
CHAPTER 7: MOOSE MANAGEMENT REPORT

From: 1 July 2011

To: 30 June 2013

LOCATION

GAME MANAGEMENT UNIT: Unit 6 (10,140 mi²)

GEOGRAPHIC DESCRIPTION: Prince William Sound and North Gulf Coast

BACKGROUND

Moose populations in most of Unit 6 originated from translocations of calves from the Kenai Peninsula, Anchorage, and the Matanuska–Susitna area (Paul 2009). The only moose endemic to Unit 6 are small populations in the Lowe River drainage in Unit 6D, which probably number about 40 animals total. Until recently, glaciers isolated the Copper River Delta (CRD) from moose populations in other parts of the state. Many people recognized the CRD contained good moose habitat.

During 1949–1958, Cordova residents successfully raised 24 captive moose calves and released them on the western CRD (Unit 6C). This small population grew rapidly and expanded eastward across the Copper River and into the Martin River Valley (Unit 6B) by the early 1960s. Eastward expansion continued into the Bering River area (Unit 6A) by the late 1960s and to Cape Yakataga by the mid-1970s. Meanwhile, the 1964 Good Friday Earthquake led to uplift of as much as 11.5 meters (38 feet) in areas of Unit 6. The CRD itself uplifted 1.8–3.4 meters (5.9–11.2 feet), effectively changing the habitat from a subtidal estuary to intertidal and supertidal wetlands that are gradually transitioning to alder dominated. Habitat has been mechanically altered nearly annually since 2007 by the U.S. Forest Service (USFS) and the Native Village of Eyak (NVE) through hydroaxing alder stands to reinitiate habitat succession.

The CRD was evaluated in the early 1990s for nutritional carrying capacity (MacCracken 1992, MacCracken et. al 1997). The carrying capacity estimate encompassed a wide range (380–1,424 moose, depending on winter snow depths). In the early 1990s, population estimation techniques transitioned from minimum count techniques to the Gasaway estimation technique (Gasaway, 1986). Nowlin (1995) revised harvest objectives in 1994 using this new information about carrying capacity of the winter ranges and better estimates of population size.

The population reached a high of approximately 1,600 in 1988 as the population came out of its irruptive period (Griese 1990). Population objectives were relatively conservative in the 1970s and early 1980s, because of concerns about mortality during severe winters. Objectives were established at 0.9–1.2 moose/mi² after a severe winter in 1971–1972 and remained conservative under management plans written in 1976 (Rausch 1977).

Hunting of the introduced population in Unit 6C began with 25 bulls harvested in 1960. Harvest began in Unit 6B during 1965 and Unit 6A during 1971. In 1977, moose in Unit 6A were

designated as 2 populations (east and west of Suckling Hills) and have been managed separately since then.

By 1994, harvest was liberalized to accommodate the interest in increased harvest opportunities (Nowlin 1998). Cow hunts were permitted to prevent post-irruptive collapse. However, since that time, the populations in Units 6B and 6A have declined and stabilized at low numbers that are incompatible with cow harvest. The last year of cow harvest in Unit 6B was in 1998 and the last year in Unit 6A was in 2005. Now cow hunts are only used in Unit 6C where moose populations are higher than publicly vetted population objectives.

Hunters harvested more than 5,000 moose from 1965 to 2013 in Units 6A, 6B, and 6C. In contrast, total kill of the endemic moose population in Unit 6D during the same period was approximately 75 moose. Clearly, moose were introduced into a highly productive area by comparison. The 10 and 20 year average annual harvest in the rest of the Unit was 110 (Standard Deviation [SD] = 32) and 106 (SD = 33) moose respectively.

The harvest allocation for cow moose in Unit 6C was moved into federal subsistence hunting in 2000, as was 75% of the bull harvest quota in 2002. This increased rural harvest opportunity for Cordova residents from an average 75% under state regulations to more than 90% under combined state and federal regulations.

MANAGEMENT DIRECTION

MANAGEMENT GOALS

Our goals in Unit 6A East are to take large moose and to provide for optimum harvest. For the remainder of Unit 6, the goals are to provide for optimum harvest and to provide for the greatest opportunity to hunt.

POSTHUNT MANAGEMENT OBJECTIVES

Our management objective for Unit 6A East is to maintain a population of 300–350 moose and a minimum bull:cow ratio of 30:100. Our objectives for Units 6A West and 6B are to maintain populations of 300–350 moose and minimum bull:cow ratios of 15:100 in each unit. In Unit 6C, our objective is to maintain a population of 400–500 moose and minimum bull:cow ratios of 25:100 to provide for improved viewing opportunities along the Cordova road system.

METHODS

During this reporting period, we conducted aerial surveys to determine population size in Units 6B and Unit 6C. Composition surveys and twinning surveys were also conducted in Unit 6C. We flew surveys in a Piper Super Cub (PA-18) and a Bellanca Scout aircraft, with the exception of stratification surveys which were flown in a Cessna 185.

Population Estimation

Population estimates are conducted between mid-January and mid-March. Surveys are dependent on adequate snow cover and an acceptable weather window for survey completion. Study design was based on stratified random sampling with the Gasaway technique from 1991 to 2012 when it transitioned to the Geospatial Population Estimate (GSPE) in 2013. Sample units are flown at altitudes of 800–1500 feet above ground level at an intensity of approximately 4–6 minutes per square mile. Sightability Correction Factors (SCFs) were also generated using more intensive

surveys (9–12 minutes per square mile.) SCFs were applied to moose observed to give an estimate of total moose.

