Moose Management Report and Plan, Game Management Unit 19:

Report Period 1 July 2010–30 June 2015, and

Plan Period 1 July 2015–30 June 2020

Joshua M. Peirce

2018

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 area, 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 website.

This species management report and plan was reviewed and approved for publication by Doreen I. Parker McNeill, Region III Management Coordinator for the Division of Wildlife Conservation, Fairbanks.

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Purpose of this Report

This report provides a record of survey and inventory management activities for moose (*Alces alces*) in Unit 19 for the previous 5 regulatory years (RY; RY10–RY14) and plans for survey and inventory management activities in the 5 years following the end of that period (RY15–RY19). A regulatory year 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 them of wildlife management activities. In 2016 the Alaska Department of Fish and Game's (ADF&G) 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 moose management reports of survey and inventory activities that were previously produced every 2 years and supersedes the 1976 draft Alaska wildlife management plans (ADF&G 1976).

I. RY10–RY14 Management Report

Management Area

Unit 19 generally includes the Kuskokwim river drainage above Lower Kalskag and includes 4 subunits (19A, 19B, 19C, and 19D) totaling approximately 36,486 mi^2.

Hunting maps for Unit 19 boundaries and special management areas are found at http://www.adfg.alaska.gov/index.cfm?adfg=maps.gallery&category=hunting.

Summary of Status, Trend, Management Activities, and History of Moose in Unit 19

According to oral history, moose initially arrived in western Interior Alaska sometime after the turn of the 20th century, and by the 1970s moose populations were at record highs. Currently, moose are found throughout this area with the exception of the rugged peaks of the Alaska Range. Predation by wolves (*Canis lupus*), black bears (*Ursus americanus*), and grizzly bears (*U. arctos*) is a major factor influencing moose abundance in Unit 19 with weather, habitat, and hunting also playing important roles.

Unit 19 can be conveniently divided into 2 regions with distinct differences in moose habitat, user access, and hunting practices. Units 19A and 19D are generally lower elevation areas accessible by boat. Hunters in these units generally live in Unit 19 or downriver in Unit 18 and hunt primarily for food. Units 19B and 19C are generally higher elevation areas where access is largely by aircraft. Few people live in these areas, and those who travel there to hunt often seek large bulls for their trophy quality, although meat also is an important consideration.

Prior to moose population density estimates such as those conducted in Unit 19A and eastern Unit 19D, aerial composition and trend surveys were the primary means of assessing population status and trend for several decades. Unfortunately, some of the older data and relevant survey information (i.e., snow conditions, weather and light conditions, survey dates, observers,

techniques used, etc.) that help to interpret these data were lost during a fire that consumed the McGrath office in December 2006.

Regulations, including controlled use areas (CUA) and management areas, and other requirements to manage moose hunting and reduce conflicts between user groups, exist throughout the area. For example, the Holitna–Hoholitna CUA imposes a boat motor horsepower restriction; the upper Holitna–Hoholitna management area requires hunters to stop at a checkstation if one is established, and hunters entering the upper Holitna–Hoholitna management area by aircraft must exit the area by the same means. Nonresident closed areas established within 2 miles of most major rivers in Units 19A and 19B prohibit nonresidents from hunting moose and caribou. Aircraft restrictions apply in the upper Kuskokwim CUA in Unit 19D; and moose hunting is allowed by Tier II permit only in parts of Unit 19A, including the Lime Village management area (LVMA). Additionally, there are meat care education requirements for nonresidents and meat-on-the-bone requirements in various areas.

Moose populations in Units 19A and 19B declined beginning in the early 1990s; conflicts between users intensified, and moose hunting regulations became more complicated. These conflicts led to the creation of the Central Kuskokwim Moose Management Planning Committee, made up of representatives of multiple user groups, and the development the *Central Kuskokwim Moose Management Plan* (CKMMP; Central Kuskokwim Moose Management Planning Committee 2004), which was finalized in June 2004 and currently guides moose management decisions in Units 19A and 19B. Similar public input has been accomplished in Unit 19D, largely through the McGrath Fish and Game Advisory Committee, and since 1995 much of this input focused on predator control.

Wolf and bear predation plays a significant role in the population dynamics of moose (Gasaway et al. 1992; Boertje et al. 2009). In Unit 19D wolves, black bears, and grizzly bears were all identified as significant predators (Keech et al. 2011). With this understanding we began managing to reduce predation in portions of Units 19A and 19D. Wolf control has been ongoing in Unit 19A since 2006, and both black and brown bears were removed from the bear control focus area (BCFA) in 2013 and 2014. In Unit 19D East, an 8,513 mi^2 area of Unit 19D upriver of the Black and Selatna river drainages, wolf control began in 2003, and black and brown bears were relocated from BCFA in 2003 and 2004. BCFA encompasses the highest density of moose in Unit 19D East and was established as a treatment area to test and implement predator population manipulations and other management actions (Fig. 1).

Intensive management of moose in Units 19A and 19D, including wolf and bear control, comprise a large percentage of the duties in the McGrath area office.

Management Direction

Existing Wildlife Management Plans

CKMMP was finalized in June 2004 and currently guides moose management decisions in Units 19A and 19B.

