
CHAPTER 15: MOOSE MANAGEMENT REPORT

From: 1 July 2011
To: 30 June 2013

LOCATION

GAME MANAGEMENT UNIT: 14C (1,912 mi²) and Portage and Placer River drainages in Unit 7

GEOGRAPHIC DESCRIPTION: Anchorage area

BACKGROUND

Moose were uncommon in the Anchorage area before the 1940s. They increased in the late 1940s as brushy secondary growth replaced mature forests that had been cut or burned during the development of Anchorage and the Fort Richardson Military Reservation. Moose numbers increased considerably during the early 1950s, and by the late 1950s and early 1960s moose were abundant. There was a reduction in numbers due to severe winters in the 1970s, but since then the moose population has remained relatively high, peaking in 2003. Since 2003, moose numbers have fluctuated, but have remained within population objectives.

Prime browse occurs in open-canopied, second-growth willow, birch, and aspen stands on burned-over military lands and on several hundred acres of military lands that have been rehabilitated during the last three decades. Parks, greenbelts, and residential areas in the Anchorage Bowl also contain browse. Quality riparian moose habitat abounds along streams and rivers, and extensive stands of subalpine willow are on south-facing slopes in most drainages. However, during the last three decades, overabundant moose have reduced the distribution and density of browse species, and overbrowsing is apparent in most of Unit 14C.

Annual harvests have fluctuated dramatically. A record harvest of nearly 500 moose (50% females) occurred in 1965, but hunters harvested only 18 moose in 1978. Diverse harvests were often due to changes in seasons and bag limits as much as changes in the moose population. Annual harvests increased steadily during the late 1980s and early 1990s but began to decline in 1992. Several new permit hunts established during the last few years have resulted in increased annual harvests.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

In Unit 14C the department management objectives for population and harvest are the same as Intensive Management objectives adopted by the Board of Game.

- Maintain a population of 1,500–1,800 moose and an annual harvest of 90–270 moose.

- Maintain a post-hunting sex ratio of no fewer than 25 bulls:100 cows.
- Maintain the moose population at a level to promote public safety by reducing conflicts with Anchorage residents.

METHODS

Every fall, we attempt to conduct both population and composition surveys for moose in most of Unit 14C. However, during some years, inadequate snow cover or inclement weather impedes survey activities. Composition counts are conducted in the Twentymile, Placer, and Portage river drainages, as well as in the Eklutna Management Area, Peters Creek valley, Thunderbird valley, and the front range of Chugach State Park. We also conduct a modified Gasaway census in Ship Creek valley and on the Joint Base Elmendorf Richardson (JBER). Beginning in 2008, we were unable to count moose in one of 14 sample areas in the JBER census area due to a housing expansion on Elmendorf Air Force Base (AFB). As a result, the 138.8 mi² census area was modified to exclude this 6.9 mi².

Hunters were required to report their success on either harvest or permit reports, depending on whether they participated in the general season or a special permit hunt. The reports require information on days hunted, hired services, harvest date and location, sex of the animal taken, method of transportation, and antler configuration. Harvest data are summarized by regulatory year (RY). A regulatory year runs from 1 July through 30 June (e.g., RY11 = 1 July 2011–30 June 2012).

A significant amount of time is spent by area staff managing moose/human interactions in Anchorage. This includes responding to reports of resident conflicts with moose, conducting various educational efforts such as wildlife safety presentations, and coordinating with media outlets to inform the public about wildlife hazards.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Moose are adversely affected by snow depths of 70–90 cm (28–36 inches), which impede movement, and depths greater than 90 cm restrict movement to the extent that adequate food intake may be unattainable (Coady 1974). Mean snow depths in Anchorage area lowlands are not normally challenging to wintering moose. Since 1988, however, the Anchorage area has experienced more deep-snow winters (i.e., greater than 30-inch depth), interspersed with a few milder winters. Continued severe winters will exacerbate overbrowsing, which may result in substantial losses of moose in subsequent years.

Deep snows during the winter of 1994–1995 caused a substantial decline in the unit's moose population. During this winter, vehicle collisions and starvation caused most of the known moose mortality. Fall 1996 surveys found the moose population 25–30% below the fall 1994 estimate (Sinnott 2002). With milder winters and a reduction in harvest, the unit's moose population recovered by fall 1998 above the upper management objective of 1,800 moose. Another severe winter in 1998–1999 reduced the population to an estimated 1,650. The

population rebounded to an estimated 2,200 in fall 2003, which is the highest estimate on record. In 2004, another severe winter, with high snow depths, occurred in the Anchorage area. A census was not conducted on Fort Richardson/Elmendorf/upper Ship Creek in fall 2004; however, by fall 2005 the estimated population was 38% lower than in fall 2003. Based on composition counts in 2004 and a high number of moose (24) reported dead from unknown causes in early 2004, the winter of 2003–2004 was one of the worst in recent years for moose mortality. From 2005 to 2008, the population rose to 1,800, but has declined since, and is now at the low end of the population objective.

During this reporting period we attempted to conduct aerial surveys annually in some hunt areas to estimate sex and age composition during fall and early winter. In 2011, surveys were conducted on JBER and in the upper Ship Creek drainage, Peters Creek, Eklutna, Thunderbird, and the Twentymile/Portage/Placer area. Fall surveys were not flown in 2012 because there was inadequate snow cover until late December, after most bulls had shed antlers.

The winter of 2011–2012 was characterized by the deepest snowfall on record. While we were not able to fly surveys in fall 2012, available evidence (e.g., few reported winterkills, average number of highway collisions) suggests that the moose population in the Anchorage area did not decline as dramatically as in previous deep snow winters. This is most likely a result of low moose numbers prior to winter snowfall. The pattern of large population declines following severe winters and slow increases following milder winters suggests that available habitat cannot sustain moose numbers at the high end of the population objective during winters characterized by above-average snowfall.

