Species Management Report and Plan ADF&G/DWC/SMR&P–2024–6

Moose Management Report and Plan, Game Management Unit 20A:

Report Period 1 July 2015–30 June 2020, and

Plan Period 1 July 2020–30 June 2025

Mark Nelson

2024

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 Jason Caikoski, Management Coordinator for Region III for the Division of Wildlife Conservation.

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Purpose of this Report

This report provides a record of survey and inventory management activities for moose in Game Management Unit 20A for the 5 regulatory years 2015–2019 and plans for survey and inventory management activities in the following 5 regulatory years, 2020–2024. A regulatory year (RY) begins 1 July and ends 30 June (e.g., RY15 = 1 July 2015–30 June 2016). 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 more efficiently report 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. RY15–RY19 Management Report

Management Area

Unit 20A is in Interior Alaska immediately south of Fairbanks, across the Tanana River and is centered on 64°10′N latitude and 147°45′W longitude. Unit 20A encompasses 6,796 square miles, but only 5,040 square miles contain topography and vegetation typically used by moose (*Alces alces*). The study area was described in detail by Gasaway et al. (1983). The northern portion consists of lowlands (Tanana Flats) with elevations ranging from 350 to 1,000 feet above sea level. The southern portion consists of the northern foothills and mountains of the Alaska Range with elevations varying up to 14,000 feet. Tanana Flats vegetation is a mosaic of succession from shrub and young forest to mature bogs and black spruce (*Picea mariana*) forest (Gasaway et al. 1983). Vegetation in the hills, foothills, and mountains grades from taiga at lower elevations into shrub-dominated communities with alpine tundra at higher elevations. The climate is typical of Interior Alaska, where temperatures frequently reach 80°F in summer and −40°F in winter. Snow depths are generally below 32 inches in the northern lowlands.

Summary of Status, Trend, Management Activities, and History of Moose in Unit 20A

Moose are presently found throughout the Tanana Flats and adjacent Alaska Range foothills at moderate to high densities (2.0–2.5 moose/square mile). Gasaway et al. (1983) presented a detailed history of the Unit 20A moose population through 1978 that included high abundance followed by a dramatic decline in the 1960s caused by severe winters, wolf predation, and liberal antlerless harvest. Boertje et al. (1996) updated the case history through 1994 to include abundance recovery following wolf control during 1976–1982. More recent publications discuss important management implications of density-dependent responses and use of antlerless harvest to mitigate decline in nutritional condition and detrimental browsing effects on vegetation, including Young and Boertje (2004, 2008, 2011), Young (2006), Boertje et al. (2007, 2009, 2019, 2020), and Paragi et al. (2015).

Preferred moose habitat is composed of riparian willow, poorly drained meadows, shallow lakes, early successional forest, and subalpine shrub communities. Suitable moose habitat covers approximately 5,040 square miles of the unit (the area below 4,000 feet in elevation exclusive of large lakes). After decades of relatively few fires, approximately 700,000 acres burned during 2001–2013 that should improve moose nutrition, productivity, and carrying capacity (Young 2014).

Currently the department is managing for a stable moose population in Unit 20A. In 2016 the Alaska Board of Game revised the intensive management (IM) population objective from 12,000–15,000 to 10,000–15,000 moose and the harvest objective from 900–1,100 to 500–900 moose. Antlerless moose hunts remain controversial and divisive because some hunters favor maximizing sustainable harvest, while others are concerned that female harvest could precipitate a decline as observed in the early 1970s (Gasaway et al. 1983). Public opposition to antlerless harvest tends to wax and wane.

Access restrictions for moose hunting are also controversial. Motorized vehicles other than aircraft are not permitted in the Wood River and Yanert controlled use areas in Unit 20A. Entry to some military land is also prohibited, which can be controversial because much of the military controlled lands would otherwise provide excellent moose hunting opportunity.

Management Direction

Existing Wildlife Management Plans

The existing wildlife management plan (Young 2017) covered a 5-year period ending in June 2020 (RY15–RY19). Prior to this plan, management action was guided by the draft wildlife management plan developed in 1976 (ADF&G 1976) and updated through public comments, staff recommendations, and Board of Game actions over the years.

Goals

- Protect, maintain, and enhance the moose population and its habitat in concert with other components of the ecosystem.
- Provide the greatest sustained opportunity to participate in hunting moose.
- Provide an opportunity to view and photograph moose.

Codified Objectives

Amounts Reasonably Necessary for Subsistence Uses

C1. Unit 20A, that portion outside the boundaries of the Fairbanks Nonsubsistence Area (FNSA) has a customary and traditional use finding for moose with amounts necessary for subsistence uses of 50–75 moose. This goal will be considered met when the harvestable surplus outside the FNSA is greater than 50 moose.

Intensive Management

C2. Population objective: 10,000–15,000 moose (adopted at the March 2016 Board of Game meeting).

C3. Harvest objective: 500–900 moose (adopted at the March 2016 Board of Game meeting).

MANAGEMENT OBJECTIVES

M1. Manage population levels based on 3-year mean spring twinning rates in conjunction with at least one of the following signals to substantiate low twinning based nutritional status: 1) <50% of 36-month-old moose are parturient; 2) average multi-year short-yearling mass is <385 pounds; or 3) >35% of annual browse biomass is removed by moose (Boertje et al. 2007):

a. <10% twinning rate (manage for population reduction).
b. 10–20% twinning rate (manage for population stability).
c. >20% twinning rate (manage for population growth).

M2. Manage for a posthunting sex ratio of ≥25 bulls:100 cows.

MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1. Geospatial population estimation (GSPE) surveys.

