MACKENZIE MOUNTAIN
NON-RESIDENT AND NON-RESIDENT ALIEN
HUNTER HARVEST SUMMARY
2002

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

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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 2002 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 2002, non-resident licences were bought by 329 hunters. Hunters from outside Canada (non-resident aliens), primarily from the United States of America, comprised 86% of the outfitted hunters in the Mackenzie Mountains; Canadian hunters from outside the NT (non-residents) comprised 14%. Of the 329 non-resident licence holders, 325 came to the NT and most spent at least some time hunting. Of 224 tags purchased for Dall's sheep, 173 rams were harvested; the average age of harvested rams was 9.9 $\pm$ 2.4 years, which represents the 6th consecutive year with an average age of *ca*. 10.0 years or older for the Mackenzie Mountains. Hunters reported seeing an average of 11.6 legal rams (horns at least ¾ curl) during their hunts and observed an estimated 58.3 lambs and 88.6 rams per 100 ewes, respectively. Of 229 tags purchased for woodland caribou 168 bull caribou were harvested. Hunters observed an estimated 59.4 caribou calves and 30.6 bulls per 100 adult female caribou, respectively. Of the 68 tags purchased for moose 42 bull moose were harvested. Hunters observed an estimated 29.2 moose calves and 95.9 bulls per 100 adult female moose, respectively. Five 5 mountain goat billies were harvested from 18 tags purchased, 11 wolves from 159 tags purchased, 1 wolverine from 97 tags purchased, and no black bears harvested from 3 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 (n=193) rating their experience as either excellent (82%) or very good (15%). Of 179 respondents, 96% indicated that they would like to return to the Mackenzie Mountains in future years and 20% were repeat clients who were returning for their 2nd to 9th hunt in the Mackenzie Mountains.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

The 140 000 km^2 (54 000 mi^2; 34.6 million acres) area of the Mackenzie Mountains in the western Northwest Territories (NWT) were first opened to non-subsistence hunters in 1965 (Simmons 1968). Since then, the Mackenzies have become world-renowned for providing a high quality wilderness hunting experience, particularly for Dall's sheep (Veitch and Simmons 1999). In return, non-resident hunters and outfitters in the Mackenzie Mountains provide an estimated $1.8 million annually to individuals, businesses, and governments in the NWT (EXCELeration Corp. 2000). The outfitted hunting industry in the Mackenzie Mountains also provides employment for 100 to 120 outfitters, guides, pilots, camp cooks, camp helpers, and horse wranglers (Kelly Hougen, President, Association of Mackenzie Mountain Outfitters personal communication).

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;
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.

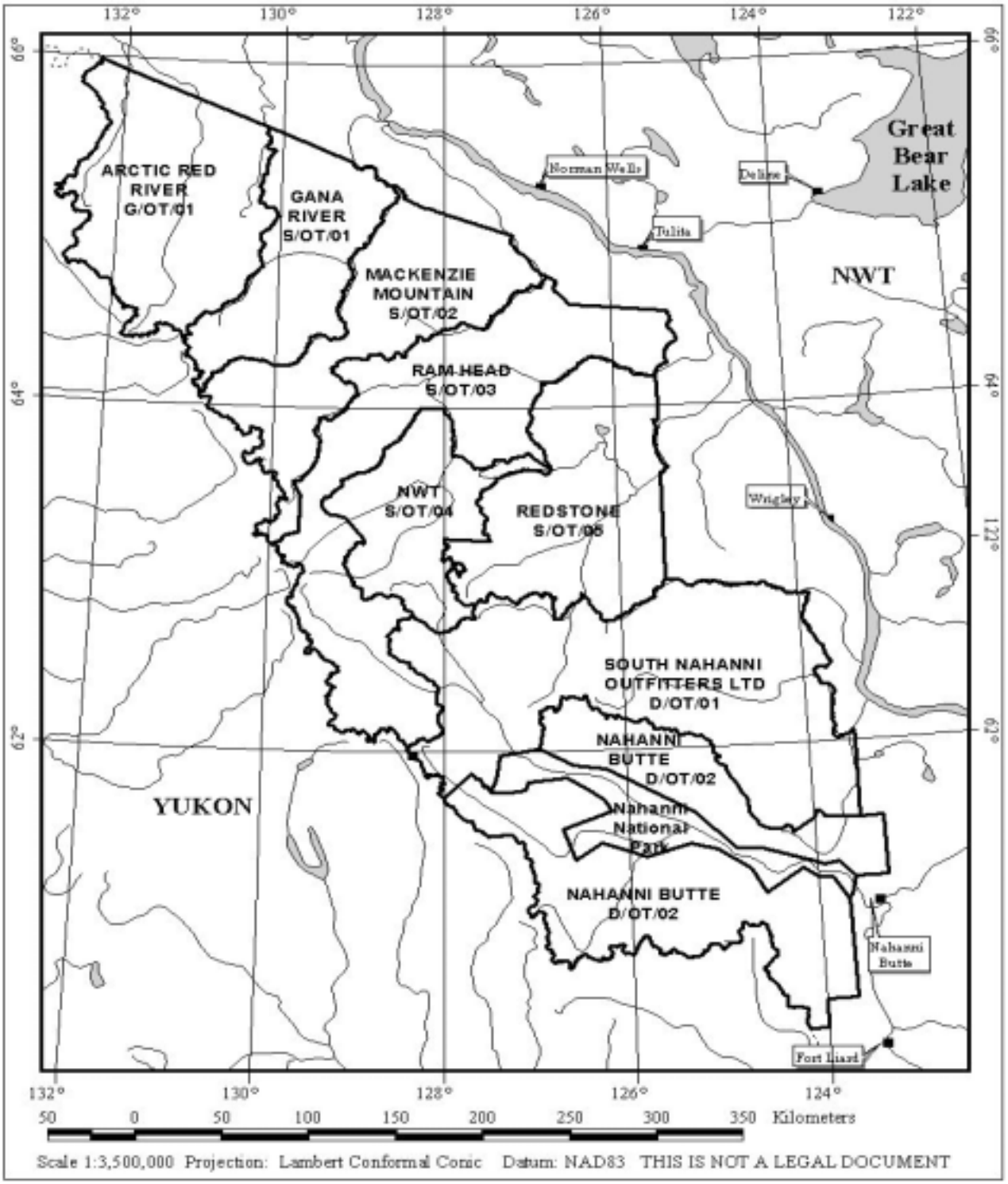


Figure 1. Outfitting zones in the Mackenzie Mountains, NWT – 2002.

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.

