Species Management Report and Plan ADF&G/DWC/SMR&P-2017-5

Moose Management Report and Plan, Game Management Unit 9:

Report Period 1 July 2010–30 June 2015, and

Plan Period 1 July 2015–30 June 2020

David W. Crowley

2017

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 Todd A. Rinaldi, Management Coordinator for the Division of Wildlife Conservation, Palmer.

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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Purpose of this Report

This report provides a record of survey and inventory management activities for moose in Unit 9 for the previous 5 regulatory years and plans for survey and inventory management activities in the 5 years following the end of that period. A regulatory year (RY) begins 1 July and ends 30 June (e.g., RY10 = 1 July 2010–30 June 2011). This report is produced primarily to provide agency staff with data and analysis to help guide and record its own efforts but is also provided to the public to inform them of wildlife management activities. In 2016 the Alaska Department of Fish and Game's (ADF&G) Division of Wildlife Conservation launched this new type of 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.

I. RY10–RY14 Management Report

Management Area

Unit 9 (33,600 mi^2) consists of the Alaska Peninsula of Southwest Alaska, bounded in the north by the drainages of Lake Clark (Unit 9B) and Tuxedni Bay on Cook Inlet (Unit 9A), on the west by the Kvichak River drainage and Bering Sea, and extending southwest to Isanotski Strait near Cold Bay and Izembek National Wild Refuge (Unit 9D; Fig. 1). Mountains of the Aleutian Range extend down the Pacific coast of the peninsula providing cool, maritime conditions, alpine tundra, heavy precipitation, high winds, and active volcanoes. Boreal forest occurs over much of the northern and central portions of Unit 9 at lower elevations, and coastal plains of rolling tundra extend down the eastern slope of the peninsula along the Bering Sea. Many of the rivers originating in Unit 9 are spawning habitat for anadromous salmon returning through Bristol Bay. Most of the Alaska Peninsula is better suited to caribou and brown bears than moose. Moose habitat is limited to relatively narrow riparian habitat and boreal forest along river and stream corridors, extending upwards into subalpine slopes during snow-free months. Although moose inhabit all 5 subunits, in reality they are monitored and managed in Units 9B, 9C and 9E—more or less a large west-central portion of the Alaska Peninsula—where most of the population and harvest occurs.

Summary of Status, Trend, Management Activities, and History of Moose in Unit 9

POPULATION SIZE AND DISTRIBUTION

There is no prehistoric evidence of moose on the Alaska Peninsula, but by 1900, moose were present in the northern area of the Alaska Peninsula (Morris 1985). Moose occupied drainages of Cook Inlet (Unit 9A), Lakes Clark and Iliamna (Unit 9B), Naknek River (Unit 9C), and the King Salmon River and Ugashik Lakes (Unit 9E) in the early 1900s in very low numbers and patchy distribution (Osgood 1904). As a colonizing species, moose increased in population size and distribution into range previously occupied by caribou and reindeer. Moose began increasing in the 1930s and rapidly expanding southwest along the Alaska Peninsula, reaching the Black Lake area by the 1940s and occupying nearly all suitable habitat in Unit 9E by the early 1950s. The

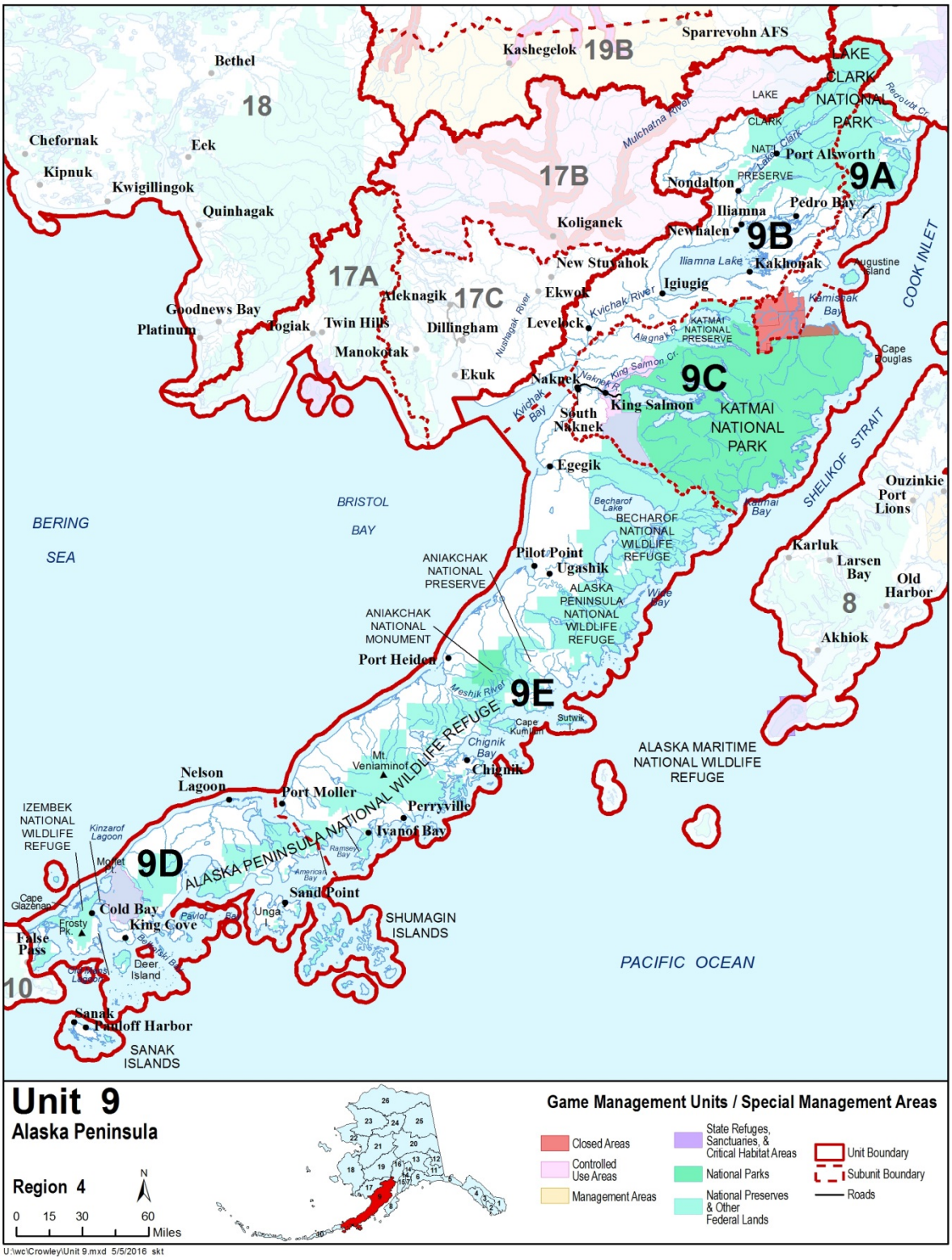

Figure 1. Unit 9 in Southwest Alaska.

geographic barrier of Port Moller and steeply-rising Aleutian Range delayed colonization southwestward into Unit 9D, and lack of habitat on the southern Alaska Peninsula limited population growth. Presumably there was limited subsistence hunting as the population took hold, and eventually population size in Unit 9D allowed a limited bulls-only hunt authorized by the Alaska Board of Game (BOG) beginning in 1998.