Population Size

Both composition and census information are used to estimate the moose population in GMU 14C. A modified Gasaway census was conducted only once (2011) during this reporting period. From that census we estimated 335 moose on JBER and in the upper Ship Creek valley. In addition, composition counts were conducted in 2011 in the Twentymile, Portage, and Placer River valleys, as well as in Peters Creek, Eklutna, and Thunderbird valleys (Table 1). During those composition counts, 178 moose were counted in the Twentymile/Portage/Placer area, 48 moose were counted in Peters Creek, and 80 moose were counted in Eklutna and Thunderbird valleys. We estimated a fall 2011 population of 1,540 moose in Unit 14C.

Population Composition

In the composition survey conducted in the Twentymile area in 2010, the bull:cow ratio was estimated to be 30 bulls:100 cows and the calf:cow ratio was 68 calves:100 cows. In 2011 the bull:cow ratio was estimated to be 21 bulls:100 cows and the calf:cow ratio was 29 calves:100 cows. Fluctuations such as these are seen regularly in the Twentymile area, which is known for population crashes following severe winters. In 2011, the total bull:cow ratio for GMU 14C was estimated to be 32 bulls:100 cows (Table 1), which was nearly the same as the last reporting period (31:100 in 2010). The overall calf:cow ratio decreased since the last reporting period (37:100 in 2010 vs. 20:100 in 2011). In both 2010 and 2011, the unit had 9 yearling bulls per 100 cows.

Distribution and Movements

Moose are year-round residents of Unit 14C, ranging from sea level to an elevation of 3,500 feet. During winters with substantial snow accumulation, most moose are found at elevations below 1,500 feet. Movements of several miles or more by both sexes occur during the breeding season in late September through October and again before green-up in late March and early April. Road construction and urban development continue to fragment habitat throughout Anchorage and can significantly alter moose movement patterns and survival. A lack of dedicated wildlife crossing structures persists throughout municipal road corridors, despite consistent recommendations to the Alaska Department of Transportation and Public Facilities (DOT&PF). Recently, a project intended to delineate movement corridors used by moose on JBER was conducted by ADF&G and JBER Natural Resources staff. Once data analysis is finished, this research may provide more evidence for the need for habitat linkages and crossing structures on high traffic roads such as the Glenn Highway.

MORTALITY

Harvest

Season and Bag Limit. Moose are harvested in Unit 14C during a general season hunt, as well as various registration and drawing permit hunts. The general season harvest occurred the day after Labor Day through 30 September, with a bag limit of 1 bull moose with spike-fork/50-inch antlers.

Drawing permit hunts on JBER included DM421–430, and were open to resident and nonresident hunters. Hunts DM421–427 are located on JBER-Richardson, with open seasons from the day after Labor Day through 15 November and 15 December–15 January. The bag limit for hunts DM422 and 424 was 1 bull; the bag limit for hunt DM423 was 1 antlerless moose; and the bag limit for hunts DM421, 426, and 427 was 1 moose of either sex. Hunting was limited to archery south of Eagle River (DM424-427) and muzzleloading rifle north of Eagle River (DM421–423). We issued 101 archery permits and 27 muzzleloader permits in 2011 and 92 archery permits and 27 muzzleloader permits in 2012 in this portion of the JBER management area (Table 4).

Moose harvest on JBER-Elmendorf was by drawing permit only and archery only (DM428–430). The open seasons for resident and nonresident hunters were the day after Labor Day through 30 September and 15 October—15 November, with a bag limit of 1 bull. We issued a total of 13 drawing permits each year for these hunts.

Moose harvest in the Anchorage Management Area is restricted to 1 antlerless moose, by muzzleloader or shotgun with front and rear sights and slugs, by drawing permit only, from 1–30 November (DM666). Ten drawing permits total were issued for 2 separate hunt areas (6 for upper Campbell Creek and 4 for McHugh Creek) during both RY11 and RY12 (Table 4).

Birchwood Management Area was open to moose hunting the day after Labor Day through 30 September by drawing permit only with a bag limit of 1 bull by archery only (DM448). Fifteen bull permits were issued in 2007; however, only 5 bull permits per year have been issued since 2008 (Table 4). This hunt has been increasingly difficult to administer, because the area is nearly

all private or railroad property, where access is restricted, or municipal park, where hunting and trapping are prohibited. Much of the private land in the Birchwood Management Area is being developed into residential housing, and the area is becoming less rural and more suburban.

Moose harvest in the Eklutna Lake Management Area was the day after Labor Day through 20 October. The bag limit was 1 bull by registration permit by archery only, with a quota of 4 bulls (RM445).

The open season for the Twentymile River area was 20 August—30 September by drawing permit for bull moose (DM210) and 20 August—10 October by drawing permit for antlerless moose (DM211). The bag limit was 1 moose by drawing permit with 40 bull permits and 30 antlerless permits issued in RY11. Due to record snowfalls in the winter of 2011–2012, permit numbers were reduced to 25 bull permits and 20 antlerless permits for RY12.

Moose harvest in the Ship Creek area is managed with drawing (DM446 and DM447) and registration permit (RM435) hunts. Drawing hunts occur the day after Labor Day—30 September. Twenty drawing permits were issued in each of RY11 and RY12. In previous years drawing permits have been issued for either sex in this area, but since 2009 the bag limit has been any bull. The registration hunt opens 25 October and runs through the end of November. The bag limit for registration permits was 1 bull. The quota for the registration hunt is based on the moose population and the number of animals harvested during the drawing hunt season.

