Species Management Report and Plan ADF&G/DWC/SMR&P–2018–47

Moose Management Report and Plan, Game Management Unit 13:

Report Period 1 July 2010–30 June 2015, and

Plan Period 1 July 2015–30 June 2020

W. Frank Robbins

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Alaska Department of Fish and Game Division of Wildlife Conservation

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

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

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Contents

List of Figures

List of Tables

List of Appendices

Purpose of this Report

This report provides a record of survey and inventory management activities for moose in Unit 13 for the previous 5 regulatory years (RY) and plans for survey and inventory management activities in the 5 years following the end of that period. A regulatory year 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 it is also provided to the public to inform it of wildlife management activities. In 2016 the Alaska Department of Fish and Game's 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

Game Management Unit 13 encompasses 23,368 mi^2 (Fig. 1) and consists of that area west of the east bank of the Copper River and drained by all tributaries into the west bank of the Copper River from Miles Glacier including the Slana River drainages north of Suslota Creek; the drainages into the Delta River upstream from Falls Creek and Black Rapids Glacier; the drainages into the Nenana River upstream from the southeast corner of Denali National Park; the drainage into the Susitna River upstream from its junction with the Chulitna River; the drainage into the east bank of the Chulitna River upstream to its confluence with the Tokositna River; the drainages of the Chulitna River (south of Denali National Park) upstream from its confluence with the Tokositna River; the drainages into the north bank of the Tokositna River upstream to the base of the Tokositna Glacier; the drainages into the Tokositna Glacier; the drainages into the east bank of the Susitna River between its confluences with the Talkeetna and Chulitna Rivers; the drainages into the north and east bank of the Talkeetna River, including the Talkeetna River to its confluence with Clear Creek, the eastside drainages of a line up the south bank of Clear Creek to the first unnamed creek on the south, then up that unnamed creek to lake 4408, along the northeast shore of lake 4408, then southeast in a straight line to the northernmost fork of the Chickaloon River; the drainages into the east bank of the Chickaloon River below the line from lake 4408; and, the drainages of the Matanuska River above its confluence with the Chickaloon River.

Additional maps for Unit 13 boundaries and special management areas are found at http://www.adfg.alaska.gov/index.cfm?adfg=maps.main.

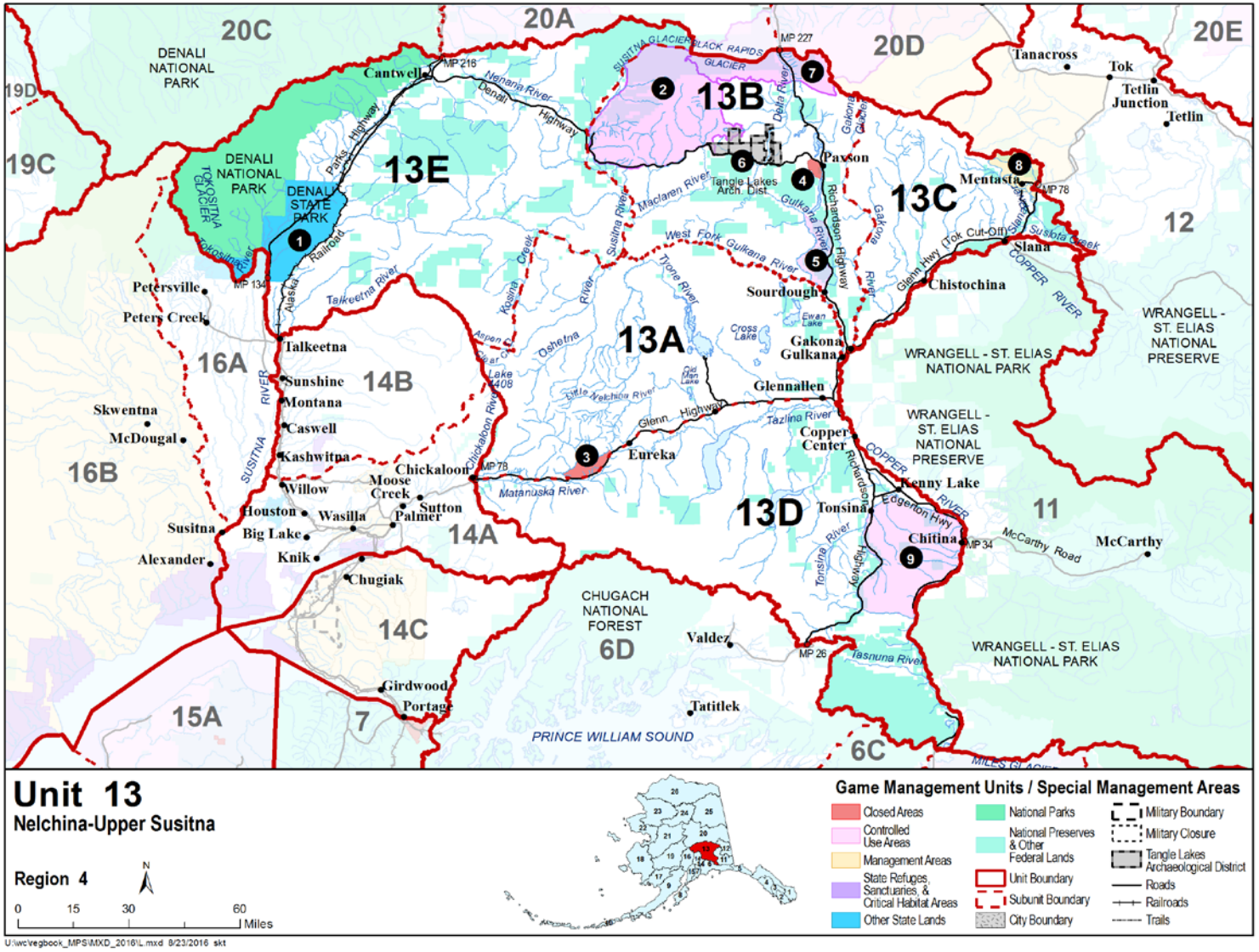

Figure 1. Unit 13 in Southcentral Alaska.

Summary of Status, Trend, Management Activities, and History of Moose in Unit 13

Unit 13 has long been an important area for moose hunting in Alaska. During the late 1960s and early 1970s annual harvests were large, averaging more than 1,200 bulls and 200 cows. Hunting seasons were long, with both fall and winter hunts. Through the 1970s and the 1980s the moose population increased steadily, increasing at an average annual rate of 5% until the population peaked. In 1987 a high of 6,892 moose were observed in established trend count areas, and the harvest peaked 1 year later when 1,259 moose were taken.

The population soon began to decline due to harsh winters with deep snow (1988–1994) and increased wolf predation. Moose harvest regulations were restricted beginning in RY90, though the population continued to decline. During fall of 1999 and 2000, unitwide wolf estimates peaked at more than 500 wolves (>12 wolves/1,000 km^2) and were the highest in more than 25 years. Snow depths during winters of 1999–2000 and 2000–2001 were considered severe. Moose harvests also declined, reaching a low of 468 in RY01. From the peak, the number of moose observed had declined by 47%.