The moose population of Unit 9 peaked in the mid-1960s, and in Unit 9E was deliberately reduced in population size (by harvest) during the 1960s and 1970s because of concern over range damage from overbrowsing, apparent nutritional stress, and low calf:cow ratios (Sellers and McNay 1983). Once the population was reduced to the desired level harvest was again restricted, but the population continued to decline because of poor recruitment until stabilizing around 1984 (Sellers 1986). By the early 1980s moose densities in Unit 9E were 60% below peak levels and calf:cow ratios were very low despite evidence from browse analysis that range conditions had improved (Sellers and McNay 1983). A 1983 census in the central portion of Unit 9E resulted in a rough estimate of 2,500 moose. Estimates for other units during this time were Unit 9C outside of Katmai National Park - 800 moose; Unit 9B - 2,000; Unit 9A – 300; and Unit 9D - 600. During the 1990s and early 2000s the Unit 9 moose population was considered stable to declining in localized areas. Recently the Unit 9 population is thought to be stable at low density (Riley 2012).

Brown bear predation on neonatal moose was considered the primary limiting factor of moose on the Alaska Peninsula from the 1990s through the present, and widely fluctuating calf:cow ratios were normal for Unit 9 (Sellers 1990; Butler 2008). Wolves also prey on moose but probably are not as significant because they occur at lower density than bears.

HARVEST MORTALITY

Reported average moose harvest during 1968–1975 was 61 in Unit 9B and 54 in Unit 9C, compared to 312 in Unit 9E where most of the moose population and hunting effort occurred (Sellers and McNay 1983). Moose harvest was stable during the 1980s and 1990s then declined during the 2000s to lows of 37, 31, and 78 in Units 9B, 9C and 9E, respectively.

BOG adopted liberalized regulations from 1964 to 1973, first to slow population growth and later (during the early 1970s) to reduce the population in Unit 9E to allow recovery of the habitat. Once the population declined to the desired objective in Unit 9E a series of hunting restrictions were enacted. Arguably the most important of these restrictions—implemented in 1976—was the first selective harvest strategy (SHS) for moose in North America (Faro 1976). SHS was considered an experimental bag limit for bulls having 50-inch antlers or 3 brow tines (bt) on at least 1 antler (50-3bt) (Sellers and McNay 1983). This regulation was designed, among other objectives, to protect bulls <5 years of age, increase bull:cow ratios, and evaluate hunters' ability to judge legal bulls by antler size. An evaluation of the 50-3bt regulation by Smith et al. (1979) and Smith (1981) concluded after 5 years that because of rapid antler growth on the Alaska Peninsula bulls aged 1–3 years were protected but not those aged 4 or 5 years, hunters could indeed judge legal bulls by antler size, and bull:cow ratio stabilized but failed to increase because of heavy harvest and poor calf survival during the first 5 years of SHS. By 1983, however, bull:cow ratio began to increase, and larger bulls were increasingly observed during

composition surveys (Sellers and McNay 1984) indicating that SHS was working as intended. BOG passed a spike-fork (SF) allowance for residents in 1999.

In response to increasing hunting pressure in the 1980s when moose were declining in Unit 9E and stable in other areas, BOG eliminated cow harvest in Unit 9E in 1983, reduced and eventually eliminated cow harvest in Units 9B and 9C (1991 and 2007, respectively), shortened seasons in Units 9E and 9C (1987–1988), and expanded the 50-3bt bull bag limit to Units 9B and 9C (Sellers 1990). Also during this period federal agencies agreed to a moratorium on permitting additional guiding outfits on federal lands. Average number of hunters decreased to 569 hunters during the 1990s, 414 hunters during the 2000s, and 351 during the 2010s. Declining hunter participation more recently can be attributed to rapidly declining caribou populations on the Alaska Peninsula that reduced and then eliminated the possibility of simultaneously hunting moose and caribou (Butler 2006).

Illegal moose harvest, and particularly the harvest of cows, has contributed to local population declines in areas accessible to villages (Butler 2008). Tensions between subsistence, resident, and nonresident hunters increased with the decline of caribou populations throughout Unit 9 during the 2000s (Butler 2008). At the suggestion of BOG, a working group of stakeholders was formed to address user group conflicts. The Unit 9 Moose Working Group met in 2010 and drafted recommendations for moose management including a transition to registration permit hunts which BOG passed for the 2011 season, and provided educational outreach on moose conservation and wolf trapping to Unit 9 residents.

Management Direction

EXISTING WILDLIFE MANAGEMENT PLANS

Alaska Wildlife Management Plans, Southwestern Alaska (ADF&G 1976) includes moose management plans for the following areas: Kvichak-Nushagak, Becharof Lake-Cinder River, Meshik-Pacific, Port Moller-Black Lake, Ivanof-Perryville, and southwestern Alaska Peninsula. Moose management strategies have been modified over the years based on public comment, department recommendations, and Board of Game actions. 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 9.

GOALS

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

CODIFIED OBJECTIVES

Amount Reasonably Necessary for Subsistence Harvest

Portions of the Unit 9 moose population have a positive customary and traditional use determination finding. The amount reasonably necessary for subsistence (ANS) in Units 9A, 9B, 9C, and 9E combined are 100–140 bull moose per year.

Intensive Management

In March 1999, BOG found that moose in Units 9B, 9C, and 9E met the criteria to be considered "important for providing high levels of human consumptive use" under the state's intensive management (IM) law. There were no IM programs initiated for moose but there were for caribou in Units 9D and 9E. IM objectives (Alaska Administrative Code 5AAC 92.108) are as follows:

Population	Finding	Population objective	Harvest objective
Unit 9A	negative		
Unit 9B	positive	2,000–2,500	100–250
Units 9C and 9E	positive	3,000–3,700	165–320
Unit 9D	negative		

MANAGEMENT OBJECTIVES

Population objectives for moose in Unit 9 are as follows:

1. Maintain existing densities in areas with moderate (0.5–1.5 moose/mi^2) or high (1.5–2.5 moose/mi^2) densities: currently this applies to Unit 9E only.
2. Increase low density populations (where habitat conditions are not limiting) to 0.5 moose/mi^2: currently applies to Unit 9 remainder.
3. Maintain sex ratios of at least 25 bulls:100 cows in medium to high density populations (Unit 9E) and at least 40 bulls:100 cows in low density areas (Unit 9 remainder).

MANAGEMENT ACTIVITIES

Population Status and Trend

ACTIVITY 1.1. Conduct aerial sex and age composition surveys in trend count areas of all units to determine status, trend, productivity, and mortality of moose.

Data Need

We use fall composition surveys to monitor bull:cow ratio, number, and percent of bulls in the population to assist in determining trends, harvest quota, and to provide maximum hunting opportunity. Calf parameters are used to monitor productivity and survival. Ratios and

proportions are also used in population simulation models used to help monitor population dynamics.

Methods

We conducted sex and age composition surveys within established trend count areas in Units 9B, 9C, and 9E during November through early December, before most bulls have dropped antlers, and when adequate snow cover was available (Appendix). We flew surveys using Piper PA-12 aircraft on traditional trend count areas with search intensities of approximately 2–4 minutes/mi^2, which varied with number of moose encountered. Pilots circled each moose, moose group, or fresh tracks to search for moose and to determine sex and age of individuals. We used total number of moose counted in trend areas to estimate moose densities within units. We used these densities to determine achievement of bull objectives (relative to density) and population trend. During years when survey coverage was incomplete (i.e., not all trend count areas surveyed), we did not assess density.

In March 2012, conditions became favorable for a geospatial population estimator (GSPE) survey in Unit 9B. Although not listed as an annual activity, we used the GSPE method (Kellie and DeLong 2006) to survey 565 survey units (strata = 102 high and 463 low) over 3,801 mi^2 bordering Lakes Iliamna and Clark and Lake Clark National Park (Riley 2012). Survey units, however, were not stratified until 3 years after the survey, using survey data, topographic maps and knowledge of habitat.

