Species Management Report and Plan ADF&G/DWC/SMR&P–2019–5

Dall Sheep Management Report and Plan, Game Management Units 12, 13C, and 20D, Tok Management Area:

Report Period 1 July 2011–30 June 2016, and

Plan Period 1 July 2016–30 June 2021

Jeffrey J. Wells

2019

Alaska Department of Fish and Game Division of Wildlife Conservation

Dall Sheep Management Report and Plan, Game Management Units 12, 13C, and 20D, Tok Management Area

Report Period 1 July 2011–30 June 2016, and

Plan Period 1 July 2016–30 June 2021

PREPARED BY:

Jeffrey J. Wells
Wildlife Biologist II

APPROVED BY:

Doreen I. Parker McNeill
Management Coordinator

REVIEWED BY:

Alyssa Crawford
Biometrician II

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

Funding for survey and inventory project 6.0 was provided through the Federal Aid in Wildlife Restoration grant program. 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 through state hunting license and tag fees.

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 Doreen Parker McNeill, Management Coordinator for Region III for the Division of Wildlife Conservation, Fairbanks.

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:

Wells, J. J. 2019. Dall sheep management report and plan, Game Management Units 12, 13C, and 20D, Tok Management Area. Report period 1 July 2011–30 June 2016, and plan period 1 July 2016–30 June 2021. Alaska Department of Fish and Game, Species Management Report and Plan ADF&G/DWC/SMR&P-2019-5, Juneau.

Contents

Purpose of this Report 1
I. RY11–RY15 Management Report 1
Management Area 1
Summary of Status, Trend, Management Activities, and History of Dall Sheep in the Tok Management Area 1
Management Direction 2
  Existing Wildlife Management Plans 2
  Goals 2
  Codified Objectives 3
    Amounts Reasonably Necessary for Subsistence Uses 3
    Intensive Management 3
  Management Objectives 3
  Management Activities 3
    1. Population Status and Trend 3
    2. Mortality-Harvest Monitoring and Regulations 8
    3. Habitat Assessment-Enhancement 11
  Nonregulatory Management Problems or Needs 13
    Data Recording and Archiving 13
    Agreements 13
    Permitting 13
Conclusions and Management Recommendations 13
II. Project Review and RY16–RY20 Plan 14
Review of Management Direction 14
  Management Direction 14
  Goals 14
  Codified Objectives 14
    Amounts Reasonably Necessary for Subsistence Uses 14
    Intensive Management 14
  Management Objectives 14
  Review of Management Activities 15
    1. Population Status and Trend 15
    2. Mortality-Harvest Monitoring 16
    3. Habitat Assessment-Enhancement 17
  Nonregulatory Management Problems or Needs 18
    Data Recording and Archiving 18
    Agreements 18
    Permitting 18
References Cited 18
Appendix. Aerial Dall sheep survey form. 20

List of Figures

Figure 1. Permit matrix for determining the number of sheep draw permits to issue within the Tok Management Area, Alaska. The permit matrix was first used during regulatory year[a] 2014. 4

Figure 2. Tok Management Area, Alaska, sheep survey units, regulatory years[a] 2011–2015. 5

List of Tables

Table 1. Tok management area Dall sheep composition counts from aerial surveys within a 990 mi^2 trend count area, summer 2011–2015, Alaska. 7

Table 2. Tok management area Dall sheep composition ratios from aerial surveys within a 990 mi^2 trend count area, summer 2011–2015, Alaska. 7

Table 3. Tok management area harvest of Dall sheep rams, regulatory years[a] 2011–2015, Alaska. 10

Table 4. Tok management area Dall sheep harvest percent by transport method, regulatory years[a] 2011–2015, Alaska. 12

Purpose of this Report

This report provides a record of survey and inventory management activities for Dall sheep in the Tok Management Area (TMA) for the 5 regulatory years 2011–2015 and plans for survey and inventory management activities in the following 5 regulatory years 2016–2021. A regulatory year (RY) begins 1 July and ends 30 June (e.g., RY10 = 1 July 2010–30 June 2011). This report is produced primarily to provide agency staff with data and analysis to help guide and record its own 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 Division of Wildlife Conservation launched this 5-year report to more efficiently report on trends and 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 and supersedes the 1976 draft Alaska wildlife management plans (ADF&G 1976).

I. RY11–RY15 Management Report

Management Area

The TMA is in east-central Alaska on the eastern edge of the Alaska Range and is centered on 63°17′N latitude and 143°21′W longitude. It is managed within the Division of Wildlife Conservation's Region III management area (Interior and Northeast Alaska) and includes portions of Game Management Units 12, 13C, and 20D. Major drainages within the area include the Tok River, Robertson River, and Johnson River drainages. The TMA encompasses 1,800 mi^2, of which the majority is generally considered suitable Dall sheep habitat (e.g. approximately 1,250 mi^2 is at or above 4,000 feet in elevation). Elevations within the TMA range from 1,600 feet along the Tanana River to >8,000 feet at the highest peaks. Tree line varies but typically occurs at 3,000–4,000 feet. Lowland areas are dominated by spruce forest, and higher elevations are dominated by shrub communities, subalpine and alpine tundra, and large swaths of glaciated areas. The climate is typical of Interior Alaska, where temperatures at lower elevations frequently reach 80° F in summer and -40° F in winter, and overall precipitation is relatively light.

Summary of Status, Trend, Management Activities, and History of Dall Sheep in the Tok Management Area

The TMA was created in 1974 to provide Dall sheep hunters the opportunity to harvest large-horned, trophy rams in uncrowded, high-quality hunting conditions (ADF&G 1976). This particular area was chosen based upon the trophy horn growth potential of rams and the relative accessibility of the area to hunters using a variety of transportation methods (ADF&G 1976). In comparing horn growth qualities of Dall sheep rams inhabiting 18 areas within 7 mountain ranges in Alaska, rams in the TMA had the fourth highest quality index value, which was based on a variety of factors, including horn volume, maximum sustained growth, and diameter of curl (Heimer and Smith 1975). Additional information on the early history of the TMA can be found in Kelleyhouse (1989).