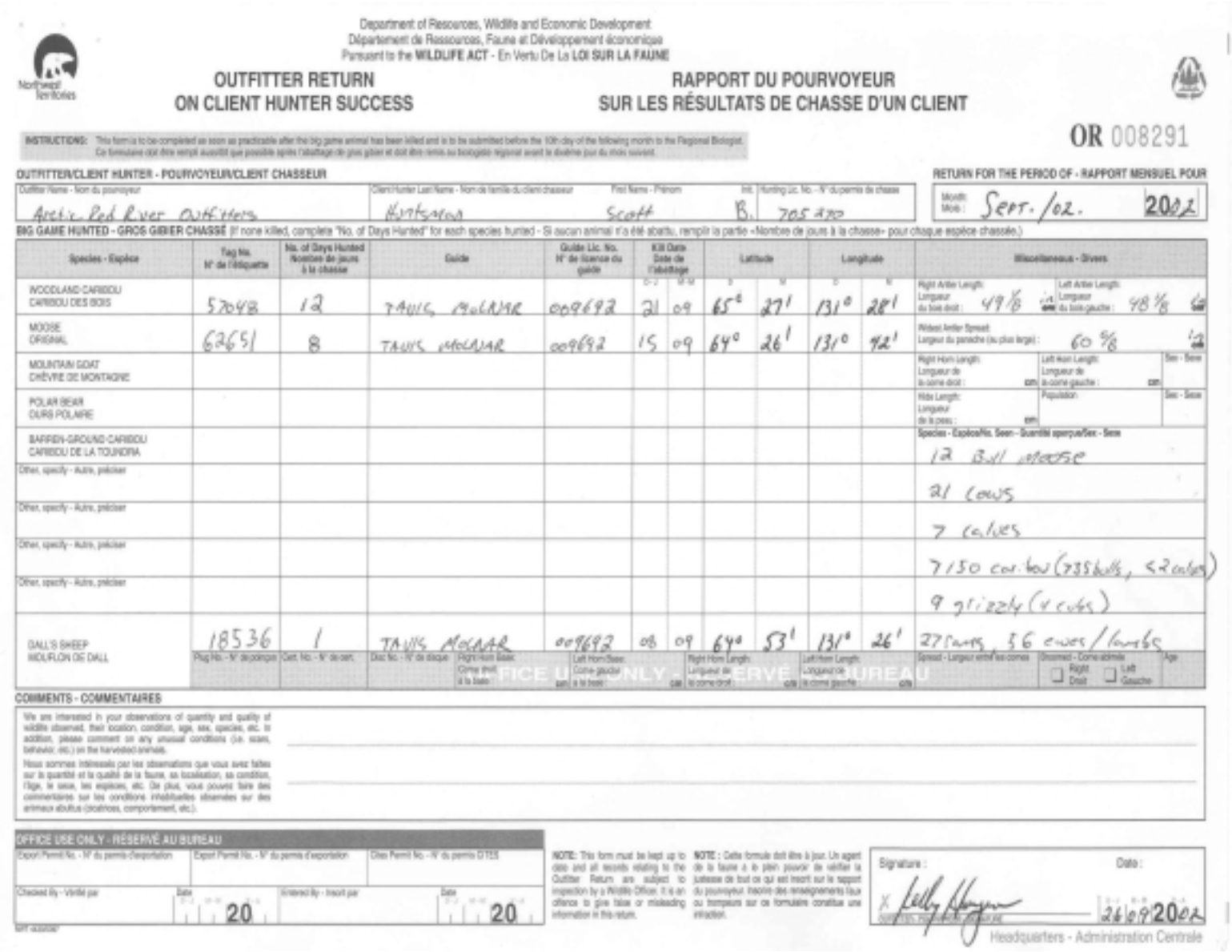
Individual non-resident hunters are annually restricted to one each of the following big game species (Appendix 2): Dall's sheep (male with at least ¾ curl horns), woodland caribou (either sex), moose (either sex), mountain goat (either sex), wolf (either sex), wolverine (either sex), and black bear (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 km^2) in the south Mackenzie Mountains is managed by Parks Canada – an agency of the Canadian federal government. Under the terms of the Sahtu Dene and Metis Comprehensive Land Claim Agreement (signed in 1993) and the Gwich'in Comprehensive Land Claim Agreement (signed in 1992), primary responsibility for wildlife management within the two settlement areas lies with the Sahtu Renewable Resources Board (SRRB) and the Gwich'in Renewable Resource Board (GRRB), respectively. Approximately 68 000 km^2 of the central and northern Mackenzie Mountains are within the Sahtu Settlement Area and 8300 km^2 are within the Gwich'in Settlement Area, which encompasses the extreme north end of the range. However, the GNWT maintains ultimate jurisdiction for management of wildlife and wildlife habitat within each of the claim areas. The Department of Resources, Wildlife & Economic Development (RWED) 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), RWED has primary responsibility for wildlife management within the Deh Cho region (approximately 59 000 km^2) of the southern half of the Mackenzie Mountains.

Each year RWED, 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 RWED to ensure that the harvest of each species is within sustainable limits.

In 1995 RWED requested that all non-resident hunters also fill out a voluntarily 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 throughout the years pertains 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 eighth consecutive year that a summary of the data collected by RWED 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), and for 2001 by Veitch and Simmons (unpublished data). Additionally, Latour and MacLean (1994) summarized data for 1979 to 1990. This report compiles the harvest data collected during the 2002 hunting season and compares it with data collected since 1995.



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	Huffman	Scott	B.	705 270

RETURN FOR THE PERIOD OF - RAPPORT MENSUEL POUR

Month/Mois: Sept. /02. 2002

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

Species - Espèce	Tag No. N° de l'étiquette	No. of Days Hunted Nombre de jours à la chasse	Guide	Guide Lic. No. N° de licence du guide	Kill Date Date de l'abattage D-J / M-M	Latitude D / M	Longitude D / 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 cm; Left Antler Length: Longueur du bois gauche: 48 1/8 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 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								7/50 cow/calf (7 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 bouchon	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 ébréchée ☐ Right Droit ☐ Left Gauche; Age

OFFICE USE ONLY - RÉSERVÉ AU BUREAU

COMMENTS - COMMENTAIRES

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

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

Export Permit No. - N° du permis d'exportation	Export Permit No. - N° du permis d'exportation	Dlas Permit No. - N° du permis D'IES
Checked By - Vérifié par	Date 20	Entered By - Inscrit par	Date 20

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 Hagyard

Date : 26/09/2002

Headquarters - Administration Centrale

Figure 2. An example of a completed outfitter return form.

METHODS

Prior to the start of the 2002 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 RWED 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 2002.

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 RWED 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.

For wildlife observation data we recorded all observations directly from the hunter observation form. 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.

Unfortunately some of the observation forms distributed in 2002 had the final section cut off. This section provided a space for hunter comments. In some instances hunter comments were included on the outfitter return forms. When observation forms lacked this section we

used the hunter comments from the corresponding outfitter return forms for our analyses. We will try to ensure in future that photocopied observation forms do not have missing sections.

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

RESULTS and DISCUSSION

Hunters

Big game hunting licences for the Mackenzie Mountains, NWT were bought by 329 non-resident hunters in 2002 (Table 1). Of those, 325 came to the NWT and spent some time hunting; 4 either cancelled their hunts or decided not to hunt after arriving in the NWT. Although Americans were the vast majority of hunters there were more international hunters in 2002 than 2001. Licence sales to non-resident Canadians was 14%, higher than in 2001 but still below the 1979-1990 average of 22% and the 17% recorded in both 1997 and 1998. Because outfitters charge in US dollars the continued low value of the Canadian dollar relative to the US dollar may be contributing to the reduced proportion of Canadian hunters. Given the recent rise in the Canadian dollar relative to the US dollar it will be interesting to see if there is an increased proportion of non-resident Canadian hunters in 2003.

