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CHAPTER 6: DALL SHEEP MANAGEMENT REPORT

From: 1 July 2010
To: 30 June 2013[1]

LOCATION

GAME MANAGEMENT UNITS: Portions of Units 12, 13C, and 20D (1,500 mi^2)

GEOGRAPHIC DESCRIPTION: Tok management area

BACKGROUND

The Tok management area (TMA) was created in 1974 to provide Dall sheep hunters additional opportunity to harvest large-horned, trophy rams (Alaska Department of Fish and Game [ADF&G] 1976). This objective is the primary consumptive use component of a management goal to provide for diversified human recreational use in this area (Kelleyhouse 1989) and was based on the horn growth potential of rams in TMA. In comparing horn growth qualities of Dall sheep rams inhabiting 7 mountain ranges in Alaska, rams in TMA exhibit the second greatest horn length and the fourth greatest horn mass qualities (Heimer and Smith 1975).

The most recent sheep population estimate for TMA was 2,000 sheep in 1989 (Kelleyhouse 1989), and anecdotal information from longtime area guides, transporters, and sheep hunters indicates that the population in TMA has declined since 1974. However, sheep survey data collected during 1974–2001 is inadequate to analyze population trend in TMA. Sheep numbers were likely stable during 2002–2010.

Sheep harvest in TMA is managed by controlling hunter numbers through a drawing permit system. This system was designed to keep annual harvests low enough to allow some rams to attain their maximum potential horn size. Harvests are also restricted to rams with at least full-curl horns. This system was successful during the 1970s through the 1990s in achieving TMA's horn quality objectives. However, in recent years the number of rams harvested each year with horns 40 inches or greater in length, and the average horn size of harvested rams, have been lower. This, combined with concerns of area residents, guides, and transporters about the size of the sheep population and the numbers of full curl or larger rams in TMA, led to reductions in the number of permits issued and investigations into long-term population trends and trends in horn sizes and ages of harvested rams.

Providing the opportunity to hunt sheep under aesthetically pleasing conditions is also a goal of this drawing permit system. Low hunter density has prevented hunter crowding and competition

[1] At the discretion of the reporting biologist, this unit report may contain data collected outside the report period.

and has generally resulted in an abundance of legal rams, including rams with horns ≥40 inches. This management strategy has also allowed ADF&G to maintain components of a high-quality hunting experience, including unrestricted methods of access to the area. Additional early history of management in TMA is available in Kelleyhouse (1989).

MANAGEMENT DIRECTION

MANAGEMENT GOALS

- Provide for diversified recreational uses of wildlife.
- Provide for the opportunity to be selective in hunting.
- Provide an opportunity to hunt under aesthetically pleasing conditions.

MANAGEMENT OBJECTIVES

- Maintain abundance of mature rams sufficient to produce a harvest of 30–45 rams with mean horn size of >36 inches and mean age of >8 years.
- Maintain an average of at least 7% rams with 40-inch or greater horns in the harvest.
- Maintain at least 60% hunter satisfaction with aesthetically pleasing, uncrowded, hunting conditions.

METHODS

We monitored harvest using reports returned by drawing permit holders. Data on harvest success, harvest location, hunter distribution, hunter residence, hunter effort, transportation type, horn size, and age were analyzed to determine whether the management goals and objectives were met. Harvest data were summarized by regulatory year (RY), which begins 1 July and ends 30 June (e.g., RY11 = 1 July 2011 through 30 June 2012).

Population composition and productivity have been periodically estimated in TMA using aerial or ground survey techniques (Gardner 2002). We conducted aerial composition surveys in a 990 mi^2 portion of TMA from early July through early August in 2006 through 2013 to determine population and composition trends. This area makes up about two-thirds of the available sheep habitat in TMA and was considerably more than the 580 mi^2 surveyed in 2002, 2003, and 2004. The 580 mi^2 trend count area surveyed during 2002–2004 falls entirely within the larger 990 mi^2 area surveyed during 2006–2013, but apparent population trends must be viewed with caution due to the difference in the size of the area surveyed.

