MACKENZIE MOUNTAIN NON-RESIDENT AND NON-RESIDENT ALIEN HUNTER HARVEST SUMMARY 2008

NICHOLAS C. LARTER AND DANNY G. ALLAIRE

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
GOVERNMENT OF THE NORTHWEST TERRITORIES
P.O. BOX 240
FORT SIMPSON, NT
X0E 0N0

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ABSTRACT

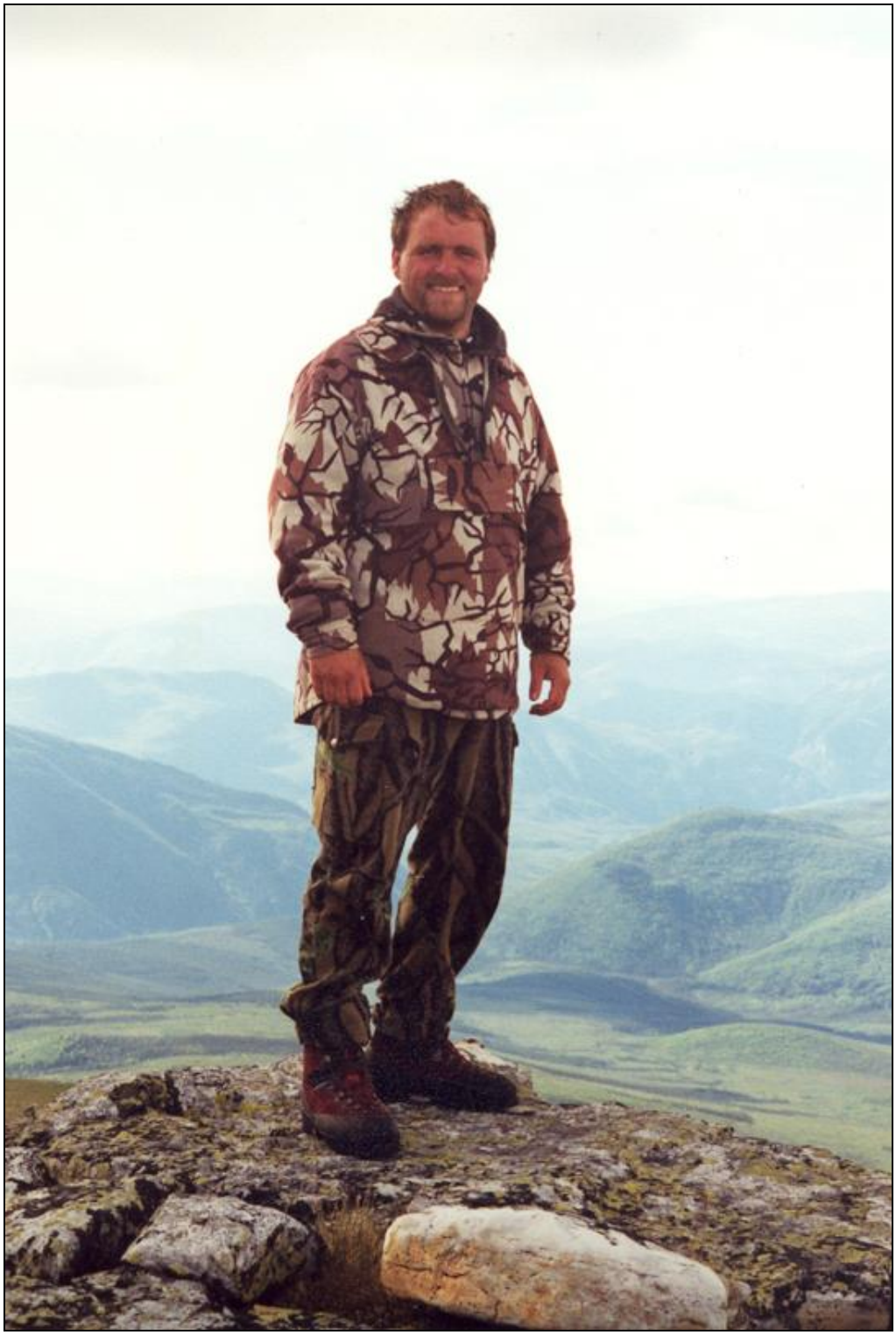
Each of the eight licensed outfitters and Renewable Resource Officers with the Sahtu and Dehcho Environment and Natural Resources (ENR) Regional office, collected data on big game harvest in the Mackenzie Mountains during the 2008 hunting season. Harvest data and observations of wildlife from non-resident and non-resident alien hunters (collectively called 'non-resident' for this report) were recorded. For 2008, 391 hunters bought non-resident licences. This is the third greatest number of licences sold to non-resident hunters (range 321-407 from 1991-2007). Hunters (n=295) from outside Canada (non-resident aliens) were primarily from the USA (n=239) and comprised 61% of the outfitted hunters; 14 and 12 of the 39 European hunters were from Germany and Spain, respectively. There were 96 (25%) Canadian hunters whose residency was from outside the Northwest Territories (NT). Of the 391 non-resident licence holders, 344 came to the NT and most spent at least some time hunting. The 2008 hunting season produced a notable first; two hunters were successful in taking all five of the trophy animals during their hunt. Prior to this season no hunter had ever taken all five trophy animals during a hunt. Of 261 tags purchased for Dall's sheep, 192 rams were harvested (including eight by resident hunters). The average annual harvest of rams is 199 over the past 18 years. The mean (±SD) age of harvested rams was 10.6 $\pm$ 1.6 years; the 21st consecutive year the average age of harvested rams from the Mackenzie Mountains has been 9.5 years or older. This is the second highest average age of harvested rams recorded in the Mackenzie Mountains since records have been kept (1967). Hunters reported seeing an average of 8.3 legal rams (horns at least ¾ curl) per hunt and observed an estimated 48.9 lambs and 98.2 rams per 100 ewes, respectively. Although lower than average, the lamb:ewe ratio falls

within the range reported since 1995. Of 275 tags purchased for mountain woodland caribou, 167 bull caribou were harvested. Hunters observed an estimated 40.5 caribou calves, and 39.7 bulls per 100 adult female caribou, respectively. Of the 109 tags purchased for moose, 75 bull moose were harvested. This matches the highest harvest in the past 18 years (range 32-75). Hunters observed an estimated 31.3 moose calves, and 115.2 bulls per 100 adult female moose, respectively. The number of calves per 100 adult females is somewhat higher than the mean 29:100 ratio recorded since 1995 and the eighth time in the past 14 years when the ratio has been $\geq$30:100. Of the 45 tags purchased for mountain goat 21 goats were harvested, 19 billies and 2 nannies. This matches the highest harvest of mountain goats since we started records in 1991 and may be related to greater accessibility to the more rugged and remote parts of the various outfitter ranges where goats are resident. The mean age, determined by horn annuli, of 18 goats harvested was 9.3 years (range 2.5-15.5 years). Five goats were >13 years old. Hunters observed an estimated 54.3 goat kids and 97.1 billies per 100 adult nannies. Seventeen wolves were harvested from 228 tags purchased. During 1991-2007 mean annual wolf harvest was 14 (range 7-23). One wolverine was harvested from 111 tags purchased. The 18 wolverines observed by hunters in 2008 remains somewhat lower than 20-35 observations during 1995-1999 and 2004-2006. All observations of wolverine were of solitary individuals. Two male black bears were harvested from 2 tags purchased; this is the first year black bears have been harvested in the Mackenzie Mountains. There has been no grizzly bear hunting season for non-residents since 1982. Hunter satisfaction remains high; 95% of respondents (n=239) rated their experience as either excellent (85%) or very good (10%). A number of hunters made specific comments about the high quality hunting experience, the abundance of wildlife in the Mackenzie Mountains (both game and predators), and the

impressive management and stewardship of the land; 21% were repeat clients returning for their 2nd to 15th hunt in the Mackenzie Mountains, and 89% indicated they would like to return in future years. We received 71% of the Voluntary Hunter Observation Forms, an improvement over recent years which we hope will continue through future years. At least 5870 kg of wild game meat, mostly moose and mountain caribou, was reported distributed locally in 2008. Replacement cost of meat from local northern retailers is estimated conservatively at about $117,400, based upon $20/kg average replacement cost. ENR worked with the outfitters to devise a more complete and efficient way to summarize meat distribution which will be implemened in the 2009 season.

This report is dedicated to the memory of Cam Lancaster

25 July, 1971 - 21 August, 2008



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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 (NT) was first opened to non-subsistence hunters in 1965 (Simmons, 1968). Since then, the Mackenzie's 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 certainly provide in excess of the $1.8 million estimated annually, a decade ago, to individuals, businesses, and governments in the NT (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, 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 Wrigley, 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. Estimated annual replacement value of this meat has ranged from *ca.* $60,000-$200,000.

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 A). No hunting is permitted within the boundaries of Nahanni National Park Reserve in the southern half of the range, except for subsistence harvest by NT General Hunting Licence holders. Under the terms of the NT *Wildlife Act*, each licensed 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 NT runs from 01 July to 30 June and those who desire to hunt big game within the NT must annually obtain a big game hunting licence and must be at least 16 years old (Department of Environment and Natural Resources, 2008). There are four classes of licenced big game hunters in the NT:

1) *General* - subsistence harvesters, primarily aboriginal people.
2) *Resident* - Canadian citizens or landed immigrants who haves been living in the NT for at least two consecutive years prior to application for the licence.
3) *Non-resident* - Canadian citizens or landed immigrants who live outside the NT, or has not resided in the NT for a full two years prior to application for the licence.
4) *Non-resident Alien* - an individual who is neither a NT 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 8 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.