In 2011, the Board of Game authorized the creation of a new drawing permit hunt in the Remainder of 14C. The boundary for this hunt includes Edmonds and Mirror Lake municipal parks, with a season of October 20—November 15 (DM444). Two permits were issued for this hunt in 2012.

Board of Game Actions and Emergency Orders. The Board of Game reauthorized all antlerless moose hunts annually during this reporting period.

In 2002, the Board of Game revised 5 AAC 92.230 (Feeding of game) to include moose in the list of wildlife illegal to negligently or intentionally feed or attract with human food, pet food, or garbage. Initially the fine was \$50, but it was increased to \$100 in September 2002, and to \$300 in May 2008. Moose in Anchorage have learned to eat from garbage cans when browse is scarce. This behavior is becoming more widespread across the Anchorage Bowl area. Alaska State Wildlife Troopers stationed in Anchorage and the Anchorage area biologists issued several citations for feeding moose during this reporting period.

Hunter Harvest. During RY11 and RY12, 137 and 100 moose were harvested, respectively, with a 2-year mean of 89 bulls and 29 cows (Table 2). Approximately 17% of the bulls were taken during the general season harvest.

Permit Hunts. During RY11, we issued 636 permits to hunt moose in Unit 14C. Of those who hunted, 22% were successful (121 hunters). In RY12, 623 permits were issued and 18% of those who hunted were successful (86 hunters) (Table 4).

Drawing permit hunts are very popular. In 2011, 7,444 applications were received for 256 drawing permits (3,191 applications were for the 70 permits for the Placer/Twenty-mile hunts). In 2012, 6,899 applications were received for 224 drawing permits (3,016 of the applications were for the 45 permits for the Placer/Twenty-mile hunts). While permit numbers were reduced during the last 2 years due to population size and record snowfall during the winter of 2011–2012, the overall number of drawing permits has increased substantially over the years (e.g., 140 permits were issued in 2003). In addition to those receiving drawing permits, 279 bow hunters in RY11 and 299 bow hunters in RY12 registered for a permit for the Eklutna Lake archery hunt, and 101 and 100 hunters registered for a permit for the Ship Creek registration hunt in RY11 and RY12, respectively. The high number of unsuccessful bow hunters in the Eklutna hunt reduced the total success rate for permit hunts in Unit 14C (Table 4).

Hunter Residency and Success. Residents of Unit 14C accounted for 63% and 59% of the moose harvested in Unit 14C in RY10 and RY11, respectively (Table 3), which is a slight decrease from RY09 (65%) and RY10 (68%). Nonlocal resident harvest slightly increased since the last reporting period at 34% and 35% of the moose harvest in Unit 14C in RY10 and RY11, respectively, compared to 30% in RY09 and 26% in RY10. Nonresidents accounted for 3% and 6% of the total harvest in Unit 14C in RY10 and RY11, respectively.

Harvest Chronology. In the general-season, spike-fork/50-inch hunts it is difficult to compare annual harvests for the first week in September (Table 5) because season opening dates are variable (i.e., the day after Labor Day). However, other than in 2012, when 43% of the harvest came in the first week, recent years have shown a continued decline in harvest during the first week of the season (Table 5). The day after Labor Day was 5 September in 2011 and 3 September in 2012.

Most moose in Unit 14C are harvested during drawing and registration permit hunts, with separate and overlapping seasons extending from the day after Labor Day to March of the following year. Therefore, the harvest chronology of these hunts is not comparable.

Transport Methods. Approximately 66% of all successful hunters used a highway vehicle for transportation to their hunting area during this reporting period (Table 6). This is roughly the same as the previous reporting period. Most moose hunt areas in Unit 14C are in jurisdictions or terrains that limit airplanes, boats, and other motorized vehicles. For example, Chugach State Park allows airplanes to land only at one airstrip (at the head of Eklutna Lake) and restricts four-wheelers to the Eklutna Lakeside Trail and logging roads in Bird Creek drainage. Only electric outboards may be used on boats on Eklutna Lake. With the exception of the Knik, Twenty-mile, and Placer rivers, which are navigable by airboats and boats with jet units, other streams in Unit 14C are not navigable by motorboats.

Other Mortality

Moose killed by vehicles and trains accounted for a large percentage of known, human-caused mortality during the past 5 years. Vehicles killed at least 239 moose and trains killed 22 moose in RY94, a record high because of near-record snow depths that forced many moose into town and onto the roads and railroad tracks. Between 70 and 185 (average of 120) moose per year were killed in vehicle collisions during 2004–2012 (Table 2). These are conservative figures because

not all collisions are reported and some moose, never found, die from injuries. Important factors which influence collision rates are the moose population level and snow depths.

An additional 10–20 moose have died from unknown causes each year. Most of these deaths occur during winter. Necropsy results revealed that at least 4 (all calves) died from cyanide gas produced during the digestion of what appeared to be Mayday tree (*Prunus padus*) or chokecherry tree (*Prunus virginianus*) (K. Beckmen, ADF&G veterinarian, personal communication). Thousands of Mayday and chokecherry trees have been planted as ornamentals in Anchorage. In some parts of the municipality, they have become invasive, replacing natural woody vegetation in riparian areas. Other moose in Anchorage have browsed ornamental evergreens, and were found dead hours or a few days later. Evergreens such as Japanese yew (*Taxus* spp.) are known to be highly toxic to herbivores; however, the number of potentially toxic ornamental plants available to moose in Anchorage is unknown. At least one of the moose that consumed toxic chokecherry also consumed Japanese yew, so exact cause of death could not be determined.