We received mandatory Outfitter Return forms for 322 (95%) of the 338 people that purchased non-resident licences. However, voluntary Hunter Observation Report forms were received from only 200 (59%) of the 338 that did at least some hunting in 2002 (Table 2). This is only a slight increase over the previous year and 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 February 2001, and a suggested procedure was to have been implemented. Also, we received >70% of the voluntary hunter observation forms for 1995 and 1996. What was strikingly apparent in 2002 was that the return rate of voluntary hunter observation forms varied substantially between outfitters; returns from Ram Head and Mackenzie Mountain Outfitters were 10% and 35% of a possible 50 and 74 respondents, respectively. Unfortunately these poor return rates came from outfitters with the greatest number of hunters. We are unable to comment on whether these 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 2002, 97% of hunters rated their experience as either excellent (82%) or very good (15%). It was the first time hunting the Mackenzie Mountains for 144 of 179 (80%) hunters; the 35 repeat hunters (20%) had hunted from 1 to 8 times previously.

Table 1. Province or country of origin for 329 non-resident hunters in the Mackenzie Mountains, 2002

Canada		United States		Europe		Other	
Yukon	1	Eastern States[1]	121	Spain	4	Mexico	3
British Columbia	20			Germany	2	Costa Rica	1
Alberta	23	Western States[2]	148	Holland	2	South Africa	1
Saskatchewan	1						
Manitoba	0						
Ontario/ Quebec	2						
Atlantic Provinces	0						
Total	47		269		8		5

[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, 1995-2002.

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

Of 179 hunters that answered our question about their plans to return to the Mackenzie's 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 2002, 8% of responding hunters reported high wolf numbers. Most reports about wolves were from the South Nahanni and Nahanni Butte Outfitter Zones. Hunter comments prior to 2000 reflected a general dissatisfaction at the inability to hunt for grizzly bears and about problems encountered with bears in and around camps. Similar comments were made by hunters in 2000 and 2002, but with a decline in frequency. All comments received are provided in Appendix 3.

Table 3. Satisfaction ratings for non-resident hunters in the Mackenzie Mountains, 1996-2002.

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%	20%	2%	3%	2%
Fair	0%	1%	0%	1%	1%	1%	3%
Poor	0%	1%	1%	20%	0%	1%	1%

Dall's Sheep (*Ovis dalli dalli*)

Dall's sheep are one of the most desired species sought by non-resident hunters in the Mackenzie Mountains. Tags to hunt Dall's sheep were purchased by 66% of non-resident hunters in 2002, down slightly from 70-71% in 1997-2000 (Table 4). At least 79% of sheep tag holders pursued Dall's sheep and they harvested 173 rams. This is the fewest Dall's sheep harvested since 1991, and down at least 10% from the average harvest 1991-2001 (Fig. 3;

Table 4. Tags for big game species purchased by non-resident hunters with outfitters in the Mackenzie Mountains, 1995-2002.

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

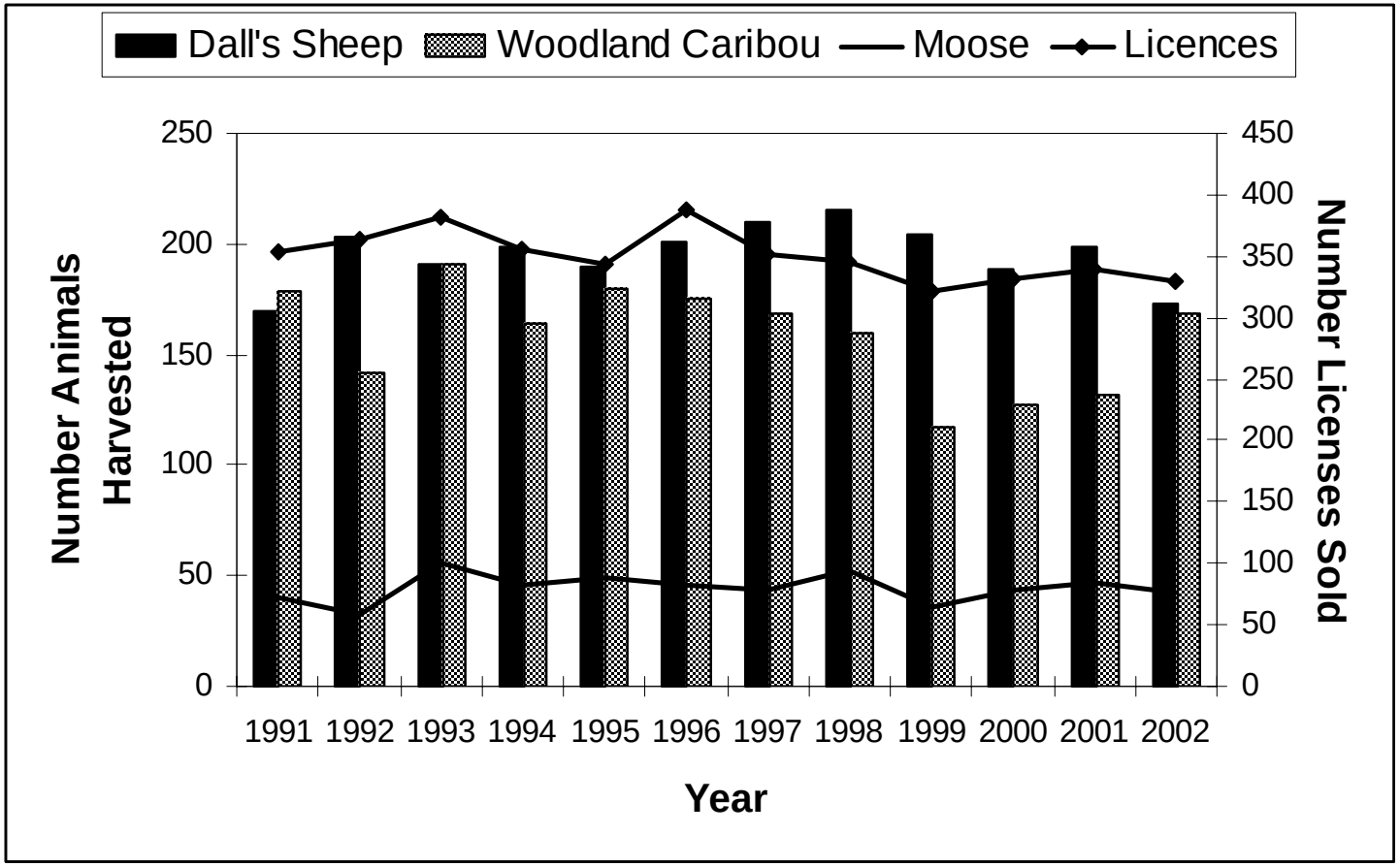


Figure 3. The number of Dall's sheep, woodland caribou, and moose harvested in the Mackenzie Mountains by non-resident hunters, and the number of non-resident licences sold during 1991-2002.

