Trophy Bighorn Sheep Management in Alberta

Bighorn Sheep Management

DRAFT -- Discussion Paper -- DRAFT

In response to stakeholder concerns of a decline in the quality and quantity of trophy rams available in some areas, SRD has completed an assessment of 35 years of trophy sheep registration and aerial survey data for bighorn sheep. The assessment indicates the harvest levels need to be adjusted to bring them into line with the management guidelines in the *Management Plan for Bighorn Sheep in Alberta (1993)*. There are no immediate regulation changes planned, but we clearly need to work with provincial hunters and outfitter/guides to achieve a better balance with our objectives. To achieve that balance, we're looking for discussion and input from stakeholders about the information contained in this discussion paper. Send your comments to Jim Allen, Head of Game Management, James.Allen@gov.ab.ca.

Sheep Management Areas

Bighorn sheep have been managed in relation to discrete Sheep Management Areas (SMAs) since the 1993 management plan. The original management areas were developed based on strictly a geographic basis overlapping wildlife management units (WMUs), with some combination of WMUs to take sheep movements across smaller units into account. Updating SMAs to be more meaningful for biological and management purposes is part of this assessment paper and is based on genetic relationships.

Trophy bighorn sheep are given identification plugs during registration that requires the drilling of a hole into one of the horns. DNA analysis from horn shavings of shot rams revealed the following genetically distinguishable sheep sub-populations (Figure. 1). These sub-populations or sheep groups were used in the following analyses and will form the basis for future management decisions. These new Sheep Management Areas (SMAs) are shown in Figure 1 and are identified by name and Wildlife Management Units (WMU) in Table 1.
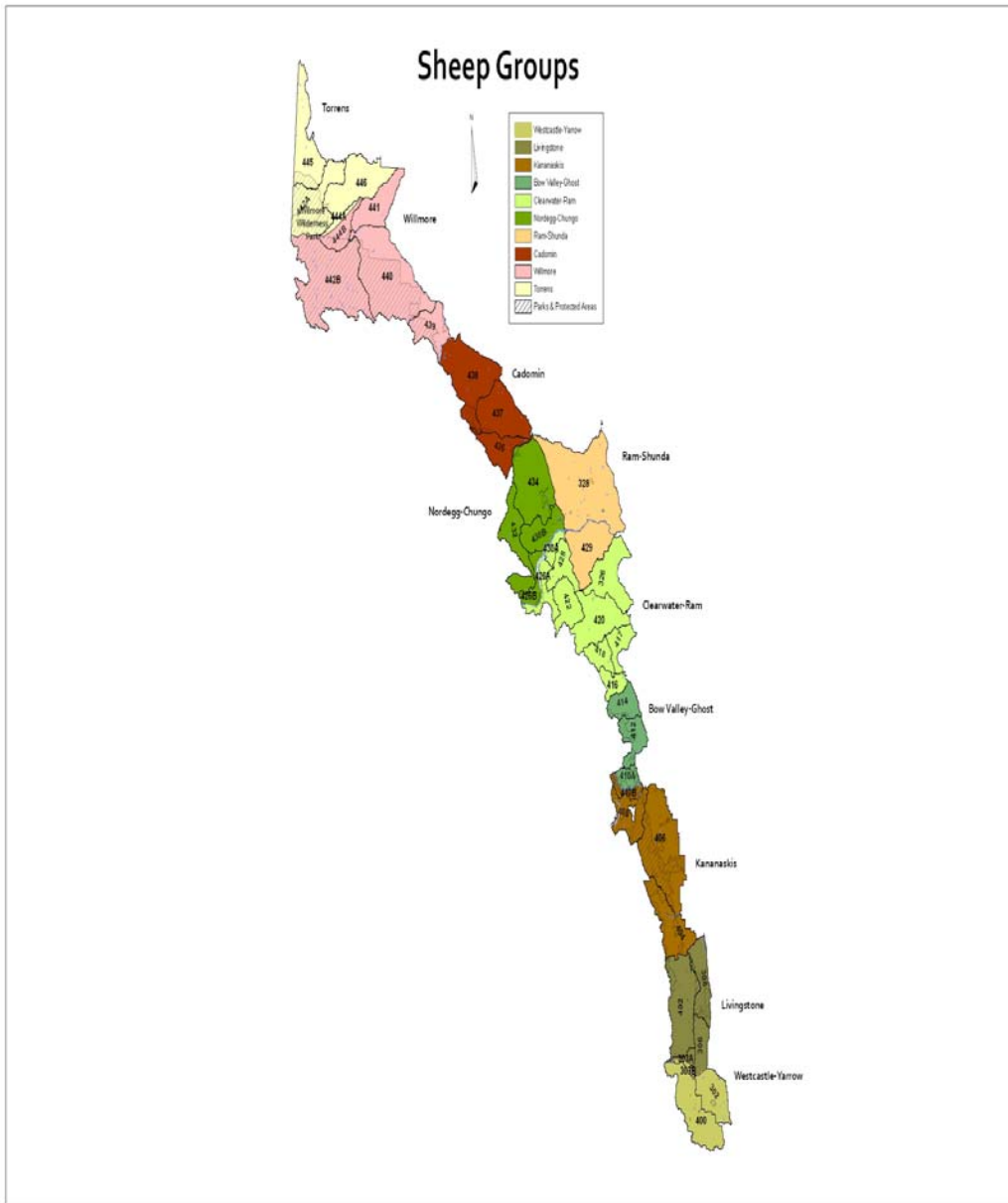
Figure 1. Bighorn Sheep Management Areas (SMAs) in Alberta, 2011.