We captured and collared cow moose in an ongoing cooperative project with the Becharof National Wildlife Refuge. We located cows using 2 or 3 fixed-wing aircraft (2 Super Cubs, 1 Cessna 185). Airplane pilots reported GPS locations, collar frequencies, and group size to the helicopter crew. We used an R44 helicopter to pursue and dart moose using 4.5 mg carfentanil citrate and 100 mg xylazine (green charges, setting 3 on Pneu-dart rifle). Moose were fitted with satellite collars that have built-in mortality signal (Telonics) and coded, visual sleeves (Alaska Tent and Tarp) for individual identification. We collected blood samples as specified by U.S. Fish and Wildlife Service (USFWS) staff. Anesthetized moose were reversed with 400 mg Tolazoline and 400 mg Naltrexone (per dose carfentanil). We scheduled moose captures during caribou work to make effective use of helicopter time.

Results and Discussion

Trend count surveys are summarized in Table 1. During the reporting period we flew 2 partial surveys in Unit 9B (2011, 2013); 2 complete surveys (2010, 2011) and 2 partials in (2012 and 2013) in Unit 9C; and 1 complete survey in Unit 9E (2010). Lack of snow severely limited survey opportunities during the reporting period.

Table 1. Moose composition counts in Unit 9, Southwest Alaska, 2006–2015 (no surveys have been conducted since 2013).

Unit	Year	Bulls: 100 cows	Yearling bulls: 100 cows	Calves: 100 cows	Calf %	Adults	Total moose	Moose/hour
9B	2005	23	6	19	13	158	182	20
	2007	39	4	4	3	71	73	
	2011	33	7	16	11	117	131	
	2013	43	6	25	15	76	89	
9C	2005[a]	34	20	19	12	440	502	36
	2006	24	9	9	7	57	61	
	2007	42	9	21	13	231	265	
	2008	47	4	13	8	166	181	
	2009[b]	35	1	16	10	111	125	
	2010[a]	48	12	13	8	180	199	18
	2011	27	13	9	7	217	232	
	2012	18	9	6	5	39	41	
	2013	15	7	19	14	31	36	
9E	2005[b]	25	5	22	15	81	95	19
	2006	39	7	29	17	43	52	27
	2009[b]	43		33	19	60	74	
	2010	62	18	24	13	172	197	

[a] Includes surveys conducted by National Park Service staff.
[b] Surveys conducted by U.S. Fish and Wildlife staff.

In Unit 9B, calf:cow ratio in 2013 was the highest observed since 1994. Bulls in Unit 9B were relatively high at 43 bulls:100 cows in 2013. In Unit 9C, calf:cow ratio was low during 2011 and 2012 (9 and 6 respectively), but increased to 19 calves:100 cows in 2013 which was more typical for Unit 9C. Bulls declined from 48 bulls:100 cows in 2010 to 15 in 2013. Normal range for bulls in Unit 9C is 25–45 bulls:100 cows. In Unit 9E, where we flew only 1 survey in 2010, calf:cow ratio was 24 calves:100 cows near the long-term average. Calf:cow ratio in Unit 9E fluctuated, often annually, between around 11 and 24 over the last several decades. I suspect this may be related to biennial bear hunts (and corresponding biennial high-low wolf harvest) in Unit 9E. Bull ratio was 62 bulls:100 cows in 2010. During the last 2 decades normal range for bull ratio in Unit 9E was relatively high at 45–65 bulls:100 cows, in part because of the selective harvest strategy for bulls (SF-50-3bt). We conducted no surveys in Units 9A or 9D, which have minimal populations and harvest, and consequently are of lowest priority for population monitoring.

Densities observed in trend count areas were below the management objective of 0.5 moose/mi^2 in Unit 9C by 2010, after which the bull ratio objective became 40 bulls:100 cows (Fig. 2). Currently bull ratios in Units 9B and 9C are below the management objective for low-density populations. Density in Unit 9E trend areas increased to 0.6 moose/mi^2 in 2010. Moose density on trend count areas was the lowest seen since the early 1980s, prior to an apparent population increase that lasted through the 1990s in Unit 9E. Twinning rates were high at approximately 65% in Units 9C and 9E (Dom Watts, Wildlife Biologist, USFWS, King Salmon) during 2014 and 2015, indicating that cows were not nutritionally stressed.

The 2012 GSPE survey flown in Unit 9B resulted in a population estimate of 1,160 ± 280 (90% CI) and density of 0.3 moose/mi^2, outside of National Park boundaries. Lake Clark National Park reported approximately 380 moose present inside the park in 2010 (Buck Mangipane, Wildlife Biologist, Lake Clark National Park, personal communication) for an approximate total of 1,540 moose in Unit 9B. This was below the management objective for density (0.5) and IM objective for number (2,000–2,500). The post-survey stratification was not the most acceptable approach, however the estimate is still valuable and a GSPE survey has been proven possible with adequate snow conditions in Unit 9. GSPE surveys should be added as an activity, and planned for, in Units 9B, 9C and 9E to be conducted during years when snow is abundant.

Numbers of moose captured during the reporting period were RY10 = 26; RY11 = 4; and RY12 = 12.

Recommendations for Activity 1.1

Continue fall composition surveys in Unit 9. In Unit 9E, modify and test techniques for conducting composition surveys with no snow (see section II. Project Review and RY15–RY19 Plan below).