The most recent sheep population estimate for the TMA was 2,000 sheep in the mid-1980s (Kelleyhouse 1989). Anecdotal information from longtime area guides, transporters, and sheep hunters indicates that the population in TMA has declined since RY74. However, sheep survey data collected during RY74–RY01 is inadequate to analyze population trend during that time in the TMA. Sheep numbers were likely stable during RY02–RY10 (Wells 2014).

Sheep harvest in the TMA is managed by controlling hunter numbers through a drawing permit system. This system is designed to keep annual harvests low enough to allow some rams to attain their maximum potential horn size and to reduce hunter crowding. One hundred permits were issued annually during most of the early 2000s, and to address crowding concerns, permits were evenly split between 2 hunt periods beginning in RY09. The number of permits was reduced to 80 to RY10 due to a reduced harvest of large rams (e.g. rams with horns of 40 inches or greater in length) and reduced average horn size of harvested rams during RY07–RY09. This, combined with concerns of area residents, guides, and transporters about the size of the sheep population and the numbers of full curl or larger rams in the TMA, led to investigations into trends in horn sizes and ages of harvested rams (Bentzen 2011).

Overall, the TMA management strategy has resulted in low hunter crowding and competition and has generally resulted in an abundance of legal rams, including rams with horns ≥40 inches. In addition, this management strategy has allowed ADF&G to maintain components of a high-quality hunting experience, including unrestricted methods of access to the area.

Management Direction

Existing Wildlife Management Plans

Direction in the Tok Sheep Management Plan (ADF&G 1976) has been reviewed and modified through public comments, department recommendations, and Alaska Board of Game actions over the years. A record of these changes can be found in the TMA Dall sheep species management reports. The plan portion of this document contains the current management plan for sheep in the TMA.

Goals

During RY11–RY15, the TMA Dall sheep management goals were as follows:

G1. Provide for diversified recreational uses of wildlife.

G2. Provide for the opportunity to be selective in hunting.

G3. Provide an opportunity to hunt under aesthetically pleasing conditions.

CODIFIED OBJECTIVES

Amounts Reasonably Necessary for Subsistence Uses

The TMA sheep population has a negative customary and traditional use finding, as determined by the Board of Game.

Intensive Management

The TMA sheep population is not in an intensive management program.

MANAGEMENT OBJECTIVES

During RY11–RY15, the TMA Dall sheep management objectives were as follows:

M1. Maintain abundance of mature rams sufficient to produce a harvest of 30–45 rams with mean horn size of >36 inches and mean age of >8 years,

M2. Maintain an average of at least 7% rams with 40-inch or greater horns in the harvest, and

M3. Maintain at least 60% hunter satisfaction with aesthetically pleasing, uncrowded, hunting conditions during RY11–RY12 (Wells 2014).

MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1. Population abundance (minimum count) and composition.

Data Needs

Minimum count population data and composition estimates are used for 3 primary purposes. The first is to assist in determining the number of draw permits to award. The total number of sheep observed during surveys is 1 parameter used in the decision matrix that guides how many draw permits to award in any given year (Fig. 1). The second purpose is to inform the public, including hunters, advisory committees, and the Alaska Board of Game, of the population status and potential trends. Lastly, the final purpose is for general long-term monitoring of the population.

Methods

Aerial population abundance (minimum count) and composition surveys were conducted annually during RY11–RY15 within a 990 mi^2 portion of the TMA (Fig. 2). This area makes up about two-thirds of the available sheep habitat in the TMA, has been surveyed annually since 2006, and includes the 580 mi^2 area surveyed during 2002–2004 (survey units 1–4). All surveys were flown in Piper PA-18 Super Cubs and were flown during July when snow cover in the alpine is typically at or near its lowest level. Surveys were usually conducted during early morning or late evening to avoid turbulence, and surveys were not conducted when there was cloud cover obscuring portions of sheep habitat.

