Species Management Report and Plan ADF&G/DWC/SMR&P–2023–9

Dall Sheep Management Report and Plan, Game Management Unit 14C:

Report Period 1 July 2016–30 June 2021, and

Plan Period 1 July 2021–30 June 2026

Timothy J. Spivey

2023

Alaska Department of Fish and Game Division of Wildlife Conservation

Dall Sheep Management Report and Plan, Game Management Unit 14C:

Report Period 1 July 2016–30 June 2021, and

Plan Period 1 July 2021–30 June 2026

PREPARED BY:

Timothy J. Spivey
Regional Wildlife Biologist

APPROVED BY:

Jeff Selinger
Management Coordinator

David Battle
Area Wildlife Biologist

REVIEWED BY:

Dr. Thomas Lohuis
Research Coordinator

PUBLISHED BY:

Sky M. Guritz
Technical Reports Editor

Alaska Department of Fish and Game
Division of Wildlife Conservation
PO Box 115526
Juneau, AK 99811-5526

Hunters are important founders of the modern wildlife conservation movement. They, along with trappers and sport shooters, provided funding for this publication through payment of federal taxes on firearms, ammunition, and archery equipment, and pay state hunting license and tag fees. These taxes and fees fund the federal Wildlife Restoration Program and the State of Alaska's Fish and Game Fund, which provided funding for the work reported on in this publication.

Species management reports and plans provide information about species that are hunted or trapped and management actions, goals, recommendations for those species, and plans for data collection. Detailed information is prepared for each species every 5 years by the area management biologist for game management units in their areas, who also develops a plan for data collection and species management for the next 5 years. This type of report is not produced for species that are not managed for hunting or trapping or for areas where there is no current or anticipated activity. Unit reports are reviewed and approved for publication by regional management coordinators and are available to the public via the Alaska Department of Fish and Game's public website.

This species management report and plan was reviewed and approved for publication by Jeff Selinger, Management Coordinator for the Division of Wildlife Conservation.

Species management reports and plans are available via the Alaska Department of Fish and Game's public website (www.adfg.alaska.gov) or by contacting Alaska Department of Fish and Game's Division of Wildlife Conservation, PO Box 115526, Juneau, AK 99811-5526; phone: (907) 465-4190; email: dfg.dwc.publications@alaska.gov. The report may also be accessed through most libraries, via interlibrary loan from the Alaska State Library or the Alaska Resources Library and Information Services (www.arlis.org).

This document, published in PDF format only, should be cited as:

Spivey, T. J. 2023. Dall sheep management report and plan, Game Management Unit 14C: Report period 1 July 2016–30 June 2021, and plan period 1 July 2021–30 June 2026. Alaska Department of Fish and Game, Species Management Report and Plan ADF&G/DWC/SMR&P-2023-9, Juneau.

Please contact the authors or the Division of Wildlife Conservation at (907) 465-4190 if you have questions about the content of this report.

Cover Photo: Dall sheep rams utilizing escape terrain in the Chugach Mountains. ©2022 ADF&G. Photo by Dr. Thomas Lohuis.

Contents

List of Figures

List of Tables

Purpose of this Report

This report provides a record of survey and inventory management activities for Dall sheep (*Ovis dalli*) in Unit 14C for the 5 regulatory years 2016–2020 and plans for survey and inventory management activities in the following 5 regulatory years, 2021–2026. A regulatory year (RY) begins 1 July and ends 30 June (e.g., RY14 = 1 July 2014–30 June 2015). This report is produced primarily to provide agency staff with data and analysis to help guide and record agency efforts but is also provided to the public to inform it of wildlife management activities. In 2016 the Alaska Department of Fish and Game's (ADF&G, the department) Division of Wildlife Conservation (DWC) launched this 5-year report to report more efficiently on trends and to describe potential changes in data collection activities over the next 5 years. It replaces the Dall sheep management report of survey and inventory activities that was previously produced every 3 years.

I. RY16–RY20 Management Report

Management Area

Unit 14C is located in Southcentral Alaska and encompasses approximately 1,961 mi^2. The boundaries of Unit 14C closely approximate those of the Municipality of Anchorage (MOA), with the Knik River forming the norther border of the unit, the Chugach Mountains along the eastern border, and the Upper Cook Inlet (including Turnagain Arm) forming the western and southern boundaries. MOA is a mosaic of both undeveloped wildlife habitat and large areas of human development. Most of MOA is characterized by large tracts of natural lands, including Chugach State Park (CSP), Chugach National Forest, Anchorage Coastal Wildlife Refuge, and Joint Base Elmendorf-Richardson (JBER; a 131 mi^2 military base). However, even the highly developed portions of MOA support wildlife in vegetated greenbelts, stream corridors, and large municipal parks. Within Unit 14C lies a small portion of the Chugach Mountains, which represents about 487 mi^2 of sheep habitat above 2,000 ft elevation. This portion of the Chugach Mountain Range is the only Dall sheep habitat in Unit 14C.

Summary of Status, Trend, Management Activities, and History of Dall Sheep in Unit 14C

Systematic aerial surveys have been conducted sporadically in the Chugach Mountains since 1949. In 1951, 477 sheep were estimated between Turnagain Arm and the Knik River (now Unit 14C). The current sheep population in Unit 14C is estimated to be roughly 3 times as large as the 1951 estimate.

Sport hunting was not considered to have had a significant influence on statewide Dall sheep populations in the early twentieth century. However, the annual sheep harvest reported to the U.S. Fish and Wildlife Service was 3 to 4 times higher in the mid-1940s compared to a decade earlier, increasing from about 200 per year to 600 per year (Scott et al. 1950). Beginning in 1942, the bag limit was reduced from 2 or 3 rams to 1 ram in various areas. Hunting pressure was heaviest near human settlements, and accessible mountain ranges near Anchorage were closed to sheep hunting to protect sheep that otherwise might have been hunted to depletion (Scott et al.

1950). Hunting season was reopened in 1961, except for the Rainbow Valley Closed Area, which extended along Turnagain Arm from Potter Station to Girdwood.