Table 1. Bighorn Sheep Management Areas (SMAs) in Alberta, 2011.

SMA Number	SMA Name	Wildlife Management Units
1	Westcastle - Yarrow	302, 303B, 400
2	Livingstone	303A, 306, 308, 402
3	Kananaskis	404, 406, 408, 410B
4A	Bow Valley - Ghost	410A, 412, 414
4B	Clearwater - Ram	326, 416, 417, 418, 420, 422, 428, 426A, 430A
4C	Nordegg - Chungo	426B, 430B, 432, 434,
5	Ram - Shunda	328, 429
6	Cadomin	436, 437, 438
7	Willmore	439, 440, 441, 442B, 444B
8	Torrens	442A, 444A, 446, 445

Licence Sales and Harvest

Hunting licence sales over the past 35 years peaked at over 3,000 in the mid-1980s and like most other hunting licences experienced a decrease through the 1990s. Since 2005, bighorn sheep hunting licence sales have increased. More recently, over the past few hunting seasons, the number of bighorn sheep licences purchased has averaged around 2,200. Provincially, trophy ram harvest has declined since the 1980s. Table 2 shows the number of resident and non-resident hunting licences sold and trophy ram harvest from 1992 to 2011.

Although trophy sheep harvest fluctuates annually, there has been a decline provincially since the mid 1980s. Not all areas of the province have experienced a decline in harvest over this time span. Areas north of the Brazeau River (SMAs 6, 7 and 8) have experienced relatively constant ram harvest; however, south of the Brazeau River the declines in harvest are more pronounced.

In Alberta there are two ways in which non-resident Canadians (NRs) can hunt trophy sheep in Alberta: through a limited entry draw for two annual permits or through licensed Outfitter-Guide. Non-resident aliens (NRAs) may only hunt bighorn sheep in Alberta through a licensed Outfitter-Guide. There are currently 88 allocations for Outfitter-Guides which they may sell to either NRs or NRAs. Of the 88 allocations and 2 NR special licences available, not all of these are purchased by hunters each year. The average number of NR and NRA sheep hunters in Alberta annually is 83.

Alberta's Management Plan for Bighorn Sheep allows for 20% of the harvest allocated for NR and NRA at a provincial scale. The long-term average has fluctuated very close to that number for the

last 20 years and in 2011 non-residents harvested 34 rams, 20% of the total combined provincial harvest of 168 rams. Hunter success for residents who purchase trophy sheep general licences and special licences has averaged around 7% over the last 20 years (1992 – 2011). NR and NRA hunter success over this same time period has averaged around 49%. A summary of resident, NR and NRA licence sales and ram harvest is presented in Table 2.

Table 2. Resident, Non-resident and Non-resident Alien bighorn sheep hunting licences and hunter success in Alberta for 1992 – 2011.