Beginning in 2010, we analyzed horn size and age of harvested rams because few rams were harvested with horns ≥40 inches in length and lower than average horn sizes were noted during RY07–RY09 (Bentzen 2011). We continued these analyses during RY10–RY13, and compiled all ram harvest data from TMA from RY74 through RY13 for which sheep age, horn length, and base diameter were recorded and examined long-term trends in age and horn length. Because sheep age, horn length, and horn base are highly correlated we used multiple regression models to examine changes in horn measurements while controlling for sheep age. This allowed us to determine whether the horn length of sheep harvested in TMA has changed within individual age

groups. These analyses were conducted using SAS version 6.2 (SAS Institute, Inc. 1990) and $\alpha = 0.05$.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

We did not obtain a sheep population estimate for TMA during RY10–RY13. However, based on composition and survey data (Tables 1 and 2), the overall population appears to have been stable in areas surveyed during 2002–2012. Mild conditions in winters 2009–2010 and 2010–2011 likely benefited sheep survival in TMA and may have been responsible for the above average number of sheep observed in 2010 and 2011 (Fig. 1). The population likely declined in 2013 due to low recruitment in 2012 and 2013 and decreased adult survival during winter 2012–2013. Winter conditions persisted into May in 2013, and snow pack in the upper Tanana valley on 1 May was 353% above average (U.S. Department of Agriculture 2013). During the 2013 survey, 881 sheep were observed in the 990 mi^2 trend area, the lowest number of sheep observed since the survey began in 2006 and 30% lower than the 2006–2012 average of 1,254 sheep.

Population Composition

Annual population composition surveys were conducted during 8–28 July in 2011–2013 (Tables 1 and 2). In 2011, lamb production was high (35 lambs:100 ewes; counts of ewes may include some young rams) and lambs composed 18% of the total population. This was similar to the average lamb production of 34 lambs:100 ewes and 19% lambs in the population during 2002–2010. In 2012 and 2013, lamb production declined to 16 lambs:100 ewes and 14 lambs:100 ewes, respectively, with an average of 8% lambs in the population. This reduction followed 2 severe winters, but lamb production remained greater than the 30-year low of 10 lambs:100 ewes observed in 2000. During winter 1999–2000, severe weather with deep snow prevailing into the lambing period preceded a shorter than average growing season. This affected sheep populations throughout Interior Alaska. Comparable reductions in sheep populations and productivity throughout the Interior were also observed in 2013 due to similar severe winter and spring weather conditions.

The proportion of all rams in the population that were full curl declined from an average of 24% during 2002–2007 to an average of 18% during 2008–2013. A low of 16% was observed in 2010. In contrast, composition data collected during the 1980s indicated that full-curl rams composed ≥36% of the rams in the population. However, comparisons of composition data from prior to 2002 should be made with caution since survey techniques varied. High lamb survival during 2002–2004 and reduced harvest in 2010 may have contributed to a slight increase in the proportion of full-curl rams in the population in 2012 and 2013.

Distribution and Movements

Heimer and Watson (1986) summarized movement and distribution data of ewes in the TMA. During RY10–RY12 we collected no additional data on distribution and movements.

MORTALITY

Harvest

Season and Bag Limit. We issued 80 permits annually in TMA during RY10–RY11, and 86 permits in RY12 (Table 3). Permits were split evenly between DS102 and DS103. In RY11 and RY12, an additional permit, the Alaska Governor's TMA Dall Sheep permit, was auctioned to raise funds for wildlife research and management in Alaska. The hunting season for DS102 was 10 August–25 August and for DS103 was 26 August–20 September, and both permits had a bag limit of 1 full-curl ram every 4 regulatory years. Harvest was limited to rams ≥8 years old or those with at least 1 full-curl horn or both horns broken (broomed).

Alaska Board of Game Actions and Emergency Orders. Increasing numbers of nonresident applications, and a larger proportion of permits allocated to nonresident hunters resulted from the ability of applicants to apply on the Internet. In 2006 the Alaska Board of Game (board) passed a proposal which took effect in RY07 limiting nonresidents to a maximum of 10% of sheep permits issued in TMA. This ensures that resident hunters continue to have a higher probability of receiving these valued permits, and addressed concerns of high harvest of full-curl rams due to the disproportionately high success rates of guided nonresident hunters.