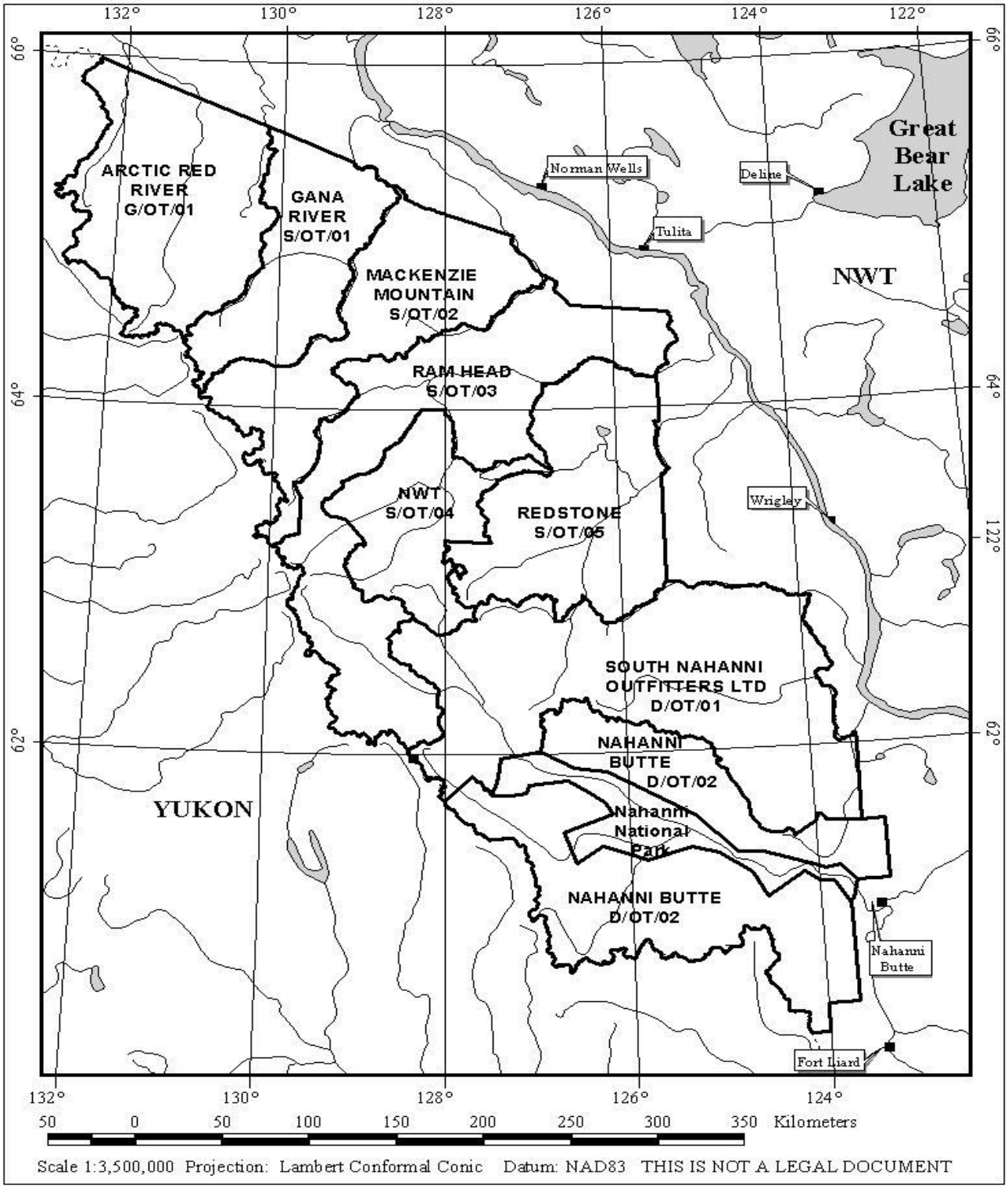


Figure 1. Outfitting zones in the Mackenzie Mountains, Northwest Territories – 2008.

Individual non-resident hunters are annually restricted to one each of the following big game species (Appendix B): 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.

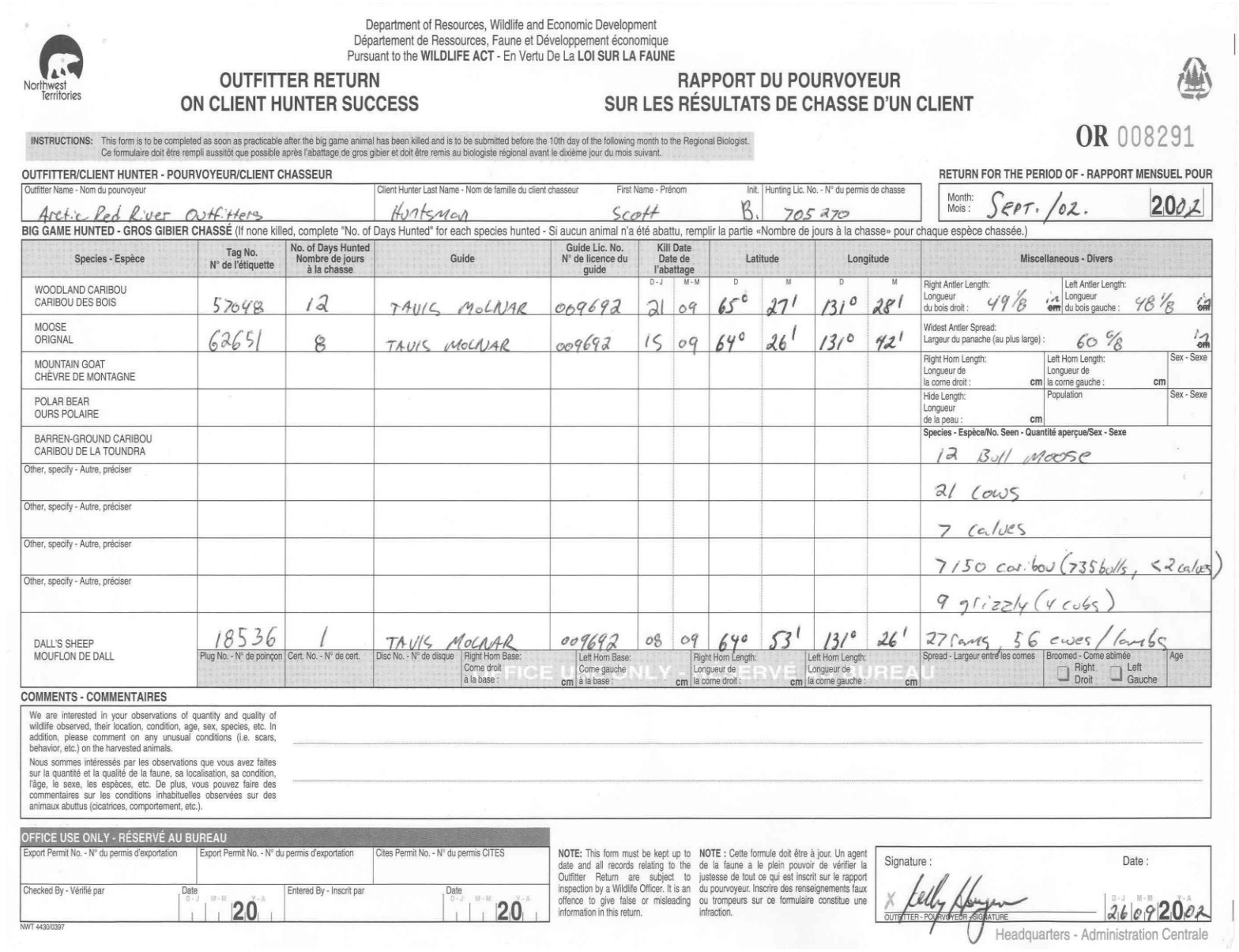
Wildlife management within the Mackenzie Mountains is the responsibility of a variety of government agencies and boards set up as a result of comprehensive land claim agreements. The Nahanni National Park Reserve (4766 km^2) in the south Mackenzie Mountains is managed by Parks Canada – an agency of the Canadian federal government. It is anticipated that within the near future the area of the Nahanni National Park Reserve will be expanded. 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), and its recent extended agreement period, 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 NT 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 GRRB, SRRB, 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 evolved through the years based upon suggestions from outfitters, their clients, and government staff. Different questions pertaining to wildlife observations, the quality of the hunting experience, the quality of services related to hunter travel, and specific topics for hunter comment have come and gone. However, one key component of the questionnaire that has remained constant pertains to reporting the different types and numbers of wildlife species 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 (Fig. 3).

This is the fourteenth 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 2002-2007 in Larter and Allaire (2003; 2004; 2005a; 2006; 2007; 2008 respectively). Additionally, Latour and MacLean (1994) summarized data for 1979 to 1990. This report compiles the harvest data collected during the 2008 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.	705270

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 abîmée: Right Droit / Left Gauche	Age

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 abuttus (cicatrices, comportement, etc.).

OFFICE USE ONLY - RÉSERVÉ AU BUREAU

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-A	Entered By - Inscrit par	Date D-J M-M 20 A-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 : D-J 26 M-M 09 A-A 2002

Headquarters - Administration Centrale

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

MACKENZIE MOUTAINS, NORTHWEST TERRITORIES
HUNTER WILDLIFE OBSERVATION REPORT – 2007

Dear Hunter: The Department of Environment and Natural Resources request your kind assistance with completing this questionnaire about your NWT hunting experience, in order to assist us with the management of Mackenzie Mountain big game populations. All the requested information is completely voluntary, but your providing it to us is most appreciated.

HUNTER INFORMATION

Last Name	First Name and Initials	
CLIFFORD	GREGORY P.	
Address- number and street, box number	**Town, City**	**Province, State, Country**
14 SAGE ROAD	LANDER	WYOMING. USA

Hunting License # HL715052 Outfitter Zone: 6/07/01 Outfitter: ARCTIC RED RIVER

Start Date of Hunt 7/15 2007 End Date of Hunt 7/24 2007 Observations Made Over 10 Days

ESTIMATED NUMBER OF DALL'S SHEEP SEEN			
¾ and Full Curl Rams	Less than ¾ Curl Rams	Ewes	Lambs
25	46	24	17

ESTIMATED NUMBER OF WOODLAND CARIBOU SEEN		
Bulls	Cows	Calves
2	1	Ø

ESTIMATED NUMBER OF MOOSE SEEN		
Bulls	Cows	Calves
Ø	Ø	Ø

ESTIMATED NUMBER OF MOUNTAIN GOAT SEEN			
Billys	Nannys	Kids	Unknown Age
Ø	Ø	Ø	Ø

Other Species						
	Wolf	Wolverine	Black Bear		Grizzly Bear	
			Adult	Cub	Adult	Cub
Number(s) Seen	3	Ø	Ø	Ø	1	Ø

How would you rate you overall hunting experience in the Mackenzie Mountains?
Excellent X Very Good _____ Good _____ Fair _____ Poor _____

How many times have you hunted in the Mackenzie Mountains, **including** this year's hunt? 2

Do you plan to return to hunt in the Mackenzie Mountains again? Yes X No _____

COMMENTS: Excellent Area / outfitter.

Thank You! Please give this form to the Officer or Clerk when you are exporting your trophies, or to the guide/outfitter with whom you hunted. We would appreciate receiving this form whether of not you harvested an animal(s).

Figure 3. Example of a fully completed Hunter Observation Report Form.

METHODS

Prior to the start of the 2008 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 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 2008.

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 (LIS-IN) 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 2008 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

An exit survey conducted in 2006 by the Department of Industry Tourism and Investment (ITI) reported that: 1) most (42%) hunters coming to the NT to hunt travel with friends, 2) most (45%) hunters planning on hunting in the NT decide 6-18 months prior to their hunt, 3) the main reason to hunt in the NT is the reputation of the outfitter (39%), and 4) that the internet is the most sought after information source being used by 54% of hunters to plan their hunts (ITI, Tourism and Parks, unpublished data).

Big game hunting licences for the Mackenzie Mountains were bought by 391 non-resident hunters in 2008 (Table 1). This is the third highest number of licenses sold (Fig. 4). Of those, 344 came to the NT and spent some time hunting; 47 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 NT. A

majority of these were guides, who purchase licenses every year but rarely have the opportunity to hunt themselves. In 2008, licence sales to non-resident Canadians (n=96) representing 25% of the number of licenses sold. This is up from the 20% reported in 2006 and 2007. We presume that continued strength of the Canadian dollar is a major contributing factor to the number of Canadian sport hunters over the past few years. Guided hunts are marketed in American dollars. The number of foreign non-resident hunters in 2008 was slightly lower than in 2007 (305 vs 311). However, for a fifth year the number of hunters from countries other than the United States, mostly Europeans and South Americans, increased (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. The 2008 hunting season produced a notable first in that not one, but two hunters were successful in taking all five of the trophy animals during their hunt. Prior to this season no hunter had ever taken all five trophy animals during a hunt.