In 1968, the sheep habitat bounded by the Knik River, Turnagain Arm, Lake George, and the Twentymile River was established as the West Chugach Controlled Use Area. No motorized vehicles other than boats and airplanes were allowed for hunting or transporting game in this area during the sheep hunting season. In 1971, much of this area was incorporated into CSP, which continued to allow sheep hunting in most of the park but prohibited all motorized access except along the north side of Eklutna Lake. The bag limit for ¾-curl rams was further restricted to ⅞-curl rams in 1979. This regulation remained in effect for 10 years. Because of increasing demand for sheep hunting in Unit 14C, a drawing permit was instituted in 1982 to maintain the number of large rams and aesthetically pleasing hunting conditions.

As the number of sheep increased through the 1980s, managers became concerned about exceeding the carrying capacity of the range. Sheep populations appear to be regulated primarily by deep snow and ice cover. However, if overabundant sheep deplete vegetation on winter ranges, subsequent severe snow and ice conditions could have an even greater effect on the population. Consequently, the bag limit was changed to "any sheep" in 1989 for some drawing permit hunts to aid in reducing the population to a more sustainable level. This regulation remained in effect through 1995. From 1996 through 2008, the bag limit for nonarchery drawing permit hunts allowed the taking of either a full-curl ram or ewe, or the hunts have been ewe-only. Since 2008, all nonarchery sheep drawing permits have been issued for full-curl rams only.

Management Direction

The prior management objective of a harvest of at least 30 full-curl rams per year has not been achieved since 2008 and does not appear to be a feasible long-term management objective for this population. Lower harvest could be attributed to a number of factors including weather, the accessibility of legal rams, and perhaps most importantly, the skill and effort of hunters drawing the permits. Furthermore, current research has shown that sheep in Unit 14C continue to have very poor body condition and variable pregnancy rates (Lohuis 2016; Lohuis 2017; Lohuis, Dial, et al. 2018; Lohuis, Smith, et al. 2018), suggesting they could be at or near the carrying capacity for the habitat. Because of these considerations, the management objectives for this reporting period (RY16–RY20) were evaluated with a plan of looking at harvest strategies other than full-curl rams in order to maximize hunting opportunity while keeping the population from expanding beyond carrying capacity.

Existing Wildlife Management Plans

Direction for the management of Unit 14C Dall sheep was outlined in the Southcentral Alaska Wildlife Management Plan (ADF&G 1976) and has been reviewed and modified through public comments, staff recommendations, and Board of Game (BOG) actions over the years. A record of these changes can be found in the division's management report series. The plan portion of this report contains the current management plan for Dall sheep in Unit 14C.

In 2000, a wildlife plan called "Living with Wildlife in Anchorage: A Cooperative Planning Effort" was created in an attempt to outline common goals for Anchorage wildlife management

(ADF&G 2000). The planning effort was initiated and led by ADF&G, and involved a team from local, state, and federal agencies with wildlife responsibilities; people from various wildlife-related interest groups; and members of the general public. This plan was intended to be used as a guide as Anchorage continued to be developed.

GOALS

- Maintain a harvestable population of Dall sheep that fluctuates in size within historical limits of abundance.

- Provide for both consumptive and nonconsumptive uses.

CODIFIED OBJECTIVES

Amounts Reasonably Necessary for Subsistence Uses

None.

Intensive Management

Sheep are not designated as an intensive management species in the state of Alaska.

MANAGEMENT OBJECTIVES

During the prior reporting period (RY11–RY15), the department evaluated the harvest objective of 30 full-curl or larger rams from Unit 14C relative to the sheep population size with the goal of identifying a sustainable harvest strategy and new management objective that could be implemented during this reporting period (RY16–RY20). A specific numerical harvest objective was not identified, and aerial survey minimum count estimates did not warrant discussion of new strategies to allow additional harvest. Consequently, the objective of providing aesthetically pleasing hunting conditions was held in place with the intent of removing the minimum harvest objective of 30 full-curl or larger rams from Unit 14C after this reporting period (RY16–RY20).

MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1. Conduct aerial surveys for Dall sheep to get an estimate of the minimum number of Dall sheep in Unit 14C.

Data Needs

Minimum count fixed-wing aerial surveys are needed to monitor and maintain the Dall sheep population at levels sufficient for both consumptive and nonconsumptive uses. This provides wildlife managers with a basic tool to monitor the population size and age/sex composition of sheep within Unit 14C.

Methods

Using fixed-wing aircraft (Piper Super Cub or similar aircraft) every year post lambing, we attempted to conduct a minimum count aerial survey for Dall sheep across the Unit 14C portion of the Chugach Mountain Range (Fig. 1). However, during some years the combination of persistent snow cover and/or inclement weather impeded survey attempts. During survey flights, sheep are classified into the following categories: legal rams (full-curl or larger), sublegal rams (less than full-curl), unclassified rams, ewes and yearling rams ("ewe-like" rams), lambs, and unidentified sheep. Yearling rams are difficult to distinguish from ewes, so their numbers are summarized together. Data from each of these surveys were recorded on a "14C Sheep Survey Datasheet" (Appendix). Following survey flights, age/sex cohort data are summarized by major drainages within the unit (e.g., Campbell Creek, Eagle River, Eklutna River, Knik River, Peters Creek Valley, Ship Creek, Thunderbird Creek, and along Turnagain Arm), summarized in a table within the Unit 14C sheep survey memorandum, and circulated to regional management staff.

Results and Discussion

July 2016 (RY16) We were able to conduct and complete a minimum count survey across the Unit 14C portion of the Chugach Mountain Range. Within the count area (Fig. 1), we found a total of 968 sheep (Rams, ewe-likes, and lambs combined; Table 1).

July 2017 (RY17) We were able to conduct and complete a minimum count survey across the Unit 14C portion of the Chugach Mountain Range. Within the count area (Fig. 1), we found a total of 1,069 sheep (Rams, ewe-likes, and lambs combined; Table 1).