In 2008 the board reviewed a proposal to divide the permits among 2 periods using ADF&G's discretionary permit authority. The board supported the plan, and starting in RY09, we issued 50 permits for 10–25 August (DS102), and 50 permits for 26 August–20 September (DS103).

In 2010 the board received a proposal to reduce the number of permits from 100 to 80 following 3 years (RY07–RY09) in which the percent of harvested rams with horns ≥40 inches in length was at or below the management objective of 7%. Although the board supported the idea, it took no action on this proposal because ADF&G has discretionary permit authority to issue fewer permits. In 2010 we issued 80 permits: 40 each for the early (DS102) and late season (DS103).

No board actions were taken and no emergency orders were issued during RY10–RY12.

Harvest by Hunters. During RY10–RY12, annual harvest ranged 25–31 rams ($\bar{x}$ = 27). The previous 5-year mean harvest was 42 rams (Table 3); however, fewer permits were issued during RY10–RY12 than during the previous 5 years. No ewes have been reported harvested in TMA since before 1990. Hunter participation averaged 79% during RY10–RY12, lower than the 85% participation during the previous 5 years. Hunter participation has generally increased since 1990, when 72% of permit recipients hunted, to a high of 90% participation in RY03. Overall, participation is expected to remain high because of the area's reputation for high success and few hunters.

Mean horn length during RY10–RY12 was 37.0 inches compared to the previous 5-year mean of 36.1 inches (Table 3). The percentage of rams in the annual harvest with horns ≥40 inches averaged 17% (n = 3–7) with a record high of 23% in RY11. This compares with the RY05–RY09 mean of 9%. Furthermore, while no rams with horns ≥43 inches were taken during RY04–RY09, 1 ram with horns ≥43 inches was taken during RY10–RY12. The average reported age of rams harvested during RY10–RY12 was 8.7 years, slightly younger than the previous 5-year mean of 9.1 years. This suggests that favorable environmental conditions during RY10–RY12

and RY07–RY09 may have resulted in more rapid horn growth in some cohorts, resulting in an increased overall average horn size in the population.

Among records of 1,519 sheep harvested during RY74–RY13, sheep age, horn length and base size data were available for 1,266 sheep (data for RY81, RY82, RY83, and RY85 are incomplete or unavailable). Although the average size of sheep horns has not changed significantly since the creation of TMA ($F = 0.43$, $P = 0.510$), the average age of sheep harvested has increased from 8.2 to 9.1 years ($F = 19.66$, $P < 0.0001$). Furthermore, although multiple regression models, controlling for the age of the sheep indicate there has been a statistically significant decrease in horn length from RY74 to RY13 ($F = 137.84$, $P < 0.0001$), the decrease is small (e.g., the model suggests a 0.2 inch decrease for 8-year-old rams from RY74 to RY13) and likely has little management significance for sheep in TMA.

These results must be interpreted with caution because the models make a number of assumptions. Records of which sheep horns were broken (broomed) are poor prior to RY00; therefore, broomed rams were not eliminated from the analysis, and the harvest data include unknown numbers of broomed horns. We must assume that the proportion of broomed rams has not changed since 1974. We eliminated all 13-, 14-, and 15-year-old sheep from the analysis due to very small sample size and the high probability of broomed horns. Prior to RY04 all data are from hunter harvest reports, and some hunters may overestimate the sheep age and horn length. However, starting in RY04 ADF&G staff collected all horn length and age data, and no pronounced changes were detected in age or horn length following this change. The assumptions of multiple regression for normal distribution of residuals of horn length, age, and year were met for all models.