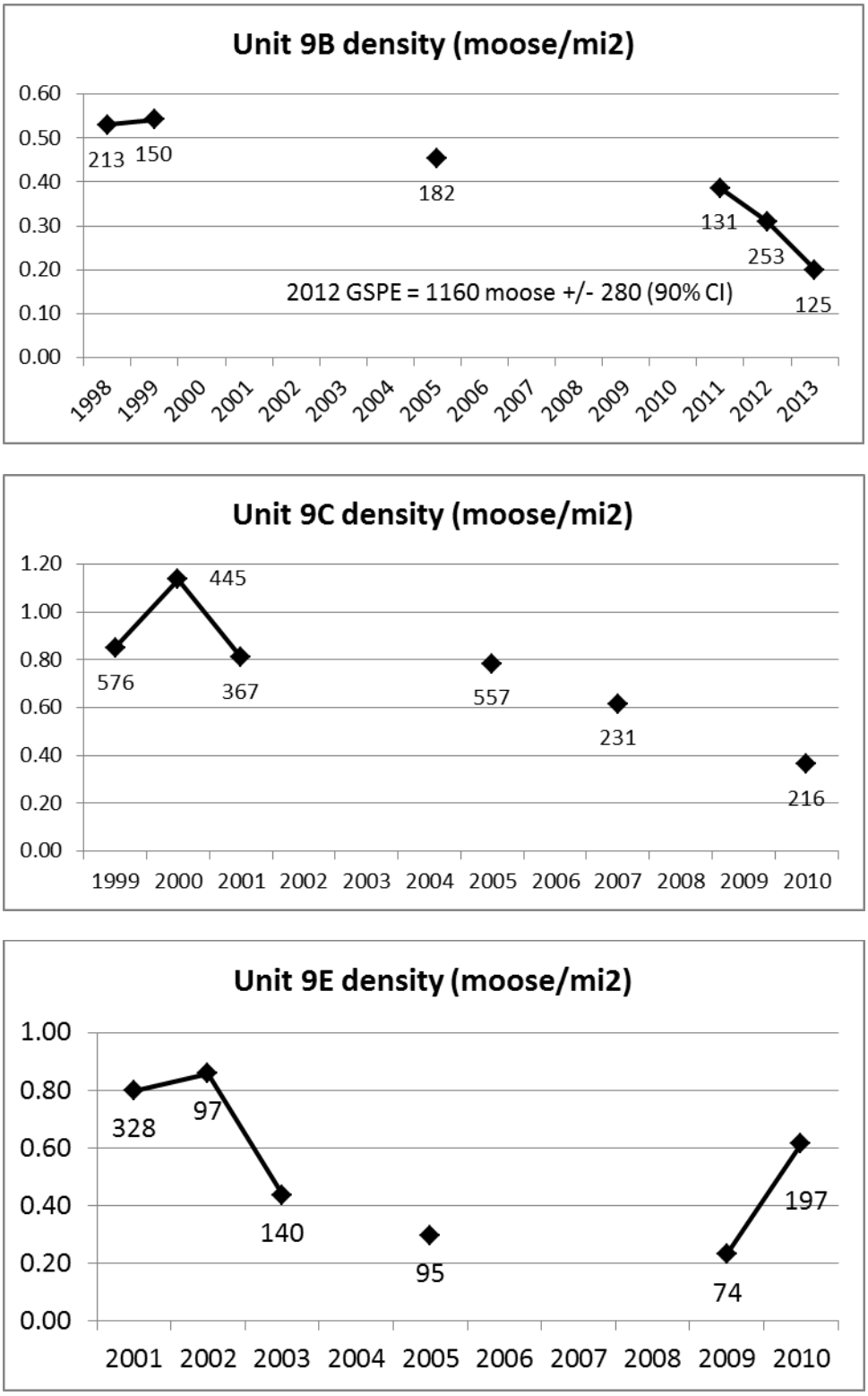

Figure 2. Unit 9 moose density pooled from trend count areas except Unit 9B, 2012 which was derived from a GSPE survey, Southwest Alaska. Labels are sample size (number of moose observed).

Mortality-Harvest Monitoring and Regulations

ACTIVITY 2.1. Monitor the moose harvest through field observations, harvest reports, and contact with hunters.

Data Needs

Monitoring, collecting, and analyzing harvest data are critical for sustained yield management, and determining if the opportunity to harvest ANS has been provided.

Methods

All moose hunts held in Unit 9 were by registration permit with mandatory reporting. Hunters were required to report within 5 days of harvest or 15 days of season closure. There were no subsistence household surveys conducted by ADF&G-Division of Subsistence during the reporting period. I contacted USFWS-Becharof National Wildlife Refuge for reported subsistence harvest in Unit 9C (hunt FM0904) during RY10–RY14.

Seasons and Bag Limits

Regulations for hunting moose are available on the ADF&G website: http://www.adfg.alaska.gov

Results and Discussion

Harvest by hunters is summarized by year and unit in Tables 2 and 3. All hunts were bulls only. Overall in Unit 9, average annual moose harvest stabilized near 100 during the reporting period after a long-term decline. Average annual harvest during the reporting period was 57% less, and the number of hunters was 38% less, than averages observed during the 1990s. Harvest and hunter participation during the decade of the 2000s were between those of the 1990s and current reporting period, indicating an approximate 20-year decline in harvest. This was probably a result of long-term declines of moose population in Units 9B and 9C, and a declining hunter population. From 1990 to 2013, the human population of Lake and Peninsula Borough was relatively stable, but Bristol Bay Borough (the Unit 9C human population) declined by 34% (Williams 2000; Alaska Department of Labor and Workforce Development 2015).

Annual harvest in Unit 9A was 2–6 moose and in Unit 9D was 0–1 during the reporting period. The number of hunters was 13–19 and 0–2 for these units, respectively. These were within the normal range for harvest and hunters. Annual harvest was stable in Unit 9B at 35–44 moose, while the number of hunters was highest since 1999. Winters 2011 and 2012 provided good snow conditions during winter hunts for snowmachine access in Unit 9B. Based on the GSPE estimate of 1,160 moose, reported harvest was about 3–3.5% of the population in Unit 9B.

Harvest in Unit 9C was stable near 20 moose/year. The number of hunters increased to 124 in RY14, the highest since RY03. In Unit 9E the RY14 harvest was the lowest on record, a result of low number of hunters (90) and a warm and stormy fall season followed by a snowless winter season.

Table 2. Moose harvest by hunters, residency and success in Unit 9, Southwest Alaska, regulatory years[a] 2010–2014.

Unit/ Regulatory year	Successful hunters						Unsuccessful hunters						Total hunters
	Local resident[b]	Nonlocal resident	Nonresident	Unk	Total	(%)	Local resident[b]	Nonlocal resident	Nonresident	Unk	Total	(%)	
Unit 9B													
2010	14	8	4	0	26	(35)	23	23	2	0	48	(65)	74
2011	29	6	4	1	40	(23)	78	33	19	5	135	(77)	175
2012	14	16	5	0	35	(21)	74	38	19	4	135	(79)	170
2013	12	9	9	0	30	(22)	65	27	12	3	107	(78)	137
2014	21	10	13	0	44	(26)	83	21	20	1	125	(74)	169
Unit 9C													
2010	16	3	0	0	19	(21)	56	10	5	0	71	(79)	90
2011	16	6	0	1	23	(21)	70	8	9	0	87	(79)	110
2012	12	5	2	0	19	(16)	78	11	8	0	97	(84)	116
2013	11	5	1	0	17	(15)	73	17	5	1	95	(85)	112
2014	16	3	4	0	23	(18)	77	10	7	1	102	(82)	125
Unit 9E													
2010	1	3	28	1	33	(42)	14	10	18	3	45	(58)	78
2011	4	3	30	0	37	(37)	20	8	34	0	62	(63)	99
2012	6	1	37	2	46	(45)	18	13	25	0	56	(55)	102
2013	6	5	35	0	46	(47)	14	20	17	0	61	(53)	97
2014	4	4	18	0	26	(29)	21	18	26	0	65	(71)	91
Unit 9 Total[c]													
2010	31	17	35	1	84	(32)	93	51	29	3	176	(68)	260
2011	49	18	38	2	107	(27)	168	54	63	6	291	(73)	396
2012	32	24	44	2	102	(25)	170	75	54	4	303	(75)	405
2013	29	22	48	0	99	(27)	156	75	39	4	274	(73)	373
2014	41	17	39	0	97	(24)	83	62	54	2	299	(76)	396

[a] Regulatory year begins 1 July and ends 30 June, e.g., regulatory year 2010 = 1 July 2010–30 June 2011.
[b] Residents of Unit 9.
[c] Also includes moose harvested in Units 9A and 9D.

Table 3. Moose harvest by registration permit hunt in Unit 9 for residents (R), nonresidents (NR) and local residents (LR), Southwest Alaska, regulatory years[a] 2011–2014 (2011 was the first year of conversion to all registration hunts).

Hunt no./ Unit(s)	Regulatory year	Legal moose	Permits issued	Percent did not hunt	Percent unsuccessful hunters	Percent successful hunters	Bulls	(%)	Cows	(%)	Total reported harvest
RM271											
9A, D, E	2011	Bull-R	115	61	71	22	10	(100)	0	(0)	10
9A, D, E	2012	Bull-R	94	54	79	16	7	(100)	0	(0)	7
9A, D, E	2013	Bull-R	101	50	76	20	10	(100)	0	(0)	10
9A, D, E	2014	Bull-R	109	49	75	14	8	(100)	0	(0)	8
RM272											
9B, C	2011	Bull-R	326	25	75	24	58	(100)	0	(0)	58
9B, C	2012	Bull-R	298	27	78	19	42	(100)	0	(0)	42
9B, C	2013	Bull-R	279	22	78	16	36	(100)	0	(0)	36
9B, C	2014	Bull-R	313	22	72	19	43	(98)	1[b]	(2)	44
RM281											
9A, E	2011	Bull-NR	71	8	54	46	30	(100)	0	(0)	30
9A, E	2012	Bull-NR	65	3	46	52	33	(100)	0	(0)	33
9A, E	2013	Bull-NR	62	10	38	61	34	(100)	0	(0)	34
9A, E	2014	Bull-NR	51	12	51	49	22	(100)	0	(0)	22
RM282											
9B, C	2011	Bull-NR	37	11	85	15	5	(100)	0	(0)	5
9B, C	2012	Bull-NR	32	19	54	23	6	(100)	0	(0)	6
9B, C	2013	Bull-NR	27	7	68	32	8	(100)	0	(0)	8
9B, C	2014	Bull-NR	31	0	58	42	13	(100)	0	(0)	13
FM0904											
9C	2014	Bull-LR	2	0	0	50	1	(100)	0	(0)	1

[a] Regulatory year begins 1 July and ends 30 June, e.g., regulatory year 2011 = 1 July 2011–30 June 2012.
[b] Illegal harvest of cow and calf near Kokhanok.