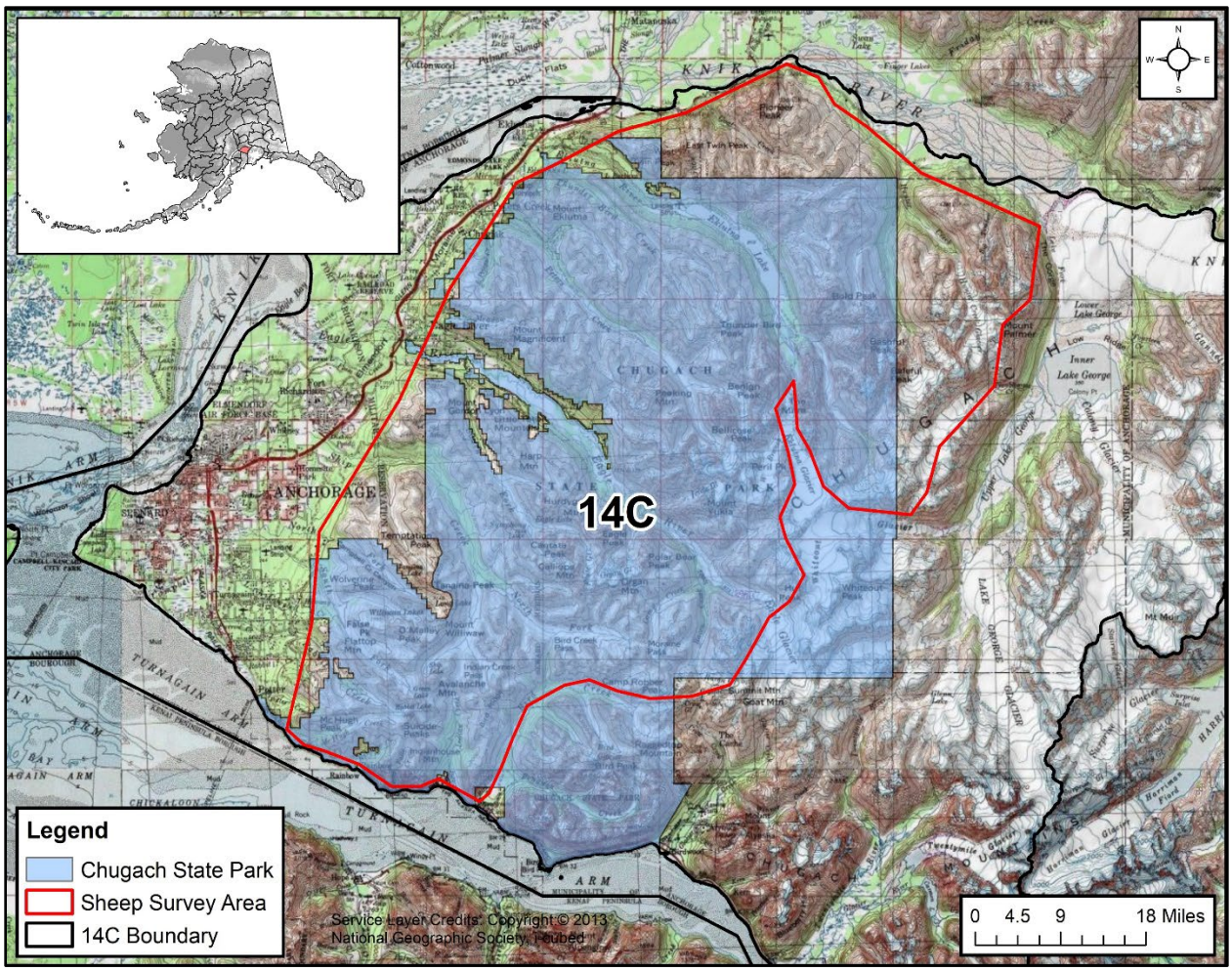
Summer 2018 (RY18) No survey was conducted due to poor weather conditions.

July 2019 (RY19) We were able to conduct and complete a minimum count survey across the Unit 14C portion of the Chugach Mountain Range. Within the count area (Fig. 1) we found a total of 1,208 sheep (Rams, ewe-likes, and lambs combined; Table 1).

Summer 2020 (RY20) No survey was conducted due to poor weather conditions.

Dall sheep minimum count surveys have been attempted on an annual basis to monitor the population within Unit 14C. Despite poor survey conditions inhibiting aerial surveys during the summers of 2018 and 2020, 3 surveys (2016, 2017, 2019) were completed during this reporting period, with the 2017 representing a "partial" survey due to missing large portions of Ship Creek, a commonly used drainage by Dall sheep in the unit.

The total number of sheep increased across surveys during this reporting period (RY16, RY17, and RY19), with the number of rams and ewes increasing between each survey undertaken, while the number of lambs only increased slightly between 2016 and 2019 (Table 1). Consequently, minimum count surveys suggest the Dall sheep population in Unit 14C trended upward between RY16–RY20, approaching similar count numbers from the early 1980s in this area (Fig. 2). However, missing years of aerial survey data limits our ability to confidently describe annual trends in the population and in general. Minimum counts are likely an underrepresentation of the total sheep population.



Produced by ADF&G using ArcGIS™ software (Esri, Redlands, California).

Figure 1. The Unit 14C Dall sheep minimum count survey area, Southcentral Alaska.

Table 1. Minimum count Dall sheep numbers for Unit 14C, regulatory years 2016–2020, Southcentral Alaska.

Regulatory year	Full-curl rams	<Full-curl rams	Unclassified	Ewe-like rams	Lambs	Unidentified	Total sheep
2016	46	233	0	540	149	0	968
2017[a]	30	259	0	601	179	0	1,069
2018[b]	–	–	–	–	–	–	–
2019	27	264	12	712	168	5	1,188
2020[b]	–	–	–	–	–	–	–

[a] A partial survey was conducted in Unit 14C.

[b] No survey was conducted due to poor weather conditions in Unit 14C.

