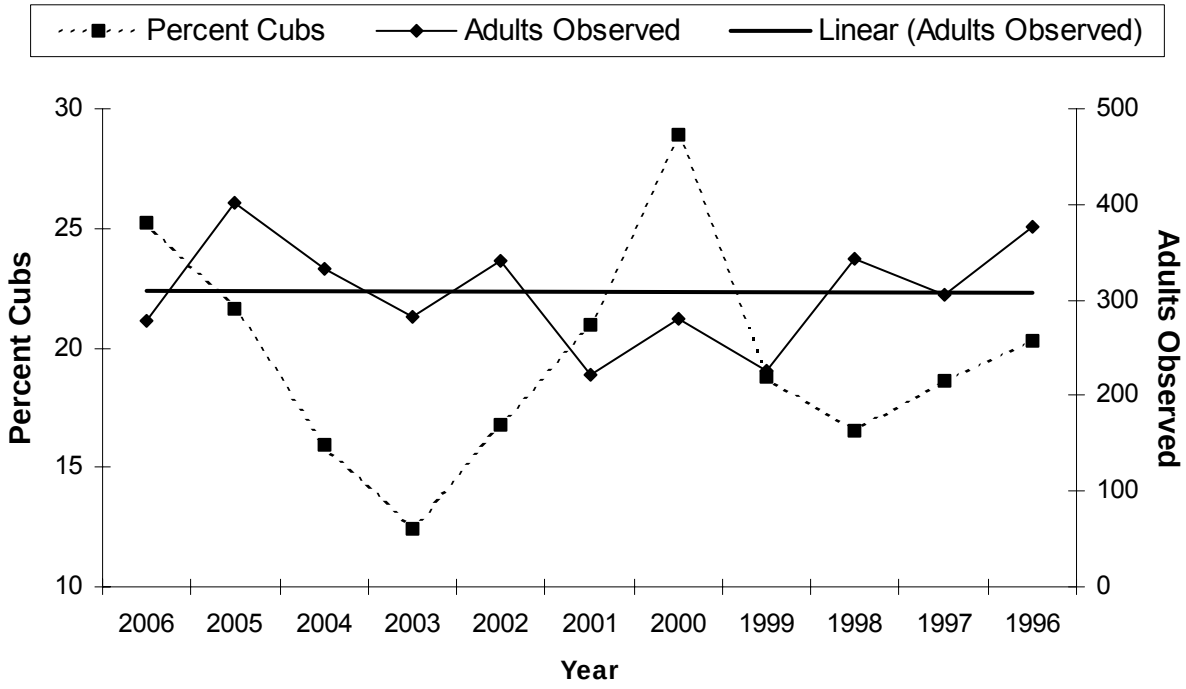


Figure 5. The percent of 'cubs' and the total number of adult grizzly bears observed by hunters from 1996-2006. Data are based upon voluntary hunter observation forms. The linear trend of total adult bears observed during the same time period is indicated.

interval of 3.8 years, and a mean litter size of 1.8. The percent 'cubs' determined from reported hunter observations during 1996-2006 indicates a periodicity of 4 years between low percentages of cubs (Fig. 5), and may be similar to what was reported during 1973-1977 when there was non-resident hunting of grizzly bears. We estimated the mean litter size from hunter observation reports by analyzing just those observations of groups of grizzly bears where cubs were present with only 1 adult present. The estimated mean litter size in 2006 was 1.9, which falls within the range of 1.4-2.0 reported from 1996-2006. The 1.9 litter size reported for 2006 falls between the mean found by Miller et al. (1982) and the 2.2 reported for grizzly bears of Kodiak Island, Alaska (Troyer and Hensel 1964). The demographic parameters of Mackenzie

Mountain grizzly bears estimated during 1996-2006 are comparable to those reported during 1973-1977 by Miller at al. (1982).

Table 20. Observations of grizzly bear reported by non-resident hunters in the Mackenzie Mountains, 1995-2006; total number of bears observed, percent of cubs/adults, number of hunters reporting grizzly observations, number of hunters seeing at least one cub/adult, the mean and maximum number of cub/adults observed. [1] All bears were not separated out by cubs and adults.

