Species Management Report and Plan ADF&G/DWC/SMR&P–2025–33

Moose Management Report and Plan, Game Management Unit 23:

Report Period 1 July 2015–30 June 2020, and

Plan Period 1 July 2020–30 June 2025

Christie R. Osburn

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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 Phillip Perry, Management Coordinator 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).

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Cover Photo: Moose in the Noatak River valley. ©2020 ADF&G. Photo by Christie Osburn.

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Purpose of this Report

This report provides a record of survey and inventory management activities for moose in Unit 23 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 23 encompasses approximately 43,000 mi² of mainland in Northwestern Alaska and covers the Kotzebue Sound, Chukchi Sea, and Arctic Ocean drainages (Fig. 1). The terrain varies from rugged mountains and river valleys to flat coastal wetlands. Spruce forests characterize eastern portions of the unit and represent the northern extent of tree line, 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 23

Moose began to appear in the eastern portion of Unit 23 during the 1920s and their range expanded to the Chukchi Sea coast by the mid-to-late 1940s (LeResche et al. 1974). Public comments, trend count surveys, and observations by department staff suggested moose abundance continued to increase throughout the region through the late 1980s. A series of severe winters and extensive spring flooding occurred during 1988–1991 causing starvation among adult moose and diminished recruitment in at least two of those years (Dau 1993). These weather effects were likely compounded by higher predator densities and an increase in moose harvest (due to low numbers of over-wintering caribou), and the unit's moose abundance began to stabilize then decline. From the mid-1990s through this reporting period calf recruitment throughout most of the unit has remained low, and moose densities have persisted at low levels in large portions of the unit (Dau 2008, Westing 2012).

Although moose have been present in Unit 23 for a relatively short time, they rapidly became an important food source for many Unit 23 residents and demand for moose by subsistence and general season hunters is high throughout the unit. Extensive waterways and winter trails provide hunters with easy access to suitable moose habitat for the duration of the hunting season.

Moose currently rank second to caribou as a source of terrestrial meat for most residents of the unit. Moose are also avidly sought by other Alaska residents (nonlocal) and, when allowed, nonresident hunters. Commercial services associated with moose hunting provide substantial income to

