

Moose Management Report and Plan, Game Management Units 20C, 20F, and 25C:

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

Anthony L. Hollis



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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 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 website.

This species management report and plan was reviewed and approved for publication by Doreen I. Parker McNeill, Management Coordinator for the Division of Wildlife Conservation, Fairbanks.

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Purpose of this Report

This report provides a record of survey and inventory management activities for moose (*Alces alces*) in Units 20C, 20F, and 25C for the 5 regulatory years (RY; RY10–RY14) and plans for survey and inventory management activities in the 5 years following the end of that period (RY15–RY19). A regulatory year 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 the Alaska Department of Fish and Game’s (ADF&G) Division of Wildlife Conservation (DWC) launched this 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 and supersedes the 1976 draft Alaska wildlife management plans (ADF&G 1976).

I. RY10–RY14 Management Report

Management Area

Unit 20C (11,902 mi²) includes drainages into the west bank of the Nenana River and into the south bank of the Tanana River west of the Nenana River. Most of Denali National Park and Preserve (DNP&P) is within Unit 20C. Unit 20F (6,267 mi²) includes drainages into the north bank of the Tanana River west of Manley Hot Springs and into the Yukon River drainage between the village of Tanana and the Dalton Highway bridge. Unit 25C (5,149 mi²) includes drainages into the south bank of the Yukon River upstream from Circle to, but not including, the Charley River drainage; the Birch Creek drainage upstream from the Steese Highway bridge; the Preacher Creek drainage upstream from and including the Rock Creek drainage; and the Beaver Creek drainage upstream from and including the Moose Creek drainage. Habitat types and terrain varies greatly in Units 20C, 20F, and 25C with areas that are flat with little topography, rolling hills, and mountainous terrain. Habitat types range from lowland riparian and grasslands, black spruce (*Picea mariana*) forest, deciduous forest, alpine and subalpine habitat and burns of various ages. The climate is typical of Interior Alaska where temperatures frequently reach 80°F during the summer months and –40°F during the winter months. Snow depths are generally low and rarely reach 32 inches, although snow depth varies greatly by elevation and generally gets deeper in the higher elevations of the units.

Summary of Status, Trend, Management Activities, and History of Moose in Units 20C, 20F and 25C

Moose densities in Units 20C, 20F, and 25C have been low for many years, presumably because of combined predation from wolves (*Canis lupus*) and bears (Gasaway et al. 1992). Wolf and bear populations are lightly harvested in these units. The high proportion of large bulls (bulls with antlers ≥ 50 inches wide) in the harvest suggests that harvest of bull moose is low. Thus, we consider harvest to be a minor factor affecting population dynamics relative to predation. Low densities do not appear to be related to habitat limitation. Although these units contain tracts of mature black spruce that are poor quality moose habitat, there appears to be a substantial amount

of riparian area, subalpine hills, and recently burned habitat capable of sustaining moose densities higher than the current levels.

Trends in moose populations have been difficult to identify due to infrequent surveys and low moose density. Densities probably fluctuate within 0.1 and 1.1 moose/mi², and more likely 0.2–0.7 moose/mi², based on Alaska and Yukon studies in large areas (>800 mi²) with 2 or more lightly harvested predators (Gasaway et al. 1992).

Moose within DNP&P have been studied more intensively than moose in the remainder of these units. Within DNP&P, radiocollared moose have been monitored for movement, behavior, survival, and reproduction (Franzmann and Schwartz 1997). Also, composition surveys and population estimates have been conducted by DNP&P biologists since 1970.

Moose in these units are an important source of food, trophies, and recreation for many residents and nonresidents. Nonconsumptive uses are particularly important in DNP&P.

Management Direction

EXISTING WILDLIFE MANAGEMENT PLANS

Direction for the management of moose in Units 20C, 20F, and 25C has 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 moose management report series. The plan section of this document contains the current management plan for moose in Units 20C, 20F, and 25C.

GOALS

- Provide for a sustained harvest of these low-density populations.
- Promote moose habitat enhancement by allowing natural fires to alter vegetation.

CODIFIED OBJECTIVES

Amounts Reasonably Necessary for Subsistence Uses

- Units 20C and 20F: 100–130 moose.
- Unit 25C, that portion outside the boundaries of the Fairbanks Nonsubsistence Use Area: 8–15 moose.

