

**MACKENZIE MOUNTAIN
NON-RESIDENT AND
NON-RESIDENT ALIEN
HUNTER HARVEST SUMMARY
2003**

NICHOLAS C. LARTER AND DANNY G. ALLAIRE

DEPARTMENT OF RESOURCES, WILDLIFE, AND ECONOMIC DEVELOPMENT
GOVERNMENT OF THE NORTHWEST TERRITORIES
P.O. Box 240
FORT SIMPSON, NT
X0E 0N0

2004

Manuscript Report No. 154

The contents of this paper are the sole responsibility of the authors

ABSTRACT

Each of the eight licensed outfitters and Renewable Resource Officers from the Sahtu and Deh Cho Regions, with the Department of Resources, Wildlife & Economic Development (RWED), collected data on big game harvest in the Mackenzie Mountains during the 2003 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 2003, non-resident licences were bought by 347 hunters. Hunters from outside Canada (non-resident aliens), primarily from the United States of America, comprised 78% of the outfitted hunters in the Mackenzie Mountains; Canadian hunters from outside the NWT (non-residents) comprised 19% of non-resident hunters. Of the 347 non-resident licence holders, 339 came to the NWT and most spent at least some time hunting. Of 257 tags purchased for Dall's sheep, 213 rams were harvested. This is the greatest number of rams harvested since 1998. The average age of harvested rams was 9.7 ± 1.7 years, which represents the 7th consecutive year with an average age of 9.6 years or older for the Mackenzie Mountains. Hunters reported seeing an average of 10.2 legal rams (horns at least $\frac{3}{4}$ curl) during their hunts and observed an estimated 49.6 lambs and 82.6 rams per 100 ewes, respectively. Of 247 tags purchased for woodland caribou 143 bull caribou were harvested. Hunters observed an estimated 38.9 caribou calves and 36.4 bulls per 100 adult female caribou, respectively. Of the 85 tags purchased for moose 48 bull moose were harvested. Hunters observed an estimated 24.6 moose calves and 129.0 bulls per 100 adult female moose, respectively. Of the 18 tags purchased for mountain goat, 6 billies were harvested. Hunters observed an estimated 61.5 goat kids and 70.5 billies per 100 adult nanny goats. Twelve wolves were harvested from 207 tags purchased, 0 wolverine from 141 tags purchased, and no black bears harvested from 9 tags purchased. There has not been an open season for non-residents to hunt grizzly bears since 1982. Hunter satisfaction remains high, with 97% of respondents rating their experience as either excellent (82%) or very good (15%). Of 191 respondents, 96% indicated that they would like to return to the Mackenzie Mountains in future years and 36% were repeat clients, returning for their 2nd to 12th hunt in the Mackenzie Mountains.

TABLE OF CONTENTS

ABSTRACT	i
LIST OF FIGURES	iii
LIST OF TABLES	iii
INTRODUCTION	1
METHODS	6
RESULTS and DISCUSSION	7
Hunters	7
Dall's Sheep (<i>Ovis dalli dalli</i>)	10
Woodland (Mountain) Caribou (<i>Rangifer tarandus caribou</i>)	16
Alaska-Yukon Moose (<i>Alces alces gigas</i>)	20
Mountain Goat (<i>Oreamnos americanus</i>)	22
Wolf (<i>Canis lupus</i>)	23
Wolverine (<i>Gulo gulo</i>)	24
Black Bear (<i>Ursus americanus</i>)	25
Grizzly Bear (<i>Ursus arctos</i>)	28
ACKNOWLEDGMENTS.....	32
PERSONAL COMMUNICATIONS	32
REFERENCES	33
APPENDIX 1. Outfitters licenced to provide services to non-resident hunters in the Mackenzie Mountains, 2003.....	37
APPENDIX 2. Summary of fees, bag limits, and seasons for big game species available to non- resident hunters in the Mackenzie Mountains, NWT – 2003.....	38
APPENDIX 3. Comments provided from non-resident hunters in the Mackenzie Mountains, NWT on voluntary Hunter Wildlife Observation Report forms, 2003.....	39
APPENDIX 4. Number, age, and horn length measurements of Dall's sheep rams harvested by non-resident hunters in the Mackenzie Mountains, 1967-2003.....	42
APPENDIX 5. Summary of age and sex ratios calculated from non-resident hunter observation reports in the Mackenzie Mountains, 1995-2003	44
APPENDIX 6. Outfitted non-resident hunter harvests in the Mackenzie Mountains,	

1991-2003.....	45
APPENDIX 7. A summary of the 2003 voluntary hunter comments broken down into specific topics.....	46

LIST OF FIGURES

FIGURE 1. Outfitter zones in the Mackenzie Mountains, Northwest Territories - 2003	2
FIGURE 2. 2003 Mackenzie Mountain Outfitter Hunt Report Form	5
FIGURE 3. The number of Dall’s sheep, woodland caribou, and moose harvested in the Mackenzie Mountains by non-resident hunters, and the number of non-resident licences sold during 1992-2003.....	12
FIGURE 4. The number of wolverines observed by hunters from 1995-2003, and the outfitter zones where the observations occurred.....	26
FIGURE 5. The percent of ‘cubs’ and the total number of adult grizzly bears observed by hunters from 1996-2003	29

LIST OF TABLES

TABLE 1. Province or country of origin of non-resident hunters in the Mackenzie Mountains, 2003.....	8
TABLE 2. Percent of Mackenzie Mountain outfitter and non-resident hunter forms submission compliance rate, 1995-2003	8
TABLE 3. Satisfaction ratings for non-resident hunters in the Mackenzie Mountains, 1996-2003.....	9
TABLE 4. Tags for big game species purchased by non-resident hunters with outfitters in the Mackenzie Mountains, 1995-2003	11
TABLE 5. Horn measurements of Dall's sheep rams harvested by non-resident hunters in the Mackenzie Mountains, 2003	14

TABLE 6.	Age-structure of Dall’s sheep rams harvested by non-resident hunters in the Mackenzie Mountains, 1995-2003	15
TABLE 7.	Dall's sheep observations reported by non-resident hunters in the Mackenzie Mountains, 2003.....	15
TABLE 8.	Classification of Dall’s sheep rams observed by non-resident hunters in the Mackenzie Mountains, 1995-2003	17
TABLE 9.	Antler measurements of woodland caribou bulls harvested by non-resident hunters in the Mackenzie Mountains, 2003	18
TABLE 10.	Woodland caribou observations reported by non-resident hunters in the Mackenzie Mountains, 2003	19
TABLE 11.	Moose observations reported by non-resident hunters in the Mackenzie Mountains, 2003.....	22
TABLE 12.	Wolf observations reported by non-resident hunters in the Mackenzie Mountains, 1995-2003	24
TABLE 13.	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 – 2003.....	25
TABLE 14.	Black bear observations reported by non-resident hunters in the Mackenzie Mountains, 1995-2003	27
TABLE 15.	Grizzly bear observations reported by non-resident hunters in the Mackenzie Mountains, 1995-2003	30

INTRODUCTION

The 140 000 km² (54 000 mi²; 34.6 million acres) area of the Mackenzie Mountains in the western Northwest Territories (NWT) were first opened to non-subsistence hunters in 1965 (Simmons 1968). Since then, the Mackenzies have become world-renowned for providing a high quality wilderness hunting experience, particularly for Dall's sheep (Veitch and Simmons 1999). In return, non-resident hunters and outfitters in the Mackenzie Mountains provide an estimated \$1.8 million annually to individuals, businesses, and governments in the NWT (EXCEleration Corp. 2000). The outfitted hunting industry in the Mackenzie Mountains also provides employment for 100 to 120 outfitters, guides, pilots, camp cooks, camp helpers, and horse wranglers (Kelly Hougen, President, Association of Mackenzie Mountain Outfitters personal communication). Additionally, fresh meat from many of the harvested animals is provided to a number of local communities including Tulita, Fort Good Hope, and Norman Wells in the Sahtu and Nahanni Butte, Fort Liard and Fort Simpson in the Deh Cho. This meat is distributed among local elders and residents and to health/long term care facilities.

Eight outfitters are currently licenced by the Government of the NWT (GNWT) to provide big game outfitting services within the Mackenzie Mountains, NWT (Fig. 1; Appendix 1). No hunting is permitted within the boundaries of Nahanni National Park Reserve in the southern half of the range, except for subsistence harvest by NWT General Hunting Licence holders. Under the terms of the NWT *Wildlife Act*, each 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 NWT runs from 01 July to 30 June and those who desire to hunt big game within the NWT must annually obtain a big game hunting licence and must be at least 16-years-old (Department of Resources, Wildlife & Economic Development 2000). There are four classes of licenced big game hunters in the NWT:

