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CHAPTER 5: DALL SHEEP MANAGEMENT REPORT

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

LOCATION

GAME MANAGEMENT UNIT: Portions of 12 (10,000 mi^2)

GEOGRAPHIC DESCRIPTION: Mentasta, Nutzotin, and northern Wrangell Mountains

BACKGROUND

Dall sheep in the northern Wrangell, Mentasta, and Nutzotin (WMN) mountains live at relatively high densities, mostly in rugged, glaciated habitats. Most rams from the WMN sheep population have smaller than average horns compared to other sheep populations in Alaska (Heimer and Smith 1975). The relative abundance of sheep and production of rams with relatively small horns indicates that conservative harvest for maximum trophy production would be an unsuitable management strategy for consumptive use in this area (Kelleyhouse and Heimer 1989). Consequently, the management objective for Unit 12 reflects our strategy to provide the greatest opportunity to participate in hunting sheep while maintaining a healthy population.

Kelleyhouse and Heimer (1990) reported that the Unit 12 sheep population increased between the late 1970s and mid-1980s, and then stabilized about 1988. The population likely declined during the early 1990s due to adverse weather and possibly predation, and increased during 1994–1999 when incidental sightings and surveys suggested lamb production was relatively high (Gardner 1999). Sheep numbers then stabilized or declined, perhaps due to adverse weather in winters 1999–2000 and 2000–2001, and aerial surveys suggest local declines in the population from 2002 to 2005 (Bentzen 2008). Severe conditions in winter 2008–2009 likely caused further declines in some areas.

The number of sheep hunters, harvest, and success rate all decreased during regulatory years (RY; regulatory year begins 1 July and ends 30 June, e.g., RY04 = 1 July 2004–30 June 2005) RY04–RY09. A similar decrease was observed during RY93–RY01 when low numbers of legal rams followed poor recruitment and survival during 1991–1993. Legal ram numbers increased during RY01–RY03 but have likely declined since, especially following the severe winter conditions of 2008–2009.

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

MANAGEMENT DIRECTION

MANAGEMENT GOAL

- Maintain a harvestable population of Dall sheep fluctuating within historical limits of abundance and the carrying capacity of their habitat.

MANAGEMENT OBJECTIVE

- Maintain an average horn size on harvested rams of ≥34 inches during the report period.

Related Management Activity

- Monitor harvest through hunter contacts and harvest reports.

METHODS

We monitored harvest by analyzing data from general harvest reports including harvest success, hunt area, hunter participation rate, residence, effort, transportation type used to access the hunt area, horn size, and ram age. Harvest data were summarized by regulatory year.

We estimated Dall sheep population composition using aerial survey data collected primarily within the Wrangell–St. Elias Preserve. During RY10–RY12 we conducted surveys between 23 June and 31 July in the Nutzotin Mountains between the Chisana Glacier and Cross Creek (count area 4E; Fig. 1); between Snag and Carl creeks and the Canada border (count area 7E); between Snag, Carl, and Beaver creeks and the Chisana River (count area 7W); and between Solo Flats and the Canada border (count area 9). Furthermore, the National Park Service surveyed between the Nabesna Glacier and Cross Creek (count area 4W) and the Nutzotin Mountains between Star and Stuver creeks and the Chisana River (count area 5E). Results from surveys in the Wrangell, Nutzotin, and Mentasta mountains prior to this report period are included in Tables 1–3 to better present population and composition trends in Unit 12. Piper Super Cubs (PA-18) were used to conduct all surveys. Surveys were flown along contours in suitable sheep habitat, and flight paths were maintained at 300–700 feet above ground level at airspeeds of 60–80 mph. We classified sheep as rams, ewes, or lambs based on horn size and body conformation. Ewes included young rams (≤1/2-curl) that could not be distinguished from ewes. Rams were also classified as either legal (full curl or both horns broomed) or sublegal (>1/2-curl but less than full curl).

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population size

The sheep population in the WMN Mountains was likely stable or slightly declining during 2005–2011 and likely declined in some areas during 2011–2013 (Table 1). Count areas 4E, 5E, 7W, 7E, and 9 were surveyed in 2011 and count areas 4W, 7E, and 9 were surveyed in 2013. Compared to 2011, 50% fewer sheep were observed in 2013 in count area 7E, but similar numbers of sheep were observed in 2011 and 2013 in count area 9. In spring 2013, freezing rain and ice followed by prolonged winter conditions with deep snow during May (U.S. Department of Agriculture 2013) likely affected adult survival as well as lamb production and survival.

