**Alaska Department of Fish and Game**
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# CHAPTER 16: DALL SHEEP MANAGEMENT REPORT

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

## LOCATION

**GAME MANAGEMENT UNITS:** Eastern Unit 24A within and east of the Dalton Highway Corridor Management Area (DHCMA), Unit 25A, and Units 26B and 26C (49,600 $mi^2$)

**GEOGRAPHIC DESCRIPTION:** Eastern Brooks Range

## BACKGROUND

Dall sheep are found throughout the mountains of the eastern Brooks Range, which includes that portion of Unit 24A within and east of the Dalton Highway corridor management area (DHCMA), Unit 25A, Unit 26B, and Unit 26C. Heimer (1985) estimated there were 13,000 sheep in the eastern Brooks Range in 1985. In Unit 26C the population subsequently declined by approximately 40% in the Hulahula drainage and similar declines appear to have occurred in many other areas of Alaska. The most likely cause of the decline was severe weather, which reduced recruitment and may have increased predation. Although few surveys have been conducted in most areas, available survey and harvest data and observations by hunters indicate that populations have stabilized at lower levels since the late 1990s.

Consumptive use of Dall sheep in the eastern Brooks Range increased during the 1980s but subsequently declined as a result of the decline in sheep numbers during the 1990s. However, the opportunity to hunt sheep remains important to resident and nonresident hunters and the eastern Brooks Range has remained a popular area for sheep hunting. Currently, the eastern Brooks Range supports over 20% of statewide sheep hunters and accounts for over 30% of statewide sheep harvest.

## MANAGEMENT DIRECTION

### MANAGEMENT GOALS

- Protect, maintain, and enhance the sheep population and its habitat in concert with other components of the ecosystem.
- Provide for continued general season harvest and subsistence use of sheep.
- Provide an opportunity to hunt sheep under aesthetically pleasing conditions.

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

- Provide an opportunity to view and photograph sheep.

**MANAGEMENT OBJECTIVE**

- Provide maximum opportunity to hunt sheep.

**RELATED MANAGEMENT ACTIVITIES**

- Monitor sheep population status through composition and trend count areas.
- Work with U.S. Fish and Wildlife Service (FWS) to modify survey techniques so they are more conducive to the assessment of management objectives.
- Monitor the effects of the full-curl general season harvest and subsistence harvest.
- Work with the Alaska Department of Fish and Game (ADF&G)-Subsistence Division and FWS to manage subsistence sheep harvests.

## METHODS

**POPULATION STATUS AND TREND**

*Upper Chandalar Drainages Survey Area and Methods (Aerial)*

ADF&G conducted annual composition surveys in the upper North Fork Chandalar River and upper Bettles River drainages in eastern Unit 24A and western Unit 25A since 2002 (S. Arthur, ADF&G, memorandum dated 21 July 2009 regarding Brooks Range sheep survey, Fairbanks). The 799 $mi^2$ survey area includes the drainages south of the North Fork Chandalar River, west of Chandalar Lake, and east of Gates of the Arctic National Park and Preserve (GAAR). Drainages within the survey area include Mathews, Big Spruce, Sheep, Robert, Phoebe, Willow, Geroe, Baby, and Quartz creeks along with portions of the DHCMA. In late June or early July, elevation contours were flown with fixed-wing aircraft in all available sheep habitat within the survey area and observed sheep were classified as lamb, ewe-like, or ram. Rams were further classified by horn size as legal for harvest (full curl or larger, including rams with both horns broken) or sublegal. Ewe-like sheep included adult females plus yearlings and 2-year-olds of both sexes that could not be distinguished from ewes.

*Upper Atigun and Sagavanirktok Drainages Survey Area and Methods (Aerial)*

An aerial composition survey of the upper Atigun and Sagavanirktok drainages was not conducted during RY10–RY12. Caikoski (2011) provide survey area descriptions and methods for a survey conducted in 2003.

*Atigun River Survey Area and Methods (Ground Based)*

In Unit 26B during 1986–2012, Arctic National Wildlife Refuge (ANWR) staff conducted annual ground-based composition surveys east of the Dalton Highway from Atigun Pass to Atigun Gorge. Sheep were located from highway vehicles and classified as lamb, ewe, yearling, 2-year-old, and ram. Rams were further classified by horn size as ¼, ⅜, ½, ⅝, ¾, ⅞, or full curl. Double-broomed rams were not classified as full curl unless they were broomed at full curl or longer. For comparison to other surveys conducted by fixed-wing aircraft, we reclassified these data as lamb, ewe-like, legal ram, and sublegal ram, recognizing that most double-broomed rams would not be included in the legal ram class.

