Species Management Report and Plan ADF&G/DWC/SMR&P-2017-4

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

Report Period 1 July 2010–30 June 2015, and

Plan Period 1 July 2015–30 June 2020

Tim C. Peltier

2017

Alaska Department of Fish and Game Division of Wildlife Conservation

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Funding for survey and inventory Project 1.0 was provided through the Federal Aid in Wildlife Restoration grant program. Hunters are important founders of the modern wildlife conservation movement. They, along with trappers and sport shooters, provided funding for this publication through payment of federal taxes on firearms, ammunition, and archery equipment, and through state hunting license and tag fees.

Species management reports and plans provide information about species that are hunted or trapped and management actions, goals, recommendations for those species, and plans for data collection. Detailed information is prepared for each species every 5 years by the area management biologist for game management units in their area, who also develops a plan for data collection and species management for the next 5 years. This type of report is not produced for species that are not managed for hunting or trapping or for areas where there is no current or anticipated activity. Unit reports are reviewed and approved for publication by regional management coordinators and are available to the public via the Alaska Department of Fish and Game's public website.

This species management report and plan was reviewed and approved for publication by Todd A. Rinaldi, Management Coordinator for the Division of Wildlife Conservation, Palmer.

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This document, published in PDF format only, should be cited as follows:

Peltier, T. C. 2017. Moose management report and plan, Game Management Unit 14A: Report period 1 July 2010–30 June 2015, and plan period 1 July 2015–30 June 2020. Alaska Department of Fish and Game, Species Management Report and Plan ADF&G/DWC/SMR&P-2017-4, Juneau.

Cover photo: A cow moose recovers from immobilization fitted with a GPS collar that will aid in a study of moose-vehicle collisions in Unit 14A, Southcentral Alaska. ©2017 Photo by Tim C. Peltier.

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Purpose of this Report

This report provides a record of survey and inventory management activities for moose in Unit 14A for the previous 5 regulatory years and plans for survey and inventory management activities in the 5 years following the end of that period. A regulatory year (RY) begins 1 July and ends 30 June (e.g., RY10 = 1 July 2010–30 June 2011). This report is produced primarily to provide agency staff with data and analysis to help guide and record its own efforts but is also provided to the public to inform them of wildlife management activities. In 2016 Alaska Department of Fish and Game's (ADF&G) Division of Wildlife Conservation launched this new type of 5-year report to more efficiently report on trends and describe potential changes in data collection activities over the next 5 years. It replaces the moose management reports of survey and inventory activities that were previously produced every 2 years.

I. RY10–RY14 Management Report

Management Area

Unit 14A is located in Southcentral Alaska, north of Anchorage. The total area of Unit 14A is 2,685 mi^2 however the area of suitable habitat below a mean height of 3,500 feet elevation is estimated at 2,131 mi^2. Unit 14A consists of all land from the east bank of the Susitna River beginning at the mouth at Cook Inlet heading north to the mouth of Willow Creek then south of the north bank of Willow and Peters Creek to the headwaters, and south of the hydrologic divide separating the Susitna River and the Knik Arm drainages to the outlet creek at lake 4408, then southeast in a straight line to the northernmost fork of the Chickaloon River then south along the east bank of the Chickaloon River to the bridge on the Glenn Highway at milepost 77.7, then following the hydrologic divide separating Carbon and Coal Creeks to the hydrologic divide between the waters of the Matanuska River and the Knik Glacier across the face of the glacier south to the south bank of the Knik River to Cook Inlet, following Cook Inlet to the mouth of the Susitna River (Fig. 1).

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

The moose population and the human population in Unit 14A have grown significantly since the area was settled by relocated farmers in the 1930s. Moose were described as scarce during the 1930s. The moose population likely grew to numbers approaching 7,000 during the 1960s (Griese and Masteller 1996). Moose numbers fluctuated with deep snow winters, but stabilized between 5,000 and 6,000 animals in the 1990s. Surveys since 2001 have shown the population at or above the upper end of the population objective range. Managers addressed the issue by increasing the number of antlerless permits available. The human population in the Matanuska–Susitna (Mat-Su) Valley continues to be one of the fastest growing areas in the state. Land-clearing activities associated with agriculture, development, and road construction have created considerable early successional habitat and thus contributed to an increase in moose browse. As the area continues to grow, much of the early seral moose habitat is being replaced with homes, roads, and associated industry (Peltier 2012).

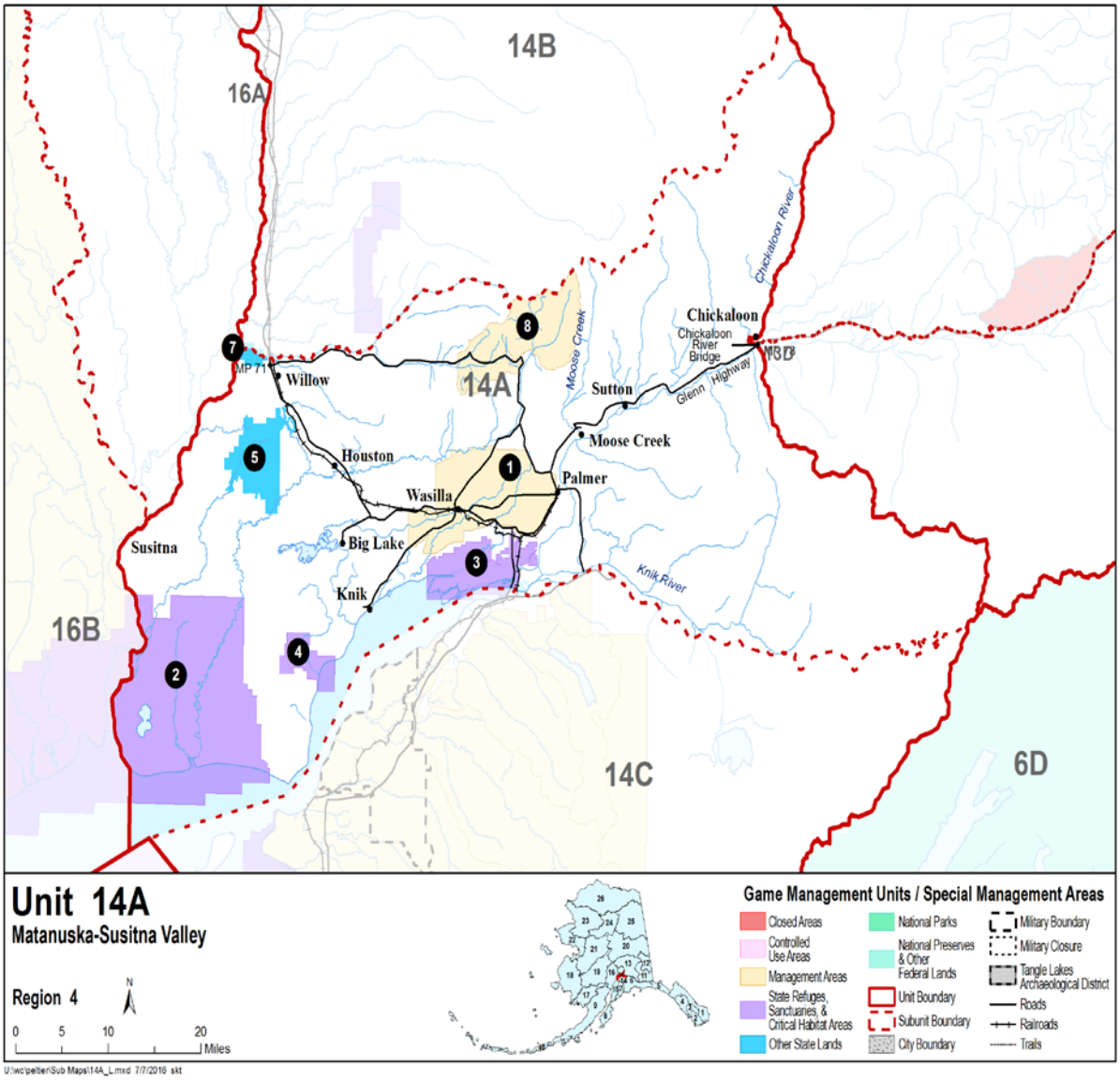

Figure 1. Unit 14A in Southcentral Alaska.

Between statehood (1959) and 1971, harvests ranged from 20 to 1,300 moose (Griese 2000). The harvest was predominantly bulls, but the harvest of antlerless moose was as high as 1,131 in RY62 (Griese 2000). Following several severe winters, antlerless moose seasons were discontinued during RY72–RY77 and the mean annual harvest of bulls declined, ranging between 167 and 346. Antlerless seasons began again in RY78. Starting in RY93, the bull harvest during the general season was restricted to moose with antlers having a spike or fork on at least one side or a minimum of 3 brow tines (bt) on at least one side or a minimum total width of 50 inches. This selective harvest strategy is referred to as "spike-fork 50-inch" (SF-50-3bt) (Schwartz et al. 1992). Between RY93 and RY10 the average general season harvest was 363 (range 226–498).