In January 2000, an intensive management (IM) plan was initiated in Unit 13 for the benefit of moose. Some increased take of wolves occurred by hunters with the use of snow mobiles, though land-and-shoot control was not allowed until January 2004. The wolf population was reduced with the Unit 13 population held at or near objective levels since spring 2006, the moose population has grown steadily.

Management Direction

EXISTING WILDLIFE MANAGEMENT PLANS

- Operational plan for IM of moose in Unit 13 during RY16–RY21, March 2016. This operational plan complements the IM plan in regulation (5 AAC 92.121).
- Direction in the Paxson, Nelchina Basin, Talkeetna River, Matanuska Glacier, Tonsina, and Klutina management plans (Alaska Department of Fish and Game [ADF&G] 1976) have been reviewed and modified through public comments, staff recommendations, and Alaska Board of Game (BOG) 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 13.

GOALS

- Protect, maintain, and enhance the moose population and its habitat in concert with other components of the ecosystem.
- Provide the greatest sustained opportunity for moose harvest.
- Provide an opportunity to view and photograph moose.

CODIFIED OBJECTIVES

Amounts Reasonably Necessary for Subsistence Harvest

- The Unit 13 moose population has a positive customary and traditional use determination. The unitwide amount reasonably necessary for subsistence is 300–600 moose.

Intensive Management

In 2000 BOG adopted a positive finding for IM of moose in Unit 13. Current IM objectives are as follows:

- Population objective: 17,000–21,400 moose.
- Harvest objective: 1,050–2,180 moose.

Unit	Population objective	Harvest objective
13A	3,500–4,200	210–420
13B	5,300–6,300	310–620
13C	2,000–3,000	155–350
13D	1,200–1,900	75–190
13E	5,000–6,000	300–600

MANAGEMENT OBJECTIVES

Manage moose populations at the following levels:

- Manage for posthunt (fall) sex ratios of 25 bulls:100 cows with 10 yearling bulls:100 cows throughout the unit.
- Twenty-five fall calves:100 cows in Unit 13A.
- Thirty fall calves:100 cows in Units 13B, 13C, 13D, and 13E.

MANAGEMENT ACTIVITIES

Assessing population status and trends, monitoring harvest and mortality, and assessing habitat conditions are integral components of management programs in Unit 13. Survey and inventory management activities used to monitor moose populations in Unit 13 are described below.

1. Population Status and Trend

ACTIVITY 1.1. Monitor and evaluate moose abundance.

Data Needs

Moose abundance data are necessary to determine population status in relation to management objectives. The geospatial population estimator (GSPE) is the preferred technique for estimating abundance, and provides an unbiased population estimate over large study areas at lower costs

than other exhaustive census methods (Kellie and DeLong 2006). GSPE also provides age-sex composition with estimated variance.

Methods

In November 2013 a GSPE survey was conducted in Unit 13E and northern Unit 13A in association with the Susitna-Watana Hydroelectric Project (ADF&G and Alaska Biological Research 2014). The survey area was divided into 633 sample units using the standard unit grid (Kellie and DeLong 2006) and stratified based on high and low moose density. The low-stratum included sample units expected to have few or no moose. Desktop stratification (Kellie and DeLong 2006) of the survey area was accomplished using land cover classifications, locations from radiocollared moose, and historic aerial trend survey data. Selected sample units were flown at a high intensity (>6.6 min/mi^2) by pilot-observer teams in fixed-wing aircraft. Observed moose were circled by the pilot, and position recorded by Global Position System (GPS) waypoint. Observers documented each moose by sex and age class. An additional fixed-wing aircraft and pilot-observer crew coordinated the survey teams and documented the detection of radiocollared moose by each team. Upon completion of a unit, pilot-observer teams or the coordination team radiotracked collared moose in the vicinity to determine if any collared moose were missed during the survey to inform a sightability correction model and derive a sightability correction factor. Alternatively, in areas without radiocollared moose, a sightability correction factor will be developed for each stratum by randomly selecting a subset of the selected units and intensively searching a quarter on the unit at 10–12 min/mi^2 and noting the difference between the number of moose seen during the regular and intensive surveys.

Results and Discussion

Seven pilot-observer teams sampled 205 sample units and observed 1,283 moose over 100 survey hours during the 2013 GSPE. The population survey estimate was 3,683 ± 274 without a sightability correction factor. Being the first GSPE conducted in this area, there are no previous GSPE results to compare.

No other GSPE surveys were completed and therefore we are unsure of our ability to meet population objectives for the other administrative subunits.

Recommendations for Activity 1.1.

Continue GSPE surveys at a rate to detect changes in abundance by administrative subunit. We would likely survey each administrative subunit on a 3-year cycle.

ACTIVITY 1.2. Monitor moose sex and age composition.

Data Needs

Moose composition data are necessary to determine population status in relation to management objectives. For more than 40 years, an established group of 8 count areas (CA) has been surveyed annually, as budget and conditions allow (CAs 3, 5, 6, 10, 13, 14, 15, and 16). In addition to the 8 established annual CAs, 6 CAs have been periodically flown when time and budget allowed. Although a GSPE survey provides unbiased estimates of populations, they can

be expensive to apply across entire units. Therefore, we will continue to perform trend surveys to index the population and to provide composition data in otherwise unsurveyed areas.

Methods

Aerial moose surveys are conducted with fixed-wing aircraft (Piper PA-18 Super Cubs) during the fall, following sufficient snowfall and before bulls had dropped antlers, to document sex and age composition and population trends in large CAs distributed throughout Unit 13 (Fig. 2). These surveys are repeated annually with an effort to use consistent pilots, timing, and conditions. Each moose observation is recorded on a trend count data sheet, along with age (calf, yearling bull, adult), antler observations (spike-fork, <50″, >50″), survey flight times, and survey condition data (Appendix A). Flight paths and waypoints for each moose observation are recorded on GPS units and saved in electronic files for each survey.

Results and Discussion

Trend count surveys are summarized in Tables 1 and 2.

Unit 13A

Annual moose population composition estimates for Unit 13A are developed from trend count surveys flown in the western portion of the unit (CAs 13 and 14). In years when time and funding are available, CA12, located in the eastern portion of the unit, has also been surveyed. During this reporting period, both CAs 13 and 14 were surveyed during 2010–2013 and only CA13 was surveyed in 2014. Between 2010 and 2014 the bull:cow ratio averaged 24 bulls:100 cows. Bulls declined slightly from 26 bulls:100 cows in 2012 to 21 but increased again to 28 bulls:100 cows in 2014. During this reporting period the calf:cow ratio averaged 22 calves to 100 cows. The lowest observed calf:cow ratio was 15 in 2012 but increased to 30 calves:100 cows in 2013.

Unit 13B

CAs 3, 5, and 6 were flown in 2010–2013. During this reporting period the bull:cow ratio averaged 35 bulls:100 cows and ranged from 32 bulls:100 cows in 2010 to 39 bulls:100 cows in 2013. The calf:cow ratio averaged 24 calves:100 cows but declined slightly from 25 calves:100 cows in 2011 to 18 calves:100 cows in 2012, though increased to 29 calves:100 cows in 2013.

