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CHAPTER 27: MOOSE MANAGEMENT REPORT

From: 1 July 2011
To: 30 June 2013[1]

LOCATION

GAME MANAGEMENT UNITS: 21A (10,797 mi^2) and 21E (7,995 mi^2) (18,792 mi^2 combined)

GEOGRAPHIC DESCRIPTION: Unit 21A, the Innoko River drainage upstream from and including the Iditarod River drainage; Unit 21E, the Yukon River drainage from Paimiut upstream to, but not including, the Blackburn Creek drainage, and the Innoko River drainage downstream from the Iditarod River drainage.

BACKGROUND

Currently, moose are found throughout Units 21A and 21E. The major factors influencing moose abundance in the area include predation, weather, and hunting. Hunting pressure is primarily focused along the major river corridors. Low harvest reporting rates, particularly by local residents of 21E, is a continuing issue.

Units 21A and 21E have distinct differences in moose habitat, user access, and hunting practices. Unit 21A contains the upper Innoko River drainage and access is largely restricted to aircraft. There are no communities in Unit 21A, and hunters there are primarily nonlocal Alaskans and nonresidents. The villages of Grayling, Anvik, Shageluk, and Holy Cross are located in Unit 21E and the lower Innoko and Yukon rivers are easily accessible by boat.

The Paradise controlled use area (CUA) has existed since 1977 and was implemented to reduce conflicts between user groups. This CUA, which lies primarily in Unit 21E between the Yukon and Innoko rivers, is closed to the use of aircraft for hunting moose including the transportation of moose hunters and their gear. This restricts access in the CUA primarily to residents with boats.

The Alaska Department of Fish and Game (ADF&G) has limited information available on the moose population in Unit 21A; however survey work has increased since 2007. In Units 21A and 21E, aerial composition surveys as well as geospatial population estimator (GSPE) surveys (Ver Hoef 2001, 2008) have been the primary means of assessing the population status.

[1] At the discretion of the reporting biologist, this unit report may contain data collected outside the report period.

Long-term historical moose survey data are limited. In Unit 21E we began collecting population and composition data in 2000. In Unit 21A, regular fall composition surveys began in 2007 and the first GSPE survey was conducted in March 2013. We have worked in close cooperation with Innoko National Wildlife Refuge (INWR) and the Bureau of Land Management (BLM) to complete these surveys.

MANAGEMENT DIRECTION

The *Yukon–Innoko Moose Management Plan* (YIMMP; ADF&G 2006) guides moose management in Units 21A and 21E. This plan established that moose management in the area would be proactive to maintain an abundant moose population that provides for high levels of consumptive use. The following management goals, objectives, and activities are based on recommendations in YIMMP:

MANAGEMENT OBJECTIVES

Population Objectives

- Manage to achieve the intensive management (IM) population objective established in 2000 of 9,000–11,000 moose in Unit 21E.
- Maintain a minimum posthunt bull:cow ratio of 25–30 bulls:100 cows in Unit 21A and Unit 21E.
- Maintain a minimum posthunt calf:cow ratio of 30–40 calves:100 cows in Unit 21E.
- Maintain at least 20% calves in the late winter moose population in Unit 21E.

Harvest Objectives

- Maintain a harvest of ≤4% of the estimated moose population in Unit 21A, and ≤4% of the estimated moose population in Unit 21E until the IM population objective has been met.
- Provide for a sustained harvest of up to 40 antlerless moose in a winter season in Unit 21E.
- Provide for the harvest of approximately 310 moose in Unit 21E by residents of Unit 21E and other Alaska residents.

MANAGEMENT ACTIVITIES

- Conduct moose composition surveys in Unit 21A and Unit 21E annually.
- Conduct a GSPE moose population estimation survey in Unit 21A and within INWR in cooperation with INWR staff whenever possible.
- Conduct a GSPE moose population estimation survey in Unit 21E every 3 years.

METHODS

The current estimate of moose numbers in Unit 21A was derived from a GSPE survey (Kellie and DeLong 2006) conducted in March 2013 by INWR, with support from ADF&G, in a 3,821 mi^2 area. We surveyed 150 (97 high density and 53 low density) of 643 sample units (SU; approximately 6 mi^2 per SU). All high density SUs were sampled and the low density SUs were selected randomly (80%) or manually to fill gaps in the randomized coverage (20%). We extrapolated the density calculated from the GSPE population estimate of the low density strata to the remaining 6,976 mi^2 of Unit 21A to derive a unitwide population estimate. No sightability correction factor (SCF) was applied to this survey and all results were reported as observable moose.

We derived estimates of moose numbers in Unit 21E from an aerial survey conducted in March 2012 in a 5,070 mi^2 area of Unit 21E using the GSPE method (Kellie and DeLong 2006) as well as radiocollared moose (Fig. 1) to determine sightability (see Keech et al. 2011 for methods). We surveyed 150 (113 high density and 37 low density) of 822 SUs. These SUs were selected randomly (90%) or manually to fill gaps in the randomized coverage (10%). An SCF was determined using a sample of radiocollared bulls and cows. We extrapolated the density calculated from the GSPE population estimate of the low density strata (including SCF) to the remaining 2,925 mi^2 of Unit 21E to derive a unitwide population estimate.