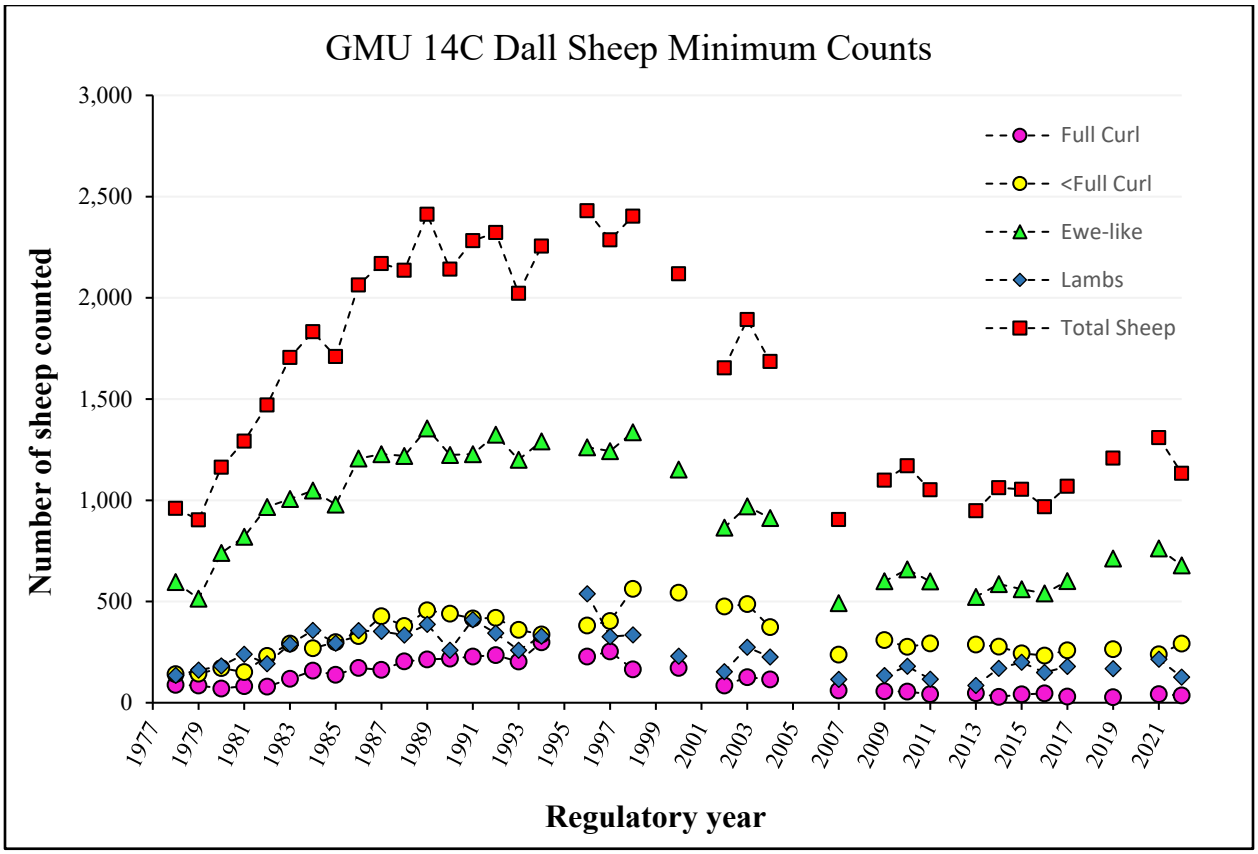


Figure 2. The number of Dall sheep observed by year (1977–2020) for Unit 14C during minimum count Dall sheep surveys. Breaks between values represent years when surveys could not be conducted. Incomplete surveys occurred during 2010, 2015, and 2017.

Recommendations for Activity 1.1

We recommend continuing with minimum count surveys and investigating whether a sightability correction factor would improve population estimates.

2. Mortality-Harvest Monitoring and Regulations

ACTIVITY 2.1. Monitor mortality and harvest in Unit 14C annually.

Data Needs

Monitoring annual harvest data provides management biologists with age and horn morphometric data from harvested rams. Drainage-specific harvest numbers can also be compared to the number of full-curl rams observed during minimum count surveys to provide area managers with a rough index of how many legal rams are harvested compared to the number identified during minimum count surveys.

Methods

Examine and summarize hunter harvest reports and records at the end of each season to quantify how many sheep were harvested within each individual drawing permit hunt area.

Season and Bag Limit

Hunts were offered during RY16–RY20 under 25 different hunt numbers (of which 4 were archery-only hunts for "any ram") with varying seasons and bag limit, with the one exception being the governor's Chugach auction/raffle permit (Table 2, Fig. 3). Harvest was regulated by the number of permits issued (Table 3).

Results and Discussion

The harvest of Dall sheep within Unit 14C is limited to drawing permits and the coveted governor's Chugach auction/raffle permit, as there is no general harvest season for Dall sheep within Unit 14C. During RY16–RY20, management staff issued between 139 and 148 permits for Dall sheep per year (Table 3).

Harvest by Hunters

During RY16–RY20, hunters harvested an average of 23 sheep per year. The highest number of sheep harvested was in RY19 at 26 animals (Table 3). Excluding rams harvested under the "any ram" drawing permits, which would not normally meet full-curl legality, all other rams harvested over RY16–RY20 were an average age of 9.2 years old, including 4 rams with at least 1 horn of 40 inches or more in length (Table 4). Between all of the hunt areas in Unit 14C, the Southwest, West, and Northwest areas accounted for 31%, 29%, and 21% of the harvest, respectively.

Hunter Residency and Success

During RY16–RY20, a total of 54 nonresidents hunted sheep, with 32 successfully harvesting a sheep. During the same period, 378 residents hunted sheep in Unit 14C with only 85 harvesting a sheep. Residents accounted for 73% of the total annual harvest while nonresidents accounted for 27%. Of the permit holders that hunted, nonresidents were more successful than residents, with annual success rates of 59% and 23%, respectively during this reporting period (RY16–RY20).