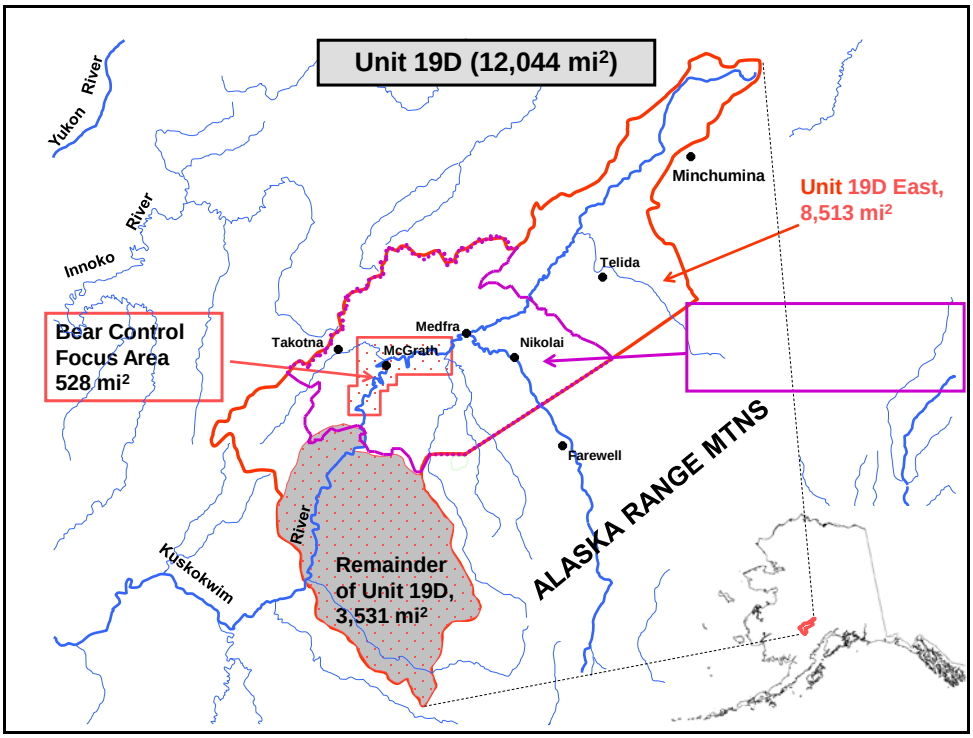

Figure 1. Unit 19D East (8,513 mi²), the Unit 19D East wolf control focus area (4,484 mi²), and the bear control focus area (528 mi²), Interior Alaska.

Goals

1. Work toward achieving the intensive management moose population and harvest objectives for Units 19A, 19B, and 19D.
2. Maintain population indices in Unit 19C consistent with stable or increasing moose numbers.
3. In Unit 19A and Unit 19D East, reduce predation on moose through predator control activities.

Codified Objectives

Amounts Reasonably Necessary for Subsistence Uses

Unit 19 has a positive finding for customary and traditional uses of moose. Amounts reasonably necessary for subsistence uses are as follows:

C1. Unit 19, not including LVMA, has an amount necessary for reasonable opportunity for subsistence uses of 400–700 moose including 175–225 moose in Unit 19A and 20–24 moose in Unit 19B.

C2. Unit 19A within LVMA has an amount necessary for reasonable opportunity for subsistence uses of 30–40 moose.

Intensive Management

C3. Units 19A and 19B intensive management population and harvest objectives – 13,500–16,500 moose with 750–950 moose available for harvest annually.

C4. Unit 19A BCFA density objective – 2.0 moose/mi^2 corrected for sightability.

C5. Unit 19A wolf control focus area (WCFA) harvest objective – 120 moose.

C6. Unit 19D East intensive management population and harvest objectives – 6,000–8,000 moose with 400–600 moose available for harvest annually.

C7. Unit 19D remainder (that portion of Unit 19D downriver of the Selatna and Black river drainages) intensive management population and harvest objectives – 4,000–6,000 moose with a harvest of 250–600 moose in the remainder of Unit 19D.

C8. Unit 19D BCFA density objective – 2.0 moose/mi^2 corrected for sightability.

C9. Unit 19D WCFA harvest objective – 180 moose.

Management Objectives

Units 19A and 19B Recommended in CKMMP

M1. Maintain a minimum fall posthunt bull:cow ratio of 20–30 bulls:100 cows.

M2. Maintain a minimum fall posthunt calf:cow ratio of 30–40 calves:100 cows.

M3. Maintain no fewer than 20% calves in late winter surveys. These were described as short yearlings in CKMMP and are approximately 10-month-old calves.

Unit 19C

M4. Maintain a minimum fall posthunt bull:cow ratio 30 bulls:100 cows.

Management Activities

1. Population Status and Trend

ACTIVITY 1.1. Conduct composition–trend surveys, particularly in portions of the unit where harvest levels make significant impacts on moose populations. (objectives C1, C2, M1, M2, M4)

Data Needs

Composition data allow us to assess if we are meeting our management objectives.