Year	Resident licences	Resident Harvest	Resident Success(%)	NR/NRA Licences	NR/NRA Harvest	NR/NRA Success(%)	NR/NRA % of Harvest
1992	1991	230	12	86	43	50	16
1993	1982	176	9	80	53	66	23
1994	1926	166	9	89	37	42	18
1995	1875	135	7	86	43	50	24
1996	1960	108	6	86	36	42	25
1997	1710	121	7	86	32	37	21
1998	1840	147	8	87	47	54	24
1999	1829	91	5	85	36	42	28
2000	1841	144	8	89	41	46	22
2001	1792	117	7	87	43	49	27
2002	1839	101	5	87	40	46	28
2003	1779	116	8	87	37	43	24
2004	1768	142	7	86	36	42	20
2005	1764	131	8	83	52	63	28
2006	2078	161	7	85	50	59	24
2007	2158	143	6	87	45	52	24
2008	2228	132	6	80	52	65	28
2009	2304	134	6	73	23	32	15
2010	2280	137	6	74	33	45	19
2011	2216	134	7	66	34	52	20
Average	**1958**	**138**	**7**	**83**	**41**	**49**	**23**

Bighorn sheep aerial survey data.

In 2011, plans were made to survey all sheep wintering ranges in the province including the national parks (thanks for assistance from the Wild Sheep Foundation, Hunting for Tomorrow Foundation and Alberta Conservation Association). Surveys were to be conducted following the conclusion of the 2010 hunting season. The only area that was not surveyed was a portion of SMA 2 due to aircraft breakdown followed by unfavourable survey conditions (high winds followed by declining snow conditions). This area is scheduled to be surveyed in 2012. The intent of this survey

was to determine the spatial winter distribution of the provincial sheep population, provincial population trends and the proportion of trophy rams that were in the post-hunting season population. The pre-hunting season population estimate was calculated to be 6,466 (Table 3).

Bighorn sheep populations

The current total provincial population of bighorn sheep is estimated to be 6,466 on provincial lands with an additional 4,500 bighorn sheep located within the three national parks (Table 3). Results of the 2011 survey indicate that the overall provincial bighorn population has not changed much in the last 10 years (Figure 2). However, there have been some SMAs which have experienced overall declines in bighorn sheep numbers, such as the Nordegg–Chungo (SMA 4 C) and Ram–Shunda (SMA 5) sheep management areas. Overall, bighorn populations are increasing north of the Brazeau River (SMAs 6, 7 and 8).

Table 3. 2011 pre-hunting season population estimate of bighorn sheep in Alberta for both provincial lands and national parks.

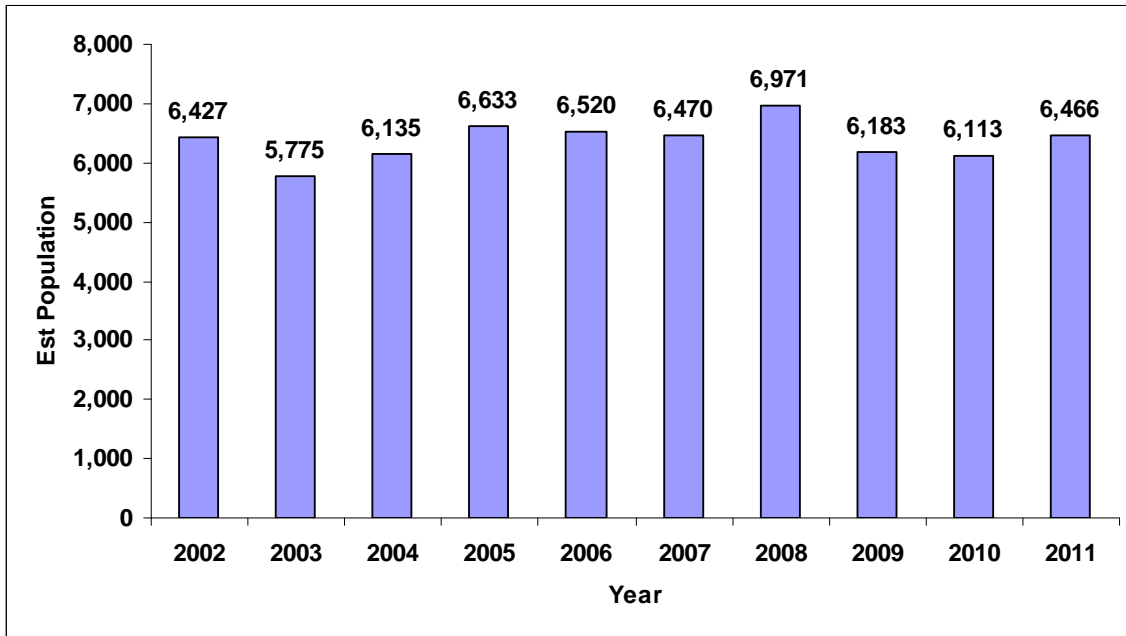| SMA	Population Estimate
1	260
2	355
3	893
4A	325
4B	1,170
4C	370
5	55
6	1,305
7	870
8	623
Peter Lougheed Provincial Park	100
Ghost Wilderness Area	100
Siffleur Wilderness Area	20
White Goat Wilderness Area	20
Total- Provincial lands	**6,466**
National Parks (Waterton, Banff and Jasper)	4,500
Provincial Total	**10,966**