Data Needs

Moose abundance and age-sex composition are integral components of management. GSPE is the preferred technique for estimating abundance in this subunit. This approach was developed specifically for this subunit, and provides age-sex composition along with an abundance estimate and accompanying variance (Ver Hoef 2001, 2008). These estimates are used for monitoring demographic trends in response to management actions intended to influence the type of harvest (sex, antler configuration, and total amount that is sustainable yield) for meeting IM population objectives and bull-to-cow objectives. Monitoring calf-to-cow and yearling-to-cow ratios allow an understanding of demographic changes indicative of production and natural mortality on calves.

Methods

Because there is limited funding and time available, the department's Fairbanks area biologists chose to alternate between conducting a survey in Unit 20A and conducting a survey in Unit 20B.

Fall 2015

Methods described in Young (2017).

Fall 2016

No survey was conducted in the Fairbanks area (Unit 20A or Unit 20B) because of weather.

Fall 2017

No survey was conducted Unit 20A because the available funding and time were spent to complete a survey in Unit 20B.

Fall 2018

A survey was attempted, but poor snow cover and high winds limited our ability to safely fly and accurately conduct the survey. Therefore, the effort was abandoned for 2018.

Fall 2019

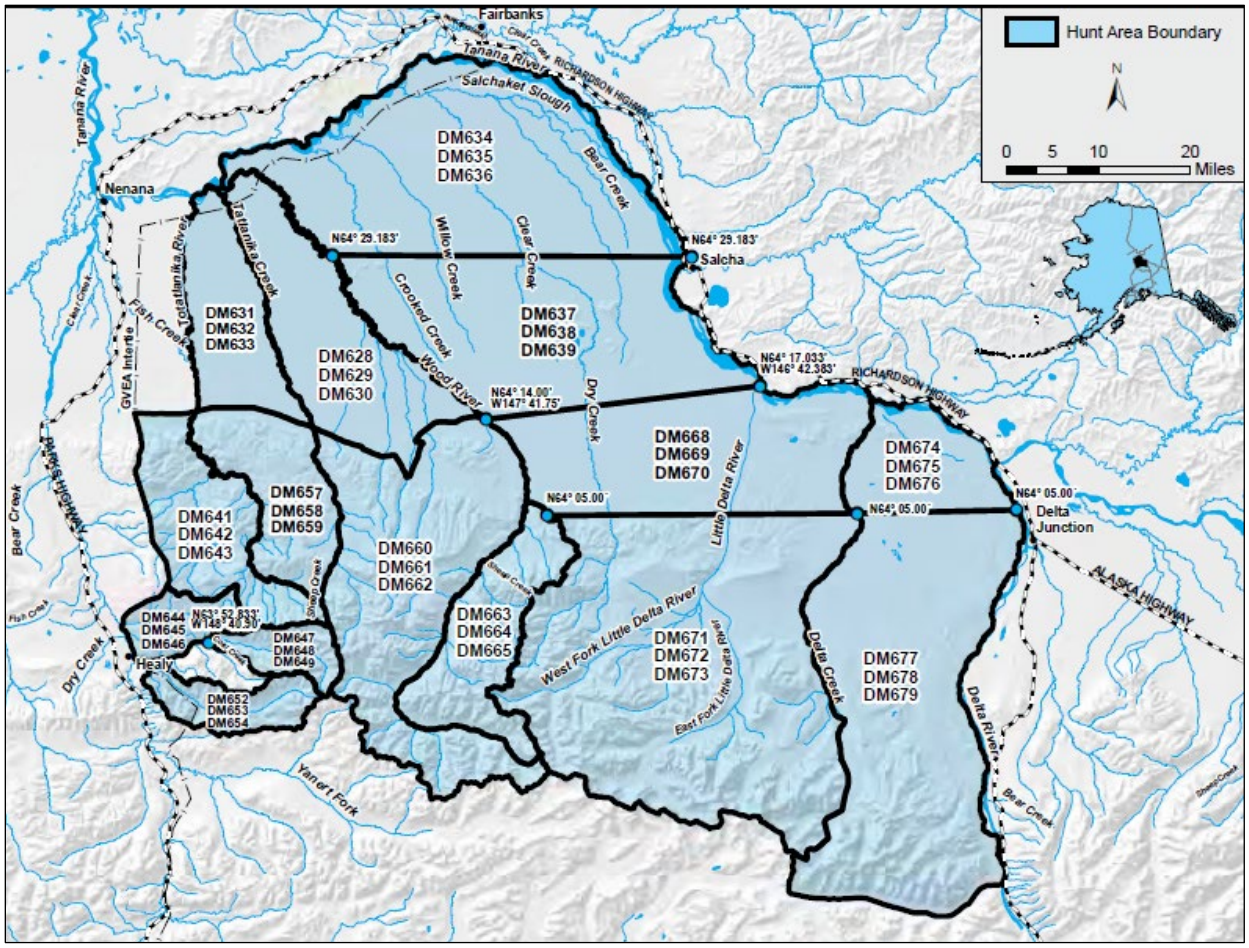
Department biologists and staff used the GSPE method (Kellie and Delong 2006) and surveyed 137 sample units (SU; 86 high density and 51 low density; 798 square miles) of 987 SUs (5,747 square miles) during 8 November–19 November (Fig. 1). A simple random sample of 136 SUs (84 high density and 52 low density) was selected from each stratum using Microsoft Excel for Microsoft 365 software. An additional 10 SUs (6 high density and 4 low density) were selected to fill gaps in the randomized coverage. We were unable to survey 6 high density SUs because of weather; we mistakenly surveyed 1 extra SU (low density), which we included in the analysis.

Search time per SU with 100% moose habitat averaged 6.48 minutes/square miles (n = 134 SUs). Survey conditions with regard to snow (age and cover), light (intensity and type), and wind (strength and turbulence) were mostly good (56%) and excellent (31%) with the remainder being fair (13%) and one being poor (n =129).