Reported moose harvest in Unit 9 was below ANS (100–140), and far below IM objectives for Units 9B, 9C and 9E, during the last 2 years. There were adequate bulls in the population to meet the ANS harvest objective, and probably the low end of IM harvest objectives.

Permit Hunts

Registration permit hunts are summarized in Table 3.

Hunter Residency and Success

Hunter residency and success (Table 2) are important components to moose management in Unit 9, particularly in monitoring harvest opportunity and success by local hunters. Hunter success was generally low (15–25%), except in Unit 9E where it exceeded 40% during RY12 and RY13. Guided nonresidents achieved 60% and 70% success during those seasons. Hunter success previously hovered near 40% unitwide, but began declining during the mid-2000s to the current level.

Harvest Chronology

The majority of moose were harvested during the September season (80–90%) in Unit 9 during the reporting period.

Transport Methods

Most hunters in Unit 9 used airplanes for transportation, except in Unit 9C where boats were used most often. More information on harvest chronology and transport methods is available online at the ADF&G website: https://secure.wildlife.alaska.gov/index.cfm?adfg=harvest.main

Other Mortality

Brown bear predation on moose calves is often found to be an important source of mortality but no studies have been done in Unit 9 (Sellers 2002; Butler 2008). BOG routinely receives proposals to increase bear harvest to protect moose. However, the predator:prey ratio in Unit 9 is probably too high to affect a change in moose density by increasing brown bear harvest.

Wolves occur at moderate densities in Units 9C and 9E (Dom Watts, personal communication). Wolf harvest by trappers and hunters increased considerably during the reporting period in Units 9C and 9E as trappers and hunters took advantage of periods of adequate snowfall. In 2010 the division sponsored wolf trapping workshops and in 2011 launched a largely-unsuccessful IM wolf control program for caribou, both of which advertised the benefits of more wolf harvest to our public constituents.

Alaska Board of Game Actions and Emergency Orders

There were many BOG actions taken during RY10 for moose including for Units 9A, B, C, D, and E, convert general season hunts to registration permit hunts; Unit 9C, extend moose season by 5 days to end 20 September; and Unit 9E, extend moose season by 5 days to end 25 September. These changes took effect in RY11. BOG summary information is available on ADF&G's website:
http://www.adfg.alaska.gov/index.cfm?adfg=gameboard.meetinginfo

There were no emergency orders issued during the reporting period.

Recommendations for Activity 2.1.

Continue.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

No nonregulatory issues regarding moose have been identified.

Data Recording and Archiving

Digital data are backed up daily on an in-house server (O:\WC-DIV). Paper records are stored in file cabinets and on shelves in the area biologist and assistant area biologist offices. Archived records are stored in indexed and labeled boxes, second floor of new warehouse (O:\WC-DIV\Admin King Salmon Area Office\Filing system\archived filing system index).

Conclusions and Management Recommendations

The moose population in Unit 9 was stable at a low density during the reporting period by most indications. Complete coverage of trend count areas (the most recent of which occurred in RY10) and the Unit 9B GSPE survey in RY12 showed densities below 0.5 moose/mi^2 with the exception of Unit 9E in 2010 (0.6 moose/mi^2). Lack of snow again limited survey opportunities during the reporting period. Basing management on moose densities has become problematic because comprehensive surveys of trend count areas have not been possible with recent snowfall patterns. As part of operational planning for the next reporting period, we propose revising the timing of trend count surveys to a pre-snow, posthunt period in Unit 9E where much of the habitat is tundra and low willow brush.

Harvest by hunters was low; approximately 3% of population in Unit 9B and probably similar in other units. Harvest by local hunters in part depended on winter snowmachine access. Moose harvest and hunter numbers were stable during the reporting period, following a long-term decline that began in the mid-1990s. Reduced number of hunters and low moose density contributed to the low harvest.

Predation on calves by bears is considered an important source of mortality, but wolves are also present at moderate density. No studies have been done on calf mortality in Unit 9. Specific causes of calf mortality is of interest but not critical to management. Bears are the most important calf predators but we won't harvest more bears to save moose calves. IM for wolves

(aerial gunning) was unsuccessful on the Alaska Peninsula. Twining rate is high indicating nutritional stress is not important in limiting calf production. This situation appears to consistent with a low level dynamic equilibrium (predator pit), which could be investigated beginning with calf mortality and survival research in Units 9B and 9C.

II. Project Review and RY15–RY19 Plan

Review of Management Direction

MANAGEMENT DIRECTION

Sustained yield management, optimize opportunity to harvest moose.

GOALS

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

CODIFIED OBJECTIVES

Amounts Reasonably Necessary for Subsistence Harvest

Units 9A, 9B, 9C, and 9E combined, 100–140 moose.

Intensive Management

IM objectives (Alaska Administrative Code 5AAC 92.108) are as follows:

Population	Finding	Population objective	Harvest objective
Unit 9A	negative		
Unit 9B	positive	2,000–2,500	100–250
Units 9C and 9E	positive	3,000–3,700	165–320
Unit 9D	negative		

REVIEW OF MANAGEMENT OBJECTIVES

1. Maintain existing densities in areas with moderate (0.5–1.5 moose/mi^2) or high (1.5–2.5 moose/mi^2) densities.
2. Increase low density populations (where habitat conditions are not limiting) to 0.5 moose/mi^2.
3. Maintain sex ratios of at least 25 bulls:100 cows in medium to high density populations (Unit 9E) and at least 40 bulls:100 cows in low density areas (Unit 9 remainder).

Basing management on densities has become problematic because complete coverage of trend count areas has not been possible with recent snowfall patterns. Calculation of density for fewer trend count areas would not be comparable. One GSPE survey in Unit 9B was far more valuable than several years' worth of inconsistent (and absent) surveys of trend count areas. I recommend adding GSPE surveys of Units 9B, 9C, and 9E to Activities. Currently we are prepared for GSPE's in Units 9B and 9C, and preparing for Unit 9E.

REVIEW OF MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1. Conduct aerial sex and age composition surveys in trend count areas to determine status, trend, productivity, and mortality of moose. Test an early fall survey date in Unit 9E.

Data Needs

We use fall composition surveys to monitor bull:cow ratio, number, and percent of bulls in the population to assist in determining trends, harvest quota and to provide maximum hunting opportunity. Seasonal calf ratios are used to monitor productivity and survival. Ratios and proportions are also used in population simulation models used to help monitor population dynamics.

Methods

We conducted fall sex and age composition surveys within established trend areas in Units 9B, 9C, and 9E during November through early December when adequate snow cover was available.

For Unit 9E I propose testing a survey of trend count areas earlier in the fall. This annual survey would occur posthunt (25 September), postleaf senescence, during the late-rut period and preferably before bear season opens during odd years (1 October). We currently delay caribou surveys to avoid disturbing high-dollar bear hunts. Habitat in Unit 9E is dominated by medium to low brush and tundra with limited forested areas. Moose would be active and visible, sexes relatively mixed, and we have collared cows to locate moose. With the rut still ongoing, moose would be in mixed groups more than any other time of year. Trend count areas cover most moose habitat and data are pooled; therefore movement of moose among trend count areas during the rut is not a factor if we survey them efficiently. Snowless conditions would be preferred for testing. Densities from these surveys probably would not be comparable to trend counts conducted in snow.