Data collected in the Gasaway technique utilized the DOS (Disk Operating System) program MoosePop whereas the transition to the GSPE utilized a combination of the GSPE analysis tool in WinfoNet for the high strata and a standard Gasaway analysis for the low strata (25 March 2014 memo from C. Westing, Area Management Biologist, to G. Del Frate, Management Coordinator, ADF&G Anchorage). WinfoNet is the Division of Wildlife Conservation's intranet data system.

Fall Composition

Composition surveys are flown to examine any potential effects of selective hunting pressure. We conduct aerial surveys to estimate fall moose population composition in November when 6–8 inches of snow increases sightability (Crowley 2010). In some years, requisite snow does not occur by the time antlers begin to shed in early December. Surveys are flown between 300 and 800 feet above ground level. Surveys prior to 2013 were done using an unstandardized approach that focused on maximizing moose observations but can be vulnerable to bias. Survey techniques in 2013 used a random sample of units (approximately 6.5 square miles) within the Geospatial Population Estimate (GSPE) survey protocol, which is less biased but can also be less efficient. Moose were classified as yearling (spike/fork), medium (<50 inch antler spread), and large (>50 inch antler spread). Cows were classified as either a cow without calf, cow with one calf, or cow with 2 calves. Prior to 2009 bulls were only classified as either yearling or >2 year old.

Data were analyzed using the GSPE analysis tool in WinfoNet. In the 2013 survey, universal stratification was applied to all units due to the high likelihood of moose presence. The web interface for GSPE analysis is not designed to run using a single stratification scheme. A “dummy” stratification was created to allow for the analysis. This was done by selecting units outside the survey area for consideration in the survey but designating them as a separate analysis area as per the advice of the analyst/programmer responsible for the WinfoNet tool.

Twinning rates

Twinning surveys are used as an indicator of habitat quality. We conducted moose twinning surveys at low level (200–600 feet above ground level), searching brush lines bordering large meadows and stream braids on the west CRD (Unit 6C). We flew surveys in Unit 6C generally in the last week of May. The objective of each survey was to see as many parturient cows as possible. Radio collars were used for surveys in 2012; however, in 2013 collars were simply noted when seen. Each moose observed was classified based on sex and parturition status, e.g. bull, yearling, and cow with 0, 1, or 2 calves.

Twinning rates were calculated based on peak calving, which takes multiple flights to determine, and were also calculated cumulatively. Surveys were flown in the morning or evening when there were calm winds and limited precipitation, which were the most likely conditions for cows with calves to be active and visible. Our sample goal was 30 parturient cows in one survey; however, data can also be considered cumulatively since it is proportional. Twinning rates were calculated as: $100 * (\text{cows with 2 calves} / \text{all cows with calves})$.

In all surveys, waypoints were taken for groups of animals to record distribution, gauge sightability, and determine inclusion in analysis. Observations of other wildlife, such as coyotes or wolves, were opportunistically recorded.

Harvest data come from hunt reports, a mandatory condition of drawing and registration permits. These data are summarized by subunit, except for Unit 6A, which was divided into eastern and western portions. The eastern portion encompassed all drainages into the Gulf of Alaska between Cape Suckling and the head of Icy Bay. The western portion encompassed all drainages into the Gulf between Cape Suckling and Palm Point. Harvest data were summarized by regulatory year (RY), which begins 1 July and ends 30 June (e.g., RY10 = 1 July 2010–30 June 2011).

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

During and since this reporting period, surveys were conducted west of the CRD (Unit 6C) and east of the CRD including the Martin River Valley (Unit 6B.) No surveys were conducted in RY12 due to weather. Surveys will be conducted in Unit 6A during the next reporting cycle.

The RY13 point estimate for Unit 6B, east of the Copper River Delta and including the Martin River Valley, is 227 (90% CI; 177–278; Table 1). All of the results for the last 5 surveys fall within the confidence intervals for this survey. The RY13 estimate is slightly lower than the RY11 estimate of 271 although confidence intervals for these surveys overlap. This population has been below the management objective of 300–350 for 15 years (Fig. 1).

The point estimate for Unit 6C, west of the Copper River Delta is 609 (90% CI; 483–734; Table 1). This is virtually identical to the previous estimate in RY12 of 601 and is above management objectives (400–500 moose; Fig. 2). Now that 2 surveys estimate a population over 600 moose, suspicions that the RY11 estimate was elevated have been largely alleviated.

Population Composition

From 2006 to 2009, the bull harvest may have been too liberal with Bulls:100 Cows (B:C) ratios documented as low as 14 B:C in 2009 (Crowley 2010). Anecdotal evidence confirmed a drop in the number of bulls in the population and antler spread data also reflected that perhaps fewer large bulls were available for harvest (Milo Burcham, personal communication, USFS, Cordova). As a result of these data, adjustments were made in quotas to allow for growth in the bull component of the population. In 2009 and 2010, when bulls were classified into the 3 categories also used in the 2013 survey, there was a preponderance of yearling bulls (Table 3). However in 2013, 54% of observed bulls were medium, 25% were large, and 21% were yearling bulls (Fig. 3).