Natural mortality was low in the Anchorage area from the mid-1950s to the late 1960s because of moderate annual snowpack and relatively low numbers of predators. The severe winters of the early 1970s reduced numbers significantly, but the population rebounded by the 1980s. More moose have died from starvation-related causes in recent winters due to 1) greater than average snowpacks in some years that cover potential browse and require greater expenditure of energy, and 2) overbrowsing in previous winters. In recent years, 4–5 packs of wolves have occupied Unit 14C, and both black and brown bears kill moose calves in summer, particularly before the salmon return to local creeks.

Moose are often reported dying from unverified, but mostly natural, causes in the Anchorage area. The reports typically peak in late winter and spring, but some of these moose were dead for months and were only found when the snow melted. Causes of these mortalities include starvation, disease, ingesting toxic substances, and accidents such as falling off a cliff or getting a leg caught in the crotch of a tree. Approximately 5–8 moose are reported dead and salvaged for nonconsumptive use in the Anchorage area each year. These mortalities are not included in the human-caused mortalities in Table 2, although some of the moose may have been injured in vehicle collisions or from eating toxic ornamental plants.

HABITAT

Assessment

Large tracts of subalpine and riparian habitat are protected throughout the 500,000-acre Chugach State Park and Chugach National Forest lands between Girdwood and Portage. Several thousand acres of lowland habitat are on military lands between lower Ship Creek and Eagle River. Extensive urbanization has reduced winter range on portions of the military reservation and on private lands throughout the unit. Several new roads and road expansion projects bisect natural areas and may result in increased moose-vehicle collisions. Fences are another growing problem for moose in that they hamper movements and often separate calves from cows.

Enhancement

Extensive habitat enhancement on military, state, and municipal lands has not occurred and is not economically feasible because burning, the most cost-effective method, is difficult to do safely in

a densely populated area. The Chugach National Forest has reclaimed some areas denuded of vegetation with small willow plantings, usually in conjunction with fish habitat projects (Jessica Ilse, USFS, personal communication). Limited habitat enhancement projects (primarily conducted with hydro-axe) have also taken place on JBER lands. Winter habitat has decreased and will inevitably continue to decrease over time in the Anchorage area, as will the number of moose that overwinter in the Anchorage Bowl.

CONCLUSIONS AND RECOMMENDATIONS

Management objectives for Unit 14C moose were met during this reporting period; fall 2011 surveys estimated the population at 1,540 moose (an increase of less than 3% since 2010), with a bull:cow ratio of greater than 25 bulls:100 cows, indicating that the population is remaining at the lower end of our objective while maintaining desired sex ratios. The creation of several new hunts has helped maintain moose numbers within population goals, resulting in a healthier population and decreased moose-human conflicts.

Moose-vehicle collisions in Unit 14C remain a significant problem. Almost 20 years ago, the DOT&PF estimated rural moose-vehicle collisions cost an average of \$15,150 for vehicle repairs; emergency, medical, and legal services; and lost wages (Alaska Department of Transportation and Public Facilities 1995). Considering inflation, moose-vehicle collisions probably cost Anchorage residents at least \$3 million/year, based on the number of moose-vehicle collisions reported between 2004 and 2013. Development of new roads and expansion of existing roads continues to destroy and fragment important moose habitat and increase the risk of moose-vehicle collisions. In general, ADF&G recommends the construction of dedicated wildlife crossing structures coupled with fencing to help mitigate negative impacts on moose. Based on research in other areas of North America and Europe (Clevenger and Waltho 2005, Seiler et al. 2003), we recommend overpass structures for moose be at least 14 feet in height. Area biologists need to be involved early in planning of roads and long fences and must have information on moose distribution and movement corridors. With this in mind, in 2013 ADF&G entered into a Memorandum of Understanding (MOU) with the Alaska Department of Transportation (DOT). This new agreement was designed to promote human safety, efficient transportation, and economical ways to design, construct, and manage Alaska's highways while reducing negative impacts to wildlife populations by bringing wildlife experts into cooperation with transportation engineers in planning efforts.

During this reporting period, wildlife staff participated in planning for a number of transportation infrastructure projects. DOT&PF is fencing a significant portion of Minnesota Road in hopes of reducing moose-vehicle collisions along several moose crossing areas. Unfortunately, this section of road has numerous vehicle overpasses and underpasses, which will require breaks in the moose fencing, possibly transferring moose-vehicle collisions to other portions of the road corridor. We recommended against fencing in this area and for additional lighting, clearing, and a reduced speed limit. We will monitor the effects of this and report in future documents.

Currently, DOT&PF is in the planning stage of new road access from the north to the Anchorage University and Medical District (U-Med). ADF&G area staff have participated in scoping meetings and provided comments. There are no data on specific movement corridors used by

moose in that area, but we have been able to offer input on typical moose use of habitat in the urban landscape.

Moose are also considered residential pests in Unit 14C by many homeowners. They can cause considerable damage to ornamental plants, vegetable gardens, and fruit trees. Some residents continue to feed local moose, despite the regulation prohibiting feeding, and when a handout is not immediately forthcoming these moose can be unusually aggressive toward people. Area staff spends considerable time listening and responding to complaints about property damage, public safety, and injured moose, and in some cases, enforcing the regulation prohibiting feeding of moose. On the other hand, residents tolerate much damage, and most residents and visitors consider moose a desirable species (Responsive Management 2010). In fact, many Anchorage residents feel that moose enrich their lives in Anchorage and make the city a unique place to live. In addition, they feel that the benefits of having moose in Anchorage outweigh the inconveniences that moose cause. Public education regarding moose behavior and biology may improve public tolerance and reduce conflicts (Whittaker et al. 2001).

