Moose Management Report and Plan, Game Management Unit 14C:

Report Period 1 July 2010–30 June 2015, and Plan Period 1 July 2015–30 June 2020

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Purpose of this Report

This report provides a record of survey and inventory (S&I) management activities for moose in Unit 14C and Portage and Placer River drainages in Unit 7 for the 5 regulatory years RY10– RY14 and plans for survey and inventory management activities in the 5 years following the end of that period (RY15–RY19). A regulatory year (RY) runs from 1 July through 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 report of survey and inventory activities that was previously produced every 2 years.

I. RY10–RY14 Management Report

Management Area

Unit 14C is located in Southcentral Alaska and is approximately 1,912 mi². The boundaries of Unit 14C closely approximate those of the Municipality of Anchorage (MOA). The MOA is a mosaic of wildlife habitat and human development. Most of the MOA is characterized by large tracts of natural lands, including Chugach State Park, Chugach National Forest, the Anchorage Coastal Wildlife Refuge, and Joint Base Elmendorf–Richardson (JBER, an 84,000-acre military base). Even the highly developed portions of the MOA support wildlife habitat in vegetated greenbelts, stream corridors, and large municipal parks. The majority of moose habitat within Unit 14C occurs within the JBER Management Area and within the drainages of the Twentymile and Placer rivers.

Summary of Status, Trend, Management Activities, and History of Moose in Unit 14C

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. Over the next several decades, the moose population remained relatively high, peaking in 2003. Since 2003, moose numbers have fluctuated but have remained within population objectives (Fig. 1).

Prime browse occurs in open-canopied, second-growth willow, birch, and aspen stands on burned-over or rehabilitated military lands. Most rehabilitation has occurred in the last 3 decades. Parks, greenbelts, and residential areas in the Anchorage Bowl also contain browse. Quality riparian habitat abounds along streams and rivers, and extensive stands of subalpine willow are on south-facing slopes in most drainages. However, during the last 3 decades, overabundant moose have reduced the distribution and density of browse species, and overbrowsing is apparent in much of Unit 14C.



Figure 1. Estimated moose population and harvest in Unit 14C, Alaska regulatory years^a (1985–2014).

^aA regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2010 = 1 July 2010–30 June 2011).

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 as much to changes in seasons and bag limits as to 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

EXISTING WILDLIFE MANAGEMENT PLANS

Direction for the management of Unit 14C moose was outlined in the Southcentral wildlife management plan (ADF&G 1976) and has been reviewed and modified through public comments, staff recommendations, and Board of Game actions over the years. A record of these changes can be found in the division's management report series. The plan portion of this report contains the current management plan for moose in Unit 14C.

In 2000 a wildlife plan called "Living with Wildlife in Anchorage: A Cooperative Planning Effort" was created in an attempt to outline common goals for Anchorage wildlife management. The planning effort was initiated and led by the Alaska Department of Fish and Game (ADF&G), and involved a team from local, state, and federal agencies with wildlife responsibilities, as well as people from various wildlife-related interest groups and members of the general public (ADF&G 2000). This plan was intended to be used as a guide as Anchorage continues to be developed.

GOALS

- > Maintain the moose population in Unit 14C for consumptive and nonconsumptive uses.
- > Mitigate human–moose conflicts to promote public safety for Anchorage residents.

CODIFIED OBJECTIVES

Amounts Reasonably Necessary for Subsistence Uses

None.

Intensive Management

In 2001, the Alaska Board of Game adopted a positive finding for the intensive management of moose in Unit 14(C). The current intensive management (IM) objectives are as follows:

- ▶ Population Objective: 1,500–1,800 moose.
- ➤ Harvest Objective: 90–270 moose.

MANAGEMENT OBJECTIVES

- 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 30 bulls:100 cows.
- Maintain the moose population at a level to promote public safety by reducing conflicts with Anchorage residents.

MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1. Conduct winter moose surveys (modified Gasaway census (Gasaway et al. 1986), supplemented by minimum counts in other drainages) to get a population estimate and composition figure.

Data Needs

Moose in Unit 14C are intensively managed. Vegetative cover in Unit 14C precludes any summer, fall, or no-snow surveys. However, winter surveys, prior to antler drop, allow the opportunity to estimate the population and composition. Aerial surveys after antler drop are solely focused on the Portage and Placer river drainages in Unit 7. Moose populations in these drainages are susceptible to large population crashes during heavy snow winters. Furthermore, moose in these drainages do not typically move out of the survey area during the winter (unlike many moose in the rest of Unit 14C), which allows for late winter surveys. Minimum population counts in these areas give us a basic tool to monitor the population and, in turn, ensure we do not overharvest and thereby prolong recovery of a population that may be declining.

Methods

Every fall, we attempt to conduct composition surveys and develop a population estimate for moose in key areas that together cover 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 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. Data from each of these surveys were recorded on an "Anchorage Moose Census Form" (Appendix A).