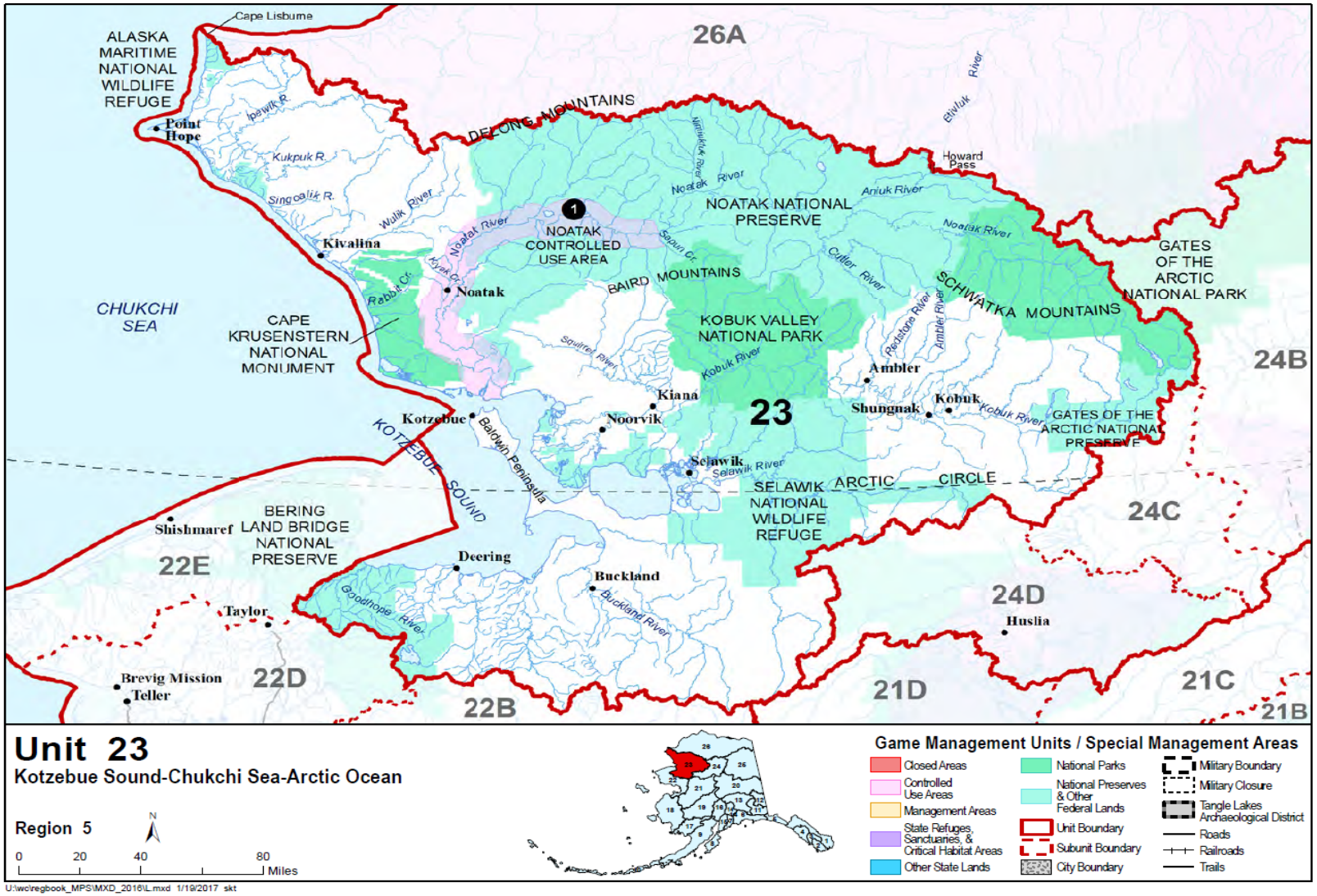

Figure 1. Map of Unit 23 including special management and controlled use areas as found in the 2019 Alaska Hunting Regulations.

outfitters and transporters who operate in Unit 23. The wide distribution and accessibility of moose throughout the unit also makes them important to nonconsumptive users (e.g., viewers and photographers).

Throughout the late 1990s and early 2000s, all moose harvest in Unit 23 was conducted under the state's general moose harvest ticket. In 2000, a positive customary and traditional use finding was determined for moose within the unit and in November 2001 an amount necessary for subsistence (ANS) of 325–400 moose was established with an intensive management population objective of 3,500–9,000 moose.

At the 2003 Alaska Board of Game (BOG) meeting, a resident registration hunt (RM880) and a series of nonresident draw hunts (DM871–DM877) were established for Unit 23 moose. These hunts, along with reductions to resident open season dates, were implemented with the intention to reduce and distribute moose harvest within the unit, as well as address user conflicts that had arisen in the area. The registration permit was introduced in RY04, and the nonresident draw permits were initiated in RY05. Seven guide-outfitter areas were established for the nonresident drawing hunts, with permit limits set at the mean number of moose harvested by nonresidents between RY00 and RY04. Hunting opportunities under the general harvest ticket remained available for those not hunting under the registration or draw permit. This hunt structure, with various season and bag limit changes, persisted through RY16; however, while markedly reducing the number of nonresident moose hunters, it only moderately reduced the level of harvest. By late 2016, inventory surveys suggested that continued abundance declines warranted a further reduction in harvest and a move to bull-only hunts. In RY17 the BOG adopted an amended proposal to change the RM880 permit to 1 antlered bull, and state biologists closed the nonresident draw hunts. At the close of this reporting period, the hunt structure remains limited to resident-only harvest of an antlered bull moose under the general state harvest ticket or RM880 registration permit.

Management Direction

Existing Wildlife Management Plans

The direction provided in the Seward-Kobuk-Noatak and Upper Noatak-Kobuk moose management plans (ADF&G 1976) has been reviewed and modified through public comments, staff recommendations, and Board of Game actions over the years. A record of these changes can be found in the division's management report series. The plan portion of this report contains the current management plan for moose in Unit 23.

Goals

- Sustain moose populations at stable or increasing levels in all major drainages.
- Maintain healthy age and sex ratios for moose populations within Unit 23.
- Monitor factors affecting natural and human-induced mortality of moose.
- Improve public understanding of regulations and their purpose.

CODIFIED OBJECTIVES

Amounts Reasonably Necessary for Subsistence Uses

The BOG has made a positive customary and traditional use determination finding for the Unit 23 moose population. The unitwide amount reasonably necessary for subsistence (ANS) is 325–400 moose.

Intensive Management

In 2001 the Alaska Board of Game adopted a positive finding for intensive management (IM) of moose in Unit 23. Current intensive management objectives are as follows:

- Population objective: 3,500–9,200 moose
- Harvest objective: 210–920 moose

MANAGEMENT OBJECTIVES

Manage moose populations at the following levels:

1. Manage for a unitwide moose population of 6,000–10,000 moose.
2. Manage for a unitwide fall bull-to-cow ratio of 40:100.

MANAGEMENT ACTIVITIES

1. Population Status and Trend

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

Data Needs

Estimating moose abundance is essential for establishing sustainable harvest levels and to determine if population, ANS, and IM objectives are being met. Spring abundance surveys also produce a recruitment index through the proportion of 10-month-old calves in the population and can be a general indicator of population trend.