Methods

We determined bull:cow, and calf:cow ratios from fall composition surveys in Unit 19A in the Aniak river drainage, including the Aniak River downstream of the Buckstock River, and the Kuskokwim River from Lower Kalskag to Aniak; in the Holitna River drainage, including BCFA; and in Unit 19C in the Farewell area, generally from the Farewell airport east to the South Fork Kuskokwim River then northerly approximately 12 miles to the second moraine, then

back to the Farewell airport. For fall trend and composition surveys, PA-18 aircraft were flown along 3–10 mile long transects generally at ½-mile intervals perpendicular to riparian moose habitats. Aircraft maintained altitudes of ≤500 feet above ground level. Pilots used a GPS to maintain the aircraft on transect. Most habitats in these areas are roughly linear and parallel to rivers and transect direction was selected to run perpendicular to habitat types to ensure that all habitat types in the area were sampled. We recorded the number of moose and classified them as cows, calves, and small, medium, or large bulls.

In Unit 19D moose composition data were assessed in an 1,118 mi^2 area known as the expanded BCFA. Bull:cow, and calf:cow ratio data were collected during geospatial population estimator (GSPE) surveys (Kellie and DeLong 2006).

Results and Discussion

Unit 19A

In November 2013 during a composition survey in the Aniak trend count area, we classified 147 moose including 38 bulls:100 cows and 41 calves:100 cows (Table 1).

In November 2010 in the Holitna BCFA (Fig. 2), we found 212 moose, with 48 bulls:100 cows and 19 calves:100 cows. In November 2011 we found 164 moose with 38 bulls:100 cows and 31 calves:100 cows. In November 2013 we observed 244 moose; ratios were 55 bulls:100 cows and 50 calves:100 cows (Table 1). The ratio of 50 calves:100 cows in 2013 is the highest ratio recorded since 1996. We speculate that the higher calf:cow ratio is a result of reduced bear numbers following our bear control effort in May 2013.

Unit 19B

No composition data are collected in Unit 19B.

Unit 19C

In November 2010 we observed 312 moose; ratios were 29 bulls:100 cows and 27 calves:100 cows. No other composition surveys were conducted in the Farewell trend count area due to unfavorable weather and other priorities.

Unit 19D

Within the expanded BCFA in 2010 among 712 moose classified, there were 49 bulls:100 cows, and 43 calves:100 cows; in 2011 among 639 moose classified, there were 33 bulls:100 cows, and 42 calves:100 cows; in 2012 among 650 moose classified there were 39 bulls:100 cows and 36 calves:100 cows (Table 1).

Recommendations for Activity 1.1

Continue.