Intensive Management

UNIT 20C

- Population objective: 3,000–4,000 moose.
- Harvest objective: 150–400 moose.

UNIT 20F

- Negative finding for intensive management (IM).

UNIT 25C

- Negative finding for IM.

MANAGEMENT OBJECTIVES

- Maintain a bull:cow ratio of $\geq 30:100$ in areas with aerial surveys and $\geq 20\%$ large bulls in the harvest in areas without aerial surveys.

MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1. Geospatial population estimation (GSPE) survey in Unit 20C.

Data Needs

Due to public proposals to BOG to conduct predator control and other regulations which allow more liberal predator hunting (e.g., brown bear baiting), a moose population estimate was needed to determine if the Unit 20C moose population was meeting the IM population objective of 3,000–4,000 moose.

Methods

We conducted a GSPE moose survey (Ver Hoef 2001, 2008; Kellie and DeLong 2006) in eastern Unit 20C during November 2011 (RY11). This was the first GSPE survey conducted in Unit 20C. The 2,962 mi² survey area is north of DNP&P, south of the Tanana River, west of the Nenana River, and east of the Kantishna River drainages. We first stratified the area during 1–2 November and classified each survey unit (SU) as either high- or low-density moose habitat according to field stratification methods outlined by Kellie and DeLong (2006). A simple random sample of 100 SUs (60 high density and 40 low density) was selected from each stratum using Microsoft Excel[®] 2010 software. We then surveyed 100 (60 high density and 40 low density; 577 mi²) of 514 SUs (2,962 mi²) during 11–15 November. Survey conditions (Gasaway et al. 1986) with regard to snow (age and cover), light (intensity and type), and wind (strength and turbulence) were reported as excellent (24%; $n = 24$), good (62%; $n = 62$), fair (4%; $n = 4$), poor (1%; $n = 1$), or unclassified (9%; $n = 9$). We then extrapolated the mean moose density estimated in this area to all of Unit 20C outside DNP&P. The GSPE method does not employ a sightability correction factor (SCF), thus does not correct for moose not seen during the survey. Rather, the GSPE method employs greater search intensity, 8–10 min/mi² in each SU versus 4–6 min/mi² (Gasaway et al. 1986), resulting in a higher level of sightability. Search time per SU in SUs with 100% moose habitat averaged 7.5 min/mi² ($n = 100$ SUs). Preliminary work with the sightability of radiocollared moose in adjacent Unit 20A indicates that an SCF of 1.16 to 1.25 may be appropriate. We applied an SCF of 1.21 to GSPE estimates of observable moose in Unit 20C to calculate total moose population size for comparison with IM population and harvest objectives (Boertje et al. 2009).

Results and Discussion

We estimate 3,800 moose inhabited Unit 20C outside DNP&P during RY11, based on the November 2011 GSPE survey in eastern Unit 20C (1,460 moose; 90% CI = 1,189–1,731). Because Unit 20C is similar in habitat type to Unit 20A, we applied an SCF of 1.21 to obtain a sightability-corrected estimate of 1,767 moose (0.6 moose/mi²). We then extrapolated this density to all of Unit 20C outside of DNP&P (6,476 mi²) to attain an estimated population of 3,801 moose. Results of the 2011 GSPE survey in Unit 20C also indicated ratios of 41 calves:100 cows and 49 bulls:100 cows. These ratios suggest light hunting pressure and moderate calf recruitment.

Recommendations for Activity 1.1

Only conduct GSPE surveys in Unit 20C if harvest indicates the population may have declined below the IM population objective.

ACTIVITY 1.2. Spring twinning surveys in Unit 20C.

Data Needs

Due to public proposals to BOG to conduct predator control and other liberalization to predator hunting (e.g., brown bear baiting), twinning surveys were conducted to determine the health of the moose population and to determine moose productivity in the unit.

Methods

Twinning surveys were conducted using various methodologies during RY10–RY14 in Unit 20C. Because of the low-density population it is difficult to get an adequate sample size of 50 parturient moose. In RY10, we conducted a twinning survey during 1–2 June 2010 in the eastern portion of Unit 20C. The survey was flown with pilot T. Seaton and observer T. Hollis in a Bellanca Scout. The weather was hot (69–71°F) and sunny and leaf emergence was 100% on all species of deciduous trees. On 1 June, transects were flown north-south from the Nenana River west to the Kantishna River and from the Bear Paw Trail North to the Tanana River. On 2 June, we flew the Tanana River corridor from Nenana downstream to Manley and back. We intensively searched the best moose habitat and avoided most of the habitat that was burned in the 2009 Railbelt Fire (500,000+ acres). Total survey time was 6.5 hours.