Habitat enhancement efforts during the 1990s were aided by fires. In 1993, a successful cooperative effort between state agencies resulted in a 900-acre controlled burn to enhance wintering moose habitat near the community of Willow (Collins 1996). In June 1996, a 37,000-acre fire, caused by humans, occurred in the Big Lake area termed the Miller's Reach Fire (Griese and Masteller 1998). Habitat regeneration from this fire substantially enhanced moose forage and habitat in Unit 14A. Since 2001 the Ruffed Grouse Society (RGS) and the State of Alaska's Division of Forestry (DOF) and Department of Fish and Game (ADF&G) have been cooperating on habitat enhancement efforts in the Matanuska Valley Moose Range (MVMR) to benefit both moose and ruffed grouse. Between 2001 and 2012, 564 acres of aspen-dominated stands were clearcut in MVMR. In addition, ADF&G staff in Palmer have been working with DOF staff on proposed timber sales in an effort to enhance moose habitat in lieu of prescribed fires.

The Alaska rail line extends from Anchorage to Fairbanks and includes 41 miles of track in Unit 14A. Moose use railroad tracks in winter for easier travelling (i.e., energy conservation) and their use becomes more pronounced in years of high snowfall; subsequently annual moose mortality from trains can vary greatly and can become excessive in snowy years.

The development and human population growth of the Mat-Su Valley has resulted in an increase in roads in the unit, along with road improvements, increase density of vehicles, and increasing speeds, have led to an increase in moose-vehicle collisions (MVC) commensurate with the population growth. Similar to moose railroad collisions, MVCs vary annually and are more common in years of high snowfall.

Management Direction

EXISTING WILDLIFE MANAGEMENT PLANS

- Direction in the Talkeetna River, Matanuska Glacier, Matanuska Valley, and Palmer Hay Flats moose management plans (ADF&G 1976) has been reviewed and modified through public comments, staff recommendations, and Board of Game actions over the years. A record of these changes can be found in the division's management report series. The plan portion of this report contains the current management plan for moose in Unit 14A.
- MVMR is located in the eastern portion of Unit 14A and western Unit 13A. It was created by the legislature in 1984 to maintain, improve, and enhance moose populations and other wildlife resources. It encompasses 132,500 acres of habitat and is co-managed by ADF&G and the Alaska Department of Natural Resources (DNR). It is managed under the Matanuska Valley Moose Range Management Plan (DNR and ADF&G 1986).

GOALS

- Protect, maintain, or enhance the moose population and its habitat in concert with other components of the ecosystem to provide for high levels of human consumptive use.
- Provide opportunities for nonconsumptive uses (e.g., to view and photograph moose).

CODIFIED OBJECTIVES

Intensive Management

In 2001 the Alaska Board of Game adopted a positive finding for intensive management of moose in Unit 14A. Current intensive management objectives are as follows:

- Population objective: 6,000–6,500 moose.
- Harvest objective: 360–750 moose.

MANAGEMENT OBJECTIVES

1. Maintain the moose population at 6,000–6,500 moose.
2. Manage for a posthunt (fall) sex ratio of 20–25 bulls:100 cows.
3. Achieve an annual harvest of 360–750 moose.

MANAGEMENT ACTIVITIES

Assessing population status and trends, monitoring harvest and mortality, and assessing habitat conditions are integral components of management of moose in Unit 14A. Survey and inventory management activities used to monitor populations in Unit 14A are described below.

1. Population Status and Trend

ACTIVITY 1.1. Conduct aerial inventory and sex and age composition survey in the unit to determine population size, composition, productivity, and trends.

Data Needs

Moose abundance is a basis from which sustainable harvest may be estimated and provides a density context for interpreting nutritional condition relative to habitat conditions. Sex and age composition information can be used to determine appropriate harvest levels and recruitment into the population. Sex and age ratio data may also be used to model population structure and trends.

Methods

Geospatial population estimator (GSPE; Kellie and DeLong 2006) surveys are conducted on all available moose habitat in the unit below 3,500 feet. Surveys are conducted between 1 November and 6 December on a triennial basis as weather and snow conditions permit. This approach produces population estimates and statistically bound sex and age composition estimates by using a stratified random sampling design and geostatistical models of autocorrelation. It is designed for high intensity surveys of moose (8–10 min/mi^2) from a PA-18 Super Cub or equivalent aircraft to obtain a relatively unbiased estimate of moose numbers, but we correct sightability for typically lower achieved search intensity. Teams of pilots and observers record moose age and sex classes in the field for later analysis (Appendix A).

In Unit 14A, annual stratification flights are generally used and conducted with a 4-person crew at approximately 1,000 feet from a Cessna 185 prior to conducting the survey of the rest of the unit with Super Cubs. Classification of survey units as high or low moose density is based on the

number of observed moose, moose tracks, and availability of favorable moose habitat which is evaluated relative to historic data. Using only 2 stratification categories minimizes potential classification error caused by moose movements between survey units and provides better continuity when the survey is interrupted by weather delays that could result in a change in moose distribution during the survey. For stratification purposes sample units that are likely to have fewer than 5 moose in the unit are considered "low" stratum and sample units that are likely to contain ≥5 moose are considered "high" stratum units. Sightability correction factors are developed for each stratum by randomly selecting a subset of the selected units and intensively searching a quarter of the unit at 10–12 min/mi^2 and noting the difference between the number of moose seen during the regular and intensive surveys.

In years where weather conditions, logistics, or budget limitations prevent the ability to complete a GSPE survey in Unit 14A, smaller scale sex and age composition surveys have been completed in order to assess population trends. In a manner similar to the GSPE survey, pilot-observer teams flying at between 300 and 500 feet above ground level count moose of each sex and age class in areas of known winter concentrations.

Results and Discussion

The Unit 14A moose population was above the population objective during the reporting period and appears to have increased from RY11 to RY13 (Table 1; Appendices B and C). The 2011 survey sampled 36 high strata units (35%) and 47 low strata units (19%) of the 352 units available. In total 24% of the available moose habitat was surveyed. The 2013 survey consisted of 34 high strata units (33%) and 48 low strata units (20%) of the 346 units available also representing 24% of the total available moose habitat. The GSPE estimates for 2011 and 2013 were similar (7,070 ± 656 in 2011 vs. 6,851 ± 680 for 2013 [point estimate ± standard error]). However differences in the sightability correction factors in the high strata of 1.13 in 2011 versus 1.15 in 2013, and low strata of 1.3 in 2011 versus 1.55 in 2013, result in an increase in the estimated population of moose in Unit 14A of 16%.

Recommendations for Activity 1.1.

Continue:

- Due to the importance of the Unit 14A moose population for the hunters of Southcentral Alaska, GSPE surveys should be continued on a biennial basis as weather and snow conditions permit and should remain one of the higher priority surveys for the Palmer office. Consultation with a biometrician to determine which adjustments in the sampling scheme should be done to address the high variance of the results. The units subsampled to develop sightability correction factors should be increased to account for variability and absence of moose spotted in both the regular and intensive surveys.

Table 1. Unit 14A moose fall composition and estimated population from geospatial population estimates, Southcentral Alaska, regulatory years[a] 2010–2014.

Regulatory year	Bulls:100 cows[b]	Yearling bulls:100 cows	Calves:100 cows	Percent calves	Adults	Moose observed	Estimated population (90% CI[c])[d]	Estimated population w/SCF[e]	Moose/mi^2 w/SCF[f]
2010[g]									
2011	19 (2)	6 (1)	41 (2)	26 (2)	1,383	1,863	7,070 (±15%)	7,993 (±19%)	3.6
2012[h]	29 (2)	7 (1)	31 (2)	19 (2)	1,190	1,474			
2013	21 (2)	8 (1)	43 (2)	26 (2)	1,289	1,750	6,851 (±16%)	9,303 (±24%)	4.2
2014[g]									

[a] Regulatory year begins 1 July and ends 30 June, e.g., regulatory year 2010 = 1 July 2010–30 June 2011.
[b] Ninety percent confidence interval, plus and minus the estimate, in parentheses.
[c] CI = confidence interval.
[d] Geospatial population estimation (GSPE) method.
[e] SCF = sightability correction factor.
[f] Based on habitat available as determined by the total area of the GSPE grid for each area.
[g] No survey completed.
[h] Sex and age composition survey of known wintering areas.

ACTIVITY 1.2. Spring twinning surveys.

