Species Management Report and Plan ADF&G/DWC/SMR&P–2023–14

Moose Management Report and Plan, Game Management Unit 18:

Report Period 1 July 2010–30 June 2015, and

Plan Period 1 July 2015–30 June 2020

Phillip Perry

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Alaska Department of Fish and Game Division of Wildlife Conservation

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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 Tony Gorn, Regional Supervisor for Region V 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). To subscribe to email announcements regarding new technical publications from the Alaska Department of Fish and Game, Division of Wildlife Conservation please use the following link: http://list.state.ak.us/mailman/listinfo/adfgwildlifereport.

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Purpose of this Report

This report provides a record of survey and inventory management activities for Moose (*Alces alces*) in Game Management Unit 18 for the 5 regulatory years 2010–2014 and plans for survey and inventory management activities in the next 5 regulatory years, 2015–2019. 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 moose management report of survey and inventory activities that was previously produced every 2 years.

I. RY10–RY14 Management Report

Management Area

Game Management Unit 18 is approximately 42,000 mi^2 of mainland in western Alaska and covers the Yukon and Kuskokwim deltas south to Cape Newnham. It also includes Nunivak, Nelson, and St. Matthews islands. Moose are not present on either Nunivak or St. Matthews islands. Mainland terrain varies from rugged mountains and river valleys to flat coastal wetlands. Spruce forests characterize eastern portions of the unit, while western portions are treeless and largely tundra covered with willow thickets along the riparian corridors.

Summary of Status, Trend, Management Activities, and History of Moose in Unit 18

Moose are thought to have begun immigrating to the Yukon-Kuskokwim Delta during the mid-to-late 1940s. Local elders from the Yukon River have confirmed this timing. The Yukon population occupies most of the available riparian habitat, and the population is growing. The Kuskokwim population is growing and is still in the process of colonizing the available riparian habitat. Most of the Yukon-Kuskokwim Delta is lowland treeless tundra, which is not suitable as winter habitat for moose.

Moose densities are at moderate to high levels and growing in the Yukon River drainage. The densities in the lower Kuskokwim River drainage are at low to moderate levels and also growing. Although moose are now more common than in the past, overall densities in Unit 18 vary from low to high, relative to habitat availability.

In the past, we believe hunting pressure impeded growth in moose abundance and prevented a Kuskokwim River moose population from becoming established. The first hunt in 5 years was allowed in September of 2009 in the lower-Kuskokwim area. Participation in this hunt was higher than expected, with over 1,300 hunters obtaining permits. It is noteworthy that 110 moose were harvested during this 10-day hunt compared to an estimated abundance of 67 moose from the survey conducted 5 years earlier. Hunting and harvests have continued at similar levels, and

by any measure, the cooperative effort between U.S. Fish and Wildlife Service (USFWS), Association of Village Council Presidents (AVCP), ADF&G, and local communities has been a success. Continued close monitoring and limited harvest on this population should ensure continued growth and greater opportunities for harvest. The growth of moose abundance along the Yukon River has not been as significant as that along the Kuskokwim River but compliance with hunting regulations has improved and abundance has positively responded.

Management Direction

Existing Wildlife Management Plans

There are no plans presently specific to moose in Unit 18. The Yukon-Kuskokwim Delta moose management plan is the last published plan that specifically addresses moose management in Unit 18 (ADF&G 1976). This plan represents the current management plan for moose in Unit 18.

Goals

- Allow Unit 18 moose abundance to increase to the level habitat can support.
- Maintain healthy age and sex composition at a minimum of 30 bulls per 100 cows for moose populations within the Yukon and Kuskokwim river drainages.
- Determine population size, trend, and composition of Unit 18 moose populations.
- Provide the greatest sustained-yield opportunity to participate in hunting moose.
- Improve harvest reporting and compliance with hunting regulations.
- Minimize conflicts among user groups interested in moose within and adjacent to Unit 18.

Codified Objectives

Amounts Reasonably Necessary for Subsistence Uses

Unit 18 has a positive customary and traditional finding for moose. The amount reasonably necessary for subsistence uses is set at 200 to 400 moose.

Intensive Management

Unit 18 has a positive finding for intensive management (IM). The Alaska Board of Game (BOG) set the population abundance objective at 1,000 to 2,000 moose. The harvest objective was set at 60 to 200 moose.