With numerous moose in the city, public safety is a concern, especially for children. Spring calving in late May through early June is a particularly dangerous time, as cow moose aggressively defend their newborn calves. Each spring, people are injured by cow moose defending their calves. Area biologists and education specialists devote considerable amounts of time teaching moose safety in schools and in other public venues. Area biologists also assist schools with moose on school grounds. A moose-safety video was produced during the 2003–2004 school year by Mirror Lake Middle School students in cooperation with Anchorage area biologists, Division of Wildlife Conservation Region II education staff, the University of Alaska Anchorage, and the Anchorage School District. Copies were distributed to all Anchorage elementary schools. The target audience was all third- through fifth-graders in the Anchorage School District; however, second-graders are also watching the video. Pre- and post-tests show a substantial increase in knowledge of how to avoid moose attacks or injuries in the event of an attack. The movie continues to be shown in Anchorage and statewide. It is available on the ADF&G website and if an educator or anyone from the public wants a free copy, they can send in a website request to the Anchorage area education specialist. The DVD is also distributed to teachers who request a bear and moose safety presentation. During the 2011-2012 school year, education staff conducted approximately 240 wildlife safety presentations to 11,000 students in Anchorage. During the 2012–2013 school year, education staff conducted approximately 200 wildlife safety presentations to 9,000 students in Anchorage.

In the fall of 2011, more than 8 miles of single track mountain bike trails were constructed in Kincaid Park, and in the summer/fall of 2013 an additional 6.6 miles of single track trails were constructed in Kincaid. These trails traverse moose calving areas and likely overlap existing game trails. Mountain biking is a high-risk activity in wildlife habitat, due to the speed that bikers travel. During spring calving in 2012, numerous groups of mountain bikers encountered cows with calves at close range. Multiple bikers sustained minor injuries from cow moose protecting their calves. We worked with several local bike groups, including Mighty Bikes and Single Track Advocates, to encourage bikers to avoid using the single track trail system during late May through late June to avoid dangerous surprise encounters with moose. While numerous efforts have been made to notify the public of this issue, many bikers have continued to use these

trails, and additional injuries have been sustained. Since biking has increased dramatically in popularity we anticipate increases in injuries to bikers from moose. We will continue to work with local trail advocate groups, and municipal and state parks to educate the public on wildlife hazards.

The Alaska Legislature enacted a “nuisance moose” law (AS 16.05.052) during its 2004 session. The law allows private individuals and organizations to capture and translocate “nuisance” moose from urban to rural areas. In spring 2011, the Alaska Moose Federation (AMF), a private organization, was issued a permit by ADF&G to capture, hold, and translocate orphaned moose calves. During 2011, 3 calves from Unit 14C were delivered to AMF, but all had to be euthanized due to various injuries; 2 were injured at the captive facility and 1 had *Cryptosporidium* when captured. In 2012, no calves from Unit 14C were delivered to AMF. In 2013, 2 calves from Unit 14C were delivered to AMF, and were successfully released near Cordova, but both succumbed to wolf predation in their first winter (T. Kavalok, ADF&G, personal communication). In addition to calves delivered to AMF, 3 calves in 2011, 1 calf in 2012, and 3 calves in 2013 were placed in captive facilities, some in Alaska and some in facilities outside the state.

We recommend maintaining the population at the low end of the current objective due to the high amount of moose–human conflict within Unit 14C, and the fact that maintaining moose numbers at a lower level will most likely result in a healthier population due to the reduction of browsing pressure, resulting in decreased nutritional stress. The most effective and socially acceptable manner to control moose numbers is through regulated hunting. Currently, the majority of moose habitat in Unit 14C is open to moose hunting, with the exception of highly developed areas of Eagle River and Anchorage and most municipal parks. Moose hunting in residential areas is not practical due to safety concerns and negative public perception. However, limited harvest of moose in large municipal parks may be feasible, although currently not permissible under municipal regulations. We recommend continued discussion with the municipality and with concerned user groups regarding limited moose hunting opportunities in city parks at a future date.

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Table 1. Unit 14C fall aerial moose composition counts and estimated population size, regulatory years 2004–2013.

Area	Regulatory year	Bulls: 100 cows	Yearling bulls: 100 cows	Calves: 100 cows	Calves (%)	Total moose observed	Moose /hour	Estimated population size ^a
Twentymile River Portage River Placer River	2004	61	34	52	24	94	30	120
	2005	--	--	--	--	--	--	
	2006	--	--	--	--	--	--	150
	2007 ^b	--	--	--	--	--	--	
	2008	30	12	25	16	192	50	192
	2009	19	5	28	19	138	46	138
	2010	30	14	68	34	160	39	160
	2011	21	6	29	19	178	61	178
	2012	--	--	--	--	--	--	--
Hillside	2004 ^c	28	11	40	24	99 ^d	30	120
	2005	--	--	--	--	--	--	
	2006	--	--	--	--	--	--	140 ^e
	2007 ^b	--	--	--	--	--	--	
	2008	--	--	--	--	--	--	155 ^e
	2009	--	--	--	--	--	--	
	2010	--	--	--	--	--	--	129 ^e
	2011	--	--	--	--	--	--	133 ^e
	2012	--	--	--	--	--	--	
Anchorage Bowl (except Hillside)	2004	--	--	--	--	--	--	
	2005	--	--	--	--	--	--	
	2006	--	--	--	--	--	--	250 ^e
	2007 ^b	--	--	--	--	--	--	
	2008	--	--	--	--	--	--	280 ^e
	2009	--	--	--	--	--	--	
	2010	--	--	--	--	--	--	242 ^e
	2011	--	--	--	--	--	--	248 ^e
	2012	--	--	--	--	--	--	