Data Needs

Determining the ratio of cows that have twin calves to cows with singletons provides an indication of maternal condition and productivity. Trends in this indicator are very important to determining the nutritional condition of the moose population, the habitat quality, and are integral to management on a sustained yield basis.

Methods

Twinning rate surveys are conducted from an R-44 helicopter flown at ≤500 feet above ground level over a set course of known calving areas. Twinning surveys are flown in late May within a week of the median calving date. They are repeated at least twice to account for differences in sightability due to weather and foliage condition as well as variations in calving phenology. All moose are classified as; bull, yearling cow, adult cow without calf, unknown, or adult cow with a single, twin, or triplet calves. A sample size of at least 100 cows was considered sufficient. Twinning rate is calculated as the proportion of cows with 2 or more calves from the sample of all cows with calves.

Results and Discussion

Twinning rates decreased from 45% in RY10 to a low of 22% in RY13 with a slight recovery to 23.8% in RY14 (Fig. 2). In spite of the decrease in the twinning rate our results indicate that there has not been a significant degradation of the habitat and that in all likelihood the population in Unit 14A is still growing. However, the potential for a lag between the degradation in habitat quality and quantity caused by overbrowsing and a detectable decline in the twinning rate may exist.

Recommendations for Activity 1.2.

- Continue with spring twinning rates surveys.
- Modify protocol for a minimum sample of 50 cows with calves in order to decrease potential sampling bias, and consult with biometrician in order to improve sampling design and accuracy of results.

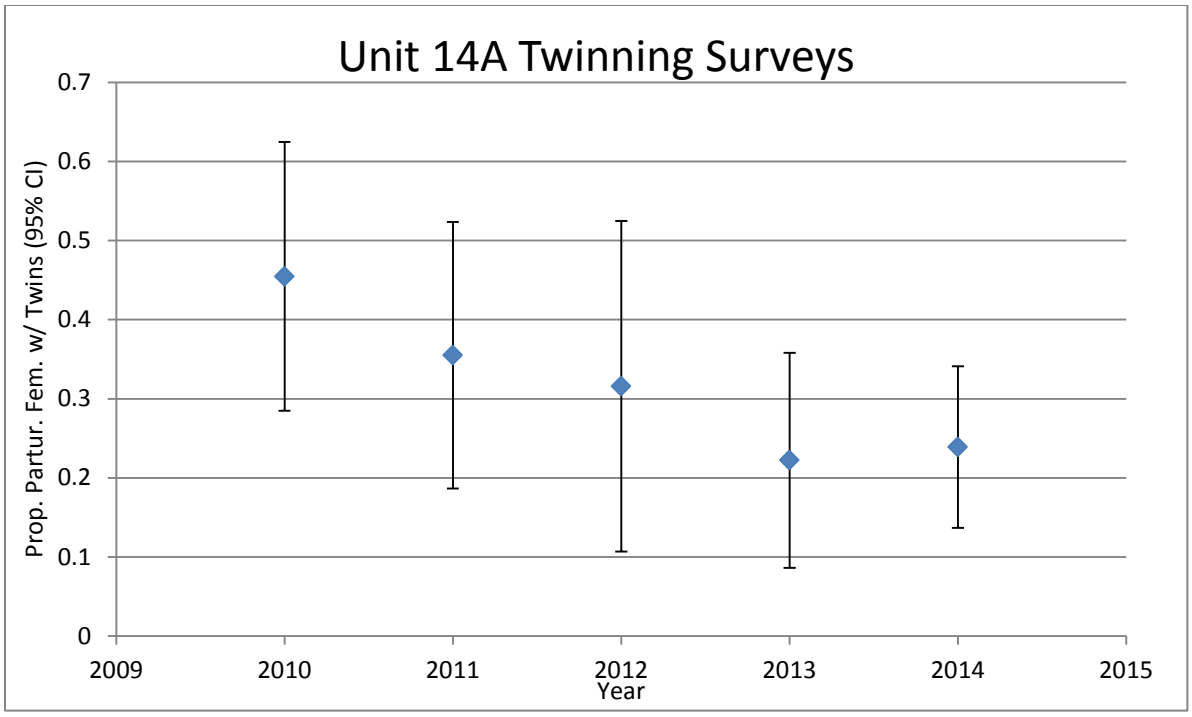

Figure 2. Unit 14A spring twinning surveys, Southcentral Alaska, regulatory years 2010–2014.

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

2. Mortality-Harvest Monitoring and Regulations

ACTIVITY 2.1. Monitor moose mortality through field observations, hunter harvest reports, contact with hunters, and reports of other causes of mortality.

Data Needs

Monitoring, collecting, and analyzing harvest data are critical for sustained yield management. Information collected for other sources of mortality help in the development of models of the population and is useful in ameliorating negative human-moose interactions.

Methods

Moose hunting effort in Unit 14A is recorded through the moose harvest report obtained and submitted by hunters that participate in hunting within the unit. This report notes number of days hunted, location, methods of take and transportation, commercial services used, and the results of the hunter effort. Reports from the Department of Public Safety, Department of Transportation, and Alaska Railroad provide information on additional forms of mortality.

Season and Bag Limit

During the reporting period the general season for both residents and nonresidents was 10–17 August (archery only) and 25 August–25 September (archery, firearm, and muzzleloader). Hunters are limited to 1 bull with either spike or forked antlers, at least 3 brow tines on one side

or antlers ≥50 inches. In addition, resident hunters may apply for an antlerless moose draw permit that allows them to take either a cow or a calf moose (DM400–DM410), or a cow, calf, or antlerless bull (DM413). Season dates for the draw are 25 August–25 September (DM400–DM410) or 1 November–25 December (DM413; Fig. 3). During this reporting period the number of draw permits available was increased from a maximum of 400 to a maximum of 1,000—currently, 900 are issued. Resident hunters under the age of 16 also may apply for an antlerless moose draw hunt for the 25 August–25 September time frame (YM412).

Beginning in RY11 resident hunters were allowed to register for a targeted hunt (AM415). Under the provisions of this hunt a person who has completed hunter education and registers during the month of October may be randomly drawn to hunt specific bull or cow moose. The intent of this hunt is to reduce the number of nuisance moose that may be causing property damage, injured moose, or moose that have the potential to be hurt or killed due to MVCs (Peltier 2014). In RY12 the program was expanded and potential areas of MVCs were identified and a 2-mile buffer zone around specific roads was created to allow permitted hunters to take moose near roads during the winter, thus potentially reducing MVCs (Fig. 4).

Season and bag limit information is available on the ADF&G website:

http://www.adfg.alaska.gov/index.cfm?adfg=wildliferegulations.hunting

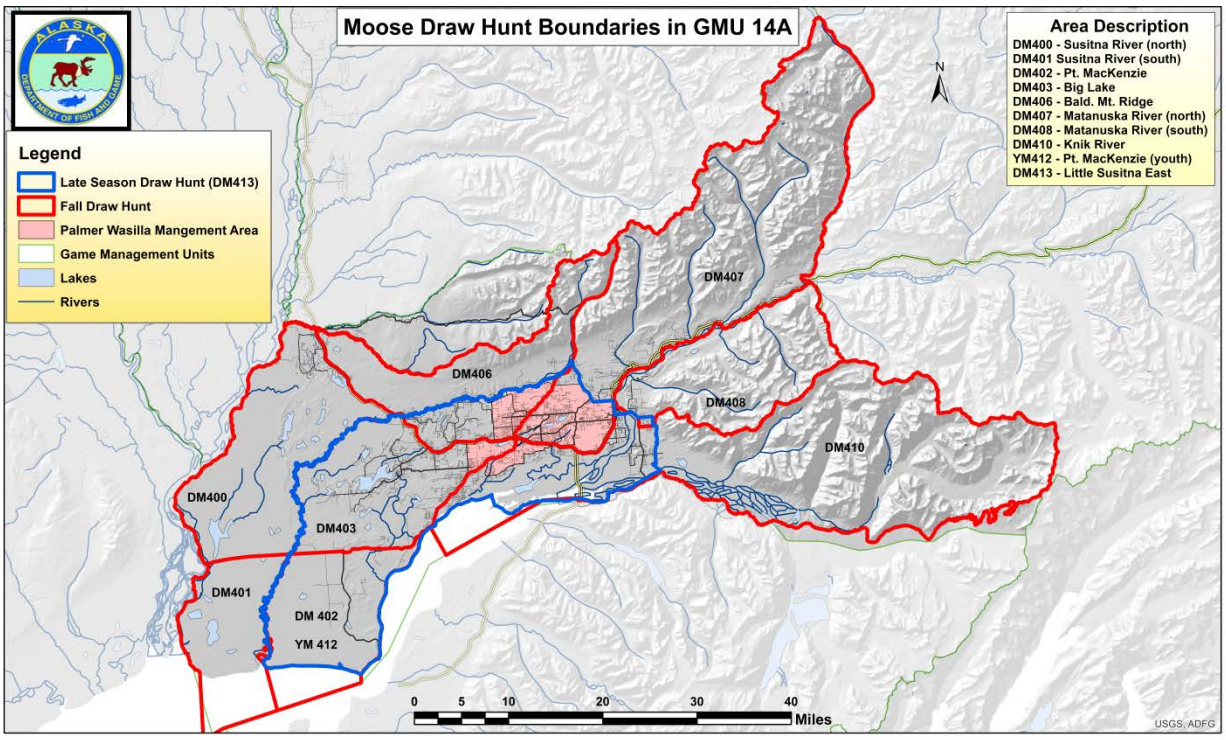

Figure 3. Unit 14A antlerless drawing permit hunts DM400–DM413, Southcentral Alaska, regulatory years[a] 2010–2014.