Results and Discussion

<u>Fall 2010 (RY10)</u>: A modified Gasaway moose census was conducted on JBER and in the upper Ship Creek drainage which produced an estimate of 339 moose in this survey area. Composition counts were conducted in the Twentymile, and Portage and Placer River valleys (Table 1) and 160 moose were counted. The 2010 unitwide population estimate was 1,500 moose (Table 2). Total bull:cow ratio for Unit 14C was estimated to be 31 bulls:100 cows and overall calf:cow ratio increased from 19:100 in 2008 to 37:100 (Table 1).

<u>Fall 2011 (RY11):</u> A modified Gasaway moose census was conducted on JBER and in upper Ship Creek drainage, which produced an estimate of 336 moose in this survey area. Composition counts were conducted in the Twentymile, Portage, and Placer River valleys; Peters Creek; and the Eklutna and Thunderbird valleys (Table 3). During those composition counts, 178 moose were counted in the Twentymile/Portage/Placer area, 48 moose in Peters Creek, and 80 moose in Eklutna and Thunderbird valleys. The fall 2011 population estimate was 1,540 moose in Unit 14C (Table 2). The overall bull:cow ratio for Unit 14C was estimated at 32 bulls:100 cows while the calf:cow ratio decreased to 20 calves:100 cows.

The Twentymile bull:cow ratio decreased from 30 bulls:100 cows in 2010 to 21 bulls:100 cows. Fluctuations such as these are seen regularly in the Twentymile area, which is known for severe population declines following severe winters.

Table 1. Number of moose observed during composition counts and Gasaway survey flights in Unit14C, Alaska, 2010.

							Calves :
					Estimated	Bulls :	100
Survey area	Bulls	Cows	Calves	Total	population size	100 cows	cows
Twentymile/Placer/Portage	24	81	55	160	160	30	68
JBER/Ship Creek ^a	46	151	38	236 ^b	339 ^c	31	26
Peters Creek ^d							
Eklutna/Thunderbird ^d							

^a Gasaway census.

^b Includes 1 unknown moose.

^c Estimates based on sightability correction factor (SCF) of 1.49 calculated with MOOSPOP.

^d Survey areas not flown.

	Table 2.	Estimated	moose po	pulation in	Unit 14C	by regula	tory year, [*]	* RY10–RY	14.
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	Estimated total	Estimated	Estimated
Regulatory year	population	bulls:100 cows	calves:100 cows
2010	1,500	31	37
2011	1,540	32	20
2012 ^a			
2013	1,533	35	22
2014 ^b			

^a A regulatory year begins 1 July and ends 30 June, e.g., regulatory year 2010 = 1 July 2010–30 June 2011.

^b No moose surveys were flown due to poor survey conditions.

Table 3. Number of moose observed during composition counts and Gasaway survey flights inUnit 14C, Alaska, 2011.

					Estimated number of	Bulls : 100	Calves :
Survey area	Bulls	Cows	Calves	Total	moose	cows	100 cows
Twentymile/Placer/Portage	25	119	34	178	178	21	29
JBER/Ship Creek ^a	69	182	28	279	335 ^b	37	14
Peters Creek	10	30	8	48	48	33	27
Eklutna/Thunderbird	18	50	12	80	80	36	24

^a Gasaway census.

^b Estimates based on sightability correction factor (SCF) of 1.18 calculated with MOOSPOP.

<u>Fall 2012 (RY12)</u>: No moose surveys were flown due to inadequate snow cover during the survey window. While surveys were not flown, anecdotal evidence (e.g., few winter kills and an average number of highway moose collisions) suggests that the moose population in the Anchorage area did not decline as drastically as it had in previous deep snow winters. The absence of a dramatic population decline is most likely a result of low moose numbers prior to the winter snowfall. These fluctuations following deep snow winters and slow increases following mild snow depth winters suggest that available habitat cannot sustain moose numbers at the high end of the population objective during deep snow winters.

<u>Fall 2013 (RY13)</u>: Composition counts were conducted in the Twentymile, Placer, and Portage river drainages; and in the Peters Creek and Thunderbird drainages (Table 4). Additionally, a modified Gasaway moose census was conducted on JBER and in the upper Ship Creek Valley, but some of the sample units could not be surveyed due to extenuating circumstances (e.g., weather, airspace closures) prior to antler drop. A total of 242 moose were counted on JBER and in the upper Ship Creek Valley, a slight decrease from 2011. The unitwide population estimate was 1,533 moose (Table 2). Calculated bull:cow ratios showed a slight increase from 2011 with an overall bull to cow ratio of 35:100 and a calf to cow ratio of 22:100 (Table 2).

					Estimated number of	Bulls : 100	Calves :
Survey area	Bulls	Cows	Calves	Total	moose	cows	100 cows
Twentymile/Placer/Portage	24	103	28	155	155	23	27
JBER/Ship Creek ^a	57	153	32	242	347 ^b	37	21
Peters Creek	12	28	9	49	49	43	32
Thunderbird	13	22	3	38	83 ^c	59	9

Table 4. Number of moose observed during composition counts and Gasaway survey flights inUnit 14C, Alaska, 2013.