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

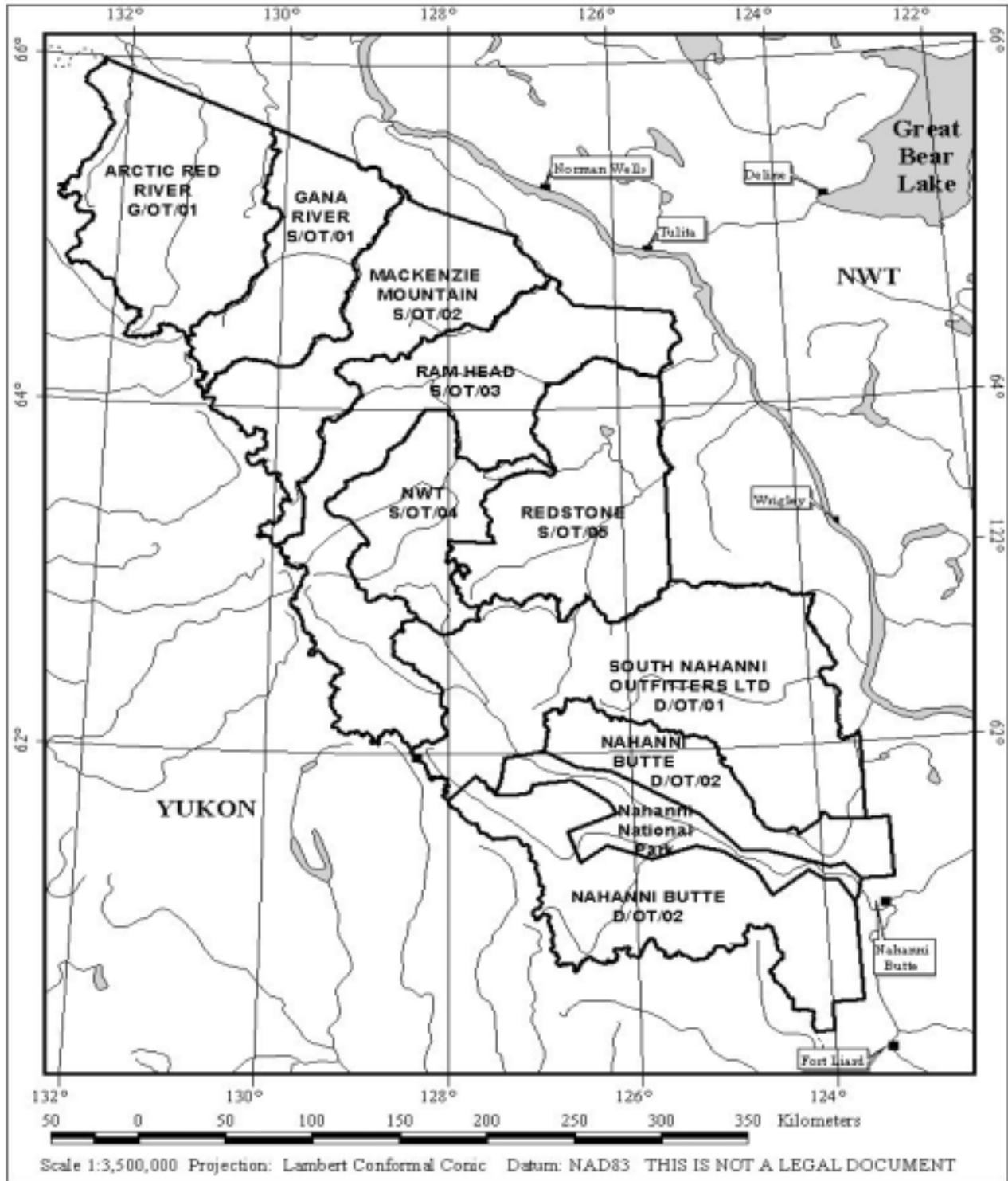


Figure 1. Outfitting zones in the Mackenzie Mountains, Northwest Territories – 2003.

- 3) *Non-resident* - Canadian citizens or landed immigrants who live outside the NWT, or have not lived within the NWT for two consecutive years prior to application for the licence; and
- 4) *Non-resident Alien* - non-Canadian citizens or non-landed immigrants.

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. For simplification in this report, we call both non-resident and non-resident alien hunting licence holders ‘non-residents’ and combine their harvest statistics.

Individual non-resident hunters are annually restricted to one each of the following big game species (Appendix 2): Dall's sheep (male with at least $\frac{3}{4}$ curl horns), 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). 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 km²) in the south Mackenzie Mountains is managed by Parks Canada – an agency of the Canadian federal government. Under the terms of the Sahtu Dene and Metis Comprehensive Land Claim Agreement (signed in 1993) and the Gwich'in Comprehensive Land Claim Agreement (signed in 1992), primary responsibility for wildlife management within the two settlement areas lies with the Sahtu Renewable Resources Board (SRRB) and the Gwich'in Renewable Resources Board (GRRB), respectively. Approximately 68 000 km² of the central and northern Mackenzie Mountains are within the Sahtu Settlement Area and 8300 km² 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 Resources, Wildlife & Economic Development (DRWED) 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 Deh Cho First Nations Interim Measures Agreement (signed in 2001), DRWED has primary responsibility for wildlife management within the Deh Cho region (approximately 59 000 km²) of the southern half of the Mackenzie Mountains.

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

In 1995, DRWED requested that all non-resident hunters also fill out a voluntary questionnaire. The questionnaire has changed and been revised through the years having included different questions pertaining to wildlife observations, the quality of the hunting experience, the quality of services related to hunter travel, and provided an opportunity for specific comments by the hunter. One key component of the questionnaire that has remained since 1995 pertained to reporting the different types and numbers of wildlife seen during their hunts. These data have been recorded and the questionnaire forms have been and will be referred to as hunter observation forms in this report.

This is the ninth consecutive year that a summary of the data collected by DRWED 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 (2000; 2001; respectively), for 2001 by Veitch and Simmons (unpublished data), and for 2002 in Larter and Allaire (2003). Additionally, Latour and MacLean (1994) summarized data for 1979 to 1990. This report compiles the harvest data collected during the 2003 hunting season and compares it with data collected since 1995.



Department of Resources, Wildlife and Economic Development
 Département des Ressources, Faune et Développement économique
 Présenté par le WILDLIFE ACT - En Vert, On Va LOU SUR LA FAUNE

OUTFITTER RETURN
 ON CLIENT HUNTER SUCCESS
 RAPPORT DU POURROYEUR
 SUR LES RESULTATS DE CHASSE D'UN CLIENT



INSTRUCTIONS: This form is to be completed in order to provide a record of the hunt and to be submitted before the 10th day of the following month to the Regional Biologist.
 Ce formulaire est à compléter afin de fournir un dossier de la chasse et doit être remis au biologiste régional avant le 10ème jour du mois suivant.

OR 008291

OUTFITTER/CLIENT HUNTER - POURVOYEUR/CLIENT CHASSEUR

Client Name: *Scott & Jennifer* Outfitter Name: *Scott & Jennifer*
 Address: *12000 100th Ave. Edmonton, Alberta T5A 1C6*

Return for the period of: *Sept./Oct. 2002*

Species - Espèce	No. of Animals N ^o de Animaux	No. of Days Hunted N ^o de Jours de Chasse	Guide	Guide No. N ^o de Guide	Sex Sexe	Age Âge	Length Longueur	Weight Poids	Measurements - Mesures
MOOSE ORIGNAN	1	8	THOMAS MCKENZIE	000692	♂	15	640	261	49 1/8 60 3/8 14
MOOSE ORIGNAN	1	1	THOMAS MCKENZIE	000692	♂	09	640	531	49 1/8 60 3/8 14
MOOSE ORIGNAN	1	1	THOMAS MCKENZIE	000692	♂	09	640	531	49 1/8 60 3/8 14
MOOSE ORIGNAN	1	1	THOMAS MCKENZIE	000692	♂	09	640	531	49 1/8 60 3/8 14
MOOSE ORIGNAN	1	1	THOMAS MCKENZIE	000692	♂	09	640	531	49 1/8 60 3/8 14
MOOSE ORIGNAN	1	1	THOMAS MCKENZIE	000692	♂	09	640	531	49 1/8 60 3/8 14
MOOSE ORIGNAN	1	1	THOMAS MCKENZIE	000692	♂	09	640	531	49 1/8 60 3/8 14
MOOSE ORIGNAN	1	1	THOMAS MCKENZIE	000692	♂	09	640	531	49 1/8 60 3/8 14
MOOSE ORIGNAN	1	1	THOMAS MCKENZIE	000692	♂	09	640	531	49 1/8 60 3/8 14
MOOSE ORIGNAN	1	1	THOMAS MCKENZIE	000692	♂	09	640	531	49 1/8 60 3/8 14

Comments - Commentaires: *7150 carbow (385kwh, 420wh), 9 71224 (4 cuts), 27 trans, 56 cuts/kwhs*

Office Use Only - Bureau d'Usage: *20*

Date: *26/09/2002*

Signature: *Kelly Hoggan*

Headquarters - Administration Centrale

Figure 2. 2003 Mackenzie Mountain Outfitter Hunt Report Form.

METHODS

Prior to the start of the 2003 hunting season, each outfitter in the Mackenzie Mountains received sufficient copies of the outfitter return and hunter observation forms for all their clients for the year. The *Wildlife Business Regulations* require outfitter returns to be returned by the tenth day of the month following the month of the hunt – e.g., for a hunter that was in the field in July, a form must be submitted by the 10th of August. Those forms were submitted to the senior biologist in either the Sahtu or the Deh Cho whether or not a client actually hunted and whether or not harvest occurred. In co-operation with DRWED 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 2003.

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 (maintained by DRWED offices across the western NWT), and with the 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 2003 for consistency and we recorded all observations directly from these hunter observation forms. If we did not receive a hunter observation form but there was wildlife observation data recorded on the outfitter return form, we entered these wildlife observation data. If we received observation information that 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 that forms with data had been provided, but for the wildlife observation analyses only one set of observation data were used because these data represented one set of wildlife observations.

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

RESULTS and DISCUSSION

Hunters

Big game hunting licences for the Mackenzie Mountains, NWT were bought by 347 non-resident hunters in 2003 (Table 1). Of those, 339 came to the NWT and spent some time hunting; 8 either cancelled their hunts or decided not to hunt due to unforeseen complications after arriving in the NWT. In 2003, licence sales to non-resident Canadians increased to 19% of total non-resident licence sales from the 14% in 2002. Sales were similar to the 1979-1990 average of 22% and the 17% recorded in both 1997 and 1998. The increased value of the Canadian relative to the American dollar likely was a factor in the increased number of Canadian hunters that hunted in the Mackenzie Mountains in 2003. The increased number of hunters in 2003 over 2002 was almost exclusively due to the 40% increase in non-resident Canadian hunters; the number of American and foreign non-resident hunters was virtually identical to 2002 (281 vs 282). There had been some worry that the BSE crises and the uncertainty, especially for American hunters, of whether they would be able to transport their trophies home with them would reduce the number of American hunters in the Mackenzie Mountains. This does not seem to have been the case. There would definitely appear to have been a positive impact of the weakening American dollar on the number of Canadian non-resident hunters coming to the Mackenzie Mountains in 2003.

We received mandatory Outfitter Return forms for 339 (98%) of the 347 people that purchased non-resident licences. However, voluntary Hunter Observation Report forms were received from only 203 (60%) of the 339 that did at least some hunting in 2003 (Table 2). This is a slight increase from previous years but still well below the return rate for the first 2 years of the program. This is quite disappointing considering that the topic of increasing the return rate of these forms was discussed with the Association of Mackenzie Mountain Outfitters at their annual general meeting in January 2002. During the annual general meeting in March 2003 there was consensus among the outfitters on the need to ensure a higher return rate of the Hunter Observation Report forms. What was strikingly apparent in 2003 was that the return rate of voluntary Hunter Observation forms varied substantially between outfitters; returns from Ram Head, NWT, and South Nahanni were 4%, 3% and 5% of a possible 46, 29, and 22 respondents,

Table 1. Province of country of origin for the 347 non-residents who purchased licences for hunting in the Mackenzie Mountains, 2003.