We received all but three mandatory Outfitter Return forms for the 391 people that purchased non-resident licences. Voluntary Hunter Observation Report forms were received from 244 (71%) of the 344 that did at least some hunting in 2008 (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, this is the first year we have shown improvement on the *ca*. 65% we received since 2004. Hopefully the trend will continue. Most outfitters have endeavoured to have these forms completed and submitted, but unfortunately two zones with fairly large clientele continue to be more lax in providing returns; we received only 4 of 47

forms from zone S/OT/03 and 28 of 66 forms from zone S/OT/02 in 2008. In order to be able to generalize observations over the entire Mackenzie Mountains, it is crucial that we receive representative observations from all outfitting zones**;** these two outfitter zones encompass the greatest range in latitude in the Mackenzie Mountains (Fig. 1). See Figure 3 as an example of a fully completed hunter observation form.

Table 1. Province, state and/or country of origin for the 391 non-residents who purchased licences for hunting in the Mackenzie Mountains, 2008.

Canada		United States		Europe		Other	
Yukon	2	Eastern States[1]	107	Spain	12	Mexico	15
British Columbia	42			Germany	14	Chile	1
Alberta	38	Western States[2]	132	Austria	7		
Saskatchewan	3			Switzerland	5		
Manitoba	2			Romania	1		
Ontario/ Quebec	5			Liechtenstein	1		
Atlantic Provinces	4						
Total	96		239		40		16

[1] AL, AR, CT, DE, 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, 1995-2008.

Form Type	2008	2007	2006	2005	2004	2003	2002
Outfitter Return (mandatory)	99	98	99	100	99	98	95
Hunter Observation (voluntary)	71	65	64	65	74	60	59

Form Type	2001	2000	1999	1998	1997	1996	1995
Outfitter Return (mandatory)	92	96	96	97	98	100	98
Hunter Observation (voluntary)	57	53	51	60	50	71	80

It is obvious that non-resident hunters immensely enjoy their hunting experience in the Mackenzie Mountains (Table 3). In 2008, 95% of respondents rated their experience as either excellent (85%) or very good (10%). Not only do voluntary client comments make specific mention of the high quality of hunts (n=102), and the abundance/quality of animals (n=52; Appendices C and D), but many comments make reference to the 1) professional and world class experience with their chosen guides, 2) the abundance of a wide variety of game species and predators, 3) the apparent health and condition of the game animals, 4) the pristine and scenic environment of the Mackenzie Mountains, and 5) compliments on the management and stewardship of the land.

Since the inception of the voluntary hunter observation forms we consistently receive comments about grizzly bears, normally to do with their abundance and problems when encountered in and around camps, and the need for or want of a hunting season on grizzly bears. This year was no different (Appendices C and D).

Comments of high wolf numbers started in 2000 and continued through this year. Most reports about wolves were from zones G/OT/01, S/OT/01 and S/OT/04. This year we received comments about the increased air traffic associated with the Howard's Pass mining operation (in zone S/OT/03), and how it had affected the distribution and abundance of mountain goats in the vicinity. We had more comments this year about inclement weather, however hunters were still successful during their hunts, it just took longer for them to succeed.

Table 3. Satisfaction ratings for non-resident hunters (including non-hunting guides) in the Mackenzie Mountains, 1996-2008.

Rating	2008	2007	2006	2005	2004	2003
Number of Hunters Reporting	239	239	230	256	229	191
Excellent (%)	85	81	80	90	84	82
Very Good (%)	10	12	16	7	10	15
Good (%)	4	5	3	2	5	3
Fair (%)	1	2	1	1	0	0
Poor (%)	0	0	0	0	1	0

Rating	2002	2001	2000	1999	1998	1997	1996
Number of Hunters Reporting	193	191	158	157	202	144	224
Excellent (%)	82	75	76	73	80	78	77
Very Good (%)	15	16	17	20	17	17	17
Good (%)	3	6	6	5	2	3	2
Fair (%)	0	1	0	1	1	1	3
Poor (%)	0	1	1	2	0	1	1

It was the first time hunting in the Mackenzie Mountains for 179 of 239 (75%) respondents (including non-hunting guides). The 49 repeat hunters had hunted from 1-15 times previously. Of 239 respondents (including non-hunting guides) 89% indicated they would like to return to the Mackenzie's to hunt in the future.

This year, 90 Association of Mackenzie Mountain Outfitters (AMMO) 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 also 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. Some outfitters keep the meat forms for their own records in order to have them available for inspection by Renewable Resources Officers (Kelly Hougen, personal communication). Starting in 2006 D/OT/02 provided ENR with a digital database of all their hunts including record of meat distribution. The distribution of wild meat by the outfitters is often a topic of heated local debate. In an attempt to better quantify the distribution of meat to local communities we discussed with the outfitters different ways to more efficiently collect this information. ENR and AMMO jointly designed a form that summarized the use and distribution of meat by species. These forms will be provided to each outfitter at the start of the 2009 hunting season. We hope that this more simplified reporting will provide a more complete picture of meat use and distribution over the entire Mackenzie Mountains. The provision of wild game meat by outfitters is an important and greatly 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 634 kg (1394 pounds) from 39 harvested Dall's sheep and 166 kg (365 pounds) from 7 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 1900 kg (4181 pounds) from 30 mountain caribou and at least 3170 kg (6975 pounds) from 18 moose. Conservatively, using $20/kg, the purchase of approximately 5870 kg (12915 pounds) of meat at retail outlets in local northern communities would cost at least $117,400.

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 261 (67%) non-resident hunters in 2008, similar to the numbers purchased in recent years (Table 4). At least 89% of sheep tag holders pursued Dall's sheep and harvested 192 rams (including 8 resident hunters). The 2008 harvest was lower than the average number of 199 sheep harvested in the Mackenzie Mountains (1991-2007) (Fig. 4; Appendices E and F). The mean (± SD) length of a sheep hunt in was 3.7 $\pm$ 2.6 days, similar to hunt lengths from 1997 to 2007 (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.

Table 4. Tags for big game species purchased by non-resident hunters with outfitters in the Mackenzie Mountains, 1995-2008.

Species	2008 391 hunters		2007 399 hunters		2006 407 hunters		2005 394 hunters		2004 337 hunters		2003 347 hunters		2002 329 hunters	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Dall's Sheep	261	67	266	67	276	68	246	62	229	68	257	74	218	66
Mountain Caribou	275	70	272	68	274	67	285	72	243	72	247	71	229	69
Moose	109	28	108	27	112	28	101	26	84	25	85	24	68	21
Mountain Goat	45	12	50	13	21	5	40	10	24	7	18	5	18	5
Wolf	228	58	227	57	201	49	214	51	166	49	207	60	159	48
Wolverine	111	28	150	38	108	27	154	39	89	26	141	40	97	29
Black Bear	2	1	7	2	3	1	40	10	8	2	9	3	3	1

Species	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	%
Dall's Sheep	220	65	231	70	227	71	246	71	252	72	252	65	218	64
Mountain Caribou	201	59	206	62	181	56	223	65	260	74	274	71	233	68
Moose	65	19	69	21	63	20	69	20	73	21	74	18	70	20
Mountain Goat	12	4	12	4	6	2	23	7	30	8	14	4	16	5
Wolf	137	40	155	47	89	28	165	48	209	59	193	50	72	21
Wolverine	83	25	85	26	65	20	99	29	135	38	114	30	35	10
Black Bear	0	0	6	2	2	<1	2	<1	8	2	0	0	0	0

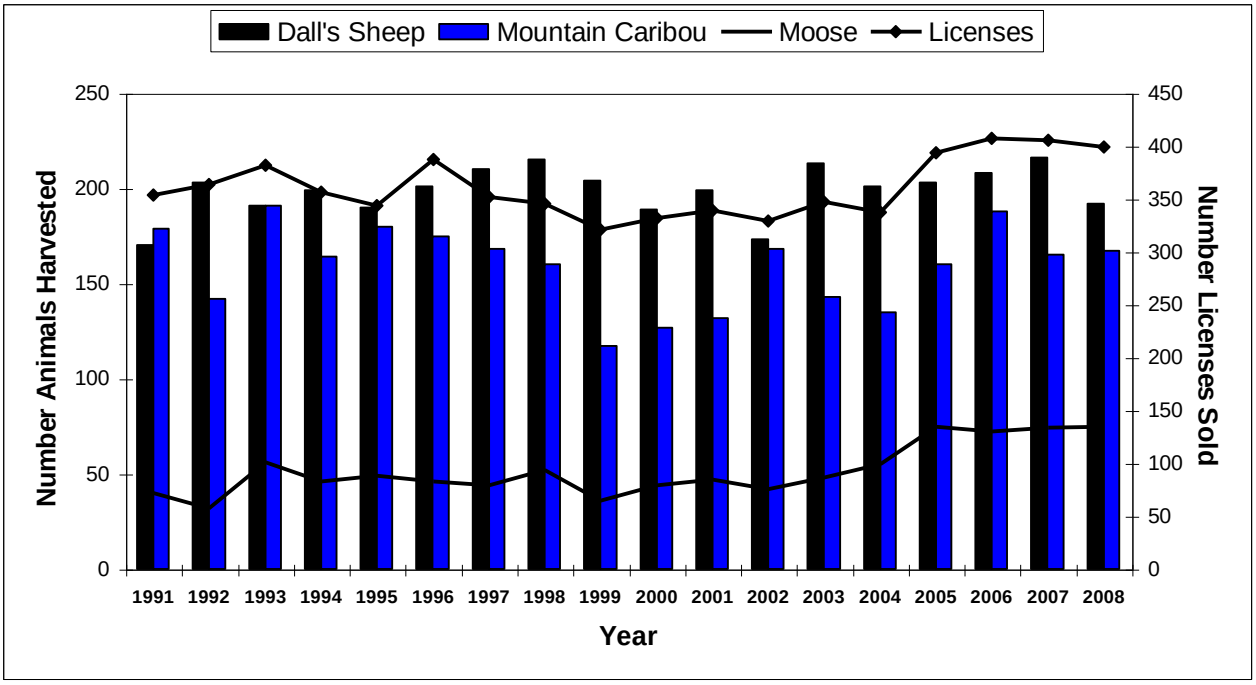


Figure 4. The number of Dall's sheep, mountain caribou, and moose harvested in the Mackenzie Mountains by non-resident hunters, and the number of non-resident licences sold during 1991-2008.

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 1972-2008, mean 89.1 ± 1.7

cm (SD) (Appendix E; 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).

Table 5. Mean length (± SD) and range (in days) of Dall's sheep hunts where at least one day was spent hunting from 1997-2008.

	2008	2007	2006	2005	2004	2003
Number of reports	192	216	214	190	167	189
Mean hunt length	3.7	4.1	4.1	4.1	4.0	3.8
Standard deviation	± 2.6	±2.6	± 2.7	± 2.6	± 2.9	± 2.9
Range	1-14	1-13	1-12	1-14	1-17	1-12
	2002	2001	2000	1999	1998	1997
Number of reports	174	176	198	201	224	216
Mean hunt length	4.7	4.8	4.6	4.7	4.4	4.3
Standard deviation	± 2.7	± 3.0	± 2.7	± 3.1	± 2.8	± 2.6
Range	1-12	1-15	1-15	1-16	1-15	1-12

In 2008, brooming was noted on 34% of left and 34% of right horns from plugged trophies, slightly higher than the 31% and 32% average of left and right horns reported over the past 12 years. One hundred and eighteen (61%) of 192 harvested rams were at least 10-years-old. The mean age (± SD) of harvested rams was 10.6 ± 1.6 years (range 6.5 to 15.5 years; Table 7). The 6.5 year-old male sheep was harvested by a resident hunter. This is the second highest average age of harvested rams recorded in

the Mackenzie Mountains since records have been kept (1967). This is the 21st consecutive year where the reported mean age of harvested rams has been 9.5 years or older (Appendix E).