*Upper East Fork Chandalar Survey Area and Methods (Aerial)*

In Unit 25A, ANWR staff conducted aerial surveys periodically since 1991 in the upper East Fork Chandalar River drainage (unpublished FWS reports entitled *Dall sheep survey in the Arctic Village sheep management area and vicinity*, authored by F. J. Mauer [1996], D. C. Payer [2006], and A. W. Brackney [2007], Fairbanks). Generally, the survey area encompasses the Arctic Village sheep management area (AVSMA), which lies between Crow Nest and Cane creeks, west of the East Fork Chandalar River to the Continental Divide and from Red Sheep Creek to Gilbeau Pass north of AVSMA. However, in most years, only portions of the survey area were surveyed. Surveys were flown with fixed-wing aircraft, along elevation contours for all available sheep habitat, and observed sheep were classified as lamb, ewe-like, or ram. Rams were further classified by horn size as mature (potentially full curl) and other ram. Ewe-like classification included adult females plus yearlings and 2-year-olds of both sexes that could not be distinguished from ewes.

*Upper Hulahula Survey Area and Methods (Ground Based)*

An aerial composition survey of the upper Hulahula drainage was not conducted during RY10–RY12. Caikoski (2011) provide survey area descriptions and methods for surveys conducted during 1992–2009.

*Population Demographics and Spatial Ecology*

In 2008, ADF&G initiated a 4-year research project to evaluate demographics and spatial ecology of Dall sheep in western Unit 25A and eastern Unit 24A (Arthur 2013). The study area was the same geographic region where ADF&G conducted composition surveys mentioned above since 2002. Objectives of the research were to estimate birth rates, lamb and ewe survival, and sheep movement. Arthur (2013) provides a more comprehensive explanation of the study objectives and methods used.

### HARVEST

Based on harvest reports, we evaluated harvest, hunter use patterns, and characteristics of harvested sheep by regulatory year (RY), which begins 1 July and ends 30 June (e.g., RY11 = 1 July 2011 through 30 June 2012). Federal subsistence permit hunts and state registration hunts were analyzed separately from general season hunts.

## RESULTS AND DISCUSSION

### POPULATION STATUS AND TREND

*Population Size*

Population size for the eastern Brooks Range is unknown. However, we compared count data of total sheep observed during composition surveys to estimate trend in the upper Chandalar/upper Bettles (eastern Unit 24A and Unit 25A) and upper Atigun River (Unit 26B) drainages. Both survey areas consisted of the same geographic area and survey techniques remained consistent within survey areas and between years. Aerial counts of total sheep in the upper North Fork Chandalar and upper Bettles River drainages of eastern Unit 24A and Unit 25A were higher in 2012 (1,738 observed sheep) compared to 2002–2009 ($\bar{x}$ = 1,350; range = 989–1,589 observed; Table 1). The cause of annual variability in counts is largely unknown, but variation in sheep

survival and recruitment, movement, and measurement error likely affect indices of abundance in this survey area.

In Unit 26B, ground-based counts conducted in the upper Atigun River during 1986–2008 have been highly variable between years making detection of trend difficult (Table 2). Total counts in 2011 (162) and 2012 (170) were below the 1986–2008 mean ($\bar{x}$ = 276) but within the range observed since 1986 (range: 120–515). This survey area is likely biased to low elevation habitats that are easily sampled from the road and sheep distribution at the time of the survey may affect survey results. Although this survey was not designed to estimate sheep population size, dramatic changes in abundance can probably be detected.

*Population Composition*

Upper Chandalar Drainage Survey Area (Aerial). ADF&G conducted composition surveys in the upper North Fork Chandalar River and upper Bettles River drainages in 2012. The 2012 lamb:100 ewe-like ratio (18 lambs:100 ewe-likes) and the proportion of lambs in the population (12%) were below the long-term mean of 27 lambs:100 ewe-likes and 16% lambs in the population during 2002–2009, but within the range observed for both demographics (range of lamb:100 ewe-likes:18–43, percent lambs: 12–25, years 2002–2009, Table 1). Although the total number of rams observed appears stable, both the number and proportion of legal sheep among all rams observed declined in 2009 and 2012 compared to 2002–2007. In 2009 and 2012, legal rams made up 10% and 9% of all rams observed compared to the 2002–2007 mean ($\bar{x}$ = 15%, Table 1).

Atigun River Survey Area (Ground Based). Unit 26B ground-based surveys conducted by ANWR in 2011 and 2012 in the upper Atigun River drainage indicated moderate lamb:ewe-like ratios ($\bar{x}$ = 42:100), that were higher than the average ratio observed during 1986–2012 ($\bar{x}$ = 31:100, Table 2). Although the proportion of legal sheep and the ratio of lambs:100 ewe-likes have been variable and appear stable since 1986, the number of rams counted in this survey are likely biased low as a result of survey design and sexual segregation of sheep among different habitat types. In this survey, counts and classifications were conducted from the Dalton Highway and were biased to lower elevation habitats visible from the road. In addition, double-broomed rams were not classified as full curl unless they were broomed at full curl or longer.