Unit 13C

CAs 10 and 16 were flown each year between 2010 and 2014. However, poor snow conditions in 2012 likely contributed to a decreased number of moose detected. The average bull:cow ratio observed was 34 bulls to 100 cows. The bull:cow ratio ranged from 27 bulls:100 cows in 2010 to 44 bulls:100 cows in 2013. The calf:cow ratio averaged 17 calves:100 cows during this reporting period and ranged from 22 calves:100 cows in 2010 and 2013 to 10 calves:100 cows in 2014.

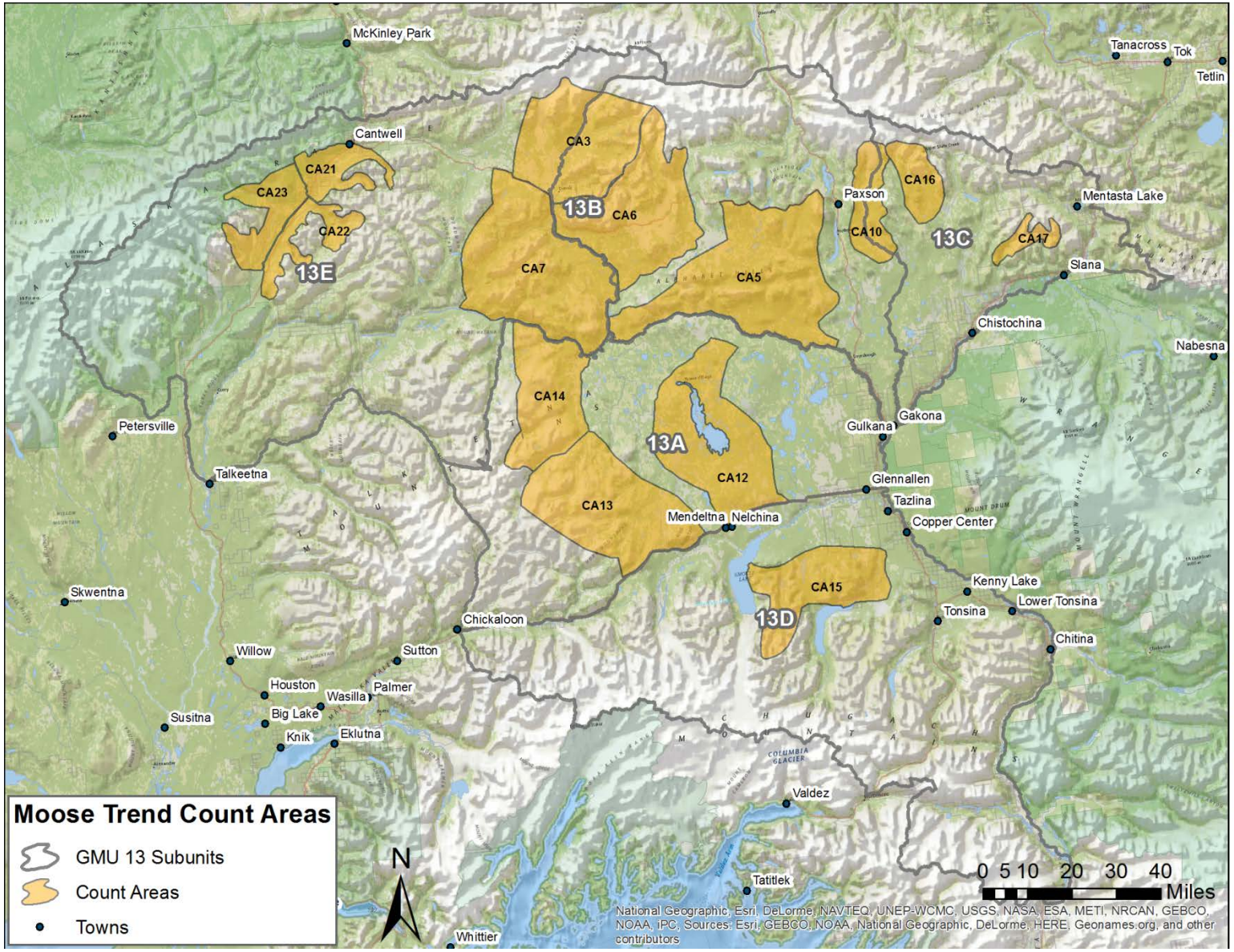

Figure 2. Unit 13 moose trend count areas, Southcentral Alaska.

Table 1. Unit 13 fall composition estimates for moose in Count Areas 3, 5, 6, 10, 13, 14, 15, and 16, Southcentral Alaska, calendar years 2010–2014.

Calendar year	Bulls: 100 cows	Yearling bulls: 100 cows	Calves: 100 cows	Calves %	Adults observed	Total moose observed	Moose/ hour	Density moose/mi^2 (observed range)
2010[a]	30	10	21	14	4,558	5,313	50	1.5 (0.6–2.2)
2011	33	10	23	15	4,777	5,604	53	1.6 (0.5–2.2)
2012	32	7	16	11	4,821	5,404	50	1.5 (0.5–2.2)
2013	34	5	27	17	4,553	5,349	49	1.5 (0.4–2.5)
2014[b]	35	9	20	13	4,616	5,301	50	1.5 (0.4–2.4)

[a] Count area 15 was not flown; data were estimated.

[b] Count areas 5, 6, and 14 were not flown; data were estimated.

Table 2. Unit 13 fall composition estimates by unit for moose in Count Areas 3, 5, 6, 10, 13, 14, 15, and 16, Southcentral Alaska, calendar year 2013.

Unit	Bulls: 100 cows	Yearling bulls:100 cows	Calves: 100 cows	Calves %	Total moose observed	Moose/ hour	Density moose mi^2
13A	21	5	31	20	1,769	52	1.8
13B	39	5	29	17	2,474	51	1.6
13C	57	8	28	15	538	57	1.8
13D	89	3	12	6	133	20	0.4
13E	29	6	21	14	1,728	46	1.4

Unit 13D

Population estimates and composition were developed from CA15 with trend surveys conducted annually between 2010 and 2014. The average bull:cow ratio observed was 71 bulls:100 cows and ranged from 62 bulls:100 cows in 2011 to 89 bulls:100 cows in 2013. During this reporting period the average calf:cow ratio was 16 calves:100 cows. The highest cow:calf ratio was observed in 2010, with 23 calves:100 cows. However, the following year the ratio dropped to 10 calves:100 cows, the lowest observed since 2005. The ratio increased slightly to 14 calves:100 cows in 2012 but remained below average in 2013 at 12 calves:100 cows. In 2014, the cow:calf ratio increased above long-term average at 17 calves:100 cows.