Calves observed in fall composition surveys support a high and increasing population. Calves:100 Cows (c:C) ratios were the highest observed (49 c:C) since the late 1970s when the population was coming out of its irruptive period. More recently the c:C ratios were 15–19 c:C except in RY05 (29 c:C; Table 2). The high value in RY05 corresponds with a higher population estimate the following year (560 moose; Table 1) suggesting that many young animals recruited into the population. Of the cows with calves at heel during fall composition surveys, 19% had

twins compared with 6% in 2010 and 12% in 2009. The most likely factor influencing the high B:C and c:C ratios is the high harvest of cows this hunting season (50 cows taken thus far.) Future adjustments to allow for more bull harvest should take pre-hunting as well as post-hunting numbers into consideration to avoid overharvest of the bull segment of the population.

MORTALITY

Harvest

Reported moose harvest for Units 6A of 32 and 19 for RY11 and RY12 (Table 4), respectively, were below both the 10-year average of 33 moose and the 20-year average of 41 moose. This may be an indication of population levels but is likely related to weather and commercial operator dynamics. Harvest in Unit 6B was also lower during this reporting period, with 32 and 19 moose taken in RY11 and RY12, respectively, compared with the 10-year average of 33 moose and the 20-year average of 41 moose. In Unit 6C, the harvest of 25 moose in RY11 was lower than the 10-year average of 49 moose and the 20-year average of 38 moose. However, the maximum allowable harvest (MAH) in RY12 was increased in response to the population exceeding its management objectives. The 6C harvest for RY12 was 56 moose. Harvest in Unit 6D was typical with only a few animals taken each year.

Seasons and Bag Limits.

Units and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open Season
<i>RY11 and RY12</i>		
Unit 6(A), all drainages into the Gulf of Alaska from Cape Suckling to Palm Point		
One bull moose	1 Sep–30 Nov (registration hunt)	1 Sep–30 Nov (drawing permit only)
Remainder of Unit 6(A)		
One bull with spike-fork antlers or 50 inch antlers or with 3 or more brow tines on one side	1 Sep–30 Nov (General hunt)	
One bull with 50-inch antlers or antlers with 3 or more brow tines on one side		1 Sep–30 Nov (General hunt)
Unit 6(B)		
One antlered moose by registration permit only	27 Aug–31 Oct (registration hunt)	No open season
Unit 6(C)		

Units and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open Season
One moose	1 Sep-31 Oct	No open season
Unit 6(D) 1 bull moose	1 Sep-30 Sep	1 Sep-30 Sep

Unit 6B is a controlled use area. No motorized vehicles are allowed for transportation 15 August–4 September, with the exception of highway vehicles on the maintained surface of the Copper River Highway. Therefore, the first 4 days of the season were open to nonmotorized hunting only. Similar to the “no same-day airborne” regulation, moose cannot be taken until after 3 a.m. following the day on which a motorized vehicle was used for transportation off the highway after 4 September. This required motorized hunters to camp out before harvesting a moose, which slowed harvest, extended the season, and allowed more hunters to participate. All airboats are required to display an Alaska Department of Fish and Game identification number.

Board of Game Actions and Emergency Orders. The resident MAH for the portion of Unit 6A West was up to 20 bulls by registration permit, and nonresident MAH was up to 5 bulls by drawing permit. The MAH has not been met for this area since RY05.

The season in Unit 6B was 1 September–30 November (unless the MAH is met) for resident hunters only with a bag limit of 1 moose. The MAH of 25 bulls by registration permit has not been met since RY10. No emergency orders were issued during this reporting period.

In 2013 the Board of Game reauthorized antlerless moose hunts in Unit 6C during the reporting period. However, the antlerless season was allowed to lapse in Units 6A and 6B since they have not been used for many years and will likely not be used in the foreseeable future. An additional hunt was established, RM169, a late season hunt (1 November–31 December) that could be used if harvest in the existing federal and state MAH was not taken and there was concern about habitat stress.

Permit Hunts. During this reporting period, Unit 6A West had one registration and one drawing permit hunt, Unit 6B had one registration hunt, and Unit 6C had one state drawing hunt. Also in Unit 6C, there were one federal subsistence hunt (both antlerless and bulls) and one potlatch bull permit each year (Table 5).

Hunter Residency and Success. Local residents composed 67% in RY11 and 81% in RY12 of successful moose hunters in Unit 6 during this reporting period (Table 6). Since 2001 all of the cow harvest and three-quarters of the bull harvest in Unit 6C have been administered through the federal system by the U.S. Forest Service, Cordova Ranger District, which requires Cordova residency. This provided a 80–93% rural allocation for Cordova residents during the reporting period. Resident-only seasons and difficult access on the Copper and Bering River deltas discouraged nonlocal hunters from participating in hunts in Units 6B and 6A West. Almost all nonresident hunting occurs in Unit 6A East. Most nonlocal Alaska residents either successfully draw for a permit in Unit 6C or they hunt in the Unit 6B registration hunt.

Harvest Chronology. Harvest is protracted in Unit 6A and Unit 6C, occurring between September and mid-October. In Unit 6B, most harvest is concentrated in early September. It is

difficult to draw conclusions from Unit 6D harvest data because of the very small sample size but most harvest occurs in September. Unitwide during this reporting period more than 60% of the harvest occurred in the first 15 days of September (Table 7).