Results and Discussion

There were two completed surveys (fall 2015 and fall 2019) of Unit 20A during RY15–RY19. The 2019 GSPE survey estimate with a sightability correction factor (SCF) of 1.21 was 11,770 moose (standard error [SE] = 1,331; 90% confidence interval [CI] = 9,581–13,959; Table 1). The SCF of 1.21 was determined during previous surveys in Unit 20A. Composition data associated with the 2019 GSPE survey included a ratio of 36 bulls:100 cows, 9 yearling bulls:100 cows, and 35 calves:100 cows (Table 1).

The 2019 Unit 20A population estimate of 11,770 (after applying a SCF) moose falls within the IM population objective of 10,000–15,000 moose. All completed surveys in the past 10 years (RY10–RY19) have also been within the IM population objective. Similarly, the bull-to-cow ratio has also been above the current management objective of 25 bulls:100 cows over that same period.



Produced by ADF&G, 2015 using ArcGIS™ software (Esri, Redlands, California); base map source: ADF&G.

Figure 1. Antlerless drawing permit hunt areas, Unit 20A, regulatory years 2015–2019, Interior Alaska.

Table 1. Moose fall composition and estimated population size from geospatial population estimates, Unit 20A, calendar years 2015–2019, Interior Alaska.

Calendar year	Bulls:100 cows[a]		Yearling bulls:100 cows[a]		Calves:100 cows[a]		Percent calves[a]		Observed: Total adults	Observed: Total moose	Estimated population with SCF = 121[a b]		Moose /mi^2 [c]
2015	29	(25–33)	7	(4–10)	31	(28–34)	22	(20–24)	1,326	1,708	12,315	(10,697–13,923)	2.4
2016[d]	–	–	–	–	–	–	–	–	–	–	–	–	–
2017[d]	–	–	–	–	–	–	–	–	–	–	–	–	–
2018[d]	–	–	–	–	–	–	–	–	–	–	–	–	–
2019	36	(25–47)	9	(6–12)	35	(29–41)	21	(17–25)	1,103	1,395	11,770	(9,581–13,959)	2.3

Note: An en dash indicates the cell contains no data.

[a] Ninety percent confidence interval in parentheses.

[b] SCF is an acronym for sightability correction factor (Boertje et al. 2009).

[c] Based on an estimated 5,040 mi^2 of moose habitat in Unit 20A.

[d] The surveys in 2016, 2017, and 2018 were not completed because of poor snow conditions, lack of funding, pilot availability, or regional priorities.

Recommendations for Activity 1.1

- Continue to conduct GSPE surveys to monitor and evaluate trends in abundance, productivity, survival, and recruitment.
- Incorporate sightability correction factor trials into GSPEs when practical to improve accuracy of population estimates and incorporate SCF variance in precision for a more informed trend analysis.
- Evaluate trends in the moose population's productivity (calves:100 cows), survival-recruitment (yearlings:100 cows), and sustainable bull harvests (bulls:100 cows).
- Utilize memos to archive details of future abundance and composition surveys.

ACTIVITY 1.2. Spring twinning surveys.

Data Needs

Estimates of moose nutritional condition and productivity are integral to long-term management on a sustained yield basis by protecting moose health and habitat. Data gathered during twinning surveys about how many cows have twins provide an indication of nutritional condition and productivity.

Methods

Twinning rate surveys consisted of roughly parallel transects flown at approximately ½-mile intervals at ≤500 feet above ground level in a PA-18 or Scout aircraft by experienced pilots with observers. All moose observed were classified as bull, yearling cow, adult cow without a calf, or adult cow with a single calf, or twin or triplet calves. Twinning rate surveys are flown in late May during or within a few days of the median calving date as determined by concurrent parturition surveys of collared cow moose (Boertje et al. 2007) to minimize potential bias resulting from predation on one calf or a pair of twins. To increase the power of statistical comparisons between survey areas and across years, we established a priori, a desired sample size of ≥50 cows with calves (Boertje et al. 2007). The twinning rate was calculated as the proportion of cows with twins or triplets from the sample of all cows with calves. We compared point estimates of observed twinning rates to thresholds adopted in our management objectives.

Results and Discussion

The overall twinning rates (i.e., northcentral Tanana Flats, western Tanana Flats, and eastern Tanana Flats–foothills combined) during spring 2016–2020 averaged 16.3 (95% CI = 13.3–19.3, Table 2). This is slightly up from the previous 5-year (2011–2015) estimate of 15.4% but still between the management objective of managing the population for stability when twinning rates are between 10% and 20%.

Recommendations for Activity 1.2

- Continue spring twinning rate surveys.
- Continue managing for a stable population.

Table 2. Moose twinning rates from transect surveys, Unit 20A, calendar years 2016–2020, Interior Alaska.

Calendar year	Date	Cows observed with single calf	Cows observed with twins	Twinning rate[a] (95% CI[b])	Total parturient cows
2016[c]	22–25 May	106	11	9.4 (4.1–14.7)	117
2017[c]	20–23 May	85	21	19.8 (12.2–27.4)	106
2018[c]	26–29 May	110	24	17.9 (11.4–24.4)	134
2019[d]	24–25 May	85	17	16.7 (9.5–23.9)	102
2020[c]	21–24 May	106	23	17.8 (11.2–4.4)	129

[a] Proportion of cows with calves that had twins.
[b] CI stands for confidence interval.
[c] A survey was conducted in each of the three survey areas (northcentral Tanana Flats, western Tanana Flats, and eastern Tanana Flats–foothills) and the results were pooled.
[d] A survey was conducted in just two areas (northcentral Tanana Flats and western Tanana Flats) and the results were pooled.

ACTIVITY 1.3. Short-yearling mass estimates.

Data Needs

Estimates of moose nutritional condition and productivity are integral to management on a sustained yield basis over the long term and the goal of protecting moose health and habitat. Short-yearling mass is an index for the nutritional condition of moose and can substantiate twinning rates.