Atigun River Survey Area (Aerial). Aerial survey of the Atigun River drainage only occurred in 2003. Results of that survey are available in Table 3 and in Caikoski (2011).

Upper East Fork Chandalar Survey Area (Aerial). ANWR staff conducted an aerial composition survey in the upper East Fork Chandalar River drainage in Unit 25A in 2012 (Table 4). A comparison of demographics across all years is not possible because survey areas differed. However, survey areas were the same in 2006 and 2012, allowing comparisons between those years. In 2012, 27 lambs:100 ewe-likes were observed representing 15% of the population. This was similar to ratios observed in 2006 when 22 lambs:100 ewe-likes representing 14% of the population was observed. The total number of mature rams and the proportion of mature rams among all rams was higher in 2012 compared to 2006. However, the proportion of legal sheep is unknown because rams were classified as either mature or other, and the mature sheep classification likely included sublegal rams.

Upper Hulahula Survey Area and Methods (Ground Based). A ground-based survey of the upper Hulahula drainage in Unit 26C typically conducted by ANWR has not occurred since 2009. Results of past surveys are available in Table 5 and in Caikoski (2011).

Direct comparisons of legal rams among surveys conducted by ADF&G and those conducted by ANWR were not possible because the criteria for classifying rams differed between surveys. Although we made general inferences about age structure among rams and between survey areas, we need consistency in classification before we can make more direct comparisons in this sex and age class.

*Distribution and Movements*

A study of GPS-radiocollared ewes during 2009–2012 in eastern Unit 24A and western Unit 25A indicated that movement of ewes was restricted to areas separated by drainages with large valley floors (Arthur 2013). These results are consistent with studies of radiocollared sheep during 1988–1992 which indicated that major drainages inhibited sheep movements, resulting in discrete subpopulations north and south of the Junjik River, and east and west of the East Fork Chandalar and Hulahula rivers. Sheep home range size was similar to those observed in the Alaska Range. However, movements of sheep near the East Fork Chandalar River were relatively extensive, perhaps because of less stable weather patterns and resulting changes in forage availability (Heimer et al. 1994).

*Survival Rates*

A 4-year ADF&G research project investigated survival rates of ewes and lambs during 2009–2012 in eastern Unit 24A and western Unit 25A (Arthur 2013). Lamb survival to age one was 68% ($n$ = 19), 48% ($n$ = 25), and 28% ($n$ = 18) for the 2009, 2010, and 2011 cohorts, respectively. Predation and drowning were the most common sources of mortality. Annual ewe survival was 85% ($n$ = 20), 88% ($n$ = 26), and 77% ($n$ = 22) in 2009, 2010, and 2011, respectively. All sources of mortality of ewes was the result of predation, primarily by wolves.

**MORTALITY**

*Harvest*

Season and Bag Limit (RY10–RY12). Only state regulations are listed below, although federal subsistence regulations applied on federal lands within the area. Rams with both horns broken and less-than-full-curl rams that were at least 8-years old were legal for harvest under the full curl definition in state regulations.

| Units and Bag Limits | Resident Open Season | Nonresident Open Season |
|---|---|---|
| Unit 24A. | | |
| RESIDENT AND NONRESIDENT HUNTERS: 1 ram with full-curl horn or larger. | 10 Aug–20 Sep | 10 Aug–20 Sep |

| Units and Bag Limits | Resident Open Season | Nonresident Open Season |
|---|---|---|
| Units 25A and 26C. | | |
| RESIDENT HUNTERS: 1 ram with full-curl horn or larger 10 Aug–20 Sep or 3 sheep may be taken by registration permit 1 Oct–30 Apr. | 10 Aug–20 Sep<br>1 Oct–30 Apr | |
| NONRESIDENT HUNTERS: 1 ram with full-curl horn or larger. | | 10 Aug–20 Sep |
| Unit 26B, private lands within Gates of the Arctic National Park. | | |
| RESIDENT HUNTERS: 3 sheep. | 1 Aug–30Apr | |
| NONRESIDENT HUNTERS: | | No Open Season |
| Unit 26B, remainder. | | |
| RESIDENT AND NONRESIDENT HUNTERS: 1 ram with full-curl horn or larger. | 10 Aug–20 Sep | 10 Aug–20 Sep |

Alaska Board of Game Actions and Emergency Orders. No Board of Game action was taken and no emergency orders were issued during RY10–RY12.