Canada		United States		Europe		Other	
Yukon	1	Eastern States ¹	136	Spain	3	Mexico	1
British Columbia	27			Germany	4	South Africa	1
Alberta	26	Western States ²	135	Austria	1		
Saskatchewan	2						
Manitoba	0						
Ontario/ Quebec	6						
Atlantic Provinces	1						
Total	66		271		8		2

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

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

Table 2. Percent of Mackenzie Mountain outfitter and non-resident hunter forms submitted, 1995-2003.

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

respectively. Unfortunately these poor return rates comprised 29% of licenced hunters that hunted in the Mackenzie Mountains during the 2003 hunting season. We are unable to comment on whether these same outfitters have historically had low rates of returns in previous years.

It is obvious that non-residents immensely enjoy their hunting experience in the Mackenzie Mountains (Table 3) – in 2003, 97% of respondents rated their experience as either excellent (82%) or very good (15%). It was the first time hunting the Mackenzie Mountains for 124 of 193 (64%) respondents; the 69 repeat hunters (36%) had hunted from 1-11 times previously. Of 186 respondents, regarding their plans to return to the Mackenzies to hunt in the future, 96% indicated they would like to return.

Hunter comments about high wolf numbers had not been mentioned prior to 2000 when 12% of responding hunters reported high wolf numbers; in 2003, 4% of respondents reported high wolf numbers. Most reports about wolves were from zones D/OT/01 and D/OT/02. Hunter comments prior to 2000 reflected a general dissatisfaction at the inability to hunt for grizzly bears and problems encountered with bears in and around camps. Similar comments were made by hunters in 2000, 2002 and 2003. All comments received are provided

Table 3. Satisfaction ratings for non-resident hunters in the Mackenzie Mountains, 1996-2003.

Rating	2003	2002	2001	2000	1999	1998	1997	1996
Number of Hunters Reporting	191	193	191	158	157	202	144	224
Excellent	82%	82%	75%	76%	73%	80%	78%	77%
Very Good	15%	15%	16%	17%	20%	17%	17%	17%
Good	3%	3%	6%	6%	20%	2%	3%	2%
Fair	0%	0%	1%	0%	1%	1%	1%	3%
Poor	0%	0%	1%	1%	20%	0%	1%	1%

in Appendix 3.

This year some of the outfitters also submitted to RWED voluntary copies of the Association of Mackenzie Mountain Outfitters meat forms; 90 forms in total. These forms record the amount of meat (sheep, caribou, moose, and goat) that was taken and how the harvested meat was utilized/distributed. With the recent increased scrutiny of outfitting operations, these voluntary forms provide additional information on the local benefits provided from harvested animals. We would like to promote the continued practice of submitting copies of these meat forms in future.

Although the majority of the meat from Dall's sheep and mountain goats is utilized in the outfitter camps, approximately 386 kg (850 pounds) from 68 harvested Dall's sheep and mountain goats, was distributed locally. Mountain caribou and moose meat is also utilized in the camps, however the majority of the harvested mountain caribou and moose meat was distributed locally: approximately 1034 kg (2275 pounds) from 27 mountain caribou and approximately 1590 kg (3500 pounds) from 15 moose. Conservatively, the purchase of approximately 3000 kg (6600 pounds) of meat at retail outlets in local communities, would be a minimum of \$60 000.

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 74% of non-resident hunters in 2003, up slightly from 70-71% in 1997-2000 (Table 4). At least 83% of sheep tag holders pursued Dall's sheep and harvested 213 rams. This is the greatest number of Dall's sheep harvested since 1998, and 8% higher than the average harvest 1992-2002 (Fig. 3; Appendices 4 and 6). The weather during 2003 was far more favourable than it had been in 2002 (Appendices 3 and 7) and may have been a factor in the increased harvest. The average length of a sheep hunt in 2003, 3.75 ± 2.9 , days was less than most previous years: 4.3 days in 1997, 4.4 days in 1998, 4.7 days in 1999, 4.5 days in 2000, and considerably 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

Table 4. Tags for big game species purchased by non-resident hunters with outfitters in the Mackenzie Mountains, 1995-2003.

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

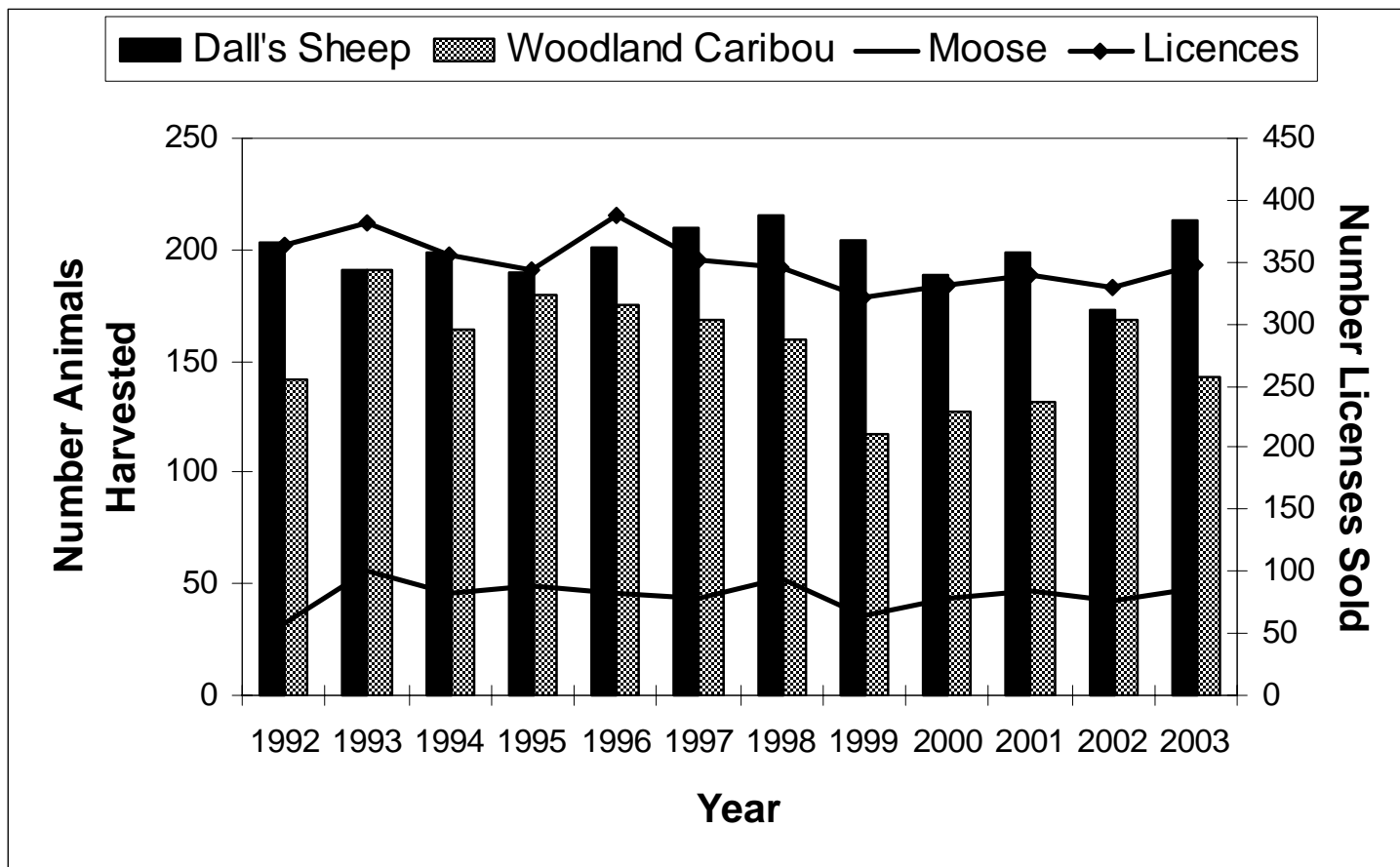


Figure 3. The number of Dall's sheep, woodland caribou, and moose harvested in the Mackenzie Mountains by non-resident hunters, and the number of non-resident licences sold during 1992-2003.

time on the hunt is typically spent in pursuit of other big game species for which tags are held, or in hunting small game.

Harvest by non-residents comprises at least 90% of the total annual harvest of Dall's sheep in the Mackenzie Mountains and takes only 0.8 to 1.5% of the estimated 14 000 to 26 000 Dall's sheep in the Mackenzie Mountains (Veitch et al. 2000a). Therefore, the current non-resident harvest level appears well within sustainable limits, provided that hunting pressure is geographically distributed across each of the zones. In the Yukon Territory - where harvest is managed by a full curl rule - thinhorn sheep managers have set the sustainable harvest at 4% of the non-lamb population (Yukon Renewable Resources 1996). In those areas of the Yukon where the management objective is to increase population size, harvest is limited to 2% of the total population.

There has been remarkable consistency from 1979 to 2003 in the mean outside contour length of the right horns from rams harvested by non-residents (Appendix 4; Table 5), which is surprising given the increase in average age during that same period. We expected to see more broomed, or broken, horn tips on older animals, since horn breakage generally occurs as a result of fights between rival males (Geist 1993).

In 2003, brooming was noted on 25% of left and 26% of right horns. This is a second year of continual decline from the 35 and 38% reported in 2001 and less than the average brooming reported during the previous decade (31 and 32%, respectively). Seventy-four (35%) of 210 aged rams taken by non-residents were at least 10-years-old, with the average age being 9.7 ± 1.7 years (range 5.5 to 16.5 years; Table 7). This is the seventh consecutive year for which the reported average age of rams harvested by non-residents has been 9.7 years or older (Appendix 4).