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

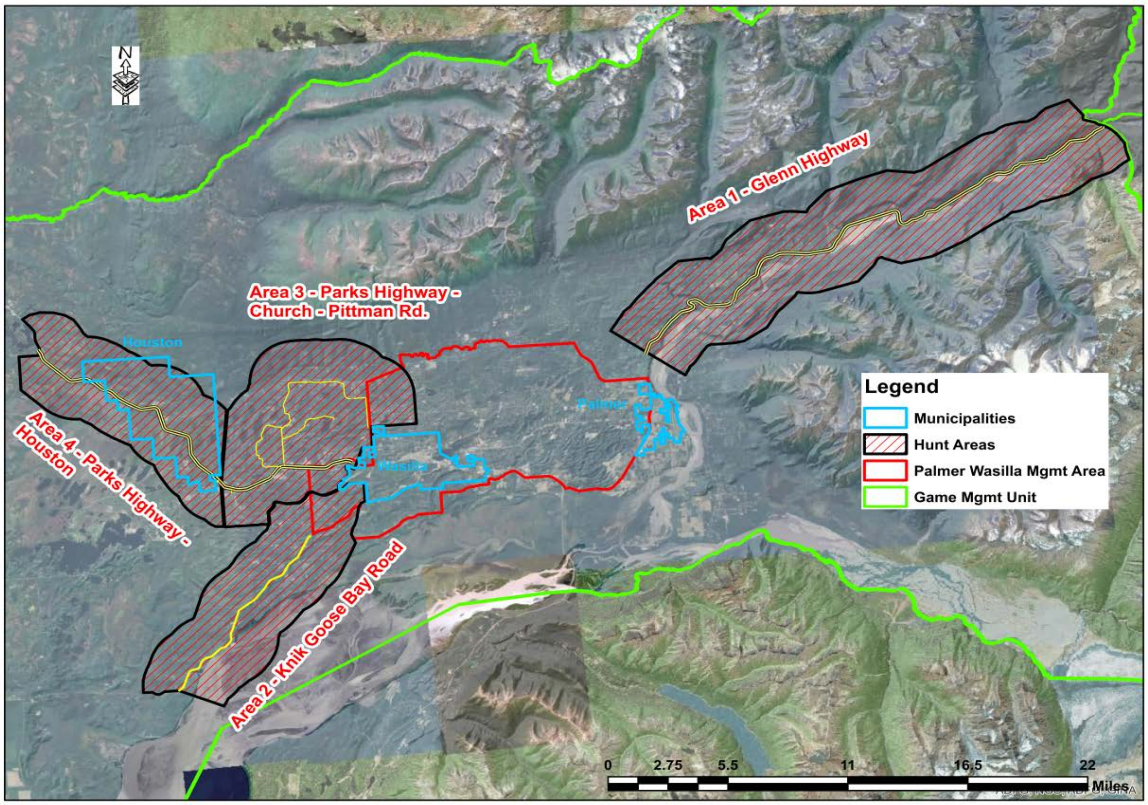

Figure 4. Targeted permit hunt AM415 zones and roadway corridors, Southcentral Alaska, regulatory years[a] 2010–2014.

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

Results and Discussion

Hunt results and causes of accidental death are summarized in Table 2. Average annual mortality was 1,127 moose during the reporting period. Due to high snow in winter RY11, antlerless draw hunts were cancelled for RY12 as a precaution. Excluding that year, average mortality is 1,220 moose per year.

Table 2. Unit 14A, moose harvest[a] and accidental death, Southcentral Alaska, regulatory years[b] 2010–2014.

Regulatory year	Harvest							Accidental deaths[c]			Grand total
	Reported				Estimated						
	M	F	Unk	Total[d]	Unreported[e]	Illegal[f]	Total	Road	Train	Total	
2010	504	209	0	713	35	60	95	229[g]	41	270	1,078
2011	525	261	2	788	37	60	97	300[h]	71	371	1,256
2012	339	122	1	462	24	60	84	179[h]	21	200	746
2013	422	514	1	937	30	60	90	218[h]	11	229	1,256
2014	480	412	1	893	34	60	94	196[h]	9	205	1,192

[a] Includes permit hunt harvest.
[b] Regulatory year begins 1 July and ends 30 June, e.g., regulatory year 2010 = 1 July 2010–30 June 2011.
[c] Road and train kills are minimum numbers.
[d] Includes moose of unknown sex.
[e] Derived by taking 7% of the reported harvest of bulls.
[f] Includes moose taken in defense of life or property, enforcement cases, and an estimate of out of season take.
[g] Roadkill estimate is based on the number of heads turned in to the Palmer ADF&G office.
[h] Roadkill estimate is based on location data provided from Department of Public Safety.

Harvest by Hunters

Reported harvest averaged 759 moose during the reporting period. Harvest was well above the harvest objective of 360–750 to reduce the population with the exception of RY12 when harvest was 462. Concerns about the effects of the heavy snow winter of RY11 led to the cancellation of the antlerless hunts in RY12.

Permit Hunts

The results of the antlerless draw hunts and the targeted hunt (AM415) are available in Table 3. To reduce the population to within population objectives, the number of permits available, and subsequently the harvest of antlerless moose, increased significantly in RY13.

Hunter Residency and Success

The vast majority of hunters reside in Unit 14. Hunter success during the general harvest season averaged 15% for the reporting period and has been decreasing over the past 3 years; however the total number of hunters has remained relatively constant with the exception of RY12. Success rates are much higher for hunters participating in the antlerless draw hunts and even higher for those selected to participate in the targeted hunt (Tables 3 and 4).

Harvest Chronology

Unlike a lot of other units, harvest in Unit 14A is distributed evenly throughout the open season with a slight increase in the last 2 weeks of the season (Table 5). Typically moose become more vulnerable to hunters during the end of the season as they approach the rut, however competition for moose in Unit 14A may lead many hunters into the field at the start of the season. Further analysis of the harvest data showed a trend toward the percentage of bulls greater than the spike/fork component decreasing during the hunting season, while the percentage of the spike/fork component increases as the season progresses. This may be the result of the decrease in availability of the larger age classes of bulls, a decrease in the selectivity of hunters as the season progresses, or a combination of the 2 factors (Peltier 2014).

Table 3. Moose harvest data by permit hunts in Unit 14A, Southcentral Alaska, regulatory years[a] 2010–2014.

Hunt/Unit/ Location	Regulatory year	Applicants	Permits issued	Percent did not hunt	Percent unsuccessful hunters	Percent successful hunters	Bulls	Cows	Unknown	Total
DM400, Unit 14A, Susitna River, Redshirt Lake										
	2010	1,291	25	0	36	64	0	16	0	16
	2011	1,211	25	8	30	70	0	11	0	11
	2012	967	0							
	2013	1,469	37	16	58	42	0	13	0	13
	2014	1,971	37	19	47	53	1	15	0	16
DM401, Unit 14A, Susitna River, Figure Eight Lake										
	2010	394	10	30	29	71	0	5	0	5
	2011	429	10	30	29	71	0	4	0	4
	2012	332	0							
	2013	563	15	13	62	38	0	5	0	5
	2014	668	15	27	72	28	0	3	0	3
DM402, Unit 14A, Point Mackenzie										
	2010	2,972	48	4	24	76	4	31	0	35
	2011	2,727	50	8	24	76	2	31	0	33
	2012	2,336	0							
	2013	3,104	75	9	37	63	1	42	0	43
	2014	4,122	75	19	48	52	0	32	0	32
DM403, Unit 14A, Big Lake										
	2010	2,199	30	9	26	74	0	20	0	20
	2011	2,144	40	15	18	82	1	27	0	28
	2012	2,224	0							
	2013	2,728	60	12	31	69	1	36	0	37
	2014	4,011	60	7	25	75	0	42	0	42
DM406, Unit 14A, Bald Mountain Ridge										
	2010	2,508	50	22	26	74	0	20	0	20
	2011	2,215	50	20	35	65	2	24	0	26