In RY11, we flew Unit 20C twinning surveys during 28–29 May. The survey was flown with pilot T. Seaton and observer T. Hollis in a Bellanca Scout. We surveyed all habitat types in the Unit 20C IM study area, including the riparian zones, marsh areas, burned forest, unburned mixed forest, alpine, and black spruce. For the second year running, we did not find a concentrated calving area. All moose we encountered were at very low density and in varying habitats. A total survey time of 7.5 hours was flown.

In RY12, the survey was conducted by radiotracking 30 adult females that were fitted with VHF radio collars in March 2012 and observing the number parturient females. The conditions for the survey were difficult because numerous thunder showers in the area needed to be avoided. We located 25 of the 30 radiocollared moose and observed 23 of them.

In RY13, we flew the Unit 20C twinning surveys on 24 June. The survey was conducted by radiotracking 35 adult females that were fitted with VHF collars in March 2011 and March 2012 and observing the parturient females. The survey was conducted in a Piper PA-18 Super Cub with pilot M. Webb and observer C. Carroll. The survey was conducted at a later than normal date because of a late spring and lack of available survey pilots. The weather conditions for the survey were good. A total of 28 of the 35 radiocollared moose were located and observed.

In RY14, we flew Unit 20C twinning surveys on 22 May, 28 May, and 4 June. The survey was conducted by radiotracking 23 adult females that were fitted with VHF radio collars in March 2011 and March 2012 and observing the parturient females. The survey was conducted in a Piper PA-18 Super Cub with pilot M. Webb and observer K. Colson. The weather conditions for the survey were good, however 100% leaf emergence made visibility difficult. A total of 18 of the 23 radiocollared moose were located and observed.

Results and Discussion

Obtaining an adequate sample of parturient moose in Unit 20C has proven difficult even with the use of radio collars. In 2010, the twinning rate was 38%, however only 8 parturient moose were located (3 sets of twins). In 2011, 8 parturient moose were also found and none of the moose had twins at heel. In 2012 we began using radiocollared moose to try to obtain twinning rates. We found that 15 of the radiocollared moose were parturient cows and 4 had given birth to twins (27% twinning rate). Twinning rates were 20% (3 sets of twins out of 15 parturient moose) in 2013 and 33% (6 sets of twins out of 18 parturient moose) in 2014. Although sample sizes were small, twinning rates averaged greater than 20% during 2010–2015. This indicates that the Unit 20C moose population is likely productive and likely not limited by forage.

Recommendations for Activity 1.2

We discontinued the Unit 20C twinning surveys after the spring 2014 survey. During 2010–2015 twinning rates averaged greater than 20%; therefore, we believe that nutrition is not a limiting factor in Unit 20C.

2. Mortality–Harvest Monitoring and Regulations

ACTIVITY 2.1. Monitor and analyze harvest data.

Data Needs

Unit 20C was identified by BOG for IM of moose with a harvest objective of 150–400 moose annually. Units 20F and 25C have no other management activities and reported harvest is used to monitor these areas. We will monitor harvest in Units 20C, 20F, and 25C to determine if we meet the management objective in all 3 units and the IM harvest objective in Unit 20C. The data are also analyzed for changes in success rate, effort, total harvest, and harvest composition that may indicate changes in population levels.

Methods

We estimated annual harvest and mortality in all units from 1) data from mandatory harvest reports, 2) our records of telephone calls from the public concerning nonhunting mortality, 3) Alaska

Wildlife Trooper records of moose–motor vehicle collisions, and 4) Alaska Railroad records of moose–train collisions between railroad mileposts 327 and 371 in Unit 20C. To estimate unreported harvest by residents of Tanana, we used a 1987 study conducted by ADF&G-Division of Subsistence (Andersen and Alexander 1992). We summarized data regarding hunter residency and success, harvest chronology, and transportation methods. When antler size of bulls was reported, we considered bulls with antler spreads <30 inches to be yearlings. Data were summarized by regulatory year.