Appendices 4 and 6). The weather this summer may have played a role in the reduced sheep harvest. Poor weather was a common comment on the hunter observation forms (Appendices 3 and 7), and snow storms were prevalent in the mountains during the latter part of July and early August. However, the average length of a sheep hunt was 4.1 ± 3.0 days - similar to 1997 (4.3 days), 1998 (4.4 days), 1999 (4.7 days), and 2000 (4.5), but a drop from the 5.3 day average for 1979-1990 (Latour and MacLean 1994). Outfitted hunts in the Mackenzie Mountains are generally booked for 10 days; when hunters fill their sheep tag, any remaining time on the hunt is typically spent in pursuit of other big game species for which tags are held, or in hunting small game.

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

There has been remarkable consistency from 1979 to 2002 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 2002, brooming was noted on 29% of left and 32% of right horns. This was lower than the 35 and 38% reported for 2001, but similar to the average brooming reported since 1991, 31 and 32% respectively. Seventy-one (43%) of 166 aged rams taken by non-residents were at least 10-years-old, with the average age being 9.9 ± 2.4 years (range 6.5-14.5 years; Table 6). This is the sixth consecutive year for which the reported average age of rams harvested by non-residents has been *ca*. 10 years or older (Appendix 4).

Table 5. Horn measurements of Dall's sheep rams harvested by non-resident hunters in the Mackenzie Mountains, 2002.

	Left Horn Contour Length		Right Horn Contour Length		Left Horn Base Circumference		Right Horn Base Circumference		Tip to Tip Spread	
	cm	in	cm	In	cm	in	cm	in	cm	in
Mean	89.3	35.2	89.2	35.1	33.6	13.2	33.5	13.1	60.6	23.9
Standard Deviation	19.2	7.6	19.3	7.6	6.9	2.7	6.8	2.7	14.9	5.9
Maximum	107.0	42.1	107.3	42.2	38	15	37	14.6	85.5	33.7
Minimum	69	27.2	67.7	26.7	28	11	28	11	46.5	18.3

Table 6. Age-structure of Dall's sheep rams harvested by non-resident hunters in the Mackenzie Mountains, 1995-2002.

	2002		2001		2000		1999		1998		1997		1996		1995	
Age	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	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
5.5	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	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	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	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	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	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	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	9	5.4	11	6.0	14	7.5	15	8.2	12	5.8	15	7.2	6	3.0	14	7.4
13.5	6	3.6	10	5.5	3	1.6	6	3.3	2	1.0	4	1.9	1	0.5	5	2.6
14.5	1	0.6	0	0.0	3	1.6	0	0	1	0.5	2	1.0	0	0.0	1	0.5
15.5	0	0.0	0	0.0	1	0.5	0	0	1	0.5	0	0.0	0	0.0	0	0.0
>10y	71		95		90		97		109		102		69		68	
%>10y	42.7		51.0		47.9		53.0		52.6		49.5		34.5		36.0	
>12y	16		21		21		21		16		21		7		20	
%>12y	9.6		11.2		11.2		11.4		7.7		10.1		3.5		10.6	

From hunters' classifications of sheep observed during their hunts in 2002 we calculated an estimated 58.3 lambs per 100 ewes, similar to the 57-60 lambs per 100 ewes for 1997-1999 and 2001, and up from 47 lambs per 100 ewes in 2000 (Table 7; Appendix 5). 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. 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 25-54).

Table 7. Dall's sheep observations reported by non-resident hunting licence holders in the Mackenzie Mountains, 2002.

	Number of Hunters Reporting	Number Observed	Mean Number Observed	Percent of Sheep Classified
Rams	157	3594	22.9	33.6
Ewes[1]	147	4058	27.6	39.6
Lambs	142	2366	16.7	23.1

[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 89:100 ram to ewe ratio (ram:ewe) estimated from hunters' observations in 2002 was nearly identical to estimates for 1999-2001 and follows the 1995-1999 trend of generally high ram:ewe (Appendix 6). 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 28-74) per 100 'nursery sheep' (Jean Carey, Sheep and Goat Biologist, Yukon Dept. of Renewable Resources unpublished data). 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 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 2002, as in previous years (1997-2001), hunters observed fewer legal (>¾ curl) rams than rams with <¾ curl during their hunts, means of 11.6 and 12.9 rams/hunt, respectively. The mean number of classified rams/hunt observed during 2002 was the highest for both <¾ curl and >¾ curl rams for the period 1997-2002. During this same period the percent of rams of both classes classified was relatively constant (Table 8.).

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

Woodland caribou are another of the more desired species sought by non-resident hunters. Tags were purchased by 69% of non-resident hunters (Table 4), and at least 73% of tag holders hunted caribou harvesting 168 bulls. The number of bulls harvested in 2002 was up from the 132, 127, and 117 taken during the three previous years, and similar to the annual mean of 164 bulls harvested during 1991-1999 (Veitch and Simmons 2000; Fig. 3; Appendix 6). The average length of a woodland caribou hunt, determined from the 188 reports where hunters spent at least 1 day hunting, was 3.6 ± 2.6 days (range 1-12 days). This is similar to the 3.5 day average for caribou hunts reported for 1979-1990, but slightly down from the *ca*. 4 day average caribou hunt from 1995-2000. Poor weather may have been a factor in the length of caribou hunts this year (Appendices 3 and 7).

There was quite a range in the 118 antler length measurements that were reported for 2002 (60.5-155.5 cm, mean *ca*. 117 ± 12 cm; Table 9). The maximum left and right antler lengths reported were 155.5 and 153.6 cm respectively. The maximum antler length recorded by Boone and Crockett 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).

Table 8. Classification of Dall's sheep rams observed by non-resident hunters in the Mackenzie Mountains, 1995 to 2002**.**

	2002		2001		2000		1999		1998		1997		1996		1995	
Ram Class	Horns >¾ curl	Horns <¾ curl	Horns >¾ curl	Horns <¾ curl	Horns >¾ curl	Horns <¾ curl	Horns >¾ curl	Horns <¾ curl	Horns >¾ curl	Horns <¾ curl	Horns >¾ curl	Horns <¾ curl	Horns >¾ curl	Horns <¾ curl	Horns >¾ curl	Horns <¾ curl
No. of Hunters Reporting	148	133	186	174	151	147	144	138	177	177	205	205	172	174	181	180
No. of Rams Classified	1720	1720	1812	1765	1351	1717	1579	1756	1848	1924	1538	1586	1713	1699	2070	1645
Percent of Rams Classified	47.9	47.9	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	11.6	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, 2002.