Methods

Unit 23 is divided into 6 population survey areas: Upper Noatak, Lower Noatak, Upper Kobuk, Lower Kobuk, Selawik, and Northern Seward Peninsula (Fig. 2). A single area is surveyed each year, on rotation, which results in a unitwide observable moose abundance estimate that spans multiple years. Surveys are often conducted in cooperation with federal partners (U.S. Fish and Wildlife Service [USFWS], National Park Service [NPS], and Bureau of Land Management [BLM]).

Abundance and recruitment estimates of observable moose are produced using a Geospatial Population Estimator (GSPE; Kellie and Delong 2006). Surveys are typically conducted during March or April, as weather and snow conditions allow. Prior to initiating the intensive searches,

Figure 2. Map of Unit 23 moose survey areas as of regulatory year 2019, Northwest Alaska.

the survey area is stratified into high- or low-density sample units based on observed moose, presence of tracks, and availability of favorable habitat.

Stratification flights are generally conducted with a 4-person team in a Cessna 185 type aircraft at approximately 1,000 ft above ground level. However, if habitat and perceived moose distribution in an area has remained comparable between survey years, stratification from the most recent survey is used to minimize survey time and expense.

Biometric consultations between 2014 and 2019 helped generate a general sampling protocol for Unit 23 GSPE surveys that entailed sampling up to 40% of the total number of sample units within an area, of which 80% were classified as high-density units and 20% low-density units. Surveys are planned such that estimates of abundance and recruitment will have 90% confidence interval (CI) half-widths that are within 15% of the estimates.

Spring GSPE surveys were completed annually during 2016–2019. In 2020, weather and staff availability precluded a spring GSPE survey of the Northern Seward Peninsula; upon consultation with the regional biometrician, a trend count was completed in lieu of a GSPE.

Results and Discussion

Moose abundance throughout the region has continued to decline with decreases in survey area abundance ranging from 17–47%. The cause of this persistent decline is unknown and likely a combination of human and environmental factors. Harvest levels in the unit are still poorly understood, making the human impact hard to quantify or evaluate.

Beginning in 2016, a research project was initiated to determine moose calf mortality rates and causes. The Lower Kobuk was identified as the target area for the 3-year project as it had seen the greatest decline in abundance, was logistically easy to access, and subject to substantial hunting pressure. Final analyses of the study are still pending but initial results suggest that while calf mortality rates are high, independently they are not great enough to explain the observed rate of population decline (W. Hansen, Moose Research Biologist, ADF&G, Nome, personal communication).

Calf recruitment rates throughout the unit continue to remain low but have not shown a consistent trend (Table 1). Abundance and recruitment summaries for each survey area can be found below.

<u>Selawik</u>

In spring 2016, 520 moose were observed and classified to produce an abundance estimate of 940 moose (90% CI: 827–1053; 0.14 moose/mi2) and a 12% recruitment rate. The 2016 estimate indicated a 46% decrease in abundance since the 2011 survey estimate of 1,739 moose (90% CI: 1,426–2,052; 0.27 moose/mi2). Calf recruitment for the 2016 survey was comparable to the 2011 recruitment rate of 10%. Snow conditions were very good in the Selawik area during the survey.

<u>Lower Kobuk</u>

The Lower Kobuk survey area saw the greatest decline from a 2012 abundance estimate of 2,546 (90% CI: 2,113–2,979; 0.25 moose/mi2) to 1,346 (90% CI: 1,131–1,561; 0.25 moose/mi2) in 2017;

this estimate reflected a 47% decrease from the 2012 survey estimate. However, calf recruitment rates nearly doubled from 7% in 2012 to 13% in 2017.

Lower Noatak

During the spring 2018 Lower Noatak survey, 489 moose were observed for an area abundance estimate of 866 moose (90% CI: 771–961; 0.14 moose/mi2). The previous survey in 2013 produced an estimate of 1,478 (90% CI: 1,197–1,759; 0.23 moose/mi2). Calf recruitment in 2018 was 12%; a slight increase from the 2013 recruitment rate of 10%.

Upper Kobuk

The spring 2019 abundance estimate in the Upper Kobuk was 601 moose (90% CI: 505–697; 0.14 moose/mi2) with a calf recruitment rate of 19%. This recruitment rate is the highest on record since 2003, when consistent GSPE sampling was implemented for the area. The previous upper Kobuk abundance and recruitment estimates occurred in 2014 and were 727 moose (90% CI: 553–901; 0.14 moose/mi2) and 7%, respectively.

Northern Seward Peninsula

In spring 2020 a trend count was conducted on the northern Seward Peninsula; 317 moose were observed with an estimated recruitment rate of 13%. The number of moose observed during the trend count exceeded the 310 moose observed during the 2015 GSPE, which produced an estimate of 617 moose (90% CI: 531–703; 0.11 moose/mi2) and a calf recruitment rate of 13%.