	2006		2005		2004		2003		2002		2001	
	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult
Total # Observed	93	279	110	402	63	333	40	283	69	341	59	222
% of Total #	25	75	21	79	16	84	12	88	17	83	21	79
# Hunters reporting	50	122	49	150	34	131	19	120	34	128	136	171
# Hunters saw ≥1	32	70	10	65	15	57	9	53	11	48	28	104
Mean # Observed	1.9	2.3	2.0	2.3	1.9	2.5	2.1	2.4	2	2.7	0.4	1.3
Max. # Observed	5	12	10	16	4	15	12	7	8	20	5	10

	2000		1999		1998		1997		1996		1995
	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	All Bears[1]
Total # Observed	113	281	52	225	68	343	70	306	96	377	389
% of Total #	29	71	19	81	17	83	19	81	20	80	nil
# Hunters reporting	108	131	98	117		177	110	170	49	132	138
# Hunters saw ≥1	51	97	28	81	31	105	32	129	46	129	123
Mean # Observed	1.1	2.1	0.5	1.9	0.5	1.9	0.6	1.8	2.0	2.9	2.8
Max. # Observed	8	12	4	12	6	16	12	17	5	15	16

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Co-operation from the outfitters operating in the Mackenzie Mountains in 2006 was again very good and we thank them for the extra efforts they made in completing, signing, and sending us their harvest report and meat distribution forms. We thank Renewable Resources Officers and clerks with ENR in Norman Wells, Fort Simpson, and Fort Liard for collecting and organizing data from non-resident hunters in their respective offices.

We also greatly appreciate the efforts, interest, and co-operation shown by our visiting hunters and the more than 80 guides that completed the forms, reported observations of animals seen, and did the various antler and horn measurements. In addition, we would like to particularly thank those hunters that took the time to write comments about their hunting experience.

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PERSONAL COMMUNICATIONS

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APPENDIX 1.

Outfitters licenced to provide services to non-resident hunters in the Mackenzie Mountains, NWT – 2006.

D/OT/01 – *SOUTH NAHANNI OUTFITTERS LTD.*

Werner and Sunny Aschbacher
PO Box 31119
Whitehorse, YT Y1A 5P7
Ph: (867)-399-3194
Fx: (867)-399-3194
e-mail: info@huntnahanni.com
website: www.huntnahanni.com

D/OT/02 – *NAHANNI BUTTE OUTFITTERS*

Cam and Clay Lancaster
PO Box 653
Hudson Hope, BC VOC 1VO
Ph: (403)-380-2789
Fx: (403)-380-6126
e-mail: claykris@pris.bc.ca
website:
www.lancasterfamilyhunting.com

G/OT/01 – *ARCTIC RED RIVER OUTFITTERS*

Kelly and Heather Hougen
P.O. Box 5988
Whitehorse, YT Y1A 5L7
Ph: (867)-633-4934
Fx: (867)-633-4934
e-mail: info@arcticred-nwt.com
website: www.arcticred-nwt.com

S/OT/01 – *GANA RIVER OUTFITTERS*

Harold Grinde
P.O. Box 528
Rimbey, AB T0C 2J0
Ph: (403)-783-3499
e-mail: ganariver@telus.net
website: www.ganariver.com

S/OT/02-*MACKENZIE MOUNTAIN OUTFITTERS*

Stan and Helen Stevens
P.O. Box 5
Tomslake, BC V0C 2L0
Ph: (250)-786-5118
Fx: (250)-786-5118
e-mail: stevens.mmo@pris.bc.ca
website: www.mmo-stanstevens.com

S/OT/03 – *RAM HEAD OUTFITTERS*

Stan and Debra Simpson
P.O. Box 89
Warburg, AB T0C 2T0
Ph: (780)-848-7578
Fx: (780)-848-7550
website: www.ramheadoutfitters.com

S/OT/04 - *NWT OUTFITTERS*

Eric Mikkelson
PO Box 106
Lazo, BC V9N 8Z8
Ph: (888)-293-2299
Fx: (250)-897-0054
e-mail: huntnwt@shaw.ca
website:
www.wildsheep.org/nwtoutfitters

S/OT/05 - *REDSTONE TROPHY HUNTS LTD.*

P.O. Box 18
Pink Mountain, BC
VOC 2BO
Ph: (250)-772-5992
Fx: (250)-261-9962
website: www.redstonehunts.com
e-mail:
redstonehunts@yt.sympatico.ca

APPENDIX 2.