Population Composition

Weather, predation, and harvest management directly influence annual composition of the population (Heimer 1988). Weather conditions are likely the primary factors limiting lamb production and population growth in this area, while harvest may be a primary factor limiting older-age ram production. The effects of predation on sheep composition in the WMN Mountains are unknown, but predation may also be a significant factor in some years.

Composition data are not directly comparable between years because different areas were sampled each year. Nevertheless, survey data from 1971–2013 are included in Tables 1–3 because these population indicators frequently exhibited consistent trends between areas. During 2005–2011, lamb abundance appeared to be moderate to high and ranged 24–43 lambs:100 ewes among areas surveyed (14–23% lambs in the population; Table 1). Recruitment was low in all areas surveyed in 2012 and 2013 and ranged 19–22 lambs:100 ewes (12–14% lambs in the population). This was likely a result of severe and prolonged winter conditions during spring 2012 and 2013.

The abundance of legal rams remained low to moderate during RY10–RY12. In the 1990s, legal ram abundance was low to moderate in all areas surveyed and ranged 1–12 legal rams:100 ewes (Tables 1–3). With few exceptions, legal ram abundance was similar during the 2000s. During RY10–RY12, legal rams ranged 2–10 legal rams:100 ewes in all areas surveyed and the proportion of the total ram population composed of full-curl rams ranged from 6% in 2013 in the eastern Nutzotin Mountains (count area 7E) to 19% in 2011 in the western Nutzotin Mountains (count areas 4W and 5E; Table 1). Since 2001, large decreases in the number of legal rams were observed in the Nutzotin Mountains (count areas 5E, 7W and 7E). A low abundance of legal rams was also recorded during aerial surveys by National Park Service staff in 2009 in portions of the heavily hunted count area 3 where only 3 full-curl rams were observed per 100 ewes. Ratios of sublegal rams:100 ewes ranged 37–68 in all areas surveyed since 2005 (with the exception of count area 9 in 2012, where only a portion of the area was surveyed; Table 1). This suggests that recruitment of 8-year-old rams was low in most areas; however, additional surveys in the same areas each year are needed to fully assess the effects of harvest on numbers of legal rams and the population composition in the WMN Mountains.

Distribution and Movements

Information on distribution and movements of Dall sheep within Unit 12 are limited. Kelleyhouse and Heimer (1989) reported that Dall sheep occur in steep terrain throughout the WMN Mountains primarily near *Dryas*-dominated feeding areas at 4,000–7,000 ft elevation. Although small mineral licks occur throughout the area, 3 large mineral licks located in Lost Creek, Sonya Creek, and East Fork Snag Creek drainages concentrate sheep during summer. During winter, most sheep concentrate on windswept alpine ridges, but snow accumulation occasionally forces sheep to brush fields at lower elevations. There are no data to indicate whether distribution and movements have changed since that time.

MORTALITY

Harvest

Season and Bag Limit. The sheep hunting season for resident and nonresident hunters during RY10–RY12 was 10 August–20 September with a bag limit of 1 ram with full-curl horn or larger or with both horns broomed.

Alaska Board of Game Actions and Emergency Orders. The Alaska Board of Game passed a proposal requiring sheep horns to be sealed in most areas of the state. Starting in RY06, horns of all Dall sheep legally harvested in Unit 12 have been sealed using a uniquely numbered aluminum plug. Since RY07 this included sheep harvested under subsistence regulations, although many sheep harvested under subsistence regulations in Unit 12 remain undocumented. No new Board of Game regulations or emergency orders were issued during RY10–RY12.

Harvest by Hunters. During RY10–RY12, 243–255 hunters ($\bar{x}$ = 248) reported taking 67–77 rams ($\bar{x}$ = 72; Tables 4 and 5), a 36% decrease from harvest during RY07–RY09 and a 49% decrease from harvest during RY04–RY06. The number of sheep hunters in the WMN Mountains steadily declined from 332 in 2007 to 246 in 2012. Total numbers of sheep hunters fluctuated in the past with similar patterns of increases and declines, but 2011 and 2012 saw the fewest sheep hunters in the WMN Mountains since at least 1990.