Harvest by Hunters. The total reported annual harvest during RY10–RY12 increased by 4% ($\bar{x}$ = 230) compared to the previous 3 years (RY07–RY09; $\bar{x}$ = 222) and has increased by 31% compared to the previous 8 years (RY02–RY09; $\bar{x}$ = 175, Table 6). Additional harvest and hunting pressure occurred in all units but was most substantial in Units 25A, 26B, and 26C. Although total harvest and the number of hunters increased slightly across the eastern Brooks Range during RY10–RY12, average success rates remained the same ($\bar{x}$ = 44%, Table 7) and horn length remained stable ($\bar{x}$ = 35.5 inches, Table 8) compared to the previous 8 years. The proportion of harvested rams with horns ≥40 inches in length increased slightly ($\bar{x}$ = 4.7%) compared to the previous 8-year mean ($\bar{x}$ = 4.1%, Table 8).

Permit Hunts. Participation in the state registration hunt RS595 has been open to all Alaska residents since RY90. However, with the exception of the first year the hunt was open, few permits have been issued each year (0–8) because the hunt is logistically difficult and hunters have limited interest in harvesting sheep during winter. During RY10–RY12, 5 sheep were harvested under RS595 (Table 9). In addition to RS595, 4 federal subsistence permit hunts (FS424, FS596/598, FS799, and FS699) occur in eastern Unit 24A, Unit 25A, Unit 25A-Unit 26C, and Unit 26B, respectively. Permits for these hunts were available to federally qualified subsistence hunters who hunted on federal land. In RY10, no sheep were reported harvested under any of the federal permit hunts and in RY11–RY12, reported federal harvest was not available.

Hunter Residency and Success. In RY10–RY11, Alaska resident hunters composed 77% of the total hunters, annually, in the eastern Brooks Range, an increase from 68% during the previous 8 years (Table 7). Overall success rates averaged 44% across RY10–RY11 and were similar compared to prior years. Nonresident hunters continued to have a higher success rate ($\bar{x}$ = 67%) compared to residents ($\bar{x}$ = 37%), reflecting the advantage of having a guide (Golden 1990). Success rates varied across the Brooks Range and were generally higher in areas that are more difficult to access or are accessible by aircraft only, compared to areas near the Dalton Highway. In addition, low success rates associated with archery-only hunts limit harvest within DHCMA.

Harvest Chronology. Most sheep harvest in the eastern Brooks Range occurs during August when the weather is most conducive to hunting (Table 10). In RY10–RY12, 79–89% of the reported harvest occurred before 1 September, consistent with previous years.

Transport Methods. Aircraft were the primary means of transportation for most hunters and were used in 77–81% of successful hunts (Table 11). Transport methods associated with most of the remaining harvest (in descending order) included highway vehicle, horse, and boat.

## CONCLUSIONS AND RECOMMENDATIONS

Sheep populations across the eastern Brooks Range appear to be stable, but remain below levels observed in the mid-1980s. Although population size and recruitment appear to be stable, survival rates, distribution, and habitat quality are poorly understood in most parts of the range.

We met our management objective to provide maximum opportunity to hunt sheep using the full-curl harvest strategy. The number of hunters increased by 35% and the harvest of full-curl rams increased by 37% during RY07–RY09 compared to the RY04–RY06 means and by 50% and 53%, respectively since RY99. However, the increasing trend in hunter numbers and harvest appeared to have stabilized during RY10–RY12. All biological indices suggest that the current level of harvest is sustainable and the current harvest remains below levels observed in the late 1980s and early 1990s when the sheep population was thought to be high and harvest ranged 250–350 rams annually.

ANWR contributed survey data in portions of the eastern Brooks Range that has helped assess sheep population status. However, survey techniques and classification schemes related to those surveys make comparisons difficult between years and survey areas. More specifically, consistency in classification is needed before inferences can be made about age structure among rams and the effects harvest may have on this segment of the population.

The management objective for the next report period will be changed to the following objectives, which are more easily quantified:

- Maximize hunter opportunity using a full-curl harvest strategy.
- Maintain an average harvest of rams ≥8 years old.