^a Gasaway census.

^b Estimates based on sightability correction factor (SCF) of 1.08 calculated with MOOSPOP.

^cEklutna not surveyed, estimate based on survey data for Eklutna from 2011.

<u>Fall 2014 (RY14)</u>: No moose surveys were flown due to inadequate snow cover during the survey window. While surveys were not flown, anecdotal evidence (e.g., few reported winter kills and an average number of highway moose collisions) suggests that the moose population in the Anchorage area did not significantly change since the 2013 surveys.

Recommendations for Activity 1.1

Continue and modify. Composition counts should continue to be conducted in Unit 14C, and the possibility of expanding the modified Gasaway census to include all drainages where minimum count surveys are currently being conducted should be explored. Annual variability in estimates obtained from minimum count surveys can make management decisions much more difficult. Much of the variability is a consequence of the survey not incorporating a sightability/detectability correction factor to correct for variable survey conditions that can dramatically influence the resulting population estimates. The methods currently used in Unit 14C to survey moose have not been changed over time to provide comparable estimates and detect trends. However, because population estimates need to be defensibile and are used to make informed management decisions, there is an increasing need to modify the current survey design to include only a modified Gasaway census. As survey methodology and analysis continue to advance it is necessary to continue to adapt our design in order to consistently provide reliable population estimates for Unit 14C.

Additionally, we recommend exploring nontraditional survey techniques to estimate moose populations in areas where aerial surveys are not possible. Currently, research and management biologists in Region II are working to develop methodology for estimating population size and

composition of moose within Anchorage. This new technique will combine a visual census with genetic based mark-recapture.

The current estimated population of about 1,500 moose appears to be sufficient to support harvest opportunity, maintain a viewable population of moose, and reduce human-moose conflicts. Therefore, maintaining the moose population at the low end of the population objective is recommended. Furthermore, the intensive management status of the moose population in Unit 14C moose should be changed to a negative finding in codified regulation. Realistically, if the population were to fall below 1,500 moose, the ability to conduct either predator control and/or population enhancement is limited due to the degree and extent of human habitation in Unit 14C.

2. Mortality-Harvest Monitoring and Regulations

ACTIVITY 2.1. Monitor mortality and harvest in Unit 14C annually.

Data Needs

Monitoring harvest data is vital in order to determine where our level of harvest falls in relation to our IM harvest objective and ensure that harvests are sustainable.

Methods

- We monitor hunter harvest via harvest reports on WinfoNet and in-person reporting.
- We monitor accidental mortality (vehicle and railroad strikes) using records from Alaska Department of Public Safety and Alaska Railroad.

Results and Discussion

Within Unit 14C, there are 17 drawing and 2 registration moose hunts (Table 5, Figures 2–4). Another 2 drawing hunts take place partially in 14C and partially in Unit 7. In addition, there is a general season for moose that runs 1 September–30 September.

Harvest by Hunters-Trappers

During this reporting period, hunters in 14C harvested 124 moose on average, and harvest was within the IM objective each regulatory year. Throughout 14C the overall take of moose has remained stable during this reporting period.

<u>General Season</u>

The general moose season included the remainder of 14C and the Chugach State Park Management Area, excluding the Ship Creek drainage. During this reporting period, an average of 23 moose were taken annually with a success rate of 15% (Table 5). Nonresidents made up 7% of the total number of hunters annually and were responsible for 12% of the annual harvest. On average, 156 hunters participated in the 14C general season hunt annually. The 14C general season is limited to bull moose with spike-fork antlers or 50-inch antlers or antlers with 3 or more brow tines on at least one side.

Table 5. Harvest and hunter participation regulatory years^a 2010–2014 for drawing, registration, and general season hunts in Unit14C, Alaska.

	Regulatory		No.				Total
Area/Hunt No.	year	Permits/tags issued	hunters	% Successful	% Bulls	% Cows	harvest ^b
Twentymile/Portage and Placer	2010	70	63	48	50	50	30
Valley DM210 and DM211	2011	70	60	45	70	30	27
	2012	45	39	49	63	37	19
	2013	45	41	41	59	41	17
	2014	70	55	49	63	37	27
JBER	2010	144	114	46	54	46	52
DM421, 422, 423, 424, 426, 427	2011	141	119	58	70	35	69
DM428 and DM430	2012	132	112	40	69	53	45
	2013	132	109	50	70	44	54
	2014	125	100	42	79	57	42
Knik River and Hunter Creek	2010	5	3	33	0	100	1
DM441	2011	5	5	20	0	100	1
	2012	5	3	33	0	100	1
	2013	5	4	100	25	75	4
	2014	5	3	100	0	100	3
Peters and Little Peters Creek	2010	5	5	20	0	100	1
DM443	2011	5	5	20	0	100	1
	2012	5	5	20	0	100	1
	2013	5	5	0	0	0	0
	2014	5	5	20	0	100	1
Edmonds and Mirror Lake	2010						
Parks	2011						
DM444	2012	2	2	0	0	0	0
	2013	2	1	0	0	0	0
	2014	2	2	0	0	0	0
Upper Ship Creek	2010	140	96	16	93	7	15
DM446 and 447	2011	121	76	21	100	0	16