Recommendations for Activity 1.1

Continue with modification. The GSPE has valid application within Unit 23 and has proved to be an effective method of estimating abundance with an acceptable level of precision. However, moose densities in the Arctic and subarctic are relatively low and distribution within the unit is extremely patchy given the geographic landscape, available habitat, and the tendencies of moose to aggregate in winter. An alternative approach has been identified as a viable, and potentially more efficient, method to estimate abundance in regions with these moose population characteristics. This alternative sampling method, Adaptive Cluster Sampling (ACS), is described by Turk and Borkowski (2005) and may prove to be a more appropriate survey technique for future abundance estimates within the unit.

An additional consideration moving forward is to reassess the sampling methods for the Upper Noatak survey area. The Upper Noatak survey area is located in the northeast portion of Unit 23; the area is 1,972 mi^2 and characterized by wide, open, rolling tundra with relatively sparse riparian corridors. The Upper Noatak has only been formally surveyed once, in RY09. The RY09 survey observed a total of 100 moose. Given the very low moose density, lack of hunting pressure, size of the survey area, and the logistical challenges of accessing the area, we recommend conducting a trend count survey of the area opportunistically as weather and staff resources allow.

Table 1. Spring moose abundance and composition, Unit 23, Northwest Alaska, regulatory years 2005–2019.

Area	Survey Year	Moose observed	Observable moose estimate (90% confidence interval)	Relative precision (%)	Calves:100 adults	Recruitment (%)	Density (moose/mi^2)	Area (mi^2)
Selawik	2007	678	2,319 (1948–2690)	16	10	9	0.35	6,580.0
	2011	448	1,739 (1426–2052)	18	11	10	0.27	6,559.0
	2016	520	940 (827–1053)	12	14	12	0.14	6,559.0
Lower Kobuk	2006	1,532	3,398 (2888–3908)	15	15	15	0.70	4,870.5
	2012[a]	789	2,546 (2113–2979)	17	8	7	0.48	5,338.0
	2017	796	1,346 (1131–1560)	16	15	13	0.25	5,338.0
Lower Noatak	2008[b]	685	2,273 (1864–2682)	18	14	12	0.35	6,404.5
	2013	413	1,478 (1197–1759)	19	11	10	0.23	6,404.5
	2018	489	866 (771–961)	11	13	12	0.14	6,404.5
Upper Kobuk	2006	219	737 (575–899)	22	15	13	0.18	4,001.5
	2014[c]	186	727 (553–901)	24	7	7	0.14	5,056.8
	2019	328	601 (505–697)	16	23	19	0.12	5,056.8
Northern Seward Peninsula	2009	293	966 (705–1227)	27	8	8	0.17	5,773.2
	2015	310	617 (531–703)	14	15	13	0.11	5,773.2
	2020[d]	317	–	–	23	7	–	–

Notes: Surveys conducted cooperatively by ADF&G, NPS, and USFWS. An en dash (–) denotes there is no applicable data.

[a] In 2012 the Lower Kobuk survey area was expanded to include the Squirrel River drainage; the 2012 survey reflects this expanded area.

[b] In 2008 the Lower Noatak survey area was modified to include Cape Krusenstern National Monument, the Wulik River drainage, and the Kivalina River drainage, and exclude portions of the upper Squirrel River drainage. The change reduced the area from 7,161.6 to 6,404.5 mi^2.

[c] In 2014 the Upper Kobuk survey area was modified to include area adjacent to the Lower Kobuk survey area.

[d] Survey was conducted as a trend count survey.

ACTIVITY 1.2. Estimate fall population composition in at least one survey area annually.

Data Needs

Fall composition surveys are required to determine the age and sex composition of the moose population within the unit and determine if there are healthy, sustainable age and sex ratios in the population. These metrics, in combination with population abundance estimates and recruitment rates, are used to inform harvest management and analyze potential effects of selective hunting measures.

Methods

Fall composition surveys are conducted across a range of habitats and terrain within a survey area. Each survey aims to observe and classify a number of moose ≥ 30% of the area's most recent abundance estimate. Aerial surveys are typically conducted between late October and early November when complete snow cover or heavy frost provide adequate sightability, and daylight hours still allow for a full day of surveying. Surveys are flown at low-level and any moose observed are recorded with a waypoint and classified into 1 of 6 categories: yearling/spike-fork bull, bull with antler spread less than 50 inches, bull with antler spread 50 inches or greater, cow, calf, or unknown sex/age class.

Results and Discussion

Fall composition surveys were completed each year during the reporting period and encompassed the Selawik, Lower Kobuk, Lower Noatak, Upper Kobuk, and Northern Seward Peninsula survey areas. Bull-to-cow ratios ranged from 27–52 bulls per 100 cows; 3 of the survey areas, Lower Kobuk, Upper Kobuk and Upper Noatak, were below the management objective of 40 bulls per 100 cows (Table 2). The Lower Kobuk area has generally been observed to host greater proportions of maternal cows and correspondingly tends to display lower bull-to-cow ratios. Composition in the Upper Kobuk was surveyed for the first time in 2018 and resulted in an estimated bull-to-cow ratio of 27:100.