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Table 1. Aerial Dall sheep composition surveys in the upper Chandalar River drainage (eastern Unit 24A and Unit 25A, 779 $mi^2$), late June or early July 2002–2012.

| Year | Legal rams (%)[a] | Sublegal rams | "Ewe-like"[b] | Lambs | % Lambs | Lambs: 100 Ewe-like[b] | Unknown rams[a] | Total |
|---|---|---|---|---|---|---|---|---|
| 2002 | 50 (12) | 380 | 884 | 221 | 14 | 25 | 4 | 1,539 |
| 2003 | 34 (14) | 207 | 621 | 114 | 12 | 18 | 13 | 989 |
| 2004 | 43 (12) | 320 | 908 | 180 | 12 | 20 | 9 | 1,460 |
| 2005 | 42 (17) | 203 | 636 | 214 | 19 | 34 | 4 | 1,099 |
| 2006 | 46 (13) | 313 | 857 | 224 | 15 | 26 | 77 | 1,517 |
| 2007 | 47 (24) | 152 | 779 | 332 | 25 | 43 | 0 | 1,310 |
| 2009 | 31 (10) | 298 | 911 | 295 | 19 | 32 | 0 | 1,535 |
| 2012 | 30 (9) | 343 | 1,153 | 212 | 12 | 18 | 0 | 1,738 |

[a] Percent legal rams is calculated as a proportion of total rams. Unknown rams were censored in calculations of percent legal rams.
[b] Includes adult females plus yearlings and 2-year-olds of both sexes.

Table 2. Ground-based Dall sheep composition surveys in Atigun River drainage (Unit 26B), June 1986–2012.

| Year[a] | Legal rams (%)[b,c] | Sublegal rams[c] | "Ewe-like"[d] | Lambs | % Lambs[b] | Lambs: 100 Ewe-like[d] | Unknown sheep[b] | Total |
|---|---|---|---|---|---|---|---|---|
| 1986 | 1 (2) | 46 | 165 | 42 | 17 | 25 | 0 | 254 |
| 1987 | 0 (0) | 59 | 130 | 47 | 20 | 36 | 0 | 236 |
| 1988 | 3 (5) | 56 | 221 | 80 | 22 | 36 | 16 | 376 |
| 1989 | 0 (0) | 87 | 237 | 40 | 11 | 17 | 0 | 364 |
| 1990 | 0 (0) | 62 | 152 | 69 | 24 | 45 | 0 | 283 |
| 1991 | 2 (3) | 73 | 296 | 122 | 25 | 41 | 22 | 515 |
| 1992 | 0 (0) | 56 | 287 | 39 | 10 | 14 | 0 | 382 |
| 1993 | 1 (1) | 69 | 183 | 24 | 9 | 13 | 0 | 277 |
| 1994 | 5 (7) | 65 | 207 | 89 | 24 | 43 | 0 | 366 |
| 1995 | 0 (0) | 55 | 224 | 28 | 9 | 13 | 0 | 307 |
| 1996[e] | 0 (0) | 19 | 114 | 49 | 27 | 43 | 2 | 184 |
| 1997 | 0 (0) | 40 | 91 | 16 | 11 | 18 | 0 | 147 |
| 1998 | 0 (0) | 25 | 141 | 70 | 30 | 50 | 2 | 238 |
| 1999 | 0 (0) | 32 | 140 | 40 | 19 | 29 | 8 | 220 |
| 2001 | 0 (0) | 31 | 133 | 44 | 21 | 33 | 0 | 208 |
| 2003 | 1 (2) | 54 | 256 | 68 | 18 | 27 | 10 | 389 |
| 2004 | 3 (5) | 53 | 193 | 34 | 12 | 18 | 3 | 286 |
| 2005 | 2 (2) | 81 | 189 | 80 | 23 | 42 | 3 | 355 |
| 2006 | 4 (9) | 42 | 172 | 55 | 20 | 32 | 17 | 290 |
| 2007 | 1 (5) | 21 | 69 | 20 | 18 | 29 | 9 | 120 |
| 2008 | 1 (3) | 39 | 127 | 46 | 22 | 36 | 13 | 226 |
| 2011 | 0 (0) | 29 | 90 | 38 | 23 | 42 | 3 | 160 |
| 2012 | 1 (3) | 37 | 92 | 39 | 23 | 42 | 1 | 170 |

*Data source*: U.S. Fish and Wildlife Service, Arctic National Wildlife Refuge.

[a] Counts prior to 1990 occurred in Atigun Gorge only; during and after 1990, counts along the Dalton Highway (Atigun Gorge to Atigun Pass) were included.
[b] Unknown sheep were censored in calculations of percent lambs. Percent legal rams is calculated as a proportion of total rams.
[c] Legal sheep do not include double-broomed horns unless broomed at full curl or longer; sublegal sheep includes double-broomed sheep less than full curl.
[d] Includes adult females plus yearlings and 2-year-olds of both sexes.
[e] Incomplete count in Atigun Gorge (snow).

Table 3. Aerial Dall sheep composition surveys in the upper Atigun River drainage (543 mi$^2$), June 2003.

| Year | Legal rams (%)[a] | Sublegal rams | "Ewe-like"[b] | Lambs | % Lambs | Lamb:100 "ewes" | Total |
|---|---|---|---|---|---|---|---|
| 2003 | 42 (21) | 163 | 589 | 147 | 16 | 25 | 941 |

[a] Percent legal rams is calculated as a proportion of total rams.
[b] Includes adult females plus yearlings and 2-year-olds of both sexes.