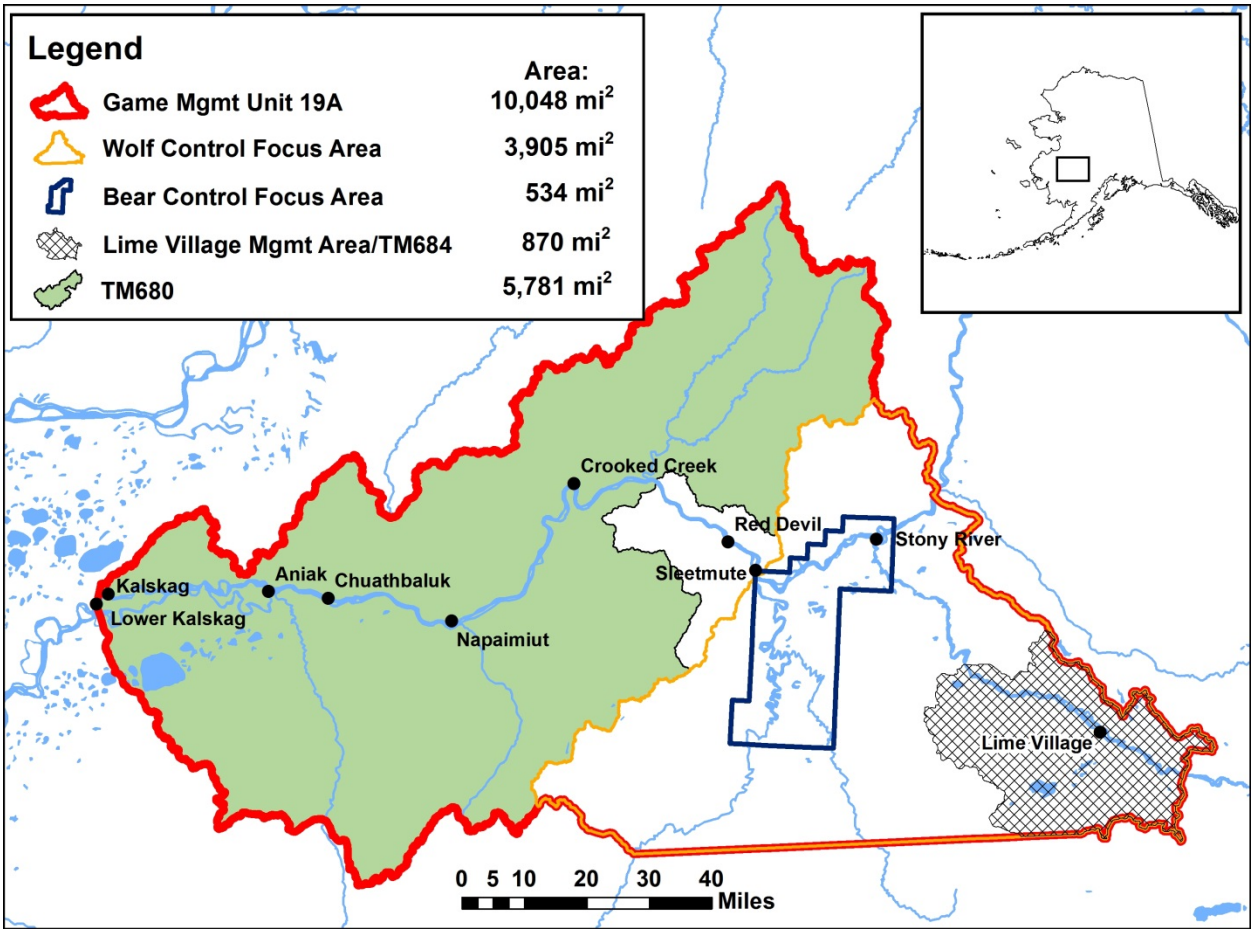

Figure 2. Unit 19 wolf control focus area and bear control focus area, Interior Alaska.

Table 1. Unit 19 fall aerial moose composition, Interior Alaska, regulatory years[a] 2010–2013.

Survey area	Regulatory year	Bulls:100 cows	Calves:100 cows	Total calves	Total adults	Total moose
Aniak	2013	38	41	34	113	147
Holitna	2010	48	19	24	188	212
	2011	38	31	30	134	164
	2013	55	50	59	185	244
Farewell	2010	29	27	54	258	312
McGrath	2010	49	43	158	554	712
	2011	33	42	154	485	639
	2012	39	36	135	515	650

[a] A regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2010 = 1 July 2010–30 June 2011).

ACTIVITY 1.2. Assess twinning rates. (objectives C3, C6, C7, M2)

Data Needs

Twinning rates are an important indicator of nutritional status and habitat quality.

Methods

To determine twinning rates in the Unit 19A BCFA, radiocollared cows were located using PA-18, Bellanca Scout, and R44 aircraft during May and early June. These cows, as well as uncollared cows observed during these flights, were enumerated and classified as being accompanied by single calves or multiple calves. The twinning rate was calculated as the proportion of cows with twins or triplets from the sample of all cows with calves.

To determine twinning rates in Unit 19D, radiocollared cows were located using PA-18 and Bellanca Scout aircraft during May and early June. These cows, as well as uncollared cows observed during these flights or observed during specific twinning rate flights, were enumerated and classified as being accompanied by single calves or multiple calves. Specific twinning rate flights were conducted with a systematic search for uncollared cows along transects generally at ½-mile intervals perpendicular to riparian moose habitats. The twinning rate was calculated as the proportion of cows with twins or triplets from the sample of all cows with calves.

Results and Discussion

Twinning rates in the Holitna BCFA portion of Unit 19A were 56% (23 of 41) and 63% (30 of 48) in 2013 and 2014.

The twinning rate of randomly observed cows in Unit 19D was 37% (14 of 38) in 2011, 34% (16 of 47) in 2012, and 22% (12 of 55) in 2013. The most recent 2-year average is 28% suggesting adequate habitat is available (Boertje et al. 2007).

Recommendations for Activity 1.2

Continue.

ACTIVITY 1.3. Assess population size through GSPE surveys. (objectives C1–C9, M3)

Data Needs

We seek to estimate annual abundance, productivity and survival-recruitment-escapement to evaluate population status and trend. Periodically scheduled estimates of abundance with associated precision will be used to monitor population size and calf:cow ratios to evaluate whether intensive management population and harvest objectives are being met, if harvestable surplus is adequate for amounts reasonably necessary for subsistence objectives, and estimate harvestable surplus to provide for maximum hunter opportunity through seasons and bag limits.

Methods

To estimate moose population size and density in Unit 19A, we conducted aerial surveys using the GSPE method (Ver Hoef 2001, 2008; Kellie and DeLong 2006). We conducted surveys during March 2010 in the western 3,444 mi^2 of this area (Unit 19A West [Aniak]); and during

March 2011 in the eastern 3,874 mi^2 of this area (Unit 19A East [Holitna]; and March 2014 in the Unit 19A BCFA). All survey units were stratified as high or low density moose habitat at the start of each survey. A simple random sample of survey units was selected from each stratum, and additional survey units were selected to fill gaps in the randomized coverage. Sightability correction factors (SCF) were obtained in both of the Unit 19A east surveys. To estimate sightability for the March 2011 survey, we randomly selected north or south halves of survey units and intensively searched those portions with the most experienced pilot–observer crew using methods described by Gasaway et al. (1986). In 2014, radiocollared moose were used to estimate sightability using the ratio of unseen to seen collars [SCF= 1/(not seen/seen)].

Since 2010, November GSPE surveys have been used to estimate moose numbers in Unit 19D. The area surveyed is the 1,118 mi^2 expanded BCFA. Estimates of total numbers of moose in Unit 19D include an SCF in 2012 and estimates of SCF in 2010, 2011, and 2015.

Results and Discussion

Units 19A

In the Aniak portion of Unit 19A in 2010, we estimated 1,130 moose (±15%, 90% confidence interval [CI]) with a density of 0.33 moose/mi^2. An analysis of the March 2011 survey data in the Holitna included an SCF and produced an estimate of 1,666 moose (±36%, 90% CI) with a density of 0.43 moose/mi^2. In BCFA in the Holitna drainage, the 2014 estimate corrected for sightability was 798 (±14%, 90% CI) with a density of 1.5 moose/mi^2 (Table 2a).