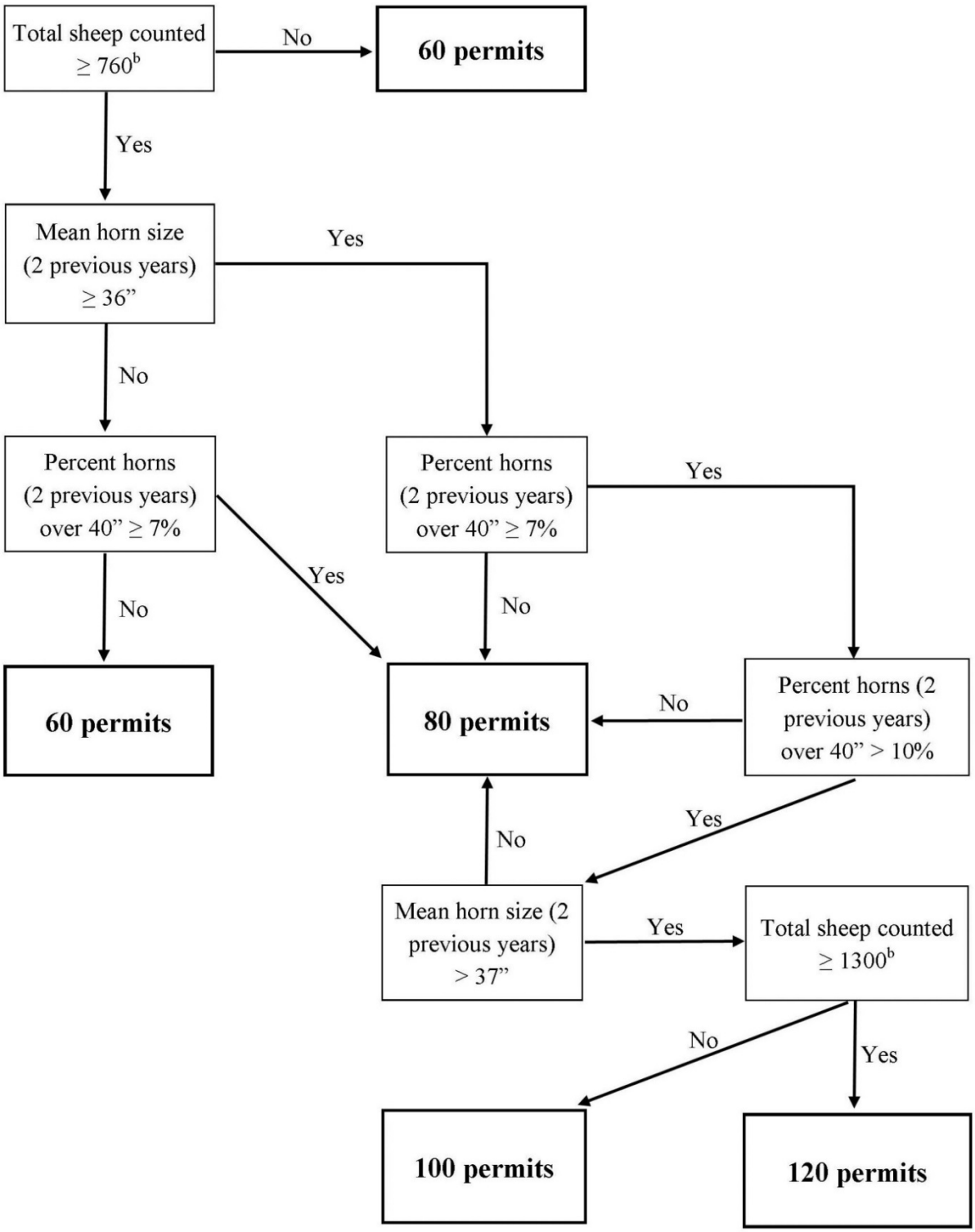

Figure 1. Permit matrix for determining the number of sheep draw permits to issue within the Tok Management Area, Alaska. The permit matrix was first used during regulatory year[a] 2014.

[a] Regulatory year begins 1 July and ends 30 June (e.g. regulatory year 2014 = 1 July 2014–30 June 2015).
[b] Total sheep counted within survey units 1–4.

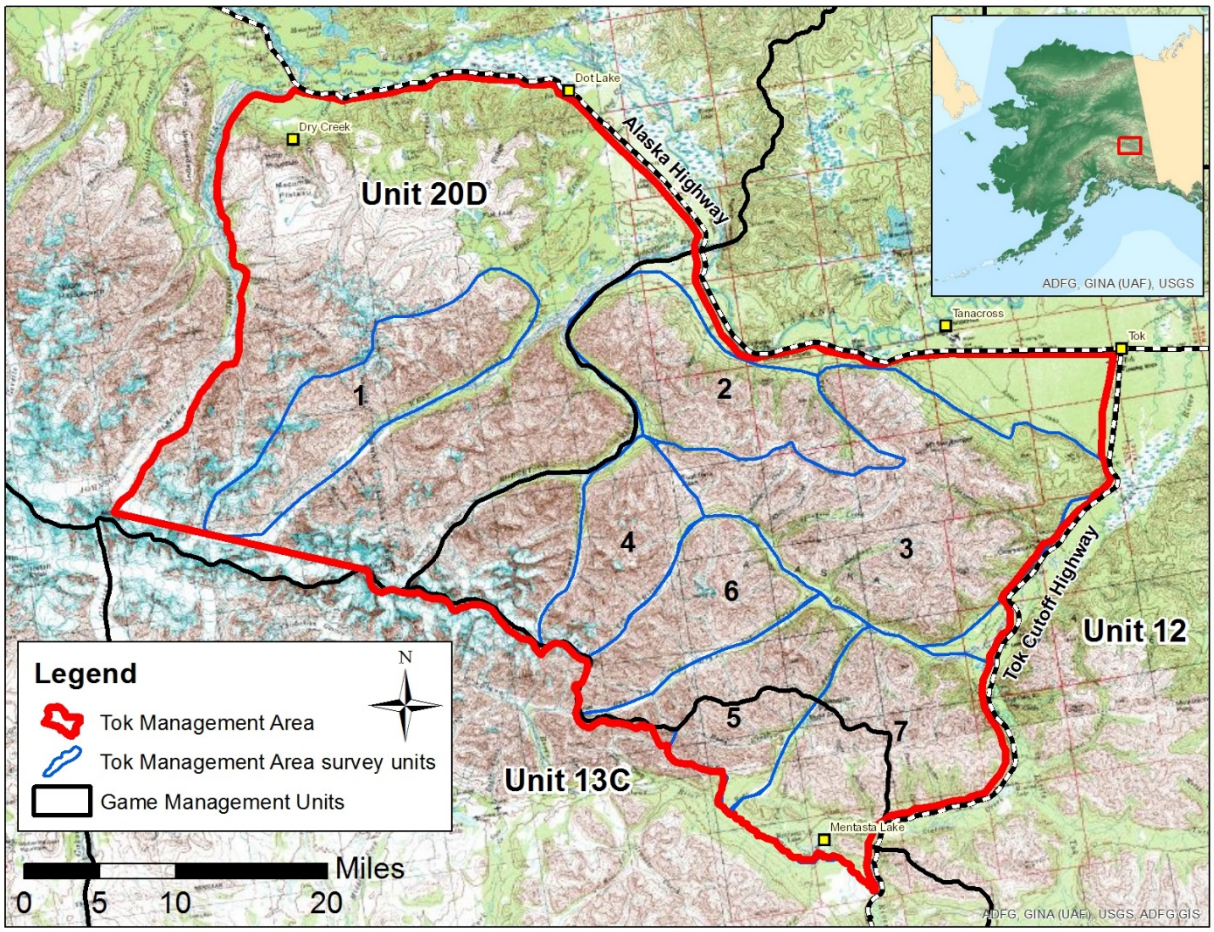

Figure 2. Tok Management Area, Alaska, sheep survey units, regulatory years[a] 2011–2015.