Many factors may influence horn growth among rams in TMA. These include 1) forage quality, 2) weather events and subsequent sheep nutrition, 3) genetic changes from movements of sheep in or out of the population, and 4) a long-term response to the selective hunting pressure on rams with the best horn growing potential. Hoefs and Nowlan (1997) found that captive Dall sheep rams had significantly greater horn growth than their wild counterparts in Yukon, Canada, and Bunnell (1978) found that Dall sheep horn growth was influenced by precipitation early in the growing season. These studies suggest that horn growth within a population is predominantly influenced by forage quality and fluctuates depending on primary productivity. Moreover, if horn growth is largely a factor of climate-mediated effects on primary productivity, selective hunting pressure on large-horned rams should have little influence on the genetic quality of the population (Hik and Carey 2000).

Although long-term average horn length has changed little since the creation of TMA, there is interannual variation and horn growth in TMA likely fluctuates through time. However, length and basal circumference of annual growth segments necessary to assess changes in horn growth on a yearly basis are not available to assess this relationship in the TMA sheep population.

Hunter Residency and Success. During RY10, RY11, and RY12, 3,341, 3,055, and 3,119 applicants applied for 40–43 DS102 permits and 2,339, 2,100, and 2,258 applicants applied for 40–43 DS103 permits. This resulted in an average of a 0.8% and 1.8% chance of being drawn for a DS102 and DS103 permit respectively.

During RY10–RY12, 88% of participating hunters were Alaska residents, who took 78% of the harvested rams (Table 4). Seven to 9 nonresidents (9–10% of permittees) were drawn annually and 92% hunted, compared to 77% of selected residents.

During RY10–RY12, the mean annual success rate was 42% (range 40%–46%), which was below the RY05–RY09 mean annual success rate of 50% (Table 4). During RY10–RY12, hunters had the greatest success in RY11 (46%) when successful hunters spent an average of 5.1 days in the field. Successful hunters were in the field 4.0 and 4.2 days during RY10 and RY12. Despite hunter concerns about an increased difficulty in finding legal rams in TMA the average number of days successful hunters spent in the field has not increased. During RY85–RY94, RY95–RY04, and RY05–RY12, successful hunters spent an average of 5.0, 5.3, and 4.5 days in the field respectively. Favorable weather is frequently the primary reason hunters spend more time hunting during certain years, which increases their chance of successfully harvesting a sheep.

Harvest Chronology. During RY10–RY12, an average of 14 (43% success) rams were harvested in the early season (DS102) and 12 (39% success) in the late season (DS103). Eighty-six percent and 47% of the harvest occurred in the first week of both seasons. Participation averaged 80% in the first season and 76% in the later season.

Transport Methods. Airplanes were the primary method of transport during RY10–RY12 (Table 5). During this report period, 75% of successful hunters used aircraft to access the area and there was a similar use of ATVs (7%), ORVs (7%), and highway vehicles (10%). During RY10–RY12, the average success rate for hunters who used aircraft was 46%, while success rates were 32% for hunters who used ATVs, ORVs, or highway vehicles.

Other Mortality

Severe winter weather and predation are the most important natural mortality factors for Dall sheep (Murie 1944, Heimer and Watson 1986, Heimer 1988). Based on numbers of sheep sighted and lamb ratios during 2002–2011 composition surveys, it appears that adult survival and lamb productivity was good during RY01–RY07 and RY09–RY10. Although survival may have been affected across all age classes during the severe winter conditions of 2008–2009, there appeared to be little effect on lamb production in 2009. In 2012, a late cool spring with more snowfall in TMA during May and June likely affected lamb survival, and prolonged winter conditions during 2012–2013 with deep snow during May following freezing rain and ice likely affected survival of all age classes, including lambs.

The overall limiting effects of wolf, bear, coyote, and golden eagle predation on the TMA sheep population are not known. Dall sheep are not normally a preferred prey of wolves, and wolf surveys in portions of Unit 12 indicate wolf numbers have been stable since 2003 (Bentzen 2012). Both coyote and golden eagle predation can be important when these predator numbers are high. Based on anecdotal data and hare pellet count transects (Krebs et al. 2001) conducted in eastern Unit 12 within the Tetlin National Wildlife Refuge, the snowshoe hare population peaked in 2007–2008 and was at or near the bottom of the cycle in 2013 (Tetlin National Wildlife Refuge, Tok, Alaska, unpublished data, 2014). Recent studies in the central Alaska Range indicate that coyote predation on Dall sheep is greatest during the peak and initial decline of cyclic hare populations (Arthur 2003, Arthur and Prugh 2010). Therefore, coyote predation may

have played a role in limiting the TMA sheep population during the hare peak in 2007–2008 and hare decline during 2009–2010.