Unit 19D

Moose numbers were estimated using GSPE techniques in November 2010, 2011, 2012, and 2015 within the expanded BCFA. We estimated 1,416 moose (±114; 90% CI) in 2010 with a density of 1.6 moose/mi^2; 1,298 moose (±121; 90% CI) in 2011 with a density of 1.5 moose/mi^2; 1,036 moose (±91; 90% CI) in 2012 with a density of 1.2 moose/mi^2; and 1,614 moose (±196; 90% CI) in 2015 with a density of 1.8 moose/mi^2 (Table 2b).

Recommendations for Activity 1.3

Continue.

2. Mortality–Harvest Monitoring and Regulations

ACTIVITY 2.1. Monitor harvest through Tier II permits, registration permits, and general season harvest reports; analyze harvest data; and assess the accuracy of these data in selected areas when possible. (objectives C1-C3, C5-C7, C9)

Data Needs

Units 19A, 19B, and 19D have been identified by the Alaska Board of Game (BOG) for intensive management of moose. There are also subsistence regulations in place which set amounts necessary for subsistence throughout Unit 19. Annual summaries of harvest are necessary to understand harvest in relation to intensive management, subsistence, and sustained yield. Analysis of harvest data also informs department recommendations to BOG.

Methods

Reporting on Tier I, Tier II, drawing and harvest ticket hunts are collected from hunters. Hunters receive 1 or 2 reminder letters and an e-mail and telephone calls if we do not receive timely harvest reports. We summarize data on hunter residency, hunter success, harvest chronology, and transport methods. These data are stored in a moose database accessible through ADF&G's Wildlife Information Network (WinfoNet).

Results and Discussion

Accurate harvest reporting is essential to managing moose in Unit 19. We will continue to work with local Fish and Game advisory committees and license vendors to stress the importance of harvest reporting. We will also continue to work from the McGrath office to follow up with individuals to ensure accurate harvest reporting.

Season and Bag Limit

Regulations for Unit 19 can be found on ADF&G's website at http://www.adfg.alaska.gov/index.cfm?adfg=wildliferegulations.hunting

Harvest by Hunters

Summaries of reported harvest by subunit are presented in Tables 3a–3d.

Harvest information for specific hunt types, harvest success, harvest chronology, and transportation are available to the public for hunt planning on ADF&G's website at https://secure.wildlife.alaska.gov/index.cfm?adfg=harvest.main

Other Mortality

Under regulation 5 AAC 92.019, hunters are permitted to take moose for customary and traditional Alaska Native funerary or mortuary religious ceremonies. In Unit 19A, 17 were taken under this regulation during RY10, 13 during RY11, 17 during RY12, 9 during RY13, and 14 during RY14. In Unit 19D mortuary moose harvest was much lower with 3 taken in RY10, 1 taken in RY11, 2 taken in both RY12 and RY13, and 3 taken in RY14.

Keech et al. (2011) found that the primary cause of moose calf mortality was predation by black bears, grizzly bears, and wolves. Deep snow has also been shown to affect moose survival (Coady 1974).

Table 2a. Summary of geospatial population estimates for moose in Unit 19A, Interior Alaska, regulatory years[a] 2010–2014.

Location and survey year	Survey area (mi²)	Strata size (mi²) Low	Strata size (mi²) High	Area searched (mi²) Low	Area searched (mi²) High	Total search area (mi²)	No. of moose estimated by strata and density (moose/mi²) Low	No. of moose estimated by strata and density (moose/mi²) High	Total estimate @ 90% CI	Average density moose/mi²	No. of survey units counted
Unit 19A West (Aniak)											
March 2010[b]	3,444	2,404	1,040	441	498	939	466 (0.19)	663 (0.64)	1,130±15%	0.33	147
Unit 19A East (Holitna)											
March 2011[c]	3,874	2,833	1,041	345	632	977	291 (0.10)	1,374 (1.32)	1,666±36%[d]	0.43	135
March 2014[e]	534		534		534	534		798 (1.5)	798±14%	1.5	84

[a] A regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2010 = 1 July 2010–30 June 2011).
[b] Population estimate is of observable moose.
[c] Estimate includes a sightability correction factor.
[d] Total is greater than sum of strata due to rounding.
[e] Only the bear control focus area was sampled in 2014 and all units are high. A sightability correction factor is included in the estimate.

Table 2b. Estimates from fall moose surveys in the expanded bear control focus area (1,118 mi^2), Unit 19D, Interior Alaska, regulatory years[a] 2010–2015.

Regulatory year	No. of moose observed	Estimate of observable moose (90% CI[b])	SCF[c] ($n_{observed}$, $n_{available}$)	Estimate with SCF applied (90% CI)	Calves: 100 cows (90% CI)	Bulls:100 cows (90% CI)	Total moose/mi^2
2010	712	1,416 (±114)	1.27	1,796 (±312)	43 (±11)	49 (±13)	1.6
2011	639	1,298 (±121)	1.27	1,647 (±295)	42 (±11)	33 (±10)	1.5
2012	650	1,036 (±91)	1.29 (23, 30)	1,337 (±256)	36 (±10)	39 (±12)	1.2
2015	811	1,614 (±196)	1.26	2,014 (±398)	41 (±12)	36 (±11)	1.8

[a] A regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2010 = 1 July 2010–30 June 2011).
[b] CI = confidence interval.
[c] SCF = sightability correction factor.