The calf-to-cow ratio ranged from 17–24 calves per 100 cows across the 5 survey areas, with a mean of 22:100.

Recommendations for Activity 1.2

Continue.

2. Mortality-Harvest Monitoring and Regulations

ACTIVITY 2.1. Monitor annual hunter harvest through registration permits and harvest tickets.

Data Needs

Harvest data are needed to ensure that moose populations are managed sustainably, and that management and harvest objectives are being met. The data obtained through harvest reporting helps assess harvest trends, location, and timing, as well as hunter effort.

Table 2. Late fall (October–early December) moose composition, Unit 23, Northwest Alaska, regulatory years 2007–2019.

Area	Year	Spike-fork bulls	Medium bulls	Large bulls	Cows	Calves	Bulls: 100 cows	Calves: 100 cows	Calves: 100 adults	Total observed
Selawik	2008	19	66	59	276	44	52	16	10	464
	2010	7	73	54	289	51	46	18	12	474
	2015	10	48	80	317	59	44	19	13	514
Lower Kobuk	2007	6	52	13	276	93	26	34	27	441
	2011	8	93	92	427	65	45	15	10	685
	2016[a]	33	85	113	606	146	38	24	17	983
Lower Noatak	2007	11	68	64	286	36	50	13	8	465
	2012[b]	3	39	45	199	24	44	12	8	310
	2017	1	30	17	116	20	41	17	12	184
Upper Kobuk[c]	2018	5	14	6	93	25	27	27	21	143
Northern Seward Peninsula	2009	7	19	22	99	5	48	5	3	152
	2014	13	14	33	176	28	34	16	12	264
	2019	3	55	27	163	34	52	21	14	284

Notes: Surveys conducted cooperatively by ADF&G, NPS, and USFWS.

[a] In 2012 the Lower Kobuk survey area was expanded to include the Squirrel River drainage, increasing the area from 4,870.5 to 5,338.0 mi^2; the 2016 survey reflects this expanded area.

[b] In 2008 the Lower Noatak survey area was modified to include Cape Krusenstern National Monument, the Wulik River drainage, and the Kivalina River drainage, and exclude portions of the upper Squirrel River drainage; the change reduced the area from 7,161.6 to 6,404.5 mi^2.

[c] Only one year of formal fall composition data exists for the Upper Kobuk survey area for 2000–2019.

Methods

Harvest data is primarily acquired through harvest reports from registration permits and harvest tickets. All moose hunters are required to obtain a permit prior to hunting and, in doing so, agree to the mandatory reporting requirements. Harvest reports collect information on whether a hunter was successful, the location and number of days they hunted, the mode of transportation they used for hunting, and if they used any commercial services. Successful hunters are also required to provide information on the method of take and the sex and antler configuration of the harvested animal. All permit holders are required to report on their permit, regardless of their success. All moose harvest data are archived by regulatory year in the ADF&G Wildlife Information Network (WinfoNet) database.

Season and Bag Limit

In January 2017, seasons and bag limits for moose within the unit were changed, as described in the *Board of Game Actions and Emergency Orders* section below.

Resident general season harvest ticket

Regulatory year	Area	Open season	Bag limit
2015–2019	Unit 23	1 September–20 September	1 bull with 50-inch antlers or antlers with 4 or more brow tines on one side

Resident registration hunt

Regulatory year	Area	Open season	Bag limit
2015–2016	Unit 23 north of and including the Singoalik River drainage	1 July–31 December	1 moose by registration permit only; however, antlerless moose may only be taken 1 Nov–31 Dec; a person may not take a calf or a cow accompanied by a calf
	Remainder of Unit 23	1 August–31 December	
2017–2019	Unit 23 north of and including the Singoalik River drainage	1 July–31 December	1 antlered bull by registration permit only
	Remainder of Unit 23	1 August–31 December	

Nonresident draw permit hunt			
Regulatory year	Area	Open season	Bag limit
2015–2017[a]	Unit 23	1 September–20 September	1 bull with 50-inch antlers or antlers with 4 or more brow tines on one side
2018–2019		No open season	–

[a] In RY17 a nonresident season drawing hunt was still in regulation, however, no permits were issued, and the nonresident season was closed beginning RY18.

Results and Discussion

Harvest by Hunters-Trappers

Annual reported harvest averaged 123 moose during RY15–RY19 (range: 94–133) with RY18 and RY19 representing the 2 lowest harvest years on record (Table 3 and 4). Conversely, the number of reported hunters increased over the reporting period from 476 hunters in RY15 to 638 hunters in RY19 (Table 5). Hunter success rate declined from 36% to 16% between RY15 and RY19 respectively (Table 3).