Table 4. Aerial Dall sheep composition surveys in the East Fork Chandalar River, Arctic Village sheep management area, June 1992–2012.

| Year | Mature rams (%)[a] | Young rams | "Ewe-like"[b] | Lambs | % Lambs | Lambs: 100 Ewe-like[b] | Total |
|---|---|---|---|---|---|---|---|
| 1992 | 4 (15) | 23 | 155 | 34 | 16 | 22 | 216 |
| 1993 | 20 (22) | 72 | 219 | 45 | 13 | 21 | 356 |
| 1994 | 16 (21) | 60 | 121 | 0 | 0 | 0 | 197 |
| 1995 | 15 (29) | 37 | 89 | 17 | 11 | 19 | 158 |
| 2006 | 32 (33) | 64 | 262 | 58 | 14 | 22 | 416 |
| 2007 | 6 (43) | 8 | 62 | 16 | 17 | 26 | 92 |
| 2012 | 59 (44) | 74 | 230 | 63 | 15 | 27 | 426 |

*Data source*: U.S. Fish and Wildlife Service, Arctic National Wildlife Refuge.

[a] Mature rams may include sublegal sheep and are not directly comparable to other surveys that include a legal ram classification. Percent mature rams is calculated as a proportion of total rams.
[b] Includes adult females plus yearling and 2-year-olds of both sexes.

Table 5. Aerial and ground-based Dall sheep composition surveys in the Hulahula drainage, June 1992–2009.

| Year | Legal rams (%)[a,b] | Sublegal rams[b] | "Ewe-like"[c] | Lambs | % Lambs[a] | Lambs: 100 Ewe-like[c] | Unknown sheep[a] | Total |
|---|---|---|---|---|---|---|---|---|
| 1992[d] | 1 (2) | 58 | 318 | 10 | 3 | 3 | 0 | 387 |
| 1993[e] | 12 (3) | 369 | 709 | 171 | 14 | 24 | 0 | 1,261 |
| 1994[e] | 6 (4) | 164 | 595 | 99 | 11 | 17 | 0 | 864 |
| 1995[e] | 25 (8) | 295 | 631 | 179 | 16 | 28 | 0 | 1,130 |
| 1998[d] | 10 (8) | 117 | 190 | 61 | 16 | 32 | 0 | 378 |
| 2000[d] | 7 (6) | 106 | 219 | 20 | 6 | 9 | 0 | 352 |
| 2003[d] | 9 (12) | 67 | 191 | 50 | 16 | 26 | 0 | 317 |
| 2004[d] | 9 (22) | 32 | 201 | 71 | 23 | 35 | 0 | 313 |
| 2005[d] | 6 (6) | 88 | 298 | 106 | 21 | 36 | 15 | 513 |
| 2006[d] | 4 (7) | 50 | 320 | 80 | 18 | 25 | 13 | 467 |
| 2007[d] | 1 (1) | 118 | 273 | 42 | 10 | 15 | 75 | 509 |
| 2008[d] | 2 (3) | 77 | 318 | 89 | 18 | 28 | 26 | 512 |
| 2009[d] | 10 (9) | 112 | 472 | 48 | 7 | 10 | 50 | 692 |

*Data source*: U.S. Fish and Wildlife Service, Arctic National Wildlife Refuge.

[a] Unknown sheep were censored in calculations of percent legal rams and percent lambs.

[b] Legal sheep do not include double-broomed horns unless broomed at full curl or longer; sublegal sheep includes double-broomed sheep less than full curl. Percent legal rams is calculated as a proportion of total rams.

[c] Includes adult females plus yearlings and 2-year-olds of both sexes.

[d] Ground survey: upper Hulahula only.

[e] Helicopter surveys over most of the drainage.

Table 6. Reported numbers of hunters[a] and harvest[a] in eastern Unit 24A and Units 25A, 26B, and 26C, regulatory years[b] 2002–2012.