Results and Discussion

Harvest by Hunters

The average reported moose harvest during RY10–RY14 was 136 (range 101–170) in Unit 20C, 43 moose (range 32–52) in Unit 20F, and 83 moose (range 64–95) in Unit 25C (Table 1). The average harvest decreased slightly in Unit 20C during RY10–RY14 compared to RY05–RY09 which averaged 140 moose. The average harvest remained the same in Unit 20F during RY10–RY14 compared to RY05–RY09 and increased in Unit 25C.

Hunter Residency and Success

During RY10–RY14, total number of hunters in Unit 20C averaged 517, compared to the RY05–RY09 average of 482. In Unit 20F, the average number of hunters during RY10–RY14 was 159, compared to the average of 148 during RY05–RY09. The average number of hunters in Unit 25C was 335 during RY10–RY14 compared to 343 during RY05–RY09 (Table 1). The average number of moose harvested each year during RY10–RY14 remained stable in all 3 units compared to RY05–RY09 (Table 2).

During RY10–RY14, up to 1 nonresident hunters annually reported hunting in Unit 20F (Table 1), even though this unit had no open moose season for nonresidents. These data may be attributed to misreporting by hunters, data management errors by ADF&G, or legitimate harvest reports from illegal nonresident hunters.

In Units 20C and 20F most successful hunters were residents of Unit 20. In Unit 25C, however, most successful hunters resided outside of Unit 25, including nonlocal residents of Alaska and nonresidents (Table 1). This difference can be attributed to the fact that relatively few people reside within Unit 25C.

Harvest Chronology

During RY10–RY14 the highest proportion of the harvest occurred during the second or third week of the fall season in all 3 units (Table 3). The fourth week of the season in Unit 20C first occurred in RY12 and will likely continue to have a high proportion of the harvest because the onset of the moose breeding season makes bulls more vulnerable to harvest. Few moose were reported harvested during the December season in Unit 20F.

Table 1. Units 20C, 20F, and 25C reported moose hunter residency and success, Interior Alaska, regulatory years^a 2003–2014.

Unit and Regulatory year	Successful hunters				Unsuccessful hunters				Total hunters
	Local ^b resident	Nonlocal resident	Nonresident	Total ^c (%)	Local ^b resident	Nonlocal resident	Nonresident	Total ^c (%)	
<i>Unit 20C</i>									
2003	59	36	10	105 (21)	252	116	26	394 (79)	499
2004	66	23	8	97 (21)	228	108	19	355 (79)	452
2005	86	36	7	129 (30)	204	81	19	304 (70)	433
2006	92	35	16	143 (28)	218	124	35	377 (73)	520
2007	90	34	16	140 (28)	219	130	18	367 (72)	507
2008	86	40	13	142 (30)	178	136	14	328 (70)	470
2009	77	49	14	140 (29)	213	105	22	340 (70)	480
2010	53	39	7	101 (23)	178	135	18	331 (75)	432
2011	71	42	9	124 (30)	172	102	11	285 (69)	409
2012	79	68	1	155 (28)	219	153	12	384 (70)	539
2013	75	62	3	144 (22)	300	179	36	515 (78)	659
2014	93	59	10	162 (30)	226	149	11	386 (70)	548
<i>Unit 20F</i>									
2003	12	8	0	20 (15)	85	29	0	114 (85)	134
2004	18	7	0	25 (22)	60	26	1	87 (78)	112
2005	27	8	1	36 (29)	64	23	2	89 (71)	125
2006	27	12	1	40 (33)	58	22	2	82 (67)	122
2007	23	6	0	29 (20)	83	29	1	113 (80)	142
2008	31	19	2	52 (31)	72	41	1	114 (69)	166
2009	38	19	2	59 (32)	90	35	2	127 (68)	186
2010	24	18	0	42 (28)	78	31	0	109 (72)	151
2011	30	19	0	49 (37)	48	36	0	84 (63)	133
2012	36	12	1	49 (30)	77	36	2	115 (70)	164
2013	22	9	0	31 (17)	96	58	2	156 (83)	187
2014	25	13	0	38 (23)	84	39	1	124 (77)	162
<i>Unit 25C</i>									
2003	3	43	6	52 (17)	20	210	19	249 (83)	301
2004	4	41	6	51 (21)	15	164	15	194 (79)	245
2005	3	56	4	63 (17)	17	248	39	304 (83)	367
2006	3	53	6	62 (18)	18	226	41	285 (82)	347
2007	4	55	9	68 (19)	9	247	32	288 (81)	356
2008	6	64	10	80 (25)	16	191	32	239 (75)	319
2009	1	95	15	111 (33)	11	183	22	216 (64)	327
2010	7	77	8	92 (26)	16	222	21	259 (72)	351