Methods

This activity is designed to estimate the difference in mass of male and female short-yearlings pretreatment (1997–2003) versus posttreatment (2015 and 2016), and proximity to the 385-pound threshold identified as indicative of poor nutritional status or the 400-pound threshold to indicate surplus nutrition (Boertje et al. 2007). Boertje et al. (2007) recommended multi-year averages when using short-yearling mass and/or twinning rates to evaluate the nutritional status of a moose population to incorporate annual variation resulting from differences in environmental conditions (e.g., weather, snow conditions, etc.). Our initial goal was to weigh 60 female short-yearlings (30 in the Tanana Flats and 30 in the Foothills) during March 2015 and March 2016. We used 2-sample t-tests to test for differences between pre- and posttreatment short-yearling mass stratified by sex. Confidence intervals were at the 95% level.

Results and Discussion

We captured and weighed 118 short-yearlings (n = 78 females and 40 males) during March 2015 and March 2016. For female short-yearlings, the difference of 6 pounds between posttreatment (372 pounds, n = 78) and pretreatment (365 pounds, n = 215) was not significant (p = 0.29). For male short-yearlings, the difference of 35 pounds between posttreatment (397 pounds, n = 40) and pretreatment (362 pounds, n = 116) was significant (p = 0.0004). Male short-yearlings are significantly larger posttreatment and are above the 385-pound threshold, however they are still not above the 400-pound threshold to indicate surplus nutrition. Females are not above the 385-pound threshold and have not shown a significant increase in short-yearling mass. This indicates that while conditions are improving, this moose population is still experiencing effects of high

density, and management efforts should focus on holding the population level steady without letting the population grow. This activity should be repeated to better understand the trend in short-yearling weights, and the influence of short-term environmental conditions (e.g., winter severity and summer conditions), and in turn to better understand the health of the habitat.

Recommendations for Activity 1.3

- Continue to capture and weigh short-yearlings (>30 each males and females) periodically to detect differences in mean mass pre- versus posttreatment years and monitor overall nutritional status of the population.

2. Mortality-Harvest Monitoring and Regulations

ACTIVITY 2.1. Monitor and analyze harvest data and other mortality.

Data Needs

Monitoring and analyzing harvest data are essential to determine whether the IM harvest objective has been achieved, and harvests are sustainable.

Methods

We estimated annual harvest from required harvest report cards. Harvest data were summarized by regulatory year. This included data from report cards from the RY15–RY19 general season harvest ticket hunt and drawing hunts (i.e., September bull hunts DM768–DM774, November muzzleloader bull hunt DM766, antlerless drawing hunts DM628–DM639, DM641–DM649, DM652–DM654, DM657–DM665, and DM668–DM679, and antlerless registration hunt RM768; Table 3 and Figs. 1–4). Hunters received 1 or 2 reminder letters and usually an email and telephone calls if we did not receive timely harvest reports. We summarized data on hunter residency, hunter success, harvest chronology, and transport methods contained in the WinfoNet database.

We estimated total take by humans (excluding mortality by motor vehicles and trains) for Unit 20A as reported hunter harvest times 1.35 (Boertje et al. 2009). This correction factor is meant to adjust mortality for all other types of reported take (e.g., hunting, defense of life or property, dispatched, and ceremonial harvest) and is estimated for unreported (e.g., illegal, snaring, and wounding loss) types of take by humans outside of train and motor vehicle collisions. Accidental mortality by motor vehicles and trains does occur in Unit 20A, but the magnitude of this mortality is unknown.

We compared total annual reported harvest to the lower limit of the IM harvest objective for Unit 20A.

Table 3. Reported moose harvest, Unit 20A, regulatory years 2015–2019, Interior Alaska.

Harvest method	Regulatory year	Permits issued (moose requested)	Did not hunt	Unsuccessful	Successful	Male	Female	Sex unknown
Ceremonial harvest authorizations[a]	2015	25 (44)	–	–	–	2	4	0
	2016	21 (38)	–	–	–	2	7	0
	2017	17 (27)	–	–	–	0	1	0
	2018	14 (26)	–	–	–	0	2	0
	2019	14 (22)	–	–	–	0	2	0
General season harvest ticket	2015	1,182	–	886	296	294	0	2
	2016	1,109	–	821	288	288	0	0
	2017	1,080	–	793	287	285	0	2
	2018	1,006	–	814	192	191	0	1
	2019	979	–	724	255	252	0	3
Drawing permits for bulls	2015	852	425	234	193	193	0	0
	2016	1,076	486	323	267	267	0	0
	2017	1,074	441	351	282	282	0	0
	2018	1,204	527	411	266	265	1	0
	2019	796	325	244	227	227	0	0
Drawing permits for antlerless	2015	0	–	–	–	0	0	0
	2016	0	–	–	–	0	0	0
	2017	384	192	123	69	5	64	0
	2018	440	257	109	74	4	70	0
	2019	266	138	80	48	1	47	0
Registration permits for antlerless	2015	0	–	–	–	0	0	0
	2016	0	–	–	–	0	0	0
	2017	30	8	11	11	2	9	0
	2018	30	5	2	23	2	21	0
	2019	20	4	1	15	1	14	0