Mean horn length among harvested rams was 34.7 inches during RY10–RY12 and has changed little since RY96. The previous 5-year and 10-year average horn lengths were both 34.7 inches (Table 5). These horn lengths are slightly longer than the averages of 33.6 inches and 34.1 inches recorded in RY81–RY85 and RY86–RY90 respectively. The increase is likely due to the change in regulations that allowed only full curl or larger rams to be harvested after RY84.

During RY10–RY12, 4 rams had horns ≥40 inches (1.9%) and the mean reported age of harvested rams was 7.7 years, considerably lower than the RY07–RY09 average of 8.5 years. The average age of harvested rams in RY11 and RY12 was the lowest reported since age data was first collected in RY91. This is in part due to a smaller percentage of older age rams in the harvest: 17% of harvested rams in RY10 were ≥10 years compared to 8% and 10% in RY11 and RY12, respectively.

Similar to previous reporting periods, areas within the WMN Mountains that produced the largest rams (≥38 inches) were along the Nabesna Glacier, Cheslina River, Snag Creek, and the upper Tetlin River. The Tetlin River is within Tetlin Native Corporation lands and was closed to most hunting, except by Tetlin Native Corporation shareholders. The other areas were difficult to access.

Hunter Residency and Success. The overall success rate of 29% during RY10–RY12 was the lowest reported success rate since at least 1990 (Table 4). By comparison, success averaged 37% during RY07–RY09 and 46% during both RY04–RY06 and RY01–RY03. Nonresident success rates (60–69%) were much higher than resident success rates (21–22%) during RY10–RY12. The primary reasons nonresidents were more successful were that most of them were guided and they hunted in the highest density sheep areas in remote portions of the unit. Few residents traveled to these areas; they hunted mainly from the Nabesna Road or Glenn Highway, where legal ram numbers were low. During RY10–RY12, nonresidents made up 25% of the sheep hunters and took 37% of the total harvest. Successful hunters spent an average of 4.6 days in the field, which is slightly more than the 4.3 and 4.2 days during RY07–RY09 and RY04–RY06, respectively.

Harvest Chronology. Most sheep were taken early in the hunting season (Table 6). During RY10–RY12, 35–42% ($\bar{x}$ = 39%) of the harvest was taken during the first week. Harvest

decreased dramatically to an average of 16% of rams taken during each of the next 3 weeks, and 7% of rams were harvested during the final week.

Transport Methods. During RY10–RY12, airplanes and horses were used by 58–76% of successful hunters (Table 7). Harvest by hunters who used aircraft and horses made up 50% and 18% of the total harvest respectively. Success rates for nonresidents were much higher than residents who used these methods (airplanes 65% vs. 28%; horses 74% vs. 43%) because most nonresidents were guided and hunted in the better quality areas. Annually during RY10–RY12, 15–28% of successful hunters used 4-wheelers or highway vehicles and 7–12% of successful hunters used boats to access sheep habitat. There was more reported use of boats by successful hunters during RY09–RY12 than RY90–RY08. Hunters who used 4–wheelers, highway vehicles, and boats averaged 13%, 17%, and 37% success, respectively. Resident hunters were the primary users of these transportation methods ($\bar{x}$ = 97%).

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). Weather conditions seem to be the primary factors limiting population growth in this area, while predation may also be a significant factor in some years. However, we did not conduct studies to determine changes in the rate or type of natural mortality during RY10–RY12 compared to those reported by Kelleyhouse and Heimer (1989), who noted predation by golden eagles, coyotes, and wolves. In 2012, a late cool spring with more snowfall during May and June likely affected lamb survival, and prolonged winter conditions during 2012–2013, with freezing rain and ice followed by prolonged winter conditions and deep snow during May likely affected survival of all age classes, including lambs.