Figure 2. Pre-hunting season estimates of bighorn sheep populations in Alberta outside of national parks (2002 –2011).

Harvest levels of trophy bighorn sheep

The Management Plan for Bighorn Sheep in Alberta (1993) indicates that the harvest level of trophy rams will generally be limited to 50% of the total number of available rams and shall not exceed 70%. At normal recruitment rates and desirable harvest rates, approximately 5% of the population should remain as trophy rams during the post-hunting season aerial surveys in the south and 4% in the north. Heavy harvest of mature rams may affect the survival of young rams (Geist 1971, Heimer et al. 1984). Ensuring the survival of some mature rams is necessary to allow for the transfer of knowledge on seasonal range use to younger rams, and to manage trophy quality.

Using the 1971 to 2011 harvest and population surveys, eight of the 10 sheep management areas were under the desired 5% goal (Figure 3). SMAs 6, 7 and 8 were all above the 4% guideline for the north. The SMA that contains Cadomin is well over because there is a reservoir of rams that is rarely available to hunt and the Clearwater - Ram SMA is above the 5% in the long-term average but has averaged only 3.4% since 2000. The Ram Mountain bighorn sheep research program have given us 30 years' worth of data to determine the annual recruitment of trophy rams into the population each year. At our current harvest rates, more than 90% of new trophy rams are being harvested in most SMAs annually. In some SMAs, the entire group of new trophy rams plus many of the surviving trophy rams from previous years are also being harvested.

The management plan guideline is that the harvest level of trophy rams available should not exceed 70%. This means that our current harvest strategies need to be brought into closer alignment with the management objective. The only exceptions are Ram–Shunda which has full curl regulations and Cadomin which has a protected reservoir of rams at the mine site. It is also worth noting that in WMU 400, since the implementation of full curl regulations in 1996, the post-hunting season aerial survey data show an improvement in total rams and an increased percentage of trophy rams (4/5 plus), though it is still currently below the 5% target.
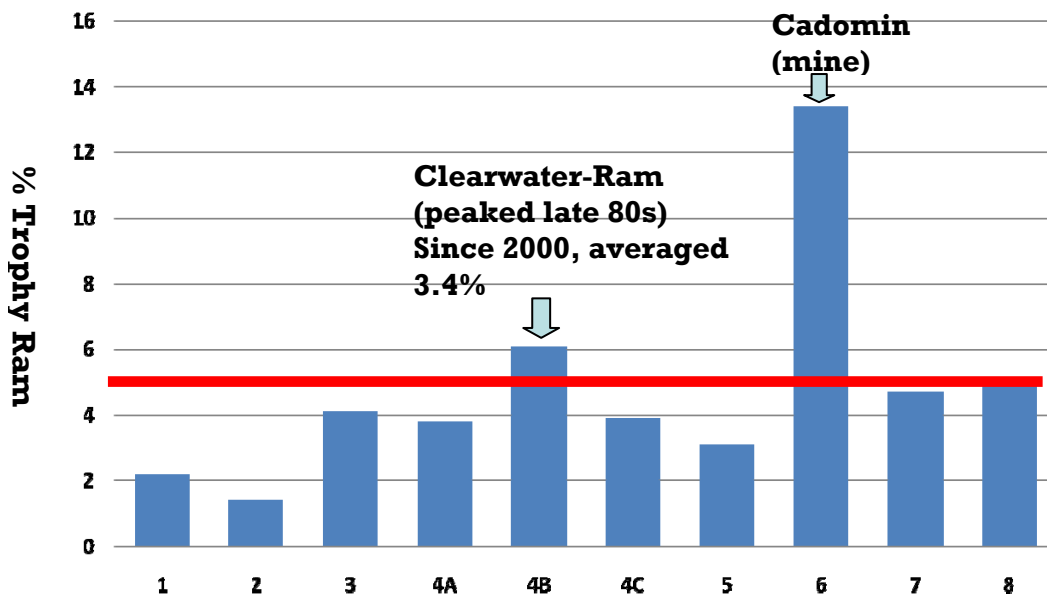