Unit and Regulatory year	Successful hunters				Unsuccessful hunters				Total hunters
	Local ^b resident	Nonlocal resident	Nonresident	Total ^c (%)	Local ^b resident	Nonlocal resident	Nonresident	Total ^c (%)	
2011	9	62	19	90 (32)	10	156	17	183 (66)	273
2012	12	55	15	86 (25)	12	204	34	257 (75)	343
2013	6	48	6	60 (16)	8	256	40	304 (84)	364
2014	7	59	14	80 (23)	15	219	31	265 (77)	345

^a Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2003 = 1 July 2003–30 June 2004).

^b Hunters who live within the unit in which they reported hunting were considered local.

^c Some reports have unknown residency, so total may not reflect the sum of local, nonlocal, and nonresident hunters.

Table 2. Units 20C, 20F, and 25C estimated moose harvest and accidental death, regulatory years^a 2003–2014.

Unit and Regulatory year	Harvest by hunters								Accidental death			Combined total
	Reported ^b				Estimated				Road ^e	Train ^f	Total	
	M	F	Unk	Total	Unreported ^c	Illegal/Other ^d	Total					
<i>Unit 20C</i>												
2003	105	0	0	105	19	0	19	0	0	0	124	
2004	99	0	0	99	18	1	19	0	0	0	118	
2005	131	1	2	134	23	0	23	0	1	1	158	
2006	141	0	2	143	25	0	25	0	3	3	171	
2007	140	0	0	140	25	0	25	0	0	0	165	
2008	142	0	0	142	25	0	25	0	0	0	167	
2009	139	0	1	140	25	0	25	0	0	0	165	
2010	101	0	0	101	18	0	18	0	0	0	119	
2011	122	0	2	124	22	0	22	0	0	0	146	
2012	150	1	4	155	27	0	27	0	0	0	182	
2013	130	0	0	130	23	0	23	0	0	0	153	
2014	169	1	0	170	29	0	29	0	0	0	199	
<i>Unit 20F</i>												
2003	20	0	0	20	4	1	5	0		0	25	
2004	27	0	0	27	5	0	5	0		0	32	
2005	35	0	1	36	6	0	6	0		0	42	
2006	39	0	0	39	7	0	7	0		0	46	
2007	29	0	0	29	5	0	5	0		0	34	
2008	53	0	1	54	9	0	9	0		0	63	
2009	56	2	3	61	10	0	10	0		0	71	
2010	43	0	0	43	8	0	8	0		0	51	
2011	48	0	1	49	8	0	8	0		0	57	
2012	49	0	3	52	9	0	9	0		0	61	
2013	31	1	0	32	5	0	5	0		0	37	
2014	39	0	0	39	7	0	7	0		0	46	

Unit and Regulatory year	Harvest by hunters								Accidental death			Combined total
	Reported ^b				Estimated			Road ^e	Train ^f	Total		
	M	F	Unk	Total	Unreported ^c	Illegal/Other ^d	Total					
<i>Unit 25C</i>												
2003	52	0	0	52	9	0	9	0		0	61	
2004	52	0	0	52	9	1	10	1		1	63	
2005	63	0	0	63	11	0	11	0		0	74	
2006	62	0	0	62	11	0	11	0		0	73	
2007	68	0	0	68	12	0	12	0		0	80	
2008	79	1	0	80	14	0	14	0		0	94	
2009	114	0	0	114	20	0	20	0		0	134	
2010	95	0	0	95	17	0	17	0		0	112	
2011	91	0	0	91	16	0	16	0		0	107	
2012	84	0	2	86	15	0	15	0		0	101	
2013	64	0	0	64	11	0	11	0		0	75	
2014	80	0	0	80	14	0	14	0		0	94	

^a Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2003 = 1 July 2003–30 June 2004).