The role of predators as a limiting factor during RY10–RY12 is unknown. Coyotes are important predators on lambs in the central Alaska Range (Scotton 1998, Arthur and Prugh 2010) and local Unit 12 residents have observed coyotes killing older sheep. Based on anecdotal data and hare pellet count transects (Krebs et al. 2001) conducted in eastern Unit 12, the snowshoe hare population peaked in 2007–2008 and was at or near the bottom of the cycle in 2013 (Tetlin National Wildlife Refuge, 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 sheep population during the hare population peak (2007–2008) and decline (2009–2010). Golden eagles can also be a significant predator on Dall sheep lambs (Arthur 2003, Arthur and Prugh 2010); however, golden eagle numbers in Unit 12 during RY10–RY12 are unknown. Sumanik (1987) determined that wolves were present at 5–7 wolves/1,000 km^2 in the nearby Kluane region of Canada, but were not a significant predator on Dall sheep in that area.

HABITAT

Assessment

The WMN Mountains are glaciated and offer steep, rugged terrain with excellent escape cover near feeding areas dominated by *Dryas* species. Human development has not substantially affected sheep habitat, and the present landownership pattern is expected to protect most habitat in the future.

CONCLUSIONS AND RECOMMENDATIONS

During RY10–RY12 we met the management goal to maintain a harvestable population of Dall sheep fluctuating within historical limits of abundance and the carrying capacity of their habitat. Unit 12 continued to be one of the most hunted game management units in the state for sheep, although the number of hunters and total harvest has been decreasing since RY04. Aerial surveys conducted during RY10–RY12 suggest a decline in sheep numbers in some areas and low recruitment in all areas during spring 2013. There continues to be a low proportion of legal rams in the Mentasta and eastern Nutzotin mountains. Consistent surveys in regular survey areas are needed to better understand local population fluctuations.

As in RY07–RY09, more people used southern Unit 12 during RY10–RY12 for wildlife viewing, especially in Wrangell–St. Elias National Park and Preserve. Several hunting guide operations and summer guiding operations offered trips to wildlife viewers.

Although we met the management objective to maintain an average horn size on harvested rams of ≥34 inches during RY10–RY12, success rates were low and hunter numbers continue to decline. The average number of days successful hunters spent in the field increased slightly from RY07–RY09, suggesting that legal rams were more difficult to find during RY10–RY12. No changes to season or bag limits are recommended at this time.

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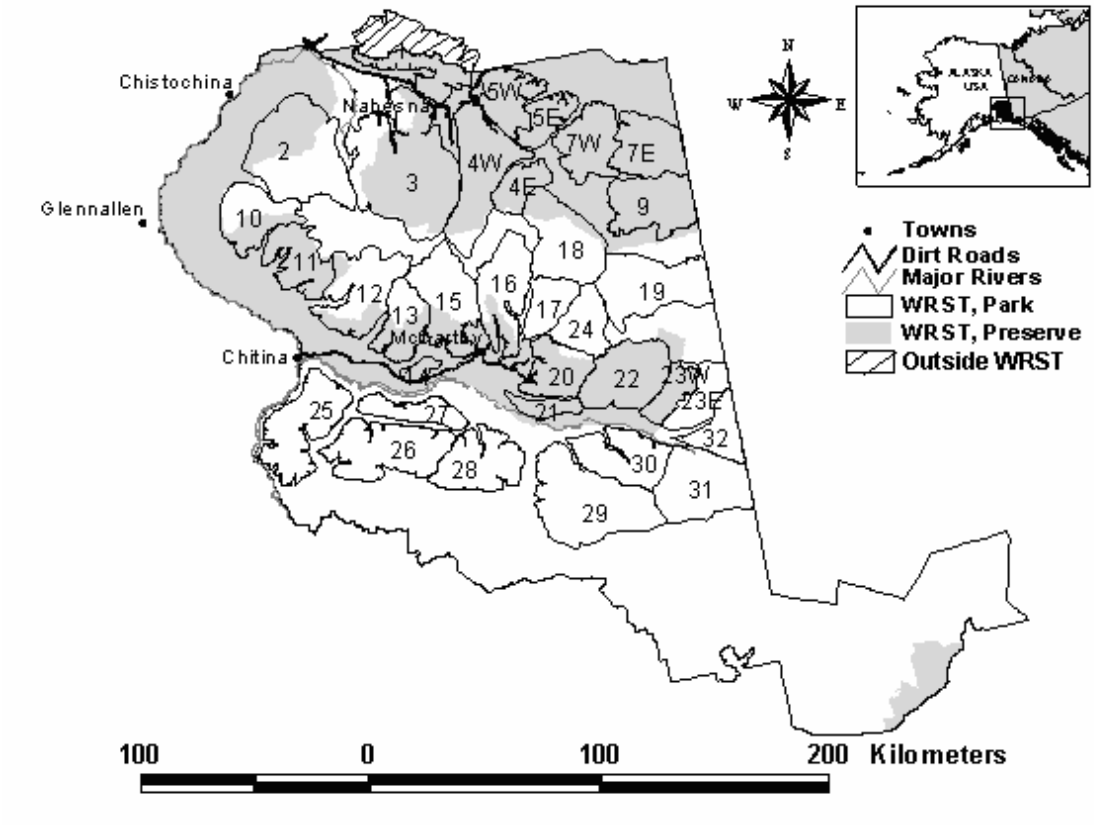