Hunt/Unit/ Location	Regulatory year	Applicants	Permits issued	Percent did not hunt	Percent unsuccessful hunters	Percent successful hunters	Bulls	Cows	Unknown	Total
	2012	1,906	0							
	2013	2,645	75	13	38	62	1	39	0	40
	2014	3,727	75	7	41	59	1	40	0	41
DM407, Unit 14A, Matanuska River, North										
	2010	4,028	80	4	34	66	0	52	0	52
	2011	3,468	85	12	33	67	1	56	0	57
	2012	2,983	0							
	2013	3,545	128	8	31	69	1	80	0	81
	2014	4,928	128	16	31	69	2	73	0	75
DM408, Unit 14A, Matanuska River, South										
	2010	1,496	65	26	56	44	0	20	1	21
	2011	1,466	75	15	44	56	2	34	0	36
	2012	1,246	0							
	2013	1,724	112	19	52	48	3	41	0	44
	2014	2,549	112	15	58	42	0	30	0	30
DM410, Unit 14A, Knik River										
	2010	2,655	40	12	23	77	1	26	0	27
	2011	2,438	50	12	27	73	1	31	0	32
	2012	1,924	0							
	2013	2,628	75	13	25	75	1	48	0	49
	2014	3,657	75	5	27	73	2	50	0	52
DM/YM412, Unit 14A, Point MacKenzie[b]										
	2010	380	12	8	27	73	0	8	0	8
	2011	428	15	13	38	62	1	7	0	8
	2012	394	0							
	2013	453	23	22	61	39	0	7	0	7
	2014	660	23	26	47	53	0	10	0	10
DM413, Unit 14A										
	2013	2,351	150	10	17	83	4	107	0	111

Hunt/Unit/ Location	Regulatory year	Applicants	Permits issued	Percent did not hunt	Percent unsuccessful hunters	Percent successful hunters	Bulls	Cows	Unknown	Total
	2014	3,738	150	8	17	83	7	107	0	114
RM/AM415, Unit 14A, Targeted Hunt[c]										
	2011	432	50	4	9	91	10	32	0	42
	2012	205	189	6	25	75	22	121	0	143
	2013	1,148	130	2	16	84	15	94	0	109
	2014	2,021	20	0	55	45	0	9	0	9

[a] Regulatory year begins 1 July and ends 30 June, e.g., regulatory year 2010 = 1 July 2010–30 June 2011.
[b] DM412 added in 2007, boundaries are the same as DM402.
[c] RM415 renamed AM415 in regulatory year 2012.

Table 4. Unit 14A moose hunter residency and success[a], Southcentral Alaska, regulatory years[b] 2010–2014.

Regulatory year	Successful						Unsuccessful						Total hunters
	Local resident[c]	Nonlocal resident	Nonresident	Unk	Total	(%)	Local resident[c]	Nonlocal resident	Nonresident	Unk	Total	(%)	
2010	473	15	13	4	505	(16)	2,535	60	64	16	2,675	(84)	3,180
2011	469	25	21	3	518	(18)	2,298	71	46	8	2,423	(82)	2,941
2012	288	15	9	2	314	(12)	2,098	60	42	3	2,203	(88)	2,517
2013	371	10	17	1	399	(13)	2,467	73	58	7	2,605	(87)	3,004
2014	431	14	24	0	469	(14)	2,702	62	60	5	2,829	(86)	3,298

[a] Does not include drawing permit hunters.
[b] Regulatory year begins 1 July and ends 30 June, e.g., regulatory year 2010 = 1 July 2010–30 June 2011.
[c] Unit 14 residents.

Table 5. Unit 14A moose harvest chronology[a], Southcentral Alaska, regulatory years[b] 2010–2014.

Regulatory year[c]	August			September				Unk	Total
	10–17	20–26	27–31	1–7	8–14	15–20	21–25		
2010	33	68	73	73	68	76	98	16	505
2011	41	82	71	64	65	92	91	12	518
2012	23	48	35	56	45	48	52	7	314
2013	51	60	47	52	53	62	62	12	399
2014	52	46	69	69	67	76	81	9	469

[a] Does not include drawing permit hunts.
[b] Regulatory year begins 1 July and ends 30 June, e.g., regulatory year 2010 = 1 July 2010–30 June 2011.
[c] Open season = 10–17 August (archery only), 25 August–25 September (General, spike fork 50-3 brow tines).

Transport Methods

Most hunters use either highway vehicles or all-terrain vehicles to access the moose hunting areas in Unit 14A. Access throughout Unit 14A is good and the extensive trail system created in the unit by all-terrain vehicles increases every year (Table 6).

Other Mortality

Moose-vehicle collisions can be a significant source of mortality for moose in Unit 14A. MVCs accounted for an average of 224 moose killed annually during the reporting period. Moose killed by trains averaged 31 per year during the same period. As a result, a collaborative investigation with Utah State has been designed to define the factors associated with MVCs and the movements of moose in the Matanuska Valley (Guttery 2016). Work is expected to commence in summer 2016.

Alaska Board of Game Actions and Emergency Orders

During the spring 2011 meeting, the Board of Game added a winter antlerless draw hunt to the other draw hunts available from 1 January to 25 February. The area selected for the hunt was the central portion of the unit. The board also added a new type of hunt that was designed specifically to address nuisance moose issues and areas where moose-vehicle collisions are likely to occur. This hunt, initially labelled RM415 and now AM415, provided up to 200 permits. Under the permit conditions, hunters were required to possess a valid hunter education card, and had to register during the month of October. Those that signed-up and met hunt suitability requirements were randomly drawn as either nuisance moose were identified, or were assigned to a predetermined area along road corridors where a high number of moose-vehicle collisions were known to occur. During the spring 2012 meeting, the board shifted the dates for the winter antlerless draw hunt from 1 November to 25 December to address concerns about the possibility of taking bulls in the midwinter hunt and increased the total number of permits available to 1,000 permits. Antlerless moose hunts are required, and have been reauthorized annually at the spring board meetings.

Recommendations for Activity 2.1.

Continue to monitor total harvest for comparison with current intensive management objectives. If the results of future population assessments show a continued increase in the population above the management objectives, consider options such as adjusting permit levels to reduce the population thus avoiding the negative impact of a population that may be above biological or social carrying capacity.

Implement research operational plan to assess factors associated with MVCs and moose movements. Work to foster communications between ADF&G, Department of Public Safety, Alaska Railroad, and nongovernmental organizations to receive timely, accurate information regarding causes of mortality and ways to reduce moose mortality in Unit 14A.

Table 6. Unit 14A transport methods (%) of successful moose hunters[a], Southcentral Alaska, regulatory years[b] 2010–2014.

Regulatory year	Transport methods (%)									
	Airplane	Horse	Boat	3- or 4-wheeler	Snowmachine	ORV[c]	Highway vehicle	Unknown	Airboat	*n*
2010	4	2	7	45	0	7	30	4	1	505
2011	4	3	8	41	0	5	34	5	0	518
2012	4	3	11	38	0	4	32	7	1	314
2013	3	1	8	42	0	7	33	6	0	399
2014	3	3	10	38	0	7	29	10	0	469

[a] Does not include drawing permit hunts.
[b] Regulatory year begins 1 July and ends 30 June, e.g., regulatory year 2010 = 1 July 2010–30 June 2011.
[c] ORV = off-road vehicle.

ACTIVITY 2.2. Age distribution of moose harvested in draw hunts and MVCs.

Data Needs

Determining the age distribution of moose may lead to understanding parameters of the population such as the potential for population growth. Comparisons of age and sex distribution of moose harvested and animals collected from MVCs can enhance our understanding of how different age classes are subjected to different mortality events.

Methods

Hunters participating in antlerless moose draw hunts (DM400–DM412 and YM413), targeted hunts (AM415), and people receiving moose from MVCs are required to submit approximately 5 inches of the lower jaw to the department for analysis. Submitted samples are examined for tooth wear and compared to teeth of known age moose. Under the antlerless moose hunts primarily only females are taken however male calves are legal for harvest, and a few antlerless bulls have been taken during the late season DM413.

Results

Preliminary analysis of age data demonstrates that significant differences in causes of cow mortality between draw hunts and MVCs exist (Fig. 5). Jaws from moose taken in draw hunts during RY12–RY14, were compared with jaws collected from road-killed moose during RY11, RY12, and RY14. While calves are legal to be taken in the draw hunt they are selected against relative to availability as hunters prefer to take larger adult cows. Calves are much more susceptible to MVCs than older age classes, however more analysis needs to be performed before definitive conclusions can be determined.

Recommendations for Activity 2.2.

Continue with jaw collection and complete further analysis on age and sex distribution of moose taken in draw hunts and MVCs.