	Regulatory		No.	%			Total
Area/Hunt No.	year	Permits/tags issued	hunters	Successful	% Bulls	% Cows	harvest
RM435	2012	120	90	17	100	0	15
	2013	120	78	12	100	0	9
	2014	120	88	17	100	0	15
Birchwood Management Area	2010	5	3	33	100	0	1
DM448	2011	5	2	0	0	0	0
	2012	5	3	0	0	0	0
	2013	5	4	0	0	0	0
	2014	3	1	0	0	0	0
Anchorage Management Area	2010	10	8	75	17	83	6
DM666	2011	10	6	33	0	100	2
	2012	10	5	40	0	100	2
	2013	10	8	63	0	100	5
	2014	13	11	73	25	75	8
General Season	2010	169	169	14	100	0	24
GM000	2011	151	151	11	100	0	16
	2012	146	146	10	100	0	15
	2013	151	151	16	96	4	24
	2014	170	170	21	100	0	36
Eklutna Lake Management Area	2010	346	231	1	100	0	3
RM445	2011	279	140	4	100	0	5
	2012	299	173	2	100	0	2
	2013	298	171	2	100	0	3
	2014	272	131	2	100	0	3
Total	2010	894	692	20	65	35	133
RY10-RY14	2011	787	564	24	76	24	137
	2012	767	578	17	75	25	100
	2013	771	572	20	72	28	116
	2014	783	566	24	79	21	135

^a A regulatory year begins 1 July and ends 30 June, e.g., regulatory year 2010=1 July 2010–30 June 2011. ^bTotal does not include moose of unknown sex.

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Figure 2. Drawing and registration hunts DM210, DM211, DM441, DM443, DM446-DM448, DM666, RM435, and RM445, Unit 14C, Alaska for regulatory years 2010–2014.^a

^a A regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2010 = 1 July 2010–30 June 2011).



Figure 3. Drawing hunts DM421–DM424 and DM426–DM430 in Alaska for regulatory years 2010–2014.^a

^a A regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2010 = 1 July 2010–30 June 2011).



Figure 4. Drawing hunt DM444 in Alaska for regulatory years 2010–2014.^a

^a A regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2010 = 1 July 2010–30 June 2011).

<u>Permit Hunts</u> The number of permits for drawing hunts in 14C is adjusted annually in response to survey numbers, harvest, and environmental factors (Table 5). We issued an average of 644 permits (registration and drawing) with RY14 having the lowest amount issued at 615 permits for both registration and drawing permits.

During this reporting period, permit numbers for the drawing hunts in the JBER Management Area and in upper Ship Creek were continually reduced in response to a deep snow winter and subsequent lack of conditions to conduct aerial surveys on JBER and upper Ship Creek.

In response to the record snow fall of the winter of 2011–2012, permit numbers in the Twentymile/Portage and Placer river valleys were reduced for two years and then increased following a very low snow year (Table 5). The moose populations in these drainages are susceptible to large population fluctuations during heavy snow winters and rapid build-up with low snow years.

Hunter Residency and Success

During this reporting period, hunters harvested an average of 124 animals. Total hunter success averaged 21% for all moose hunts (Table 5). Hunter participation averaged 594 hunters with the highest number of individual hunters seen in RY10 at 692 hunters (Table 6).

Local residents made up a majority of the successful hunters (62%) during this reporting period with nonresidents accounting for 5% of the successful hunters (Table 6). On average, only 12 nonresidents hunted 14C annually.

Other Mortality

Natural mortality was low in the Anchorage area from the mid-1950s to the late 1980s because of moderate annual snowpack and relatively low numbers of predators. 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 a 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 killed by vehicles and trains accounted for a large percentage of known, human-caused mortality during the past 5 years. An average of 91 moose per year were killed in vehicle collisions RY10–RY14 (Table 7). These are conservative figures because not all collisions are reported and some moose, never found, die from injuries.

An estimated 10–20 additional moose died from unknown causes each year. The majority of these deaths occur during winter. While many of these animals were not necropsied and a concrete cause of death cannot be determined, it is suspected that some of these deaths are due to the ingestion of highly toxic ornamental plants (which were found in the general vicinity). In previous years, several moose that have died of unknown causes during winter were necropsied.

	Successful Unsuccessful							Successful Unsuccessful					
Regulatory year	Local ^b resident	Nonlocal resident	Nonresident	Total (%)		Local ^b resident	Nonlocal resident	Nonresident	Total (%)	Unspecified	Total hunters		
2010	93	35	7	135 (20)		354	182	19	555 (80)	1	691		
2011	87	46	4	137 (24)		279	142	6	427 (76)	0	564		
2012	62	34	5	101 (18)		311	143	22	476 (82)	1	578		
2013	68	39	8	115 (20)		279	150	27	456 (80)	1	572		
2014	79	48	8	135 (24)		291	121	18	430 (76)	1	566		
Total	389	202	32	623 (21)		1,514	738	92	2,344 (79)	4	2,971		

Table 6. Hunter residency for all Unit 14C, Alaska hunts, regulatory years^a 2010–2014.