Area	Regulatory year	Bulls: 100 cows	Yearling bulls: 100 cows	Calves: 100 cows	Calves (%)	Total moose observed	Moose /hour	Estimated population size ^a
JBER Upper Ship Cr.	2004 ^f	--	--	--	--	--	--	
	2005	59	16	31	17	395	38	435
	2006	45	14	30	17	404	26	452
	2007 ^b	--	--	--	--	--	--	
	2008	48	11	15	9	335	25	473
	2009	--	--	--	--	--	--	
	2010	31	7	26	16	211	31	339
	2011	37	8	14	9	280	22	335
	2012	--	--	--	--	--	--	
Eagle River ^g	2004	--	--	--	--	--	--	
	2005	--	--	--	--	--	--	
	2006	--	--	--	--	--	--	120 ^e
	2007 ^b	--	--	--	--	--	--	
	2008	--	--	--	--	--	--	135 ^e
	2009	--	--	--	--	--	--	
	2010	--	--	--	--	--	--	122 ^e
	2011	--	--	--	--	--	--	125 ^e
	2012	--	--	--	--	--	--	
Peters Creek ^h	2004	--	--	--	--	--	--	
	2005	--	--	--	--	--	--	
	2006	--	--	--	--	--	--	65 ^e
	2007 ^b	--	--	--	--	--	--	
	2008	--	--	--	--	--	--	73 ^e
	2009	--	--	--	--	--	--	
	2010	--	--	--	--	--	--	48 ^e
	2011	33	10	27	17	48	16	48
	2012	--	--	--	--	--	--	

Area	Regulatory year	Bulls: 100 cows	Yearling bulls: 100 cows	Calves: 100 cows	Calves (%)	Total moose observed	Moose /hour	Estimated population size ^a
Eklutna River Thunderbird Cr.	2004	--	--	--	--	--	--	
	2005	--	--	--	--	--	--	
	2006	--	--	--	--	--	--	45 ^e
	2007 ^b	--	--	--	--	--	--	
	2008	58	--	37	15	48	12	58
	2009	--	--	--	--	--	--	
	2010	--	--	--	--	--	--	78 ^e
	2011	36	16	24	15	80	17	80
	2012	--	--	--	--	--	--	--
Bird Creek Indian River ⁱ	2004	--	--	--	--	--	--	
	2005	--	--	--	--	--	--	
	2006	--	--	--	--	--	--	110 ^e
	2007 ^b	--	--	--	--	--	--	
	2008	--	--	--	--	--	--	124 ^e
	2009	--	--	--	--	--	--	
	2010	--	--	--	--	--	--	
	2011	--	--	--	--	--	--	103 ^e
	2012	--	--	--	--	--	--	--
Hunter Creek ^h Knik River	2004	--	--	--	--	--	--	
	2005	--	--	--	--	--	--	
	2006	--	--	--	--	--	--	150 ^e
	2007 ^b	--	--	--	--	--	--	
	2008	--	--	--	--	--	--	165 ^e
	2009	--	--	--	--	--	--	
	2010	--	--	--	--	--	--	148 ^e
	2011	--	--	--	--	--	--	152 ^e
	2012	--	--	--	--	--	--	--

Area	Regulatory year	Bulls: 100 cows	Yearling bulls: 100 cows	Calves: 100 cows	Calves (%)	Total moose observed	Moose /hour	Estimated population size ^a	
Lake George ^j	2004	--	--	--	--	--	--	140 ^e	
	2005	--	--	--	--	--	--		
	2006	--	--	--	--	--	--		
	2007 ^b	--	--	--	--	--	--		
	2008	--	--	--	--	--	--	155 ^e	
	2009	--	--	--	--	--	--	129 ^e	
	2010	--	--	--	--	--	--		
	2011	--	--	--	--	--	--	129 ^e	
2012	--	--	--	--	--	--	--		
Unit 14C	2004 ^f	43	22	45	24	183	28	1600	
Total	2005	57	16	31	17	395	38		
	2006	45	14	30	17	404	26		
	2007 ^b	--	--	--	--	--	--		
	2008	45	11	19	5	574	29		1800
	2009	--	--	--	--	--	--		1500
	2010	31	9	37	30	371	24		
	2011	32	9	20	15	586	25		1540
	2012	--	--	--	--	--	--	--	

^a Estimates based on sightability correction factors (SCF) of 1.12 (2006), 1.41 (2008), 1.49 (2010), and 1.18 (2011) calculated with MOOSPOP for the Fort Richardson/Elmendorf/Upper Ship Creek census area, except estimates in unsurveyed drainages are extrapolated based on trends on the Fort Richardson/Elmendorf/Upper Ship Creek census area; ^b Fall surveys not conducted due to lack of snow; ^c Bear Valley not surveyed due to turbulence; ^d Total includes 10 adult/yearling moose of unknown sex; ^e No recent aerial surveys completed; therefore, estimate is best guess; ^f No aerial survey of Fort Richardson/Elmendorf/Upper Ship Creek census area because of difficulty obtaining flight clearances from Range Control due to military training activities; ^g Eagle River count area last surveyed in 1998; ^h Peters Creek count area and Hunter/Knik count area last surveyed in 2001; ⁱ Bird/Indian count area last surveyed in 1988; ^j Lake George count area last surveyed in 1997.

Table 2. Unit 14C moose harvest and accidental death, regulatory years 2004–2013.