Figure 3. Percentage of trophy rams found in each SMA during post-hunting season surveys (1971 – 2011).

Age of Harvested Rams, Horn Length, and Basal Circumference

The registration of harvested trophy bighorn sheep started in 1971 and the database holds over 8,000 entries of trophy rams with age and horn measurements. Using data collected between 1974 and 2010, an analysis was completed to determine if there have been any changes over time in age, horn length, or basal circumference of harvested trophy bighorn sheep.

Provincially, the average age of harvested rams has been increasing (Figure 4) and this trend is also evident in many of the individual SMAs, which means that by the time rams acquire legal-sized horns, they are significantly

older than earlier populations. The proportion of young rams (4- and 5-year olds) in the harvest has been declining (Figure 5), which contributes to the increasing age of harvested rams. The reduction of 4- and 5-year rams in the annual harvest indicates that there are fewer of the younger, faster-growing rams available for harvest. Rams now require additional years to achieve trophy size, which is likely due to lower growth rates of horns than in the past. These results indicate that fast-growing, larger rams are being shot at a young age; therefore, they are being removed from the population before breeding age.

Since horn growth is a highly heritable trait, the loss of these fast-growing rams prior to their ability to contribute genetically could result in artificial selection against large rams (Coltman et al. 2003). While we cannot conclusively attribute these results to hunting pressure, they are consistent with findings from Ram Mountain (Coltman et al. 2003) and other jurisdictions (e.g., British Columbia—Hengeveld et al. 2011). Other possible factors that could contribute to a decline in horn growth over time include climatic conditions and habitat quality associated with sheep densities (Jorgenson et al. 1998, Rominger and Goldstein 2006, Wishart 2006).

Analysis of sheep harvested by hunters did in fact show that horn growth (basal circumference and horn length) has decreased over time when the age of sheep is taken into consideration. Over time, horn length and circumference have declined provincially since the mid-1990s but this trend is not consistent throughout the province. For example the Kananaskis, Bow Valley–Ghost, Clearwater–Ram and Nordegg–Chungo have exhibited a decrease in overall horn length and circumference while ram horns in other SMAs such as Cadomin and Torrens have increased.