From hunters' classifications of sheep observed during their hunts in 2003 we calculated an estimated 49.6 lambs per 100 ewes, lower than the 57-60 lambs per 100 ewes for 1997-1999 and 2001, and up from 47 lambs per 100 ewes in 2000 (Table 6; Appendix 5). What was apparent during 2003 was the great variability in lamb:ewe ratio across the Mackenzie Mountains. The 60 lambs per 100 ewes found in D/OT/02 were some of the highest in recent memory (Cam Lancaster, Nahanni Butte Outfitters personal communication), while the ratios in S/OT/01 were low (Harold Grinde, Gana River Outfitters personal communication) at 42 lambs

Table 5. Horn measurements of Dall's sheep rams harvested by non-resident hunters in the Mackenzie Mountains, 2003.

	Left Horn		Right Horn		Left Horn Base		Right Horn Base		Tip to Tip	
	Contour Length		Contour Length		Circumference		Circumference		Spread	
	cm	in	cm	In	cm	in	cm	in	cm	in
Mean	90.0	35.4	89.8	35.4	33.4	13.1	33.4	13.1	59.1	23.3
Standard Deviation	8.7	3.4	8.4	3.3	1.93	0.8	1.95	0.8	7.9	3.1
Maximum	107.5	42.3	107.5	42.3	38.5	15.2	38.0	15.0	88.0	34.6
Minimum	59.8	23.6	63.0	24.8	28.2	11.1	28.0	11.0	42.0	16.5

per 100 ewes. A relatively high lamb:ewe ratio in the southern part of the Mackenzie Mountains was observed during aerial sheep surveys of three major ranges in August, 58, 45, and 60 lambs per 100 ewes (N. Larter and D. Allaire in preparation). For the Richardson Mountains of the northern Yukon and NWT, Nagy and Carey (1991) suggest an August ratio of 43 lambs per 100 ewes would have allowed for their observed 10.5% average annual rate of increase from 1986 to 1991. Subsequent to a decline in this unhunted population from 1997-2003, Nagy et al. (in preparation) 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 westcentral Alberta and found a mean of 43 lambs per 100 ewes in September (range 25 to 54).

Differences in adult sex ratios among populations may result from differences in hunting pressure, differences in survival of males and females from birth to adulthood, or both (Nichols and Bunnell 1999). However, since the ratio of rams to ewes is almost never equal in wild populations of mountain sheep, even where they are unhunted, it is clear that there is a different natural mortality rate for the two sexes. Geist (1971) suggested that this difference is a result of injuries and stress accumulated by males during the breeding season. The 83:100 ram to ewe

Table 6. Age-structure of Dall's sheep rams harvested by non-resident hunters in the Mackenzie Mountains, 1995-2003.

Age	2003		2002		2001		2000		1999		1998		1997		1996		1995	
	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	1	0.5	0	0.0
4.5	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
5.5	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	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	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	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	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	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	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	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	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	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	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	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	74		71		95		90		97		109		102		69		68	
%>10y	35.2		42.7		51.0		47.9		53.0		52.6		49.5		34.5		36.0	
>12y	18		16		21		21		21		16		21		7		20	
%>12y	8.6		9.6		11.2		11.2		11.4		7.7		10.1		3.5		10.6	

Table 7. Dall's sheep observations reported by non-resident hunters in the Mackenzie Mountains, 2003.

	Number of Hunters Reporting	Number Observed	Mean Number Observed/hunter	Percent of Sheep Classified
Rams	127	3316	26.1	35.6
Ewes ¹	123	4014	32.6	43.1
Lambs	122	1990	16.3	21.4

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

ratio estimated from hunters' observations in 2003 was nearly identical to estimates for 1999-2001 and follows the 1995-1999 trend of generally high ram:ewe ratio (Appendix 5). In the Yukon, mid to late June annual aerial surveys to count and classify sheep from 1973 to 1998 produced an average of 48 rams (range 28 to 74) per 100 'nursery sheep' (Jean Carey, Yukon Dept. of Renewable Resources unpublished data). For the un hunted Richardson Mountains herd (Yukon-Northwest Territories), Nagy et al. (in preparation) reported 41 rams per 100 'nursery sheep' in 2003 following a decline from peak population size in 1997. In Alaska, ram:ewe for two un hunted 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 range from 33:100 (heavily hunted) to 87:100 (lightly hunted). Therefore, the mean ram:ewe of 83:100 calculated from hunters' observations since 1995 (Appendix 5) suggests that the harvest of rams in the Mackenzie Mountains is sustainable at current levels.

In 2003, hunters observed slightly more legal ($>3/4$ curl) rams ($n=1662$) than rams with $<3/4$ curl ($n=1654$) during their hunts. The mean number of classified $>3/4$ rams/hunt observed during 2003 was the highest reported for 1995-2003. During this same period the number of rams classified/year ranged from 3124 to 3175.

Woodland (Mountain) Caribou (*Rangifer tarandus caribou*)

Woodland caribou are another of the more desired species sought by non-resident hunters. Tags were purchased by 71% of non-resident hunters (Table 4), and at least 58% of tag holders hunted caribou harvesting 143 bulls. The number of bulls harvested in 2003 was slightly below the mean annual harvest of 157 bulls during 1991-2003 (Fig. 3; Appendix 6). The average length of a woodland caribou hunt, determined from the 233 reports where hunters spent at least 1 day hunting, was 2.6 ± 2.9 days (range 1-14 days). This is similar to the 3.5 day average for caribou hunts reported for 1979-1990, but lower than the *ca.* 4 day average caribou hunt from 1995-2000. (Appendices 3 and 7).

There was quite a range in the 95 reported antler length measurements (74.5-143.0 cm, mean *ca.* 119.6 ± 17 cm; Table 9). The maximum left and right antler lengths reported were 143.0 and 142.0 cm respectively. The maximum antler length recorded by Boone and Crockett

Table 8. Classification of Dall's sheep rams observed by non-resident hunters in the Mackenzie Mountains, 1995 to 2003.

Ram Class	2003		2002		2001		2000		1999		1998		1997		1996		1995	
	Horn	Horn	Horn	Horn	Horn	Horn	Horn	Horn	Horn	Horn	Horn	Horn	Horn	Horn	Horn	Horn	Horn	Horn
	> ³ / ₄	< ³ / ₄	> ³ / ₄	< ³ / ₄	> ³ / ₄	< ³ / ₄	> ³ / ₄	< ³ / ₄	> ³ / ₄	< ³ / ₄	> ³ / ₄	< ³ / ₄	> ³ / ₄	< ³ / ₄	> ³ / ₄	< ³ / ₄	> ³ / ₄	< ³ / ₄
	curl	curl	curl	curl	curl	curl	curl	curl	curl	curl	curl	curl	curl	curl	curl	curl	curl	curl
No. of Hunters Reporting	127	121	148	133	186	174	151	147	144	138	177	177	205	205	172	174	181	180
No. of Rams Classified	1662	1654	1720	1720	1812	1765	1351	1717	1579	1756	1848	1924	1538	1586	1713	1699	2070	1645
Percent of Rams Classified	50.1	49.9	50.0	50.0	49.1	47.8	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 no. Observed	11.9	11.9	11.6	12.9	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

Table 9. Antler measurements of woodland caribou bulls harvested by non-resident hunters in the Mackenzie Mountains, 2003.

	Contour Length	
	Left Antler	Right Antler
Number Measured	95	95
Mean (cm)	119.6	119.7
Mean (in)	47.1	47.1
Standard Deviation (cm)	17.3	16.9
Standard Deviation (in)	6.8	6.6
Maximum (cm)	143.0	142.0
Maximum (in)	56.3	56.0
Minimum (cm)	74.5	76.5
Minimum (in)	29.3	30.1

for mountain 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). Thirteen of the top 50 mountain caribou recorded in the 11th edition of the Boone and Crockett Club record book are from the Mackenzie Mountains, with the highest scoring antlers holding 6th place (Byers and Bettas 1999).

From hunters' classifications of woodland caribou observed during their hunts, we calculated ratios of 38.9 calves and 36.4 bulls per 100 adult females (cows) and bulls comprised 20.8% of all caribou classified (Table 10). The 38.9 calves:100 cows is somewhat lower than the 43:100 average from 1995-2003, while the 36.4 bulls:100 cows is similar to the 36:100 average (Appendix 5). Bulls comprised 20.9% of all caribou classified in 2003, up from the 15.9% of all caribou classified in 2002, but less than the 27% and 22% of all caribou classified for 2001 and 2000 respectively. Bergerud (1978) summarized data for eight North American caribou populations that were either non-hunted or hunted non-selectively (i.e., both males and females included in the harvest) and documented a cumulative average bull component of 39%.

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 ≥ 1 -year-old. Therefore, further investigation is warranted to determine the reason for lower bull:cow ratios reported for the Mackenzie Mountains. Caribou in the Mackenzie Mountains are estimated to number between 12 400 and 17 400 from at least 4 separate herds shared between the Yukon and NWT: Bonnet Plume herd (5000 estimated), Redstone herd (5-10 000 estimated), South Nahanni (2000 estimated), and La Biche (400 estimated) (Yukon Renewable Resources 1996). They are subjected to an annual bull-selective non-resident harvest averaging only 157 animals per year (1991-2003). The resident harvest of woodland caribou in the Mackenzie Mountains also tends to be bull-selective (but not restricted to bulls) and is generally light (i.e., 25 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). In March 2002, 10 female woodland caribou from the Redstone caribou herd were equipped with satellite radio collars as part of a study of woodland caribou in the central and northcentral Mackenzie Mountains. This study is being conducted by staff with the Sahtu Renewable Resources Board. In December 2000, a workshop on woodland caribou co-management was held in Norman Wells (Olsen 2000; 2001; Olsen et al. 2001).

Table 10. Woodland caribou observations reported by non-resident hunters in the Mackenzie Mountains, 2003.

Age/Sex class	Number of Hunters Reporting	Number Observed	Mean Number Observed/hunter	Percent of Total Classified
Bulls	157	3950	25.2	20.8%
Cows	148	10 837	73.2	57.0%
Calves	124	4213	34.0	22.2%

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 24% of non-resident hunters in 2003, which is somewhat higher than in previous years (Table 4). At least 56% of tag holders hunted moose and harvested 48 bulls which is similar to previous years' mean of 45 moose/year during 1991-2002 (Fig. 3). Moose hunts in 2003 averaged 2.8 ± 2.9 days, ranging from 1 to 14 days, which was shorter than in previous years, average of *ca.* 4 days/hunt during 1995-2001.