[a] Regulatory year begins 1 July and ends 30 June (e.g. regulatory year 2011 = 1 July 2011–30 June 2012).

Survey crews consisted of a pilot and an observer seated behind the pilot. All of the pilots were experienced with Dall sheep surveys, while observer experience levels varied. The flight path and technique varied by pilot-observer team, although typically the 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. The end goal was to thoroughly search each survey unit and to observe all of the sheep within the unit. When sheep were observed, the group size, location (latitude and longitude), and composition were recorded. Composition was defined by the following categories: ewe (or ewe-like; this category includes yearlings of both sexes and rams of ¼ curl or less), lamb, <½ curl ram, ½ to ¾ curl ram, ¾ to <full-curl ram, and ≥full-curl ram (Appendix). During RY14 and RY15, photos were taken of some of the groups with a Canon EOS 50D digital camera with an 18–200 mm lens to aid in determining the overall number and composition. No sightability correction factor (SCF) was estimated during the RY11–RY15 surveys; therefore, the total number of sheep observed represents a minimum count estimate.

RY11. Surveys were conducted during 8–22 July. Little information on survey and weather conditions was recorded. Total flight time (including ferry time) was 30.5 hours and total survey time was 23.5 hours.

RY12. Surveys were conducted during 14–26 July. Little information on survey and weather conditions was recorded, although notes were made that patchy snow conditions persisted throughout the survey area. Total flight time (including ferry time) was 37 hours and total survey time was 29.4 hours.

RY13. Surveys were conducted during 12–14 July and survey conditions were reported as excellent. Total flight time (including ferry time) was 31.2 hours and total survey time was 24.6 hours.

RY14. Surveys were conducted during 14–18 July. Survey conditions were generally excellent, although snow on some north-facing slopes may have reduced sightability of sheep in some areas. Total flight time (including ferry time) was 32.1 hours and total survey time was 22.6 hours.

RY15. Surveys were conducted during 6–13 July. Low clouds, wind, and smoke precluded quick completion of the survey. Overall, survey conditions were adequate to good. Very little snow remained within the survey area, which likely increased sightability, while some unfavorable weather (moderate wind, turbulence, and low sun angle) on the first day of the survey likely decreased sightability. Additionally, the span of time required to complete the survey may have allowed sheep movements between survey units, although attempts were made to complete as many adjacent survey units as possible on each day surveys were conducted. More information on specific weather and survey conditions can be found in the 2015 survey memo (Jeffrey Wells, Assistant Area Biologist, ADF&G, Tok, Tok Management Area aerial sheep survey memorandum, 10 September 2015). Total flight time (including ferry time) was 36.0 hours and total survey time was 24.0 hours.

Results and Discussion

The TMA sheep population likely decreased during RY11–RY15, particularly between RY12 and RY13. The average number of sheep observed during the RY13 and RY14 surveys was 39% fewer than the average number of sheep observed during the RY11 and RY12 surveys (Table 1). Although these surveys represent a minimum count and are not corrected for sightability, it is likely that this decrease represents an actual decline in the population and is not the result of poor surveys or poor sightability, for several reasons: First, it appears that there was poor recruitment during spring and summer in both 2012 and 2013, in which less than 10% of the sheep observed during surveys were lambs and lamb:ewe ratios were low (Table 2). Second, the population likely declined due to decreased adult survival during winter 2012–2013. Winter conditions persisted into May in 2013, and snowpack in the upper Tanana valley on 1 May was 353% above average (U.S. Department of Agriculture 2013). Fewer ewes and rams were observed during the 2013 survey compared to the 2012 survey (Table 1); ewes seemed to be impacted more than the rams by the hard winter.

Table 1. Tok management area Dall sheep composition counts from aerial surveys within a 990 mi^2 trend count area, summer 2011–2015, Alaska.

	Rams				Other Sheep				
Year	Legal rams[a]	Sublegal rams[b]	Unclassified rams	Total rams	Ewes[c]	Lambs	Unidentified sheep	Total other sheep	Total sheep
2011	63	365	0	428	753	263	1	1,017	1,445
2012	82	362	0	444	782	121	0	903	1,347
2013	61	268	0	329	485	67	0	552	881
2014	60	261	0	321	414	100	0	515	835
2015	70	181	0	251	489	231	0	720	971

[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.

Table 2. Tok management area Dall sheep composition ratios from aerial surveys within a 990 mi^2 trend count area, summer 2011–2015, Alaska.

Year	Legal rams: 100 ewes[a]	Sublegal rams: 100 ewes	Total rams: 100 ewes	Lambs: 100 ewes	Lambs % of total
2011	8	49	57	35	18
2012	11	46	57	16	9
2013	13	55	68	14	8
2014	14	63	78	24	12
2015	14	37	51	47	24

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

The TMA population likely increased between RY14 and RY15, although the RY15 population likely remained lower than the RY11–RY12 levels. Recruitment was very high during spring and summer 2015. The proportion of lambs and the lamb:ewe ratio observed during the 2015 survey were the highest observed since surveys began.

Changes in composition occurred during RY11–RY15 which were likely largely the result of poor recruitment during spring and summers 2012 and 2013 and the severe winter and spring of 2012–2013. Very few sublegal rams were observed during the 2015 survey, which is likely the result of poor recruitment during 2012 and 2013 (Tables 1 and 2). In addition, the ratio of rams-to-ewes increased between RY11–RY12 and RY13–RY14, which suggests that ewes were likely impacted to a greater degree than rams by the severe winter of 2012–2013.