Summary of fees, bag limits, and seasons for big game species available to non-resident in the Mackenzie Mountains, NWT - 2006. [Note: all prices are in Canadian funds.]

Species	Status	Tag Fee	Trophy Fee	Bag Limit	Season
Black Bear	Non-resident	$20.00	$100.00	1 adult bear not accompanied by a cub	15 Aug - 31 Oct
	Non-resident alien	$50.00	$100.00		15 Aug – 30 June
Woodland Caribou	Non-resident	$20.00	$200.00	1	25 Jul - 31 Oct
	Non-resident alien	$50.00	$200.00		
Mountain Goat	Non-resident	$20.00	$200.00	1	15 Jul - 31 Oct
	Non-resident alien	$50.00	$200.00		
Moose	Non-resident	$20.00	$200.00	1	1 Sep - 31 Oct
	Non-resident alien	$50.00	$200.00		
Dall's Sheep	Non-resident	$20.00	$200.00	1 adult male with min. ¾ curl	15 Jul - 31 Oct
	Non-resident alien	$50.00	$200.00		
Wolf	Non-resident	$20.00	$100.00	1	15 Aug - 31 May
	Non-resident alien	$50.00	$100.00		25 Jul - 10 Oct
Wolverine	Non-resident	$20.00	$100.00	1	15 Aug - 31 Oct
	Non-resident alien	$50.00	$100.00		25 July - 31 Oct

Source: Department of Environment and Natural Resources. 2006. Northwest Territories Summary of Hunting Regulations. Department of Environment and Natural Resources, Yellowknife, NT. 26 pp.

APPENDIX 3.

Comments provided from non-resident hunters in the Mackenzie Mountains, NWT on voluntary Hunter Wildlife Observation Report forms, 2006. We have not printed actual names of outfitters or their personnel (XXX).

Would like to come for grizzly also.
Very professional outfitter and very professional guide.
Best outfitter and guide I ever had. Great game quality and well planned hunt. I will be back.
Excellent experience will be back!
Good hunt, no problems, well run safe outfitter.
Beautiful place to hunt. Very good organization done by the outfitter! Professional guiding.
Great hunt good guide need grizzly tags
Excellent organization and guiding.
Very good organization, dangerous hunting because of too many grizzlies which are not scared!
Very good place, very good organization and also very good guide. Everything perfect!!
Everything perfect, good areas for hunt, good guides, very good houses for hunters, so at the end is perfect to enjoy hunting.
Very good hunting experience with an excellent guide.
This year I found it dangerous sometimes because of to many grizzly's. Not one night in the tent on Root a bear nearer than
15 metres around.
Everything was excellent. I'm very glad and grateful.
I am so glad and grateful. Everything was very excellent!
Very good.
Its very nice.
I am so glad and wandered if all tag was harvested
Everything was great and excellent!
Beautiful hunting outfit.
Very hard hunting
Ripped his calf muscle and had to be flown out.
I just love the NWT. This is my second time in the north, you land is amazing/spectacular.
Didn't show up due to health problems.
It was a well organized fair chase bow hunt.
This is a beautiful wild area that must be preserved as such. However to designate a huge portion of this Nahanni Park, which would eliminate hunting, would be insane. It would open up no new recreational opportunities but would devastate the outfitting business, Don't do it!! Broken front leg had healed over but was a compound fracture at one time, archery ram.
Wonderful hunting experience wonderful facilities. Always safety of client first. Did not hunt caribou.
Very good outfitters. Shot and missed went home early.
Very good outfitters.
Wow!
Excellent accommodations, guides and immediate pick up of crew and camp after kill. Excellent group of people and Inter-relationship with all the children.
Would be a shame to see this turn into a non-hunting park.
Awesome