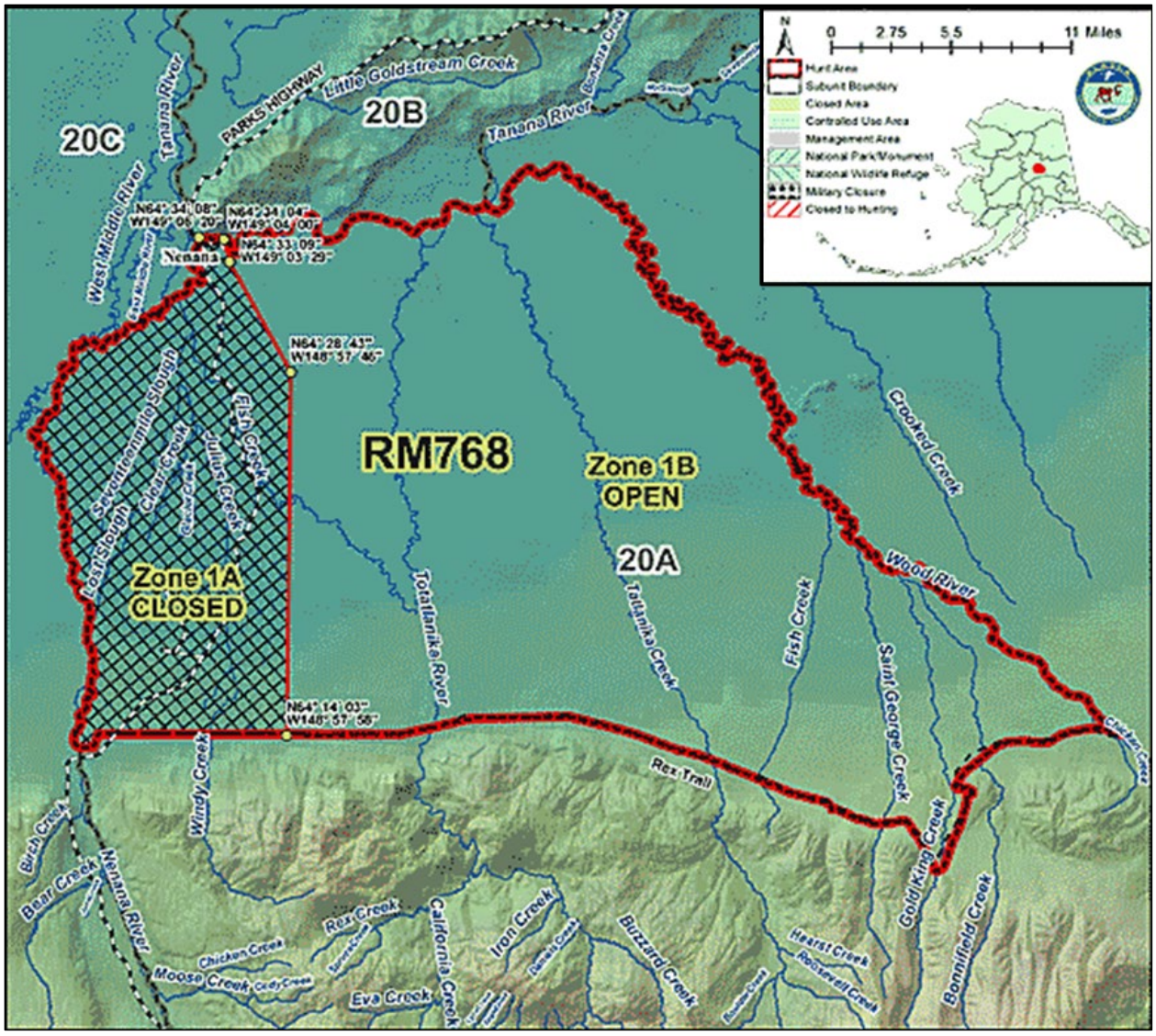
Continued

Table 3. Page 2 of 2.

Harvest method	Regulatory year	Permits issued (moose requested)	Did not hunt	Unsuccessful	Successful	Male	Female	Sex unknown
Total 20A harvest	2015	2,078	–	–	–	489	4	2
	2016	2,223	–	–	–	557	7	0
	2017	2,565	–	–	–	574	74	2
	2018	2,676	–	–	–	462	94	1
	2019	2,063	–	–	–	481	63	3

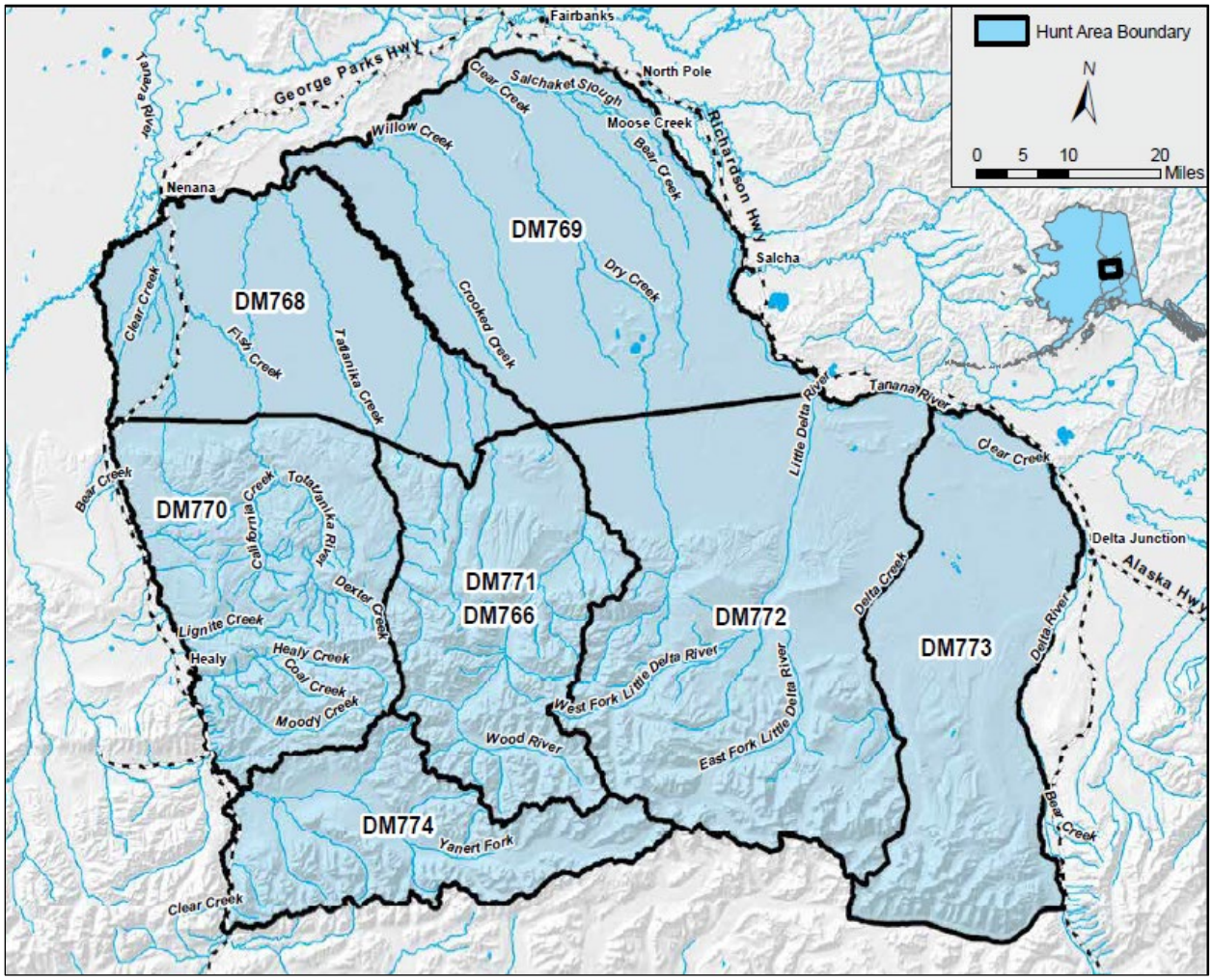
Note: This table includes harvest from hunter reports.