3. Habitat Assessment-Enhancement

ACTIVITY 3.1. Assess habitat quality and availability.

Data Needs

Monitoring browse utilization by moose and forage plant condition enables an evaluation of the impact of increasing moose density on the available habitat and can serve as a signal to liberalize harvest in order to avert habitat degradation and a subsequent crash in the moose population.

Methods

Staff developed a browse survey scheme based on the work of Paragi and Kellie (2011), and Seaton et al. (2011) with a modification that allowed for sampling in highly developed areas. Using the GSPE grid of Unit 14A, we randomly selected 40 units for sampling and selected plot centers randomly within those units.

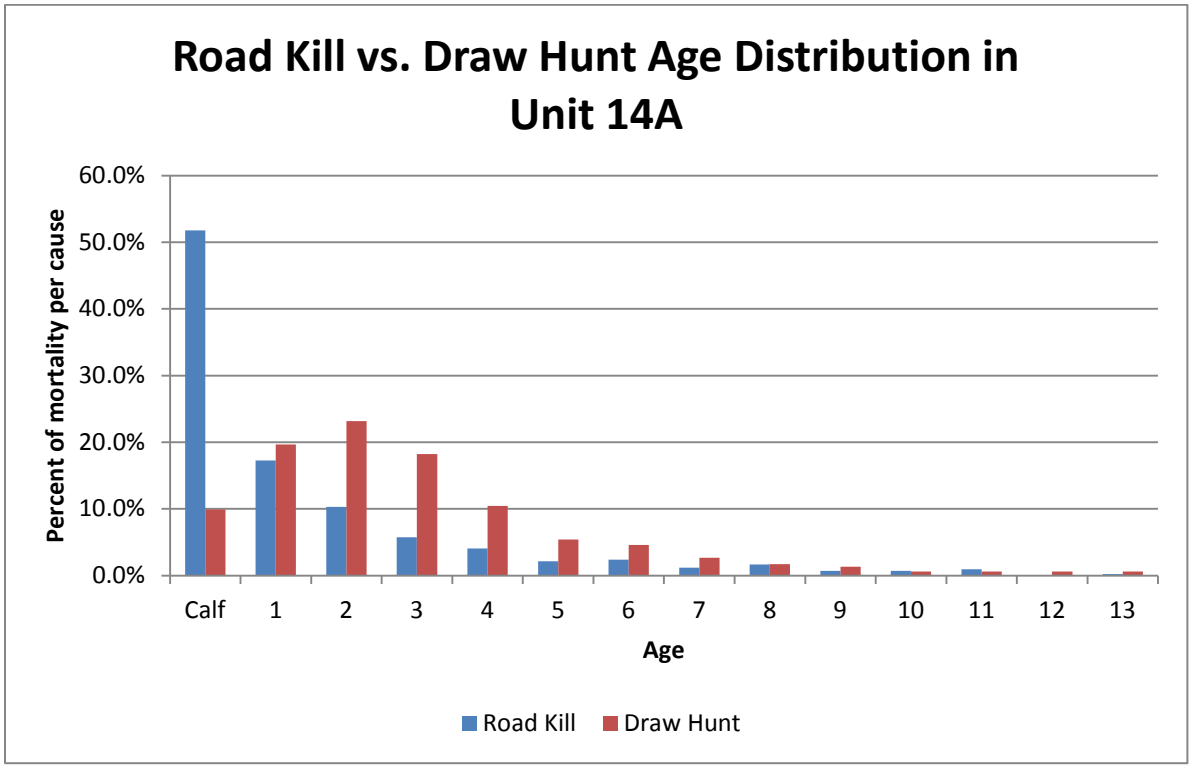

Figure 5. Age distribution of road-killed and draw hunt moose in Unit 14A, Southcentral Alaska.

Results and Discussion

We sampled 31 plots in spring 2015. We accessed 10 plots via R-44 helicopter and 21 by highway vehicle and on foot. We counted preferred browse species and measured a subsample of preferred browse species. We recorded slope, aspect, and other data and took photos of each area (Appendix D). Further analysis of the recorded data is ongoing.

Recommendations for Activity 3.1.

Continue:

- Continue to evaluate the unit for proportional offtake and browse plant condition as a confirmatory metric when the abundance of moose changes substantially or twinning information indicates a substantial change in moose nutritional condition.

ACTIVITY 3.2. Habitat enhancement.

Data Needs

Identifying and treating areas of mature forest stands to return them to earlier stages of succession increases the amount of forage available for moose and enhances their nutritional condition. This in turn allows for greater productivity and improves the overall habitat condition of the unit. In Unit 14A this may be particularly important as the benefits provided from the

Miller's Reach fire over the last 20 years provide diminishing returns as the area matures to later seral stages.

Methods

Areas of potential habitat enhancement have been identified for treatment either by prescribed burning or clearcutting of mature stands. This effort is limited to state-owned lands and occurs as money, personnel, and time are available to complete the projects.

Results and Discussion

Since 2001, ADF&G in cooperation with RGS, and occasionally Rocky Mountain Elk Foundation and DOF, contracted aspen cutting in MVMR to produce early successional growth to benefit grouse, moose, and other species. During RY11, 32 acres of aspen were treated and another 38 acres were treated in RY12. Since the start of the project, 564 acres have been treated. However, large mature contiguous stands of aspen are becoming scarce in MVMR.

Working with DOF, 310 acres of mature mixed birch spruce forest northeast of Sutton within MVMR were identified for a prescribed burn in RY14. A burn plan was developed through DOF for Granite Creek. Public outreach to discuss the goals of the prescribed burn in order to get "buy in" from the local community was completed through the public meeting process and opinions about the efforts were favorable. Unfortunately weather and habitat conditions were not conducive to complete the project during spring 2014. The prescribed burn is tentatively scheduled to be completed in spring 2017.

Recommendations for Activity 3.2.

- Continue with efforts to complete the Granite Creek burn and identify other areas where habitat enhancement efforts can be successfully accomplished given the constraints of this developed landscape; and identify potential funding sources to complete other projects in the unit.

ACTIVITY 3.3. Modify fire suppression levels to allow for natural fire regime to enhance moose habitat.

Data Needs

Natural fires return forests to earlier seral stages which are more productive for moose and other wildlife. By reducing the level of fire suppression levels determined by DOF from full or modified to limited, forest firefighting efforts would be reduced should a natural fire occur in the unit. This in turn would allow more acres of mature stands to burn and return to earlier seral stages.

Methods

ADF&G coordinated with DOF foresters to determine where fire suppression levels could be reduced to limited and sent letters of support for changing suppression levels where appropriate (Appendix E)

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

None identified.

Recording

- GSPE Moose Survey Form (Appendix A).
- Browse survey form (Appendix D).

Archiving

- GSPE data are stored on an internal database housed on a server (http://winfonet.alaska.gov/index.cfm). Digitized field data sheets are stored in file folders located in the Palmer Assistant Area biologist's office.
- Field data sheets are scanned and housed on the computer server in the Palmer Area Biologist office (O:\WC\Palmer Area Office Folder\Species\Moose\Moose Population Estimation\14A Moose Survey Data\Archived Survey Sheets) and stored in file folders located in the Palmer Assistant Area Biologist's office.

Conclusions and Management Recommendations

The fact that the moose population has been over the population objective since at least 2001 and appears to be increasing in spite of increased harvest is concerning. Increasing the number of antlerless permits and implementing a new targeted hunt appear to have slowed the growth of the moose population, but the population should be closely monitored to ensure that it has not been overharvested or grown to the point that nutritional limitations could start to have an effect.

Effective intensive management and mitigation for increased development and urban expansion in this subunit requires investigation into the distribution and movement of moose. Specifically, studies investigating the annual moose movement patterns into the Point MacKenzie agricultural area, the 1996 Big Lake burn and other areas, will reveal the proportion of moose that are migratory and where these individuals spend the non-winter months. The Point MacKenzie winter population exceeds 10 moose/mi^2 — one of the highest densities in the state. Movement and habitat studies will help us understand how many moose the unit can hold from a biological and a social perspective. Research staff have been developing a study that will look at different aspects of moose movement and seasonal distribution. This information will help demarcate travel corridors and ameliorate conflicts arising from further development. The study will also provide the added benefit of supplementing our twinning information and provide parturition data as well.

II. Project Review and RY15–RY19 Plan

Review of Management Direction

MANAGEMENT DIRECTION

There are no changes in the management direction for Unit 14A. However in an effort to develop a more effective management strategy within the existing framework, area staff are expanding and documenting potential improvements to the current program.

GOALS

The goals for Unit 14A moose management remain unchanged. Specifically they are to

- Protect, maintain, or enhance the moose population and its habitat in concert with other components of the ecosystem to provide for high levels of human consumptive use.
- Provide opportunities for nonconsumptive uses (e.g., to view and photograph moose).