This location of my hunt (sites, guides and outfitter's) have made a dream come true for my successful hunt of a trophy Dall's sheep. Everyone is very professional and knowledgeable of the location's safety and success to give you this experience. Thanks to XXX my guide and XXX for the safe flights. You guys XXX are all professionals.
First Air lost my pack which made things tough I plan to contact them, as that is unacceptable.
I'd consider getting gear to a hunter a priority, as there is no way to re-outfit in Fort Simpson. Hunter quit do to worrying about getting weathered in.
Left after 3 days it is all they wanted to hunt.
Very good!
Nice area.
Passed up a bunch of good rams, no kill.
Outstanding hunt, great adventure.
Bow hunter, bad weather only hunted 2 days.
Excellent hunt, lots of sheep.
Impressive sheep country.
Had a great time.
Great!!!! Missed rams several times with bow and 1 with rifle.
Great hunt!
Excellent hunt, outfitters were outstanding.
Had great time. Saw fantastic country. Outfitter operation - outstanding guide - excellent.
Excellent game populations and outfitter.
Excellent hunting and outdoor experience. Great people - outfitter.
Did not hunt due to weather.
Guide was incredible; seen 6 black bears in one basin at same time. Big moose and sheep but have a bad knee; back and could not get to them. Client hurt his knee moose hunting and did not finish hunt.
XXX is awesome. We saw lots of 6, 7 year old up and coming rams. Everything looked happy.
The amount of grizzly's seen, by the rest of the guides and myself, its too bad we are not able to harvest 2 or 3 in a season.
The XXX outfit, XXX and staff are a top rated operation. All animals looked healthy.
One of the best hunts I have ever been on! Saw lots of up and coming rams (6-8 yr old), all animals seen looked in good shape.
Excellent outfitter in a very game rich environment. It was truly a great outdoor experience. Sheep generally appeared Healthy, and mature rams were abundant. The ram taken was limping on the right front leg, but no injury was apparent.
Excellent experience again! Ram was not in great condition (minimal rump fat) and had uneven tooth wear.
I would like to get the harvest report for 2005 and 2006 - Please mail it to me as you used to do in the past. Thanks.
Ram was old, and in poor condition.
XXX was outstanding in every respect!!!
Wonderful experience in Mackenzie Mountains.
Ram killed had the worst case of lump jaw I have seen in 15 years.
Did not hunt; just accompanied his friend, XXX.
Observed 20 ewes and lambs (5 lambs) and 9 rams. No obvious deformities or abnormalities.
All animals appeared in good shape.
Ram's joint's was very swollen and arthritic.

All animals seen looked to be in good condition. Both animals killed were very fat. Exceptional country and wild life.
All animals appeared in good health with no obvious deformities.
Several rams were observed with black tails. Not sure when in my lifetime I'll make it back, but had a wonderful hunting
experience and hunted with a first rate outfit in XXX outfitters. It seems the animal management will support hunting for
many generations.
All animals seen appeared to be healthy and in good shape.
Beautiful country, great outfitter and guides and excellent hunt!
Great hunt. Great guides. Great outfitter. Lots of game.
All game seen appeared healthy, no injuries seen. Great place to hunt I hope to return soon. Thank you!! I want to bring my family along next time!!! Hopefully my daughter and son will be able to come hunt with me in the future. "what awesome country" !!!
All animals seen appeared to be in great condition.
All animals appeared to be in good condition.
This is truly wilderness at its finest please try to keep it.
Observed a pack of 7 wolves with 3 pups near the Ramparts River.
Wonderful outdoor experience, all animals seen were in good shape.
Sweet.
All animals seen were in great shape.
Lots of trophy caribou bulls, all animals appeared in good shape. Caribou bedded on snow packs to escape bugs during heat.
All animals in good shape.
Observed 1 lone wolf chasing mature bull caribou down the XXX valley + a grizzly digging out ground squirrels.
Lots of trophy bulls, animals in good shape.-
Hunter did not take a ram. (turned down several good rams).
Excellent area, well managed.
Beautiful country with plentiful game.
Beautiful country.
Seen a lot of Grizzly bear, maybe a hunting season should be opened for them.
It was unbelievable!
Great Trophy Quality.
Beautiful area. I hope to hunt in the NWT again!
Very nice experience. The area was awesome.
Very enjoyable experience. Beautiful scenery and great wildlife to see.
Great hunt, great people at XXX Outfitters.
Great outfitter and camp. Had a great time.
Our hunting party saw 8 grizzly bears over a 10 day hunt (total of 3 hunters).
There should be a grizzly season.
The camp staff saw 11 other different bears during the last 2 weeks.
NWT should introduce grizzly bear season based on animal group sightings, and other evidence.
Outfitter and guides of XXX provided a once in a life time adventure. It was safe and intensive at all times.
The number of bears seen or heard about certainly warrant a limited season.
Great time