Unit 13E

Annual moose population composition estimates for Unit 13E are developed from trend count surveys flown in the eastern portion of the unit (CA3). In years where time and funding are available CAs 7, 21, 22, and 23 also have been surveyed. During this reporting period all CAs were surveyed only in 2013. CAs 3 and 7 were surveyed in 2012, and CAs 3, 21, 22, and 23 were surveyed in 2010. CA3 was surveyed each year during this reporting period. The bull:cow ratio averaged 33 bulls:100 cows over the last 5 years, and ranged from 31 bulls:100 cows in 2012 to 40 bulls:100 cows in 2014. During this reporting period the calf:cow ratio averaged 20 calves:100 cows and ranged from 7 calves:100 cows in 2014 to 26 calves:100 cows in 2011. The low ratio observed in 2014 was likely a result of inconsistent snow coverage and poor lighting conditions during surveys.

Recommendations for Activity 1.2.

Continue.

ACTIVITY 1.3. Spring twinning surveys.

Data Needs

Estimates of moose nutritional condition are important to management on a sustained yield basis, and to help managers protect the population from density precipitated declines in productivity and damage to habitat. Twinning rates provide an index of nutritional health of cows (abundant nutrition on the landscape correlates with healthy, fecund cows and high twinning rates).

Methods

In March 2012, 29 cow moose were captured and collared with very high frequency (VHF) radio transmitters in the Alphabet Hills region of southern Unit 13B. Starting in 2012 through 2014 collared cows were located daily by fixed-wing aircraft from mid-May until early June to determine parturition, twinning, and calf mortality. Data were compiled and compared to previous years' data and reported as required.

During October 2012 and March 2013, cow and bull moose were capture and equipped with VHF and Argos-linked satellite (GPS) collars in association with the Susitna-Watana Hydroelectric Project (ADF&G and Alaska Biological Research 2014). The majority of collars (66) were deployed on cows. To accurately document productivity and associated calf loss,

twinning surveys were conducted daily during calving. Small fixed-wing airplanes were utilized for these radiotracking flights (15 May–4 June). Location, date, reproduction, and survival status of moose were documented during each flight.

While localized twinning rates can be estimated by radiocollared cows in the Alphabet Hills of southern Unit 13B, and collared cows in the northwest portion of Unit 13 (Unit 13E and northwest Unit 13A), the large remainder of the unit has no radiocollared cows. Random twinning surveys provide a method by which to assess twinning in areas where radiocollared animals are not present.

Random twinning flights were flown in Units 13A, 13C, and 13E in mid-May and early June to minimize biases from predation. Twinning rate was calculated as the percentage of cows with twins detected among all cows observed with calves.

Results and Discussion

In 2012, Alphabet Hills cows were located during only 4 twinning flights, and 1 of 10 cows ≥3-years old were observed with twins. The resulting 10% twinning rate was likely biased low as a result of the low number of flights, distributed over several days (18 May–2 June). Of the 17 cows ≥3-years old monitored over 19 flights during spring 2013, 3 were observed with twins (18%). In 2014, 18 cows ≥3-years old were observed with a calf (72%), 8 of which were observed with twins (44%).

Radiocollared cows in the Susitna-Watana Study Area (northwest Unit 13A and southern Unit 13E) twinned at a rate of 30%, 46%, and 46% in 2012, 2013, and 2014 respectively.

No random twinning flights were conducted in 2010 or 2011. In 2012, 40 postparturient cows with young were randomly located in northwest Unit 13A and southern Unit 13E. Of these, 16 were observed with twins (40%). Random twinning flights were conducted in western Unit 13A and Unit 13C during 2013. In western Unit 13A, 6 of 32 cows with twins at heel were observed (19%), and 10 of 24 cows in Unit 13C were observed with twins (42%). In 2014, random twinning flights were conducted in three units, western Unit 13A, Unit 13C, and Unit 13E. Observed twinning rates were 26% (n = 50), 30% (n = 10), and 25% (n = 28), in western Unit 13A, Unit 13C, and Unit 13E respectively.

While twinning rates do provide an index of cow nutritional status, we do acknowledge a lag between browse depletion and a resulting decline in productivity.

Recommendations for Activity 1.3.

Continue.

2. Mortality-Harvest Monitoring and Regulations

ACTIVITY 2.1. Monitor and analyze harvest and other mortality data.

Data Needs

The BOG has identified the Unit 13 moose population as important for providing high levels of harvest for human consumptive use and established an annual harvest objective of 1,050–2,180. BOG also established an amount necessary for subsistence of 300–600. Annual summaries of harvest are needed to examine harvest relative to objectives, to help direct future harvest strategies, and ensure sustained yield harvest. Monitoring harvest is also essential to inform the regulatory process. In Unit 13, the timely tracking of harvest during the hunting season is imperative to successfully administering the Community Subsistence Harvest (CSH) hunt. Monitoring and analyzing harvest data annually are also important to understand hunter effort and success in Unit 13.

Methods

There are 3 types of harvest opportunity for moose hunts in the Nelchina Basin. General season hunt using a harvest ticket, subsistence hunters participate by the CSH hunt, and a few permits are issued by lottery (drawing permit). Individuals who obtain a moose permit from ADF&G are required to report on their permit after successful harvest, or after the end of the season. Failure to report on either a CSH or drawing permit results in 2 reminders and eventual penalty. Hunt reports are recorded in ADF&G's Wildlife Information Network (WinfoNet) moose harvest database, and include information regarding hunter residency, success, effort, hunt location, date of kill, transportation, and antler size. The harvest reporting requirement for the CSH hunt is 24 hours, and reports are received by telephone and online. Harvest information is summarized daily for the CSH hunt, and annually for all other hunts. Federal hunters report to the Bureau of Land Management (BLM) ADF&G staff retrieve the federal harvest information from the BLM annually, once the information becomes available.

Season and Bag Limit

Current Unit 13 moose season dates and bag limits are available on the ADF&G website:

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

Results and Discussion

Harvest by Hunters

The total Unit 13 reported bull harvest (Table 3) has increased from a low of 468 in 2001 to an average of 848 bulls during the reporting period (range 711 in 2012 to 954 in 2011).

Table 3. Unit 13 moose harvest[a] and accidental death, Southcentral Alaska, regulatory years[b] 2010–2014.

Regulatory	Reported				Estimated			Accidental			Grand
year	M	F	U	Total[c]	Unreported	Illegal	Total	Road	Train[d]	Total	total
2010	937	1	0	938	25	25	50	50	63	113	1,101
2011	953	1	0	954	25	25	50	36	42	78	1,082
2012	704	5	2	711	25	25	50	27	27	54	815
2013	714	2	0	716	25	25	50	38	22	60	826
2014	919	4	0	923	25	25	50	38	11	49	1,022

[a] Includes permit hunt harvest, harvest tickets and federal subsistence hunts.
[b] Regulatory year begins 1 July and ends 30 June, e.g., regulatory year 2010 = 1 July 2010–30 June 2011.
[c] Includes unknown sex.
[d] Unit 13E – the Alaska Railroad.

Permit Hunts

Five any-bull resident drawing hunts (DM330–334) were offered between 2010 and 2013, with a total of 325 permits issued for 2010. Permit numbers decreased to 225 and 104 in 2011 and 2012 but increased to 225 in 2013. Permit success was relatively high despite the remote location of the hunt areas. In 2011, a total of 118 permittees reported hunting (53%), taking 49 bulls (42% hunt success). In 2012, 104 permittees reported hunting (53%), taking 33 bulls (60% hunt success). During 2013, the last year the drawing hunts were offered, harvest declined with 53% of permittees reported hunting and harvesting 47 bulls (39% hunt success).