Recommendations for Activity 1.1.

Continue.

- Utilize memos to archive details of future abundance and composition surveys to record details of methods and results.

2. Mortality-Harvest Monitoring and Regulations

ACTIVITY 2.1. Monitor and analyze harvest data.

Data Needs

Harvest data are necessary to determine whether trophy management objectives are achieved.

Methods

Annual harvest was estimated from mandatory harvest report cards and through the mandatory horn sealing process. Successful hunters are required to have the horns sealed within 30 days of the date of kill at an ADF&G office. During the sealing process, a uniquely numbered aluminum plug is placed in the horn, the sheep is aged, a broken determination (both, 1, or neither horns broken) is made, and measurements (including total length and base circumference) are taken. If timely harvest reports are not received, hunters receive up to 2 reminder letters, an e-mail (if an email address was provided by the hunter), and in some situations, a telephone call.

Season and Bag Limit

The sheep hunting season for resident and nonresident hunters during RY11–RY15 was 10–25 August for DS102 and 26 August–20 September for DS103. In addition, 1 Alaska Governor's TMA Dall sheep permit was auctioned annually to raise funds for wildlife research and management in Alaska, and the season for this permit was 10 August–20 September. The bag limit for all TMA permits was 1 ram every 4 years with a full-curl or larger horn, with both horns broken (broomed), or at least 8 years old.

Results and Discussion

Harvest by Hunters-Trappers

Total reported annual harvest during RY11–RY15 averaged 23 rams per year (range 18–31; Table 3). With the exception of RY11, the management objective to harvest 30–45 rams per year was not met. This was the result of a combination of factors, including lower sheep numbers, lower numbers of permits, lower participation rates (particularly during RY12 and RY13), and poor weather during some of the hunting seasons (e.g., poor weather during the RY15 DS102 season was likely the primary driver behind the low success rate of 33%). Average harvest was similar between the DS102 (12 rams/year) and DS103 (10 rams/year) hunts.

Annual mean horn length during RY11–RY15 was 36.5 inches (range 35.4–37.5; Table 3). The management objective for a mean horn size of >36 inches was met in RY11, RY12, and RY15, and was not met in RY13 and RY14. The failure to meet this objective in RY13 and RY14 was likely largely due to lower sheep numbers following the winter of 2012–2013. There are only 4 other years since RY90 that this objective has not been met. Average horn size was identical between the DS102 and DS103 hunts (36.4 inches), while the governor's tag had the highest average horn size (38.5 inches). Mean horn size during RY11 (37.5 inches) was the largest observed in the last 25 years.

The proportion of rams with horns ≥40 inches ranged from 0% in RY14 to 23% in RY11 (Table 3). The management objective to maintain an average of at least 7% rams with 40-inch or greater horns in the harvest was not met during RY13–RY15. Similar to the average horn size objective, the main reason for the failure to meet this objective was likely due to reduced sheep numbers following the winter of 2012–2013. The proportion of rams ≥40 inches in RY11 was the highest observed in the last 25 years.

The annual mean age of harvested rams during RY11–RY15 was 8.5 years (range 8.3–8.8; Table 3). The management objective for a mean age of >8 years was met every year. The proportion of older rams in the harvest remained relatively stable during RY11–RY14 (17–24% of the annual harvest ≥10 years) and increased during RY15 (35% of the harvest ≥10 years). The severe winter of 2012–2013 did not appear to result in a reduced number of older age rams in the harvest, while the increased proportion of older rams in the RY15 harvest could be partially a result of lower harvest from the prior 2 years, which thereby could have increased the survival of legal rams.

Drawing permit management

During RY11–RY15, an average of 3,186 and 2,268 hunters applied annually for DS102 and DS103 permits, respectively. This resulted in an overall average chance of being drawn of 1.1% and 1.6% for the DS102 and DS103 hunts respectively. Since the inception of the TMA, the number of permits awarded has been decreased 3 times (RY02, RY10, and RY13); however, a systematic approach to guide when to change (increase or decrease) the number of permits to award was lacking. During RY13, ADF&G, in conjunction with the Upper Tanana Fortymile Advisory Committee, developed a systematic method to aid in determining the number of permits to award based on survey and harvest data (Figure 1). The goals of this approach were to

Table 3. Tok management area harvest of Dall sheep rams, regulatory years[a] 2011–2015, Alaska.

Hunt no.	Regulatory year	Permits issued[b]	% hunted	% successful	Total harvest	Mean horn length[b]	*n* ≥40″ (%)	Mean age
DS102	2011	40	88	40	14	36.0	1 (7)	8.7
	2012	43	74	47	15	36.9	3 (20)	8.5
	2013	40	70	50	14	36.3	0 (0)	8.6
	2014	30	83	40	10	36.0	0 (0)	8.5
	2015	30	93	33	9	36.5	0 (0)	8.5
DS103	2011	40	78	52	16	38.6	5 (31)	8.7
	2012	43	70	30	9	35.9	1 (11)	7.3
	2013	40	70	29	8	34.2	0 (0)	7.5
	2014	30	70	33	7	34.4	0 (0)	7.9
	2015	30	63	59	10	36.6	1 (10)	9.1
DS102, DS103, and SS102[c]	2011	81	81	47	31	37.5	7 (23)	8.8
	2012	87	72	40	25	36.5	4 (16)	8.3
	2013	81	70	40	23	35.4	1 (4)	8.3
	2014	61	77	38	18	35.5	0 (0)	8.3
	2015	61	79	44	20	36.5	1 (5)	8.8

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory 2011 = 1 July 2011–30 June 2012).
[b] Mean horn length reported in inches.
[c] Alaska Governor's TMA Dall sheep permit – 1 issued annually.

allow for maximum participation in the TMA hunt while simultaneously achieving management objectives. This approach was used to determine the number of permits to award for the RY14–RY17 hunts.