[a] Ceremonial harvest authorizations (5AAC 92.019) are required for taking big game for certain religious ceremonies within nonsubsistence areas defined in 5 AAC 99.015. Ceremonial harvest outside nonsubsistence areas certainly occurs but is not well documented.



Produced by ADF&G, 2015 using ArcGIS™ software (Esri, Redlands, California); base map source: ADF&G.

Figure 2. Antlerless registration permit hunt area, Unit 20A, regulatory years 2015–2019, Interior Alaska.



Produced by ADF&G, 2015 using ArcGIS™ software (Esri, Redlands, California); base map source: ADF&G.

Figure 3. Bull drawing permit hunt areas, Unit 20A, regulatory years 2015–2019, Interior Alaska.

Results and Discussion

Harvest by Hunters

The total harvest of moose was within the IM objectives of 500–900 moose for all years (Table 4). No antlerless drawing or registration hunts were held during RY15 and RY16, and during those years the harvest was mostly bulls. Limited antlerless registration and drawing permits were offered during RY17–RY19 following our management strategy to hold the population steady while it is within the current IM population objectives.

Table 4. Reported and estimated moose harvest, Unit 20A, regulatory years 2015–2019, Interior Alaska.

	Harvest[a]				
	Reported				Estimated[b]
Regulatory year	Male	Female	Unknown	Total	total
2015	489	4	2	495	668
2016	557	7	0	564	761
2017	574	74	2	650	878
2018	462	94	1	557	752
2019	481	63	3	547	738

[a] Harvest includes ceremonial harvest, and general season, drawing, and registration permit harvests.
[b] The estimated total is the total reported harvest times 1.35 (Boertje et al. 2009) to account for wounding loss, unreported, and illegal harvest.

Permit Hunts

BULL

The bull permits for Unit 20A remained popular, and for the 50–60% of the permit winners who used the permit, the success rate remained high (39–48%). The number of permits the department gives out each year varies according to population parameters (i.e., estimated number of bulls and bull-to-cow ratios) and hunter success rates, so we can distribute hunter effort and harvest across Unit 20A's moose habitat.

ANTLERLESS

Prior to RY17, the IM population objective was 12,000–15,000 moose and the population estimates were just below or right around 12,000 moose. Therefore, the population was managed for growth and no antlerless drawing or registration permits were issued. The IM objective was changed starting in RY17 to 10,000–15,000 moose, which triggered a change in strategy to manage for a stable population. When managing for a stable population, antlerless drawing and registration hunts are issued on a limited basis. The goal is to harvest cow moose at ≤1% of the midpoint of the estimated total population level. For example, the 2019 population estimate midpoint was 11,770 moose, so we would want to harvest ≤118 cow moose. Harvesting ≤1% of cow moose in this manner will prevent the population from growing and will generally hold the population steady, which is consistent with managing the population when it is within the IM population objective.

During RY17–RY19, between 266 and 440 drawing permits were issued each year within the Fairbanks Nonsubsistence Area for antlerless moose. Many permit holders did not hunt (50–58%), but of those that did, the success rate was 36–40%.

Outside the FNSA registration, antlerless permits were issued for RY17–RY19. Thirty permits were issued in RY17 and FY18 and 20 permits in RY19. Most (73–83%) of those permits were used and the success rate was very high (50–94%).

Hunter Residency and Success

Moose hunter numbers in the general season declined slightly from RY15 to RY19 (Table 5). The overall success rate remained around 25% except for RY18 when the success rate dipped to 20%. RY18 had an extremely rainy September, which led to poor moose hunting success for many Interior areas. When including all harvest types, the overall moose harvest has remained stable between 668 (RY15) and 878 (RY17), which is within the IM objectives of 500–900 moose (Table 4). The reinstatement of antlerless drawing and registration permits in RY17 and the continued use of bull drawing permits during RY15–RY19 has greatly increased the moose hunting opportunity in Unit 20A, which should remain in place so long as the population remains within the IM objective.