^b Data from moose harvest ticket reports in moose harvest database using ADF&G's Wildlife Information Network (WinfoNet).

^c Based on 17.7% unreported harvest (including wounding loss) estimated by Gasaway et al. (1992).

^d Data from Fairbanks Alaska Wildlife Troopers wildlife mortality logs and ADF&G records.

^e Documented kills from Fairbanks Alaska Wildlife Troopers wildlife mortality logs.

^f Confirmed dead Alaska Railroad mileposts 327.0–370.9; "missing" (moose hit but not recovered) are not included. Data provided by the Alaska Railroad and summarized by ADF&G, Palmer.

Table 3. Units 20C, 20F, and 25C reported percent moose harvest chronology by month/day, Interior Alaska, regulatory years^a 2003–2014.

Unit/Regulatory year	Harvest percent chronology by month/day ^b					<i>n</i>
	9/1–9/7	9/8–9/15	9/16–9/20	9/21–9/25	12/1–12/10	
<i>Unit 20C</i>						
2003	21	54	25			102
2004	32	28	39			92
2005	25	40	35			124
2006	37	35	28			134
2007	31	47	22			137
2008	22	44	33			142
2009	31	39	30			137
2010	31	40	29			101
2011	27	40	33			122
2012 ^c	17	30	28	25		151
2013	17	20	35	28		130
2014	22	24	32	21		170
<i>Unit 20F</i>						
2003	26	32	37		5	19
2004	26	41	30		4	27
2005	26	40	31		3	35
2006	31	46	23		0	39
2007	14	59	24		3	29
2008	23	53	23		2	53
2009	25	34	36		5	59
2010	16	49	26		9	43
2011	28	39	27		6	47
2012	16	56	24		4	51
2013	22	44	16		9	32
2014	8	44	23	21	4	39
<i>Unit 25C</i>						
2003	45	55				49
2004	44	56				52
2005	39	61				59
2006	43	56				57
2007	44	56				66
2008	44	56				75
2009	49	51				113
2010	45	55				95
2011	35	65				90
2012	41	59				82
2013	28	72				64
2014	29	71				80

^a Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2003 = 1 July 2003–30 June 2004).

^b Does not include kills reported outside open hunting seasons or hunters who did not report date of kill.

^c Season was lengthened 5 days in Unit 20C beginning in regulatory year 2012.

Transport Methods

The most successful hunters in Unit 20C use boats, 3- or 4-wheelers, and airplanes for transportation (Table 4). Extensive river systems, many lakes, and an expanding trail system make these transport methods most successful. In Unit 20F, boats and 3- or 4-wheelers are the primary modes of transportation for successful hunters. In Unit 25C, successful moose hunters use highway vehicles, 3- or 4-wheelers, or boats. Transportation methods used throughout this area reflect access opportunities.

Other Mortality

In Unit 20C, 3 of 9 radiocollared yearlings (33%) died within 1 year of capture and all were killed by wolves. Of 26 radiocollared adult females, only 1 died within a year of capture (4%). Cause of death was unknown. Twenty-two adult females survived until the May 2013 calving season and 14 (64%) were observed with calves at heel on 7 August 2013. By March 2014 only 6 of the original 22 pregnant females (27%) were observed with a calf at heel.

Alaska Board of Game Actions and Emergency Orders

During the March 2012 meeting, in an attempt to increase harvest in Unit 20C to meet the IM harvest objective, BOG increased the length of the season for moose by 5 days for residents and 10 days for nonresidents and added antler restrictions for nonresidents. We recommended this change after completing an IM feasibility assessment and determining that increasing the season length would be the appropriate action to increase harvest in the area. During the February 2014 meeting, BOG adopted regulations to lengthen both the fall season and the winter season in western Unit 20F. No BOG actions were taken, and no emergency orders were issued during RY10–RY14 in Unit 25C.

Recommendations for Activity 2.1

We recommend continuing to monitor and analyze harvest in Units 20C, 20F, and 25C. Harvest data are an important component to monitoring and managing the moose population in these units.

Table 4. Units 20C, 20F, and 25C reported moose harvest percent by transport method, Interior Alaska, regulatory years^a 2003–2014.