^a A regulatory year begins 1 July and ends 30 June, e.g., regulatory year 2010 = 1 July 2010-30 June 2011. ^b A local resident is a resident that resides in GMU 14C.

Regulatory year	Vehicle collisions	Train collisions	
2010	80 ^b	7	
2011	98 ^c	15	
2012	70	3	
2013	99 ^d	3	
2014	108	1	

Table 7. Reported accidental moose deaths in Unit 14C, regulatory years^a 2010–2014.

^a A regulatory year begins 1 July and ends 30 June, e.g., regulatory year 2010 = 1 July 2010–30 June 2011.

^b Data available only from 15 July 2010 to 15 December 2010.

^c Data available only from 1 July 2011 to 20 March 2012.

^d Data available only from 1 July 2013 to 21 May 2014.

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, these plants 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 and at least one necropsied calf was confirmed to have died from the ingestion of Japanese yew. However, the number of potentially toxic ornamental plants available to moose in Anchorage is unknown.

Alaska Board of Game Actions and Emergency Orders

The Board of Game (BOG) reauthorized all the antlerless moose hunts in Unit 14C and the Unit 7 portion of DM211 every year of this reporting period.

<u>2010:</u>

• No Southcentral BOG meeting.

2011:

- Created the Joint Base Elmendorf–Richardson (JBER) Management Area and aligned moose hunting on Elmendorf Air Force Base and Fort Richardson Army Installation.
- Created a bow-only drawing moose hunt for any bull moose in Edmonds Lake and Mirror Lake Parks (DM444).

2012:

• No Southcentral BOG meeting.

<u>2013:</u>

• No new actions were taken.

<u>2014:</u>

• No Southcentral BOG meeting.

Recommendations for Activity 2.1

We recommend continuing harvest and mortality monitoring.

3. Habitat Assessment–Enhancement

Currently, ADF&G is not conducting any habitat enhancement in 14C. However, on JBER lands, habitat enhancement specifically for moose does occur via hydro-axing. Joint Base Elmendorf–Richardson currently has a 10-year plan for moose habitat enhancement, and hydro-axes different plots each year (U.S. Air Force 2016). As part of their moose habitat enhancement, they completed browse surveys for various plots across JBER.

Results and Discussion

Extensive habitat enhancement on 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, Wildlife Biologist, U.S. Forest Service, 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.

Large tracts of subalpine and riparian habitat are protected throughout the 500,000-acre Chugach State Park, as well as Chugach National Forest lands between Girdwood and Portage. There are several thousand acres of lowland habitat 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.

Recommendations

As several lines of evidence suggest that the moose population in Unit14C is near carrying capacity, basic habitat assessments are recommended to provide qualitative and quantitative information on habitat use and available forage quality. However, because habitat enhancement is problematic in Unit 14C due to equipment access, land status, and proximity to urban developments, habitat enhancement is not recommended at this time.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

• Moose-vehicle collisions in Unit 14C remain a significant problem. 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. Area biologists need to be involved early in the planning of roads and long fences and must have information on moose distribution and movement corridors.

- As a result of moose living and breeding in the urban parts of Anchorage, every spring we receive numerous calls regarding moose calves, particularly those thought to be orphaned. In recent years, there have been several organizations that have tried to collect, raise, and release orphan calves. A comprehensive orphan moose calf guide is needed to support staff actions in regards to these calves and interacting with moose calf raising organizations.
- Continue to work with the Anchorage Parks and Recreation department and local trail advocate groups on trail planning to avoid human–moose conflicts on single track and other bike trails. Over recent years, the demand for more bike and single track trails has grown. As parks become more saturated with trails moose will have less escape terrain.
- Moose are also considered residential pests in Unit 14C. 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. 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. Continuing to educate the public on moose behavior and how to stay safe around moose will help reduce conflicts and increase the public tolerance of moose (Whittaker et al. 2001).
- Continue discussions with the municipality and with concerned user groups regarding providing limited moose hunting opportunities in city parks at a future date.

Data Recording and Archiving

- Moose survey form (Appendix A).
- Management moose captures (entangled or objects attached) will be entered into the department's WinfoNet database. Field sheets are stored in the Anchorage ADF&G building in office 2004.
- All moose survey data paper files are stored in the Anchorage ADF&G building in office 2006.
- Digital copies of JBER moose surveys are found in (cjstantorf(\\dfg.alaska.local\Home\Anchorage) (H:)\Asst. AB Anchorage Files\Anchorage AAB Files\BGDIF\Moose\JBER Survey's)
- Moose harvest reports for all 14C hunts are stored in the WinfoNet database.

Agreements

None.

Permitting

ADF&G collection permit.