The mean tip-to-tip spread of 34 measured antlers was 150.0 ± 27.4 cm (59.1 ± 10.8 in) from bull moose harvested by non-residents in 2003. This was somewhat higher than in previous years where the mean tip-to-tip spreads were 149.3 cm, 144.3 cm, 147.0 cm, and 144.2 cm for 2002, 2001, 2000, and 1999, respectively. The maximum recorded moose antler spread in 2003 was 165 cm (65.0 in), 23 cm narrower than the maximum recorded antler spread for an Alaska-Yukon moose taken in the NWT in 1995. Two moose taken from the Mackenzie Mountains are in the top 20 Alaska-Yukon moose recorded in the record book of the Boone and Crockett Club and hold places 11 and 15 (Byers and Bettas 1999); the rest of the top 20 were all taken in Alaska. The maximum antler spread recorded from across the subspecies' range is 210 cm (82.7 in; Bubenik 1997), with a new record currently pending.

From hunters' observations of moose seen during hunts we calculated ratios of 24.6 calves:100 adult females (cows) and 129 bulls:100 cows (Table 11). This is the ninth consecutive year in which moose calf:cow ratios have not been greater than 30:100. This is considerably lower than the 40-60:100 that are 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 5). No research has been done on moose in the Mackenzie Mountains; therefore, we have no explanation for the apparent discrepancy in calf production, survival, or both between the mountains and the river valley. A

survey of moose in the Norman Wells study area in January 2001 estimated a calf:cow ratio of 18:100 (DRWED, Norman Wells unpublished data), and an aerial survey of the Mackenzie River Valley and vicinity in the Deh Cho Region south from the Blackwater River to Jean Marie River conducted in November 2003 estimated 32:100 (N. Larter unpublished data), indicating that low calf:cow may no longer be restricted to the Mackenzie Mountains and that more study is required to determine the cause(s).

The 2003 bull:cow was higher than the average of 101:100 (range 75-129:100) from 1995-2003. Ratios from the Mackenzie Mountains are 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 ratio have reduced reproductive rates (Schwartz et al 1992); populations with a more skewed sex ratio had a relative rate of population increase greater than populations without a skewed sex ratio (Van Ballenberghe 1983). However, a recent study of 8 heavily harvested moose populations in Norway indicated a relationship between declining recruitment rate and skewed adult sex ratio (Solberg et al. 2002). Based upon hunter observations since 1995, there is no indication of any decreasing trend in the bull:cow ratio of moose in the Mackenzie Mountains hence the adult sex ratios are not a factor in the low calf:cow ratios reported. The reported sex ratios may have an inherent bias towards a greater number of bulls if harvesters consistently spend more time searching for moose in areas frequented more by large males than females.

Table 11. Moose observations reported by non-resident hunters in the Mackenzie Mountains, 2003

Age/Sex class	Number of Hunters Reporting	Number Observed	Mean Number Observed/Hunter	Percent of Total Classified
Bulls	93	414	4.45	51
Cows	74	321	4.34	39
Calves	43	79	1.84	10

Mountain Goat (*Oreamnos americanus*)

Tags to hunt mountain goats were purchased by just 5% of non-resident hunters in 2003 (Table 4). Sales of mountain goat tags show more annual fluctuation than tags for any other ungulate species available to non-resident hunters in the Mackenzie Mountains. Since 1995 annual tag sales have ranged from 6 to 30 (Table 4) while harvest during that period ranged from 1 to 9 animals (Appendix 6). In 2003, at least 6 tag holders hunted mountain goats and all 6 harvested billies. The average hunt length was 1.0 ± 2.0 days (range 1-8 days), which was lower than previous years; no hunts have been longer than 8 days in the past 8 years.

Mountain goats are known to occur in 5 of the 8 outfitting zones in the Mackenzie Mountains, occurring almost exclusively below $63^{\circ} 00'$ N (DRWED, Norman Wells unpublished data). They are most numerous in high relief terrain along the Yukon-NWT border between $61^{\circ} 00'$ and $62^{\circ} 00'$ N. However since 1995, we have only received hunter observations or harvest reports of goats from 4 zones - D/OT/01, D/OT/02, S/OT/03, and S/OT/04. In 2003, observations of mountain goats by hunters came only from zones D/OT/02 (n=181) and S/OT/04 (n=1 unknown adult). Classified animal observations from zone D/OT/02 provided estimates of 61.5 kids:100 nannies and 70.5 billies:100 nannies. These ratios are similar to those reported from this zone in 2002, of 55.2 and 75.9, respectively (n=67 classified animals).

The largest horns from a mountain goat taken in 2003 were 24.0 cm (right) and 23.3 cm (left). This is the largest set of mountain goat horns since 1998, when a goat with horns of 23.5 cm (right and left) was taken. No mountain goats from the NWT are listed in the 11th edition of the Boone and Crockett Club record book (Byers and Bettas 1999).

Wolf (*Canis lupus*)

Wolf tags were purchased by 60% of non-resident hunters in 2003 (Table 4) and 12 wolves were harvested (Appendix 6). In 2003 more hunters observed at least one wolf than in most previous years. The total number of wolves observed in 2003 was similar to the annual average of 204 wolves from 1995-2003 (Table 12). Four percent of responding hunters indicated that they believed wolf numbers were high. This was down from 2000 and 2002 when 8% and 12% of respondents believed wolf numbers were high; 2000 was the first year that any hunters had commented on wolf numbers.

The number of hunters reporting in 2002 and 2003 was higher than in previous years, however this may have resulted from a slight change in how we defined hunter reporting. For data collected since 2002, 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. However, this assumption is likely invalid for previous years' data and would bias the post 2001 values to be higher than the previous years. We plan on using the same assumption for future harvest reports.

Table 12. Wolf observations reported by non-resident hunters in the Mackenzie Mountains, 1995-2003.

	2003 ¹	2002 ¹	2001	2000	1999	1998	1997	1996	1995
No. Hunters Reporting	203	197	142	116	103	148	141	76	119
No. Observed	200	249	215	228	142	148	200	186	269
Mean No. Observed	1.0	1.3	1.5	2.0	1.4	1.0	1.4	2.4	2.3
No. Hunters That Saw at Least 1	74	69	65	61	40	57	76	26	26

¹ Change in reporting for 2003 may have resulted in artificially lower numbers of hunters reporting for 1995-2001, see text.

Wolverine (*Gulo gulo*)

Wolverine tags were purchased by 40% of non-resident hunters (Table 4). At least 36% of tag holders hunted wolverines, but none were harvested in 2003. Twelve different sightings of wolverines were reported in 2003 from 4 different hunter zones, G/OT/01, S/OT/01, S/OT/02, and S/OT/05, with only 6% of hunters reporting wildlife observations seeing wolverines. All observations except one were of lone animals. One hunter reported a family of four.

Wolverines occur throughout the Mackenzie Mountains, but sightings are generally rare. Reported sightings for 2000-2003 averaged *ca.* 10/year. Interestingly, reported sightings for 1995-1999 were 3 times greater (*ca.* 31/year; Fig. 4). Most wolverine observations are made in hunting zones G/OT/01, S/OT/01, S/OT/04, and S/OT/05. More wolverine tags were purchased in 2003 than in any previous year. There were no relationships between the number of wolverines observed/year and annual harvest or tags purchased/year (Table 13).

Table 13. 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 1995-2003.

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

Black Bear (*Ursus americanus*)

Non-resident hunters purchased 9 black bear tags in 2003. No black bears have been harvested by non-residents in the Mackenzie Mountains in the last 8 years. Black bears are relatively rarely seen in the Mackenzie Mountains and in most years are reported only from below 63° 00 N. In 2003, 37 black bears (34 adults and 3 cubs) were reported from zones D/OT/02 (32 adults and 2 cubs), G/OT/01 (1 adult) and S/OT/05 (1 adult and 1 cub) (Table 14). As with the other post 2001 carnivore data, we assumed that all returned observation forms where blanks, zeroes, or dashes occurred in the boxes indicating the number of carnivores observed was a report of no carnivores being observed. This assumption is likely invalid for previous years' data and likely inflates the 2002 and 2003 values relative to previous years. We plan on using this assumption for future harvest reports.