Unit and Regulatory year	Harvest percent by transport method								<i>n</i>
	Airplane	Horse/ Dogsled	Boat	3- or 4-wheeler	Snowmachine	Other ORV	Highway vehicle	Unk/ Other	
<i>Unit 20C</i>									
2003	27	5	24	24	0	12	7	2	105
2004	30	1	27	22	0	14	5	0	99
2005	21	1	32	25	1	13	3	3	134
2006	29	1	27	27	0	10	3	3	143
2007	24	1	28	28	0	11	7	1	140
2008	37	1	30	18	0	12	2	0	142
2009	20	1	32	26	0	14	6	1	140
2010	19	0	31	30	0	13	7	0	101
2011	23	0	31	35	0	7	4	0	122
2012	15	1	37	28	0	12	5	2	155
2013	22	2	30	27	0	13	5	1	130
2014	18	0	34	27	0	11	5	5	170
<i>Unit 20F</i>									
2003	0	0	50	30	5	10	5	0	20
2004	0	0	37	22	4	11	26	0	27
2005	6	0	28	31	3	5	25	2	36
2006	5	0	33	31	0	18	13	0	39
2007	3	0	31	38	7	7	14	0	29
2008	3	2	31	39	4	9	12	0	54
2009	0	0	36	46	7	2	8	2	61
2010	6	2	33	34	9	7	7	2	43
2011	2	0	35	37	6	6	14	0	49
2012	6	0	35	24	4	6	19	6	52
2013	0	0	22	50	9	13	6	0	32
2014	0	0	51	21	3	10	10	5	39
<i>Unit 25C</i>									
2003	6	0	29	44	0	8	12	2	52
2004	4	0	17	46	0	4	27	2	52
2005	0	0	30	48	0	6	14	2	63
2006	6	0	21	53	0	6	13	0	62
2007	1	0	22	53	0	0	25	0	68
2008	4	0	23	51	1	1	19	1	80
2009	5	0	21	51	0	6	15	2	114

Unit and Regulatory year	Harvest percent by transport method								<i>n</i>
	Airplane	Horse/ Dogsled	Boat	3- or 4-wheeler	Snowmachine	Other ORV	Highway vehicle	Unk/ Other	
2010	2	0	28	55	0	2	12	1	95
2011	1	0	26	51	0	2	20	0	91
2012	5	0	18	49	0	2	24	2	86
2013	8	0	14	56	0	5	17	0	64
2014	6	0	34	46	0	1	11	2	80

^a Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2003 = 1 July 2003–30 June 2004).

3. Habitat Assessment–Enhancement

ACTIVITY 3.1. Browse removal surveys.

Data Needs

Browse surveys in Unit 20C help to determine if the habitat and available browse is a limiting factor restricting growth of the moose population.

Methods

During March 2011 we conducted a browse survey east of the Kantishna River in Unit 20C to evaluate browse abundance relative to current levels of use by moose and determine if habitat may be a limiting factor preventing growth to the moose population in the area (Seaton et al. 2011). Preferred forage species were analyzed from 35 random plots throughout the area to determine the rate of consumption by moose. A detailed description of the survey methods, sampling design, and results can be found in an upcoming research report (Paragi and Kellie, *In prep*).

Results and Discussion

In spring 2011 we determined that eastern Unit 20C had a low to moderate browse removal rate of 19% (Paragi and Kellie, *In prep*). In comparison adjacent Units 20A and 20B, where moose density and nutritional stress is higher, have removal rates of 40% and 28% respectively. With 81% of the available forage unbrowsed annually, it is likely that habitat in Unit 20C is not a factor limiting moose population growth.

Recommendations for Activity 3.1

Browse removal surveys do not need to be conducted in Unit 20C unless we detect a significant change in the population and its health. Based on this survey and several recent wild fires in the unit, habitat does not appear to be a limiting factor.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

Data Recording and Archiving

Harvest and GSPE data will be stored on internal databases housed on ADF&G's Wildlife Information Network (WinfoNet; <http://winfonet.alaska.gov/index.cfm>) server. Field data sheets will be stored in 3-ring binders located in the Fairbanks Assistant Area Biologist's office (Room 118) in Fairbanks.

Electronic copies of data, memos and reports will be stored in the WinfoNet Data Archive. Project Title: 20C, 20F, or 25C Moose. Project ID: 20CF25C GSPE. Primary Region: Region III.

Agreements

None.

Permitting

None.