MANAGEMENT OBJECTIVES

1) Allow the lower Yukon River moose population to grow in abundance to at least 4,000 moose.

2) Allow the lower Kuskokwim River moose population to increase from its estimated size of 75 to 250 moose to at least 2,000 moose.

3) Manage for a post-hunt (fall) sex ratio of 30 bulls:100 cows.

4) Conduct seasonal sex and age composition surveys as weather allows.

5) Estimate abundance and recruitment during winter in the established survey areas on an annual rotation.

6) Conduct fall and/or winter surveys to document population trends.

7) Adjust hunts to help achieve population goals and management objectives.

8) Improve knowledge of and compliance with harvest reporting requirements and hunting regulations through education and incentives.

9) Address user conflicts through education and hunter contacts.

MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1. Estimate late winter abundance in at least one survey area annually. Estimate calf recruitment in at least one late winter survey annually.

Data Needs

Moose abundance is the basis for managing moose for sustainable harvest. Calf recruitment is another metric that is important for understanding a moose population and how a population is being affected by factors such as habitat condition and predation. Conducting abundance estimates in fall is preferable, but adequate snow cover and flying weather rarely allow this to occur. As a result, surveys to estimate abundance are typically conducted in late winter or early spring. Resulting winter or spring abundance estimates are valuable because they provide insight into overall abundance as well as recruitment of 10-month-old moose.

Methods

Geospatial population estimator (GSPE; Kellie and Delong 2006) surveys are attempted every winter in 1 of the 4 survey areas (Fig. 1). This procedure produces abundance estimates and statistically bounded sex and age composition estimates by using fixed- or random-sampling designs and geostatistical models of autocorrelation. It is designed for high search intensity (8–12 min/mi^2) from a PA18 Super Cub or equivalent aircraft to obtain estimates.