	Contour Length	
	Left Antler	Right Antler
Number Measured	118	118
Mean (cm)	117.3	117.7
Mean (in)	46.2	46.3
Standard Deviation (cm)	12.5	12.2
Standard Deviation (in)	4.9	4.8
Maximum (cm)	155.5	153.6
Maximum (in)	61.2	60.5
Minimum (cm)	79	75
Minimum (in)	31.1	29.5

From hunters' classifications of woodland caribou observed during their hunts, we calculated an estimated 59.4 calves and 30.6 bulls per 100 adult females (cows) and bulls comprised 15.9% of all caribou classified (Table 10). The 59.4 calves:100 cows is the highest reported, far surpassing 42:100, the average of the previous 7 years (Appendix 5). Contrastingly, the 30.6 bulls:100 cows is down substantially from the 61:100 in 2001 and the 1995-2001 average of 36:100 (Appendix 5). Bulls comprised only 15.9% of all caribou classified in 2002, down from the 27, 22, and 20% of all caribou classified for 2001, 2000, and 1999 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 $\geq$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 159 animals per year (1991-2002). 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 (Jody Snortland, Executive Director and Sahtu Settlement Harvest Study Co-ordinator, SRRB unpublished data). The northern mountain population of woodland caribou was assessed as a species of Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

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 SSRB. 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, 2002.

Age/Sex class	Number of Hunters Reporting	Number Observed	Mean Number Observed/hunter	Percent of Total Classified
Bulls	169	4361	25.8	15.9%
Cows	165	14253	86.4	52.0%
Calves	143	8472	59.2	30.9%

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 21% of non-resident hunters in 2002, which is similar to previous years (Table 4). At least 62% of tag holders hunted moose and harvested 42 bulls which is similar to previous years', mean of 45 moose/year during 1991-2001 (Fig. 3). Moose hunts in 2002 averaged 2.6 ± 2.6 days, ranging from 1-12 days, which was shorter than in previous years, average of *ca*. 4 days/hunt during 1995-2001.

The mean tip-to-tip spread of 32 measured antlers was 149.3 ± 17.4 cm (58.8 ± 6.85 in) from bull moose harvested by non-residents in 2002. This was somewhat higher than in previous years where the mean tip-to-tip spreads were 144.3 cm, 147.0 cm, and 144.2 cm for 2001, 2000, and 1999, respectively. The maximum recorded moose antler spread in 2002 was 178 cm (70.1in), 10 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).

From hunters' observations of moose seen during hunts we calculated an estimated 29.2 calves and 95.9 bulls per 100 adult females (cows) (Table 11). This is the eight consecutive year in which moose calf:cow ratios have been ≤30:100, which is somewhat lower than the 40-60:100 that has been 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). We have no explanation for the apparent discrepancies between ratios from the mountains and the river valley. Because the Mackenzie Mountains data are collected during fall and in areas frequented more by adult males lower ratios would be expected, and those reported are not especially low (R. Ward personal communication). A

January 2001 survey of moose near Norman Wells estimated 18:100 (RWED, Norman Wells unpublished data), indicating a low calf:cow not restricted to the Mackenzie Mountains.

The 2002 bull:cow was similar to the average of 98:100 (range 75-120:100) from 1995-2002. These ratios 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 an 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 (Bubenik 1972). Studies on tundra moose in Alaska have not found evidence that moose populations with low bull:cow 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 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, 2002

Age/Sex class	Number of Hunters Reporting	Number Observed	Mean Number Observed/Hunter	Percent of Total Classified
Bulls	72	283	3.9	42.6
Cows	69	295	4.3	44.4
Calves	38	86	2.3	13

Mountain Goat (*Oreamnos americanus*)

Tags to hunt mountain goats were purchased by just 5% of non-resident hunters in 2002 (Table 4). Sales of mountain goat tags show more annual fluctuation than for any other ungulate species available to non-resident hunters in the Mackenzie Mountains. Since 1995 annual tag sales have ranged from 6-30 (Table 4), whereas harvest during that period ranged from 1-6 animals (Appendix 6). In 2002, at least 5 tag holders hunted mountain goats and all five harvested billies. The average hunt length was 2.8 ± 1.7 days (range 1-5 days), similar to that reported from 1996-2000. The average hunt length in 2001 was noticeably lower than in other years at 1.5 ± 0.7 days. No hunts have been longer than 6 days in the past 7 years.

Mountain goats are known to occur in 5 of the 8 outfitting zones in the Mackenzie Mountains, occurring almost exclusively below 63^{o} 00' N (RWED, Norman Wells unpublished data). They are most numerous in high relief terrain along the Yukon-NWT border between 61^{o} 00' and 62^{o} 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 2002, observations of mountain goats by hunters came only from zones D/OT/01 and D/OT/02.

The largest horns from a mountain goat taken in 2002 were 21.5 cm (right) and 20.5 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 48% of non-resident hunters in 2002 (Table 4) and 11 wolves were harvested (Appendix 6). In 2002 more hunters observed at least one wolf than in previous years and the total number of wolves observed in 2002 was the highest since 1995 (Table 12). Eight percent of responding hunters indicated that they believed wolf numbers were high. This was up from the 3% of responding hunters in 2001, but down from the 12% of responding hunters in 2000, the first year that there were any hunter comments on wolf numbers.

The number of hunters reporting in 2002 was higher than in previous years, however this may have resulted from a slight change in how we defined hunter reporting. For the 2002 data,

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 when forms with blank spaces were not included as no observations. This would bias the 2002 returns by indicating a higher hunter reporting than in previous years. We plan on using the same assumption about no wolves being reported for future harvest reports.

Table 12. Wolf observations reported by non-resident hunters in the Mackenzie Mountains, 1995-2002**.**

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

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

Wolverine (*Gulo gulo*)

Wolverine tags were purchased by 29% of non-resident hunters (Table 4). At least 41% of tag holders hunted wolverines, with 1 wolverine being taken in 2002. Nine different sightings of wolverines were reported in 2002 from 5 different hunter zones, D/OT/02, S/OT/01, S/OT/02, S/OT/04 and S/OT/05, with only 5% of hunters reporting wildlife observations seeing wolverines. All observations were of lone animals.

Wolverines occur throughout the Mackenzie Mountains, but sightings are generally rare. Reported sightings for 2000-2002 averaged <10/year. Interestingly, reported sightings for 1995-1999 averaged >30/year (Figure 4). Most wolverine observations are made in hunting zones G/OT/01, S/OT/01, S/OT/04, and S/OT/05. There was no relationship between the yearly harvest and the number of wolverines observed in a year. The highest percentage of purchased wolverine tags was in 1997, the year with the most reported wolverine observations, but there was no relationship between the percentage of wolverine tags purchased and the number of reported observations (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 1995-2002.