Table 6. Horn measurements of Dall's sheep rams harvested by non-resident hunters in the Mackenzie Mountains, 2008.

	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	88.7	34.9	88.8	35.0	33.0	13.0	32.9	13.0	57.7	22.7
Standard Deviation	8.3	3.3	7.6	3.0	1.9	0.8	1.9	0.8	10.2	4.0
Maximum	107	42.1	108.3	42.6	38.0	15.0	38.0	15.0	80.0	31.5
Minimum	62	24.4	63	24.8	28.5	11.2	28.5	11.2	37.7	14.8

From hunters' classifications of sheep observed during their hunts in 2008 we calculated an estimated 49 lambs per 100 ewes (Table 8). This is lower than the 55:100 lamb:ewe average ratio reported since records were started, but it falls within the range of ratios reported since 1995 (Appendix G). For the Richardson Mountains of the northern Yukon and NT, 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).

Table 7. Age-structure of Dall's sheep rams harvested by non-resident and resident (n=8) hunters in the Mackenzie Mountains, 1995-2008.

	2008		2007		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.	%	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	0	0.0	0	0.0	1	0.5	0	0.0
4.5	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	0	0.0	0	0.0
5.5	0	0.0	1	0.5	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	2	0.9	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	4	2.1	7	3.2	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	21	11.0	17	7.9	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	48	25.0	33	15.3	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	53	27.6	54	25.0	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	28	14.6	65	30.1	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	25	13.0	19	8.9	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	7	3.6	15	6.9	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	4	2.1	2	0.9	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	1	0.5	1	0.5	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	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	118		156		122		105		92		74		71		95		90		97		109		102		69		68	
%>10	61.5		72.2		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	37		37		32		19		22		18		16		21		21		21		16		21		7		20	
%>12	19.3		17.1		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, 2008.

	Number of Hunters Reporting	Number Observed	Mean Number Observed/hunter	Percent of Sheep Classified
Rams	196	3548	18.1	39.7
Ewes[1]	168	3614	21.5	40.5
Lambs	158	1767	11.2	19.8

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

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 98.2:100 ram to ewe ratio (ram:ewe) estimated from hunters' observations in 2008 is similar to that reported from 2004-2006 and somewhat higher than that reported prior to 2004 (Appendix G). 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.

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 G) suggests that the harvest of rams in the Mackenzie Mountains is sustainable at current levels.

In 2008, hunters observed fewer rams (3548) than in previous years (Tables 8, 9). Many hunters complained about the inclement weather conditions (Appendix C), which apparently reduced the total number of sheep seen on many hunts in 2008. Hunters observed slightly fewer legal (>¾ curl) rams (n=1520) than rams with <¾ curl (n=1698) during their hunts (the curl of 330 rams couldn’t be determined). The mean number of legal rams observed per hunt was 8.3 (Table 9).

Table 9. Classification of Dall's sheep rams observed by non-resident hunters in the Mackenzie Mountains, 1995 - 2008.

Ram Class	2008		2007		2006		2005		2004		2003		2002	
	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	Horn >¾ curl	Horn <¾ curl
Number of hunters reporting	184	174	150	168	180	171	186	182	188	183	127	121	148	133
Number of rams classified	1520	1698	1902	2266	1769	2019	1787	1899	2185	2324	1662	1654	1720	1720
Percent of rams classified	47.2	52.8	45.6	54.4	46.7	53.3	48.5	51.5	48.5	51.5	50.1	49.9	50.0	50.0
Mean number of rams observed/hunt	8.3	9.8	11.0	13.5	9.9	12.0	9.6	10.4	11.6	12.7	11.9	11.9	11.6	12.9

Ram Class	2001		2000		1999		1998		1997		1996		1995	
	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	Horn >¾ curl	Horn <¾ curl
Number of hunters reporting	186	174	151	147	144	138	177	177	205	205	172	174	181	180
Number of rams classified	1812	1765	1351	1717	1579	1756	1848	1924	1538	1586	1713	1699	2070	1645
Percent of rams classified	50.7	49.3	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	9.7	10.1	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 275 (70%) of non-resident hunters (Table 4), and at least 77% of tag holders hunted caribou harvesting 167 bulls. The 2008 harvest is slightly above the mean annual harvest of 159 (range 117-191) recorded from 1991-2008 (Fig. 4; Appendix F). The mean (±SD) length of a mountain caribou hunt, determined from the 190 reports where hunters spent at least 1 day hunting, was 3.0 ± 3.0 days (range 1-15 days). This is somewhat shorter average hunt length than in previous years (Table 10) and may reflect higher reported incidences of inclement weather for hunts in 2008.

Table 10. Mean length (± SD) and range (in days) of mountain caribou hunts where at least one day was spent hunting from 2000-2008.

	2008	2007	2006	2005	2004	2003	2002	2001	2000
Number reports	190	172	171	191	120	172	181	178	141
Mean hunt length	3.0	4.0	4.3	3.7	4.9	3.8	3.6	4.3	4.0
Standard deviation	± 3.0	± 3.2	± 3.1	± 3.8	± 3.9	± 2.8	± 2.7	± 3.2	± 2.7
Range	1-15	1-16	1-14	1-32	1-34	1-14	1-12	1-15	1-12

From hunters' classifications of mountain caribou observed during their hunts, we calculated ratios of 40.5 calves and 39.7 bulls per 100 adult females (cows); bulls comprised 22.0% of all caribou classified (Table 11). The calf:cow ratio for 2008 is somewhat lower than the average of 44:100 since 1995 (range 36-59:100) while the

bull:cow ratio is somewhat higher than the average of 37:100 since 1995 (range 21-61:100) (Appendix G).

Table 11. Observations of mountain caribou reported by non-resident hunters in the Mackenzie Mountains, 2008.

Sex/Age Class	Number of Hunters Reporting	Number Observed	Mean Number Observed/hunter	Percent of Total Classified
Bulls	178	3391	19.1	22.0
Cows	172	8540	49.7	55.5
Calves	147	3460	23.6	22.5

In 2008 we received antler lengths from 133 (80%) of successful hunters; a similar percentage as in previous years. Antler measurement information sometimes goes unreported on outfitter forms. This year, as in other years, there was substantial variation in antler lengths, range 74.0-147.0 cm (29.1-57.9 in.). The maximum left and right antler lengths reported were 145.0 and 147.0 cm respectively (Table 12). 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 2009).

Another measuring system for antlered animals is from Safari Club International (SCI), which has a unique all-inclusive record keeping system for measuring trophies; the most used system in the world. Unlike Boone and Crockett this system has no

deductions or penalizing for asymmetry. Some outfitters prefer using this measuring system, especially for caribou, because it provides points for all tines and there are no deductions, (Jim Lancaster, personal communication). Ten of the top 20 mountain woodland caribou recorded in the Safari Club International record book are from the Mackenzie Mountains with a caribou harvested in 2006 holding 2nd place in scoring (Safari Club International, on-line trophy database accessed 2009).

Table 12. Antler measurements of mountain caribou bulls harvested by non-resident hunters in the Mackenzie Mountains, 2008.

	Contour Length	
	Left Antler	Right Antler
Number Measured	133	133
Mean (cm)	115.9	116.3
Mean (in)	45.6	45.8
Standard Deviation (cm)	47.7	47.8
Standard Deviation (in)	18.8	18.8
Maximum (cm)	145.0	147.0
Maximum (in)	57.1	57.9
Minimum (cm)	74.0	76.0
Minimum (in)	29.1	29.9

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). A 2007 survey during the rut estimated 33.7 bulls:100 adult cows (R. Farnell and K. Egli, Yukon Territorial Government, unpublished data). A 2008 composition count during the rut in the same general area estimated a slightly higher ratio of 35.5 bulls:100 adult cows (Troy Hegel, personal communication). 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 2004-2007 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 will 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) (Jan Adamczewski, personal communication; Mark O'Donoghue, personal communication; Alasdair Veitch, personal communication). They are subjected to an annual bull-selective non-resident harvest averaging just 159 males per year (1991-2008). 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; Ken Davidge, personal communication). Subsistence harvesters in the Mackenzie Mountains include residents of both the NT 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). A recent analysis of these location data indicates that some of the collared animals in the range of the Redstone herd are relatively sedentary yearround, while others show the more typical seasonal migratory movements (John Nagy, personal communication).

Satellite radio collars were deployed on 9 adult female caribou during March 2000 and October 2001 by the Yukon Department of the Environment (Jan 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, but 3 animals were determined to be from the

Finlayson herd. This was a co-operative study between Yukon Territorial Government, Parks Canada (Nahanni National Park) and the Wildlife Conservation Society (Weaver 2006). In October 2008 30 female caribou were equipped with satellite collars along the Yukon-Northwest Territories border. Partners in this project include the Yukon Territorial Government, Nahanni National Park Reserve, Parks Canada, Park Establishment Branch, Parks Canada, Department of Environment and Natural Resources, GNWT and the Canadian Parks and Wilderness Society, NWT Chapter (Troy Hegel, personal communication).

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 Mackenzie's 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=109) of non-resident hunters in 2008 (Table 4). At least 75% of tag holders hunted moose and harvested 75 bulls. This equals the highest harvest of moose since 1991 when reporting started (range 32-75). Over the past 4-5 years the have been more moose hunts and moose harvested (Fig. 4; Appendix F). The mean (± SD) length of a moose hunt, determined from the 82 reports where hunters spent at least 1 day hunting, was 3.6 $\pm$ 2.9 days (range 1-16 days), similar to what was reported for previous years (Table 13).

The higher numbers of moose harvested in recent years is likely in part related to the change in ownership of outfitting zone D/OT/01. This zone is one of the largest with

an abundance of good moose habitat. Prior to 2005 few moose were harvested in this zone annually (<4 moose/year 1991-2004) because the majority of clients were interested in sheep hunting, very few were interested in moose hunting. The new owner has a client base which includes a large number of European hunters who are specifically looking for trophy moose for European mounts.

Table 13. Mean length (± SD) and range (in days) of moose hunts where at least one day was spent hunting from 2000-2008.

		2008	2007	2006	2005
Number reports		82	80	72	85
Mean hunt length		3.6	4.0	3.6	4.4
Standard deviation		± 2.9	± 2.5	± 2.7	± 3.1
Range		1-16	1-9	1-11	1-14
	2004	2003	2002	2001	2000
Number reports	49	60	46	42	48
Mean hunt length	4.8	3.9	3.6	3.7	4.4
Standard deviation	± 3.3	± 2.8	± 2.6	± 2.9	± 2.7
Range	1-12	1-14	1-12	1-12	1-12

Over the past few years ENR has been collecting front incisor teeth from moose harvested by hunters in the southern portion of the Mackenzie Mountains on a voluntary basis. These teeth are forwarded to Matson's Laboratory for aging**.** Age is determined by counting the cementum annuli much like the growth rings of a tree. 1 June is used as the birth date for moose and caribou (Matson, 1981). We currently have ages from 47 harvested moose. The ages range from 3 to 15 years (mean 7.4 years; median 6.5 years).