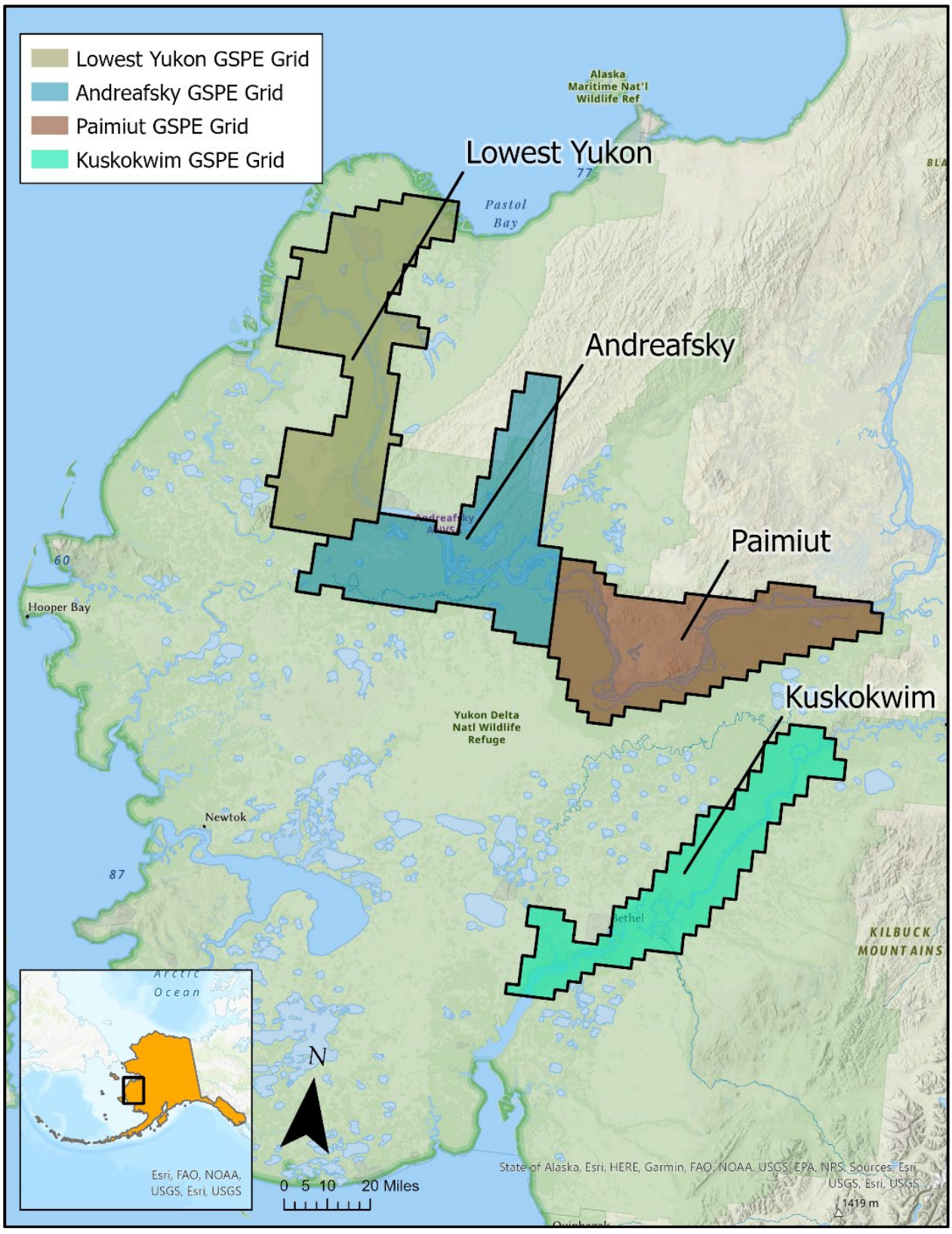

Figure 1. Map of Unit 18 geospatial population estimator (GSPE) survey areas, western Alaska.

Stratification into high- and low-density survey units is based on observed moose, moose tracks, moose beds, and the amount of moose habitat within the survey unit. In Unit 18, stratification is typically based on previous surveys and updated by flying through survey units deemed as likely to change in classification due to changes in moose abundance and distribution. Typically, units are classified as high density if we suspect 4 or more moose will be found in the unit, and low density if we expect to find 3 or fewer moose. In Unit 18, a goal of 70 survey units are sampled, where 60% are allocated to high-density units and 40% to low-density units.

Adequate snow cover and flying weather in February and March are required to conduct these surveys. In some years conditions are such that no surveys are completed. In a typical year we conduct 1 GSPE survey in 1 of the 4 survey areas. We have conducted 2 GSPE surveys in a single year when time and funding were sufficient. During the reporting period we completed GSPE surveys in the Kuskokwim survey area (2011, 2015), the Andreafsky survey area (2012) and the Paimiut survey area (2013).

Results and Discussion

During this reporting period 2 GSPE surveys were completed in the Unit 18 Kuskokwim count area. The 2011 survey estimate was 672 moose (95% confidence interval (CI) = 531–813; Table 1). In the winter of 2015, the survey estimate was 1,378 moose (95% CI = 1,213–1,543; Table 1). The area surveyed in 2015 was expanded downriver of Bethel and was 1,241.4 mi^2 compared to the previous survey of 907 mi^2. This area was expanded because moose became common in habitat that was previously unoccupied. The estimated moose density was 0.8 moose/mi^2 in the 2011 survey, and 1.1 moose/mi^2 in the 2015 survey (Table 1). Recruitment estimates for these 2 surveys were 33% calves in 2011 and 30% calves in 2015.

We completed a GSPE survey in the Andreafsky count area in 2012 and the Paimiut count area in 2013. The estimate from the Andreafsky survey was 2,748 (95% CI = 2,309–3,187) moose and 5,597 (95% CI = 4,757–6,437) from the Paimiut survey. Density estimates in the 2 areas were 2.4 moose/mi^2 and 3.6 moose/$mi^{2,}$ respectively. Estimated recruitment during the 2013 Paimiut survey was 26% calves and 26% calves during the 2012 Andreafsky survey.

These results reflect a general trend of growth in abundance throughout the unit. In the past 15 years the Lower Kuskokwim count area has been surveyed 6 times and the estimates have ranged from only 86 moose in 2000 to 1,378 in 2015. Similar growth in abundance has occurred in all the areas surveyed in the unit.