Table 5. Moose hunter residency and success, general season, Unit 20A, regulatory years 2015–2019, Interior Alaska.

	Successful				Unsuccessful				
Regulatory year	Resident	Non-resident	Unknown	Total	Resident	Non-resident	Unknown	Total	Total hunters
2015	214	80	2	296	793	87	6	886	1,182
2016	205	83	0	288	720	100	1	821	1,109
2017	206	80	1	287	713	79	1	793	1,080
2018	134	58	0	192	706	108	0	814	1,006
2019	183	72	0	255	653	71	0	724	979

Note: Table excludes ceremonial harvest, drawing, and registration permit hunters.

Other Mortality

No new information was gathered on natural or human-caused mortality outside of harvest during RY15–RY19. Historic information on predation and vehicle or train accidents are summarized in Young (2012).

Recommendations for Activity 2.1

- Continue to monitor total harvest for evaluation of the IM harvest objective.
- Modify comparisons of IM harvest objective using a 3-year running means to account for annual variability.

3. Habitat Assessment-Enhancement

ACTIVITY 3.1. Assess habitat condition (goal of protecting habitat).

Data Needs

Monitor forage utilization by moose and forage plant condition enables evaluation of whether moose density is having an adverse effect on habitat. This is necessary to meet the goal of protecting moose habitat.

Methods

There were no habitat monitoring efforts during RY15–RY19.

Results and Discussion

None for RY15–RY19.

Recommendations for Activity 3.1

- Continue to evaluate the need for estimating browse offtake and browse plant condition to be obtained as a confirmatory metric when abundance of moose changes substantially, or twinning surveys indicate substantial change in moose nutritional condition. Guidelines for assessing the degree of change warranting browse surveys is provided in Boertje et al. (2007) and Paragi et al. (2015), both of which have information specific to Unit 20A.
- Continue to evaluate the opportunity for habitat enhancement in areas of late-seral condition through fire management options (suppression policy), prescribed fire, or mechanical treatments designed to enhance early seral habitat, particularly in areas accessible to hunters.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

Data Recording and Archiving

- GSPE and harvest data are stored on an internal database housed on a server (http://winfonet.alaska.gov/index.cfm). Field data sheets for surveys are stored in 3-ring binders located in the Fairbanks Area Biologist Office (Room 118).
- All other electronic data and files such as survey memos and reports are located on the regional office server (S:\Fairbanks Area). Field data sheets, paper files, hard copies, etc., are located in the file cabinet located in Fairbanks Area Biologist Office.

Agreements

Currently there are no agreements with other agencies pertaining to moose management.

Permitting

No permits were needed to conduct moose management activities in Unit 20A during RY15–RY19.

Conclusions and Management Recommendations

Two population surveys were conducted over this 5-year reporting period (RY15–RY19) and the midpoint of both estimates were within the IM population objective of 10,000–15,000 moose. We will continue to manage this population to remain stable. A key part of managing for a stable population is to harvest a low percentage of cows each year. Without harvesting these cows, the population will likely continue to grow and may exceed the IM population objective. When this

has happened in the past the excess moose outgrew the available habitat and we saw lower twinning rates, lighter short-yearlings, and excessive browse removal. When conditions get this poor, drastic measures must be taken to reverse the trends that usually involve large-scale antlerless hunts. It is more preferable to manage the population at a more stable level, but this will require annual approval from Advisory Committees to hold antlerless hunts each year. While we have been able to secure approval for these hunts, there are often concerns from the Advisory Committees and the public. We will continue to manage this population for stability while the population estimates fall within the IM objectives.

We conducted two GSPEs during RY15–RY19, and in both cases we met our IM population objective and met our management objective for bull-to-cow ratios. We also met our IM harvest objectives in each regulatory year of RY15–RY19. Because we have maintained the harvest and population within our objectives, we will continue the current management strategy and activities. We will also continue to refine our methods to increase our efficiency and effectiveness of monitoring the population.

II. Project Review and RY20–RY24 Plan

Review of Management Direction

MANAGEMENT DIRECTION

The RY15–RY19 management direction for moose in Unit 20A is appropriate to continue in RY20–RY24.

GOALS

- Protect, maintain, and enhance the moose population and its habitat in concert with other components of the ecosystem.
- Provide the greatest sustained opportunity to participate in hunting moose.
- Provide an opportunity to view and photograph moose.

CODIFIED OBJECTIVES

Amounts Reasonably Necessary for Subsistence Uses

- Unit 20A, that portion outside the boundaries of the FNSA customary and traditional use finding for moose with amounts necessary for subsistence uses of 50–75 moose. This goal will be considered met when the harvestable surplus outside the FNSA is greater than 50 moose. There are 5,040 square miles of moose habitat in Unit 20A and 19% (959 square miles) is outside the FNSA. Therefore, when 19% of the harvestable surplus for Unit 20A is greater than 50 moose, the ANS will have been met.

Intensive Management

- Population objective: 10,000–15,000 moose
- Harvest objective: 500–900 moose

MANAGEMENT OBJECTIVES

- Manage population levels based on multi-year mean spring twinning rates in conjunction with at least one of the following signals to substantiate low twinning-based nutritional status: 1) <50% of 36-month-old moose are parturient; 2) average multi-year short-yearling mass is <385 pounds; or 3) >35% of annual browse biomass is removed by moose (Boertje et al. 2007). The management strategy is also summarized in Appendix A:
    - <10% twinning rate (manage for population reduction).
    - 10–20% twinning rate (manage for population stability).
    - >20% twinning rate (manage for population growth).
- Manage for a posthunting sex ratio of ≥25 bulls:100 cows.

REVIEW OF MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1. Geospatial population estimation (GSPE) surveys.

Data Needs

No change from RY15–RY19. We will seek to estimate abundance, productivity (i.e., calf-to-cow ratios), and survival/recruitment/escapement (yearling bull-to-cow ratios, bull-to-cow ratios) to evaluate population status and trends.