Few incidences of diseased sheep have been reported in TMA and we do not believe disease was a limiting factor to population growth during RY10–RY12. We have no data estimating mortality due to accidents.

HABITAT

Assessment

TMA consists of rugged, glaciated terrain with *Dryas*-dominated habitats. Mixed bunch-grass and forb communities are also available and important to sheep in TMA. Currently the habitat condition in TMA is not well understood. Additional studies of possible changes in forage quality and availability are needed to address their potential impact on Dall sheep within TMA.

The largest threat to TMA Dall sheep habitat is the possibility of mining development. The upper Tok River, upper Robertson River, and Rumble Creek drainages are mineralized and could be developed. Mining exploration is ongoing throughout the east fork of the Robertson River and in the upper Tok River, both of which are areas that support high numbers of sheep. We will continue to coordinate with ADF&G's Habitat Division to minimize impacts.

NONREGULATORY MANAGEMENT PROBLEMS AND NEEDS

TMA was created in 1974 to provide a limited number of Dall sheep hunters the opportunity to harvest large-horned, trophy rams. Trophy sheep were not defined, but the objectives to maintain an average harvest of rams with horns ≥36 inches, including a minimum percentage of rams with horns ≥40 inches (7%), indicate that horn quality should be an important aspect of TMA management. Results of a hunter survey in 2000 and suggestions for management actions in TMA that are appropriate to meet the trophy quality expectations of hunters and maintain pristine hunting conditions were summarized by Gardner (2002). Differences were found between user groups in both the philosophies and definitions of trophy rams and what was acceptable hunting opportunity and hunter crowding. However, over 90% of survey respondents generally supported the current management objectives for maintaining the limited number of drawing permits, limiting harvest to benefit trophy ram management, and preventing hunter crowding. Ninety-eight percent of TMA applicants supported maintaining uncrowded hunting conditions. In 2002, the number of permits offered was reduced from 121 to 101 to ensure that management objectives continue to be met. This number of permits was further lowered to 81 permits in 2010 following concerns of guides and local residents over the low number of rams with horns over 40 inches harvested during 2007, 2008, and 2009.

CONCLUSIONS AND RECOMMENDATIONS

During RY10–RY12, average horn length and age of harvested rams met the minimum harvest management objectives of mean horn size of >36 inches and mean age of >8 years, while the percentage of harvested rams with horns >40 inches exceeded minimum objectives. However, harvests of 26 rams in RY10 and 25 rams in RY12 did not meet the harvest objective of 30–45 rams per year. This was a result of both a lower number of permits issued, and lower participation and success rates. Based on the low number of permits issued annually during RY10–RY12, it is likely that we met the objective to maintain at least 60% hunter satisfaction

with aesthetically pleasing, uncrowded, hunting conditions. However, precise hunter satisfaction estimates are difficult to determine without hunter surveys; therefore, this objective will be removed for the next report period, and the management goal to provide an opportunity to hunt under aesthetically pleasing conditions will be modified to include a reference to uncrowded hunting conditions.

Mean horn size of rams harvested during RY10–RY12 was high (37.0 inches). This may be a result of both a decrease in the number of permits awarded beginning in 2010 and favorable environmental conditions for horn growth. Although the average age of harvested rams has increased since the inception of TMA, overall average horn size has not changed. Furthermore, average horn size by age has decreased, but this decrease is minimal. Horn growth in TMA may follow a cyclic pattern similar to that observed in Yukon, but we are not able to assess this possibility without measurements of annual growth.

Although the TMA sheep population generally appears to be stable, long-term consistency in areas surveyed are needed for precise estimates of population status and trends. We now have 11 years of consistent survey data from TMA, although analysis of population status and trends must be made with caution since only a portion of TMA is surveyed and a TMA-specific sightability correction factor does not exist. Lamb ratios were above 30 lambs:100 ewes during 2002–2011, which indicates the population was not limited by production but by mortality related to specific winter weather events during this period. However, the population was likely limited by recruitment in 2012 and 2013 when prolonged winter conditions into springtime reduced lamb ratios to below 16 lambs:100 ewes.