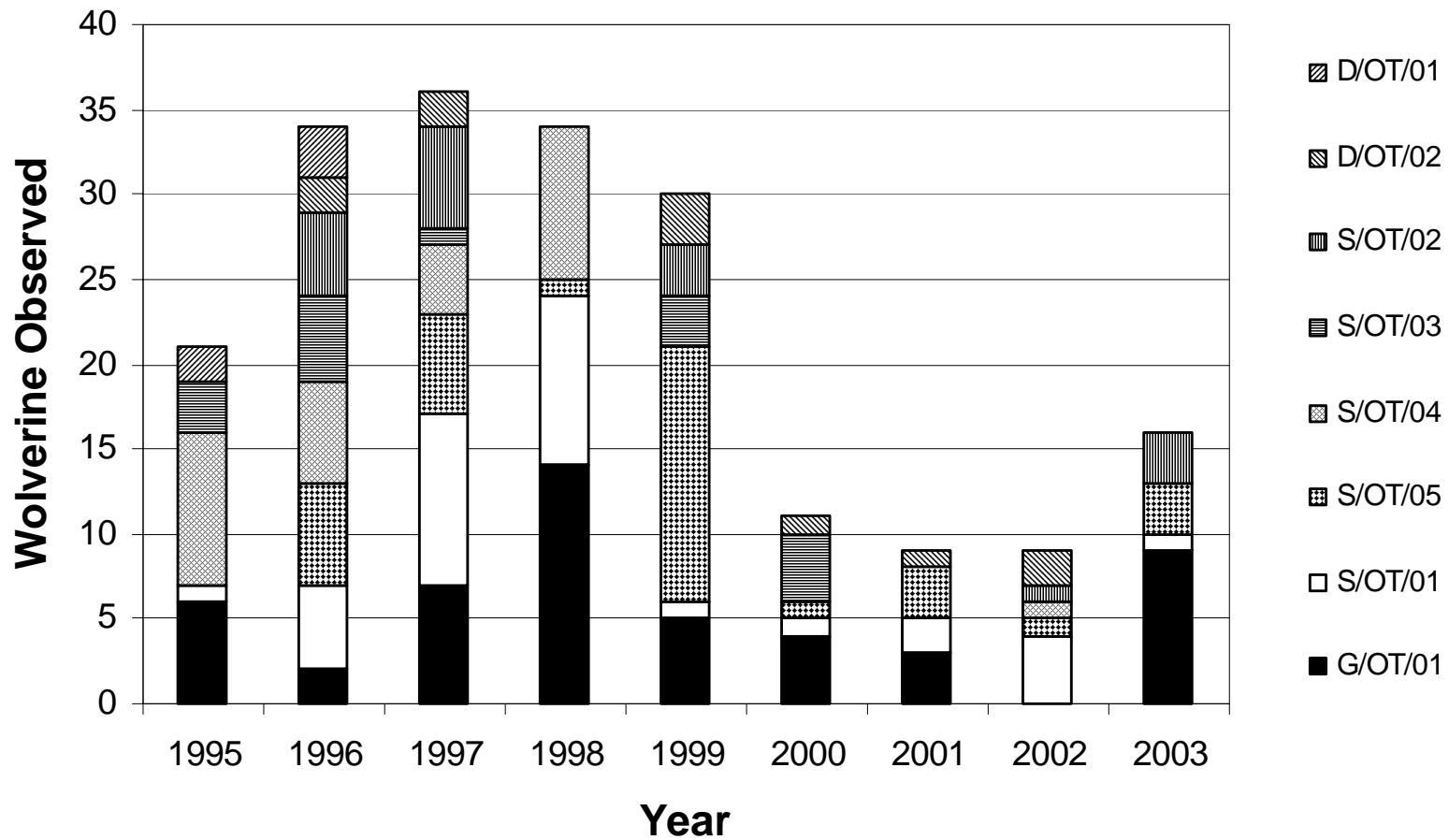


Figure 4. The number of wolverines observed by hunters from 1995-2003, and the outfitter zones where the observations occurred. Data are based upon voluntary hunter observation forms.

Table 14. Black bear observations reported by non-resident hunters in the Mackenzie Mountains, 1995-2003.

	2003		2002		2001		2000		1999		1998		1997		1996		1995
	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	All Bears ¹
Total # Observed	3	34	3	17	0	7	2	15	4	7	0	15	2	3	1	10	11
% of Total Observed	8	92	15	85	0	100	12	88	36	64	0	100	40	60	9	99	nil
No. Hunters Reporting	191 ²	191 ²	199 ²	199 ²	127	130	88	93	87	89	121	124	96	96	6	14	44
No. Hunters Saw at Least 1	2	21	2	14	1	7	1	10	2	6	0	8	2	3	1	9	9
Maximum # Observed	2	7	2	3	0	1	2	3	2	2	0	3	1	1	1	2	2

¹ All bears were not separated out by cubs and adults.

² Change in reporting for 2002 may have resulted in artificially lower numbers of hunters reporting for 1995-2001, see text.

Grizzly Bear (*Ursus arctos*)

The Mackenzie Mountains have been closed to non-residents for hunting grizzly bears since 1982 and resident hunters have been restricted to one bear per lifetime since the same year (Veitch 1999). It is clear from the comments made by hunters on voluntary observation forms that, despite the lack of hunting opportunities, grizzly bears remain a subject of considerable interest for non-resident hunters and their guides in the Mackenzie Mountains (Appendices 3 and 7). Consistent with the past 5 years, this year hunters reported loss of meat, capes, food, and equipment to grizzly bears, a perception that there were too many grizzly bears, and several implicated grizzly bears as the principal reason for low numbers of moose and caribou calves. A frequent comment suggested that bears have lost their fear of humans because of a lack of hunting and a concern that this was a human safety issue. However, since the closure of the non-resident season there have been no documented injuries from grizzly bears in the Mackenzie Mountains (Veitch 1999). At least 30 grizzly bears have been killed in defence of life and property in the Mackenzie Mountains since 1993-94, none occurring in outfitting zones in the Deh Cho Region (DRWED, Norman Wells unpublished data; K. Davidge personal communication).

While the mean number of adult grizzly bears observed by hunters has remained relatively stable from 1996-2003 (mean=297), the cub to adult ratio calculated from the hunter observations was $\geq 50\%$ greater in 2000 than in any other year, with cubs comprising 29% of all bears observed (Fig. 5; Table 15); percent cubs observed in 2003 were the lowest recorded during the same period. Because cub grizzlies in the Mackenzie Mountains tend to stay with their mothers for 3 years (Miller et al. 1982), reported observations of 'cubs' refers to cubs-of-the-year, yearlings, and 2-year-old bears. Miller et al. (1982) documented a low reproductive rate for female grizzly bears in Mackenzie Mountains, with no sows less than 8-years-old producing cubs, an average inter-litter interval of 3.8 years, and a mean litter size of 1.8. The percent 'cubs' determined from reported hunter observations during 1996-2003 indicate an inter-litter interval of 4 years (Fig. 5), similar to what was reported during 1973-1977 when there was non-resident hunting of grizzly bears. These current data imply that in 2004 we would expect another peak in percent 'cubs' observed. We estimated the mean litter size

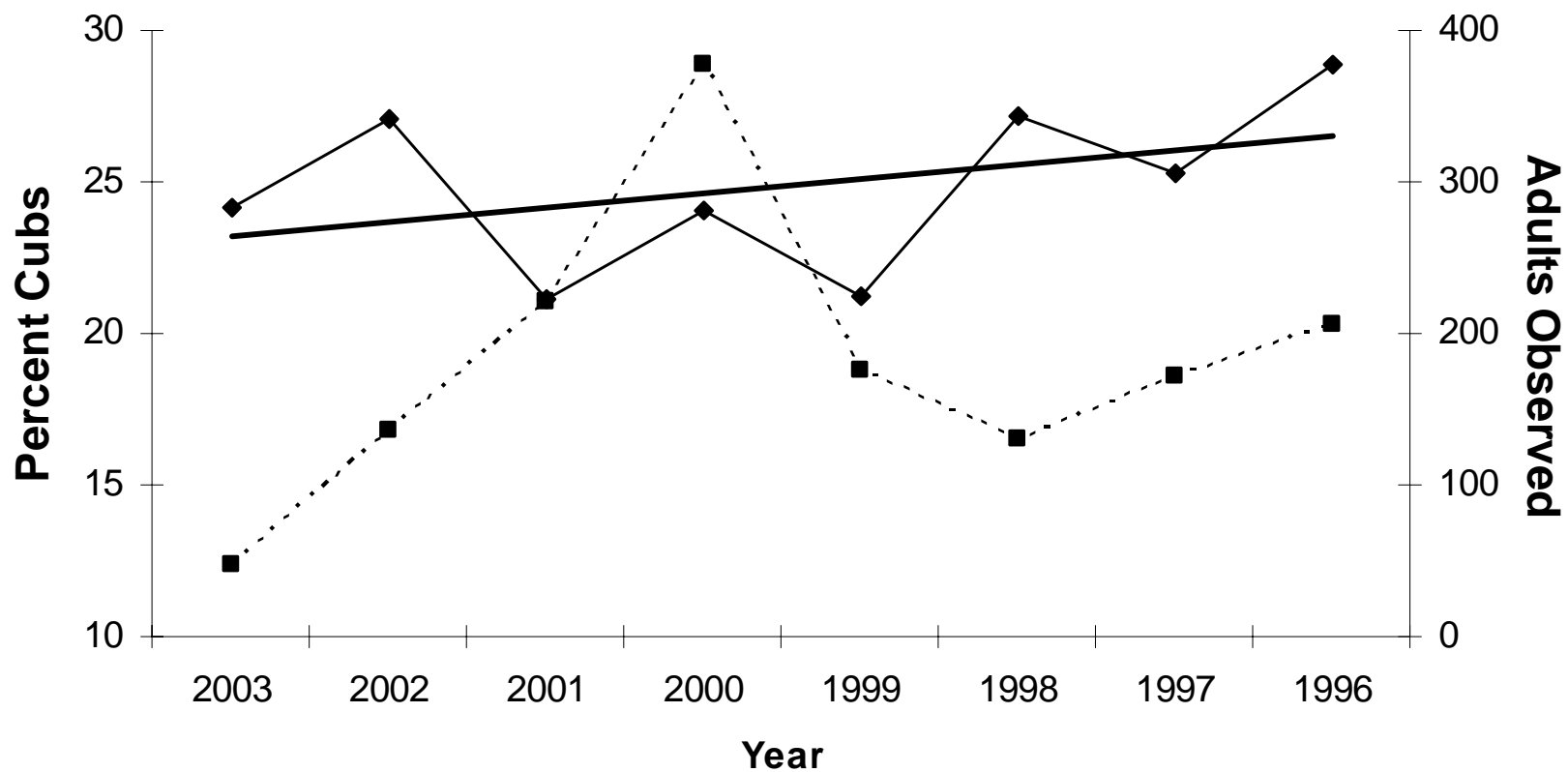


Figure 5. The percent of 'cubs' and the total number of adult grizzly bears observed by hunters from 1996-2003. Data are based upon voluntary hunter observation forms. The linear trend of total adult bears observed during the same time period is indicated.

Table 15. Grizzly bear observations reported by non-resident hunters in the Mackenzie Mountains, 1995 – 2003.

	2003		2002		2001		2000		1999		1998		1997		1996		1995
	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	All Bears ¹
Total # Observed	40	283	69	341	59	222	113	281	52	225	68	343	70	306	96	377	389
% of Total Observed	12	88	17	83	21	79	29	71	19	81	17	83	19	81	20	80	nil
No. Hunters Reporting	19	120	34	128	136	171	108	131	98	117	139	177	110	170	49	132	138
No. Hunters Saw at least 1	9	53	11	48	28	104	51	97	28	81	31	105	32	129	46	129	123
Mean # Observed	2.1	2.4	2	2.7	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
Maximum # Observed	12	7	8	20	5	10	8	12	4	12	6	16	12	17	5	15	16

¹ All bears were not separated out by cubs and adults.

from 1996-2002 hunter observation reports by analyzing just those observations of groups of grizzly bears where cubs were present with only 1 adult present. The estimated mean litter size was 1.7 (range 1.4-1.9) from 1996-2003, similar to that reported by Miller et al (1982). It would appear that there has not been any substantial change in those demographic parameters estimated during 1996-2002 compared to those reported during 1973-1977 by Miller et al. (1982).