Recommendations for Activity 1.1

Continue. There are no recommended changes to the survey schedule or methodology. GSPE surveys should continue to be scheduled by rotation prioritizing areas that it has been the longest since the previous survey. Continued biometric review will provide sampling guidance to improve estimate precision.

Table 1. Unit 18 moose population estimate history, 1988 through 2014, Alaska.

Survey Area	Year	Area (mi^2)	Estimate (95% CI[a])	Density (moose/mi^2)	Census technique
Lowest Yukon	1988	–	0	–	Minimum count
	1992	–	28	–	Minimum count
	1994	–	65	–	Minimum count
	2002	1,168	674 (526–822)	0.7	Spatial method
	2005	1,193	1,341 (1,059–1,623)	1.1	Spatial method
	2008	1,193	2,827 (2,491–3,163)	2.5	Spatial method
	2008	1,193	3,230 (2,552–3,908)	2.7	Spatial with SCF[b]
Andreafsky	1995	1,393	52 (14–90)	<0.1	Gasaway method
	1999	2,279	524 (368–680)	0.2	Spatial method
	2002	1,150	418 (324–512)	0.4	Spatial method
	2012	1,596	2,748 (2,292–3,204)	2.4	Spatial method
Paimiut	1992	1,558	994 (798–1,190)	0.6	Gasaway method
	1998	1,558	2,024 (1,763–2,285)	1.3	Gasaway method
	2002	1,571	2,382 (1,998–2,766)	1.5	Spatial method
	2006	1,571	3,614 (2,960–4,268)	2.3	Spatial method
	2013	1,571	5,597 (4,763–6,431)	3.6	Spatial method
Lower	1993	648	216 (120–312)	0.3	Gasaway method
Kuskokwim	2000	907	86 (63–109)	0.1	Spatial method
	2002	907	117 (96–138)	0.1	Spatial method
Lower	2002	869	94 (72–116)	0.1	Spatial method
Kuskokwim	2004	869	70 (47–93)	0.1	Spatial method
(Unit 18 only)	2008	869	515 (425–605)	0.6	Spatial method
	2008	869	668 (521–815)	0.8	Spatial with SCF[b]
	2011	869	672 (530–814)	0.8	Spatial Method
	2015	1,241	1,378 (1,213–1,543)	1.1	Spatial Method

Note: En dash represents data not available.
[a] Confidence interval (CI).
[b] Sightability correction factor (SCF) applied to census estimate.

ACTIVITY 1.2. Estimate fall composition by observing one-fourth to one-third of the previous GSPE estimate in at least one survey area annually.

Data Needs

Fall age-sex composition estimates (bull-to-cow and calf-to-cow ratios) provide useful information in managing moose. This has become more important in the Kuskokwim count area because quota hunts occur there and the potential for overharvest of bulls is high.

Methods

We completed fall trend count and composition surveys using Piper PA-18 aircraft in several areas during RY10–RY14 (Table 2). Surveys have been prioritized based on management concerns (low bull-to-cow ratios, hunt areas with quotas and high pressure) and the presence of

suitable survey conditions and favorable flying weather. Conditions were favorable for completing these surveys only in 2011 and 2013 (Table 1).

Results and Discussion

We have been able to complete composition surveys during only 3 of the 5 years of this report period (RY10–RY14) because of inclement weather. The results from the 2010, 2011, and 2013 surveys show that the percentage of calves in all survey areas has remained relatively high (25% to 38%; Table 2). This is consistent with the continued growth in estimated abundance we have observed in all the areas. Bull-to-cow ratios ranged from 30:100 to 50:100, which is equal to or above the goal of 30:100. The moose population in the Yukon Drainage appears to have an increasing trend in both bull-to-cow ratios and abundance. In addition, recruitment appears to be high, and the harvest of bulls in the fall is relatively stable. The bull-to-cow ratio on the Kuskokwim was still high in 2013, at 41:100, but has declined slightly from 50:100 in 2011. Moose composition surveys in the Kuskokwim area are the highest priority because estimates are used annually for setting fall hunt quotas.

Table 2. Unit 18 moose fall composition from aerial surveys, 2010–2014, Alaska.