The mean (± SD) tip-to-tip spread of measured antlers from bull moose harvested by in 2008 was 145.5 ± 55.5 cm (57.3 ± 21.9 in., n=63). This year we received the greatest number of antler measurements from outfitters (Table 14). This year's maximum recorded antler spread was 174.0 cm (68.5 in.), slightly less than the maximum recorded antler spread of 188.00 cm (74 in.) for a record Alaska-Yukon moose taken in the NT in 1996. 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 14 and 19 (Byers and Bettas, 1999); the rest of the top 20 were all taken in Alaska and the Yukon. There is another top 20 (#15 pending) moose antlers entered with the Boone and Crockett Club, it has not been accepted yet.

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

	2008	2007	2006	2005	2004
Measured (n)	63	62	56	53	38
Average spread	145.5	141.1	141.3	144.9	150.3
Range	101-174	102-179	107-170	122-188	127-174

	2003	2002	2001	2000	1999
Measured (n)	34	32	32	34	26
Average spread	150.0	149.3	144.3	147.0	144.2
Range	107-165	103-178	113-165	127-179	109-166

From hunters' observations of moose during hunts we calculated ratios of 31.3 calves:100 adult females (cows) and 115.2 bulls:100 cows (Table 15; Appendix G). This is somewhat higher than the mean 29:100 calf:cow ratio recorded since 1995 and the eighth time in the past 14 years when the ratio has been $\geq$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 G). However, these surveys are conducted after the major fall subsistence harvest and variable female harvest can certainly impact the interpretation of calf:cow ratios. As no research has been done on moose in the Mackenzie Mountains, 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 Jean Marie River conducted in November 2003 estimated 32:100 (Larter, in press). These studies indicate that low calf:cow ratios may not be restricted to the Mackenzie Mountains and that further studies are 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; Larter, in press).

Table 15. Observations of moose reported by non-resident hunters in the Mackenzie Mountains, 2008.

Age/Sex class	Number of Hunters Reporting	Number Observed	Mean Number Observed/Hunter	Percent of Total Classified
Bulls	101	416	4.1	46.7
Cows	83	361	4.3	40.6
Calves	56	113	2.0	12.7

The bull:cow ratio of 115:100 reported for 2008 is higher than the 105:100 average from 1995-2008, but falls within the reported range of 76-137:100 (Appendix G). 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 eight 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 an unlikely 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 6-50 during 1995-2007 (Table 4) with a mean annual harvest of eight goats (range 1-21) over the same time (Appendix F). In 2008, mountain goat tags were purchased by 45 (12%) of non-resident hunters. Twenty-one goats were harvested in 2008; 19 billies and two nannies. The 2008 harvest matches the 2007 harvest as the highest harvest of mountain goats from 1991-2008 (Appendix F). The mean (± SD) length of a goat hunt, determined from the 21 reports where hunters spent at least one day hunting, was 3.0 $\pm$ 1.8 days (range 1-8 days), within the range of what was reported in previous years (Table 16).

Mountain goats are known to inhabit five of the eight 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 four of those outfitter zones - D/OT/01, D/OT/02, S/OT/03, and S/OT/04 (see Fig. 1). In 2008, observations of mountain goats by hunters came from just two of those zones D/OT/01 (n=56), and

D/OT/02 (n=208), but goats were harvested from three zones including S/OT/03. We estimated 54.3 kids and 97.1 billies per 100 nannies based upon this year's hunter observations. This is the highest billie:100 nannies reported since we requested mountain goat observations in 2002 (Appendix H).

Table 16. Mean length (± SD) and range (in days) of goat hunts where at least one day was spent hunting from 2000-2008.

	2008	2007	2006	2005	2004	2003	2002	2001	2000
Number reports	21	27	12	18	8	6	4	2	1
Mean hunt length	3.0	2.7	2.8	3.8	3.9	3.0	2.8	1.5	3.0
Standard deviation	± 1.8	± 1.7	± 1.5	± 2.8	± 1.6	± 2.6	± 1.9	± 0.7	nil
Range	1-8	1-6	2-6	1-14	2-6	1-8	1-5	1-2	3

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 since then. Of the 60 goat (52 billies and eight nannies) ages we have to date the range has been from 2.5 to 15.5 years with 31 aged <8 years, 29 aged >8 years, with 20 animals >10 years (Fig. 5). Of the 18 goats (16 billies and 2 nannies) aged in 2008, five were aged >13 years. The largest horns from a mountain goat taken in 2008 were 24.7 cm (left) and 24.6 cm (right). No mountain goats from the NT are listed in the 11th edition of the Boone and Crockett Club record book (Byers and Bettas, 1999). Based upon the horn age and length data over the past four years there is somewhat of a linear relationship between age and horn length from 2.5-8.5 years, but after that age there is almost no

relationship. This relationship implies that large horned animals are found over a wide range in animal ages (Fig. 5).

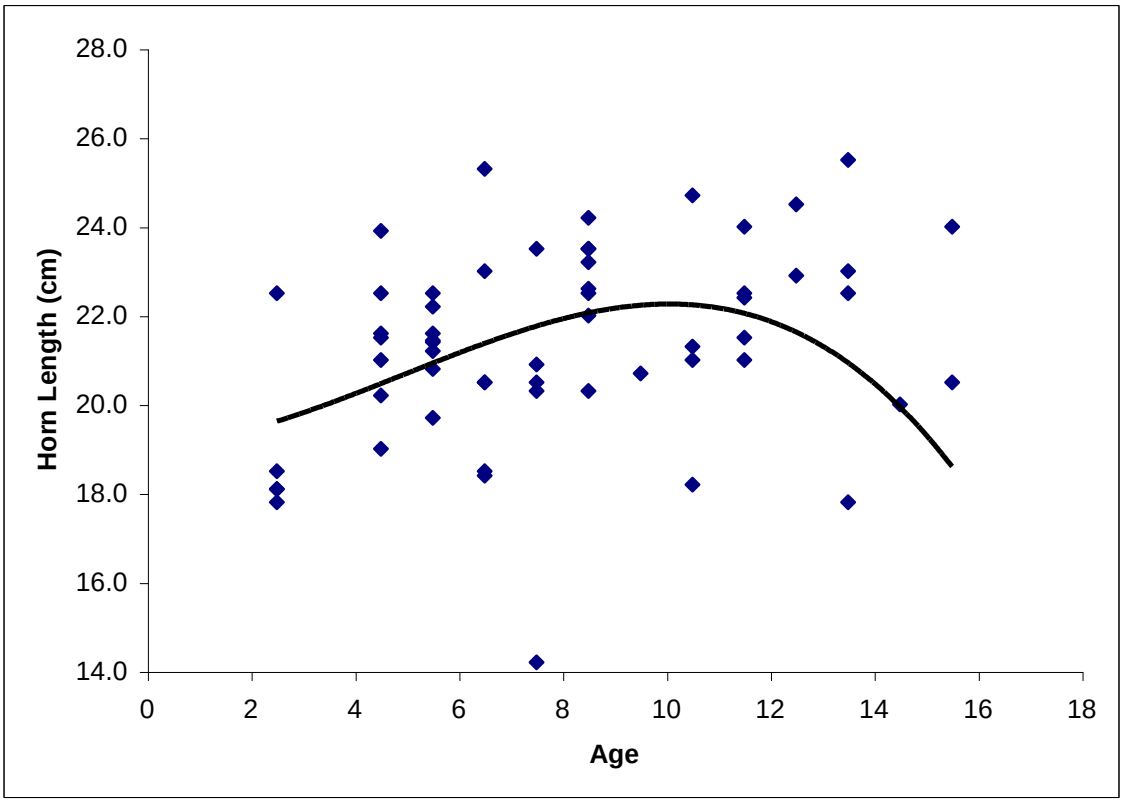


Figure 5. The relationship between the horn length (cm) and age (based upon horn annuli) of 60 mountain goats harvested in the Mackenzie Mountains 2005-2008. Line of best fit is a 3rd order polynomial.

There is some evidence that goat numbers and distribution have been increasing in zone D/OT/02 in the southern Mackenzie Mountains (Larter, 2004; Jim and Clay Lancaster, personal communication). Although the kids:100 nannies and billies:100 nannies reported from hunter observations in this zone over the past two years are somewhat lower than those from hunter observations in other zones, the total number of goats observed has been increasing in recent years and billies have

been observed in places they had not been seen previously in zone D/OT/02 (Clay Lancaster, personal communication; Appendix H).

In a 2.5 hour rotary-winged survey of zone D/OT/02 on 11 September 2006, 88 goats were observed (38 billies, 27 nannies, 19 kids, and four 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. ENR hopes to conduct future surveys of mountain goats in zones D/OT/01 and D/OT/02 in 2009 or 2010. Surveys would be mid-summer and conducted later in the day rather than during the morning and early afternoon. Mountain goat nursery groups are more active and visible above treeline at those times (Werner Aschbacher, personal communication; Jim and Clay, Lancaster personal communications).

The recent increase in the number of mountain goats harvested (see Appendix F) may be related to changes in accessibility to the more remote and rugged parts of the various outfitter ranges where goats are resident. The use of rotary aircraft in recent years has permitted outfitters to get into some areas of their zones where they have never been before, areas where goats have been found. This accessibility to increased areas of untouched goat range has likely had some effect on the increased success in goat harvest.

Wolf (*Canis lupus*)

Wolf tags were purchased by 58% (n=228) of non-resident hunters in 2008 (Table 4) with 17 wolves harvested (Appendix F). The wolf harvest was similar to that from 1991-2007 (mean 14, range 7-23). The number of wolves observed in 2008 (n=260) was similar to observations in previous years (Table 17). Only 1% of responding hunters indicated that they believed wolf numbers were high, similar to 2003-2005, but less than other years. 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, which is attributed 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, 1995-2008.

	2008[1]	2007[1]	2006[1]	2005[1]	2004[1]	2003[1]	2002[1]
Number hunters reporting	239	244	239	254	244	203	197
Number wolves observed	260	262	202	245	317	200	249
Mean observed/hunter	0.8	1.1	0.8	1.0	1.3	1.0	1.3
Number hunters seeing ≥1	76	88	84	76	81	74	69
	2001	2000	1999	1998	1997	1996	1995
Number hunters reporting	142	116	103	148	141	76	119
Number wolves observed	215	228	142	148	200	186	269
Mean observed/hunter	1.5	2.0	1.4	1.0	1.4	2.4	2.3
Number hunters seeing ≥1	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 28% (n=111) of non-resident hunters in 2008 (Table 4). At least 21% (n=23) of tag holders actively hunted wolverines, one wolverine was harvested in 2008. Hunters reported spending from 1-8 days actively hunting wolverine (mean ± SD of 3.8 ± 1.75 days). Hunters reported 18 observations of solitary wolverines. Observations were reported from six of the eight outfitter zones, but most observations came from D/OT/01, D/OT/02, S/OT/01 and G/OT/01 (Fig. 6). All observations were of individual animals. Historically, wolverine observations have been

mostly of solitary animals with few family groups being observed. The number of animals observed this year is similar to the lower levels reported from 2000-2003, and less than the 20-35 observed during 1995-1999 and 2004-2007 (Table 18; Fig. 6). Wolverine numbers are believed to be declining in other parts of their range in the Northwest Territories (Suzanne Carriere, personal communication). Our hunter reported wolverine observations may be consistent with declining numbers.