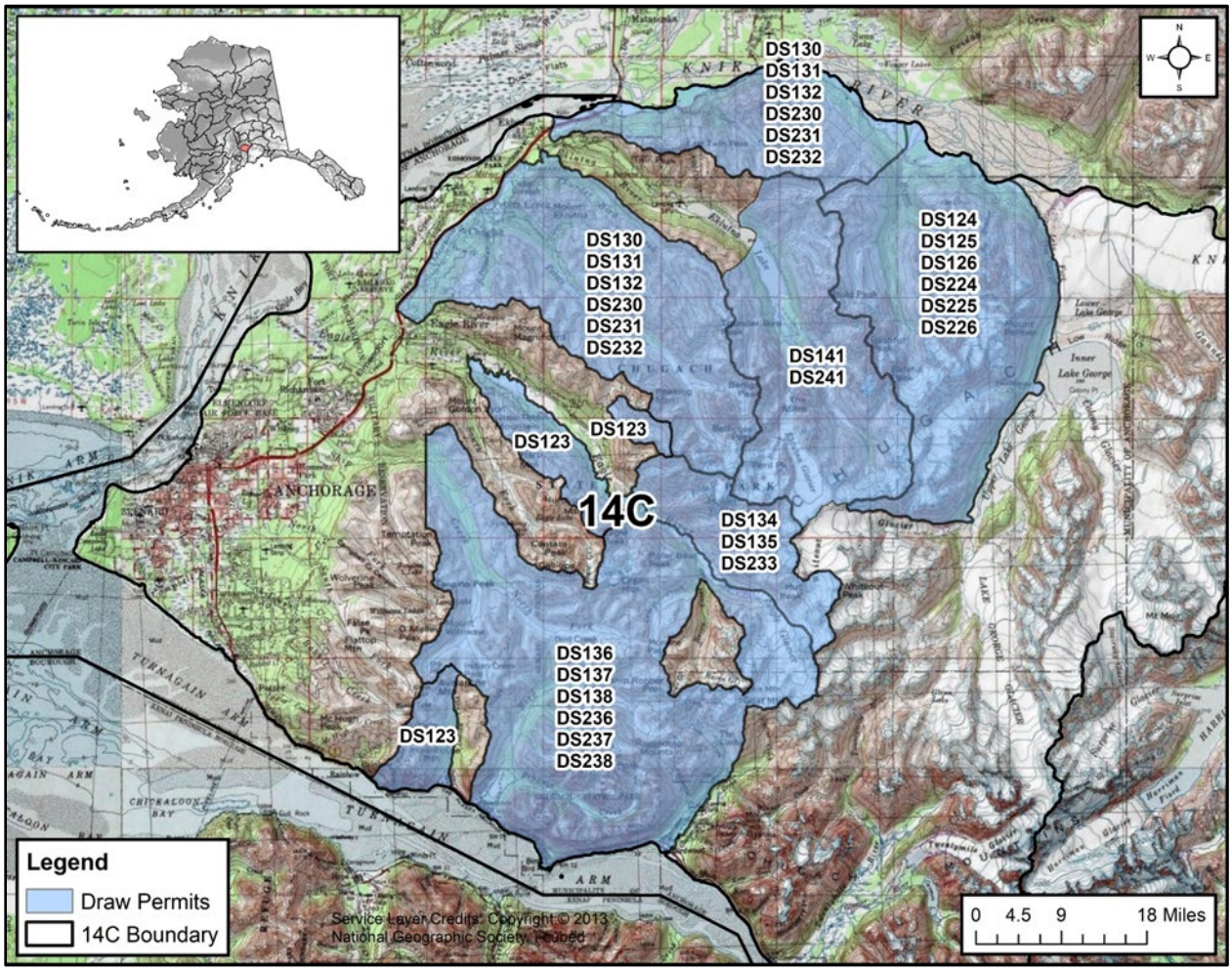
Other Mortality

Some out-of-season take does occur but is relatively small given the large amount of backcountry recreational use by the public that occurs year-round, as well as the presence of both the Alaska Wildlife Troopers and CSP rangers monitoring the area.

Survival data from collared animals (adult ewes, sublegal rams, and lambs) suggests predation does not represent the main source of nonhunting mortality for sheep in Unit 14C. Therefore, this population may not be limited by predation, which has been documented as a limiting factor for other sheep populations in Alaska (Lohuis 2016). Rather, mortality from weather-related events (e.g., deep snow and avalanches), old age, and poor body condition appear be the main sources of nonhunting mortality.

Additionally, results from a statewide disease screening initiative for the bacterium *Mycoplasma ovipneumoniae* (*M. ovi*), suggest that while certain *Mycoplasma* strains do exist in wild sheep and other ungulate populations in Alaska, they do not appear to negatively affect survival in the same manner as has been observed within Bighorn sheep populations in the lower 48 states (K. B. Beckmen, M.S., D.V.M., Ph.D., Wildlife health and Disease Veterinarian,

ADF&G unpublished data, Fairbanks, 2022). In addition, no sheep from Unit 14C have tested positive for *M. ovi*, despite extensive sampling since 2012 (T. Lohuis, Ph.D., ADF&G, DWC Research Coordinator, Anchorage, personal communication).



Produced by ADF&G using ArcGIS™ software (Esri, Redlands, California).

Figure 3. The Unit 14C Dall sheep drawing permit hunting areas, Southcentral Alaska.

Table 2. Season dates and bag limits for Dall sheep in Unit 14C for regulatory years 2016–2020, Southcentral Alaska.

Hunt area	Hunt number	Season	Legal animal
Central	DS123	10 Aug–30 Sep	One ram with full curl horn or larger
Northeast	DS124	10–22 Aug	One ram with full curl horn or larger
Northeast	DS125	23 Aug–4 Sep	One ram with full curl horn or larger
Northeast	DS126	5–17 Sep	One ram with full curl horn or larger
Northwest	DS130	10–22 Aug	One ram with full curl horn or larger
Northwest	DS131	23 Aug–4 Sep	One ram with full curl horn or larger
Northwest	DS132	5–17 Sep	One ram with full curl horn or larger
Upper ER[a]	DS134	10–22 Aug	One ram with full curl horn or larger
Upper ER	DS135	5–17 Sep	One ram with full curl horn or larger
Southwest	DS136	10–22 Aug	One ram with full curl horn or larger
Southwest	DS137	23 Aug–4 Sep	One ram with full curl horn or larger
Southwest	DS138	5–17 Sep	One ram with full curl horn or larger
West	DS140	1–10 Oct Certified bowhunters only	Any ram
West	DS141	6–30 Sep Certified bowhunters only	Any ram
Northeast	DS224	1–22 Aug	One ram with full curl horn or larger
Northwest	DS230	10–22 Aug	One ram with full curl horn or larger
Northwest	DS231	23 Aug–4 Sep	One ram with full curl horn or larger
Northwest	DS232	5–17 Sep	One ram with full curl horn or larger
Upper ER	DS233	23 Aug–4 Sep	One ram with full curl horn or larger
Southwest	DS236	10–22 Aug	One ram with full curl horn or larger
Southwest	DS237	23 Aug–4 Sep	One ram with full curl horn or larger
Southwest	DS238	5–17 Sep	One ram with full curl horn or larger
West	DS240	Oct 1 – Oct 10 Certified bowhunters only	Any ram
West	DS241	Sep 6 – Sep 30 Certified bowhunters only	Any ram
Unit wide	SS143[b]	Aug 10 – Oct 10	One ram with full curl horn or larger

[a] Hunt boundary consists of the Upper Eagle River valley.
[b] The governor's Chugach sheep permit allows the hunter to access sheep within 13D, 14A, and 14C.