Survey area	Year	Bulls: 100 cows	Calves: 100 cows	Total calves	Percent calves (95% CI[a])	Total adults	Total moose
Unit 18 Kuskokwim	2011	50	49	88	25 (21–30)	268	356
	2013	41	72	146	34 (31–40)	287	433
Unit 18 Lowest Yukon	2010	30	69	293	35 (32–38)	552	845
	2013	40	48	170	26 (22–29)	493	663
Unit 18 Andreafsky	2010	42	61	186	38 (34–42)	433	619
	2013[b]	–	–	–	–	–	–

[a] Confidence interval (CI).
[b] No surveys were conducted in the Andreafsky survey area in 2013.

Recommendations for Activity 1.2

There are no recommended changes to the survey schedule or methodology. Biometric review will provide sampling guidance to improve estimate precision. Target samples sizes relative to estimated abundances will be used in the future to ensure the ability to detect trends in age and sex composition.

ACTIVITY 1.3. Estimate twinning rates by finding 50 cows with calves in at least 2 survey areas annually.

Data Needs

Twinning rates give insight into habitat condition and productivity of a population. This information can then be used to decide when to recommend antlerless hunts. Twinning surveys will ideally occur in the areas where a GSPE or composition survey occurred, so production information is synchronous with estimated abundance or composition.

Methods

We typically use a PA-18 Super Cub to find moose cows with calves in the last week of May. The more interior (eastern) part of the unit is typically flown first because leaf out in deciduous trees and shrubs progresses from east to west in the spring. We use the borders of the GSPE survey areas to define survey units. Pilots fly transects at 300 to 500 feet above ground level (AGL) in areas within survey units that we have found moose calving in the past. When a cow moose with a calf is sighted, it is either classified as a cow with a single calf or twin claves.

Results and Discussion

We are able to survey and calculate twinning rates in at least 2 areas per year (Table 3). During RY10–RY14, twinning rates in all the areas have remained high, at approximately 50%, with the exception of 2012 in the Lowest Yukon area at 31%.

Table 3. Unit 18 twinning rates, regulatory years 2010–2014, Alaska.

	Year (*n*)				
Area	2010	2011	2012	2013	2014
Kuskokwim	–	53% (30)	47% (30)	52% (29)	52% (29)
Lowest Yukon	59% (30)	50% (30)	31% (31)	49% (30)	49% (30)
Andreafsky	–	50% (30)	61% (31)	–	–
Paimiut	50% (32)	–	50% (36)	–	–

Note: Sample size (*n*) is shown in parentheses. En dashes indicate no survey was conducted in that survey area in a given year.

Recommendations for Activity 1.3

Continue. There are no recommended changes to the survey schedule or methods. Biometric review will provide guidance to improve precision of estimates. Target samples sizes relative to estimated abundance will be used in the future to ensure the ability to detect trends in twinning rates.

2. Mortality-Harvest Monitoring and Regulations

ACTIVITY 2.1. Monitor Unit 18 moose harvest.

Data Needs

Unit 18 was identified by the Alaska Board of Game (board) as an area with a positive finding for the customary and traditional (C&T) use of moose and an amount necessary for subsistence uses (ANS) of 200 to 400 moose. The board also established an intensive management goal of 1,000 to 2,000 moose and a harvest objective of 60 to 200 moose. Harvest reporting is important to gauge whether goals and objectives set by the BOG have been met.

Methods

We use ADF&G's Wildlife Information Network (WinfoNet) database to track harvest of registration and general season hunts. Hunters report their harvest in a variety of ways; in the case of the 2 registration permits, they are required to contact us by phone within a short period

of time after success. Other methods of reporting include an in-person visit to the ADF&G office, mail, online via the ADF&G website, or afterhours drop box located at the ADF&G office in Bethel.

Season and Bag Limit

Current Unit 18 moose season dates and bag limits are available on the ADF&G website: http://www.adfg.alaska.gov/index.cfm?adfg=wildliferegulations.hunting.

Results and Discussion

Harvest by Hunters-Trappers

General season and permit hunt reports are summarized for Unit 18 in Tables 4 and 5. The reported harvest has been above the intensive management (IM) and ANS harvest objectives during RY10–RY14. The long-term trend is increasing in numbers of hunters and harvest. The RY10–RY14 trend is more stable, with overall harvest averaging 571 moose in the past 5 years which is an increase from the RY05–RY09 average of 411 moose.