Hunter Residency and Success

Mean annual success rate during RY11–RY15 was 42%, which is lower than the RY06–RY10, 5-year average of 47% and the RY91–RY10 average of 46%. Again, this was likely due to a combination of factors, including lower sheep numbers and poor weather during some of the hunting seasons. Mean success rates were similar between the DS102 (42%) and DS103 (41%) hunts; however, there was more variability in the success rates of DS103 hunters (range 29–59%) compared to DS102 hunters (range 33–50%).

Transport Methods

Similar to prior reporting periods, the type of transportation used by most successful hunters during RY11–RY15 was airplanes ($\bar{x}$ = 69%); the next most common methods were highway vehicles and/or walking in on foot (Table 4).

Alaska Board of Game Actions and Emergency Orders

In February 2014 the Board of Game changed the proportion of TMA draw permits allocated to nonresident from a maximum of 10% of the permits to a fixed 10% of the permits. The limit of 50% of these nonresidents who could hunt with a resident relative instead of a guide was retained.

Recommendations for Activity 2.1.

- Continue to utilize the systematic approach to determine the number of permits to award (Figure 1).
- Take additional horn measurements during the sealing process to assess factors influencing horn growth in TMA rams.
- Work with biometric staff to analyze long-term trends in horn size and age of harvested rams from the TMA, similar to the analyses conducted by Bentzen (2011) and Wells (2014).

3. Habitat Assessment-Enhancement

No habitat assessment or enhancement was conducted within the TMA during RY11–RY15.

Table 4. Tok management area Dall sheep harvest percent by transport method, regulatory years[a] 2011–2015, Alaska.

Regulatory year	Harvest percent by transport method									
	Airplane	Horse	Boat	3- or 4-wheeler	Snowmachine	ORV	Highway vehicle	Walk	Airboat	*n*
2011	71	0	0	10	0	6	7	6	0	31
2012	80	0	0	4	0	4	8	4	0	25
2013	57	0	0	17	0	0	22	4	0	23
2014	66	0	6	0	0	0	6	16	6	18
2015	70	0	0	5	0	5	5	15	0	20

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory 2011 = 1 July 2011–30 June 2012).

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

No nonregulatory management problems or needs were identified during this reporting period.

Data Recording and Archiving

- All electronic files such as survey memos, reports, survey data, and maps are located on the Tok server (S:\Wells\Sheep\TMA Sheep and S:\Wells\MAPS\TMA Sheep). All hard copy data sheets, paper files, etc. are found in the file cabinet in the conference room in the Tok office.

- Electronic copies of survey memos, survey data, and maps are stored in the WinfoNet Data Archive. Project Title: Tok Sheep. Primary Region: Region III.

Agreements

None

Permitting

None

Conclusions and Management Recommendations

Minimum count and composition surveys during RY11–RY15 suggest that the TMA sheep population decreased during this reporting period, although improvements (e.g. high recruitment) were observed during RY15. Partially as a result of the lower sheep numbers, fewer draw permits were issued during RY13–RY15 compared to previous years. Beyond altering permit numbers, few management actions can currently be taken in response to changing population numbers, although future studies should include an investigation into potential changes in habitat and how this may be playing a role in TMA population dynamics and distribution.

Management objectives related to harvest were not met during portions of RY11–RY15. The management objective to harvest 30–45 rams per year was met only in RY11. Although this objective might have been met in several of the other years if the number of permits had been increased, an increased harvest likely would have decreased the likelihood of achieving the trophy horn management objectives. Management objectives related to mean horn size and proportion of rams ≥40 inches were not met during several years, likely largely due to decreased sheep numbers. However, mean horn size and proportion of trophy rams during RY11 were the highest observed in several decades. The mean age management objective was met during all 5 years. The primary management action for achieving these management objectives is to alter the number of drawing permits. The systematic approach to deciding how many permits to award (Fig. 1) should be continued and should help in achieving management objectives during RY16–RY20.

The management objective to maintain at least 60% hunter satisfaction with aesthetically pleasing, uncrowded, hunting conditions was eliminated in RY13 (Wells 2014). Although hunter

satisfaction is an important part of any hunt, this objective was dropped because no hunter surveys to assess satisfaction were taking place.

II. Project Review and RY16–RY20 Plan

Review of Management Direction

MANAGEMENT DIRECTION

The RY11–RY15 management direction and goals for the TMA were generally appropriate; however, the goals will be altered slightly for RY16-RY20. This is to realign management goals for the TMA with the management direction specified when the TMA was established. For example, the management goal to provide for diversified recreational uses of wildlife does not relate well to TMA Dall sheep management, so this goal will be eliminated.

GOALS

Goals for the RY16–RY20 reporting period will be as follows:

G1) Maintain a harvestable population of Dall sheep fluctuating within historical limits of abundance and the carrying capacity of their habitat,

G2) Provide for the opportunity to be selective in hunting and to hunt large-horned sheep, and

G3) Provide the opportunity to hunt sheep under aesthetically pleasing and uncrowded conditions.

CODIFIED OBJECTIVES

Amounts Reasonably Necessary for Subsistence Uses

The TMA sheep population has a negative customary and traditional use finding, as determined by the Board of Game.

Intensive Management

The TMA sheep population is not in an intensive management program.

MANAGEMENT OBJECTIVES

The RY11–RY15 management objectives for the TMA were generally appropriate; however, these objectives will be split from 2 objectives into the following 4 objectives for RY16–RY20:

M1. Maintain an annual average horn size of >36 inches on harvested rams. This objective will be considered to be met if the average annual horn size, as measured during the mandatory sealing process, exceeds 36 inches.

- The management action taken related to this objective will be to alter the number of permits awarded in subsequent years, based on the 2-year average horn size (Fig. 1).

M2. Maintain an annual average age of >8 years for harvested rams. This objective will be considered to be met if the average annual age, as determined during the mandatory sealing process, exceeds 8 years.