Figure 1. Locations of Unit 12 Dall sheep aerial survey units 4E, 4W, 5E, 5W, 7E, 7W, and 9, within Wrangell–St Elias (WRST) National Park and Preserve (Terwilliger 2005).

Table 1. Unit 12 Dall sheep aerial composition counts within the Wrangell–St Elias National Park and Preserve, 2001, 2002, 2005–2007, 2009, and 2011–2013.

Count area	Year	Legal rams[a]	Sublegal rams[b]	Unclassified rams	Total rams	Ewes[c]	Lambs	Unidentified	Total other sheep	Total sheep	Legal rams:100 ewes	Sublegal rams:100 ewes	Total rams:100 ewes	Lambs:100 ewes	Lambs % of total
1[d]	2002	46	270	0	316	575	123	3	701	1,017	8	47	55	21	12
	2012	60	321	0	381	664	167	0	831	1,212	9	48	57	25	14
4E	2006	7	24	0	31	65	25	0	90	121	11	37	48	38	21
	2011	7	42	0	49	72	29	0	101	150	10	58	68	40	19
4W	2006	42	89	3	134	315	136	0	451	585	13	28	43	43	23
	2013	32	135	0	167	308	67	0	375	542	10	44	54	22	12
5W	2007	40	83	0	123	209	66	0	275	398	19	40	59	32	17
5E	2001	54	207	0	261	516	90	0	606	867	11	40	51	17	10
	2011	14	58	0	72	142	35	0	177	249	10	41	51	25	14
7W	2001[e]	25	88	0	113	153	33	0	186	299	16	58	74	22	11
	2002	58	191	0	249	426	129	0	555	804	14	45	59	30	16
	2005	26	100	0	126	260	63	0	323	449	10	38	48	24	14
	2011	15	91	0	106	235	59	0	294	400	6	39	44	25	15
5E and 7W combined	2001	79	295	0	374	669	123	0	792	1,166	12	44	56	18	11
7E	2007	14	87	1	102	248	62	0	310	412	6	35	41	25	15
	2011	9	81	0	90	193	63	0	256	346	5	42	47	33	18
	2013	3	44	0	47	105	20	0	125	172	3	42	45	19	12
9	2002	40	194	0	234	358	125	18	501	735	11	54	65	35	17
	2005	30	179	5	214	436	107	0	543	757	7	41	49	25	14
	2011	20	126	0	146	338	114	0	452	598	6	37	43	34	19
	2012[f]	6	94	0	100	394	82	0	476	576	2	24	25	21	14
	2013	27	135	0	162	336	65	0	401	563	8	40	48	19	12

[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] Mentasta Mountains.
[e] Count area 7 only included from Snag Creek east.
[f] Count area 9 only included from Ophir Creek and Divide Creek east.

Table 2. Unit 12 Dall sheep aerial composition counts in the Mentasta Mountains, 1971–1997.