There is no relationship between the number of wolverine observed/year and annual harvest nor does the number of tags purchased/year explain annual differences in wolverine observations (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, G/OT/01, S/OT/01, and S/OT/04.

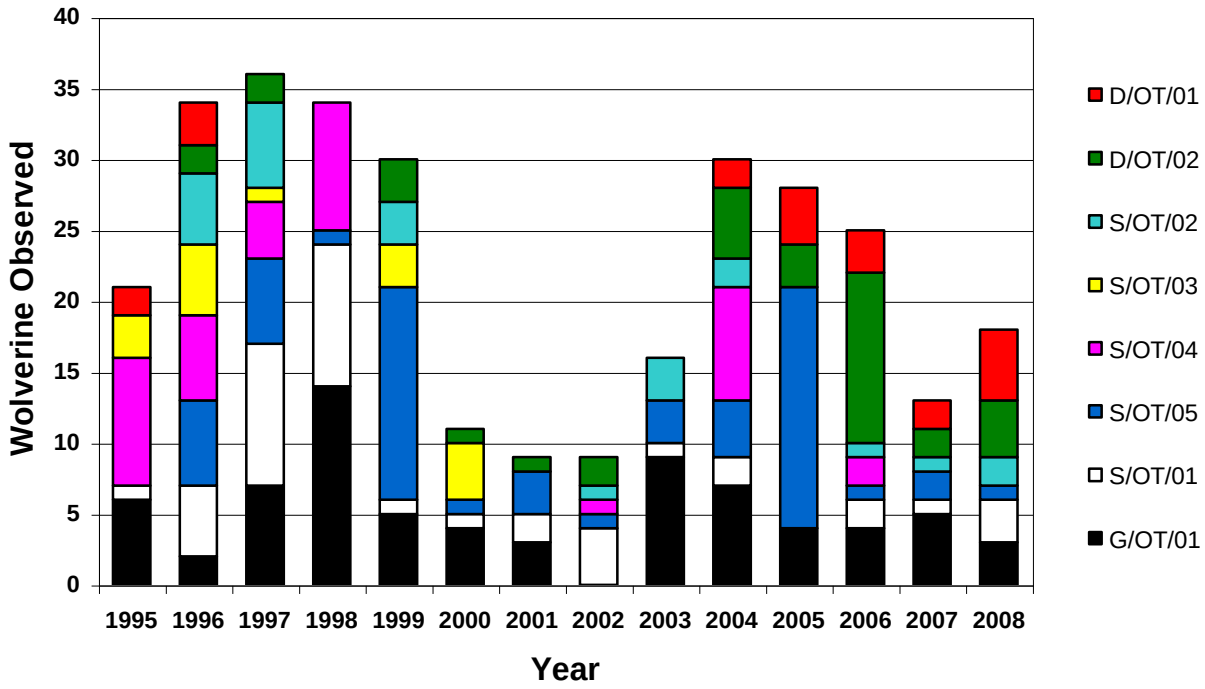


Figure 6. The number of wolverines observed by hunters from 1995-2008 and the outfitter zones where the observations occurred. Data are based upon voluntary hunter observation forms.

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 1995-2008.

Year	2008	2007	2006	2005	2004	2003	2002
Reported Observed	18	13	25	28	30	12	9
Number Harvested	1	0	1	1	0	0	1
No. Wolverine Tags	111	150	108	154	89	141	97
% Wolverine Tags	28	37	27	39	26	40	29
Total Hunting Tags	391	399	407	394	337	347	338
Year	2001	2000	1999	1998	1997	1996	1995
Reported Observations	9	11	30	34	36	34	21
Number Harvested	2	0	3	0	1	4	1
No. Wolverine Tags	83	78	65	99	135	114	35
% Wolverine Tags	26	23	20	29	38	29	11
Total Hunting Tags	344	332	321	345	352	387	333

Black Bear (*Ursus americanus*)

Few tags are purchased for black bears and this year was no exception (Table 4). Two non-resident hunters purchased black bear tags in 2008. What was exceptional was that both tag holders succesfully harvested male bears. This is the first time that any black bear have been harvested in the Mackenzie Mountains. 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 2008, 56 black bears (48 adults and 8 cubs) were observed based upon returned voluntary hunter observation forms. Bears were observed in outfitter zones D/OT/01 (16 adults and 3 cubs), D/OT/02 (27 adults and 1 cub) and

S/OT/05 (5 adults and 4 cubs) (Table 19). This year, outfitters commented on the increased observations of black bears in their areas (Clay and Jim Lancaster, personal communication; Werner Aschbacher, personal communication). There have been an increasing number of reported observations in recent years (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 somewhat inflates the 2002 through 2008 values relative to 1996-2001 values.

Table 19. Observations of black bear reported by non-resident hunters (including non-hunting guides) in the Mackenzie Mountains, 1995-2008.

	2008[1]		2007 [1]		2006 [1]		2005 [1]		2004 [1]		2003 [1]		2002 [1]	
	Cub	Ad	Cub	Ad	Cub	Ad	Cub	Ad	Cub	Ad	Cub	Ad	Cub	Ad
Total # Observed	8	48	4	34	2	27	4	21	1	23	3	34	3	17
% of Total Observed	14	86	11	89	7	93	16	84	4	96	8	92	15	85
No. Hunters Reporting	4	34	244	244	239	239	256	256	229	229	191	191	199	199
No. Hunters Saw at Least 1	3	10	2	17	1	14	3	18	1	19	2	21	2	14
Maximum # Observed	3	4	2	8	2	11	2	2	1	3	2	7	2	3

	2001		2000		1999		1998		1997		1996		1995 [2]
	Cub	Ad	Cub	Ad	Cub	Ad	Cub	Ad	Cub	Ad	Cub	Ad	All Bears
Total # Observed	0	7	2	15	4	7	0	15	2	3	1	10	11
% of Total Observed	0	100	12	88	36	64	0	100	40	60	9	99	nil
No. Hunters Reporting	127	130	88	93	87	89	121	124	96	96	6	14	44
No. Hunters Saw at Least 1	1	7	1	10	2	6	0	8	2	3	1	9	9
Maximum # Observed	0	1	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 C and D). Consistent with the past 10 years, hunters in 2008 reported the loss of meat, capes, food, to grizzly bears, a perception that there were too many grizzly bears, and that a hunt should be considered. Outfitters also continue to mention camp and equipment damage by grizzly bears both during and after the season. Even though 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 (Ballard, 1992), there were no hunter comments indicating low moose or caribou calf numbers this year. 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 seven incidents in 2008 in the southern Mackenzie Mountains when grizzlies claimed meat from a moose kill while guides were in the vicinity. In these instances the guide and hunter left the area without incident (Carl Lafferty, personal communication). Since 1993 there have been 55 nuisance grizzly bears killed, the majority in the Sahtu (n=34) and Gwich'in (n=14) Regions with just seven in the Dehcho, five of those seven

kills occurred in the past three years (ENR Norman Wells and Fort Simpson, unpublished data). To minimize human-grizzly bear interactions electric fences have been used at main camps, temporary camp time use has been reduced, clean camp policy is standard, and some known high use grizzly bear areas have been avoided.

While the mean number of adult grizzly bears observed by hunters has fluctuated around a mean of 306 from 1996-2008, the cub to adult ratio calculated from the hunter observations has shown marked fluctuations with some periodicity (Fig. 7; Table 20). There was a peak in 2000, with 29 cubs/100 adult bears observed, followed by a decline to a low of 12 cubs/100 adult bears in 2003, and a subsequent increase. In 2008, the 34 cubs/100 adult bears is the highest reported (Fig. 7; Table 20). Because cub grizzlies in the Mackenzie Mountains tend to stay with their mothers for three years (Miller et al., 1982), reported observations of ‘cubs’ likely 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 the Mackenzie Mountains, with no sows less than 8-years-old producing cubs, an average inter-litter interval of 3.8 years, and a mean litter size of 1.8. The ‘cubs’/100 adult bears determined from reported hunter observations during 1996-2008 shows somewhat of a periodicity, but with more than four years between low cubs/100 adults (Fig. 7). This may or may not 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 one adult. The estimated mean litter size in 2008 was 1.5, which falls within the range of 1.4-2.0 reported from 1996-2008. The 1.5 litter size reported for 2008 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 1996-2008 remain generally comparable to those reported during 1973-1977 by Miller at al. (1982).

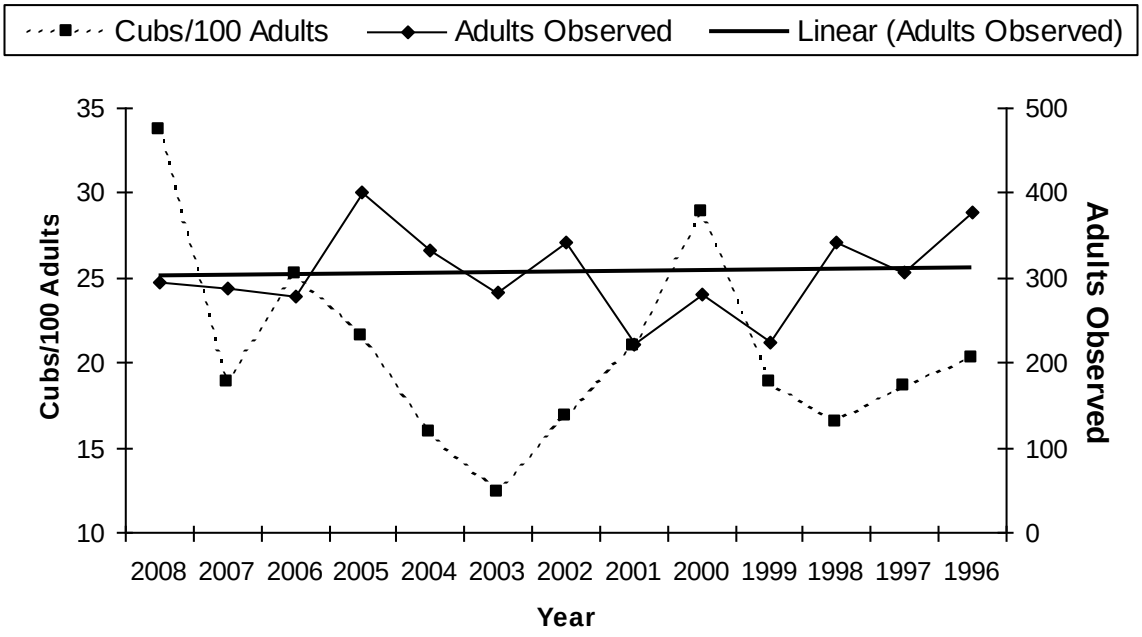


Figure 7. The number of 'cubs'/100 adults and the total number of adult grizzly bears observed by hunters from 1996-2008. Data are based upon voluntary hunter observation forms. The linear trend of total adult bears observed during the same time period is indicated.

Table 20. Observations of grizzly bear reported by non-resident hunters in the Mackenzie Mountains, 1995-2008; 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.