Transport Methods. Unit 6A is the only area where a significant proportion of the harvest is airplane supported (Table 8). Airboats, boats, and ORVs (including 3- and 4-wheelers) are also utilized, particularly in the Bering River portion (Unit 6A West). Local hunters use larger boats (seiners or tenders) to transport smaller vessels for use in the hunt. Harvest in Unit 6B predominantly utilizes airboats. Unit 6C has good road access from Cordova, allowing both highway vehicle and airboat access to moose. Unit 6D harvest occurs by boat or highway vehicles; however, small sample size limits inference. These patterns of use have not changed over the past 5 years.

Other Mortality

Brown bears and black bears undoubtedly prey upon moose calves and, to a lesser degree, adult moose. However, the magnitude of these events is poorly understood. As in previous periods, brown bears and wolves were observed chasing and feeding on calves and adult moose throughout the moose range of Unit 6 (Dave Crowley, former Cordova ADF&G Area Management Biologist, personal communication). Estimates Carnes (2004) made of moose kill rates for wolves in Unit 6 were low compared to other areas of Alaska. However, calf survival, measured by the percent calves seen on spring surveys, is lowest in Unit 6A where predator populations are likely highest. The percent of calves observed may indicate that young cohorts are not recruiting into the adult population in adequate numbers. Calf survival is highest in Unit 6C where predator populations are more regulated by hunting pressure (Table 1).

Moose are known to be more susceptible to predation during deep snow winters. Unit 6 can experience deep snow events with variable persistence. The winter of RY11 was a 100-year weather event with 10 feet of snowfall in 2 weeks, which was persistent well into the spring. Despite this weather event, calf recruitment in Unit 6B and Unit 6C in RY11 surveys fell within normal ranges. The nature of the snow pack may have influenced the effect on the moose population. The snow contained numerous hard layers that prevented moose from “punching through” and being limited by its full depth.

HABITAT

Assessment

Twinning surveys were flown in RY11 and RY12 to continue to assess habitat status in Unit 6C as the population has exceeded its population objective. Daily surveys in this reporting period indicated a twinning rate of 41–54% for cows with calves at heel. The pooled estimate for RY11 is a twinning rate of 46% (95% CI of 30–62 assuming normal binomial distribution). The pooled estimate for RY12 is a twinning rate of 50% (95% CI of 35–65 assuming normal binomial distribution). Peak twinning rates in 2013 are quite comparable to those observed in previous years (Table 9). Moose twinning rates in the west CRD are among some of the highest observed in Alaska, implying excellent nutritional status of both moose and habitat. Although this seems to support the argument for increasing herd size in Unit 6C, the threshold level at which moose may begin impacting habitat is unknown for coastal populations. When moose density in Unit 20A (Tanana Flats) increased above approximately 1,000 moose/1,000 km² during the last decade, twinning rates decreased to 3–10% (Boertje et al. 2007). Managers are currently struggling to reduce herd size in the area to protect habitat. In contrast, moose density in Unit 6C

has ranged 1,250–1,900 moose/1,000 km² since 2005 with as yet little or no indication of nutritional stress.

Enhancement

Habitat modification began experimentally in the 1990s and has been conducted regularly since 2007 by USFS and NVE to address concerns that habitat was converting from willow to alder dominated stands that are less suitable for moose. Mechanical habitat alteration using hydroaxe has been utilized annually. At this time, an estimated 616 acres have been cut.

CONCLUSIONS AND RECOMMENDATIONS

Moose populations in Units 6A and 6B have been below management objectives for many years. These objectives were set in the absence of habitat data. These populations may be stabilized at low densities and may be influenced by high predation compared to moose in Unit 6C where wolves and bears are more aggressively pursued by hunters.

Twinning surveys should be conducted in Unit 6B to evaluate habitat. If twinning rates are high in Unit 6B, a compelling case could be made that predation is inhibiting the growth of this population. However, if the habitat is simply not as productive it may be indicative that the population objectives that have been set are not appropriate. In fact, only 4 times in the entire history of monitoring moose in this area has the population estimate fallen within its objective (1991, 1992, 1996, and 1998). Twinning surveys should also continue in Unit 6C as the population continues to grow and has exceeded population objectives despite aggressive harvest rates (including on cows). Rump fat depth and/or short yearling weights may also be used to evaluate resource constraints.

A revised carrying capacity estimate is being generated for Unit 6C (the west CRD) that should be used to evaluate the appropriateness of existing management objectives (Smythe 2015). These data will be available in the autumn of 2014 and will be presented and discussed as part of a public process. An analysis is also being performed on the use and efficacy of hydroaxed plots by moose in Unit 6C.

Fall composition surveys should continue to rotate between survey areas to monitor for the potential effects of selective harvest pressure. Unit 6B fall composition should be examined with the highest priority. It is likely that the inability of this population to increase into the range of the management objective is related to lower recruitment but fall composition surveys and habitat data will help clarify what is driving this population.

The MAH for the hunt in Unit 6B (locally referred to as the Martin River hunt) will be adjusted downward since the population is below management objectives, the current harvest rate on the population is high (around 10%) and the existing MAH has not been met since RY10.