Since the inception of TMA, the number of permits awarded have been decreased twice (2002 and 2010) but a corresponding increase in the number of permits has yet to occur. Therefore, ADF&G, in conjunction with the Upper Tanana Fortymile Advisory Committee, is in the process of developing a more systematic method to aid in determining the number of permits to be awarded based on survey and harvest data. One goal will be to allow for maximum participation in the TMA hunt while simultaneously achieving management objectives. We will also continue to monitor and investigate the effects of permit numbers on harvest. Complaints from hunters concerning the reduced number of permits or hunter crowding were low, but public opinion on trophy quality and the aesthetic importance of an uncrowded hunt have not been quantified since 2000. We recommend surveys of public opinion to reassess the desires of sheep hunters following recent changes in sheep management.

For the next report period the management objectives and goals will be:

MANAGEMENT GOALS

- Provide for diversified recreational uses of wildlife.
- Provide for the opportunity to be selective in hunting.
- Provide an opportunity to hunt under aesthetically pleasing, uncrowded, conditions.

MANAGEMENT OBJECTIVES

- Maintain abundance of mature rams sufficient to produce a harvest of 30–45 rams with mean horn size of >36 inches and mean age of >8 years.

- Maintain an average of at least 7% rams with 40-inch or greater horns in the harvest.

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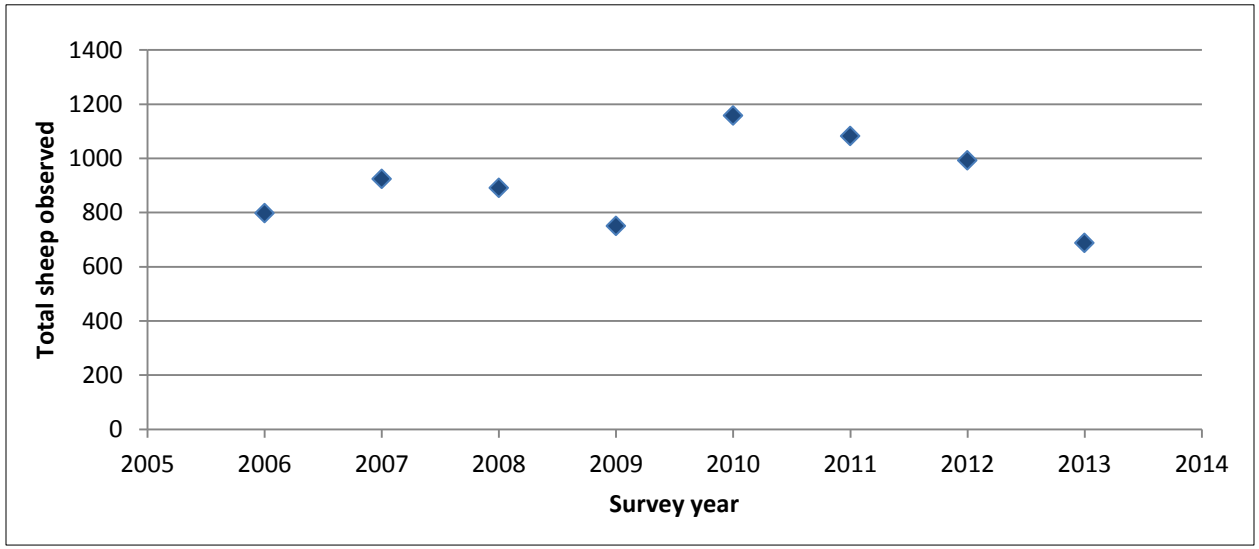

Figure 1. Numbers of Dall sheep observed in a 990 mi^2 trend count area[a] within the Tok management area from 2006 through 2013.