Permit Hunts

During this reporting period, Unit 23 utilized the general season harvest ticket and 2 types of permit hunts: a nonresident drawing permit (DM871–DM877, DM885) and an extended season, resident registration permit (RM880). Due to declining moose abundance, nonresident drawing permits were only issued in RY15 and RY16 with 50 total drawing permits issued each year.

On average, 545 RM880 permits (range: 509–585) were issued annually during RY15–RY19 (Table 3). Since the initial introduction of the RM880 permit in RY04, issuance has gradually increased over time (Saito 2014), likely due, in part, to an increase in the public's understanding of licensing and permit requirements.

Hunter Residency and Success

The majority of moose harvest within Unit 23 is by local resident hunters, on average accounting for 67% of total harvest (Table 4). Subsistence household surveys and anecdotal information attest that this proportion of local resident harvest is most certainly an underrepresentation.

Table 3. Unit 23 moose permit issuance, effort, harvest, and success rate by hunt type, Northwest Alaska, regulatory years 2015-2019.

Hunt[a]	Regulatory year	Permits issued	Hunted	Did not hunt	Did not report	Moose harvested	Success rate %
DM871[b]	2015	10	8	2	0	2	25
	2016	10	6	4	0	4	67
DM872[b]	2015	6	3	3	0	1	33
	2016	6	1	5	0	0	0
DM874[b]	2015	7	6	1	0	3	50
	2016	7	7	0	0	5	71
DM875[b]	2015	9	3	6	0	1	33
	2016	9	6	3	0	3	50
DM876[b]	2015	9	8	1	0	5	63
	2016	9	7	2	0	4	57
DM885[b]	2015	9	9	0	0	6	67
	2016	9	8	1	0	4	50
RM880	2015	571	336	223	12	112	33
	2016	519	319	198	2	102	32
	2017	509	277	194	38	108	39
	2018	542	281	125	136	85	30
	2019	585	373	198	14	86	23
GM000[c]	2015	–	121	–	–	39	32
	2016	–	69	–	–	24	35
	2017	–	90	–	–	25	28
	2018	–	65	–	–	9	14
	2019	–	53	–	–	13	25

Note: An en dash (–) denotes there is no applicable data.

[a] No permits were issued for drawing hunts DM873 and DM877 during this reporting period.

[b] Nonresident drawing permits were suspended in RY17 due to declining moose abundance.

[c] Harvest ticket data only includes hunters that reported hunting in GMU23.

Table 4. Unit 23 moose harvest and annual percent of harvest by residency, Northwest Alaska, regulatory years 2015–2019.

Regulatory year	Local resident harvest (%)	Nonlocal resident harvest (%)	Nonresident harvest[a] (%)	Unknown residency harvest (%)	Total harvest
2015	87 (52)	60 (36)	20 (12)	1 (0)	168
2016	91 (65)	35 (25)	11 (8)	3 (2)	140
2017	98 (74)	35 (26)	–	–	133
2018	65 (69)	29 (31)	–	–	94
2019	75 (76)	24 (24)	–	–	99

Note: Dashes (-) are present when no harvest of that category was documented.
[a] Nonresident draw permits were not issued during RY17–RY19.

Table 5. Unit 23 moose hunter residency and success, Northwest Alaska, regulatory years 2015–2019.

	Successful hunters					Unsuccessful hunters						
Reg. year	Local resident (%)	Nonlocal resident (%)	Nonresident[a] (%)	Unk. (%)	Total	Local resident (%)	Nonlocal resident (%)	Nonresident[a] (%)	Unk. (%)	Total	Total hunters[b]	% Total success
2015	87 (32)	60 (40)	20 (45)	1 (50)	168	187 (68)	91 (60)	24 (55)	1 (50)	303	471	36
2016	91 (21)	35 (24)	11 (46)	3 (100)	140	351 (79)	110 (76)	13 (54)	0 (0)	473	614	23
2017	98 (21)	35 (25)	–	–	133	360 (79)	106 (75)	–	–	466	599	22
2018	65 (14)	29 (20)	–	–	94	399 (86)	115 (80)	–	–	514	608	15
2019	75 (14)	24 (21)	–	–	99	448 (86)	91 (79)	–	–	539	638	16

Note: Unk. stands for unknown, Reg. stands for regulatory and en dashes (–) are present when no hunters of that category were documented.
[a] No nonresident draw permits were issued during RY17–RY19.
[b] Does not include harvest ticket / permit holders who did not hunt.