Great time
Great hunt, scenic beauty
I enjoyed my hunting experience and hope to return and hunt here again some day.
I had a true adventure. I am planning on returning and hunting again with XXX Outfitters.
Great outfitter
Excellent hunt with XXX well pleased with every one.
Great experience. Good people.
We were extremely pleased with the way this outfitter conducted this hunt. The guide was exceptional. The outfitter does an excellent job of managing his area for the optimal experience of the hunter.
The highlight of the trip had to be listening to XXX sing his original tune "The Guide Song". I strongly urge the bureau of tourism tape the song for promotional purposes. XXX can be reached at 506-434-1168.
Excellent guide - the very best.
Very good people, good food, good hunting, good guides.
Open grizzly bear hunting
Animals numbers are very good. We observed sheep and caribou in many areas. Your management plan seems very effective for quality and quantity of animals.
Hurt his back went home
Great country, plenty of quality game, + an outstanding outfitter!
Well managed
It was a great experience hunting in the Mackenzie and there's a lot of wildlife.
If you "open" grizzly gear season amount/number of sign is high with a lot of adult/cub via size of tracks in all areas hunted.
I am an outfitter here in the NWT area XXX. Love the country - Enjoyed every minute. Lots of game.
Great country sheep hunting great look forward to coming back. One of the best times I have ever had, guide was excellent.
2nd trip with Redstone seen 4 grizzlies, 2 wolves and numerous ewes/lambs.
All wildlife observed appeared to be healthy. Multiple sightings of sheep were made each day.
Harvested ram was healthy and in excellent condition - no visible scars or unusual behaviour.
Great experience, not many people get to share. Saw lots of game, bear, wolves, rams and ewes. Dallas was superb.
Excellent Dall's sheep population; migrating caribou also. Rugged terrain allows escape for most species.
Had a very good experience, beautiful country, game plentiful, will return. Quantity seen was very good, however, quality was expected to be better given the amount of sheep observed.
Great area, very beautiful and very great sheep! Did not see a lot of rams!
Very adventerous hunt. Was a very nice full curl ram with a scar on its nose.
Wonderful experience. All animals were in great condition, viewed wildlife all through hunt of various species; lots of game.

APPENDIX 4.

A summary of the 2006 voluntary hunter comments broken down into specific topics.

No. of hunters reporting	No. of hunters mentioning good quality hunts	No. of hunters mentioning abundance of animals	No. of hunters mentioning grizzlies	No. of hunters mentioning wolves	No. of hunters mentioning bad weather
162	72	36	16	6	4

APPENDIX 5.

Number, age, and horn length measurements of Dall's sheep rams harvested by non-resident hunters in the Mackenzie Mountains, 1967-2006.