	2008		2007		2006		2005		2004		2003		2002	
	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult
Total # Observed	99	294	54	288	93	279	110	402	63	333	40	283	69	341
% of Total #	25	75	16	84	25	75	21	79	16	84	12	88	17	83
# Hunters reporting	48	139	28	127	50	122	49	150	34	131	19	120	34	128
# Hunters saw ≥1	31	64	17	56	32	70	10	65	15	57	9	53	11	48
Mean # Observed	2.1	2.1	1.9	2.3	1.9	2.3	2.0	2.3	1.9	2.5	2.1	2.4	2	2.7
Max. # Observed	6	12	5	15	5	12	10	16	4	15	12	7	8	20

	2001		2000		1999		1998		1997		1996		1995
	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	All Bears[1]
Total # Observed	59	222	113	281	52	225	68	343	70	306	96	377	389
% of Total #	21	79	29	71	19	81	17	83	19	81	20	80	nil
# Hunters reporting	136	171	108	131	98	117	139	177	110	170	49	132	138
# Hunters saw ≥1	28	104	51	97	28	81	31	105	32	129	46	129	123
Mean # Observed	0.4	1.3	1.1	2.1	0.5	1.9	0.5	1.9	0.6	1.8	2.0	2.9	2.8
Max. # Observed	5	10	8	12	4	12	6	16	12	17	5	15	16

ACKNOWLEDGEMENTS

We appreciate the continued co-operation from the outfitters operating in the Mackenzie Mountains in 2008, and thank them for the extra efforts they made in completing, signing, and sending us their harvest reports and meat distribution forms. We especially want to thank those outfitters who spent additional time compiling and sending additional information so that this report could be completed in a timely fashion.

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. We would particularly like to thank those hunters that took the time to write comments about their hunting experience.

We thank Mary Knox for ensuring that all data she received by the Sahtu ENR office was forwarded to the Fort Simpson ENR office, and Keith Hickling for providing the nuisance bear data. John Nagy provided unpublished data from Richardson Mountain Dall's sheep work and a reanalysis of satellite collared mountain caribou data. We gratefully acknowledge the Boone and Crocket Club for providing us with access to their on-line trophy database and Safari Club International for providing us with caribou data from their on-line trophy database. Matson's Laboratory aged all of the moose teeth. We thank the Department of Industry, Tourism & Investment for providing unpublished data from their 2006 exit survey questionnaire.

PERSONAL COMMUNICATIONS

Jan Adamczewski, Liard Regional Biologist, Fish and Wildlife Branch Yukon Environment, Watson Lake, YT, currently Wildlife Biologist, department of Environment and Natural Resources, Yellowknife, NT.

Werner Aschbacher, South Nahanni Outfitting, Whitehorse, YT.

Suzanne Carriere, Ecosystem Management Biologist, Department of Environment and Natural Resources, Yellowknife, NT.

Ken Davidge, Renewable Resources Officer, Department of Environment and Natural Resources, Ft. Simpson, NT, currently retired.

Troy Hegel, Caribou Biologist, Fish and Wildlife Branch Yukon Environment, Whitehorse, YT.

Kelly Hougen, Past-President, Association of Mackenzie Mountain Outfitters, Whitehorse, YT.

Carl Lafferty, Manager, Wildlife and Environment, Department of Environment and Natural Resources, Fort Simpson, NT.

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

Jim Lancaster, Nahanni Butte Outfitting, Smithers, BC.

John Nagy, Senior Wildlife Biologist, Department of Environment and Natural Resources, Yellowknife, NT.

Mark O'Donoghue, Northern Tutchone Regional Biologist, Fish and Wildlife Branch, Yukon Environment, Mayo, YT.

Alasdair Veitch, Supervisor of Wildlife, Department Environment and Natural Resources, Norman Wells, NT.

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Appendix A.

Outfitters licenced to provide services to non-resident hunters in the Mackenzie Mountains, NT – 2008.

D/0T/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/0T/02 – *NAHANNI BUTTE OUTFITTERS*

Clay and Jim Lancaster
PO Box 3854
Smithers, BC VOC 2N0
Ph: (250)-846-5309
2nd Ph: (250)-263-9197
e-mail: jladventures@xplornet.com
website:
www.lancasterfamilyhunting.com

G/0T/01 – *ARCTIC RED RIVER OUTFITTERS*

Tavis Molnar
PO Box 1
Whitehorse, YT Y1A 5X9
Ph: (867)-633-4934
Fx: (867)-633-4934
e-mail: arcticred@canada.com
website: www.arcticred-nwt.com

S/0T/01 – *GANA RIVER OUTFITTERS*

Harold Grinde
P.O. Box 528
Rimbey, AB T0C 2J0
Ph: (403)-357-8414
e-mail: ganariver@pentnet.net
website: www.ganariver.com

S/0T/02-*MACKENZIE MOUNTAIN OUTFITTERS*

Stan and Helen Stevens
P.O. Box 175
Dawson Creek, BC V1G 4G3
Ph: (250)-786-5118
Fx: (250)-786-5404
e-mail: stevens.mmo@pris.bc.ca
website: www.mmo-stanstevens.com

S/0T/03 – *RAM HEAD OUTFITTERS*

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

S/0T/04 - *NWT OUTFITTERS*

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

S/0T/05 - *REDSTONE TROPHY HUNTS*

Dave Dutchik
P.O. Box 18
Pink Mountain, BC VOC 2BO
Cell: (250)-261-9962
Ph/Fx: (250)-772-5992
e-mail: redstone@netkaster.ca
website: www.redstonehunts.com

Appendix B.

Summary of fees, bag limits, and seasons for big game species available to non-resident hunters in the Mackenzie Mountains, NT - 2008. [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 15 Aug – 30 June
	Non-resident alien	$50.00	$100.00		
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. 2008. Northwest Territories Summary of Hunting Regulations. Department of Environment and Natural Resources, Yellowknife, NT. 30 pp.

Appendix C.

Comments provided from non-resident hunters in the Mackenzie Mountains, NT on voluntary Hunter Wildlife Observation Report forms, 2008. We have not printed actual names of outfitters or their guides (XXX).

Great hunt, beautiful mountains, peeks aren't quite high enough. (joke)
Good mountain hunting.
Very well organized hunt, great facilities.
Outstanding service - very professional especially impressed with the quality of the infrastructure. Of couse anytime you got the sheep of your dreams on the first hour, first day!
This was my first time hunting in the Mackenzie Mountain Range, I enjoyed my hunt very much, seen a lot of game animals and would very much like to come back and hunt again. I had trouble with a grizzly bear, you should offer a grizzly season to the outfitters.
I would like to be informed about the distribution of species in the area, to have all experienced hunting guide, to plan day to day the hunting. Better to aim for less than 4 trophies, probably 3 is the best.
XXX and XXX were awesome. XXX is an awesome operation. Rebooking for moose, Thanks!
Excellent outfitter, unbelievable amount of wildlife.
First quality and very professional outfitting.
I had an awesome experience, and I wish I could do it again right now. Thanks for everything.
I had a wonderful rewarding experience and I rate XXX as one of the best outfitters I have ever hunted with. This is a 1st class operation.
Excellent.
Excellent good hunting.
Very professional and organized. Their minding of the environment and the fluid quality of attention to details as to the habits of the game and the needs of the hunter make this a first class operation and experience.
I have seen a lot of grizzly tracks, I think so its hard to hunt.
It was a very hard but successful and excellent hunt! Lots of thanks!
Very professional outfitter, beautiful area, good weather.
Fantastic!
Outfitter did an excellent job!
Great hunting area and awesome scenery.
All in all it was excellent hunting experience in wonderful country and lots of game, in a perfect outfit!
Thanks for all.
Everything was perfect.
We need grizzly licences!! The moose is the new #11 in SCI, and the new#15 in Boone and Crocket. (pending).
There are too many grizzlies!!
We need grizzly licences.
XXX + guides were the best possible in hunting ability and support.
Seen a lot of grizzly tracks, the government should think about giving quotas for "non-resident".
Didn't show up due to health problems.
A hunt of a lifetime. Would recommend to everybody. XXX truly make dreams come true.
Great people, great outfitter.
Has a great hunt, great guides. Harvested a great ram.
Bear ate meat
Wonderful experience, beautiful Dall's sheep taken.
Hunted one day for Dall's sheep and got a nice full curl ram, hunted one day for caribou. Did not see any.
Excellent hunting in the Mackenzie.

Outstanding service! Guides were very knowledgeable and helpful on the hunt. The entire operation at XXX is top notch. All the guides were friendly and hospitable. Great hunt!

This hunt was an excellent experience. The guides were very knowledgeable and made the hunt very enjoyable.

Hunter left without us measuring ram. He took it with him. Inspected in Fort Simpson.

Best mountain hunt ever, better than Tajikistan!!!

Everything was spendid, I will return more times…

Great hunt, I'll be back.

No harvest bow hunter, lots of rams. Weather allowed me to hunt only 3 days total.

Excellent hunting experience. Mackenzie Mountains are beautiful.

Excellent hunt, camp, area, scenery, guides, cooks, helpers, and outfitter!! Best experience and hunt I've been on, most rememorable esp. Hard hunt as in walking in the mountains, but very rewarding when successful! Thank you, we would definitely recommend this XXX to everyone who is fit to do it!

XXX have been as professional group to hunt with safety and respect to the animals and environment came first. Great hunt and organization.

All animals looked healthy. 1) Open all species on July 15th versus a different date. 2) Open up an extended grizzly season.

All animals looked healthy. Open up an extended grizzly season!!!

All animals appeared healthy; sheep seemed to be very active. Outstanding area and a terrific outfitter.

All animals looked in great shape. Excellent, beautiful wild country I truly hope remains this way. A wonderful hunt experience! Thank You!

All animals observed looked to be extremely healthy. Professionals in all aspects.

All game looked in excellent shape. Great hunt, great service from NWT, Natural Resources, keep the good work!

All animals fat. Everything I dreamed except the weather.

All wildlife appeared healthy. Hunting with XXX was great, a dream come true.

Great resources and an outfitter that is committed to conserving and improving the outdoor/wildlife experience made my trip to NWT an incredible memory that I hope to try and duplicate. Thank you.

Bad weather only hunted 2 days.

Good weather healthy animals; killed the wolf.

A great experience with XXX.

Great hunting experience!!! I took a 39" Fannin !!! (score 163) also, a net 371 woodland caribou and a wolf.

All game looked in great shape.

A very game rich area. Weather was tough as we were fogged in several days until no visiblity. Trophy management within area is top notch - hope the road and exploration stay away forever - thanks.

All animals in good condition. One ewe with 6 inch growth on hip, one orphan moose calf running around. Hunter hunted 1/2 day. Excellent outfitter - very accommodating! I would highly recommend this outfitter.

XXX is extremely professional and provides an exceptional representation of Canada.

XXX were extremely professional and great guides. The Mackenzie Mountains and surrounding area is beautiful + I cannot wait to return!

XXX provided an incredible experience. I hope to return in the near future!

Lots and lots of snow, caribou looked healthy. XXX is a great operation!

Everytime I've been here we have seen grizzly bears and twice had problems with them and it seems a shame not to have a season on them. The pilot saw a sow + 2 cubs just west of our camp which would have brought the total number of bears to 4 bears within a mile of our camp.

All game in good condition 20" snow.

Animals all in good shape, 50% calf count on caribou. Hunter quit hunting after Day 1 on sheep!

Hunted with XXX, got weathered in and couldn't hunt last 5 days. Great hunt & experience - some what fouled by the weather.