Overall, hunter effort increased during the reporting period from 471 active hunters in RY15 to 638 active hunters in RY19 (Table 5). The greatest hunter success was realized by nonresident hunters in RY15 and RY16 with 45% and 46% success, respectively. Nonlocal residents, on average, were 6% more successful than local resident hunters over the reporting period. Overall, hunter success declined during the reporting period from 36% in RY15 to 16% in RY19. The decrease in success rate is likely a reflection of the low-density, declining moose abundance within the unit, but some portion may also be attributed to changes in hunter participation. Beginning in RY17, nonresident hunters, who likely put significant effort into finding harvestable moose, were no longer allowed to hunt moose within the unit and likely accounted for some portion of the higher success rates observed in RY15 and RY16. Additionally, more local hunters began proactively getting permits but only opportunistically hunting for moose. Rather than going on dedicated periods of species-specific hunts, many residents of the region often hunt on a more opportunistic basis while out on the landscape traveling or engaging in other subsistence activities; this can make it challenging to truly assess changes in species-specific hunter effort at the local level.

Harvest Chronology

Similar to previous reporting periods, the greatest harvest within the unit occurs in September, accounting for 69% of all harvest during the reporting period (Table 6). August is the next most common month for harvest, representing 16% for the same period. Harvest drops off through late October and early November when freeze-up begins to limit travel by boat and ATV. Local harvest picks up again, at low levels, in December when snow and ice conditions allow for travel by snowmachine. Harvest reported in the months of January through June occurred under federal subsistence regulations prior to the alignment with state season dates.

Transport Methods

Boating remains the primary method of transportation reported by hunters in Unit 23 (Table 7). Very few roads exist within Unit 23, so waterways function as the main travel corridors during the peak fall hunting months. As to be expected, most harvest reported during the winter months utilized snowmachines.

Other Mortality

While natural mortality (and specifically predation by bears and wolves) certainly occurs, it is not actively monitored. Anecdotal evidence suggests that predator numbers have generally increased in the unit, but the overall impact of predation on moose survival and abundance is unknown.

Nonharvest mortalities are opportunistically documented during survey activities within the unit and when reported by members of the public.

Alaska Board of Game Actions and Emergency Orders

In January 2017 the BOG considered proposal 36, which regarded the annual reauthorization of antlerless moose harvest within Unit 23. At that time, 3 hunt structures were in place for moose in Unit 23: a resident general harvest ticket hunt with an antler-restricted season; a nonresident drawing hunt with an antler-restricted season; and the resident RM880 registration hunt with

both an antlered and antlerless season. For the resident registration hunt, the antlered hunt season began 1 July in the portion of Unit 23 north of and including the Singoalik River drainage, and 1 August in the remainder of Unit 23; in both areas the antlered season ended 31 October. The antlerless hunt season was from 1 November–31 December and prohibited the take of calves or cows with calves. Given the observed unitwide declines in abundance, department staff opposed the reauthorization of an antlerless moose hunt and recommended amending the regulation to only allow the harvest of antlered bull moose during the 1 November–31 December hunting season. The BOG adopted the proposal, as amended, and the season and bag limit has remained in place since.

Table 6. Unit 23 Moose harvest chronology by month, Northwest Alaska, regulatory years 2015–2019.

Regulatory year	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Unk	Total harvest
2015	1	0	20	118	3	4	17	0	0	3	0	2	168
2016	0	0	24	90	10	1	8	2	0	2	0	3	140
2017	0	0	16	87	9	1	13	0	0	2	0	5	133
2018	0	0	13	66	9	1	5	0	0	0	0	0	94
2019	0	0	14	67	11	0	6	0	0	0	0	1	99
Percent of 5-year total harvest	0	0	14	68	7	1	8	0	0	1	0	2	634

Note: Unk represents harvest occurring in an unknown month.

Table 7. Transportation method used by active moose hunters in Unit 23, Northwest Alaska, regulatory years 2015–2019.

Regulatory year	Airplane	Horse/ dog	Boat	3- or 4-Wheeler	Snow-machine	ORV	Highway vehicle	Walked	Other	Unknown
2015	146	1	274	18	38	3	0	0	0	11
2016	81	0	271	21	23	2	0	2	2	6
2017	64	0	196	16	22	1	0	1	2	8
2018	56	0	171	19	16	0	0	1	0	9
2019	54	0	325	22	17	0	1	1	4	4

Recommendations for Activity 2.1

Harvest monitoring through harvest reporting and subsistence household surveys should continue.

3. Habitat Assessment-Enhancement

ACTIVITY 3.1. Estimate browse removal rates and plant architecture within selected survey areas.

Data Needs

Should the population abundance decrease to levels below the objectives set by the BOG, assessing range quality is a component of intensive management feasibility assessments (ADF&G 2011). Estimating browse removal rates and the local plant architecture can inform whether moose may have become nutritionally limited within a survey area.

Methods

Browse removal and plant architecture assessments were conducted as described by Seaton (2002) and Paragi et al (2015).

Results and Discussion

In April 2017, a browse removal study was conducted in concert with the Lower Kobuk spring abundance survey. The survey assessed the removal rate, plant assemblage, and plant architecture at 30 plots within the Lower Kobuk GSPE survey area. Analysis of the survey data produced a browse removal rate of 19%, indicating that moose within the survey area were not likely experiencing density-dependent nutritional limitations, which would be expected for browse removal rates of >35% (Boertje et al. 2007).