Conclusions and Management Recommendations

Moose are adversely affected by snow depths of 70–90 cm (28–36 inches), which impede movement, and depths greater than 90 cm, which restrict movement to the extent that adequate food intake may be unattainable (Coady 1974). Mean snow depths in the 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-inches depth), interspersed with a few milder winters. Continued severe winters will exacerbate overbrowsing, which may result in substantial losses of moose in subsequent years.

The winter of 2011–2012 was characterized by the deepest snowfall on record. Even though surveys were not conducted in the fall of 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 was 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.

Management objectives for Unit 14C moose were met during this reporting period. Currently, the population is remaining at the lower end of our objective while maintaining desired sex ratios and harvest objectives. The creation of several new hunts has helped maintain moose numbers within population goals, resulting in a healthier population and decreased moose–human conflicts.

Due to the high amount of moose–human conflicts within Unit 14C, maintaining the population at the low end of the current objective is recommended. 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, Anchorage, and most municipal parks. Additionally, the intensive management finding for moose in 14C should be changed to a negative finding in codified regulation. Realistically, if the population were to fall below 1,500 moose, the ability to conduct either predator control or population enhancement would be very limited.

II. Project Review and RY15–RY19 Plan

Review of Management Direction

MANAGEMENT DIRECTION

There are no changes to the management direction for moose in Unit 14C.

GOALS

- Maintain the moose population in GMU 14C for consumptive and nonconsumptive uses.
- Mitigate human-moose conflicts to promote public safety for Anchorage residents.

CODIFIED OBJECTIVES

Amounts Reasonably Necessary for Subsistence Uses (ANS)

None.

Intensive Management

In 2001, the Alaska Board of Game adopted a positive finding for the intensive management (IM) of moose in Unit 14(C). The current intensive management objectives are as follows:

- Population Objective: 1,500–1,800 moose.
- Harvest Objective: 90–270 moose.

MANAGEMENT OBJECTIVES

- 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 30 bulls:100 cows.
- Maintain the moose population at a level to promote public safety by reducing conflicts with Anchorage residents.

REVIEW OF MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1. Conduct winter moose surveys (modified Gasaway census (Gasaway, 1986), supplemented by minimum counts in other drainages) to get a population estimate and composition figure.

Data Needs

A more robust population estimate with confidence intervals is needed in the areas of Unit 14C that are open to harvest. Additionally, a technique is required that will provide an estimate of moose numbers in those areas of Unit 14C in which aerial surveys cannot be conducted; a large portion of Unit 14C lies within the Anchorage urban area and the FAA Class C veil of the Ted Stevens Anchorage International Airport.

Methods

The modified Gasaway census should be expanded to include all of the drainages where minimum count surveys are currently being conducted, and new methods to count moose in areas of 14C that cannot be surveyed using typical methods should be explored. A new ground-based technique that combines a visual census with genetic information collected from biopsy samples (including genetic samples from road killed and hunter harvested moose) is currently being explored as a method of counting moose in the Anchorage urban area. Application of the new survey technique will be attempted midwinter in RY16 with help from research biologists.

2. Mortality-Harvest Monitoring

ACTIVITY 2.1. Monitor mortality and harvest in Unit 14C annually.

Data Needs

No change from prior reporting period.

Methods

No change from prior reporting period.

3. Habitat Assessment–Enhancement

Currently, there is no habitat assessment or enhancement done in 14C by ADF&G.

Data Needs

While the work on JBER provides information on habitat use on the installation, it is not necessarily a representation of habitat use in the rest of Unit 14C. Habitat survey plots in different areas of Unit 14C could provide a more complete idea of habitat use and forage quality.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

No change from prior reporting period.

Data Recording and Archiving

- Moose Survey Form (Appendix A)
- Management moose captures (entangled or objects attached) will be entered into ADF&G's WinfoNet database. Field sheets are stored in the Anchorage ADF&G

building in office 2004.

- All moose survey data paper files are stored in Anchorage ADF&G building in office 2006.
- Digital copies of JBER moose surveys are found in (cjstantorf(\\dfg.alaska.local\Home\Anchorage) (H:)\Asst. AB Anchorage Files\Anchorage AAB Files\BGDIF\Moose\JBER Survey's)
- Moose harvest reports for all 14C hunts are stored in the WinfoNet database.

Agreements

None.

Permitting

ADF&G collection permit.