Table 3a. Unit 19A reported moose harvest, Interior Alaska, regulatory years[a] 2010–2014.

Regulatory year	Bulls	Cows	Unknown	Total	Total hunters	Harvest success (%)
2010	84	0	0	84	224	38
2011	67	0	2	69	193	36
2012	98	0	1	99	202	49
2013	98	0	0	98	224	44
2014	102	0	0	102	183	56

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2010 = 1 July 2010–30 June 2011).

Table 3b. Unit 19B reported moose harvest, Interior Alaska, regulatory years[a] 2010–2014.

Regulatory year	Bulls	Cows	Unknown	Total	Total hunters	Harvest success (%)
2010	21	0	0	21	63	33
2011	15	0	0	15	47	32
2012	18	0	0	18	45	40
2013	28	0	0	28	52	54
2014	26	0	0	26	61	43

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2010 = 1 July 2010–30 June 2011).

Table 3c. Unit 19C reported moose harvest, Interior Alaska, regulatory years[a] 2010–2014.

Regulatory year	Bulls	Cows	Unknown	Total	Total hunters	Harvest success (%)
2010	71	0	0	71	131	54
2011	76	0	0	76	127	60
2012	97	0	0	97	172	56
2013	74	0	0	74	176	42
2014	81	0	0	81	148	55

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2010 = 1 July 2010–30 June 2011).

Table 3d. Unit 19D reported moose harvest, Interior Alaska, regulatory years[a] 2010–2014.

Regulatory year	Bulls	Cows	Unknown	Total	Total hunters	Harvest success (%)
2010	126	0	0	126	286	44
2011	149	0	0	149	307	49
2012	119	0	0	119	312	38
2013	136	1	0	137	281	49
2014	164	0	0	164	318	52

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2010 = 1 July 2010–30 June 2011).

Alaska Board of Game Actions and Emergency Orders

Moose hunting regulations did not change during RY10–RY14, and no emergency orders were issued.

In 2014 BOG reauthorized the intensive management plans for Units 19A and 19D (Title 5 Alaska Administrative Code [AAC] 92.123). These plans authorize both bear and wolf control and establish population and harvest objectives.

Recommendations for Activity 2.1

Continue.

3. Habitat Assessment–Enhancement

None.

Nonregulatory Management Problems or Needs

Low snow winters continue to hamper our ability to monitor moose in the Aniak drainage of Unit 19A. New survey techniques may need to be developed to alleviate this issue.

Data Recording and Archiving

GSPE data are stored in WinfoNet using the moose survey application. Field data sheets are located in files in the McGrath office.

Agreements

None.

Permitting

None.

Conclusions and Management Recommendations

The combined Units 19A and 19B intensive management population and harvest objectives (13,500–16,500 moose and harvest of 750–950) were not achieved. This intensive management population objective would require a moose density within the entire area of approximately 0.75–0.93 moose/mi^2. Our recent moose density estimate of 0.43 moose/mi^2 in Unit 19A WCFA during March 2011 was well below this objective. The 5-year average (RY10–RY14) harvest of 112 moose in Units 19A and 19B (Tables 3a and 3b) are well below the intensive management harvest objective of 750–950 moose.

Even with ongoing wolf control in the Unit 19A WCFA, moose numbers have failed to increase at a rate which we can detect. This prompted BOG to authorize a lethal removal of black and grizzly bears during May 2013 and 2014. The project was modeled after the Unit 19D research which demonstrated a positive response in moose numbers following both wolf and bear

removals (Keech et al. 2011). Monitoring moose numbers in the Unit 19A WCFA is a priority to determine if predator removals were effective in increasing moose densities. To accomplish this, we will need continued funding for GSPE surveys as well as maintaining radio collars on moose within BCFA to obtain estimates of sightability.

We met our objective of at least 20–30 bulls:100 cows in Unit 19A. The November 2013 bull:cow ratio was 38 bulls:100 cows in the Aniak trend count area and 55 bulls:100 cows within the Unit 19A BCFA.

We achieved our fall calf composition objective of a minimum of 30–40 calves:100 cows in Unit 19A in November 2013 with 41 calves:100 cows in the Aniak and 50 calves:100 cows in BCFA.

We did complete a late winter survey in the BCFA portion of Unit 19A in 2014. We had 24% calves which was above our objective of no fewer than 20% calves. This survey was conducted after the first year of bear control and calf survival that summer appeared to be good.

No composition data have been collected in Unit 19B since 2005. Therefore, we are unable to determine whether we have achieved our composition objectives in Unit 19B. However, with an average harvest of only 22 moose/year from the area, we are likely at or above the objective of 20–30 bulls:100 cows.

The objective in Unit 19C to maintain a fall posthunt bull:cow ratio of at least 30 bulls:100 cows was not achieved in RY10 (29 bulls:100 cows), which was the last time we conducted a composition survey. Complaints of crowded hunting conditions are common in this area, and success was lower in RY13–RY14 than it has been in previous years. Completing a composition survey in Unit 19C is a high priority.