The registration data that was used for these analyses has some inherent limitations and biases. Small rams are underrepresented in the database since they do not meet the minimum legal size limit and thus cannot be harvested. Also, we were unable to directly assess age-specific horn growth rates because annuli are not currently being measured as part of the registration process.
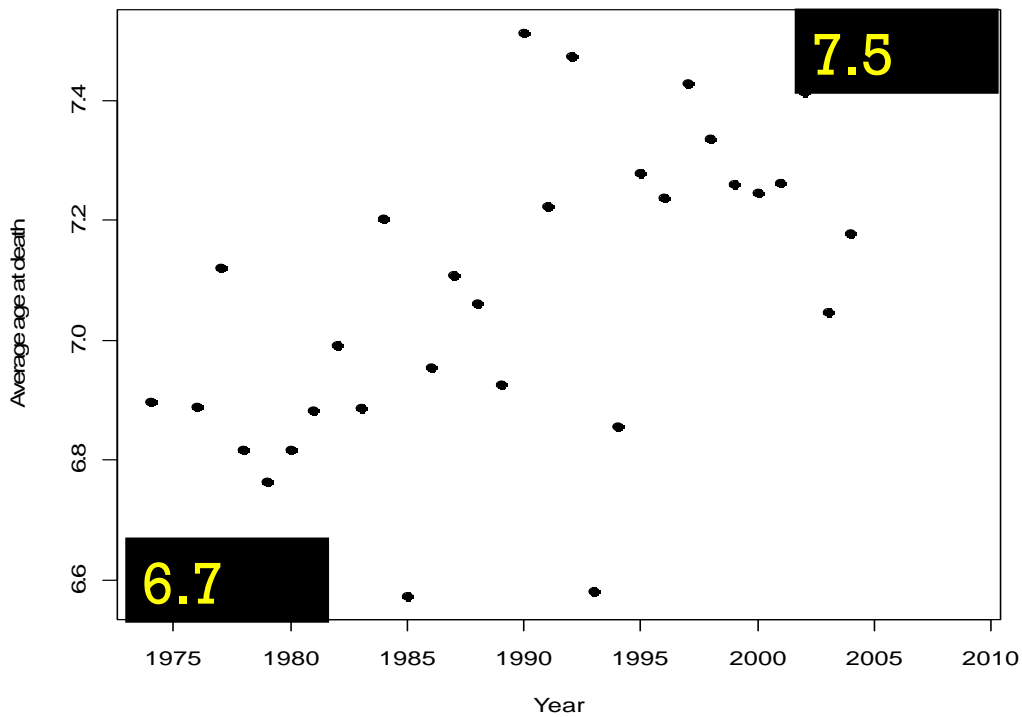
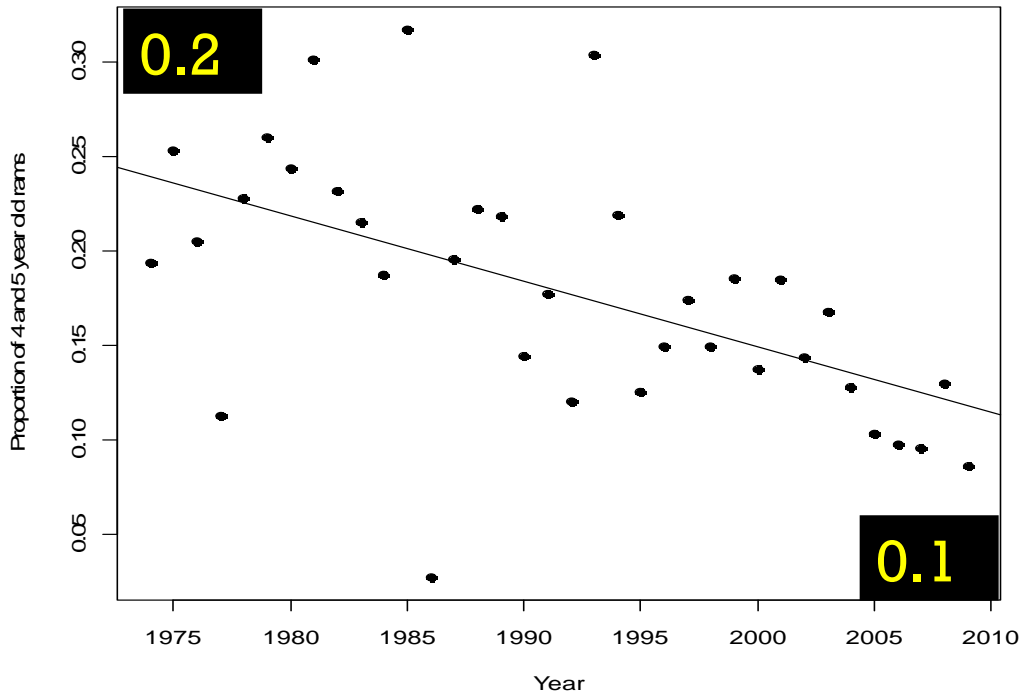**Figure 4.** The average age of rams harvested provincially (1975 – 2010).

Figure 5. Proportion of 4- and 5-year-old rams in the annual harvest of bighorn sheep from 1975 to 2010.

Management Options

The *Management Plan for Bighorn Sheep in Alberta (1993)* lists several options that could be considered to increase the number of rams available. They include the following:

- longer waiting periods for purchasing a trophy sheep licence following successfully harvesting a ram,
- increased licence fees,
- limited entry draw (special licences), or
- a limit on the number of trophy rams per hunter in a lifetime.

All of these options have advantages and disadvantages and will have varying effects on hunting opportunities. We believe it is important to keep recreational hunting opportunities for residents as liberal as possible, but hunting opportunities must be in the framework of maintaining quality hunting and conservation management. There are no regulation changes planned for trophy bighorn sheep in the immediate future. This paper is presented to the Alberta public for discussion and to encourage input for consideration in management planning for the future.

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