Year	Number of Sheep Harvested	Age (Years)		Length of Right Horn	
		Mean	Sample Size	Mean (cm)	Sample Size
1967-1968	223	8.4	Unknown	86.4	168
1969	110	-	-	-	-
1970	94	-	-	-	-
1971	88	-	-	-	-
1972	110	8.5	96	86.2	90
1973	89	8.9	86	84.4	88
1974	93	9.2	85	88.6	91
1975	129	7.6	67	84.6	127
1976	144	7.8	46	88.0	144
1977	132	5.7	69	86.8	132
1978	187	8.5	115	88.9	165
1979	200	8.7	108	90.7	154
1980	180	-	-	89.9	127
1981	187	8.1	101	93.7	157
1982	126	8.7	98	89.7	124
1983	100	9.0	80	90.9	94
1984	102	8.4	98	91.2	99
1985	123	8.1	115	89.7	112
1986	154	8.8	132	88.4	153
1987	148	8.9	148	89.4	148
1988	177	9.8	166	91.7	161
1989	207	9.9	199	90.4	203
1990	219	9.8	200	90.2	218
1991	170	9.7	161	89.1	170
1992	203	9.7	199	88.0	202

APPENDIX 5 (CONT.)

Number, age, and horn length measurements of Dall's sheep rams harvested by non-resident hunters in the Mackenzie Mountains, 1967-2006. Number harvested includes [1]10, [2]2 and [3]10 harvested by resident hunters.

Year	Number of Sheep Harvested	Age (Years)		Length of Right Horn	
		Mean	Sample Size	Mean	Sample Size
1993	191	9.7	181	87.6	190
1994	199	9.5	191	89.8	196
1995	190	9.7	189	89.3	189
1996	201	9.5	200	88.7	201
1997	210	10.0	206	89.9	203
1998	215	10.0	207	90.0	209
1999	204	10.2	183	88.8	184
2000	189	10.0	189	89.5	189
2001	199	10.0	188	87.7	189
2002	173	9.9	166	89.2	166
2003	213	9.7	210	89.8	212
2004	201[1]	10.0	199	89.3	200
2005	203[2]	10.2	196	89.4	199
2006	208[3]	10.4	206	88.4	207

APPENDIX 6.

Summary of age and sex ratios calculated from non-resident hunter observation reports in the Mackenzie Mountains, 1995-2006.

Year	Dall's Sheep		Mountain Caribou		Moose	
	Lambs: 100 Ewes	Rams: 100 Ewes	Calves: 100 Cows	Bulls: 100 Cows	Calves: 100 Cows	Bulls: 100 Cows
1995	67	82	36	34	30	95
1996	44	82	45	40	26	76
1997	57	55	36	21	30	107
1998	60	84	36	34	30	95
1999	58	90	43	25	20	100
2000	47	90	41	39	26	89
2001	59	89	56	61	28	120
2002	58	89	59	31	29	96
2003	50	83	39	36	25	129
2004	53	93	42	38	30	101
2005	51	98	42	42	33	110
2006	53	96	43	37	33	137
Mean 1995-2006	55	86	43	37	28	105

APPENDIX 7.

Outfitted non-resident hunter harvests in the Mackenzie Mountains, 1991-2006.

[1,3] Includes 10 harvested by resident hunters; [2] Includes 2 harvested by resident hunters.

Year	Number of Licences Sold	Number of Animals Harvested					
		Dall's Sheep	Mountain Caribou	Moose	Mountain Goat	Wolf	Wolverine
1991	354	170	179	40	6	14	3
1992	364	203	142	32	4	7	0
1993	382	191	191	56	9	7	3
1994	356	199	164	46	5	15	2
1995	344	190	180	49	6	14	1
1996	387	201	175	46	4	11	4
1997	352	210	168	44	2	17	1
1998	345	215	160	52	5	9	0
1999	321	204	117	36	1	11	3
2000	332	189	127	44	1	14	0
2001	339	199	132	47	2	15	2
2002	329	173	168	42	5	11	1
2003	347	213	143	48	6	12	0
2004	337	201[1]	135	55	6	18	0
2005	394	203[2]	160	74	18	19	1
2006	407	208[3]	188	72	12	23	1
Mean 1991-2006	356	198	158	49	6	14	1