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Table 1. Unit 6 moose population estimates, RY04–RY13.

Unit	Year	Survey date	Calves (%)	Adult Estimate	Population Estimate	90% C.I	Moose Observed
6A East	RY07	29 Jan 08	7	213	230	212–247	203
	RY09 ^a	02 Feb 10	-	44	280	-	49
6A West	RY05	31 Jan 06	15	233	275	238–311	206
	RY07	31 Jan 08	7	257	276	249–301	232
	RY08	14 Feb 09	3	187	245	212–279	194
6B	RY07	18 Jan 07	9	179	242	225–258	195
	RY09	17 Mar 10	16	144	172	116–227	122
	RY11	29 Jan 12	16	204	271	236–307	174
	RY13	19 Feb 14	16	165	196	117–274	106
6C	RY05	01 Feb 06	10	438	488	423–553	361
	RY06	18 Jan 07	20	310	560	453–667	409
	RY07	14 Jan 08	15	273	430	389–471	361
	RY08	14 Feb 09	19	314	388	304–403	269
	RY09	16 Mar 10	17	200	296	164–426	251
	RY10	23 Feb 11	17	248	398	324–471	308
	RY11	25 Jan 12	22	361	601	536–666	535
	RY13	19 Feb 14	25	232	609	483–734	291

^a Brief survey between Cape Yakataga and Icy Bay east of established survey, colonized by moose and now hunted regularly. These data were added to the survey results for RY08 for the RY09 estimate.

Table 2. Unit 6 moose composition estimates, RY04–RY13.

Unit	Year	Survey date	Number observed			Bulls: 100 cows	Calves: 100 cows	Calves (%)	Moose observed
			Bulls> 2 yrs	Cows	Calves				
6A West ^a	RY05	04 Dec 05	20	143	18	18	13	10	187
	RY09	17 Nov 09	20	129	19	20	15	11	174
6B	RY05	02 Dec 05	26	77	19	45	25	15	129
6C	RY05	1 Dec 05	32	151	44	30	29	18	240
	RY07	30 Nov 07	16	83	14	36	17	11	129
	RY09	16 Nov 09	15	230	34	14	15	11	298
	RY10	02 Dec 10	12	183	35	22	19	14	258
	RY13 ^b	02 Dec 13	50	129	63	49	49	25	255

^a Composition data not collected in 6A East.

Table 3. Unit 6C composition survey detail RY09–RY13.

Survey date	Yrlg bulls	Medium bulls	Large bulls	Bulls >2 yrs	Cows	Calves	Unk	B:C	c: C	Calves (%)	Total
11/16/09	18	9	6	15	230	34	1	14	15	11	298
12/2/10	28	9	3	12	183	35	0	22	19	14	258
12/2/13 ^a	13	34	16	50	129	63	0	49	49	25	255

^a Data collected using a Modified Geospatial Population estimate (GSPE) for Bulls was 64 Bulls:100 Cows (95% CI of 30–97). The GSPE found 50 Calves:100 Cows (95% CI of 17–83)

Table 4. Unit 6 moose harvest RY08-RY12

Unit	Year	Reported Harvest				Total ^a
		Males	(%)	Females	(%)	
6A East	RY08	12	(100)	0	(0)	12
	RY09	13	(100)	0	(0)	13
	RY10	18	(100)	0	(0)	18
	RY11	19	(100)	0	(0)	19
	RY12	7	(100)	0	(0)	7
6A West	RY08	16	(100)	0	(0)	16
	RY09	14	(100)	0	(0)	14
	RY10	12	(100)	0	(0)	12
	RY11	13	(100)	0	(0)	13
	RY12	12	(100)	0	(0)	12
6B	RY08	26	(100)	0	(0)	26
	RY09	29	(100)	0	(0)	29
	RY10	25	(100)	0	(0)	25
	RY11	16	(100)	0	(0)	16
	RY12	17	(100)	0	(0)	17
6C	RY08	48	(69)	22	(31)	70
	RY09	43	(81)	10	(19)	53
	RY10	18	(58)	13	(42)	31
	RY11	15	(60)	10	(40)	25
	RY12	22	(39)	34	(61)	56
6D	RY08	7	(100)	0	(0)	7
	RY09	5	(100)	0	(0)	5
	RY10	4	(100)	0	(0)	4
	RY11	6	(100)	0	(0)	6
	RY12	4	(100)	0	(0)	4
Unit 6	RY08	109	(83)	22	(17)	131
	RY09	104	(91)	10	(9)	114
	RY10	77	(86)	13	(14)	90
	RY11	69	(87)	10	(13)	79
	RY12	62	(65)	34	(35)	96

^a Unreported, illegal, or accidental kill combined are probably less than 5 animals in each area each year.

Table 5. Unit 6 moose harvest data by permit hunt, RY08–RY12.