- Due to the full-curl harvest strategy used in the TMA, which restricts harvest to mature rams, this objective has historically been met and no management action beyond maintaining the full-curl harvest strategy has been necessary. However, if the objective is not met in the future, permit numbers could be altered in order to help achieve the objective.

M3. Maintain at least 7% rams with ≥40 inches horns in the annual harvest. This objective will be considered to be met if the annual proportion of rams with horns ≥40 inches, as measured during the mandatory sealing process, exceeds 7% of the total harvest.

- The management action taken related to this objective will be to alter the number of permits that are awarded. This will be based upon the 2-year proportion of rams with horns ≥40 inches (Fig. 1).

M4. Using a full-curl harvest strategy, maintain an annual harvest of 30–45 rams. This objective will be considered to be met if the annual harvest, as determined through the mandatory reporting and sealing process, is within 30–45 rams.

- This objective is secondary to objectives M1–M3. Permit numbers are altered largely with the intent to meet objectives M1 and M3 (Fig. 1) which means that at lower permit numbers (e.g. 60), harvest will likely be lower than 30 rams. However, at the higher permit numbers (80 and above), this harvest objective is achievable and reflects the general intent of TMA management to allow for the harvest of 30–45 rams annually.

REVIEW OF MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1. Conduct population abundance (minimum count) and composition surveys (Goal G1).

Data Needs

No change from prior reporting period. Minimum count population data and composition estimates will be used to 1) assist in determining the number of permits to award, 2) inform the public of population status and trends, and 3) for general long-term monitoring of the population.

Methods

Aerial survey methods will be the same as those described in the report section for RY11–RY15.

RY16 – Aerial surveys were completed during 5–13 July within the 990 mi^2 trend count area within the TMA.

RY17–RY20 – Annually survey the 990 mi^2 trend count area within the TMA.

ACTIVITY 1.2. Monitor distribution and movements (Goals G1 and G3).

Data Needs

There is anecdotal information from local longtime residents that sheep distribution within the TMA has changed over the last 20 or more years. Changes in sheep distribution could have direct impacts on the distribution of hunters on the landscape, and potentially on how permits are allocated both spatially and temporally since one of the primary management goals within the TMA is to provide the opportunity to hunt in uncrowded conditions.

Methods

Historic sheep survey information will be digitized into ArcGIS and investigated for potential shifts in summer distribution. Biometric assistance will likely be needed for this analysis. In addition, GPS waypoints will continue to be collected for all sheep groups encountered during surveys.

2. Mortality-Harvest Monitoring

ACTIVITY 2.1. Monitor and analyze harvest data (Objectives M1–M4).

Data Needs

No change from prior reporting period. Harvest data are necessary to assess whether the trophy harvest management objectives are achieved.

Methods

No change from prior reporting period, with the exception that additional horn measurements may be taken during the sealing process to assess factors influencing horn growth in TMA rams (for more details see the Federal Aid Research Project 2.0 Statement "Assessing Dall's sheep horn morphometrics as a management tool," by wildlife biologist and project leader Brad R. Wendling, ADF&G). In addition, biometric staff will be consulted to analyze long-term trends in horn size and age of harvested rams from the TMA, similar to the analyses conducted by Bentzen (2011) and Wells (2014).

ACTIVITY 2.2. Monitor disease prevalence (Goal G1).

Data Needs

Wild sheep are susceptible to a variety of diseases, of which the most detrimental are respiratory infections that result in pneumonia, which can result in all-age mortality and is typically followed by extended periods of poor lamb recruitment and population declines (Brewer et al. 2014). The pathogens that are most often associated with population-level respiratory disease events in bighorn sheep include several in the Pasteurellaceae family and *Mycoplasma ovipnuemoniae*, all of which are common to domestic sheep and goats. Although no Dall sheep

populations have been known to experience large-scale die-offs due to the respiratory pathogens described above, they are believed to be susceptible due to their relative isolation and lack of previous exposure with domestic sheep and goats (Jex et al. 2016).

Although there are limited but unknown numbers of domestic sheep and goats in the vicinity of the TMA (e.g., within communities and rural residential sites), there are currently no signs that disease is a limiting factor in the TMA sheep population. In addition, Dall sheep disease sampling to date within Alaska suggests there is a very limited presence of bacterial and viral pathogens and there is no evidence of transmission of pathogens from domestic stock (K. Beckmen, Wildlife Veterinarian, and T. Lohuis, Wildlife Biologist, ADF&G, memorandum 3 March 2016, Anchorage). However, no disease monitoring has been conducted within the TMA since 1990. Although the transmission risk of these pathogens to the TMA sheep population in the near future is likely low, the potential risk to the population if disease transmission occurs is high. Therefore, it is important to establish a baseline presence/absence of pathogens in order to increase the chances of detecting a change in pathogen presence in the future (Wild Sheep Working Group 2017).

Methods

Sampling will occur opportunistically via hunter-harvested rams. Thirty sampling kits will be distributed to hunters who volunteer to bring the kits with them into the field during RY17. The samples requested from hunters will generally follow the guidelines outlined by the Wildlife Health Committee of the Western Association of Fish and Wildlife Agencies (Wildlife Health Committee 2015), although the final sampling methodology has not yet been completed. Future sample kit numbers and distribution will depend on results (e.g., return rate from hunters) obtained during RY17.

3. Habitat Assessment-Enhancement

ACTIVITY 3.1. Monitor habitat use (Goal G1).

Data Needs

Changes in habitat could lead to changes in sheep distribution; however, little is known about the sheep habitat within the TMA. The only study conducted specifically on sheep habitat within the TMA was within the Sheep Creek and Robertson River drainages in the late 1970s (Winters 1980). This study investigated summer habitat, including food utilization and nutritional quality.