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Appendix A. Anchorage, Alaska moose census for
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MOOSE CENSUS FORM									
Pgof									
SU# Strata TYPE OF SEARCH						TIME SPENT SEARCHING			
SU size Date									
PilotStandard						STD. INT.			
Acft type Temp [°] F Intensive						Start @			
GMU: Location (approx. 12 min/mi ²) Elapsed: min.									
CHECK CONDITIONS THAT MAY HAVE AFFECTED THE QUALITY OF THE DATA:									
Inadequate search effortInadequate snow coverPoor LightLow clouds or fog									
Uncooperative pilot	Improper and	d pilot	Observ	_ Observer airsickPoor visibility / snow on tree Inexperienced observerMovement in/out of adjacer					
Classification errors	movement in/out of i	ntensive sea	arch area	Too	manym	noose in intensive search area (>15)			
SURVEY RATING SNOW	AGE SNOW COVER		PREDOM	NANT HA	BITAT	TYPE IN THE SAMPLE UNIT (circle one):			
A Excellent 2 <1 w	n 1. Complete eek 2. Some low w	eg showing	1 OPEN	lower els	evation	predom shrub riparian or wetland			
B. Good 3. >1 w	eek 3. Bare ground	l showing	2. MIXED	OPEN FC	DREST N	with some shrub understory			
C. Fair	-	-	3. DENSE	SPRUCE	FOREST	with little shrub understory			
D. Poor LIGHTT	YPE LIGHT INTENSI	TY 2 Low	4. DENSE	DECIDUC	OUS FO	REST birch, aspen, etc. – few shrubs			
2. Flat	2. Medium	J. LOW	6. BURN	FINESTIR	00				
≤30" 31-49" ≥50	" COWS		1		in				
Ref. BULLS	Cow Cow	Cow Lo	ne	Total	SCF				
nos. YRLG MED. LRG	. W/O W/1	W/2 Ca	lf Unkn	Moose	Plot?	REMARKS			
1									
2									
3									
4									
5									
6									
7									
8									
9							\neg		
10									
11		┼──╟──					\neg		
12		┼──╟──							
13							\neg		
SURVEY SUMMARY (Do not add calves to cows in column totals):									
1-13						SCF Plot Summary:			
14-42						# Moose reg. search			
Total						# Moose int. search			

Appendix B. GMU 14C, Alaska moose survey 2011 memorandum.

STATE OF ALASKA

DEPARTMENT OF FISH AND GAME

DIVISION OF WILDLIFE CONSERVATION

MEMORANDUM

- TO: Gino Del Frate Management Coordinator ADF&G/DWC/Reg. II Anchorage
- FROM: Jessy Coltrane, Area Biologist Dave Battle, Assistant Area Biologist ADF&G/DWC/Reg.II GMU 14C Anchorage

RE: GMU 14C Moose Survey 2011

15 December 2011

From 14 November 2011 to 27 November 2011, Dave Battle (Assistant Area Biologist), Tony Camahan (Wildlife Technician) and I conducted moose surveys in Game Management Unit (GMU) 14C. Surveys were conducted using a fixed-wing super cub piloted by Billy Wiederkehr, Wiederkehr Air, and Jose de Creeft, Northwind Aviation. Composition counts were conducted in the Twentymile, Placer, and Portage River drainages, as well as in the Eklutna Management Area, Peters Creek valley, and Thunderbird valley. We also completed a Gasaway census in Ship Creek valley and on the Joint Base Elmendorf Richardson (JBER).

Based on our surveys, I estimate a moose population of 1540 moose in GMU 14C, with a calf:cow ratio of 20 calves per 100 cows and a bull:cow ratio of 32 bulls per 100 cows (Table 1; Fig. 1). This estimate was derived using three methods. The Gasaway census provides a population estimate with a correction factor for moose surveyed in the Ship Creek/JBER count areas. This area currently and historically maintains the largest number of moose in GMU 14C (approximately 23% of total population). The areas in which we completed composition counts provide us with minimum numbers of moose; however we had excellent survey conditions and the entire drainages were surveyed. While we are unable to calculate a correction factor for sightability to these numbers, I feel that our counts were relatively comprehensive and reflect the majority of moose in these areas. Given different terrain and habitat we feel it was inappropriate to expand the sightability correction factor from the Gasaway survey. For the areas within GMU 14C that we did not survey in 2011, we estimated moose numbers using previous estimates and percentages of the entire population that were derived in prior survey years. For example,

SEAN PARNELL / GOVERNOR

333 Raspberry Rd. Anchorage, AK 99518 PHONE: (907) 267-2811 e-mail: jessy.coltrane@alaska.gov historic surveys have indicated that 7% of the total moose population in GMU 14C is found in Bird Creek and Indian Creek drainages. Therefore we estimate the number of moose in these drainages to be 7% of the current population.

The current population estimate is within our population objective of 1500 to 1800 moose (Fig. 1). This estimate is similar to the 2010 estimate of 1500 moose; however our survey in 2011 was more comprehensive than in 2010. To date moose harvest in GMU 14C is 89 moose (6 % of the total estimated population); however, our late season hunt will continue through January and we expect to harvest up to 20-30 additional moose this season.

We are faced with numerous survey challenges in GMU 14C, including vast areas of human development and large tracts of public land within restricted air space. In these areas it is virtually impossible to count moose using traditional aerial methods. This winter we will work with Biometrician Earl Becker to research potential ground-based methods to assess moose densities in municipal parks, which provide the largest portion of habitat in GMU 14C that cannot be surveyed from the air. We will also be working with Earl Becker to potentially address sightability factors in heavily forested areas and determine if there are other survey methods that would be more appropriate than the Gasaway census.