Unit/ Hunt number ^a	Year	Legal moose	Permits issued	Percent did not hunt	Percent successful hunters	Bulls	(%)	Cows	(%)	Total reported harvest
6A/RM160	RY08	Bull	47	60	63	12	(100)	0	(0)	12
	RY09	Bull	59	51	41	11	(100)	0	(0)	11
	RY10	Bull	70	61	41	11	(100)	0	(0)	11
	RY11	Bull	53	60	57	12	(100)	0	(0)	12
	RY12	Bull	46	67	53	8	(100)	0	(0)	8
6A/DM160	RY08	Bull	5	40	67	2	(100)	0	(0)	2
	RY09	Bull	5	0	80	3	(100)	0	(0)	3
	RY10	Bull	5	40	33	1	(100)	0	(0)	1
	RY11	Bull	5	60	50	1	(100)	0	(0)	1
	RY12	Bull	5	20	100	4	(100)	0	(0)	4
6B/RM164	RY08	Bull	183	28	20	26	(100)	0	(0)	26
	RY09	Bull	264	22	14	29	(100)	0	(0)	29
	RY10	Bull	233	37	17	25	(100)	0	(0)	25
	RY11	Bull	197	36	13	16	(100)	0	(0)	16
	RY12	Bull	177	41	16	17	(100)	0	(0)	17
6C/DM167	RY08	Bull	13	0	92	12	(100)	0	(0)	12
	RY09	Bull	13	15	100	11	(100)	0	(0)	11
	RY10	Bull	6	17	80	4	(100)	0	(0)	4
	RY11	Bull	7	31	67	6	(100)	0	(0)	6
	RY12	Bull	7	0	86	6	(100)	0	(0)	6
6C/ Federal subsistence ^b	RY08	Both	70	11	98	36	(62)	22	(38)	58
	RY09	Both	65	20	93	32	(76)	10	(24)	42
	RY10	Both	40	7	82	14	(52)	13	(48)	27
	RY11	Both	29	7	86	9	(47)	10	(53)	19
	RY12	Both	66	12	93	16	(32)	34	(68)	50

^a RM prefix was a registration hunt, DM prefix a drawing hunt.

^b Federal subsistence hunts, including bull, antlerless, and potlatch bull.

Table 6. Unit 6 moose hunter residency and success, RY08–RY12.

Unit	Year	Successful					Unsuccessful					Total hunters
		Local ^a resident	Nonlocal resident	Non- resident	Total	(%)	Local resident	Nonlocal resident	Non- resident	Total	(%)	
6A East	RY08	0	0	14	14	(42)	1	1	17	19	(58)	33
	RY09	1	1	11	13	(43)	3	4	9	17 ^b	(57)	30
	RY10	0	0	18	18	(62)	1	0	10	11	(38)	29
	RY11	1	0	17	19 ^b	(56)	0	2	13	15	(44)	34
	RY12	0	1	6	7	(41)	0	4	6	10	(59)	17
6A West	RY08	10	2	2	14	(64)	6	1	1	8	(36)	22
	RY09	9	2	3	14	(50)	10	4	0	14	(50)	28
	RY10	9	2	1	12	(39)	12	4	3	19	(61)	31
	RY11	12	0	1	13	(57)	7	2	1	10	(43)	23
	RY12	7	1	4	12	(63)	7	0	0	7	(37)	19
6A TOTAL	RY08	10	2	16	28	(44)	7	2	28	37	(59)	65
	RY09	10	3	14	27	(46)	13	8	9	31 ^b	(53)	58
	RY10	9	2	19	30	(50)	13	4	13	30	(50)	60
	RY11	13	0	18	32 ^b	(56)	7	4	14	25	(44)	57
	RY12	7	2	10	19	(53)	7	4	6	17	(47)	36
6B	RY08	23	3	0	26	(20)	93	13	0	106	(80)	132
	RY09	22	7	0	29	(14)	139	36	0	175	(86)	204
	RY10	19	6	0	25	(17)	108	14	0	122	(83)	147
	RY11	15	1	0	16	(13)	93	17	0	110	(87)	126
	RY12	16	1	0	17	(16)	81	7	0	88	(84)	105

Table 6, continued.

Unit	Regulatory year	Successful					Unsuccessful					Total hunters
		Local ^a resident	Nonlocal resident	Non-resident	Total	(%)	Local resident	Nonlocal resident	Non-resident	Total	(%)	
6C	RY08	67	3	-	70	(97)	1	1	-	2	(3)	72
	RY09	48	5	-	53	(95)	3	0	-	3	(5)	56
	RY10	30	1	-	31	(82)	6	0	-	6	(18)	38
	RY11	20	5	-	25	(81)	3	3	-	6	(19)	31
	RY12	52	4	-	56	(92)	4	0	-	4	(8)	61
6D	RY08	5	0	2	7	(21)	24	3	0	27	(79)	34
	RY09	4	1	0	5	(9)	38	8	7	53	(91)	58
	RY10	3	1	0	4	(13)	24	3	1	28	(88)	32
	RY11	5	1	0	6	(19)	18	6	1	25	(81)	31
	RY12	3	1	0	4	(13)	21	3	3	27	(87)	31
Unit 6	RY08	105	8	18	131	(44)	125	19	28	172	(57)	301
TOTAL	RY09	84	16	14	114	(30)	193	52	16	262	(69)	377
	RY10	61	10	19	90	(32)	151	21	14	186	(67)	277
	RY11	53	7	18	79 ^b	(32)	121	30	15	166	(68)	245
	RY12	78	8	10	96	(41)	113	14	9	136	(58)	233

^a Residents of Unit 6.^b Includes 1 hunter with unknown residency.