Table 3. Harvest and hunter participation for Dall sheep drawing and governor's auction/raffle hunts in Unit 14C, for regulatory years 2016–2020, Southcentral Alaska.

Hunt No. / Area	Regulatory year	Permits issued	No. hunters	Percent successful	Rams	Ewes	Total harvest
DS124-126,224	2016	7	6	50%	3	0	3
Northeast	2017	7	6	0%	0	0	0
	2018	7	5	60%	3	0	3
	2019	10	7	29%	2	0	2
	2020	10	6	33%	2	0	2
DS130-132,230-232	2016	18	15	40%	6	0	6
Northwest	2017	18	13	31%	4	0	4
	2018	18	16	44%	7	0	7
	2019	21	17	29%	5	0	5
	2020	21	16	13%	2	0	2
DS123	2016	1	1	100%	1	0	1
Central	2017	1	1	100%	1	0	1
	2018	1	1	0%	0	0	0
	2019	1	1	100%	1	0	1
	2020	1	1	0%	0	0	0
DS134-135,233	2016	3	3	67%	2	0	2
Upper Eagle River	2017	3	3	67%	2	0	2
	2018	3	3	0%	0	0	0
	2019	3	3	33%	1	0	1
	2020	3	3	33%	1	0	1
DS136-138,236-238	2016	24	21	24%	5	0	5
Southwest	2017	24	21	33%	7	0	7
	2018	24	21	33%	7	0	7
	2019	27	21	43%	9	0	9
	2020	27	20	40%	8	0	8
DS140 & 240	2016	61	43	5%	2	0	2
West (archery only)	2017	60	36	19%	7	0	7
	2018	60	41	10%	4	0	4
	2019	60	37	11%	4	0	4
	2020	60	41	17%	7	0	7
DS141, 241,	2016	25	14	14%	2	0	2
West Eklutna	2017	25	16	13%	2	0	2
(archery only)	2018	25	16	13%	2	0	2
	2019	25	20	15%	3	0	3
	2020	25	18	0%	0	0	0
Governor's Tag	2016	1	1	100%	1	0	1
SS143	2017	1	1	100%	1	0	1
	2018[a]	1	1	100%	1	0	1
	2019	1	1	100%	1	0	1
	2020[a]	1	1	100%	1	0	1
Total	2016	140	104	21%	22	0	22
RY16-RY20	2017	139	97	25%	24	0	24
	2018[a]	139	104	23%	24	0	24
	2019	148	107	24%	26	0	26
	2020[a]	148	106	20%	21	0	21

[a] Ram taken under SS143 governor's permit in Unit 13D; harvest entry included in annual total harvest.

Table 4. Demographic and morphometric characteristics of Dall sheep harvested within Unit 14C, regulatory years 2016–2020, Southcentral Alaska.

Regulatory year	Rams[a,b]	Average horn length (inches)	No. ≥40 inches (%)	Average age (years)	Ewes	Total sheep harvest
2016	18	37.1	2 (11)	9.5	0	18
2017	20	36.7	1 (5)	9.2	0	20
2018	18	36.6	0 (0)	9.1	0	18
2019	20	36.8	1 (5)	9.1	0	20
2020	14	36.8	0 (0)	8.9	0	14

[a] Only includes rams identified as legal under the full curl definition with both age and measurement data; does not include rams taken under the any ram bag limit hunts.
[b] Does not include rams taken under SS143 outside of Unit 14C.

Alaska Board of Game Actions and Emergency Orders

There were no actions taken at the RY18 Board of Game (board) meeting affecting Dall sheep in Unit 14C. There were no board meetings for the Southcentral area during regulatory years 2016, 2017, 2019, or 2020.

Recommendations for Activity 2.1

We recommend continuing harvest and mortality monitoring.

3. Habitat Assessment-Enhancement

No large-scale habitat evaluations or assessments were conducted during RY16–RY20; however, ADF&G initiated a small-scale graduate research project investigating the species and nutritional quality of vegetation used by Dall sheep in several areas of Unit 14C. Very little is known about the habitat and forage quality for sheep in Unit 14C. Considering the wide fluctuation in sheep numbers in this unit within the last 40 years, this represents a significant knowledge gap. Gaining a better perspective of habitat quality will aid area biologists in managing the sheep population. ADF&G is awaiting data analysis and results.

Efforts to better understand Dall sheep habitat quantity and quality within Unit 14C are valuable to management. While this graduate project will not be carried forward by ADF&G staff, efforts to investigate habitat and forage quality that may be affecting sheep will be.

Current research has identified sheep captured and collared in Unit 14C to be in poor body condition, likely contributing to low and variable pregnancy rates of ewes over consecutive years (Lohuis 2016, Lohuis 2017, Lohuis, Dial, et al. 2018, Lohuis, Smith, et al. 2018). A definitive explanation for why Unit 14C sheep are in poor body condition has not yet been determined, however potential changes in the frequency of extreme winter weather conditions or the amount and quality of available forage may be contributing factors.

Because very little is known about the quantity and quality of Dall sheep habitat in Unit 14C, we recommend further investigating methods to delineate how much true sheep habitat is available, while continuing analysis of forage species quantity and quality on the landscape.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

Bighorn sheep (*Ovis canadensis*) populations in some lower 48 states have been severely impacted or extirpated by respiratory infection, ultimately resulting in fatal pneumonia. A primary pathogen in this process is *Mycoplasma ovipneumoniae*, *(M. ovi.)* which may be transmitted from domestic sheep or goats to wild stock (Besser et al. 2012).