In 2012, a resident drawing antlerless hunt (DM325) was held for the first time in Unit 13 since 1994. A total of 10 permits were issued, and 10 permittees reported hunting (100%). The harvest was 4 cows (40% hunt success). The antlerless hunt continued in 2013 and 2014, with 10 permits issued each year. The reported harvest was 2 cows in 2013, and 3 bulls and 4 cows in 2014.

During this reporting period, 5 nonresident drawing hunts (DM335–339) were offered. The number of nonresident moose permits issued ranged from 65 to 115. A total of 65 nonresident permits were issued in 2011, resulting in a harvest of 16 bulls. Permit numbers were increased to 105 for 2012 and 115 for 2014 in which a total of 9 and 20 bulls were harvested respectively. During this reporting period the average annual nonresident harvest was 15 bulls.

The CSH program was initiated in 2009 with only one participating community-group and a liberalized bag limit for taking "any" bull moose. For the purposes of this hunt an "any bull" is a bull moose that does not meet the general season antler restriction of other hunts in the same area. The CSH program was not offered in 2010, but in 2011 a total of 753 hunters from 11 communities-groups participated in the CSH moose hunt. Of those, 310 reported hunting (some utilized designated hunters). A total of 86 bulls were taken, with 64 qualifying as "any bulls" (Table 4). Of the 961 participating CSH hunters in 2012, 357 reported hunting. Of the 98 bulls harvested, 76 were classified as "any bulls." Participation in the CSH program increased from 19 communities/groups in 2012 to 45 communities-groups in 2013. Of the 842 CSH participants that reported hunting in 2013, a total of 156 bulls were harvested, including 85 "any bulls." Participation in the CSH program stabilized in 2014, with 43 communities-groups subscribing to the program. Harvest declined slightly to 150 bulls, with 76 classified as "any bulls."

Hunter Residency and Success

Local residents (residents of Unit 13) harvested 7% of the moose under the general season this reporting period (Table 5). The success rate for general season moose hunters has been stable over time, averaging 17% from RY94 through RY10. Success decreased to 16% during this reporting period as a result of the below average success rate in 2012 (12%) and 2013 (11%). Successful hunters spent an average of 6.9 days in the field during this reporting period, a decrease from the 7.4 days during the previous 10 years. Unsuccessful hunter effort during this reporting period was 7.7 days per hunter compared to an average of 7.6 days during the previous 10 hunting seasons.

Table 4. Unit 13 moose harvest data for state permit hunts, Southcentral Alaska, regulatory years[a] 2010–2014.

Hunt number(s)	Regulatory year	Permits[b] issued	Percent did not hunt	Percent unsuccessful hunters	Percent successful hunters	Bulls	Cows	Unknown	Harvest
Resident	2010	325	39	54	46	92	0	0	92
Any Bull	2011	225	47	59	42	49	0	0	49
DM330–334	2012	104	47	40	60	33	0	0	33
	2013	225	46	61	39	47	0	0	47
Resident	2012	10	0	60	40	0	4	0	4
Antlerless	2013	10	20	75	25	0	2	0	2
DM325	2014	10	20	0	100	3	4	0	7
Nonresident	2010	115	43	78	22	13	0	0	13
Antler Restricted	2011	65	46	54	46	16	0	0	16
DM335–339	2012	105	44	84	16	9	0	0	9
	2013	105	43	70	30	18	0	0	18
	2014	115	38	71	29	20	0	0	20
Community	2010	No hunt							
Subsistence	2011	753	58	72	28	86	0	0	86
Harvest Hunt	2012	961	62	73	27	98	0	0	98
CM300	2013	2,066	56	81	19	156	0	0	156
	2014	1,771	62	75	25	150	0	0	150
Registration Winter Hunt RM319	2014	386	61	97	3	4	0	0	4

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

[b] One permit was issued to the Community Subsistence Harvest hunt coordinator; community hunt harvest tickets were issued to individual hunters.

Table 5. Unit 13 moose hunter residency and success for general harvest ticket hunt only, Southcentral Alaska, regulatory years[a] 2010–2014.

	Successful				Unsuccessful				
Regulatory year	Local[b] resident	Nonlocal resident	Nonresident	Total[c]	Local[b] resident	Nonlocal resident	Nonresident	Total[c]	Total hunters
2010	67	677	0	756	428	2,858	16	3,332	4,088
2011	49	669	4	724	249	2,808	9	3,084	3,808
2012	39	465	0	505	282	3,442	17	3,749	4,254
2013	27	412	3	443	267	3,313	24	3,608	4,051
2014	38	616	6	666	263	2,731	21	3,047	3,713

[a] Regulatory year begins 1 July and ends 30 June, e.g., regulatory year 2010 = 1 July 2010–30 June 2011.
[b] Residents of Unit 13.
[c] Includes unspecified residency.

Resident any-bull drawing hunters on average spent 6.3 days in the field per successful hunter for the 5 hunts during this reporting period, and unsuccessful drawing hunters averaged 5.7 days in the field. Successful CSH hunters spent an average of 4.0 days in the field during this reporting period, while unsuccessful hunters spent an average 7.3 days in the field. Nonresident drawing hunters on average spent 5.8 days to take a bull, while unsuccessful nonresidents spent 7.7 days in the field.

Harvest Chronology

Chronology data for the general hunt are presented in Table 6. Moose become increasingly vulnerable throughout September, and harvest typically increases as the season progresses. Leaf fall starts occurring, bull movements increase, and onset of the rut increases the effectiveness of calling.

For the resident any-bull drawing hunts, the majority of the harvest (72%) occurred during the first 14 days of the season. The nonresident drawing hunters harvested bulls throughout the season.

Because the CSH hunt began 10 August during this reporting period, 22 days prior to the other moose hunts in the unit, the harvest chronology is somewhat different. Most (72%) of the harvest occurred before 1 September.

Transport Methods

Unit 13 general season moose hunters typically use all-terrain vehicles (ATV), off-road vehicles, or highway vehicles to reach hunting areas, but the most important method of transportation for moose hunters since RY93 has been ATVs (Table 7). Hunters using ATVs and off-road vehicles took 75% of the total moose harvest during this reporting period.

Resident any-bull drawing hunters generally utilized the same transportation methods as general season hunters. The only other common transportation methods were airplanes in the DM332 hunt (eastern Alphabet Hills). Nonresident drawing hunters primarily used ATVs, off-road vehicles, and highway vehicles. Hunters participating in DM338 (Unit 13D) primarily used aircraft.

Other Mortality

Brown bears are abundant in Unit 13 and are important predators of neonatal moose calves. Research in the 1970s indicated brown bears kill up to 50% of the calves within the first 6 weeks of life (Ballard et al. 1981). Although brown bears kill adult moose, the rate is much lower than for calves. A substantial reduction in bear numbers (1,979 bears removed from the upper Susitna) increased calf survival significantly in this unit (Ballard et al. 1987). Based on this research, liberalized hunting regulations have been in effect for brown bears in Unit 13 since the mid-1990s to reduce the population and increase calf survival unitwide. However, even though bear harvests have doubled under the more liberal regulations, calf recruitment has not increased.