| Regulatory year | Unit | | | | | | | | Total harvest |
|---|---|---|---|---|---|---|---|---|---|
| | 24A East | | 25A | | 26B | | 26C | | |
| | Hunters | Harvest | Hunters | Harvest | Hunters | Harvest | Hunters | Harvest | |
| 2002 | 30 | 11 | 91 | 40 | 102 | 29 | 82 | 28 | 108 |
| 2003 | 43 | 17 | 102 | 53 | 115 | 33 | 81 | 39 | 142 |
| 2004 | 42 | 17 | 83 | 45 | 130 | 41 | 71 | 49 | 152 |
| 2005 | 43 | 18 | 108 | 66 | 165 | 47 | 73 | 40 | 171 |
| 2006 | 60 | 17 | 111 | 74 | 151 | 30 | 85 | 41 | 162 |
| 2007 | 48 | 14 | 121 | 77 | 168 | 55 | 120 | 70 | 216 |
| 2008 | 60 | 27 | 145 | 74 | 205 | 57 | 112 | 67 | 225 |
| 2009 | 53 | 17 | 142 | 84 | 147 | 47 | 117 | 76 | 224 |
| 2010 | 51 | 23 | 158 | 77 | 186 | 63 | 117 | 66 | 229 |
| 2011 | 58 | 16 | 155 | 89 | 183 | 55 | 151 | 87 | 247 |
| 2012 | 48 | 17 | 132 | 62 | 192 | 64 | 145 | 72 | 215 |

[a] Excludes state registration and federal subsistence permit hunts.
[b] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2002 = 1 July 2002–30 June 2003).

Table 7. Eastern Unit 24A and Units 25A, 26B, and 26C sheep hunter[a] residency and success, regulatory years[b] 2002–2012.

| | Successful hunters | | | | | Unsuccessful hunters | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Regulatory year | Local[c] resident | Nonlocal resident | Nonresident | Unk | Total (%) | Local[c] resident | Nonlocal resident | Nonresident | Unk | Total (%) | Total hunters |
| 2002 | 0 | 36 | 54 | 4 | 94 (35) | 2 | 116 | 52 | 3 | 173 (65) | 267 |
| 2003 | 1 | 52 | 72 | 0 | 125 (42) | 1 | 124 | 43 | 2 | 170 (58) | 295 |
| 2004 | 0 | 55 | 76 | 2 | 133 (48) | 1 | 117 | 23 | 3 | 144 (52) | 277 |
| 2005 | 5 | 77 | 86 | 1 | 169 (44) | 4 | 187 | 27 | 1 | 219 (56) | 388 |
| 2006 | 5 | 78 | 69 | 4 | 156 (39) | 2 | 197 | 41 | 6 | 246 (61) | 402 |
| 2007 | 2 | 116 | 97 | 1 | 216 (47) | 2 | 206 | 32 | 1 | 241 (53) | 457 |
| 2008 | 0 | 123 | 87 | 15 | 225 (43) | 3 | 241 | 44 | 7 | 295 (57) | 520 |
| 2009 | 0 | 122 | 94 | 8 | 224 (49) | 3 | 185 | 44 | 3 | 235 (51) | 459 |
| 2010 | 1 | 148 | 79 | 1 | 229 (45) | 2 | 240 | 42 | 0 | 284 (55) | 513 |
| 2011 | 1 | 153 | 90 | 1 | 245 (45) | 1 | 261 | 37 | 3 | 302 (55) | 547 |
| 2012 | 0 | 139 | 74 | 0 | 213 (43) | 0 | 237 | 39 | 3 | 279 (57) | 492 |

[a] Excludes state registration and federal subsistence permit hunts.
[b] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2002 = 1 July 2002–30 June 2003).
[c] Local resident is a resident of Units 25A, 26B, 26C, Coldfoot, or Wiseman.

Table 8. Dall sheep mean horn length of harvested rams in eastern Unit 24A and Units 25A, 26B, and 26C, regulatory years[a] 2002–2012.

| Regulatory year | $n$[b] | $\bar{x}$ Horn length (inches) | % ≥40 inches |
|---|---|---|---|
| 2002 | 94 | 35.5 | 3 |
| 2003 | 125 | 35.2 | 4 |
| 2004 | 136 | 35.5 | 6 |
| 2005 | 168 | 35.0 | 4 |
| 2006 | 147 | 35.4 | 6 |
| 2007 | 218 | 35.5 | 2 |
| 2008 | 225 | 35.3 | 2 |
| 2009 | 224 | 35.5 | 6 |
| 2010 | 223 | 35.5 | 4 |
| 2011 | 239 | 35.7 | 6 |
| 2012 | 206 | 35.4 | 4 |

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2002 = 1 July 2002–30 June 2003).
[b] Excludes state registration and federal subsistence permit hunts.