Moose groups will be located opportunistically by search areas of suitable habitat from an airplane and by tracking radiocollared cows (currently around 20). Group composition (by sex and age) and total group size will be determined and the vicinity around each group or harem will be intensively searched for satellite animals within 400 meters of the main group. We will attempt to sample approximately 25% of the total moose population (roughly 500 moose) to ensure that estimates are representative to the population. Population ratios and proportions will be calculated (see Table 1) along with appropriate 90% confidence intervals. Bull:cow ratio estimates will be evaluated in relation to management objectives. We will also use models to

evaluate trends in population parameters (calf:cow ratio, bull:cow ratio) over the 5-year period. We will continue the cooperative project with USFWS to increase number and distribution of cows collared. If this method proves successful, it will also be tested to the north in units with more extensive boreal forest.

ACTIVITY 1.2. Conduct a GSPE survey in Units 9B, 9C, or 9E every 2–5 years when snow conditions allow, February–March. This is a new activity beginning RY16.

Data Needs

A GSPE population estimate is important for sustained harvest management by assessing moose abundance, density, and trends (90% CI ± 10–20%). Estimating density is important because our management objectives above are based on density, e.g., low density populations are managed for a higher bull:cow ratio.

Methods

Prepare, update and review methods, maps, and equipment annually for GSPE with sightability correction factor trials (Kellie and DeLong 2006) in anticipation of snowfall. Stratify by aircraft before survey.

Biometric Review

Geospatial Population Estimator

Estimate the abundance of moose using the GSPE with sightability correction factors such that a 90% CI has bounds between 14% and 20%. Biometrician and management staff review the ability to achieve the level of precision before surveys. Estimate trend in moose populations using a generalized linear mixed effects model (DeLong and Taras 2009): https://winfonet.alaska.gov/sandi/trend/pdf/moose_trend_analysis.pdf

ACTIVITY 1.3. Maintain a minimum sample of 20 cow moose with VHF and satellite collars in Unit 9B. This is a new activity beginning RY16.

Data Needs

Locate cows during surveys. Monitor productivity, survival, twinning rate in Unit 9B, where moose harvest is important to 6–7 villages. Currently we have collared cows in Units 9C and 9E for monitoring by USFWS-Becharof National Wildlife Refuge.

Methods

See Activity 1.1 in section I. RY10–RY14 Management Report above. Capture cows in April after caribou captures. Distribute collars along Kvichak, Alagnak, King Salmon rivers and southern Lake Iliamna region.

ACTIVITY 1.4. As possible, conduct calf mortality study to estimate relative importance of various forms of mortality. This is a new activity beginning RY16.

Data Needs

Determine what the limiting factors are on moose calf survival. We know that bears are important calf predators but do not know the relative importance of wolves, or if increasing wolf harvest benefits calf survival.

Methods

Monitoring calf survival will require capturing and radiocollaring calves between the ages of 2 hours and 2–3 days. When a new calf is located by fixed-wing pilot, an R-44 helicopter will be directed to the site; biologists will decide if a capture attempt is feasible. Upon locating a likely candidate the pilot will separate cow from calf and descend to drop the biologist for the capture attempt. Captured calves will be collared, sexed, weighed and quickly released, under 20 seconds if possible. To avoid abandonment, we will only capture dry calves (i.e., calves that are more than 2 hours old) and use non-latex gloves to be discarded after each capture to reduce scent transfers that might lead to abandonment. Calves will be marked with de-scented VHF transmitters attached to elastic, expandable nylon collars designed to break off if the animal grows sufficiently. Calf collars will transmit a rapid-signal mortality mode after being stationary for 1 hour. Calves will be weighed using a spring scale and cloth sling to be discarded after each use to avoid scent transfer. We will monitor survival of collared calves daily through mid–June. Upon detecting a mortality signal, we will fly to the site in a helicopter to evaluate cause of death. Mortality investigations should typically occur within a few hours of death and, when possible, necropsy performed on carcasses. Evidence of predation may include presence of predator still on site, wounding patterns, bony remains, caching behavior, tracks, scat, or hair signs. Examine all remains to determine if other factors contributed to death such as starvation or drowning.

2. Mortality-Harvest Monitoring

ACTIVITY 2.1. Monitor harvest and other mortality annually in Unit 9.

Data Needs

Same as report.

Methods

Same as report. Consider trend analysis of harvest and hunters.

3. Habitat Assessment-Enhancement

ACTIVITY 3.1. Conduct annual twinning surveys in Units 9B and 9C in cooperation with USFWS and National Park Service. This is a new activity beginning RY16.

Data Needs

Twinning rate will be used as an index to productivity and nutritional status of female moose (Gasaway et al. 1992; Boertje et al. 2007).

Methods

Coordinate surveys with USFWS staff, who are already doing twinning surveys in Unit 9C and northern Unit 9E. Conduct surveys using fixed-wing aircraft, locate cows via telemetry and by systematic grid search of moose habitat beginning early in the morning. Attempt to locate and classify 80–100 (cows and calves) to determine twinning rate, calculated as (cows with twins and triplets)/(cows with calves)*100. Conduct repeated surveys starting 20 May until twinning rate declines due to predation and other causes.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

None identified.

Data Recording and Archiving

Digital data are backed up daily on an in-house server (O:\WC-DIV). Paper records are stored in file cabinets and on shelves in the area biologist and assistant area biologist offices. Archived records are stored in indexed and labeled boxes, second floor of new warehouse (O:\WC-DIV\Admin King Salmon Area Office\Filing system\archived filing system index).

Agreements

ADF&G and USFWS data sharing agreement (Memorandum of Understanding) for moose.

Permitting

Institutional Animal Care and Use Committee approval, moose captures.

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Appendix. Unit 9 moose survey memoranda, Southwest Alaska.

STATE OF ALASKA

SEAN PARNELL, GOVERNOR

DEPARTMENT OF FISH AND GAME

DIVISION OF WILDLIFE CONSERVATION

Main Street
P.O. Box 37
King Salmon, AK 99613
PHONE: (907) 246-3340
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MEMORANDUM

TO: Lem Butler
Management Coordinator
ADFG/DWC/Reg. IV
Palmer

DATE: February 8, 2011

FILE: GMU_9E_Moose_Comp_2010.docx

FROM: Meghan Riley
Acting Area Wildlife Biologist
GMU 9 & 10
ADFG/DWC/Reg. IV
King Salmon

SUBJECT: GMU 9 moose surveys

A composition survey of moose in subunit 9E was conducted between December 5 and December 8, 2010. Moose were surveyed from the King Salmon River to the Dog Salmon River in the north and from Pumice Creek to Black Lake in the south. Lem Butler (ADFG), Meghan Riley (ADFG), Mark Packila (Wildlife Air, Piper PA-18 Super Cub), and Mike Meekin (Meekin's Air Service, Cessna 185) searched moose habitat using fixed-wing aircraft. All moose encountered were categorized by age and sex. Because moose were observed opportunistically and the sample size (197 moose) was relatively small, this sampling method may introduce bias and results should be interpreted conservatively.

The calf ratio (23.6 calves:100 cows) observed in 2010 was higher than what was normally observed during trend surveys in subunit 9E (25-year trend survey average: 17.7 calves:100 cows). Recruitment appeared to be highest in the southern portion of the subunit near Black Lake where the most cows with twins were observed. Recruitment was lower between the Meshik River and Ugashik lakes. However, sample size precludes a more formal analysis.

The bull ratio was exceptionally high throughout the subunit (62.3 bulls:100 cows) and well above the proposed management objective (to maintain a ratio of at least 40 bulls:100 cows in low-density areas and maintain a ratio of at least 25 bulls:100 cows in medium- to high-density areas). The bull ratio was higher in the northern portion of the subunit around Ugashik Lake where moose are less abundant. The high bull ratio suggests that the moose population in subunit 9E can sustain a higher harvest rate than it is currently experiencing. While some caution

must be used with the interpretation of this data, the result is not surprising given that much of the survey area is difficult for hunters to access.