Table 7. Unit 6 moose harvest percent by time period, RY08–RY12.

Unit	Year	Harvest periods (%)						<i>n</i>	
		August 20–31	September 1–15 16–30		October 1–15 16–31		November 1–30		December 1–31
6A	RY08	0	21	46	25	7	0	0	28
	RY09	0	37	30	26	4	4	0	27
	RY10	0	30	20	17	33	0	0	30
	RY11	0	47	28	25	0	0	0	32
	RY12	0	47	26	26	0	0	0	19
6B	RY08	0	69	31	0	0	0	0	26
	RY09	0	69	10	3	17	0	0	29
	RY10	0	48	44	8	0	0	0	25
	RY11	0	56	31	6	6	0	0	16
	RY12	0	47	6	47	0	0	0	17
6C ^a	RY08	0	39	20	17	16	3	6	70
	RY09	0	25	36	13	11	4	11	53
	RY10	0	32	39	6	13	3	6	31
	RY11	0	52	8	28	4	4	4	25
	RY12	0	54	17	13	6	4	7	54
6D	RY08	0	38	50	13	0	0	0	7
	RY09	0	40	60	0	0	0	0	5
	RY10	0	50	50	0	0	0	0	4
	RY11	0	17	83	0	0	0	0	6
	RY12	0	25	75	0	0	0	0	4
Unit 6 TOTAL	RY08	0	41	30	15	10	2	3	131
	RY09	0	39	29	13	11	3	5	114
	RY10	0	37	34	10	16	1	2	90
	RY11	0	48	27	20	3	1	1	79
	RY12	0	50	19	21	3	2	4	94

^a Number of moose harvested (*n*) in 6C may not include all federal subsistence harvest because date of kill is not consistently reported.

Table 8. Unit 6 moose harvest percent by transport method, RY08–RY12.

Unit	Regulatory year	Airplane	Boat	Airboat	3 or 4 ORV	Highway Vehicle	<i>n</i>
6A	RY08	36	14	32	18	0	28
	RY09	48	30	15	7	0	27
	RY10	40	20	17	23	0	30
	RY11	43	10	30	20	0	31
	RY12	65	12	29	0	0	18
6B	RY08	0	13	52	0	35	23
	RY09	22	19	41	0	19	27
	RY10	22	22	48	0	9	23
	RY11	13	0	80	14	7	15
	RY12	0	21	57	0	7	14
6C ^a	RY08	0	10	57	12	21	68
	RY09	4	9	42	9	36	53
	RY10	0	3	45	19	32	31
	RY11	0	4	50	13	33	24
	RY12	0	2	30	11	57	56
6D	RY08	0	17	0	17	67	6
	RY09	0	60	0	0	40	5
	RY10	0	75	0	25	0	4
	RY11	17	33	0	17	33	6
	RY12	0	25	0	0	75	4
Unit 6	RY08	8	12	48	11	21	125
TOTAL	RY09	19	19	33	6	23	112
	RY10	19	17	34	16	14	88
	RY11	21	8	43	13	14	76
	RY12	12	8	33	9	39	92

^a Number of moose harvested (*n*) in 6C does not include all federal subsistence harvest because hunter transportation is not always recorded.

Table 9. Unit 6C twinning survey results RY07–RY12.

Date	Cows			Total moose ^b	% calves	Hours searched	Twinning rate
	0 calf ^a	1 calf	2 calf				
5/21/2013	61	5	5	93	16	4	50.0
5/23/2013	102	5	6	146	12	7	54.5
5/29/2013	57	11	10	108	29	7	47.6
5/23/2012	46	7	5	78	22	6.4	41.7
5/28/2012	66	13	12	142	26	3.75	48.0
5/26/2009	21	2	4	45	22	2.5	66.7
5/28/2009	40	8	7	82	27	2.7	46.7
5/29/2008	46	8	11	103	29	3.75	57.9
6/7/2008	13	3	3	41	22	3	50.0
5/26/2007	41	4	8	91	22	3.5	66.7
6/12/2007	50	3	5	84	15	3.3	62.5

Unit 6B- East Copper River Delta (Martin River Valley) Post-hunt Moose Population Estimate