Table 9. Eastern Unit 24A and Units 25A, 26B, and 26C reported Dall sheep harvest by permit hunt (FS424[a], RS595[b], FS596[c], FS799[d], and FS699[e]), regulatory years[f] 2002–2012.

| Regulatory year | FS424 (Unit 24A) | RS595 (Unit 25A and Unit 26C) | FS596/598 (Unit 25A) | FS799 (Unit 25A and Unit 26C) | FS699 (Unit 26B) | Total reported harvest |
|---|---|---|---|---|---|---|
| 2002 | 2 | 0 | 0 | 3 | 0 | 5 |
| 2003 | 2 | 0 | 0 | 0 | 0 | 2 |
| 2004 | 3 | 0 | 0 | 1 | 0 | 4 |
| 2005 | 2 | 0 | 0 | 2 | 0 | 4 |
| 2006 | 5 | 0 | 1 | 0 | 1 | 7 |
| 2007 | 1 | 0 | 3 | 0 | 0 | 4 |
| 2008 | 0 | 1 | 0 | 0 | 1 | 2 |
| 2009 | 0 | 3 | 0 | 0 | 0 | 3 |
| 2010 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2011 | n/a | 3 | n/a | n/a | n/a | 3 |
| 2012 | n/a | 2 | n/a | n/a | n/a | 2 |

[a] Federal subsistence hunt FS424 includes Unit 24A, except that portion within Gates of the Arctic National Park.
[b] State registration hunt RS595 includes Unit 25A, east of the Middle Fork Chandalar River and Unit 26C.
[c] Federal subsistence hunt FS596/598 includes Unit 25A within the Arctic Village sheep management area.
[d] Federal subsistence hunt FS799 includes most of Unit 25A and all of Unit 26C.
[e] Federal subsistence hunt FS699 includes Unit 26B within the Dalton Highway corridor management area.
[f] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2002 = 1 July 2002–30 June 2003).

Table 10. Eastern Unit 24A and Units 25A, 26B, and 26C Dall sheep harvest[a] chronology percent by month/day, regulatory years[b] 2002–2012.

| Regulatory year | Harvest chronology percent by month/day | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 8/5–8/11 | 8/12–8/18 | 8/19–8/25 | 8/26–9/1 | 9/2–9/8 | 9/9–9/15 | 9/16–9/22 | *n* |
| 2002 | 5 | 31 | 30 | 19 | 7 | 3 | 4 | 93 |
| 2003 | 17 | 39 | 24 | 14 | 3 | 2 | 1 | 122 |
| 2004 | 21 | 39 | 20 | 12 | 5 | 2 | 0 | 134 |
| 2005 | 20 | 37 | 23 | 12 | 5 | 1 | 1 | 169 |
| 2006 | 25 | 33 | 14 | 14 | 6 | 4 | 3 | 156 |
| 2007 | 22 | 29 | 26 | 12 | 6 | 3 | 3 | 213 |
| 2008 | 17 | 30 | 25 | 13 | 8 | 5 | 1 | 223 |
| 2009 | 16 | 38 | 24 | 12 | 5 | 3 | 2 | 215 |
| 2010 | 19 | 37 | 22 | 11 | 5 | 4 | 1 | 226 |
| 2011 | 26 | 29 | 24 | 10 | 6 | 2 | 1 | 241 |
| 2012 | 26 | 31 | 19 | 11 | 7 | 4 | 1 | 204 |

[a] Excludes state registration and federal subsistence permit hunts and sheep reported taken outside of the general season dates.
[b] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2002 = 1 July 2002–30 June 2003).

Table 11. Eastern Unit 24A and Units 25A, 26B, and 26C Dall sheep harvest[a] percent by transport method, regulatory years[b] 2002–2012.

| Regulatory year | Harvest percent by transport method | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Airplane | Horse | Boat | 3- or 4-wheeler | Snowmachine | ORV | Highway vehicle | Unk | *n* |
| 2002 | 84 | 4 | 3 | 0 | 0 | 0 | 9 | 0 | 94 |
| 2003 | 80 | 8 | 3 | 0 | 0 | 0 | 7 | 2 | 125 |
| 2004 | 83 | 8 | 0 | 0 | 0 | 0 | 8 | 1 | 136 |
| 2005 | 75 | 8 | 1 | 0 | 0 | 0 | 15 | 1 | 169 |
| 2006 | 68 | 10 | 9 | 1 | 0 | 0 | 12 | 1 | 156 |
| 2007 | 78 | 10 | 2 | 0 | 0 | 0 | 9 | 1 | 216 |
| 2008 | 73 | 9 | 3 | 0 | 0 | 0 | 14 | 1 | 225 |
| 2009 | 74 | 10 | 2 | <1 | 0 | 1 | 11 | 1 | 224 |
| 2010 | 77 | 7 | <1 | <1 | 0 | 0 | 11 | 3 | 229 |
| 2011 | 81 | 6 | 3 | <1 | 0 | 0 | 8 | 1 | 247 |
| 2012 | 77 | 6 | 1 | 0 | 0 | 0 | 15 | 1 | 213 |

[a] Excludes state registration and federal subsistence permit hunts.

[b] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2002 = 1 July 2002–30 June 2003).