Table 4. Number of hunters and reported general season harvest in Unit 18, regulatory years 2000 through 2014, Alaska.

Regulatory year	Number of hunters	Reported Harvest
2000	421	175
2001	428	162
2002	589	223
2003	633	233
2004	528	226
2005	661	317
2006	648	330
2007	827	458
2008	849	465
2009	964	486
2010	1,121	582
2011	861	546
2012	909	527
2013	935	563
2014	1,044	637

Table 5. Unit 18 Moose registration permit hunts, regulatory years 2008 through 2014, Alaska.

Regulatory year	RM615			RM620		
	Permits issued	Hunted	Harvested	Permits issued	Hunted	Harvested
2008	–[a]	–[a]	–[a]	40	35	13
2009	1,397	1,042	110	45	33	10
2010	1,527	1,149	102	48	44	11
2011	1,573	1,171	116	46	36	17
2012	1,456	1,131	102	53	37	13
2013	1,458	1,130	119	42	36	15
2014	1,263	912	125	44	40	12

[a] The RM615 moose hunt area had no open season from 2004–2008.

Hunter Residency and Success

The majority of hunters in Unit 18 during the general season are Alaska residents and comprise 88% to 93% of hunters over the reporting period. The proportion of nonresident hunters increased every year during the reporting period from 3% in 2010 to 8% in 2014. The remainder of hunters are of unknown residency and range from 3% to 7% of hunters annually. This is often due to the receipt of hunt reports for which no hunter information was submitted to the department.

The RM615 and RM620 registration moose hunts are resident-only hunts and over the reporting period success rates varied from 9% to 14% in the RM615 hunt area and 25% to 47% in the RM620 hunt area.

Harvest Chronology

The majority of the harvest in Unit 18 occurs during the fall (Table 6). The number of moose harvested in the winter has been fairly stable during the last 5 years. Overall harvest in Unit 18 has increased as abundance has increased.

Transport Methods

Transport methods for hunting moose are primarily boat and snowmachine. Most fall harvest is by boat and most of the winter harvest is by snowmachine. Unit 18 is almost entirely roadless with the few roads primarily located in the communities themselves. The one exception is the road from St. Mary's to Mountain Village. Off-road vehicles are used sometimes, but most lands in Unit 18 are either private or federal lands which limit the use of such vehicles. Airplanes are used to an even lesser extent and primarily in the fall.

Other Mortality

Wolves, black bears, and brown bears are present in Unit 18 where moose occur. While no direct studies have been conducted to assess the level of predation on moose in the unit, observations

by staff and the public confirm that some predation occurs. Examples include direct observation of both brown and black bears either actively eating moose calves, hunting calves in May or June during twinning surveys, and wolves near moose kills in the winter. While predation on moose is certainly happening, neither wolf or bear predation appear to have any significant effect on the overall number of moose or calf survival at this time.

Table 6. Fall and winter moose harvests for Unit 18, all hunts regulatory years 2000 through 2014, Alaska.

Regulatory year	Fall harvest		Winter harvest		Unknown harvest		Total harvest (*n*)
	(*n*)	(%)	(*n*)	(%)	(*n*)	(%)	
2000	166	95	5	3	4	2	175
2001	140	86	9	6	13	8	162
2002	202	91	10	4	11	5	223
2003	220	94	13	6	0	0	233
2004	189	84	36	16	1	1	226
2005	253	80	64	20	0	0	317
2006	256	78	70	21	4	1	330
2007	370	81	86	19	2	1	458
2008	374	78	81	17	23	5	478[a]
2009	479	79	123	20	4	1	606[b]
2010	494	71	175	25	26	4	695[b]
2011	469	69	166	24	43	6	678[b]
2012	401	64	146	23	76	12	623[b]
2013	507	71	188	26	21	3	716[b]
2014	636	82	140	18	1	<1	777[b]

[a] Total general season harvest plus RM 620 Registration permit harvests.
[b] Total general season harvests plus RM 620 and RM615 registration permit harvests.