All game looked in excellent shape. Bowhunter - several chances, no kills. Lamb was a guess as most of the ewes/lambs were at long distance. We had lots of snow and fog. I was very surprised at the # of grizzlies. Many times their tracks were in the snow over ours.

Weather sucks, XXX was great.

After seeing the amount of grizzly bears. I would like to see a season in this territory for this species.

Professional outfitter well operated.

Great grizzly bear and mature sheep population.
Great hunt, with a super guide. I would hunt with XXX again in a heartbeat.
This area needs to be opened up to grizzly hunting. The numbers in this area are way to high. Thanks!
Abundant wildlife seen. No human pressure experiences seen in the wilderness nor amongst the wildlife. Appears to be quality management.
Lots of bears, would like to see some grizzly tags available.
Need tags for non-resident grizzly bears!!!
Was pleasantly pleased to see a few grizzly bears and shocked when our hunting group seen as many as they said. Should open a "Grizzly Bear" season. Perhaps.
Awesome country full of game that hasn't been hunted much! Awesome!!!
Place is beautiful, had the time of my life.
Please open up grizzly bear.
Excellent hunt, weather wet with rain, sleet and snow - Hard for hunting game movement was slow except for 1.5 days. I was not hunting for sheep so not really looking for them or in their area.
XXX is a good man that makes a great effort to run a quality operation.
It would be great if all outfitters ran their area like XXX. They are a credit to the outfitting industry.
Cancellation could not come.
No animals taken, injured knee on 2nd day. Home early.
Beautiful Country + views. Excellent outfitter + accomodations + hospitality. Good fishing!
You have something to be proud of! One of the best outfitter I've been with!!!
Good area, good outfitter & good guides. Very satisfied - highly recommend.
Excellent area, excellent guides, excellent outfitter, a lot of game (sheep)
Excellent area to hunt. Excellent outfitter and staff. Highly recommend hunting trip.
Beautiful area, excellent outfitter + staff.
Excellent guide + very personable folks.
Tough - nice ram the fog, fog, fog.
I am very pleased to see such great care taken by the outfitter to maintain the natural beauty of the Northwest Territories.
Excellent experience.
Fantastic area. Despite foul weather I saw a lot of game. Outfitter was outstanding and worked very hard for me.
When does the sun shine? Excellent outfit + guide.
Great hunt packed in 3 years of winter (by Arizona standards) in 10 days.
I had a nice, long, tough hunt. I also got both animals I came for. Good people. I would come again, but not sure if there's time in the next 5-10 years.
Top notch in every aspect.
Great hunt!
Very professional and personal. Strictly fair chase backpack hunting. Great guides. Lots of animals, and very friendly. Would hunt with XXX again.
Lots of wildlife + a good time.
I do not understand why non-residents cannot hunt grizzly bear. I saw a large grizzly bear and grizzly bear scat and markings everyday during my hunt. I would be interested in hunting them. Can you open grizzly bear up for non-residents in the Mackenzie Mountains.
I have hunted on the Mackenzie Mountains 3 different times. Each time I see grizzly bears and a lot of sign of grizzly bears. Would you please consider the opening of grizzly bear to non-residents. I would be interested in hunting them with the XXX if I was able to get a tag.
Thank you!
Too many bears/ took my cape and meat! Grizzly got all meat and full cape.hide.
Weather was bad
Grizzly took 180 lbs from camp
Grizzly got 180lb of moose meat at killsite
Grizzly got rest of caribou meat in camp
Grizzly got caribou meat in camp

Grizzly got 300 lb of moose meat

Grizzly got 300 lb of moose meat.

Tremendous outfit and adventure may try moose later on. As fine a group of guides, outfitters, organization and equipment "I've ever seen"!!

Sheep was sparse but visible in the area we hunted ram had a lot of fat, caribou were more plentiful every day. The wolf was old and scared from fighting. Plentiful game and good service made for an enjoyable hunt!

Quality of wildlife observed in the Mackenzie was very good. The quality of the sheep was very good. Outfitters should be given more control/input in grizzly bear + wolf management in the Mackenzie Mountains.

Beautiful country, keep it that way, would love to come back + do it again. Great hunt, lots exercise. Very good people to work with.

Lots of big grizzly bears, wish was open to take one. Sheep looked to be in good condition. Big country high mts. Huge untouched land. Hard working caring crew, unreal meals, trip of a lifetime.

Did not see a lot of game due to bad weather. Shot a good ram.

Good age on rams harvested many 10 and over. Outstanding experience in a great mountain range - first rate outfitter and camp (best I've ever been with). Excellent stock and equipment - two thumbs up!

Hunt was very well conducted guides were excellent, courteous and helpful. Accommodations were well cared for and comfortable. Hosts were of high calibre I felt very safe and was very satisfied with the hunt. It has been an incredible experience both from the hunting and the magnificient beauty. People have been delightful and friendly.

Lots of wildlife observed. Saw lots of grizzly bears just riding up trails. Pretty country, lots of wildlife, too many grizzly's.

Hunted one day, the rest of the season I guided. Throughout the season quanity and quality of game was normal.

Only hunted one day, all the rest of the season I was guiding.

Seemed to be lots of game, but difficult to assess quality due to bad weather. Hunting was great, outfitter was great, weather was aweful.

We saw bear, wolves, sheep + caribou, all in excellent condition, super numbers of sheep and caribou. The rams harvested + caribou were in prime condition, horns in excellent shape. The sheep (rams) to pick from were outstanding. We had a super hunt, abundant game, never expected to see that many sheep. Would highly recommend the area + outfitter to anyone.

Lots of sheep in the area, prime locations, easy to access, quality of the rams was exceptional. All sheep were in excellent shape. Great place to be. XXX's place and people are great folks. Lots of game.

Weather limited the number of animals seen and it seemed caribou were not running yet. When we could glass seen good numbers of sheep, and trailing around the country seen many wolf and bear tracks. Outfitter is great, area is great just horrible weather for 9 out of the 12 days.

XXX is a very hard worker around camp and horses, will be a great guide with more experience. Weather impacted the hunt, but overall an excellent experience.

Had a great time. Lots of game each day! Bad weather for 12 day's here 20 day's. Lot's of game each day. *Note: need to open bear.

Great experience. Safety was always priority with caution placed before any decision made. Excellent experience.

Very knowledgeable outfitter. Safety always took precedence.

Good hunt, good area, need to be able to hunt bear. Great Experience!!! Nice place to experience.

Game was plentiful, excellent hunting, area looked undisturbed and natural. Overall one of nicest places to hunt.

Excellent overall trip from camp to hunting experience.

Good number of game and in good shape. Lots of game.

Game was in great shape and in good numbers. Lots of game.

All animals were in very good condition and feed conditions were extremely good. Outfitter did great job.

Caribou - saw several hundred of all ages all animals including the one I took were in very good condition. Everything - Excellent food, cabins, horses.

Caribou #s + size are above my expectations. Great trip. Good accommodations.

After 28 trips to various african countries on hunting safaris. I would rate the quanity and quality of game observed to any of them! The hunting experience was fantastic. XXX provides excellent guiding service, accommodations, and patience. I would recommend their services without reservation to any willing hunter.

Clean camp, abundant game.

Good numbers of caribou were very good.

I believe the quality and quanity of all animals are excellent. Excellent hunting experience.

Lots of caribou.

Sheep were sparse wolf made bears from fighting.

Great hunt + XXX was an excellent guide. Very comfortable accommodations.

Great hunt + XXX was an excellent guide. Very comfortable accommodations.

Saw 1 bull moose, approx. 8 years old, excellent condition, great habitat. Saw a few caribou. Great hunt in true wilderness coutry; Excellent guide - experience of a lifetime!

Excellent hunting - facilities/ great abundance of wildlife. Excellent hunt.

Many species sharing area - grizzly, caribou, moose and wolverine were within 1 km of camp. Great numbers of game throughout the trip. Did not see any trophy caribou but herds seemed healthly with lots of calves.

Observed one wolf. Did not hunt more than one day due to guiding. Only hunted for one day, all other days I was guiding.

Great outfitter, very professional, great accommodations, food and guides.

Appendix D.

A summary of the 2008 voluntary hunter comments broken down into specific topics.

No. of hunters reporting	No. of hunters mentioning good quality hunts	No. of hunters mentioning abundance /quality of animals	No. of hunters mentioning grizzlies	No. of hunters mentioning wolves	No. of hunters mentioning Park expansion	No. of hunters mentioning bad weather
160	102	52	34	2	0	20

Appendix E.

Number, age, and horn length measurements of Dall's sheep rams harvested by non-resident hunters in the Mackenzie Mountains, 1967-2008. Number harvested includes [1]10, [2]2, [3]10, [4]6 and [5]8 harvested by resident hunters.

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	159
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

Appendix E (cont.)

Number, age, and horn length measurements of Dall's sheep rams harvested by non-resident hunters in the Mackenzie Mountains, 1967-2008. Number harvested includes [1]10, [2]2, [3]10, [4]6 and [5]8 harvested by resident hunters.

Year	Number of Sheep Harvested	Age (Years)		Length of Right Horn	
		Mean	Sample Size	Mean	Sample Size
1992	203	9.7	199	88.0	202
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
2007	216 [4]	10.8	216	88.3	216
2008	192 [5]	10.6	192	88.8	192
Mean 1972-2008	173	9.3	152	89.1	165

Appendix F.

Outfitted non-resident hunter harvests in the Mackenzie Mountains, 1991-2008. Number harvested includes [1]10, [2]2, [3]10, [4]6 and [5]8 harvested by resident hunters.

Year	Number of Licences Sold	Number of Animals Harvested						
		Dall's Sheep	Mountain Caribou	Moose	Mountain Goat	Wolf	Wolverine	Black Bear
1991	354	170	179	40	6	14	3	0
1992	364	203	142	32	5	7	0	0
1993	382	191	191	56	9	7	3	0
1994	356	199	164	46	5	15	2	0
1995	344	190	180	49	6	14	1	0
1996	387	201	175	46	4	11	4	0
1997	352	210	168	44	2	17	1	0
1998	345	215	160	52	5	9	0	0
1999	321	204	117	36	1	11	3	0
2000	332	189	127	44	1	14	0	0
2001	339	199	132	47	2	15	2	0
2002	329	173	168	42	5	11	1	0
2003	347	213	143	48	6	12	0	0
2004	337	201 [1]	135	55	6	18	0	0
2005	394	203 [2]	160	75	18	19	1	0
2006	407	208 [3]	188	72	12	23	1	0
2007	405	216 [4]	165	74	21	12	0	0
2008	399	192 [5]	167	75	21	17	1	2
Mean 1991-2008	361	199	159	52	8	14	1	0

Appendix G.

Summary of age and sex ratios calculated from non-resident hunter observation reports in the Mackenzie Mountains, 1995-2008.

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
2007	64	83	52	37	36	101
2008	49	98	41	40	31	115
Mean 1995-2008	55	87	44	37	29	105

Appendix H.

Summary of age and sex ratios calculated from non-resident hunter observation reports of mountain goats, 2002-2008.

Year	Kids:100 Nannies	Billies:100 Nannies	Total Animals
2002	55.2	75.9	69
2003	61.5	70.5	182
2004	57.1	77.1	84
2005	66.0	50.4	306
2006	61.5	51.4	245
2007	71.2	57.7	393
2008	54.3	97.1	264
Mean	61.0	68.6	221