ACKNOWLEDGMENTS

Co-operation from the outfitters operating in the Mackenzie Mountains in 2003 was again very good and we thank them for the extra effort they gave in completing, signing, and sending us their harvest report forms. We thank Renewable Resources Officers and clerks with DRWED 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, and did the various antler and horn measurements. In addition, we would like to particularly thank those hunters that took the time to write comments.

We would like to thank Richard Popko, Alasdair Veitch, and Keith Hickling for ensuring that all data received by the Sahtu DRWED office was forwarded to the Fort Simpson DRWED office, and for stimulating conversation on the report contents. Lana Robinson (Sahtu GIS Project, Norman Wells) prepared the map of outfitting zones. John Nagy provided unpublished data from his work in the Richardson Mountains.

PERSONAL COMMUNICATIONS

Harold Grinde, Gana River Outfitters, Rimbey, AB.

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

Cam Lancaster, Nahanni Butte Outfitters, Lethbridge, AB.

Ken Davidge, Renewable Resources Officer, Department of Resources, Wildlife & Economic Development, Fort. Simpson, NT.

REFERENCES

- Bergerud, A.T. 1978. Caribou. pp. 83-102 *in* Schmidt, J.L. and Gilbert, D.L. (eds.) Big game of North America: ecology and management. Stackpole Books, Harrisburg, PA. 494 pp.
- Bishop, R.H. and Raush, R.A. 1974. Moose population fluctuations in Alaska. 1950-1972. *Naturaliste Canadien* 101: 559-593.
- Bubenik, A.B. 1972. North American moose management in light of European experiences. *Proceedings of the North American Moose Conference Workshop* 8: 279-295.
- Bubenik, A.B. 1997. Evolution, taxonomy, and morphophysiology. pp. 77-123 *in* Franzmann, A.W. and Schwartz, C.C. (eds.) Ecology and management of the North American moose. Smithsonian Institution Press, Washington, DC. 733 pp.
- Byers, C.R. and Bettas, G.A. 1999. Records of North American Big Game. 11th Edition. Boone and Crockett Club, Missoula, MT. 712 pp.
- Crête, M., Taylor, R.J., and Jordan, P.J. 1981. Optimization of moose harvest in southwestern Quebec. *Journal of Wildlife Management* 45: 598-611.
- Department of Resources, Wildlife & Economic Development 2000. Northwest Territories summary of hunting regulations 2000-2001. Department of Resources, Wildlife & Economic Development, Yellowknife, NT. 24 pp.
- EXCEleration corp. 2000. Benefits of outfitted hunting in the NWT Mackenzie Mountains. Final report prepared for the Association of Mackenzie Mountain Outfitters in co-operation with the town of Norman Wells and the Department of Resources, Wildlife & Economic Development. Calgary, AB. 45 pp.
- Geist, V. 1971. Mountain sheep: a study in behaviour and evolution. University of Chicago Press, Chicago, IL. 383 pp.
- Geist, V. 1993. Wild sheep country. NorthWord Press, Minocqua, WI. 173 pp.
- Jorgenson, J.T. 1992. Seasonal changes in lamb:ewe ratios. *Northern Wild Sheep and Goat Council* 8: 219-226.
- Larter, N.C. and Allaire, D.G. 2003. Mackenzie Mountain non-resident and non-resident alien hunter harvest summary 2002. Manuscript Rep. No. 152, Dept. of Resources, Wildlife & Economic Development, Ft. Simpson, NT. 46pp.

- Latour, P. and MacLean, N. 1994. An analysis of data returned by outfitted hunters from the Mackenzie Mountains, NWT, 1979-1990. File Rep. No 110, Dept. of Renewable Resources, Norman Wells, NT. 41 pp.
- MacLean, N. 1994a. Population size and composition of moose in the Tulita area, NWT, November 1993. Manuscript Rep. No. 78, Dept. of Renewable Resources, Yellowknife, NT. 18 pp.
- MacLean, N. 1994b. Population size and composition of moose in the Fort Norman area, NWT, November 1993. Manuscript Rep. No. 80, Dept. of Renewable Resources, Yellowknife, NT. 17 pp.
- Miller, S.J., Barichello, N. and Tait, D. 1982. The grizzly bears of the Mackenzie Mountains, Northwest Territories. N.W.T. Wildl. Serv. Compl. Rep. No. 3, Yellowknife, NT. 118 pp.
- Minitab Inc. 1989. Minitab version 7.2 (computer program). State College, PA : Minitab Inc.
- Nagy, J. and Carey, J. 1991. Dall sheep survey in the Richardson Mountains, 1991. Unpublished survey report manuscript, Dept. of Resources, Wildlife, and Economic Development, Inuvik, NT. 8 pp.
- Nagy, J.A., Auriat, D. and Cooley, D. in preparation. Richardson Mountains Dall's Sheep population survey, August 2003.
- Nichols, L. and Bunnell, F. 1999. Natural history of thinhorn sheep. pp. 23-77 *in* Valdez, R. and Krausman, P.R. (eds.). Mountain sheep of North America. University of Arizona Press, Tucson, AZ. 353 pp.
- Olsen, B. 2000. Fall distribution and population composition of woodland caribou in the central Mackenzie Mountains, October 2000. Manuscript Report No. 1 (draft), Sahtu Renewable Resources Board, Tulita, NT. 15 pp.
- Olsen, B. 2001. Caribou studies in the Redstone River watershed: research proposal 2001. Unpublished research proposal submitted to Sahtu Renewable Resources Board, Tulita, NT. 5 pp.
- Olsen, B., MacDonald, M., and Zimmer, A. 2001. Co-management of woodland caribou in the Sahtu Settlement Area: Workshop on Research, Traditional Knowledge, Conservation and Cumulative Impacts. Special Publication No. 1, Sahtu Renewable Resources Board, Tulita, NT. 22 pp.
- Schwartz, C.C. 1997. Reproduction, natality, and growth. pp. 141-171 *in* Franzmann, A.W. and Schwartz, C.C. (eds.) Ecology and management of the North American moose. Smithsonian Institution Press, Washington, DC. 733 pp.

- Schwartz, C.C., Regelin, W.L., and Franzmann, A.W. 1992. Male moose successfully breed as yearlings. *Journal of Mammalogy* 63: 334-335.
- Simmons, N.M. 1968. Big game in the Mackenzie Mountains, Northwest Territories. *Proceedings of the Federal-Provincial Wildlife Conference*. 32: 35-42.
- Solberg, E.J., Loison, A., Ringsby, T.H., Saether, B.E., and Heim, M. 2002. Biased adult sex ratio can affect fecundity in primiparous moose *Alces alces*. *Wildlife Biology* 8: 117-128.
- Van Ballenberghe, V. 1983. The rate of increase in moose populations. *Alces* 25: 25-30.
- Veitch, A.M. and Popko, R.A. 1996. 1995 Mackenzie Mountain non-resident hunter harvest summary. Manuscript Rep. No. 90, Dept. of Renewable Resources, Norman Wells, NT. 22 pp.
- Veitch, A.M. and Popko, R.A. 1997. Mackenzie Mountain non-resident and non-resident alien hunter harvest summary, 1996. Manuscript Report No. 97, Dept. of Resources, Wildlife & Economic Development, Norman Wells, NT. 37 pp.
- Veitch, A.M., Popko, R.A., and N. McDonald. 1996. Size, composition, and harvest of the Norman Wells area moose population, November 1995. Manuscript Rep. No. 93, Dept. of Renewable Resources, Norman Wells, NT. 32 pp.
- Veitch, A.M. and Simmons, E.N. 1998. Mackenzie Mountain non-resident and non-resident alien hunter harvest summary, 1997. Manuscript Report No. 106, Dept. of Resources, Wildlife & Economic Development, Norman Wells, NT. 28 pp.
- Veitch, A.M. and Simmons, N. 1999. Dall's sheep – Northwest Territories. pp. 54-58 in Toweill, D.E. and Geist, V. (eds.) *Return of royalty: wild sheep of North America*. Boone and Crockett Club and Foundation for North American Wild Sheep, Missoula, MT. 214 pp.
- Veitch, A.M. 1999. Status of grizzly bears in the Mackenzie Mountains, NWT. Unpublished report, Department of Resources, Wildlife & Economic Development, Norman Wells, NT. 28 pp.
- Veitch, A. and Simmons, E. 2000. Mackenzie Mountain non-resident and non-resident alien hunter harvest summary, 1999. Manuscript Report No. 121, Dept. of Resources, Wildlife & Economic Development, Norman Wells, NT. 29 pp.
- Veitch, A.M., Simmons, E., Adamczewski, J., and Popko, R. 2000a. Status, harvest, and co-management of Dall's sheep in the Mackenzie Mountains, NWT. *Northern Wild Sheep and Goat Council* 11: 134-153.

- Veitch, A., Simmons E., and Whiteman, N. 2000b. Mackenzie Mountain non-resident and non-resident alien hunter harvest summary, 1998. Manuscript Report No. 120, Dept. of Resources, Wildlife & Economic Development, Norman Wells, NT. 31 pp.
- Veitch, A., Popko, R. and Whiteman, N. 2000c. Classification of woodland caribou in the central Mackenzie Mountains, Northwest Territories, August 1999. Dept. of Resources, Wildlife & Economic Development Manuscript Rep. No. 122, Norman Wells, NT. 13 pp.
- Yukon Renewable Resources. 1996. Sheep management guidelines. Dept. of Renewable Resources, Yukon Territorial Government, Whitehorse, YT. 10 pp.

Appendix 1. Outfitters licenced to provide services to non-resident hunters in the Mackenzie Mountains, NWT – 2003

D/OT/01 – SOUTH NAHANNI OUTFITTERS

Sonya and Werner Aschbacher
PO Box 20113 Y1A 7A2
Whitehorse, Yukon
Ph: (867)-393-3194
Fx: (867)-393-3194
e-mail: snahanni@vianet.on.ca
website: www.southnahannioutfitters.com

S/OT/02 - MACKENZIE MOUNTAIN OUTFITTERS

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

D/OT/02 – NAHANNI BUTTE OUTFITTERS

Cam and Clay Lancaster
PO Box 653
Hudson Hope, BC
VOC 1V0
Ph: (250)-783-9197
Fx: (403)-380-6126
email: claykris@pris.bc.ca
website: www.lancasterfontana.com

S/OT/03 – RAM HEAD OUTFITTERS

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

G/OT/01 – ARCTIC RED RIVER OUTFITTERS

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

S/OT/04 - NWT OUTFITTERS

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

S/OT/01 – GANA RIVER OUTFITTERS

Bill and Carol McKenzie
P.O. Box 4659
Quesnel, BC V2J 3J8
Ph: (250)-992-8639
Fx: (250)-992-8639

S/OT/05 - REDSTONE TROPHY HUNTS LTD.