Efforts to conduct trend area surveys in subunit 9E were stymied by inadequate snow cover during the sampling window (mid-November to mid-December).

cc: Chuck Ardizzone, USFWS, Anchorage
Geoff Beyersdorf, BLM, Anchorage
Lem Butler, ADFG, Palmer
Bruce Dale, ADFG, Palmer
Troy Hamon, NPS, King Salmon
Bill Schaff, USFWS, King Salmon
Dom Watts, USFWS, King Salmon

STATE OF ALASKA

SEAN PARNELL, GOVERNOR

DEPARTMENT OF FISH AND GAME

DIVISION OF WILDLIFE CONSERVATION

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MEMORANDUM

TO: Lem Butler
Management Coordinator
ADFG/DWC/Reg. IV
Palmer

DATE: March 27, 2012

FILE: 9BC_Moose_Surveys_2011.docx

FROM: Meghan Riley
Acting Area Wildlife Biologist
GMU 9 & 10
ADFG/DWC/Reg. IV
King Salmon

SUBJECT: GMU 9 moose surveys

Trend area surveys of moose in unit 9 were conducted between November 20 and December 6, 2011. The trend area surveys were conducted in the portion of subunit 9B south of Lake Iliamna (Big Mountain, Nakeen), and in subunit 9C (Branch River, King Salmon Creek, Park Border). Moose were also surveyed in the Copper River drainage, between Iliamna River and Kokhanok, to collect additional composition data for southern 9B. Pilots Dale Myers (Katmai Guide Service, Aviat A1-A Husky) and Mark Packila (Wildlife Air, Piper PA-18 Super Cub) flew transects through the survey areas with Meghan Riley (ADFG) and Cory Stantorf (ADFG) acting as observers. All moose encountered were categorized by age and sex. In addition, bulls were categorized by antler size. Survey conditions were generally good, with minimal wind and adequate snow cover to spot moose.

The calf ratio in southern 9B averaged 16 calves:100 cows and was similar to ratios observed during previous trend surveys in the subunit (25-year trend survey average = 19 calves:100 cows). Recruitment appeared highest in the southwest portion of the subunit in the Nakeen trend area.

The bull ratio in southern 9B averaged 33 bulls:100 cows and was similar to ratios observed during previous trend surveys in the subunit (25-year trend survey average = 39 bulls:100 cows). The bull ratio was lowest in the southwest portion of the subunit in the Nakeen trend area. Moose movements and sexual segregation in this trend area are believed to be responsible for the low bull ratios that have been consistently observed here since the late 1980s. Bull ratios in other areas surveyed were close to or above objectives.

The calf ratio in 9C averaged 9 calves:100 cows and was lower than ratios observed during previous trend surveys in the subunit (25-year trend survey average = 19 calves: 100 cows).

Recruitment appeared to be highest in the central portion of the subunit in the King Salmon Creek trend area, though sampling error due to small sample size should be considered when interpreting these data.

The bull ratio in 9C averaged 27 bulls:100 cows and was lower than ratios observed during previous trend surveys in the subunit (25-year trend survey average = 40 bulls:100 cows). The bull ratio was lower than expected in the southern portion of the subunit in the Park Border trend area (16 bull:100 cows), an area known to experience fluctuations in moose numbers over the course of the winter due to changes in moose distribution. Prior surveys in 2009 and 2010 found much higher bull ratios in the trend area (35 and 33 bulls:100 cows respectively). Bull ratios in the Branch and King Salmon Creek trend areas were at or near management objectives.

Given the inherent limitations of trend surveys, survey data must be considered on a multi-year basis, and trends can only be determined by comparing multi-year averages. The Alaska Department of Fish and Game uses 3-year averages when evaluating moose trend data in GMU 9. Generally, calf:cow and bull:cow ratios observed in southern 9B were similar to values observed in the past and do not indicate changes in the 9B moose population. The low bull and calf ratios observed in 9C this year appear to be an anomaly based on prior survey results, but also represent a potential cause for concern and should be closely monitored. Surveying this subunit should be made a priority in 2012. Calf:cow ratios in Unit 9C fall within the normal range of values observed in the past, but the values observed in two of the trend areas during the 2011 surveys would be unable to sustain the population at its current size if they persist. The bull:cow ratio in 9C dropped in 2011 because of data in a single trend area, however it cannot be determined if this was caused by an actual change in the population. Analysis based on a 3-year average was not possible due to delays between comprehensive surveys of the subunit. As a precautionary measure, the fall moose season in this subunit will revert to the former season dates (hunts will close on September 15) until we verify that the change does not reflect an actual change in the population. The season was liberalized in 2011 because of the high bull ratios observed during past surveys. Hunter access in 9C has traditionally been limited to creeks and rivers, and hunters were unable to access areas with good moose numbers during the fall. The season will remain conservative until a biological change in the population can be ruled out.

cc: Chuck Ardizzone, USFWS, Anchorage
Lou Bender, ADFG, Palmer
Bruce Dale, ADFG, Palmer
Troy Hamon, NPS, King Salmon
Buck Mangipane, NPS, Port Alsworth
Bill Schaff, USFWS, King Salmon
Dom Watts, USFWS, King Salmon

GMU 9B – Moose Surveys, 2011

Summary of Moose Observations

Area	Date	Bulls				Cows				Calves	Total Moose	Count Time (hrs)
		Small	Medium	Large	Total	w/ 0	w/ 1	w/ 2	Total			
Big Mountain	11/20	0	8	2	10	25	1	1	27	3	40	3.2
Nakeen	11/23	2	7	0	9	39	8	1	48	10	67	2.4
Copper River	12/5	0	5	5	10	12	1	0	13	1	24	4.0
Total		2	20	7	29	76	10	2	88	14	131	9.6

Moose Sex and Age Ratios

Area	Ratios		% Cows	% Calves	% Bulls	Bulls		
	Bulls:100 cows	Calves:100 cows				% Small	% Medium	% Large
Big Mountain	37.0	11.1	67.5	7.5	25.0	0	80.0	20.0
Nakeen	18.8	20.8	71.6	14.9	13.5	22.2	77.8	0.0
Copper River	76.9	7.7	54.2	4.1	41.7	0	50.0	50.0
Combined	33.0	15.9	67.2	10.7	22.1	6.9	69.0	24.1

GMU 9C – Moose Surveys, 2011

Summary of Moose Observations

Area	Date	Bulls				Cows				Calves	Total Moose	Count Time (hrs)
		Small	Medium	Large	Total	w/ 0	w/ 1	w/ 2	Total			
Branch River	11/25	3	10	11	24	58	4	0	62	4	90	4.0
Park Border	11/28	3	7	5	15	86	4	2	92	8	115	3.6
K. Salmon Creek	12/6	0	6	1	7	14	3	0	17	3	27	4.7
Total		6	23	17	46	158	11	2	171	15	232	12.3

Moose Sex and Age Ratios

Area	Ratios		% Cows	% Calves	% Bulls	Bulls		
	Bulls:100 cows	Calves:100 cows				% Small	% Medium	% Large
Branch River	38.7	6.5	68.9	4.4	26.7	12.5	41.7	45.8
Park Border	16.3	8.7	80.0	7.0	13.0	20.0	46.7	33.3
K. Salmon Creek	41.2	17.6	63.0	11.1	25.9	0	85.7	14.3
Combined	26.9	8.8	73.7	6.5	19.8	13.0	50.0	37.0