Regulatory year	Hunter harvest						Accidental death ^b			
	Reported			Estimated			Road	Train	Total	Total
	M (%)	F (%)	Total ^a	Unreported	Illegal	Total				
2004	62 (75)	21 (25)	83	10	10	20	185	7	192	295
2005	68 (67)	34 (33)	104	10	10	20	116	9	125	249
2006	80 (71)	33 (29)	113	10	10	20	119	11	130	263
2007	84 (69)	38 (31)	123	10	10	20	111	10	121	264
2008	96 (72)	38 (28)	134	10	10	20	112	7	119	273
2009	102 (69)	46 (31)	149	10	10	20	140	14	154	323
2010	86 (64)	47 (35)	135	10	10	20	119	7	126	281
2011	104 (76)	33 (24)	137	10	10	20	110	15	125	282
2012	74 (75)	25 (25)	100	10	10	20	70	3	73	193

^a Includes those with unreported sex.

^b Reported deaths only.

Table 3. Unit 14C moose hunter residency and success, regulatory years 2004–2013.

Regulatory year	Successful				Unsuccessful				Total hunters ^b
	Local resident ^a	Nonlocal resident	Nonresident	Total ^b (%)	Local resident ^a	Nonlocal resident	Nonresident	Total ^b (%)	
2004	55	22	3	80 (17)	260	106	13	380 (83)	460
2005	72	23	4	99 (20)	281	108	11	401 (80)	500
2006	79	24	8	113 (21)	303	96	19	423 (79)	536
2007	79	28	7	114 (16)	421	163	16	602 (84)	716
2008	81	36	5	122 (19)	364	156	8	528 (81)	650
2009	82	38	6	127 (18)	384	185	15	590 (82)	717
2010	82	31	7	120 (18)	347	179	19	549 (82)	669
2011	80	44	4	128 (24)	263	131	6	403 (76)	531
2012	51	30	5	86 (16)	292	135	20	449 (84)	535

^a Residents of Unit 14C. Includes only Unit 14C portion of DM210.

^b Includes hunters with unspecified residency.

Table 4. Unit 14C moose harvest data by permit hunt, 2004–2013.

Hunt no. /Area	Regulatory year	Permits issued	Percent did not hunt	Percent unsuccessful hunters	Percent successful hunters	% Bulls	% Cows	Total harvest ^a
DM210, 211 Twentymile Portage	2004	25	16	57	43	89	11	9
	2005	20	5	37	63	100	0	12
	2006	20	5	58	42	100	0	8
	2007	20	15	29	71	100	0	12
	2008	20	15	24	76	100	0	13
	2009	70	9	32	68	60	40	42
	2010	70	4	52	48	50	50	30
	2011	70	13	55	45	70	30	27
	2012	45	13	51	49	63	37	19
DM421,422,423 JBER (muzzleloader)	2004	25	12	73	27	83	17	6
	2005	25	8	48	52	75	25	12
	2006	25	8	74	26	83	17	6
	2007	25	16	67	33	71	29	7
	2008	25	12	55	45	90	10	10
	2009	25	12	73	27	100	0	6
	2010	27	26	50	50	90	10	10
	2011	27	15	48	52	75	25	12
	2012	27	11	74	26	83	17	6
DM424,425,426, 427 JBER (archery)	2004	100	13	67	33	55	45	29
	2005	100	16	60	40	58	42	33
	2006	100	16	57	43	53	47	36
	2007	100	14	66	44	50	50	38
	2008	100	13	51	49	53	47	43
	2009	95	17	53	47	49	51	37

Hunt no. /Area	Regulatory year	Permits issued	Percent did not hunt	Percent unsuccessful hunters	Percent successful hunters	% Bulls	% Cows	Total harvest ^a
	2010	99	20	54	46	39	61	36
	2011	101	17	37	63	66	34	53
	2012	92	16	51	49	64	36	36
DM428,429,430 JBER (archery)	2004	20	5	50	50	67	33	9
	2005	25	24	21	79	60	40	15
	2006	25	12	45	55	58	42	12
	2007	25	12	55	45	40	60	10
	2008	25	12	45	55	58	42	12
	2009	18	17	47	53	100	0	8
	2010	18	17	60	40	83	17	6
	2011	13	8	64	36	100	0	4
	2012	13	15	62	38	100	0	3
DM441 Hunter (antlerless)	2004	10	30	86	14	0	100	1
	2005	10	40	83	17	0	100	1
	2006	10	30	57	43	0	100	3
	2007	5	0	40	60	33	67	3
	2008	5	40	67	33	0	100	1
	2009	5	60	50	50	100	0	1
	2010	5	40	67	33	0	100	1
	2011	5	0	80	20	0	100	1
	2012	5	40	67	33	0	100	1
DM442 Ship (antlerless)	2004	40	30	93	7	0	100	2
	2005	0	--	--	--	--	--	--
	2006	0	--	--	--	--	--	--

Hunt no. /Area	Regulatory year	Permits issued	Percent did not hunt	Percent unsuccessful hunters	Percent successful hunters	% Bulls	% Cows	Total harvest ^a
	2007	0	--	--	--	--	--	--
	2008	0	--	--	--	--	--	--
	2009	0	--	--	--	--	--	--
	2010	0	--	--	--	--	--	--
	2011	0	--	--	--	--	--	--
	2012	0	--	--	--	--	--	--
DM443	2004	10	20	100	0	0	0	0
Peters and Little Peters	2005	10	40	67	33	0	100	2
	2006	10	20	75	25	50	50	2
	2007	5	20	100	0	0	0	0
	2008	5	20	100	0	0	0	0
	2009	5	40	100	0	0	0	0
	2010	5	0	80	20	0	100	1
	2011	5	0	80	20	0	100	1
	2012	5	0	80	20	0	100	1
DM444	2005	--	--	--	--	--	--	--
Edmonds and Mirror Lake Parks	2006	--	--	--	--	--	--	--
	2007	--	--	--	--	--	--	--
	2008	--	--	--	--	--	--	--
	2009	--	--	--	--	--	--	--
	2010	--	--	--	--	--	--	--
	2011	--	--	--	--	--	--	--
	2012	2	0	100	0	0	0	0
DM446, 447	2005	40	28	66	34	70	30	10
Ship Creek	2006	50	24	61	39	80	20	15
	2007	50	30	66	34	75	25	12
	2008	50	36	69	31	60	40	10
	2009	50	22	62	38	67	33	15
	2010	40	30	68	32	89	11	9