P.O. Box 18
Pink Mountain, BC
VOC 2B0
Ph: (250)-772-5992
Fx: (250)-261-9962
website: www.redstonehunts.com

Appendix 2. Summary of fees, bag limits, and seasons for big game species available to non-resident in the Mackenzie Mountains, NWT 2003. [Note: all prices are in Canadian funds.]

Species	Status	Tag Fee	Trophy Fee	Bag Limit	Season
Black Bear	Non-resident	\$20.00	\$100.00	1 adult bear not accompanied by a cub	15 Aug - 31 Oct
	Non-resident alien	\$50.00	\$100.00		
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. $\frac{3}{4}$ 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 Resources, Wildlife & Economic Development. 2003. Northwest Territories Summary of Hunting Regulations. Department of Resources, Wildlife & Economic Development, Yellowknife, NT. 24 pp.

Appendix 3. Comments provided from non-resident hunters in the Mackenzie Mountains, NWT on voluntary Hunter Wildlife Observation Report forms, 2003. We have not printed actual names of outfitters or their personnel (XXX).

With an older ram, but had a broke horn
Saw 16 rams in one day. The ram we shot was very thin, due to very bad teeth
Appeared to be an old ram. Not much fat.
Saw 3 bands of rams and 1 group of ewes and lambs with a good lamb crop
Good healthy fat sheep
Lots of bad weather, stuck in camp, lots of predators.
Lots of smoke from fire on south Kotaneelee's
Had a terrific hunt. The outfitter and guide were great. It was an experience of a lifetime
Estimate all meat taken for caribou
The most organized outfitter hunt I have ever been on (about 12) great food-personal - accommodations –
and travel to and from the airport
Outfitter does excellent job
Unbelievable
The superb contrast between the people in land disturbing the park compared to the untouched wilderness
outside of the park where I hunted clearly means do not expand the park or if expanded allow hunting in the park
(new and old).
We did see wolf tracks and evidence of sheep kill
Excellent overall hunting experience. I think the sheep population is very healthy overall,
having seen some fantastic rams. My ram was in excellent condition.
Great hunt, XXX did a fantastic job.
Being 80 years of age I don't plan on hunting in the Mackenzie's again
XXX very well organized and very professional
Excellent Game Population
Great hunt very professional guide, outstanding outfitter
Awesome
Boys are doing OK
Great time
Great outfitter, hunting excellent as usual will be back for Moose, Sheep, Caribou
Great Outfitters and Guides
Great Hunt/ Great country sheep populations and lamb crops are in excellent shape (**Whitetail Deer Doe**)
Best outfit I've ever hunted with
Game Inspection at Fort Liard would make this **much** easier to leave for the States
Great Guides, very well run organization, lots of moose!
Excellent hunting area and outfitter (Bow hunter shot lots no kills)
Lost ram in lightning storms called an end to hunt
Hunter suffered from anxiety attack and went home early after only 1 day
Hunter left early after 1 day with anxiety attack
Lots of opportunity, just could not put it together. 3 days in tent to bad weather.
Client will return next year, weather was poor and he was a bow hunter
Did not come hunting
Competent, professional, attentive, principled outfitter and guide. Truly jaw-dropping scenery.
Once-in-a-lifetime, incomparable experience.
Observed sow and cub grizzly

XXX and his guide XXX were very professional and safety conscious.
We saw 84 rams in a 5 day period. The hunt was challenging mentally and physically.
This was an excellent, enjoyable total hunting experience. I had a super time.
Couldn't believe the amount of rams I saw of all ages, maybe 75 rams altogether. There is no doubt that I will be back to enjoy the NWT again. (Very many rams of all age classes seen, many mature rams.
Hunter has hunted with us before and wanted an exceptional ram so turned down many good rams.)
Thank You
Excellent operation, professional staff, beautiful country completely untouched by humans, abundant wildlife.
Exceptionally large bodied ram in excellent physical condition, but horn growth lower than expected for this year.
My experience with XXX this year and in the past has been by far the best of my hunting career of 41 years.
I will return to XXX many more times
Great time good accommodation made to feel very welcome!
Great Hunt - Saw an incredible number of sheep
XXX is one of the premiere hunting spots in the world.
Full of quality game animals and mountains second to none.
Ram in excellent shape teeth and body, horn growth very good.
Front teeth mostly fallen out except two. The two left were very worn.
Ram looked in good shape physically. Horn growth week the last two years
Very professional outfitter/well run and would not hesitate to recommend.
Pristine and wild country. A wonderful experience
Outfitter and guide very competent, informative of everything around you.
Clean comfortable camps and food for the weather conditions. The whole staff at base camp was wonderful.
All information before hunt was right to the point. Hunt was exactly as talked about before hunt.
I had the best hunt I've ever been on, seen some of the most beautiful country ever.
Seen lots of game and had a great time, I hope to come back soon
Sow and cubs looked to be in good condition. Sheep and caribou were both in excellent condition.
Sheep in good shape
Saw sow with 2 cubs and family of 4 wolverines. Ram was in good shape and teeth were good also.
Old ram good shape good teeth
Saw two moose in 55-58" class and four grizzly bears
Ram taken had scar tissue on lungs; lungs were fused to rib cage, but in good condition.
Possibly survived bronchial infection
Hunter has only Dall's sheep harvest information
Caribou was still fat and in good condition even though he was very old and his teeth were worn out
It has been a wonderful experience. Spectacular scenery and lots of wildlife. (father, son)
It has been a wonderful experience. Spectacular scenery and lots of wildlife. (father, son)
Caribou was in excellent condition. Many grizzlies in the area.
Excellent outfitter saw lots of rams and 3 mature bulls.
Lots of game, plenty of opportunity - Bow hunter
Excellent outfitter and guide (Lots of mature bulls seen! Bow hunter)
Bow hunter
Bow hunter
Hunter did not show up
We saw a lot of bears, One caused trouble at camp and took most of my meat
No comments on the bottom of wildlife obs.
Simply had a great time everything is top notch
Excellent hunt, great outfitter
Excellent guide and camp very professional
XXX was a pleasure to be around. My guide XXX was very efficient and let me make the final decision.
Had a wonderful time

Excellent overall experience. I would recommend XXX to anyone interested in sheep hunting.
The outfitter, guides and cooks were the best
12.5 years old ram broken jaw 3 yrs ago. No front teeth, skinny because of jaw, winter hair still on cape
Guides, rangler, cook excellent with up and comers like these, our future is in great hands
(All animals appeared in good health no signs of lump jaw or other maladies)
Hunt was excellent, though one thing I would change is find out first what are the expectations of the hunter.
I felt like I had no choice but to shoot this ram. No one asked me what I was looking for.
Not what the guide is looking for. Next time I will make sure that all parties know what I am looking for.
All in all great hunt! I just wanted to spend more time looking for the best possible animal.
Hunt went well. Everything was great. Accommodations were even better then the last time I was in camp.
My son thoroughly enjoyed his wilderness adventure. Thanks XXX.
Thank you
Excellent guide and outfit, extremely professional and friendly. Wouldn't go anywhere else. Awesome hunt!
Great Outfitters and guides are very good people to work with.
Your government should be very proud to have them represent you.
Lots of bears/ definite need for non-resident tag. Arctic ground squirrels are not endangered.
Hunting was good, could have been better because of weather
Pickup horns were chewed
My guide is guide of the year! XXX!!
Saw many caribou, small bands of 5-6 animals
Lots and lots of wolf sign. Seen lots of bears and some were aggressive need some type of bear season
Low numbers of moose calves, high bear encounters with no fear in bears.
XXX was sick in bed entire hunt
Excellent guides, cooks, camps and food, very nice area
The hunt was great, too many bears
Our hunting party encountered quite a few grizzlies and they had no fear of humans. I would highly recommend
a limited amount of tags to be available before a serious injury occurs. We also noticed too few number of calves
apparently due to over predation from wolves and bears. XXX runs a top notch outfit and very professional.
No comment on number of times been with outfitter
Excellent outfitter and guide
Great guides and outfitter looking to return again soon
I would highly recommend XXX for a true wilderness experience

Appendix 4. Number, age, and horn length measurements of Dall's sheep rams harvested by non-resident hunters in the Mackenzie Mountains, 1967-2003.

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

Appendix 4 (cont.) - Number, age, and horn length measurements of Dall's sheep rams harvested by non-resident hunters in the Mackenzie Mountains, 1967-2003.

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

Appendix 5. Summary of age and sex ratios calculated from non-resident hunter observation reports in the Mackenzie Mountains, 1995-2003.

Year	Dall's Sheep		Woodland 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
1995-2003 Mean	56	83	43	36	27	101

Appendix 6. Outfitted non-resident hunter harvests in the Mackenzie Mountains, 1991-2003.

Year	Number of Licences Sold	Number of Animals Harvested					
		Dall's Sheep	Woodland Caribou	Moose	Mountain Goat	Wolf	Wolverine
1991	354	170	179	40	6	14	3
1992	364	203	142	32	4	7	0
1993	382	191	191	56	9	7	3
1994	356	199	164	46	5	15	2
1995	344	190	180	49	6	14	1
1996	387	201	175	46	4	11	4
1997	352	210	168	44	2	17	1
1998	345	215	160	52	5	9	0
1999	321	204	117	36	1	11	3
2000	332	189	127	44	1	14	0
2001	339	199	132	47	2	15	2
2002	329	173	168	42	5	11	1
2003	347	213	143	48	6	12	0
Mean 1991-2003	350	197	157	45	4	13	1.5

Appendix 7. A summary of the 2003 voluntary hunter comments broken down into specific topics.

No. of hunters reporting	No. of hunters mentioning good quality hunts	No. of hunters mentioning abundance of animals	No of hunters mentioning grizzlies	No. of hunters mentioning wolves	No. of hunters mentioning bad weather
165	95	17	31	7	6