Moose abundance and age-sex composition are integral components of management. GSPE is the preferred technique for estimating abundance and also provides age-sex composition with variance. These estimates are used for monitoring demographic trends in response to management actions intended to influence type of harvest (sex, antler configurations, and total amount that is sustainable yield) for meeting IM and management objectives. Monitoring calf-to-cow and yearling-to-cow ratios allow a better understanding of demographic changes indicative of production and natural mortality on calves.

Methods

- Utilize the GSPE methods (Kellie and DeLong 2006) when necessary to incorporate SCF trials and stratification flights to estimate abundance and composition of moose in Unit 20A.
- Consult with biometric staff to evaluate GSPE information to:
    - determine appropriate ratio of high- to low- sample units;
    - estimate the abundance of moose with appropriate confidence interval (90%);
    - estimate trend in moose populations using linear mixed models when appropriate (DeLong and Taras 2009);

    - estimate bull-to-cow, yearling bull-to-cow, and calf-to-cow ratios with appropriate confidence intervals and compare to objectives.
- Alternate GSPE surveys in Unit 20A with Unit 20B as both are managed out of the Fairbanks Area Office. Inadequate time, pilots, and funding is available to survey both units in the same year, so a staggered approach is necessary.

ACTIVITY 1.2. Spring Twinning Surveys.

Data Needs

No change from RY15–RY19. Estimates of moose nutritional condition and productivity are integral to management on a sustained yield basis over the long term and the goal of protecting moose health and habitat. Data gathered during twinning surveys about how many cows have twins provide an indication of condition and productivity.

Methods

No change from RY15–RY19.

- Multi-year mean unitwide twinning rates will be used to assess status and management actions according to management objectives.
- Biometric review: Estimate twinning rates and construct 95% CI. Review the historical precision of the surveys and determine the precision necessary to compare survey results to management objectives.

ACTIVITY 1.3. Short-yearling spring mass estimate.

Data Needs

No change from RY15–RY19. Short-yearling mass provides information about the nutritional condition of the moose population that is integral to management on a sustained yield basis over the long term.

Methods

No change from RY15–RY19.

- Compare the current (2022–2024) mass of short-yearling female and male moose with those captured in 2015–2016 (after the population reduction) with those captured in 1997–2003 (before the population reduction), and use the 385-pound threshold identified in the management objectives to substantiate the low twinning-based nutritional status (Boertje et al. 2007). Multi-year samples will be incorporated to account for annual variation in short-yearling mass resulting from differences in environmental conditions (e.g., weather, snow conditions, etc.).
- Biometric review: Estimate current short-yearling mass and compare to postreduction and prereduction short-yearling mass to determine if the current short-yearling mass has changed.

2. Mortality-Harvest Monitoring

ACTIVITY 2.1. Monitor and analyze harvest data and other mortality.

Data Needs

No change from RY15–RY19. Monitoring and analyzing harvest data are essential to determine whether the IM harvest objective has been achieved and harvests are sustainable.

Methods

- Monitor total harvest for comparisons with the IM harvest objective.
- Compare reported harvest to the lower limit of the IM harvest objective using a 3-year running means to account for annual variation in harvest.

3. Habitat Assessment-Enhancement

ACTIVITY 3.1. Assess habitat condition (goal of protecting habitat).

Data Needs

No change from RY15–RY19. Monitoring forage utilization by moose and forage plant condition enables evaluation of whether moose density is having an adverse effect on habitat. This may be necessary to meet the goal of protecting moose habitat.

Methods

No change from RY15–RY19.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

Data Recording and Archiving

- Capture, survey, and harvest data will be entered into the WinfoNet database. Field data sheets will be scanned to PDF and housed on the computer in the Fairbanks Area Biologist Office (Room 118), on the regional office server (S:\FAIRBANKS AREA\Moose) and the paper files will be stored in the file cabinet in Room 118.
- GSPE data will be stored on an internal database housed on a server (http://winfonet.alaska.gov/index.cfm) and archived in WinfoNet under Survey and Inventory Tools. Field data sheets will be stored in 3-ring binders located in the Fairbanks Area Biologist Office (Room 118).

Agreements

Currently there are no agreements with other agencies pertaining to moose management.

Permitting

No permits are expected during RY20–RY24.

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Appendix A. Decision framework for Unit 20A moose that links management recommendations to metrics of population trend, nutritional status, and bull-to-cow ratio in the context of management objectives, Interior Alaska.

Population trend	Nutritional status	Bulls:100 cows	Recommended Management Action: Bull harvest rate	Recommended Management Action: Cow harvest rate
Increasing (lambda >1.02)	High[a]	≥25	>5%	1–2%
		<25	4–5%	1–2%
	Moderate[b]	≥25	4–5%	2–3%
		<25	<4%	2–3%
	Low[c]	≥25	>5%	>3%
		<25	4–5%	>3%
Stable (lambda = 0.98–1.02)	High[a]	≥25	4–5%	<1%
		<25	4–5%	<1%
	Moderate[b]	≥25	4–5%	1–2%
		<25	4–5%	1–2%
	Low[c]	≥25	4–5%	>2%
		<25	4–5%	>2%
Decreasing (lambda <0.98)	High[a]	≥25	4–5%	0%
		<25	<4%	0%
	Moderate[b]	≥25	4–5%	0–1%
		<25	4–5%	0–1%
	Low[c]	≥25	4–5%	0–2%
		<25	4–5%	0–2%

[a] High is a 3-year mean twinning rate >20% and/or female 10-month mass >385 lb.
[b] Moderate is a 3-year mean twinning rate of 10–20% and/or female 10-month mass 365–385 lb.
[c] Low is a 3-year mean twinning rate <10% and/or female 10-month mass <365 lb.


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