Location: GMU 9E, Upper Ugashik Lake to Meshik River
Date: December 5, 2010

		Small	Medium	Large	Total
Cows	Calves	bulls	bulls	bulls	moose
77	13	12	25	14	141

16.9 calves:100 cows 66.2 bulls:100 cows

Location: GMU 9E, Meshik River to Black Lake
Date: December 8, 2010

		Small	Medium	Large	Total
Cows	Calves	bulls	bulls	bulls	moose
29	12	7	5	3	56

41.4 calves:100 cows 51.7 bulls:100 cows

Combined Areas:

		Small	Medium	Large	Total
Cows	Calves	bulls	bulls	bulls	moose
106	**25**	**19**	**30**	**17**	**197**

23.6 calves:100 cows 62.3 bulls:100 cows

Percent cows = 53.8%
Percent calves = 12.7%
Percent bulls = 33.5%

Percent small bulls = 28.8%
Percent medium bulls = 45.5%
Percent large bulls = 25.8%

MEMORANDUM

TO: Lem Butler
Management Coordinator
ADF&G/DWC/Reg. IV
Palmer

DATE: December 24, 2012

FROM: Chris Peterson
Wildlife Biologist
ADF&G/DWC/Reg. IV
King Salmon

SUBJECT: Unit 9C and 9B Moose Composition Fall Survey

A composition survey of the Unit 9C and Nakeen area of 9B was conducted December 6- 7, 2012. Chris Peterson (ADF&G) and Trooper Joe Wittkop (Wildlife Troopers-King Salmon, Piper PA-18 Super Cub) surveyed areas of Unit 9C and 9B with high likelihood of presence of wintering moose. When moose were observed, Peterson classified their age and sex, and recorded their GPS location. Survey conditions were limited by weather, availability of pilot and aircraft, and aircraft mechanical problems, resulting in only a partial survey. A total of 364 miles was traveled over the 2 flight periods. The duration of the survey over both days was 5.5 hours. A total of 43 moose were classified. There was sufficient separation between moose groups surveyed to ensure that moose were not sampled twice and that all observations were independent. When question of independence arose, the previous group thought to be a possible duplication was re-located and eliminated from question.

The portion of Unit 9C northeast from King Salmon along the boundary of the Katmai Preserve and Wilderness was surveyed twice, October 6 and 7. On October 7, weather conditions precluded access to some areas and the survey moved east into more clear conditions, just within the Preserve boundary. As weather and snow conditions deteriorated and time shortened, we moved west in search of improved conditions in the Nakeen area of Unit 9B. In this area, we found no snow and poor light conditions. Due to the poor observability of moose, we ended the survey and returned to King Salmon.

There were 43 moose observed, including 35 cows, 2 calves and 6 bulls. The majority of these moose were located in the area of Sugarloaf Mountain. East of this area we found multiple hillsides with numerous moose trails, but no moose. Due to the age of snow cover and poor light conditions, we were unable to determine where these moose had traveled.

During this partial survey, the calf:cow ratio observed is 5.7 calves:100 cows. The bull:cow ratio observed is 17 bulls:100 cows. Due to the partial nature of this survey, interpretation of these results is not recommended.

		Small	Medium	Large	Total
Cows	Calves	bulls	bulls	bulls	moose
35	**2**	**3**	**2**	**1**	**43**

6 calves:100 cows 17 bulls:100 cows

Percent cows = 81%
Percent calves = 5%
Percent bulls = 14%

Percent small bulls = 50%
Percent medium bulls = 33%
Percent large bulls = 17%

Moose Composition Survey data, December 6–7, 2012, Unit 9C and Nakeen area of Unit 9B.

		Bulls			Cows			Calf			
Group #	**Waypoint**	**Yearling**	**Medium**	**Large**	**Cow**	**Cow w/1 calf**	**Cow w/2 calf**	**Lone Calf**	**Unkown sex/age**	**Total**	**Remarks**
1	0447		1	1	11					13	Sugarloaf Mt. NE
2	0448				2					2	Alagnak R.
3	0449				6					6	Alagnak R. island
4	0450				1					1	yearling
5	0451		1							1	
6	0452					1				2	
7	0453									0	wolverine
8	0454	1								1	
9	0455	1			2					3	bull had only 1 antler
10	0456				1					1	
11	0457	1			8					9	
12	0458					1				2	
13	0459				2					2	Nakeen –poor light, no snow.
	TOTAL	**3**	**2**	**1**	**33**	**4**	**0**	**0**	**0**	**43**	

MEMORANDUM

TO: Lem Butler
Management Coordinator
ADFG/DWC/Reg. IV
Palmer

DATE: December 9, 2013

FROM: Chris Peterson
Wildlife Biologist
ADFG/DWC/Reg. IV
King Salmon

SUBJECT: Subunits 9B, C, and E Fall Moose Composition Surveys

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Composition surveys of the subunits 9B, C, and E were conducted from November 25–27, 2013. On November 25 Dave Crowley (ADF&G) with Mark Packila (Wildlife Air, PA18 Super Cub) and Chris Peterson (ADF&G) with Sargent Scott Quist (Wildlife Troopers-King Salmon, PA18 Super Cub) surveyed areas of subunits 9B and 9E, respectively, with high likelihood of presence of wintering moose. November 26 Chris Peterson and Mark Packila surveyed areas of subunit 9B, and on November 27 they surveyed areas of subunits 9C and 9E. When moose were observed, Peterson and Crowley classified their age and sex, and recorded their latitude and longitude. Survey conditions were limited by weather, availability of pilot and aircraft, and aircraft mechanical problems, however, a good coverage of most areas was accomplished. One hundred thirty seven moose were classified. There was sufficient separation between moose groups surveyed to ensure that moose were not sampled twice and that all observations were independent.

A total of 137 moose were classified based on age and sex during the survey flights (Table 1). On November 25 the King Salmon Creek area and Cinder River areas were surveyed with 43 moose observed (n = 36, King Salmon Creek area; n = 7, Cinder River area). In addition we surveyed the Blue Mountain area but found no moose. November 26 the Big Mountain and Chekok River areas were surveyed with 53 moose observed (n = 32, Big Mountain; n = 21, Chekok River). November 27 we flew southwest to subunit 9E and surveyed Upper and Lower Ugashik, Dog Salmon, Mother Goose, and Pacific areas. Early clear conditions deteriorated to rapidly thickening fog as we entered the Lower Ugashik area, resulting in complete loss of ground level visibility for the Lower Ugashik, Dog Salmon and Mother Goose areas. We crossed east over the mountains to clear conditions, and surveyed the Pacific area.

Based on the composition of moose observed during these survey flights, we estimated that there were 25 calves:100 cows and 38 bulls:100 cows in Unit 9 as a whole (Table 2). The ratios in subunit 9B were 23 calves:100 cows and 34 bulls:100 cows. The ratios in subunit 9C, represented only by the King Salmon Creek area, were 19 calves:100 cows and 15 bulls:100 cows. We did not observe a sufficient number of moose to determine composition ratios in subunit 9E.

Table 1. Moose composition survey data, November 25–27, 2013, Unit 9.

		Bulls			Cows			Calf	
SubUnit	**Search Time (hrs.)**	**Yearling**	**Medium**	**Large**	**Cow**	**Cow w/1 calf**	**Cow w/2 calf**	**Lone Calf**	**Unkown sex/age**
9B	7.25	3	13	7	41	11	1	0	0
9C	2.5	2	0	2	23	3	1	0	0
9E	10	0	1	4	2	1	1	0	0
Total	19.75	5	14	13	66	30	9	0	137

Table 2. Composition of moose observed in Unit 9.

		Small	Medium	Large	Total
Cows	Calves	bulls	bulls	bulls	moose
84	**21**	**5**	**14**	**13**	**137**

25 calves:100 cows 38 bulls:100 cows

Percent cows = 61%
Percent calves = 15%
Percent bulls = 23%

Percent small bulls = 16%
Percent medium bulls = 44%
Percent large bulls = 41%


ALASKA
DEPARTMENT OF FISH AND GAME