While one strain of *M. ovi* has been detected in sheep and caribou herds in other Alaskan mountain ranges, it does not appear to be a pathogenic strain and does not appear to cause large scale mortality events in Alaskan sheep herds (K. B. Beckmen, M.S., D.V.M., Ph.D., Wildlife Health and Disease Veterinarian, ADF&G unpublished data, Fairbanks, 2022). Furthermore, despite extensive testing of radiocollared, hunter harvested, and opportunistically sampled dead sheep that were reported to the department, *M. ovi* has not been detected in Unit 14C, nor have other pathogens been shown to have a population level effect (Lohuis et al. 2020, 2021).

However, exposure to one strain of *M. ovi* does not confer immunity to other strains (Cassirer et al. 2017). As more domestic sheep and goats, including pack goats, are brought into the Anchorage bowl and surrounding communities, there is growing concern that other strains of *M. ovi* or other pathogens could be introduced into wild sheep or goat herds. Therefore, to maintain the disease-free status of Dall sheep and mountain goat (*Oreamnos americanus*) populations in Alaska with regard to *M. ovi*, domestic sheep and goats need to be separated from wild stock and should not be allowed to enter wild sheep or goat habitat.

Data Recording and Archiving

- Dall sheep survey form (Appendix).

- Digital copies of all Dall sheep survey datasheets and memoranda (Appendix) are stored in the Anchorage Fish and Game office in office 2006. Electronic copies are stored on the Division of Wildlife Conservation common server in Anchorage at the following address: O:\DWC\common\Anch_Wildlife_Management\BGDIF\Dall sheep.

- Dall sheep harvest reports for all Unit 14C sheep hunts are stored in the WinfoNet database.

Agreements

None.

Permitting

None.

Conclusions and Management Recommendations

The sheep population in Unit 14C climbed from approximately 1,000 sheep in the late 1970s to a high of 2,430 sheep in 1996 based on minimum count aerial surveys. Following the late 1990s, sheep numbers in Unit 14C declined until 2007, when the minimum count survey yielded 904 sheep. This decline has been attributed primarily to several severe winters which may have reduced recruitment during those years; however, other variables undoubtedly impacted the population. As a result of this decline and current population status, the number of full-curl permits available was reduced and the harvest objective of at least 30 full-curl rams annually has not been met since 2008.

Although there have been recent increases in the number of sheep observed during minimum-count aerial surveys, the harvest objective is not being met. A combination of less permits being available, lower hunter success rates, and a decrease in horn morphometrics within this population suggests that an annual harvest objective of 30 full-curl rams is no longer feasible. New goals and objectives in the *Project Review and RY21–RY25 Plan* section of this publication are more realistic and achievable.

Furthermore, while current survey data suggests the Unit 14C sheep population may be increasing or stable, this population should be monitored closely, as historical aerial survey data suggests that this population may fluctuate dramatically. If the population continues to increase, but harvest remains below prior objectives, additional harvest opportunities such as nonarchery "any ram" permits could provide for the additional harvest of rams from a variety of age classes without introducing an increase in enforcement issues.

II. Project Review and RY21–RY25 Plan

Review of Management Direction

Management Direction

The RY16–RY20 annual harvest objective of 30 full-curl rams has not been achieved since 2008 and is not feasible at the current population level. Additionally, current research has shown that sheep in Unit 14C have poor late-winter body condition (Lohuis 2016, 2017; Lohuis, Dial et al. 2018; Lohuis, Smith et al. 2018), however the proximate cause of those findings has yet to be determined. Due to these considerations, management objectives will be evaluated on an annual basis to provide flexibility for setting permit quotas, with the intended goal of maintaining a healthier and more sustainable sheep population.

Goals

- Maintain a healthy and harvestable population of Dall sheep that fluctuates in size within historical limits of abundance.

- Provide for both consumptive and nonconsumptive uses.

CODIFIED OBJECTIVES

Amounts Reasonably Necessary for Subsistence Uses

None.

Intensive Management

Sheep are not designated as an intensive management species in the state of Alaska.

MANAGEMENT OBJECTIVES

The department will evaluate the harvest objective relative to the sheep population size with the goal of maintaining a sustainable harvest strategy while also providing flexibility to modify the management objective for this population during the RY21–RY25 reporting period. The specific numerical harvest of 30 full-curl or larger rams was no longer practical given harvest rates over the last 10 regulatory years, and therefore, the current RY21–RY25 objectives are identified below:

- Maintain a harvestable surplus of Dall sheep within Unit 14C, while also providing aesthetically pleasing hunting conditions to avoid overcrowding of hunters in the field.

- Provide for both consumptive and nonconsumptive uses.

REVIEW OF MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1. Conduct aerial surveys for Dall Sheep to get an estimate of the minimum number of Dall Sheep in Unit 14C (same as RY16–RY20).

Data Needs

A more robust population estimate, preferably with a sightability correction factor, is needed for the Unit 14C sheep population.

Methods

We recommend continuing with minimum count survey methods as described in the RY16–RY20 report and investigating whether a sightability correction factor would improve population estimates.

2. Mortality-Harvest Monitoring

ACTIVITY 2.1. Monitor mortality and harvest in Unit 14C annually (same as RY16–RY20).

Data Needs

In addition to data needs identified during RY16–RY20, the RY21 sheep hunting season yielded the lowest statewide harvest since 1962, highlighting the need to be conservative with setting permit quotas while monitoring population and harvest levels. However, should the Unit 14C sheep population continue to increase toward historically high levels as were observed during the 1990s, we would like to investigate the potential for providing additional harvest opportunities through a limited number of "any ram" permits in addition to existing full-curl ram permits.

As survival data from collared animals (adult ewes and lambs) suggests predation does not represent the main source of nonhunting mortality for sheep in Unit 14C (Lohuis 2017; Lohuis, Smith et al. 2018), we would like to continue analyzing survival data from collared individuals. Specifically, it would be informative to know whether any relationship exists between winter weather, precipitation patterns, and nonhunting mortality as has been examined within sheep populations from other mountain ranges in Alaska (Rattenbury et al. 2018).

Methods

Continue to examine hunter harvest reports and records at the end of each season to quantify how many sheep were harvested. We also recommend further examination of survival data or reports of nonhunting mortality potentially associated with extreme weather and precipitation patterns.