Table 6. Unit 13 moose harvest (%) chronology by seasonal weeks for general state harvest ticket hunt only, Southcentral Alaska, regulatory years[a] 2010–2014.

Regulatory year	Season dates	Week of harvest[b]			
		1st	2nd	3rd	4th
2010	1 Sep–20 Sep	3	22	32	24
2011	1 Sep–20 Sep	7	32	35	27
2012	1 Sep–20 Sep	8	33	39	21
2013	1 Sep–20 Sep	8	30	36	27
2014	1 Sep–20 Sep	8	29	35	28

[a] Regulatory year begins 1 July and ends 30 June, e.g., regulatory year 2010 = 1 July 2010–30 June 2011.
[b] For the conventional moose season, weeks end 1 September, 8 September, 15 September, and 22 September.

Table 7. Unit 13 successful moose hunter transport methods (%) for general state harvest ticket hunt only, Southcentral Alaska, regulatory years[a] 2010–2014.

Regulatory year	Transport method (%)							
	Airplane	Horse	Boat	4-wheeler	Snowmachine	ORV[b]	Highway vehicle	Airboat
2010	6	1	4	58	0	17	13	1
2011	7	1	5	59	0	17	10	1
2012	5	1	4	55	0	22	12	1
2013	5	0	8	50	0	22	14	0
2014	5	1	7	55	0	21	11	0

[a] Regulatory year begins 1 July and ends 30 June, e.g., regulatory year 2010 = 1 July 2010–30 June 2011.
[b] ORV = off-road vehicle.

Alaska Board of Game Actions and Emergency Orders

In March 2009 BOG created the CSH program for moose. Residents of the 8 Ahtna communities: Chitina, Kluti Kaah, Tazlina, Gakona, Gulkana, Chistochina, Mentasta, and Cantwell were eligible. Other Alaskan residents were allowed to participate if they had ties to one of the 8 Ahtna communities. Community hunters were allowed to hunt in Unit 11, Unit 13, and a small portion of Unit 12 near Mentasta. The CSH program included a quota of 100 bulls not meeting the general season antler restrictions, or "any-bulls." During 2013, the any-bull quota for the Unit 13 portion of the CSH hunt area was 85. In addition to the any-bull option, CSH hunters were allowed an unlimited number of bulls meeting the state general hunt antler restrictions (spike-fork, 50-inch, 4 brow tine bulls). CSH season dates were 10 August–20 September. Due to a court ruling, BOG eliminated the CSH hunt for the RY10 season.

In March 2011, BOG adopted a new version of the CSH hunt using previously established boundaries and season dates. For 2011, any community or group of Alaskan hunters numbering 25 or more could apply for the hunt. Up to 70 bulls not meeting general season antler restrictions could be taken (additional spike-fork, 50-inch, and 4 brow tine bulls could also be taken).

BOG increased the CSH quota of any-bulls from 70 to 100 in 2013. For 2014, BOG added a winter CSH hunt (1 December–31 December) and allocated any-bull permits to 1 permit per every 3 households in the group. BOG summary information is available on the ADF&G website:

http://www.adfg.alaska.gov/index.cfm?adfg=gameboard.meetinginfo

Emergency orders were issued to manage the CSH and registration hunts during this reporting period. The CSH program includes a 24-hour reporting requirement to ensure an acceptable level of hunt management, where the bag limit is changed by emergency order to antler restricted (spike-fork, 50-inch, 4 brow tine) when the any-bull harvest has met the quota for each unit. Emergency orders issued during this reporting period are not presented in this report but are available from staff. Current year's emergency orders can be found on the ADF&G website:

http://www.adfg.alaska.gov/index.cfm?adfg=wcnews.main

The extensive CSH hunt conditions can be found online at

http://www.adfg.alaska.gov/index.cfm?adfg=huntlicense.cultural

Recommendations for Activity 2.1.

Continue.

3. Habitat Assessment-Enhancement

ACTIVITY 3.1. Monitor and evaluate forage plants to understand sustainable density of moose.

Data Needs

Monitoring forage utilization by moose and habitat condition provides information necessary to determine if moose density is impacting forage adversely. Monitoring of forage plants provides information about how much of available browse is being removed by the existing moose

population and the degree of browsing pressure during the life of the plant (Seaton 2002). Browse biomass removal is an indicator of moose nutritional condition (Seaton 2002; Boertje et al. 2007; Seaton et al. 2011). Monitoring browse plant architecture provides additional information on the effects of moose browsing on vegetation condition as a function of moose density (Seaton 2002; Paragi et al. 2015). Browse data are best used in conjunction with body condition and other parameters such as twinning data to assess habitat condition and trend and gauge whether more moose could be sustained on the landscape.

Methods

Data on browse production and removal were collected by highway vehicle and snowmachine during 10–26 April 2012 in Unit 13A. Browse was sampled at 29 plots (2 additional plots had no browse) and 2,108 twigs on 223 plants were measured and recorded (Appendix B) using techniques developed by Seaton (2002) and Seaton et al. (2011) to estimate the proportion of browse biomass removed by moose.

During 2013, browse sampling was conducted in Unit 13E and northern Unit 13A in association with the Susitna-Watana Hydroelectric Project. Browse data were collected, as described by Seaton (2002) and Seaton et al. (2011), by 2 teams of biologists from 28 March to 5 April 2013. A Robinson R-44 helicopter was used to access the area. Browse was sampled at 35 plots (4 additional plots had no browse, and 25 had no browse species).

Browse sampling was conducted in the southern portion of Unit 13B (Alphabet Hills) in 2014. Two teams of biologists sampled 30 plots (5 additional plots had no browse) 1–3 April 2014. Access was by R-44 helicopter. Two additional plots, accessed by snowmachine along the Denali Highway, were sampled on 8 April 2015.

Results and Discussion

During 2012, browsing occurred on 226 (10.7%) of the twigs (16 biomass removals by snowshoe hare) of which 114 twigs (50.4%) were browsed beyond current annual growth. Browsing was concentrated on 3 (*Salix alaxensis*, *S. bebbiana*, and *S. pulchra*) of the 7 species measured. The deterministic estimate of browse biomass removal was 31.9% ± 6.2% (95% CI 25.7–38.1%), and the bootstrap estimate with 1,000 resampling events was 31.4% (95% CI: 17.5–39.5%). This plant mean removal was moderately high across the gradient observed in Interior Alaska (Seaton et al. 2011). Browse removal >35% warrants consideration of elevated harvest to improve nutritional condition of moose (Boertje et al. 2007). However, during the 2012 browse survey, the areas sampled by highway vehicle and snow machine were easily accessible by moose and a high degree of browse removal was expected.

Results of browse sampling conducted in 2013 and 2014 are not currently available.

Recommendations for Activity 3.1.