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

Black Bear (*Ursus americanus*)

Non-resident hunters purchased 3 black bear tags in 2002. No black bears have been harvested by non-residents in the Mackenzie Mountains in the last 7 years. Black bears are relatively rarely seen in the Mackenzie Mountains and in most years are reported only from below 63^{o} 00 N. In 2002, 20 black bears (17 adults and 3 cubs) were reported from a total of 3 zones (D/OT/02, G/OT/01 and S/OT/01). Few observations occurred in the northern part of the Mackenzie Mountain range with most observations (14 adults and 3 cubs) made in D/OT/02 (Table 14). As with the other 2002 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

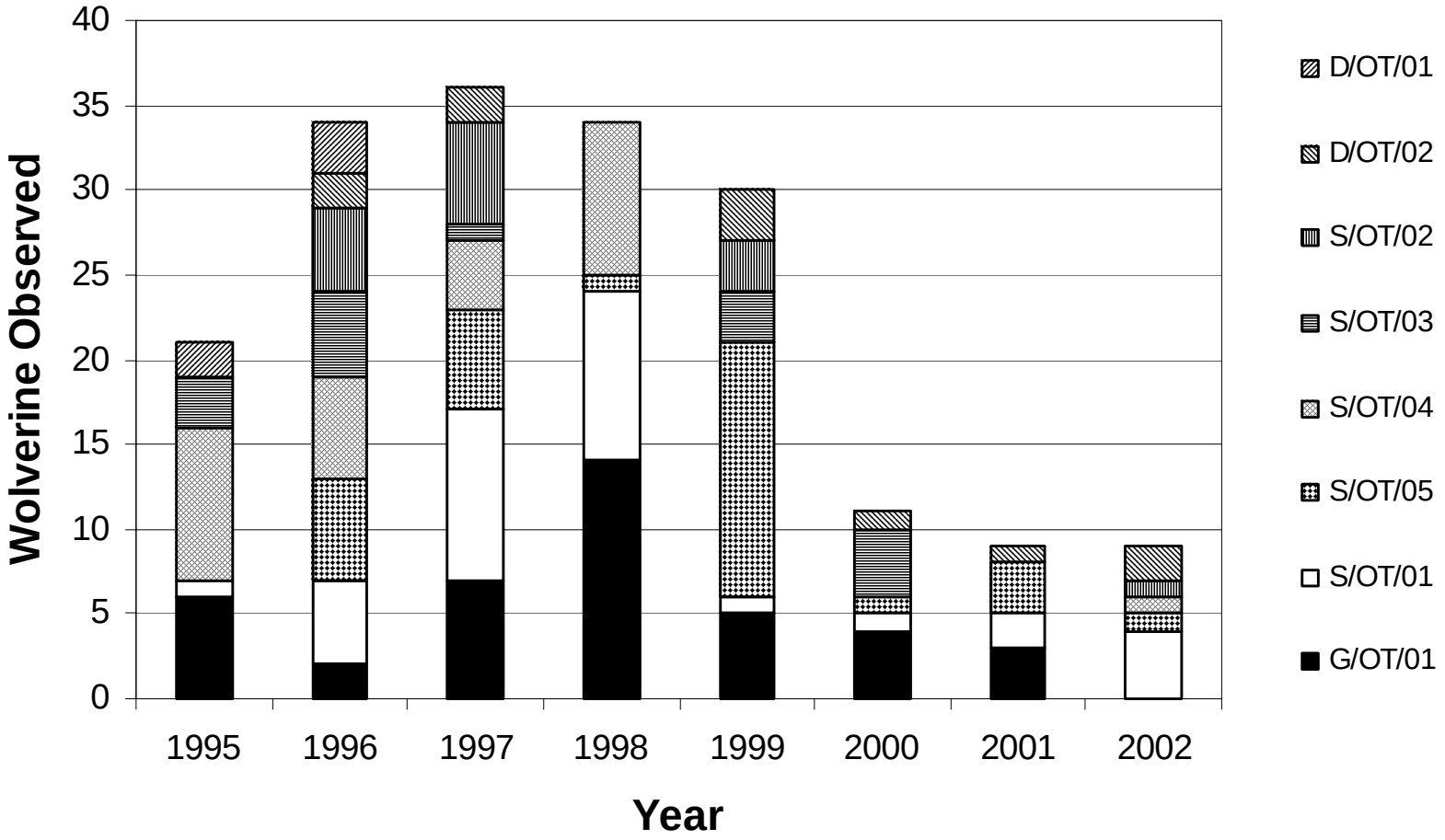


Figure 4. The number of wolverines observed from 1995-2002, and the outfitter zones where the observations occurred. Data are based upon voluntary hunter observation forms.

Table 14. Black bear observations reported by non-resident hunters in the Mackenzie Mountains, 1995-2002.

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

likely invalid for previous years' data and likely inflates the 2002 values relative to previous years. We plan on using this assumption for future harvest reports.

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). In 2002, 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 1993-1994, none occurring in outfitting zones in the Deh Cho Region (RWED, Norman Wells unpublished data; K. Davidge personal communication).

While the mean number of adult grizzly bears observed by hunters has remained relatively stable from 1996-2002, the cub to adult ratio calculated from the hunter observations was at least 50% greater in 2000 than in any other year, with cubs comprising 29% of all bears observed (Fig. 5; Table 15). 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 1996-2002 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