The Unit 19D East population may be below our objective of 6,000–8,000, however we have not conducted a survey in this area since 2008 due to a lack of funding. The moose population is likely below the objective of 4,000–6,000 within the remainder of Unit 19D; however this area has never been surveyed. A reported average harvest in all of Unit 19D of 139 moose during RY10–RY14 did not meet the Unit 19D East harvest objective of 400–600 or the harvest objective of 250–600 in the remainder of Unit 19D. Achieving the intensive management harvest objectives would be unsustainable at this time and is unlikely in the future due to limited access throughout Unit 19D.

Unit 19D has a density objective of 2.0 moose/mi^2 in BCFA and a harvest objective of 180 moose from WCFA. The midpoint of the fall 2015 population estimate for BCFA is 1.8 moose/mi^2 which is below the density objective. Harvest from within WCFA averaged 95 moose during RY10–RY14, which was also below the objective.

Generally we have sufficient resources to conduct 1 population estimate (or a subset of one) per year; 3 fall composition surveys, dependent upon weather; and 1–3 spring twinning surveys. Therefore, we conduct a single moose population estimate each year and rotate these surveys on a 3-year cycle, recognizing that we will occasionally be unable to conduct surveys due to weather. We conduct GSPE surveys in the Unit 19A WCFA, Unit 19D with an emphasis in the expanded BCFA, and Unit 21E (not included in this report). If the opportunity presents itself to

conduct a survey in Unit 19A West (Aniak), we take advantage of it, but this is not part of the normal cycle. When population estimates are necessary beyond these areas, we extrapolate from these surveys to obtain those estimates.

II. Project Review and RY15–RY19 Plan

Review of Management Direction

Management Direction

There are no suggested changes in the management direction.

Goals

The first plan for moose in this area was drafted in 1976. Since that time, goals, objectives, and activities have been identified in management reports or other planning documents such as CKMMP created in 2004. These efforts established that moose management in Units 19A and 19D would provide for abundant moose populations with high levels of consumptive use.

Codified Objectives

Amount Reasonably Necessary for Subsistence Uses

C1. Unit 19, not including LVMA, has a customary and traditional use finding and an amount necessary for reasonable opportunity for subsistence uses of 400–700 moose including 175–225 moose in Unit 19A and 20–24 moose in Unit 19B.

C2. Unit 19A within LVMA has a customary and traditional use finding and an amount necessary for reasonable opportunity for subsistence uses of 30–40 moose.

Intensive Management

C3. Units 19A and 19B intensive management population objective is 13,500–16,500 moose.

C4. Units 19A and 19B intensive management harvest objective is 750–950 moose available for harvest annually.

C5. Unit 19A BCFA density objective is 2.0 moose/mi^2, corrected for sightability.

C6. Unit 19A WCFA harvest objective is 120 moose.

C7. Unit 19D East intensive management population objective is 6,000–8,000 moose.

C8. Unit 19D East intensive management harvest objective is 400–600 moose available for harvest annually.

C9. Unit 19D remainder (that portion of Unit 19D downriver of the Selatna and Black river drainages) intensive management population objective is 4,000–6,000 moose.

C10. Unit 19D remainder intensive management harvest objective is 250–600 moose.

C11. Unit 19D BCFA density objective is 2.0 moose/mi^2 corrected for sightability.

C12. Unit 19D WCFA harvest objective is 180 moose.

Management Objectives

Units 19A and 19D

M1. Maintain a minimum fall posthunt bull:cow ratio of 30 bulls:100 cows.

M2. Maintain a minimum fall posthunt calf:cow ratio of 30–40 calves:100 cows.

M3. Maintain no fewer than 20% calves in late winter surveys.

Units 19B and 19C

M4. Maintain a minimum fall posthunt bull:cow ratio of 30 bulls:100 cows.

Review of Management Activities

1. Population Status and Trend

ACTIVITY 1.1. Conduct composition–trend surveys annually, particularly in portions of Unit 19 where harvest levels can make significant impacts on moose populations. (objectives C1, C2, C4, C8, C10, C12, M1, M2, M4)

Data Needs

No change from the previous report period (RY10–RY15). Survey data allow us to assess if we meet management objectives. (M1, M2, M4)

Methods

We will determine bull:cow, and calf:cow ratios from fall composition surveys in Unit 19A in the Aniak River drainage, including the Aniak River downstream of the Buckstock River, and the Kuskokwim River from Lower Kalskag to Aniak; in the Holitna River drainage, including BCFA; and in Unit 19C in the Farewell area, generally from the Farewell airport east to the South Fork Kuskokwim River then northerly approximately 12 miles to the second moraine, then back to the Farewell airport. For fall trend and composition surveys, PA-18 aircraft are flown along 3–10 mile long transects generally at ½-mile intervals perpendicular to riparian moose habitats. Aircraft maintained altitudes of ≤500 feet above ground level. Pilots use a GPS to maintain the aircraft on transect. Most habitats in these areas are roughly linear and parallel to rivers and transect direction is selected to run perpendicular to habitat types to ensure that all habitat types in the area were sampled. We record the number of moose and classify them as cows, calves, and small, medium, or large bulls.