Continue to evaluate the need for estimating browse use and habitat condition as the density of moose changes or twinning surveys indicate a substantial change in moose nutritional condition.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

Data Recording Archiving

- State moose harvest data are stored on an internal server (http://winfonet.alaska.gov/index.cfm). Federal moose harvest data must be collected from the Bureau of Land Management (BLM), and are stored electronically on the Glennallen Area Biologist's hard drive (D:\BGDIF\Moose\MooseHarvest\Unit13).
- Field data sheets are stored in file folders located in the Glennallen Area Biologist's office. Additional field data are electronically stored on the Glennallen Area Biologist's hard drive (D:\BGDIF\Moose\) (Appendices A and B).

Conclusions and Management Recommendations

A comparison of the number of moose counted indicates there has been an increase in all sex and age categories of moose. Overall, observed numbers of moose are up significantly since the last low in 2002, with the largest increases in Units 13A, 13B, and 13C. This suggests that moose numbers have increased in Unit 13 over the past decade.

The increase in moose observed is attributed primarily to increased overwinter survival due to reduced predation through active wolf management. Also contributing to the increased survival was the occurrence of relatively mild winters since 2000. Mild winters also help increase productivity, as cows in better physical condition have higher calving rates.

Fall calf ratios during this reporting period are well above those observed in the late 1990s, when moose were rapidly declining, but are still below management objectives across the unit. Brown bear predation continues to be an important factor in neonatal calf survival in Unit 13. Liberalized hunting regulations since 1994 have resulted in an increase in brown bear harvests, but no effect on neonatal calf mortality has been detected.

Harvests and hunting pressure in Unit 13 continued to increase during this reporting period; however, both harvests and hunting effort remain well below the level observed in the late 1980s. Whether Unit 13 can meet all population and harvest objectives for moose is yet to be determined. Habitat issues may influence harvest rates once we approach higher levels. The lack of substantial fires over the past 50 years may have resulted in lower browse quality.

Unit 13 has several areas where habitat improvement could produce more favorable browse conditions for moose. Due to the size and remoteness of much of the unit, fire is considered the only option for extensive habitat improvement. Wildfires occurred throughout much of Unit 13 before 1950, when fire suppression activities began. Since then, negligible acreage has burned. Current fire suppression policies in the "Copper Basin Fire Management Plan" set aside large portions of the unit as limited suppression (let-it-burn) areas where wildfires will not be suppressed to mimic natural disturbance. However, some wildfires have been suppressed, even if they occurred in an area designated as limited suppression. The current level of fire suppression has resulted in fewer fires and reduced seral habitat available as moose browse. This has likely reduced the moose carrying capacity over extensive portions of Unit 13.

Research throughout the 1990s in western Unit 13A suggested that browse utilization rates were sustainable (Collins 2002) when the moose numbers were lower. There are indications that browse quality in Unit 13A may not be as good as in other portions of the state. McArt et al. (2009) found higher levels of tannins and lower nitrogen in Unit 13A browse than in nearby study areas in Denali National Park (Unit 13E).

The use of prescribed fires to replace wildfire as a method of improving moose habitat has had limited application in Unit 13. The climate typically prevents the use of prescribed fire, except in the driest years. Also, scattered cabins and private landownership have increased over the years and increase the liability associated with the use of prescribed fire. In spite of problems associated with controlled burns, work with BLM and the Alaska Department of Natural Resources (DNR) has been ongoing, and a prescribed fire was completed in 2004. The Alphabet Hills controlled burn was ignited in August 2004 and approximately 41,000 acres[2] burned around Kelly Lake on the south slopes of the Alphabet Hills in Unit 13B. The burn plan was updated in 2013 and is being revised to meet current DNR standards.

We recommend continuing to increase moose harvests in those portions of Unit 13 where moose numbers have increased the most. Specifically, bull harvests should continue to be liberalized in Units 13A, 13B, and 13C as long as the bull:cow ratio remains above objectives. Also, limited cow harvests should be utilized to provide additional opportunity in specific areas given public support. Given the controversial nature of antlerless hunts, a limited number of permits should be made available for clearly identified hunt areas where moose are abundant, and the permit hunts should be limited by conservative harvest objectives for each area.

II. Project Review and RY15–RY19 Plan

Review of Management Direction

MANAGEMENT DIRECTION

There are no changes in the management direction for Unit 13.

GOALS

- Protect, maintain, and enhance the moose population and its habitat.
- Provide the greatest sustained opportunity for moose harvest.
- Provide an opportunity to view and photograph moose.

CODIFIED OBJECTIVES

Amount Reasonably Necessary for Subsistence Uses

- 300–600 moose.

Intensive Management

- Population objective: 17,000–21,400 moose.
- Harvest objective: 1,050–2,180 moose.

Unit	Population objective	Harvest objective
13A	3,500–4,200	210–420
13B	5,300–6,300	310–620
13C	2,000–3,000	155–350
13D	1,200–1,900	75–190
13E	5,000–6,000	300–600

MANAGEMENT OBJECTIVES

Manage moose populations at the following levels:

- Manage for posthunt (fall) sex ratios of 25 bulls:100 cows with 10 yearling bulls:100 cows throughout the unit.
- Twenty-five fall calves:100 cows in Unit 13A.
- Thirty fall calves:100 cows in Units 13B, 13C, 13D, and 13E.

REVIEW OF MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1. Monitor moose abundance in at least one administrative subunit annually.

Data Needs

Moose abundance data are necessary to determine population status in relation to management objectives. GSPE is the preferred technique for estimating abundance, and provides an unbiased population estimate over large study areas at lower costs than other exhaustive census methods (Kellie and DeLong 2006). GSPE also provides age-sex composition with estimated variance.

Methods

GSPE surveys at a rate to detect changes in abundance by administrative subunit. We would likely survey each administrative subunit on a 3-year cycle. Precision will be based in consultation with a staff biometrician.

ACTIVITY 1.2. Monitor moose population composition.

Data Needs

Moose composition data are necessary to determine population status in relation to codified and management objectives. Although GSPE provides unbiased estimates of populations it can be

expensive to apply across entire game management units. Therefore, we will continue to perform trend surveys to index the population and to provide composition data in otherwise unsurveyed areas.

Methods

Will follow methods from prior reporting period.

ACTIVITY 1.3. Spring twinning surveys.

Data Needs

Estimates of moose nutritional condition are important to management on a sustained yield basis, and to ensure against density precipitated declines in productivity and damage to habitat. Twinning rates provide an index of nutritional health of cows (abundant nutrition on the landscape correlates with healthy cows and high twinning rates).

Methods

We will follow methods from the prior reporting period and strive for a minimum sample size of 50 observed cows with calves.

2. Mortality-Harvest Monitoring

ACTIVITY 2.1.

Data Needs

No change from prior reporting period. Monitoring harvest during the hunting season is essential to successfully administer the CSH hunt. Monitoring and analyzing harvest data annually is important to understand harvest pressure, hunter effort, and hunter success in Unit 13.