[a] Area includes all drainages flowing into the Tok River from the Tok glacier to the Glenn Highway, the Clearwater Creek drainages, Mount Neuberger, and the mountains between Yerrick Creek and the Robertson River, the mountains between Rumble creek and the upper Tok River and all drainages flowing into the west bank of the West Fork Robertson River.

Table 1. Tok management area sheep composition counts from aerial surveys, 2002–2013.

	Rams				Other Sheep					
Year	Legal rams[a]	Sublegal rams[b]	Unclassified rams	Total rams	Ewes[c]	Lambs	Unidentified sheep	Total other sheep	Total sheep	Area surveyed[d] (mi^2)
2002	85	264	0	349	466	187	1	654	1,003	580
2003	53	182	0	235	692	224	7	923	1,158	580
2004	65	153	0	218	593	186	0	779	997	580
2006	56	179	1	236	580	207	27	814	1,050	990
2007	54	196	0	250	683	245	0	928	1,178	990
2008	66	202	18	286	716	245	0	961	1,247	990
2009	52	235	0	287	562	187	0	749	1,036	990
2010	64	319	12	395	833	250	0	1,083	1,478	990
2011	63	365	0	428	753	263	1	1,017	1,445	990
2012	82	362	0	444	782	121	0	903	1,347	990
2013	61	268	0	329	485	67	0	552	881	990

[a] Full curl or larger.

[b] Greater than ¼-curl but less than full curl.

[c] Ewe classification also includes yearlings of both sexes and rams of ¼-curl or less.

[d] The area surveyed during 2002–2004 is included within the larger area surveyed during 2006–2013.

Table 2. Tok management area Dall sheep composition ratios from aerial surveys, 2002–2013.

Year	Legal rams: 100 ewes	Sublegal rams: 100 ewes	Total rams: 100 ewes[a]	Lambs: 100 ewes	Lambs % of total
2002	18	57	75	40	19
2003	8	26	34	32	19
2004	11	26	37	31	19
2006	10	31	41	36	20
2007	8	29	37	36	21
2008	9	28	40	34	20
2009	9	42	51	33	18
2010	8	38	47	30	17
2011	8	49	57	35	18
2012	11	46	57	16	9
2013	13	55	68	14	8

[a] Total includes unclassified rams.

Table 3. Tok management area harvest of Dall sheep rams, regulatory years[a] 1990–2012.

Hunt no.	Regulatory year	Permits issued[b]	% Successful hunter	% Unsuccessful hunter	% Did not hunt	$\bar{x}$ Horn length	$n \geq 40''$ (%)	$\bar{x}$ Age	Total harvest
DS102	1990	120	44	56	28	37.0	6 (17)	9.2	36
	1991	120	56	44	23	36.9	9 (17)	8.9	52
	1992	120	42	58	26	37.1	6 (16)	8.6	37
	1993	120	42	58	13	37.3	6 (13)	9.0	44
	1994	120	46	54	28	36.9	3 (8)	9.2	39
	1995	120	39	61	18	37.2	8 (13)	9.4	38
	1996	120	56	44	17	36.2	5 (9)	8.9	56
	1997	120	43	57	20	36.5	3 (7)	8.9	41
	1998	120	54	46	13	36.2	4 (7)	9.0	56
	1999	120	40	60	13	36.3	4 (10)	9.5	42
	2000	121	34	66	19	36.1	3 (9)	9.3	33
	2001	121	34	66	17	35.4	3 (9)	8.7	34
	2002	101	39	61	13	36.2	3 (9)	8.9	34
	2003	101	52	48	10	35.6	4 (9)	8.7	46
	2004	101	59	41	21	36.5	5 (11)	8.4	47
	2005	101	53	47	16	36.1	4 (9)	8.6	45
	2006	101	49	51	17	36.8	9 (22)	9.4	41
	2007	101	46	54	14	35.6	3 (7)	8.7	40
	2008	101	51	49	15	36.4	2 (5)	9.6	44
DS102	2009	101	51	49	17	35.7	2 (5)	9.2	42
and	2010	80	40	60	19	36.9	3 (12)	8.9	26
DS103[c]	2011	81	46	54	17	37.5	7 (23)	8.8	31
	2012	87	40	60	28	36.5	4 (16)	8.3	25

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory 1990 = 1 July 1990–30 June 1991).
[b] Beginning in regulatory year 2000, includes an additional Alaska Governor's TMA Dall sheep permit.
[c] Permits were split evenly between DS102 and DS103 beginning in regulatory 2009, except 2010 (DS102 = 40 + DS103 = 39 + Governor's permit = 80 total).