In Unit 19D moose composition data are assessed in an 1,118 mi^2 area known as the expanded BCFA. Bull:cow, and calf:cow ratio data are collected during GSPE surveys (Kellie and DeLong 2006).

Results of this activity will be compared to the lower limit of the bull:cow ratio management objectives. In addition, desired precision and sample size needed to attain that precision (for example bull:cow ratio estimates with 90% CI) will be investigated and specified through consultation with regional biometricians. Survey locations and methods will be more fully described in survey memos for the next project review and to facilitate consultation with biometricians.

ACTIVITY 1.2. Assess twinning rates. (objectives C3, C5, C7, C9, C11, M2)

Data Needs

No change from the previous report period; twinning rates are an important indicator of nutritional status and habitat quality.

Methods

To determine twinning rates, radiocollared cows will be located using PA-18, Bellanca Scout, and R44 aircraft during May and early June. Twinning survey flights will be conducted with a systematic search for uncollared cows along transects generally at ½-mile intervals perpendicular to riparian moose habitats. Radiocollared cows, as well as uncollared cows observed during these flights, will be enumerated and classified as being accompanied by single calves or multiple calves. The twinning rate will be calculated as the proportion of cows with twins or triplets from the sample of all cows with calves.

To determine twinning rates in Unit 19D, radiocollared cows will be located using PA-18, Bellanca Scout, or similar aircraft during May and early June. These cows, as well as uncollared cows observed during these flights or observed during specific twinning rate flights, will be enumerated and classified as being accompanied by single calves or multiple calves. Specific twinning rate flights are conducted with a systematic search for uncollared cows along transects generally at ½-mile intervals perpendicular to riparian moose habitats. The twinning rate will be calculated as the proportion of cows with twins or triplets from the sample of all cows with calves.

Desired precision and sample size needed to attain that precision will be investigated and specified through consultation with a regional biometrician. We will also evaluate 2-year average twinning rates in Units 19A and 19D in relation to the objectives for this activity, as outlined in the intensive management operational plans for Units 19A and 19D.

ACTIVITY 1.3. Assess population size through GSPE surveys and compare to objectives. (objectives C1–C3, C5, C7, C9, C11, M3)

Data Needs

No change from report section, this document. Density estimates help us to determine the harvestable surplus in relation to intensive management objectives and amounts necessary for subsistence.

Methods

We will continue to assess moose densities in Units 19A and 19D using GSPE surveys (Kellie and DeLong 2006) conducted in late winter. Additionally, biometric review will be sought prior

to future GSPE surveys to optimize the allocation of high to low strata sampled as well as establishing sightability trials. All GSPE surveys will be designed to achieve precision of at least ±20% at the 90% CI, but actual precision will vary with survey conditions, funding, pilot skill, and other variables. We recognize the challenges of observing moose in late winter surveys (e.g., shadows in dense cover on sunny days) and intend to estimate an SCF with each GSPE using radiomarked moose or other appropriate techniques. Due to resource constraints, we will attempt to survey Units 19A and 19D only every 3 years. However, funding, weather, availability of other resources, and other area priorities may prevent this.

2. Mortality–Harvest Monitoring

ACTIVITY 2.1. Monitor harvest through registration and drawing permit reports and harvest ticket reports; analyze harvest data; and assess the accuracy of these data in selected areas when possible. (objectives C1, C2, C4, C6, C8, C10, C12)

Data Needs

No change from report section, this document. Units 19A, 19B, and 19D have been identified by BOG for intensive management of moose. There are also subsistence regulations in place which set amounts necessary for subsistence throughout Unit 19. Annual summaries of harvest are necessary to understand harvest in relation to intensive management, subsistence, and sustained yield. Analysis of harvest data also informs department recommendations to BOG. Such analysis will be discussed with a regional biometrician to determine whether trends and inferences are correctly applied.

Methods

No change from previous reporting period (RY10–RY15). Reporting on Tier I, Tier II, drawing, and harvest ticket hunts will be collected from hunters. Hunters who do not report in a timely manner will receive 1 or 2 reminder letters and an e-mail and telephone calls. We will summarize data on hunter residency, hunter success, harvest chronology, and transport methods. These harvest data are stored in a moose database accessible through WinfoNet. Desired precision of data stored in the WinfoNet moose harvest database may be assessed through consultation with a biometrician.

3. Habitat Assessment–Enhancement

None.

Nonregulatory Management Problems or Needs

Low snow winters continue to hamper our ability to monitor moose in the Aniak drainage of Unit 19A. New survey techniques may need to be developed to alleviate this issue.

Data Recording and Archiving

- Harvest data and GSPE survey data will be stored in an internal moose database housed on a server (http://winfonet.alaska.gov/index.cfm) and archived in *WinfoNet* under *Harvest Information* and *Survey and Inventory Tools*.

- In addition, survey memos and other pertinent electronic survey information (e.g., survey maps) will be archived in *WinfoNet* under *Data Archive*.

- Hard-copy field data are located in files in the McGrath office. Historic data will be archived in the WinfoNet data archiving system as time permits.

Agreements

The *Central Kuskokwim Moose Management Plan* (CKMMP; Central Kuskokwim Moose Management Planning Committee 2004).

Permitting

ADF&G Collecting Permit (Josh Peirce #09-045).

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