Sex/age class	1971[a]	1973[a]	1980[a]	1997[b]	1997[c,d]
Legal rams	78	141	112	70	47
Sublegal rams[e]	10	106	185	97	246
Unclassified rams	22	19	10	0	0
Total rams	110	266	307	167	293
Ewes[f]	555	537	754	692	811
Lambs	137	41	356	196	222
Unidentified	0	150	132	0	0
Total other sheep	692	728	1,242	888	1,033
Total sheep	802	994	1,549	1,055	1,326
Legal rams:100 ewes	14	26	15	10	6
Sublegal rams:100 ewes	2	20	25	14	30
Total rams:100 ewes[g]	20	50	41	24	36
Lambs:100 ewes	25	8	47	28	27
Lambs % of total	17	4	23	19	17

[a] Legal size ram is ≥¾-curl.
[b] Subset of total area surveyed in 1997 to be consistent with counts conducted during 1971–1980.
[c] Counts reflect sheep observed in entire 1997 survey area.
[d] Legal ram is ≥ full curl.
[e] Greater than ¼-curl but less than legal size.
[f] Ewe classification also includes yearlings of both sexes and rams of ¼-curl or less.
[g] Total includes unclassified rams.

Table 3. Unit 12 Dall sheep aerial composition counts[a] within Wrangell–St Elias National Preserve, 1991–1998.

Sex/age class	1991	1992	1993	1998 (East)	1998 (West)
Legal rams[b]		31	111	22	34
Sublegal rams[c]		140	544	110	117
Unclassified rams		30	0	0	0
Total rams	174	201	655	132	151
Ewes[d]	416	440	1,323	373	470
Lambs	75	83	120	113	152
Unidentified	57	0	0	0	0
Total other sheep	548	523	1,443	486	622
Total sheep	722	724	2,098	618	773
Legal rams:100 ewes		7	8	6	7
Sublegal rams:100 ewes		32	41	30	25
Total rams:100 ewes[e]	42	46	49	36	32
Lambs:100 ewes	18	19	9	30	32
Lambs % of total	10	12	6	18	20

[a] Data from National Park Service.
[b] Full curl or larger.
[c] Greater than ¼-curl but less than full curl.
[d] Ewe classification also includes yearlings of both sexes and rams of ¼-curl or less.
[e] Total includes unclassified rams.

Table 4. Unit 12 sheep hunter residency and success, regulatory years[a] 1990–2012.

Regulatory year	Successful					Unsuccessful					Total hunters[c]
	Local[b] resident	Nonlocal resident	Nonresident	Total[c]	(%)	Local[b] resident	Nonlocal resident	Nonresident	Total[c]	(%)	
1990	12	129	83	237	(53)	28	159	16	211	(47)	448
1991	17	159	92	272	(55)	23	173	19	219	(45)	491
1992	10	83	81	177	(43)	17	194	14	230	(57)	407
1993	4	104	62	173	(39)	24	222	23	274	(61)	447
1994	8	93	62	167	(44)	14	177	18	209	(56)	376
1995	15	78	85	179	(49)	35	133	15	183	(51)	362
1996	8	77	77	164	(50)	15	133	16	166	(50)	330
1997	6	64	58	129	(51)	13	90	20	123	(49)	252
1998	4	75	78	160	(45)	15	149	31	198	(55)	358
1999	3	60	71	137	(41)	13	162	23	199	(59)	336
2000	2	47	48	99	(34)	21	141	26	189	(66)	288
2001	1	62	61	126	(44)	12	121	22	158	(56)	284
2002	3	72	56	131	(50)	8	108	17	133	(50)	264
2003	3	66	77	146	(45)	8	151	17	176	(55)	322
2004	1	83	62	152	(43)	19	156	20	201	(57)	353
2005	3	65	69	138	(48)	19	109	21	149	(52)	287
2006	3	66	61	131	(43)	14	145	16	176	(57)	307
2007	2	65	61	128	(39)	13	166	25	204	(61)	332
2008	0	79	39	118	(39)	12	162	14	188	(61)	306
2009	3	49	42	94	(32)	7	174	15	196	(68)	290
2010	3	44	29	77	(30)	14	145	19	178	(70)	255
2011	0	43	29	72	(30)	16	142	13	171	(70)	243
2012	1	45	21	67	(27)	16	150	12	179	(73)	246

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 1990 = 1 July 1990–30 June 1991).
[b] Resident of Unit 12.
[c] Total hunters includes hunters who did not report residency.

Table 5. Unit 12 sheep harvest, regulatory years[a] 1990–2012.