Table 4. Tok management area sheep hunter residency and success, regulatory years[a] 1990–2012.

Regulatory year	Successful				Unsuccessful				Total hunters
	Local resident[b]	Nonlocal resident	Nonresident	Total (%)	Local resident[b]	Nonlocal resident	Nonresident	Total (%)	
1990	2	31	3	36 (44)	3	43	0	46 (56)	82
1991	3	47	2	52 (56)	0	38	3	41 (44)	93
1992	4	30	3	37 (42)	4	46	2	52 (58)	89
1993	3	39	2	44 (42)	6	54	1	61 (58)	105
1994	4	31	4	39 (46)	4	40	2	46 (54)	85
1995	9	44	7	60 (61)	2	37	0	39 (39)	99
1996	7	44	5	56 (56)	2	40	2	44 (44)	100
1997	3	35	3	41 (43)	8	45	1	54 (57)	95
1998	1	55	0	56 (54)	2	43	2	47 (46)	103
1999	2	39	1	42 (41)	1	58	2	61 (59)	103
2000	0	29	4	33 (34)	1	63	1	65 (66)	98
2001	2	27	5	34 (34)	3	60	4	67 (66)	101
2002	2	30	2	34 (39)	6	47	1	54 (61)	88
2003	6	38	2	46 (52)	7	33	2	42 (48)	88
2004	0	42	5	47 (59)	0	31	2	33 (41)	80
2005	0	32	13	45 (53)	0	37	3	40 (47)	85
2006	2	27	12	41 (49)	1	41	1	43 (51)	84
2007	0	31	9	40 (46)	0	45	2	47 (54)	87
2008	2	32	10	44 (51)	0	41	1	42 (49)	86
2009	0	31	11	42 (50)	1	41	0	42 (50)	84
2010	3	19	4	26 (40)	1	35	3	39 (60)	65
2011	3	21	7	31 (46)	0	36	0	36 (54)	67
2012	1	17	7	25 (40)	2	34	2	38 (60)	63

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory 1990 = 1 July 1990–30 June 1991).

[b] Local resident includes residents of Units 12, 13, 20E, or 20D.

Table 5. Tok management area sheep harvest percent by transport method, regulatory years[a] 1990–2012.

Regulatory year	Harvest percent by transport method								*n*
	Airplane	Horse	Boat	3- or 4-wheeler	Snowmachine	ORV	Highway vehicle	Unknown	
1990	53	0	0	8	0	3	36	0	36
1991	63	2	0	0	0	6	27	2	52
1992	57	3	0	3	0	3	30	3	37
1993	75	0	0	5	0	0	18	2	44
1994	82	0	0	3	0	0	13	3	39
1995	63	0	0	6	0	5	20	5	60
1996	63	2	2	7	0	0	23	4	56
1997	73	0	0	12	0	0	15	0	41
1998	54	0	0	5	0	4	36	2	56
1999	57	0	0	21	0	0	21	0	42
2000	67	0	0	18	0	6	6	3	33
2001	85	0	0	3	0	0	12	0	34
2002	74	0	0	18	0	0	9	0	34
2003	57	0	0	20	0	0	17	7	46
2004	85	0	0	4	0	0	6	4	47
2005	80	0	2	4	0	0	9	4	45
2006	56	0	7	15	2	5	12	2	41
2007	83	0	0	5	0	0	12	0	40
2008	70	0	2	5	0	5	17	2	44
2009	62	0	0	12	0	10	16	0	42
2010	73	0	0	8	0	11	8	0	26
2011	71	0	0	10	0	6	13	0	31
2012	80	0	0	4	0	4	8	4	25

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory 1990 = 1 July 1990–30 June 1991).