Alaska Board of Game Actions and Emergency Orders

The Board of Game addressed several proposals regarding moose in Unit 18 at the November 2011 and January 2013 meetings. In general, the board has incrementally increased opportunities for resident hunters in the northern third of Unit 18 at each meeting for the past 10 years because moose abundance along the Yukon drainage has increased to historic highs. The most recent board action increased the bag limit to 2 moose from 1 August–15 March in "Unit 18 Remainder." This area is approximately encapsulated by the 3 survey areas along the Yukon drainage and some coastal areas of Unit 18 containing moose that have recently migrated from traditional moose habitats of the past. Board summary information is available on the ADF&G website: http://www.adfg.alaska.gov/index.cfm?adfg=gameboard.meetinginfo.

Emergency orders (EOs) were issued in each year of the reporting period (RY10–RY14) to close the season for RM615. Harvest reporting for RM615 has been required from 1 to 3 days after success and the season has been open from 4 to 7 days before attaining the quota. Several EOs were also issued to extend and expand the scope of the winter moose season in "Unit 18 Remainder." Emergency orders are not presented in this report in their entirety but are available

from staff and the most recent EOs are available at the ADF&G website: http://www.adfg.alaska.gov/index.cfm?adfg=wcnews.main.

Recommendations for Activity 2.1

Continue. Monitor total harvest for IM and ANS harvest objectives and in-season management quotas where appropriate.

3. Habitat Assessment-Enhancement

No browse surveys were conducted in RY10–RY14.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

The illegal harvest, particularly of cows within the Kuskokwim River drainage has decreased dramatically during RY10–RY14. Other factors that can affect moose management are a poorly developed cash economy, declining commercial fishing opportunities, and a large and growing density of people along major rivers. These factors complicate moose management considerably. More than 20,000 rural residents live in 42 communities throughout Unit 18 and continued effort is necessary to curb illegal harvest of moose. Another factor is the declining number of Mulchatna caribou, which affects the ability of local hunters to gather meat.

Recent actions by user groups to shoulder some responsibility for the growth of local moose populations are welcome signs of increasing participation with existing management systems. Continued efforts to work with local user groups are vital for effective management and we are encouraged by the efforts of the Lower Kuskokwim Advisory Committee to adopt a strategy to improve moose numbers within the Kuskokwim drainage.

Data Recording and Archiving

- Harvest data are stored on ADF&G's Wildlife Information Network database (http://winfonet.alaska.gov/index.cfm).
- Field data sheets for surveys are stored in file folders in filing cabinets in the Bethel area office.
- All other electronic data and files, such as survey memoranda and reports, are located on computer hard drives and the regional server.

Agreements

None.

Permitting

None.

Conclusions and Management Recommendations

Moose have colonized the Yukon-Kuskokwim Delta in moderate to high densities along the Yukon River from its mouth to Paimiut and have increased from low to moderate densities throughout the remainder of the unit. Moose occupy a significant portion of available habitat in Unit 18 and only a few areas of habitat remain unoccupied, most notably south of the Kuskokwim drainage. In most areas where moose are present, their numbers are lower than what the habitat can support. Calf production and yearling recruitment are high, but probably will not remain so long term, especially along the Yukon drainage where densities are highest and growth in abundance was rapid.

We recommend that monitoring and inventory of the moose population in Unit 18 remain a priority, especially abundance estimation along the Yukon and Kuskokwim rivers. ADF&G should also continue to estimate composition and perform trend counts. As populations have increased, habitat assessment will become a more important part of our management activities. Abundance estimates in conjunction with composition surveys will provide the department with baseline demographic and recruitment information to properly manage the moose population.

II. Project Review and RY15–RY19 Plan

Review of Management Direction

Management Direction

There are no changes to the management direction for moose in Unit 18.

Goals

- Allow Unit 18 moose abundance to increase to the level habitat can support.
- Maintain healthy age and sex composition at a minimum of 30 bulls per 100 cows for moose populations within the Yukon and Kuskokwim River drainages.
- Determine population size, trend, and composition of Unit 18 moose populations.
- Provide the greatest sustained-yield opportunity to participate in hunting moose.
- Improve harvest reporting and compliance with hunting regulations.
- Minimize conflicts among user groups interested in moose within and adjacent to Unit 18.

CODIFIED OBJECTIVES

Amounts Reasonably Necessary for Subsistence Uses

Unit 18 has a positive customary and traditional finding for moose. The amount reasonably necessary for subsistence uses is set at 200 to 400 moose.