CODIFIED OBJECTIVES

Intensive Management

In 2001 the Alaska Board of Game adopted a positive finding for intensive management of moose in Unit 14A. As per the intensive management law, maintain:

- A population of 6,000–6,500 moose.
- Achieve an annual harvest of 360–750 moose.

MANAGEMENT OBJECTIVES

In addition to the population and harvest goals stated above, manage for a posthunt (fall) sex ratio of 20–25 bulls:100 cows.

REVIEW OF MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1. Conduct GSPE survey every other year to inventory and determine sex and age composition in the unit and to determine population size, productivity, and trends. The survey should be designed such that the interval proportion of the mean is ≤20% at the 90% confidence interval.

Data Needs

Same as report.

Methods

Due to the importance of the Unit 14A moose population, surveys should be conducted on a biennial basis. The lack of favorable conditions to conduct a GSPE survey during fall 2015 makes the unit a priority for fall 2016.

Variance in the estimate and specifically in the sightability correction factor suggest that the total area surveyed, and the number of units selected for intensive surveys should be increased in order to gain precision in the estimate. Area staff should consult with a biometrician to determine the most effective methods to accomplish this goal.

In years where a complete GSPE survey is not completed, sex and age composition surveys should be completed to detect any changes in the sex and age ratios that may augment existing data to determine trends and inform management decisions.

Data Needs

Area staff should consult with a biometrician to determine the amount of moose that need to be observed, and which areas in the unit need to be sampled in order to have the statistical power required to adequately sample the population.

Methods

Using pilot-observer teams in a manner similar to GSPE surveys, composition surveys can be quickly conducted in areas of known moose concentrations.

ACTIVITY 1.2. Manage population levels based on multi-year mean spring twinning rates in conjunction with at least one of the following signals to substantiate low twinning-based nutritional status: <50% of 36-month-old moose are parturient, average multi-year short yearling mass is <385 pounds (175 kg), or >35% of annual browse biomass is removed by moose (Boertje et al. 2007):

a. <10% twinning rate (manage for population reduction)

b. 10–20% twinning rate (manage for population stability)

c. >20% twinning rate (manage for population growth)

2. Mortality-Harvest Monitoring

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

Data Needs

Same as report.

Methods

Same as report except that a collaborative research project to assess factors associated with MVCs and moose movements will begin in summer 2016.

ACTIVITY 2.2. Age distribution of moose harvested in draw hunts and MVCs.

Data Needs

Same as report.

Methods

Same as report.

3. Habitat Assessment-Enhancement

ACTIVITY 3.1. Assess habitat quality and availability.

Data Needs

Same as report.

Methods

Same as report. Repeat the assessment if there are large changes in the population during the planning period.

ACTIVITY 3.2. Habitat enhancement.

Data Needs

Same as report.

Methods

Same as report.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

Same as report.

Data Recording and Archiving

- GSPE data are stored on an internal database housed on a server (http://winfonet.alaska.gov/index.cfm). Digitized field data sheets are stored in file folders located in the Palmer Assistant Area biologist's office.
- Field data sheets are scanned and housed on the computer server in the Palmer Area Biologist office (O:\WC\Palmer Area Office Folder\Species\Moose\Moose Population Estimation\14A Moose Survey Data\Archived Survey Sheets) and stored in file folders located in the Palmer Assistant Area Biologist's office.
- Historical (1990–2016) survey notes and data sheets should be scanned for more secure data archive.

Agreements

Alaska Department of Fish and Game and the Alaska Department of Natural Resources – Division of Forestry Little Granite Creek Prescribed Burn Plan.

Permitting

Institutional Animal Care and Use Committee approval, moose captures.

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Appendix A. Moose survey form used in stratified surveys such as the geospatial population estimator and for composition surveys, Alaska.

MOOSE SURVEY FORM

Date ____/____/____ Page ____ of ____

GMU ____ Count Area ____ Mi² in count area ____

Aircraft Type ____ Pilot/Observer ____/____ Cost/hr ____

WEATHER:

Cloudcover (%) ____ Precipitation ____ Temp ____

Wind Speed and Direction ____ Turbulence ____

CONDITIONS:

Light				Snow age and cover				Flight Time
Type		Intensity		Age		Cover		Depart
Bright	☐	High	☐	Fresh	☐	Complete	☐	Start Count
Flat	☐	Medium	☐	Moderate	☐	Low vegetation showing	☐	Stop Count
		Low	☐	Old	☐	Bare ground showing	☐	Return
								Flight Time
General Survey Conditions			☐ Excellent		☐ Good	☐ Fair	☐ Poor	Survey Time

	BULLS				COWS				Unk	
Group No.	Yearlings S/F	3 pt.	Med <50"	Large ≥50"	w/o calf	w/1 calf	w/2 calf	Lone Calf	sex/ age	Remarks
1										
2										
3										
4										
5										
6										
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Totals										

Appendix B. Moose survey report summary for Unit 14A, Southcentral Alaska, 2011.

Palmer Moose Survey Results 2011

This year the Palmer office was able to complete moose surveys for GMU's 14A and 16B–Middle.

The results for 14A are:

Unit 14A	2008		Corrected Est. & SCF - 2008		**2011**		Corrected Est. & SCF - 2011	
	Estimate	90% Interval	Est.	90% or Var	Estimate	90% Interval	Est.	90% or Var
All Moose	5333	0.1411	**6684**	17.5%	7069	0.1525	**7993**	18.9%
High Strata	2537	0.0964	1.246	Var 0.0006	3526	0.1974	1.134	Var 0.0053
Low Strata	2796	0.2546	1.260	Var 0.011	3544	0.2324	1.127	Var 0.0140
Bull : 100 Cow	23.11	0.1930			17.38	0.2307		
Calf: 100 Cow	42.06	0.1871			43.51	0.2086		

14A Notes: The total number of bulls remained relatively unchanged between 2008 and 2011, but the ratio dropped because we have so many more cows running around out there. The conditions were great when we started but we were prevented from surveying for a couple of days due to high winds. The winds scoured the valley and probably increased the number of animals we missed in the later part of the survey as opposed to the beginning. Pre survey scouting by Lou and Mike Meekin showed quite a few moose on top of Baldy. We did not survey that area until after the winds came through and while we still saw plenty of moose we also noticed a lot of trails of moose coming off the mountains. This year we flew a total of 36 high strata units and 47 low strata units.

Appendix C. Moose survey report summary for Units 14A and 14B, Southcentral Alaska, 2013.

THE STATE of ALASKA
GOVERNOR SEAN PARNELL

Department of Fish and Game
DIVISION OF WILDLIFE CONSERVATION
Central/Southwest Regional Office
1800 Glenn Highway, Suite 4
Palmer, Alaska 99645-9965
Main: 907.861.2100
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Memorandum

To: Lem Butler, Regional Supervisor

CC: Tim Peltier, Palmer Assistant Area Biologist

From: Todd Rinaldi, Palmer Area Biologist

Date: 25 February 2014

Subject: 2013 Moose Survey Results for GMU 14A &14B

In November of 2013 we completed 2 independent moose surveys in GMU14A and 14B using the Geospatial Population Estimator (GSPE) method.

GMU 14A

During 15-17 November 2013, 4 pilot/observer teams in PA-18s sampled 520 mi^2 of GMU 14A (total survey area = 2195 mi^2). This translates to 34 high and 48 low strata for a total of 82 of 345 available quadrats. Snow cover was mostly complete but many areas had low vegetation showing.

We randomly selected 40 of the sampled quadrats (19 high and 21 low) for intensive sampling. These quadrats were flown at search intensities of 3.9-4.6 min/km^2 immediately upon completion of the quadrat to calculate a sightability correction factor (SCF) following Gasaway et al. 1986.

We observed 1750 moose and many were still on the slopes of Mt. Baldy suggesting that the snow had yet to push the moose completely out of the higher country. The GSPE population estimate was calculated at 6851 moose (SE = 679.89). The bull to cow ratio was 21:100 which is an increase of 4% from 2011. Calf to cow ratio also showed a slight increase at 45:100. After applying the SCF (1.14 high and 1.35 low), the population in GMU14A was determined to be at 8500 moose. This is an increase from the 2011 estimate of 8000 moose and is consistent with the continued growth of the moose population in GMU14A since at least 1988. The population remains above the objective of 6000-6500 moose and has been since 2000. This survey took 79 flight hours to complete at a cost of $19,651.

GMU 14B

We completed the survey of GMU 14B in 3 days between 25-29 November 2013 using five PA-18s. The survey took 89 flight hours to complete at a cost of $21,138. Weather prevented flights on 27-28 November; however there is no evidence that this weather instigated any substantial movements by moose.