Recommendations for Activity 3.1

Browse surveys should continue as needed. Current browse removal rates and moose densities do not imply that the Unit 23 moose population is nutritionally limited; however, browse surveys should be continued in specific survey areas if populations show significant change in abundance. If moose abundance within a survey area begins to show stability, a browse survey may also be warranted to document a baseline of browse removal rate and plant architecture.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

Data Recording and Archiving

Harvest data are stored digitally in ADF&G's Wildlife Information Network Database (WinfoNet). Survey data and associated memorandums are stored digitally on the Kotzebue server (W:\moose) and in paper format in file cabinets located in the Kotzebue office.

Agreements

There were no agreements during this reporting period.

Permitting

No permitting was required during this reporting period.

Conclusions and Management Recommendations

Awareness, comprehension, and compliance with regulation and harvest reporting continue to be one of the greatest challenges within Unit 23. Recent changes to hunting regulations, on both state and federal lands, have led to confusion among many who aim to be compliant but are unclear about the distinctions between the two managing entities. Great efforts should be made to keep state and federal seasons and bag limits in alignment. Continued outreach and education regarding the importance of bag limits and accurate harvest reporting will become even more important if moose abundance within the unit continues to decline. The Kotzebue management biologists will continue to work with our Region V outreach and education specialist to maximize public outreach and comprehension with the resources available.

II. Project Review and RY20–RY24 Plan

Review of Management Direction

MANAGEMENT DIRECTION

There are no planned changes to the management direction.

GOALS

- Sustain moose populations at stable or increasing levels in all major drainages.
- Maintain healthy age and sex ratios for moose populations within Unit 23.
- Monitor human-influenced and natural mortality factors affecting moose.
- Improve public understanding of regulations and their purpose.

CODIFIED OBJECTIVES

Amounts Reasonably Necessary for Subsistence Uses

The BOG has made a positive customary and traditional use determination finding for the Unit 23 moose population. The unitwide amount reasonably necessary for subsistence (ANS) is 325–400 moose.

Intensive Management

In 2001 the Alaska Board of Game adopted a positive finding for intensive management (IM) of moose in Unit 23. Current intensive management objectives are as follows:

- Population objective: 3,500–9,200 moose.
- Harvest objective: 210–920 moose.

MANAGEMENT OBJECTIVES

Manage moose populations at the following levels:

1. Manage for a unitwide moose population of 6,000–10,000 moose.
2. Manage for a unitwide fall bull-to-cow ratio of 40:100.

REVIEW OF MANAGEMENT ACTIVITIES

1. Population Status and Trend

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

Data Needs

No change from RY15–RY19.

Methods

Annual abundance and calf recruitment surveys will be conducted using the Adaptive Cluster Sampling (ACS) method described by Turk and Borkowski (2005). The critical value, number of initial random sample units, and the strata allocation will be determined based on simulations and calculations run with data from previous GSPE surveys. Values will be chosen that are expected to minimize survey effort while obtaining a precise abundance.

Efforts will be made to complete an ACS survey in one survey area per year, and if resources and weather allow, to conduct a trend count survey in the Upper Noatak survey area once per reporting period.

ACTIVITY 1.2. Estimate fall population composition in at least one survey area annually.

Data Needs

No change from RY15–RY19.

Methods

No change from RY15–RY19.

2. Mortality-Harvest Monitoring

ACTIVITY 2.1. Monitor annual hunter harvest through registration permits, harvest tickets, and subsistence household surveys.

Data Needs

No change from RY15–RY19.

Methods

No change from RY15–RY19.

3. Habitat Assessment-Enhancement

ACTIVITY 3.1. Estimate browse removal rates and plant architecture within selected survey areas.

Data Needs

No change from RY15–RY19.

Methods

No change from RY15–RY19.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

Declining moose populations throughout the unit continues to be a point of interest. While the final results of the Lower Kobuk neonate survival study are still pending, preliminary results strongly suggest that the level of neonate mortality is not great enough to explain the persistent population declines observed within the unit (W. Hansen, Moose Research Biologist, ADF&G, Nome, personal communication). Browse survey results, twinning rates, and neonate weights do not indicate a nutritional limitation. An investigation of adult moose survival rates may lend further insight into the cause of these continued declines.

Members of the public continue to cite increasing predator numbers as a driving factor in local ungulate abundance declines and generally favor hunting seasons and bag limits that allow opportunity to reduce predator populations, including a proposed regulatory change to a 2-bear bag limit for resident and nonresident hunters.

Data Recording and Archiving

Harvest data will continue to be stored digitally in ADF&G's Wildlife Information Network Database (WinfoNet). Survey data and associated memorandums will be stored digitally on the Kotzebue server (W:\moose) and in paper format in file cabinets located in the Kotzebue office.

Agreements

None.

Permitting

None.

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