Methods

A habitat monitoring program may be initiated during the RY16–RY20 reporting period. This will depend in part on results obtained relating to Activity 1.2 efforts to evaluate potential shifts in sheep distribution. A short pilot study will take place during July or early August 2017 to examine some of the plots included in the Sheep Creek and Robertson River study (Winters 1980). Coordination with the Region III sheep biologist will take place both during the pilot study and during planning and implementation of the habitat monitoring program, if it is initiated. In addition, consultation with biometric staff will occur if a habitat monitoring program is initiated.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

No nonregulatory management problems or needs are identified for RY16–RY20.

Data Recording and Archiving

Recording

- Dall sheep survey form (Appendix)
- ArcGIS version 10.3 (store and analyze spatial data)

Archiving

- Harvest data will be stored on an internal database housed on the Wildlife Information Network (WinfoNet) server (http://winfonet.alaska.gov/index.cfm) and archived in *WinfoNet* under *Harvest Information*.
- All electronic files such as survey memos, reports, survey data, and maps will be located on the Tok server (S:\Wells\Sheep\TMA Sheep and S:\Wells\MAPS\TMA Sheep). All hard copy data sheets, paper files, etc. will be stored in the file cabinet in the conference room in the Tok office.
- In addition, electronic copies of survey memos, survey data, and maps will be stored in the WinfoNet Data Archive. Project Title: Tok Sheep. Primary Region: Region III.

Agreements

None.

Permitting

None.

References Cited

Alaska Department of Fish and Game (ADF&G). 1976. Alaska wildlife management plans: Interior Alaska (draft proposal; subsequently adopted by Alaska Board of Game). Division of Game, Federal Aid in Wildlife Restoration, Project W-17-R, Juneau.

Bentzen, T. W. 2011. Portions of Units 12, 13C, and 20D Dall sheep. Pages 56–71 [*In*] P. Harper, editor. Dall sheep management report of survey and inventory activities 1 July 2007–30 June 2009. Alaska Department of Fish and Game, Division of Wildlife Conservation, Federal Aid in Wildlife Restoration Project 6.0, Juneau.

Brewer, C. E., V. C. Bleich, J. A. Foster, T. Hosch-Hebdon, D. E. McWhirter, E. M. Rominger, M. W. Wagner, and B. P. Wiedmann. 2014. Bighorn Sheep: Conservation challenges and management strategies for the 21st century. Wild Sheep Working Group, Western Association of Fish and Wildlife Agencies. Cheyenne, Wyoming.

Heimer, W. E., and A. C. Smith III. 1975. Ram horn growth and population quality: Their significance to Dall sheep management in Alaska. Alaska Department of Fish and Game, Division of Game, Wildlife Technical Bulletin 5, Juneau.

Jex, B. A., J. B. Ayotte, V. C. Bleich, C. E. Brewer, D. L. Bruning, T. M. Hegel, N. C. Larter, R. A. Schwanke, H. M. Schwantje, and M. W. Wagner. 2016. Thinhorn sheep: conservation challenges and management strategies for the 21st Century. Wild Sheep Working Group, Western Association of Fish and Wildlife Agencies, Boise, Idaho.

Kelleyhouse, D. G. 1989. Units 12, 13, and 20 Dall sheep. Pages 39–48 [*In*] S. O. Morgan, editor. Dall sheep annual report of survey and inventory activities 1 July 1987–30 June 1988. Alaska Department of Fish and Game, Division of Wildlife Conservation, Federal Aid in Wildlife Restoration Study 6.0, Juneau.

U.S. Department of Agriculture. 2013. Alaska snow survey report, May 1, 2013. Natural Resources Conservation Service, Anchorage, Alaska. http://ambcs.org/pub/BasinRpt/2013/may.pdf (Accessed 12 May 2017).

Wells, J. J. 2014. Portions of Units 12, 13C, and 20D Dall sheep. Chapter 6, pages 6-1 through 6-16 [*In*] P. Harper and L. A. McCarthy, editors. Dall sheep management report of survey and inventory activities 1 July 2010–30 June 2013. Alaska Department of Fish and Game, Species Management Report ADF&G/DWC/SMR-2014-4, Juneau.

Wildlife Health Committee. 2015. WAFWA Wildlife Health Committee 2014 bighorn sheep herd health monitoring recommendations. Western Association of Fish and Wildlife Agencies, Boise, Idaho.https://www.wafwa.org/Documents%20and%20Settings/37/Site%20Documents/Working%20Groups/Wild%20Sheep/Disease/BHS%20herd%20health%20monitoring_Final%201_3_2015.pdf (Accessed 25 April 2019).

Wild Sheep Working Group. 2017. Adaptive Wild Sheep Disease Management Venture (DMV) Strategy, Western Association of Fish and Wildlife Agencies, Boise, Idaho. https://www.wafwa.org/Documents%20and%20Settings/37/Site%20Documents/Working%20Groups/Wild%20Sheep/Most%20Recent%20WSWG%20Meeting%20Info/DMV%20Wild%20Sheep%20Strategy%20Jan%202017.pdf (Accessed 3 May 2019).

Winters, J. F. 1980. Summer habitat and food utilization by Dall's sheep and their relation to body and horn size. Master's Thesis, University of Alaska Fairbanks.

Appendix. Aerial Dall sheep survey form.

Aerial Dall Sheep Survey Form Page___of___

Date:_____ Count Area:_____

Observer:_____ Pilot:_____ Aircraft:_____ Datum:_____

Depart Time:_____ Begin Survey:_____ Total Flight Time:_____

Return Time:_____ End Survey:_____ Total Survey Time:_____

Weather (record cloud cover and height, wind, snow cover, etc):_____

Additional comments:_____

Group #	Wypt #			Rams						Totals		Comments /	
		Ewes	Lambs	<1/2	1/2-3/4	3/4-7/8	Full	Unid	Total	Unid.	TOTAL	Lat.	Long.
Page totals													

Version edited June 2017 Flip page for additional observations


ALASKA
DEPARTMENT OF FISH AND GAME