Regulatory year	Rams	$\bar{x}$ Horn length	$\bar{x}$ Age	Total sheep[b]	Hunters
1990	237	34.4	8.7	237	448
1991	272	34.3	8.7	272	491
1992	177	34.5	8.6	177	407
1993	169	34.5	8.5	173	447
1994	159	34.2	8.5	167	376
1995	174	34.2	8.7	179	362
1996	164	34.7	8.8	164	330
1997	129	35.0	9.2	129	252
1998	156	34.7	9.2	160	358
1999	135	34.5	9.0	137	336
2000	96	34.8	8.6	99	288
2001	124	34.7	8.5	126	284
2002	130	34.8	8.5	131	264
2003	145	34.3	8.6	146	322
2004	152	34.5	8.2	152	353
2005	134	34.7	8.4	138	287
2006	125	34.9	8.6	131	307
2007	126	34.7	8.9	128	332
2008	118	34.8	8.6	118	306
2009	94	34.5	8.0	94	290
2010	77	34.7	8.0	77	255
2011	72	34.8	7.5	72	243
2012	67	34.5	7.6	67	246

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 1990 = 1 July 1990–30 June 1991).
[b] Total sheep includes illegal ewe harvest and unknown sex.

Table 6. Unit 12 sheep harvest chronology percent by time period, regulatory years[a] 1990–2012.

Regulatory year	Harvest chronology percent by time period						*n*[b] (Total harvest)
	8/10–8/16	8/17–8/23	8/24–8/30	8/31–9/6	9/7–9/13	9/14–9/20	
1990	43	20	12	10	7	7	230 (237)
1991	40	21	8	13	12	5	267 (272)
1992	34	20	19	14	5	8	172 (177)
1993	41	15	16	15	11	3	167 (173)
1994	40	13	19	16	5	7	164 (167)
1995	39	18	13	14	11	5	175 (179)
1996	42	11	17	15	11	5	158 (164)
1997	40	16	12	17	5	10	126 (129)
1998	34	18	14	12	12	11	160 (160)
1999	36	19	16	14	7	8	137 (137)
2000	35	14	22	14	11	3	99 (99)
2001	47	14	14	11	7	7	123 (126)
2002	50	10	16	15	6	3	131 (131)
2003	42	17	9	14	8	9	144 (146)
2004	44	11	16	11	11	7	149 (152)
2005	33	26	9	16	5	11	136 (138)
2006	33	22	15	12	9	8	130 (131)
2007	36	19	21	10	10	4	128 (128)
2008	39	7	14	22	12	6	118 (118)
2009	39	18	14	11	9	10	93 (94)
2010	41	18	12	12	9	8	77 (77)
2011	35	18	24	12	8	3	72 (72)
2012	42	21	13	12	3	9	67 (67)

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 1990 = 1 July 1990–30 June 1991).
[b] *n* (sample size) may be less than total harvest due to incomplete reporting of kill date.

Table 7. Unit 12 sheep harvest percent by transport method, regulatory years[a] 1990–2012.

Regulatory year	Harvest percent by transport method								Total harvest
	Airplane	Horse	Boat	3- or 4-wheeler	Snowmachine	ORV	Highway vehicle	Unknown	
1990	54	23	2	9	0	2	9	1	237
1991	56	22	4	5	0	2	9	3	272
1992	62	27	1	2	0	2	6	1	177
1993	62	24	2	5	0	1	5	2	173
1994	59	20	6	9	0	0	5	1	167
1995	50	27	4	10	0	1	8	1	179
1996	53	26	3	7	0	3	8	0	164
1997	55	23	4	5	0	0	12	1	129
1998	54	25	6	6	0	1	8	0	160
1999	48	26	8	9	0	1	7	1	137
2000	59	20	7	3	0	1	10	0	99
2001	57	20	6	9	0	2	4	2	126
2002	45	23	9	9	0	0	14	1	131
2003	43	31	5	8	0	1	11	1	146
2004	41	23	5	14	0	1	15	1	152
2005	47	27	1	10	0	1	11	2	138
2006	55	28	3	8	0	0	6	0	131
2007	40	25	8	13	0	0	12	2	128
2008	51	20	8	9	0	1	10	1	118
2009	45	16	15	5	0	2	14	3	94
2010	52	18	12	5	0	0	10	3	77
2011	53	23	7	7	0	0	10	0	72
2012	45	13	12	13	0	0	15	2	67

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