For 2013, we increased the sampling effort to include 40 high (253 mi²) and 39 low (243 mi²) strata consistent with sampling protocols described in Kellie and DeLong (2006) for better precision. This represents 43% of the survey area. Of the sampled strata, 16 high and 14 low strata were randomly selected and flown at 3.9-4.6 min/km² to calculate an SCF. Snow cover was complete throughout the survey area.

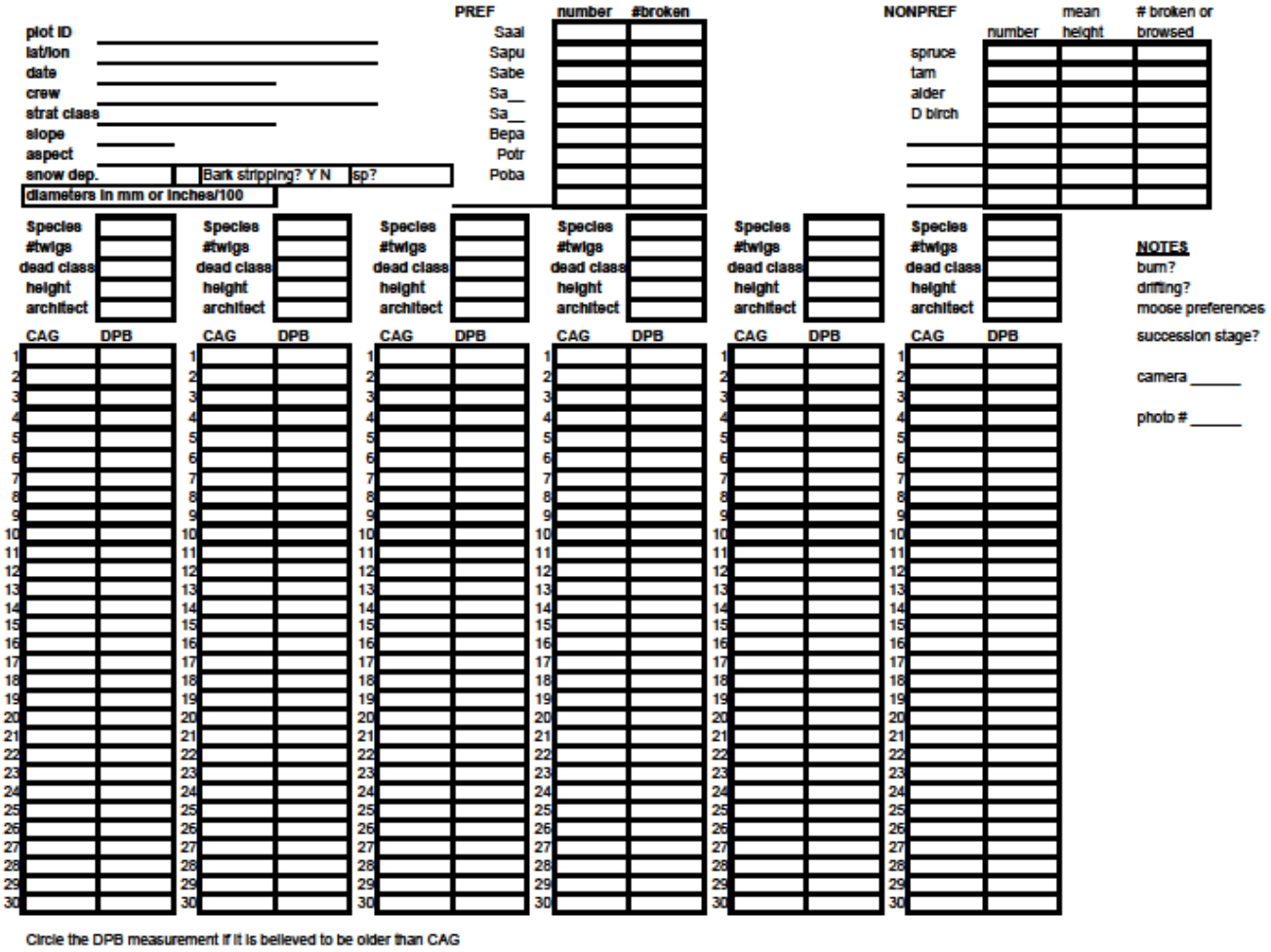
We counted 1261 moose and calculated the population estimate at 2112 (SE = 112.75). The bull to cow ratio was 30:100 - a decrease of 4% from 2009. Calf to cow ratio showed a 10% increase to 28:100. After applying the SCF (1.15 high and 1.31 low) the population in GMU14B was determined to be at 2700 moose. This is an increase from the uncorrected 2011 estimate of 1662 moose and may be the first time since 1987 that the moose population in GMU14B is within its objective of 2500-2800.

	14A		Corrected Est. & SCF		14B		Corrected Est. & SCF	
Parameter	Estimate	90% Interval	Estimate	90% CI or Variance	Estimate	90% Interval	Estimate	90% CI or Variance
All Moose	6851	0.163	8500	21.4%	2112	0.087	2700	31.8%
High Strata	3263	0.176	1.15	0.005	477	0.020	1.15	0.003
Low Strata	3588	0.267	1.35	0.025	1635	0.113	1.31	0.082
Bulls:100 Cow	20.9	0.179	-	-	29.9	0.179	-	-
Calves:100 Cow	44.5	0.247	-	-	27.5	0.129	-	-

Kellie, K.A. and R.A. DeLong. 2006. Geospatial survey operations manual. Alaska Department of Fish and Game. Fairbanks, Alaska, USA.

Gassaway, W.C., DuBois, S.D., Reed, D.J., and Harbo, S.J. 1986. Estimating moose population parameters from aerial surveys. Biological Papers of the University of Alaska, Number 22. 108 p.

Appendix D. Browse survey data sheet.



Architecture classes (browsing history of the plant, includes this year, and all visible evidence of past years)
broomed- more than half of the CAG twigs rise from lateral twigs that are the result of browsing
unbrowsed- no evidence of past browsing
browsed- less than half of the CAG twigs rise from lateral twigs that are the result of browsing

Species					
#twigs					
dead class					
height					
architect					

	CAG	DPB	CAG	DPB	CAG	DPB	CAG	DPB	CAG	DPB	CAG	DPB
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
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26												
27												
28												
29												
30												

Dead classes (amount of dead material that comprizes a plant)
X= no dead
L= less dead than live material
M= more dead than live material

STEPS IN SURVEY
1. Locate center of plot
2. Locate boundary of plot
3. If no pref plants, pick alt
4. Snow depth
5. Choose random distance and direction from center to start measuring closest plant of each pref species
6. Turn head and grab stem on plant
7. Measure 10 twigs starting at terminal end of that stem
8. height, # twigs, spp, arch. # stems only between 0.5m and 3.0m
9. Choose next random distance and direction from center for other plants to measure
9.5. Goal is 30 twigs/ spp
10. Estimate # of all woody browse plants by species in plot

TIPS
*Pref plant has CAG twigs between 0.5m and 3m
*Bepa, Sasi, Sabe, etc., can be nonpref plants if they are too tall
*measure plant height from ground

Appendix E. Letter to Alaska Division of Forestry requesting changes in wildland fire protection levels, 2014.

THE STATE of ALASKA
GOVERNOR SEAN PARNELL

Department of Fish and Game
DIVISION OF WILDLIFE CONSERVATION
Central/Southwest Region
1800 Glenn Highway, Suite 4
Palmer, Alaska 99645-6736
Main: 907.861.2100
Fax: 907.861.2121

July 11, 2014

Norm McDonald
Alaska Division of Forestry
Mat-Su Area Fire Management Officer
101 Airport Rd
Palmer, Alaska 99645

Dear Mr. McDonald:

At our meeting on 10 July 2014 you indicated that fire suppression management options may be reconsidered in parts of Game Management Unit 14A&B and 16. We strongly encourage the Department of Natural Resources to consider reducing the fire suppression levels from full or modified to limited wherever it is prudent to do so and encourage the use of a modified suppression level where a more conservative approach is necessary. Allowing fire to play a natural role in the ecosystem leading to early successional hardwood habitats will greatly benefit moose, grouse and other wildlife species by providing essential cover and browse.

Moose populations in these management units are especially important. The Alaska Board of Game identified these moose populations as important for providing high levels of harvest for human consumptive use. Establishing and maintaining a mosaic of serial stages and forest types that mimic wildfires and natural succession would enhance the habitat and the likelihood of meeting moose population and harvest objectives in coming years.

Thank you for your consideration of this request. We will gladly consult with you and provide additional information, when necessary, as you review the wildfire designations for these areas.

Sincerely,

Lem Butler

Lem Butler
Regional Supervisor
Division of Wildlife Conservation, Region IV


ALASKA
DEPARTMENT OF FISH AND GAME