3. Habitat Assessment-Enhancement

ACTIVITY 3.1. Research sheep habitat and forage that may be affecting Unit 14C sheep populations (new RY21–RY25).

Data Needs

Very little is known about the habitat and forage quality for sheep in Unit 14C. Considering the wide fluctuation in sheep numbers in this unit within the last 40 years, this represents a significant knowledge gap.

Methods

Research was initiated in RY16 by Region II wildlife research staff to examine sheep habitat in Unit 14C. This research includes determining seasonal diets of sheep through field observations, field vegetation sampling and fecal collections, quantifying diet quality through laboratory analyses and quantifying the amount of existing sheep habitat. This research will be continuing throughout the time period covered by this plan.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

No change from the RY16–RY20.

Data Recording and Archiving

- Dall sheep survey form (Appendix).
- Digital copies of all Dall sheep survey datasheets and memoranda (Appendix) are stored in the Anchorage Fish and Game office in office 2006. Electronic copies are stored on the Division of Wildlife Conservation common server in Anchorage at the following address: O:\DWC\common\Anch_Wildlife_Management\BGDIF\Dall sheep.
- Dall sheep harvest reports for all Unit 14C sheep hunts are stored in the WinfoNet database.

Agreements

None.

Permitting

None.

References Cited

Alaska Department of Fish & Game (ADF&G). 1976. Alaska wildlife management plans: Southcentral Alaska. Draft proposal subsequently approved by the Alaska Board of Game. Division of Game, Federal Aid in Wildlife Restoration, Project W-17-R, Juneau.

Alaska Department of Fish and Game. 2000. Living with wildlife in Anchorage: A cooperative planning effort [web page]. Division of Wildlife Conservation, Anchorage. http://www.adfg.alaska.gov/index.cfm?adfg=anchoragewildlifeplanning.main.

Besser, T. E., M. A. Highland, K. Baker, E. F. Cassirer, N. J. Anderson, J. M. Ramsey, K. Mansfield, D. L. Bruning, P. Wolff, J. B. Smith, and J. A. Jenks. 2012. Causes of pneumonia epizootics among bighorn sheep, western United States, 2008–2010. Emerging Infectious Diseases 18(3):406–414. doi:10.3201/eid1803.11554 .

Cassirer, E. F., K. R. Manlove, R. K. Plowright, and T. E. Besser. 2017. Evidence for strain-specific immunity to pneumonia in bighorn sheep. Journal of Wildlife Management 81(1):133-143. DOI: 10.1002/jwmg.21172.

Lohuis, T. 2016. Ewe Dall sheep survival, pregnancy and parturition rates, and lamb recruitment in GMU 14C, Chugach Mountains, AK. Alaska Department of Fish and Game, Division of Wildlife Conservation, Federal Aid Annual Research Performance Report 1 July 2015–30 June 2016, Federal Aid in Wildlife Restoration Project 6.18, Juneau.

Lohuis, T. 2017. Ewe Dall's sheep survival, pregnancy and parturition rates, and lamb recruitment in GMU 14C, Chugach Mountains, AK. Alaska Department of Fish and Game, Division of Wildlife Conservation, Federal Aid Annual Research Performance Report 1 July 2017–30 June 2018, Federal Aid in Wildlife Restoration Project 6.18, Juneau.

Lohuis, T., R. Dial, and B. Wendling. 2018. Ewe Dall's sheep survival, pregnancy and parturition rates, and lamb recruitment in GMU 14C, Chugach Mountains, AK. Alaska Department of Fish and Game, Division of Wildlife Conservation, Federal Aid Annual Research Performance Report 1 July 2017–30 June 2018, Federal Aid in Wildlife Restoration Project 6.18, Juneau.

Lohuis, T., K. Smith, L. Metherell, and R. Dial. 2018. Dall's sheep population declines in Alaska's Chugach Range may be related to climate and weather patterns. Proceedings of the 21st Biennial Northern Wild Sheep & Goat Council Symposium.

Lohuis, T., R. Dial, and B. Wendling. 2020. Ewe Dall's sheep survival, pregnancy and parturition rates, and lamb recruitment in GMU 14C, Chugach Mountains, AK. Alaska Department of Fish and Game, Division of Wildlife Conservation, Federal Aid Annual Research Performance Report 1 July 2019–30 June 2020, Federal Aid in Wildlife Restoration Project 6.18, Juneau.

Lohuis, T., R. Dial, and B. Wendling. 2021. Ewe Dall's sheep survival, pregnancy and parturition rates, and lamb recruitment in GMU 14C, Chugach Mountains, AK. Alaska Department of Fish and Game, Division of Wildlife Conservation, Federal Aid Annual Research Performance Report 1 July 2020–30 June 2021, Federal Aid in Wildlife Restoration Project 6.18, Juneau.

Rattenbury, K. L., J. H. Schmidt, D. K. Swanson, B. L. Borg, B. A. Mangipane, and P. J. Sousanes. 2018. Delayed spring onset drives declines in abundance and recruitment in a mountain ungulate. Ecosphere 9(11): 02513. 10.1002/ecs2.2513.

Scott, R. F., E. F. Chatelain, and W. A. Elkins. 1950. The status of the Dall sheep and caribou in Alaska. North American Wildlife Conference 15:612–626.

Appendix. Unit 14C Dall Sheep Survey Form.

14C Sheep Survey

Page _____ of _____ pages

GMU:_____ Weather Conditions:_____ DO NOT FLY PAST NOON

Date:_____ Temperature:_____ OR

Time Off:_____ Time On:_____ Precipitation: (Rain,.....Snow,.....or None) 65 DEGREES

Time Start:_____ Time End:_____ Snow Conditions: (clear,.. < ½,.. > ½,.. or Overcast)

Pilot/Observer:_____ Turbulence: (None, ... Light, ... or Moderate)

Aircraft Type:_____

Comments (e.g., sun intensity, horizon, & side of plane): _____

		Sheep						Goats				
Area	Waypoint #	Leg. Ram	Sub. Ram	Unk. Ram	Ewe	Lamb	Unid.	Adults	Kids	%Cover	%Snow	Collar?
Total												


ALASKA
DEPARTMENT OF FISH AND GAME