Survey Area	Bulls	Cows	Calves	Total	Estimated Number of Moose	Bulls : 100 Cows	Calves : 100 Cows
Twentymile/Placer/Portage	25	119	34	178	178	21	29
JBER/Ship Creek*	83	222	31	280	335	37	14
Peters Creek	10	30	8	48	48	33	27
Eklutna/Thunderbird	18	50	12	80	80	36	24

Table 1. Number of moose observed during composition counts and Gasaway survey flights in GMU 14C, 2011.

* Gassaway census



Unit 14C Moose Population Estimate and Harvest

Figure 1. Estimated moose population and harvest in GMU 14C (1985-2011).

Appendix C. GMU 14C. Alaska moose survey 2013 memorandum.



Department of Fish and Game

DIVISION OF WILDLIFE CONSERVATION Anchorage Area Office

> 333 Raspberry Rd. Anchorage, AK 99518 Main: 907.267.2257 Fax: 907.267.2433

MEMORANDUM

TO: Gino Del Frate Management Coordinator ADF&G/DWC/Reg. II Anchorage

FROM: Jessy Coltrane Area Biologist ADF&G/DWC/Reg.II GMU 14C Anchorage

RE: GMU 14C Moose Survey 2013

15 January 2014

On 17 November, and 2 – 4 December 2013, Dave Battle (Assistant Area Biologist), and Dave Saalfeld (Regional Wildlife Biologist) conducted moose surveys in Game Management Unit (GMU) 14C. Surveys were conducted using fixed-wing super cubs piloted by Billy Wiederkehr, Wiederkehr Air (surveyed all four days), and Mike Meekin (surveyed 2 – 3 December 2013), Meekin's Air Service. Composition counts were conducted in the Twentymile, Placer, and Portage River drainages, as well as in Peters Creek, Thunderbird and Upper Ship Creek Valley. In addition, we surveyed Joint Base Elmendorf-Richardson lands north of Eagle River. For all survey areas, multiple transects were flown starting above the treeline and continuing throughout the drainage or until all available habitat was surveyed. Pilots used a global positioning system (GPS) trackline to ensure adequate coverage in each drainage or unit. Additional passes were made in areas with dense canopy cover to account for reduced sightability of moose in these habitats. Once moose were observed, the aircraft made multiple passes so the observer could enumerate the number of individual moose within a group, and classify them as yearling bulls (antlers ≤ 30 in), medium bulls (31 – 49 in), large bulls (>50 in),

cows without calves, cows with one calf, and cows with twins, lone calves, and unidentified moose.

Due to poor snow coverage throughout most of November, and inclement weather conditions and lack of pilot availability during late November, surveys could not be conducted throughout all of GMU 14C before bulls started dropping their antlers in mid-December. For the areas surveyed, viewing conditions were fair to good on the days the survey was conducted with complete snow coverage and partly cloudy to sunny conditions. However, low fog reduced visibility on JBER during the afternoon of 3 December. Winds were light with temperatures ranging from -12°C to -3°C. Surveys were flown between 1000 and 1545 with a total survey time of 12 hours and 57 minutes. A total of 467 moose (Table 1) were counted, with an observation rate of 36 moose per hour.

Due to incomplete survey coverage, a population estimate for GMU 14C has not yet been calculated. However, our compositional counts provided a calf:cow ratio of 22 calves per 100 cows and a bull:cow ratio of 35 bulls per 100 cows for all areas surveyed combined (Table 1). Compositional counts only provide a minimum number of moose within GMU 14C.

In 2011, our surveys resulted in a population estimate of 1540 moose, with a calf:cow ratio of 20 calves per 100 cows and a bull:cow ratio of 32 bulls per 100 cows. This estimate was within the population objective of 1500 to 1800 moose for GMU 14C. Although we have yet to calculate a current population estimate, the current estimate for calf:cow and bull:cow ratios is similar to the 2011 estimate. To date moose harvest in GMU 14C is 90 moose; however, not all late season hunters have reported. The final harvest tally could include up to 5 additional moose.

We are faced with numerous survey challenges in GMU 14C, including vast areas of human development and large tracts of public land within restricted air space. In these areas it is virtually impossible to count moose using traditional aerial methods. This winter we are working with ADFG Biometrician Earl Becker to investigate the development of ground-based methods to assess moose densities in municipal parks, which provide the largest portion of habitat in GMU 14C that cannot be surveyed from the air. We will also be working with Earl Becker to determine a correction factor for surveys flown on JBER and Upper Ship Creek Valley and a final population estimate for GMU 14C. The results of this analysis will be outlined in a future memo.

			-	-		Bulls : 100	Calves : 100
Survey Area	Date	Bulls	Cows	Calves	Total	Cows	Cows
Twentymile/Placer/Portage	4 Dec	24	103	28	155	23	27
JBER/Ship Creek	2-3 Dec	55	142	28	225	39	20
Peters Creek	18 Nov	12	28	9	49	43	32
Thunderbird	18 Nov	13	22	2	38	59	9

Table 1. Number of moose observed during composition counts in GMU 14C, 2013.

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Division of Wildlife Conservation