Conclusions and Management Recommendations

Moose populations in Units 20C, 20F, and 25C are at low densities. Hunting pressure was relatively low. During RY10–RY12, we met our goal to promote natural fires to enhance moose habitat through our efforts on an interagency fire management team. We also met our goal to provide for sustained harvest of these low-density populations by providing harvest ticket moose hunts. With ratios of 49 bulls:100 cows in Unit 20C in fall 2011, we likely met our objective to maintain a bull:cow ratio of $\geq 30:100$ in areas with aerial surveys. We also met our objective of $\geq 20\%$ large bulls in the harvest (42% in Unit 20F, 36% in 25C) in areas without aerial surveys.

During the 2012 BOG meeting we recommended lengthening the hunting season by 5 days in Unit 20C. We based this recommendation on the high bull:cow ratio (49 bull:100 cows in 2011) and the need to meet the IM harvest objective of 150–400 moose as required in Alaska Administrative Code 5 AAC 92.108. It appears that the longer season increased harvest to within the range of the IM harvest objective. We have no further recommendations for regulatory changes in Unit 20C and no regulatory changes are recommended at this time in Units 20F and 25C.

II. Project Review and RY15–RY19 Plan

Review of Management Direction

MANAGEMENT DIRECTION

There are no changes in the management direction for Units 20C, 20F and 25C. However, in an effort to continue an effective management strategy within the existing framework, area staff will continue exploring possible strategies that will improve the current program.

GOALS

- G1. Provide for a sustained harvest of these low-density populations.
- G2. Promote moose habitat enhancement by allowing natural fires to alter vegetation.

CODIFIED OBJECTIVES

Amounts Reasonably Necessary for Subsistence Uses

The units listed below have customary and traditional use finding for moose, with amounts necessary for reasonable opportunity for subsistence uses of the following:

- C1. Units 20C and 20F: 100–130 moose.

- C2. Unit 25C, that portion outside the boundaries of the Fairbanks Nonsubsistence Use Area: 8–15 moose.

Intensive Management

UNIT 20C

- C3. Population objective: 3,000–4,000 moose.
C4. Harvest objective: 150–400 moose.

MANAGEMENT OBJECTIVES

- M1. Maintain $\geq 20\%$ large bulls in the reported harvest.

REVIEW OF MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1. GSPE survey in Unit 20C. (objectives C1, C2, C3)

Data Needs

If public proposals to BOG or indications of a changing population (activity 2.1) warrant collection of population data, a GSPE survey may be needed to determine if the Unit 20C moose population meets the IM population objective of 3,000–4,000 moose.

Methods

A GSPE moose survey (Ver Hoef 2001, 2008; Kellie and DeLong 2006) may be conducted if harvest data indicate population may be changing. If these data are needed, input from biometric staff will be sought to verify and, if needed, refine the methods prior to conducting this survey.

2. Mortality–Harvest Monitoring

ACTIVITY 2.1. Monitor and analyze harvest data. (objectives C1, C2, C4, M1)

Data Needs

No change from previous report period. We will monitor harvest in Units 20C, 20F, and 25C to determine if objectives are met. The data will also be analyzed for indicators such as success rate, effort, total harvest, and harvest composition that may indicate changes in population levels.

Methods

- Monitor harvest records for comparison with the IM harvest objective and the amounts reasonably necessary for subsistence (see “I. RY10–RY14 Management Report | 2. Mortality–Harvest Monitoring | Methods” this document).
- Compare reported harvest, using 3-year running means to account for annual variation in harvest, to the lower limit of the IM harvest objective in Unit 20C.

- Use linear regression models to evaluate harvest trends.
- Use biometric review to evaluate harvest numbers.

3. Habitat Assessment–Enhancement

No change from prior reporting period. Browse removal rates were low (Hollis 2010). No activities are anticipated or recommended.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

Data Recording and Archiving

Harvest and GSPE data are stored in databases available through ADF&G’s Wildlife Information Network (WinfoNet; <http://winfonet.alaska.gov/index.cfm>) server.

Electronic copies of data, memos and reports will be stored in the WinfoNet data archive. Project Title: 20C, 20F, or 25C Moose. Project ID: 20B GSPE. Primary Region: Region III. Field data sheets will be stored in 3-ring binders located in the Fairbanks Assistant Area Biologist’s office in Fairbanks.

Agreements

None.

Permitting

None.

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