Intensive Management

Unit 18 has a positive finding for intensive management. The Alaska Board of Game (BOG) set the population abundance objective at 1,000 to 2,000 moose and the harvest objective at 60 to 200 moose.

MANAGEMENT OBJECTIVES

1) Maintain lower Yukon moose populations at a level the habitat can consistently support while ensuring sustainable harvest (new).

2) Allow the lower Kuskokwim River moose population to increase above its estimated size of 1,378 moose to at least 2,000 moose (modified).

3) Conduct browse assessment surveys on a rotating basis in to coincide with abundance surveys for paired estimates (new).

4) Manage for a post-hunt (fall) sex ratio of 30 bulls:100 cows.

5) Conduct seasonal sex and age composition surveys as weather allows.

6) Estimate abundance and recruitment during winter in the established survey areas on an annual rotation.

7) Conduct fall and/or winter surveys to document population trends.

8) Adjust hunts to help achieve population goals and management objectives.

9) Improve knowledge of and compliance with harvest reporting requirements and hunting regulations through education and incentives.

10) Address user conflicts through education and hunter contacts.

REVIEW OF MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1. Estimate spring abundance in at least one survey area annually.

Data Needs

There is no change from the RY10–RY14 report period.

Methods

Biometric review will be initiated in survey design for future moose population surveys. This will optimize allocation among high-density and low-density strata to achieve the desired precision of the abundance estimate.

ACTIVITY 1.2. Estimate fall bull and calf composition in at least one survey area annually.

Data Needs

There is no change from the RY10–RY14 report period.

Methods

Current surveys are flown with approximated transects perpendicular to the riparian zone as time and weather allows. Future surveys will be flown after biometric consultation on desired sample sizes and allocation of effort.

ACTIVITY 1.3. Estimate twinning rates by finding 50 cows with calves in at least 2 survey areas annually.

Data Needs

There is no change from the RY10–RY14 report period.

Methods

We will seek biometric review to define the sample size that is warranted for estimating a decline in twinning rates as a trigger to enhance monitoring efforts for a suspected decline in abundance.

ACTIVITY 1.4. Assess body condition of 10-month-old calves and attach radio collars.

Data Needs

There is no change from the RY10–RY14 report period.

Methods

There is no change from the RY10–RY14 report period.

2. Mortality-Harvest Monitoring

ACTIVITY 2.1. Monitor mortality and harvest in Unit 18 annually.

Data Needs

There is no change from the RY10–RY14 report period.

Methods

We will monitor harvest using the WinfoNet harvest database for registration and general season moose hunts in Unit 18.

3. Habitat Assessment-Enhancement

ACTIVITY 3.1. Monitor forage plants to understand sustainable density of moose.

Data Needs

Monitoring of forage plants provides information about how much available browse is being removed by the existing moose population and the degree of browsing pressure during the life of the plant (Seaton 2002). Browse biomass removal is an indicator of moose nutritional condition (Seaton 2002, Boertje et al. 2007, Seaton et al. 2011). Monitoring browse plant architecture provides additional information on the effects of moose browsing on vegetation condition as a function of moose density (Seaton 2002, Paragi et al. 2015). Browse data are best used in conjunction with body condition and other animal parameters to assess habitat condition and trend, and gauge whether more moose could be sustained on the landscape.

We plan to follow the general protocol and methodology of Seaton (2002) that was updated by Paragi et al. (2015) for estimating browse removal rates in the same areas that we estimate moose abundance. We will conduct browse surveys in the same areas that GSPE surveys are conducted, and plan to do them in the same survey area where moose are counted in a given year. A Robinson R-44 helicopter is used to ferry 2 crews of 2 people to each sampling block that coincides with our GSPE blocks. Each crew identifies the different browse species in the sampling area and measures annual growth and bite diameters when appropriate. Data is then entered in a database and analyzed with a tool imminently available in WinfoNet.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

Data Recording and Archiving

- Harvest data are stored on ADF&G's Wildlife Information Network database (http://winfonet.alaska.gov/index.cfm).
- Field data sheets for surveys are stored in file folders in filing cabinets in the Bethel area office.
- All other electronic data and files, such as survey memoranda and reports, are located on computer hard drives and the regional server.

Agreements

None.

Permitting

None.

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