Hunt no. /Area	Regulatory year	Permits issued	Percent did not hunt	Percent unsuccessful hunters	Percent successful hunters	% Bulls	% Cows	Total harvest ^a
	2011	20	15	65	35	100	0	6
	2012	20	10	61	39	100	0	7
DM448, 449 Birchwood (archery only)	2004-05	15	20	83	17	100	0	2
	2005-06	15	15	100	0	0	0	0
	2006-07	15	53	100	0	0	0	0
	2007-08	15	47	88	13	100	0	1
	2008-09	5	60	100	0	0	0	0
	2009-10	5	60	0	100	100	0	2
	2010-11	5	40	67	33	100	0	1
	2011-12	5	60	0	100	0	0	0
	2012-13	5	40	100	0	0	0	0
DM666 Anchorage (muzzleloader, shotgun only)	2005-06	4	0	0	100	0	100	4
	2006-07	4	0	25	75	0	100	3
	2007-08	8	0	37	63	0	100	5
	2008-09	8	25	17	83	0	100	5
	2009-10	10	30	29	71	0	100	5
	2010-11	10	20	25	75	17	83	6
	2011-12	10	40	67	33	0	100	2
	2012-13	10	50	60	40	0	100	2
RM435 ^c Ship	2007-08	355	55	89	11	94	6	18
	2008-09	139	30	89	11	100	0	11
	2009-10	102	25	90	10	100	0	7
	2010-11	100	28	91	9	100	0	6
	2011-12	101	42	83	17	100	0	10
	2012-13	100	27	89	11	100	0	8

Hunt no. /Area	Regulatory year	Permits issued	Percent did not hunt	Percent unsuccessful hunters	Percent successful hunters	% Bulls	% Cows	Total harvest ^a
RM445 ^c	2004-05	218	58	96	4	100	0	4
Eklutna	2005-06	257	32	98	2	100	0	3
(archery only)	2006-07	249	31	99	1	100	0	2
	2007-08	298	37	100	0	0	0	0
	2008-09	325	36	99	1	100	0	2
	2009-10	363	34	99	1	100	0	2
	2010-11	346	33	99	1	100	0	3
	2011-12	279	50	96	4	100	0	5
	2012-13	299	42	99	1	100	0	2
Totals for all permit hunts ^d	2004-05	463	16	79	21	66	34	62
	2005-06	506	26	76	24	64	36	92
	2006-07	508	24	77	23	62	38	87
	2007-08	906	39	81	19	64	36	107
	2008-09	707	29	79	21	66	34	107
	2009-10	748	27	77	23	63	37	125
	2010-11	725	28	79	21	56	44	111
	2011-12	636	35	78	22	73	27	121
	2012-13	623	30	82	18	70	29	86

^aIncludes permittees who did not report; ^bIncludes moose with unspecified sex; ^cRegistration hunt; ^dIncludes all DM210 hunt area.

Table 5. Unit 14C moose harvest ^a chronology, regulatory years 2004–2013.

Regulatory year	Percent of harvest						<i>n</i>
	8/26–9/1	9/2–9/8	9/9–9/15	9/16–9/22	9/23–9/29	9/30–10/6	
2004–05 ^b	0	21	26	26	26	0	19
2005–06 ^c	0	10	20	10	50	10	10
2006–07 ^d	4	20	24	28	20	4	25
2007–08 ^e	0	13	27	27	27	0	15
2008–09 ^f	0	13	17	21	50	0	24
2009–10 ^g	0	10	5	35	45	5	20
2010–11 ^h	0	0	33	21	42	4	24
2011–12 ⁱ	0	13	13	20	33	20	15
2012–13 ^j	0	43	14	7	36	0	14

^a Does not include permit hunt harvests.

^b Season 9/7–9/30

^c Season 9/6–9/30

^d Season 9/5–9/30

^e Season 9/4–9/30

^f Season 9/2–9/30

^g Season 9/8–9/30

^h Season 9/7–9/30

ⁱ Season 9/6–9/30

^j Season 9/4–9/30

Table 6. Unit 14C moose harvest^a percent by transport method, regulatory years 2004–2013

Regulatory year	Percent of harvest								<i>n</i>
	Airplane	Horse	Boat	3- or 4-wheeler	Snowmachine	Off-road vehicle	Highway vehicle	Unknown/ Other	
2004	3	4	8	6	0	0	79	1	80
2005	2	3	9	1	0	1	77	6	99
2006	4	6	8	4	0	2	66	11	113
2007	4	10	7	4	0	0	73	1	114
2008	4	7	7	3	0	0	74	4	122
2009	3	5	17	2	0	1	64	7	127
2010	1	9	11	4	0	0	67	7	120
2011	4	8	14	2	0	0	66	6	128
2012	0	8	7	2	0	1	67	13	86

^a Does not include Placer and Portage drainages (Unit 7).