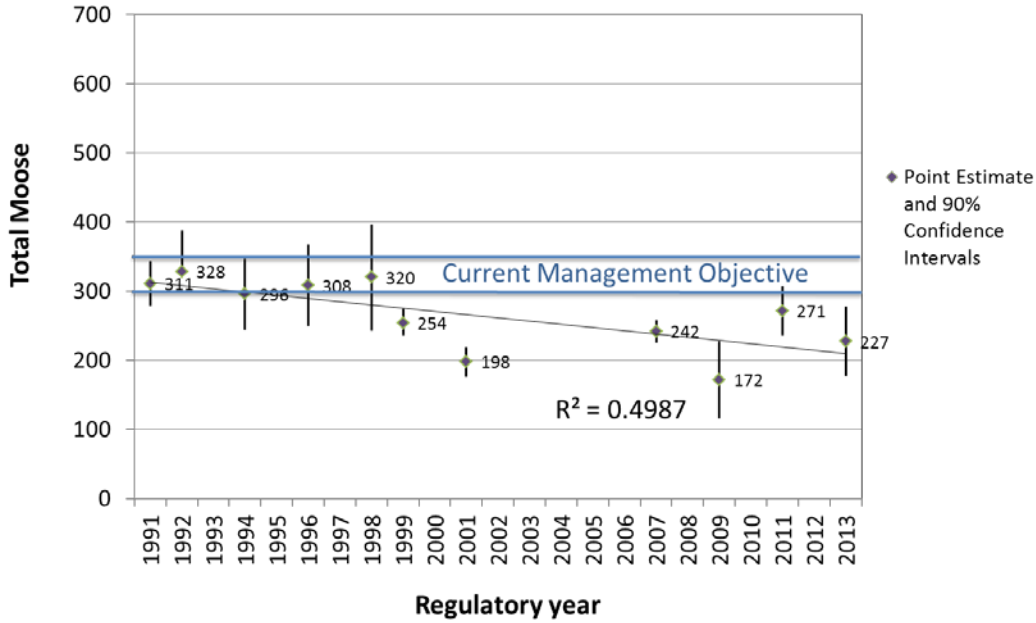


Figure 1. Post-hunt moose population estimate, Unit 6B, RY91–RY13.

Unit 6C- West Copper River Delta Post-hunt Moose Population Estimate

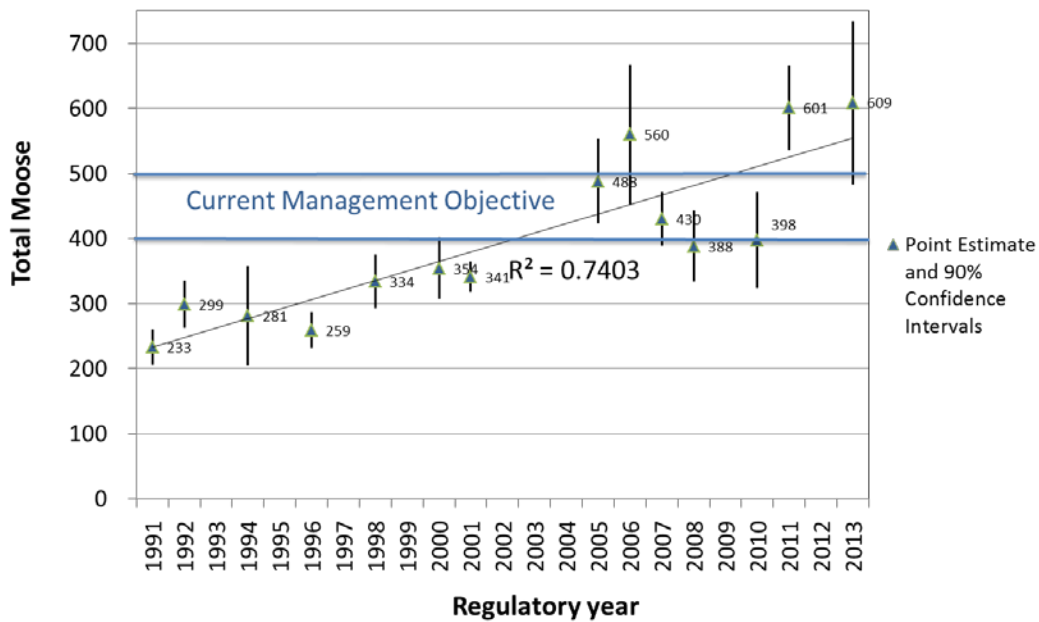


Figure 2. Post-hunt moose population estimates in Unit 6C, RY91–RY13.

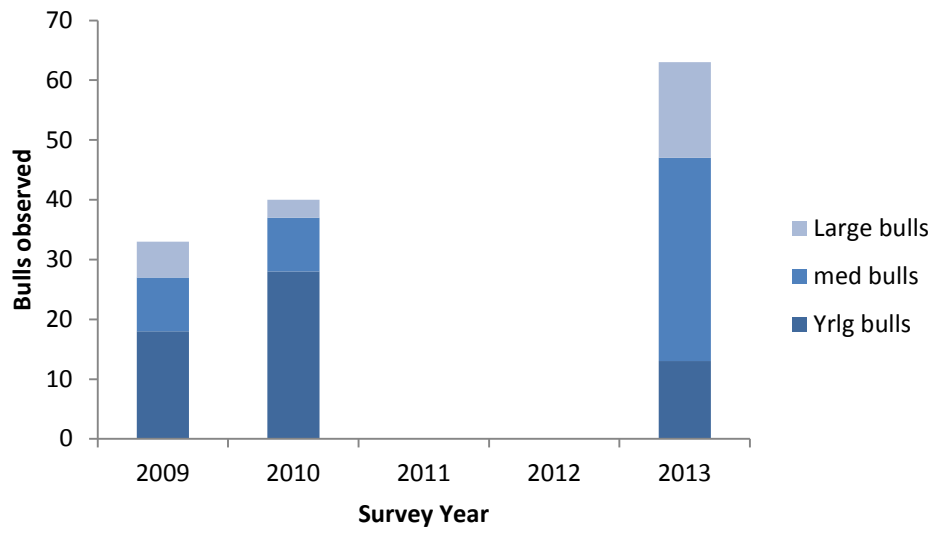


Figure 3. Size distribution of bulls in Unit 6C observed during fall composition surveys