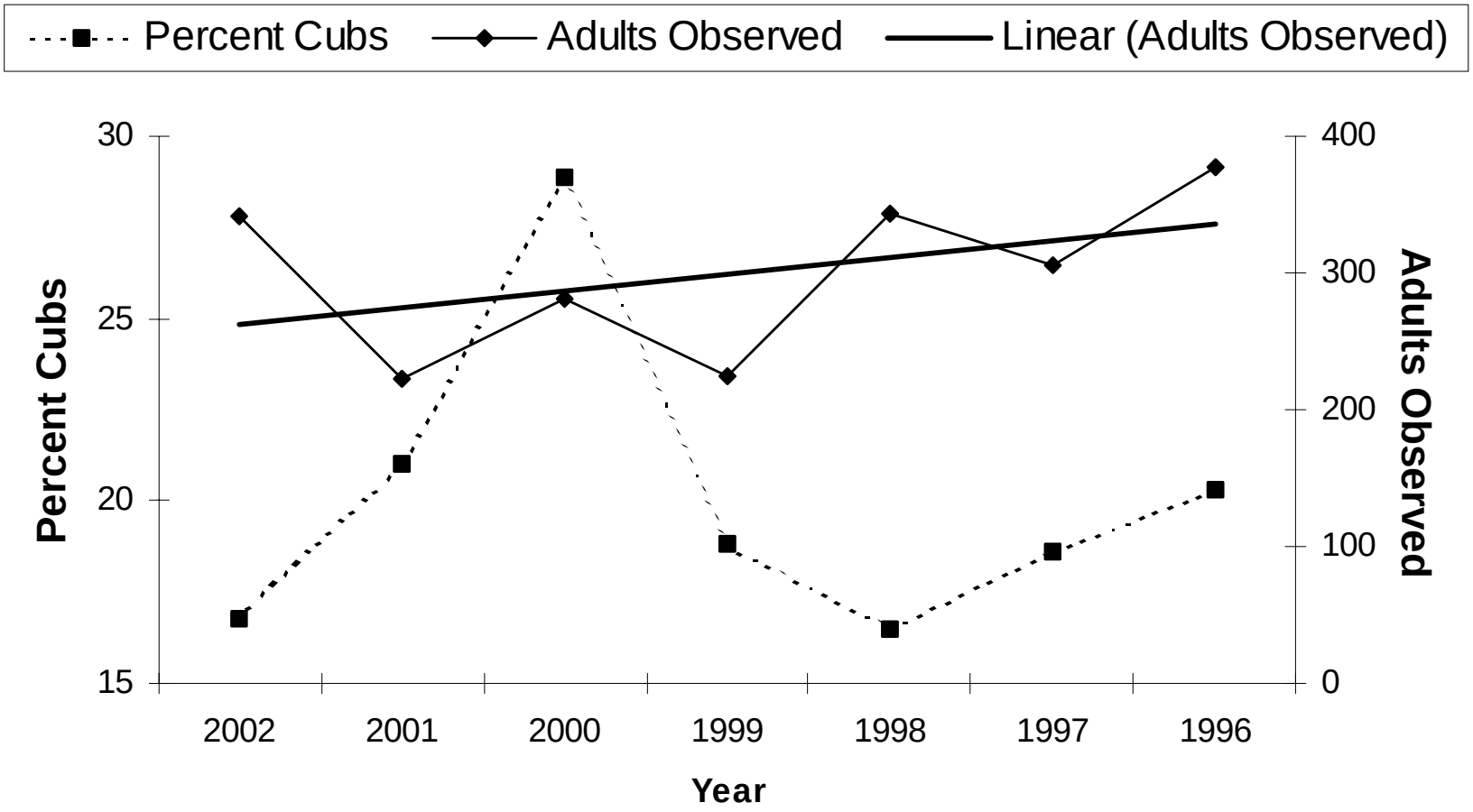


Figure 5. The percent of 'cubs' and the total number of adult bears observed from 1996-2002. Data are based upon voluntary hunter observation forms. The linear trend of total adult bears observed during the same time period is indicated.

Table 15. Grizzly bear observations reported by non-resident hunters in the Mackenzie Mountains, 1995 – 2002**.**

	2002		2001		2000		1999		1998		1997		1996		1995
	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	All Bears[1]
Total # Observed	69	341	59	222	113	281	52	225	68	343	70	306	96	377	389
% of Total Observed	17	83	21	79	29	71	19	81	17	83	19	81	20	80	nil
No. Hunters Reporting	34	128	136	171	108	131	98	117	139	177	110	170	49	132	138
No. Hunters Saw at Least 1	11	48	28	104	51	97	28	81	31	105	32	129	46	129	123
Mean # Observed	2	2.7	.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	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.

size 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 1996-2002, 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 at al. (1982).

RECOMMENDATIONS

1. Ensure that all the voluntary hunter observation forms distributed in 2003 request the same information and if possible redesign and redistribute the form prior to the onset of the 2003 non-resident hunting season in the Mackenzie Mountains.

2. Discuss with the Renewable Officers in both the Sahtu and the Deh Cho the possibility of collecting additional measurements from the horns of harvested Dall's Sheep. These data will be used in a study looking at synchrony in horn growth patterns which has been ongoing in the Yukon.

3. Collect baseline data on moose distribution in addition to the harvest location data. The need to better delineate habitats and areas where moose (especially subspecies *gigas*) are prevalent and where absent was an important topic at the Departmental Moose Workshop held in May, 2003.

ACKNOWLEDGMENTS

Co-operation from the outfitters operating in the Mackenzie Mountains in 2002 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 RWED in Norman Wells, Fort Simpson, and Fort Liard for collecting and organizing data from non-resident hunters in their respective offices.

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

We would like to thank Richard Popko, Alasdair Veitch, and Keith Hickling for ensuring that all data received by the Sahtu RWED office was forwarded to the Fort Simpson RWED office, which will now be compiling Mackenzie Mountain non-resident harvest statistics, and for stimulating conversation on the contents and previous drafts of this report. Lana Robinson (Sahtu GIS Project, Norman Wells) prepared the map of outfitting zones.

PERSONAL COMMUNICATIONS

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

Jody Snortland, Executive Director, Sahtu Renewable Resources Board, Tulita, NT.

Richard Ward, Moose Biologist, Wildlife Management, Department of Energy, Mines and Resources, Yukon Territorial Government, Whitehorse, YT.

Ken Davidge, Renewable Resources Officer III, Department of Resources, Wildlife & Economic Development, Government of the Northwest Territories, Ft. Simpson, NT.

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Appendix 1. Outfitters licenced to provide services to non-resident hunters in the Mackenzie Mountains, NWT – 2002

D/OT/01 – *SOUTH NAHANNI OUTFITTERS*
Kevin Mattice
358 Golf Course Rd.
Huntsville, ON P1H 1N8
Ph: (705)-789-5754
Fx: (705)-789-9514
e-mail: snahanni@vianet.on.ca
website: www.southnahannioutfitters.com

D/OT/02 – *NAHANNI BUTTE OUTFITTERS*
Cam and Clay Lancaster
PO Box 653
Hudson Hope, BC
VOC 1VO
Ph: (250)-783-9197
Fx: (403)-380-6126
email: claykris@pris.bc.ca
website: www.lancasterfontana.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/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/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

S/OT/03 – *RAM HEAD OUTFITTERS*
Stan and Debra Simpson
P.O. Box 89
Warburg, AB T0C 2T0
Ph: (780)-848-7578
Fx: (780)-848-7550
website: www.ramheadoutfitters.com

S/OT/04 - *NWT OUTFITTERS*
Eric Mikkelson
PO Box 106
Lazo, BC V9N 8Z8
Ph: (888)-293-2299
Fx: (250)-897-0054
email: huntnwt@shaw.ca
website: www.wildsheep.org/nwtoutfitters

S/OT/05 - *REDSTONE TROPHY HUNTS LTD.*
P.O. Box 18
Pink Mountain, BC
VOC 2BO
Ph: (250)-772-5992
Fx: (250)-261-9962
website: www.redstonehunts.com

Appendix 2. Summary of fees, bag limits, and seasons for big game species available to non-resident and non-resident alien hunters in the Mackenzie Mountains, NWT 2002. [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. 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: Government of the Northwest Territories. 2002. 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, 2002. Names of outfitters and guides have not been printed (XXX).