Methods

No change from prior reporting period. Individuals who obtain a moose permit from ADF&G (harvest ticket, registration, or CSH) are required to report on their permit after successful harvest, or after the end of the season. Failure to report results in 2 reminders and eventual penalty. Hunt reports are recorded in WinfoNet, and include information regarding hunter residency, success, effort, hunt location, date of kill, transportation, and antler size. Harvest information is summarized daily for the CSH hunt, and annually for all other hunts. Federal hunters report to BLM. ADF&G staff retrieve federal harvest information from BLM annually, once the information becomes available.

3. Habitat Assessment-Enhancement

ACTIVITY 3.1. Monitor forage plants to understand sustainable density of moose.

Data Needs

Monitoring forage utilization by moose and habitat condition provides information necessary to determine if moose density is impacting forage adversely. Monitoring of forage plants provides

information about how much available browse is being removed by the existing moose population and the degree of browsing pressure during the life of the plant (Seaton 2002). Browse biomass removal is an indicator of moose nutritional condition (Seaton 2002; Boertje et al. 2007; Seaton et al. 2011). Monitoring browse plant architecture provides additional information on the effects of moose browsing on vegetation condition as a function of moose density (Seaton 2002; Paragi et al. 2015). Browse data are best used in conjunction with body condition and other parameters such as twinning data to assess habitat condition and trend and gauge whether more moose could be sustained on the landscape.

Methods

We will follow methods from prior reporting period.

NONREGULATORY MANAGEMENT PROBLEMS OR NEED

Data Recording and Archiving

- State moose harvest data will be stored on an internal server (http://winfonet.alaska.gov/index.cfm). Federal moose harvest data must be collected from BLM, and are stored electronically on the Glennallen Area Biologist's hard drive (D:\BGDIF\Moose\MooseHarvest\Unit13).
- Field data sheets will be stored in file folders located in the Glennallen Area Biologist's office. Additional field data are electronically stored on the Glennallen Area Biologist's hard drive (D:\BGDIF\Moose\).

Permitting

Institutional Animal Care and Use Committee approval, moose captures.

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Appendix A. Moose trend count data sheet.

MOOSE SURVEY FORM

Page____of____

GMU/Subunit _____ Count Area_____ Survey Type *(circle one)*

Date _____ Pilot/observer_____ Trend Count or GSPE

Survey conditions (circle): Excellent Good Fair Poor (turn around and go home)

Weather: clouds _____ precipitation_____

winds/turbulence _____ temperature_____

depart time: _____ break time: _____ return time: _____ total flight time: _____

survey start time: _____ break time: _____ survey stop time: _____ total survey time: _____

Light	
Type	Intensity
Bright	High
Flat	Med
	Low

Snow age and cover	
Fresh	Complete
≤ week	Some low vegetation showing
> week	Bare ground showing

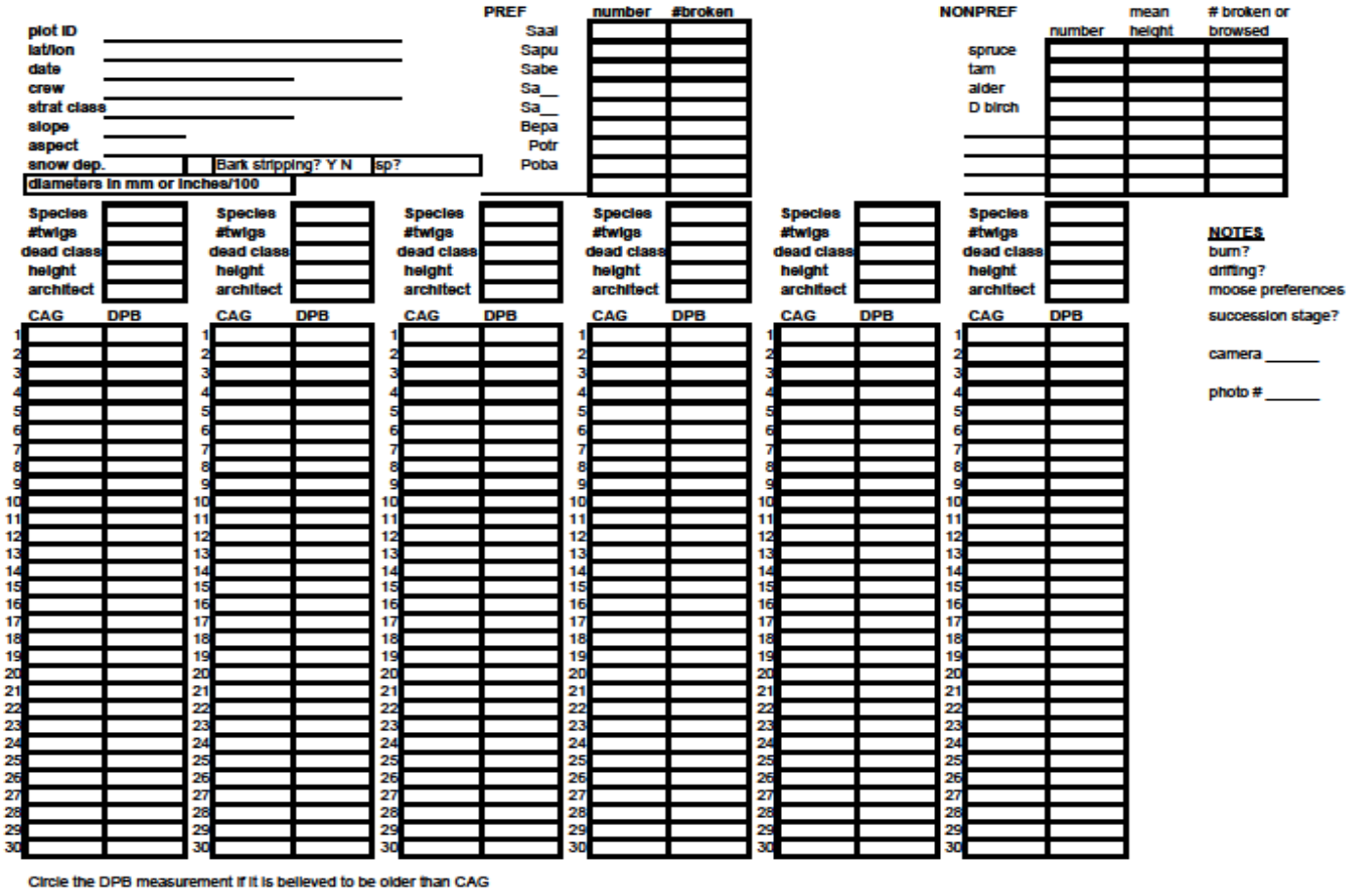
Search Type

Standard (~ 6.5 - 8 min/mi^2, ~ 45min)

Intensive (~ 10 - 12 min/mi^2, + 20min)

Waypoint No.	Bulls			Cows			Lone calf	Unk sex/ age	Total Moose	Remarks
	Ylg	Med <50"	Lge ≥50"	w/o calf	w/1 calf	w/2 calf				
Totals										

Appendix B. Browse sampling 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												
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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, Saal, Sabe, etc., can be nonpref plants if they are too tall
*measure plant height from ground


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