biological samples to Deh Cho
2/3 days in tent due to weather
Was using a bow, but shot sheep on last day with a rifle
lots chopper activity along Liard Range (seismic?), poor lamb crop
old ram with little fat
poor weather 1/5 days out hunting
saw 3 golden eagles
I hunted only 3 days out of the 10; I had a twisted ankle and had to come back to main camp. Did not get a Dall's sheep
Tremendous hunting
Hopefully!
I had unique and educational experience hunting in the NWT, where I saw and did things I will not soon forget.
We've hunted and fished with outfitter/guides in Montana, Wyoming, California & Alaska. This was our best experience -well run by our outfitter + guide in remarkable country. It was great to drink from streams again!
A truly great area and experience
Wonderful country - XXX does a supper job - truly professional
Best experience in my life
Great to see large numbers of game of various species while hunting
The area is beautiful and rich in wild game. It was great having no signs of other people having been in the area.
XXX Outfitters is an outstanding group with attention to all details
See ya again
Great experience, hope to come again
Excellent experience
Great hunt
Superb area for game & guide service
Excellent experience
The weather was wet
Wonderful hunt, guide & outfitter. Mother nature could have been nicer, but oh well…
The grizzly bears that we saw were right in camp or close to camp. Presenting a danger to human life as they show very little fear
Excellent outfitter + guide - beautiful country + scenery - abundant game - just an overall great trip – I will be back with my wife! Too many grizzlies though!
Except for the weather-excellent and very good number of sheep
weather rough
Excellent experience-Quantity & quality of game excellent
I had an incredible hunt harvesting a huge bull moose and a monster bull caribou.
I would say the great hunting was only outdone by the people we met in camp. A 5 star hunt.
We had a great time with all involved it was a trip of a lifetime thank you very much
Too many bears
Beautiful mountains-excellent habitat for caribou & dall's sheep
Outstanding hunt

Great outfitter and guide

Great time

The Mackenzie mountains are over run with an over abundance of aggressive grizzly bears with no fear of man because they have never been hunted. You have created a situation that is very dangerous for humans until these bears can regain a healthy respect and fear of man. They need to be hunted.

Bear problem becoming very big problem-seen two very aggressive bears

Need to do something about grizzly population - too many bears - need to establish hunting to thin the population.

Great country

My hunt was very well organized, very professional I enjoyed it very much

Excellent outfitter, guides, food, accommodations. Best effort I have seen to give hunters opportunities

Grizzly bears should be allowed a limited harvest

Excellent hunt

Great place to hunt

There must be a lot of bears. With in six hours there was a bear on our kill

Our outfitter did an excellent job in all aspects of the hunt! The Mackenzie mountains are truly one of the last untouched areas on earth! Suggestions; grizzly population high and they have no fear of man. a non resident season should be managed to prevent future problems. Keep up the good work.

Good trip, good guides, poor weather

Many grizzly sightings

Surprised NWT- Doesn't have a grizzly season limited or otherwise.
Bears seen constantly-by other clients-guides etc. 2 came in our camp-at the same time

Excellent hunt in beautiful country

Unable to leave Norman Wells when hunt was ended due to cargo shipment
(charged exorbitant amount plus change fee to change flight-more than anyone else)

Awesome hunting but there are way too many grizzly bears.
There needs to be a season opened up to hunt grizzly in the NWT.

Outfitter and guide was extremely competent and provided me with a wonderful experience

I had a wonderful time!

Excellent Hunt, excellent outfitter with knowledgeable people and excellent equipment

XXX Outfitters very professional, excellent service, and highly dedicated to quality game management and conservation.

Beautiful area!

I found XXX Outfitters to have the highest standards of professionalism

XXX Outfitters treated me well, had a great area to hunt.

My guide XXX worked harder than any other guides I have hunted with.

Expense is the only limiting factor

XXX Outfitters had a well organized hunt, excellent guides.

It's great to see an outfitter take painstaking care to adhere to regulations (meat) and take pride in the trophy care

Outstanding outfitter-conscientious guide-experienced-dedicated

XXX runs a great camp! Wonderful time! Air travel is too expensive to change.
Try to get the costs down and I will hunt here a lot more (more flexible on flights out)

I observed all sorts of game every day. Lots of caribou and sheep of all ages and sex.
It seems that both species are doing very well in the area we hunted.

I saw three wolves, sheep every day of all size, sex and age. Caribou were abundant with daily sightings of all age + size animals. I was very impressed with quantity and quality of all game species seen.

I was fortunate to harvest a nice ram and bull caribou. Saw lots of sheep every day we hunted.
Spotted grizzly bear on several occasions

I observed large number of caribou of both sex and good number of sheep of both sex

The quality of animal observed, looked good and healthy

With the number of bears in the area; it would seem to reason that this area could be opened for grizzly bear hunting. Beautiful country!

I saw a lot of game of both sexes in good condition. Wildlife was abundant. No bears

I saw a lot of cows and a lot of other game

Not what was expected. Weather prevented daily observation. Way to many grizzly bears, very few caribou and sheep not abundant in area we hunted

Lots of sheep, ewes and lambs - some good rams, very old ones - lots of caribou cows and bulls

There was a good amount of species to hunt

There seems to be plenty of sheep, caribou and grizzly bears and a good population of wolf

I saw over one hundred ewes and lambs, and over twenty good rams, too many caribou to keep track of both cows and bulls. I also saw more bears than I have seen in my life. One almost everyday. They came into camp and stole five quarters of caribou. We couldn't keep them out!

Sheep many, caribou - a few days too early for many to be seen - did not see wolverine & wolf

For one day of hunting I was very happy with the numbers

I enjoyed sheep hunting - although it was difficult. They were where you found them. I was disappointed on number of caribou. Just weren't enough bulls. I expected to do much observing and sighting. My caribou quality was, however, very good.

There is an abundance of game; appears healthy. No unusual observations; too many wolves!

Very happy with the game quality and quantity. Wish I could have spent more time hunting

Beautiful country, World class!- The grizzly bears seem way too numerous, they have no fear to humans, they have no respect. I feel the outfitter should be responsible for the harvest of a certain number of mature bears every year.

I really feel that there should be grizzly season in the Mackenzie Mountains, in my opinion probably 6 to 8 permits per outfitter maybe a point system similar to the Yukon's management program

Plenty of game 1500 - 2000 caribou. Too many bears

A great hunting area for caribou. The bear population is very prolific!

Lots of sheep. Some caribou, few wolves

Too many grizzly bears; caribou had scar in chest

I had a great time and had a wonderful experience

Beautiful country - will return soon

Large numbers of caribou in excellent condition

The liver on one hunters caribou had 2 parasitic cysts I would like to know what it was

low numbers animals in good condition

A super abundance of wildlife every day

Plenty of game (caribou/bears/dall’s sheep)

Quantity and quality bulls

Many caribou, healthy looking animals, observed one wolf, three bears, all species appeared healthy to me

Good mix of cows and bulls excellent quality of game

For my one day of hunting I seen plenty of game & way too many bears

XXX was unable to go out on a horse and hunt. His days were spent in base camp

Saw pair of gyro falcons, fresh grizzly, wolf & wolverine tracks at 64° 41 30 126° 51 30

Appendix 4. Number, age, and horn length measurements of Dall's sheep rams harvested by non-resident hunters in the Mackenzie Mountains, 1967-2002.

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, 1967-2002.

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

Appendix 5. Summary of age and sex ratios calculated from non-resident hunter observation reports in the Mackenzie Mountains, 1995-2002.

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
1995-2002 Mean	56	83	44	36	27	97

Appendix 6. Outfitted non-resident hunter harvests in the Mackenzie Mountains, 1991-2002.

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
Mean 1991-2002	350	195	159	45	4	12	2

Appendix 7. A summary of the 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
104	31	32	24	8	8