During November 2008–2012, fall composition surveys were conducted annually in Unit 21A. Surveys in 2008–2009 were flown using a similar technique beginning at the INWR cabin (63°38.34′N, 158°01.84′W) on the Innoko River and proceeding to the confluence with the North Fork. In 2010 and 2011, INWR staff conducted composition surveys with similar aircraft, but different techniques. In 2010 a line transect survey was attempted in which the pilot flew precisely on predetermined transects; however effort was high and sample size was low. In 2011–2012, GSPE survey units were selected by INWR in an area similar to previous composition surveys. In all years each moose or group of moose was circled to determine composition.

During November 2008–2011 we flew fall composition surveys in Unit 21E between the Innoko and Yukon rivers. Surveys were flown in PA-18 or similar aircraft at roughly 70 mph on east–west transects approximately ¾ miles apart and 500 feet above ground level. Surveys began at a point 14 miles south of Shageluk and ended at a point 5 miles north of Holy Cross. Each moose or group of moose was circled to determine composition.

Twinning surveys were attempted in Unit 21A in 2008–2010 and 2012, however sample sizes were low (<17 each year) and data were not analyzed.

Twinning surveys were conducted in Unit 21E during late May or early June 2008–2012 from PA-18 or similar aircraft flown at approximately 70 mph and 500 feet above ground level. We flew in east–west transects approximately 1 mile apart along the Yukon River from Paimiut to Holy Cross and then between the Yukon and Innoko rivers from Holy Cross north to Anvik and Shageluk. All moose observed were recorded; however, only cows with calves were classified as adult cow with single or twin/triplet calves. Radiocollared adult females were used to increase observations during 2010–2012. Twinning rate was calculated as the number of cows with twins/triplets divided by the number of cows with calves.

Two methods were used to determine harvest in Units 21A and 21E. First, we used mandatory harvest report cards from general season harvest tickets and drawing permits on which hunters report residency, effort, location of hunt, transportation method, commercial services used, success, sex of kill, and antler width. Second, we used household surveys conducted by ADF&G-Division of Subsistence to estimate the number of moose harvested by local residents (ADF&G 2006). Population and harvest data were summarized by regulatory year (RY), which begins 1 July and ends 30 June (e.g., RY11 = 1 July 2011–30 June 2012).

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size and Trend

Unit 21A. The March 2013 GSPE survey estimated a density of 0.3 observable moose/mi^2 or 1,047 moose ±24% (90% CI) in the survey area (Table 1a) with 21% calves. The current estimate for all of Unit 21A is 2,442 observable moose. No SCF was applied to this estimate.

Unit 21E. The March 2012 GSPE survey indicated a density of 1.0 observable moose/mi^2 or 4,914 moose ±11% (90% CI) in the survey area with 19% calves. Correcting for sightability resulted in an estimate of 5,701 moose ±16% (90% CI) in the survey area. Using the 2012 GSPE low density estimate of 0.43 moose/mi^2 (with a low density SCF = 1.33) extrapolated over the 2,925 mi^2 not included in the Unit 21E moose survey area gives a unitwide population estimate of 6,959 moose. This survey was not statistically different from prior surveys, and indicates the winter moose population in Unit 21E was likely stable during 2000–2012 (Table 1b).

Population Composition

Results of fall composition surveys in Unit 21A during November 2008–2012 ranged 54–82 bulls:100 cows and 8–44 calves:100 cows (Table 2a). The number of moose observed was low in 2008; however in 2009–2012 a larger sample size was achieved.

Fall composition surveys in Unit 21E during November 2008–2011 indicated a high bull:cow ratio in all years except 2009 (Table 2b). In 2009, weather prevented us from surveying the entire area and in particular an area where high numbers of bulls were found in the past.

During twinning survey attempts in Unit 21A, few cows with calves were found and no inference on productivity is warranted. In Unit 21E the most recent 2-year average twinning rate was 37% (Table 3) indicating habitat was not limiting this moose population (Boertje et al. 2007).

Distribution and Movements

During the 1980s, ADF&G cooperated with INWR and BLM on a moose radiotelemetry study in which 15 cows and 20 bulls were radiocollared. Approximately half the cows and 25% of the bulls spent the entire year in the lowlands. Most of the remaining moose spent winters in the lowlands and summers in the mountains. Two bulls spent the entire year in the mountains, and 1 bull and 1 cow showed large movements. The bull was captured near Holikachuk in Unit 21E and spent summers in the upper Iditarod River area. The cow was captured north of Holy Cross and spent summers downriver of Mountain Village in Unit 18.

During 14–18 March 2010, 54 moose were radiocollared in Unit 21E. GPS radio collars were deployed on 24 bulls and 20 cows and 10 VHF radio collars were deployed on cows (Fig. 1). On 21 April 2011, 3 additional moose (2 bulls and 1 cow) were radiocollared to replace radiocollared moose which had died. The GPS radio collars acquire up to 6 location fixes daily and will allow a more thorough analysis of movements. Distribution and movement of these moose will be summarized in 2015. In addition the radio collars were used to obtain an SCF for the 2012 GSPE survey. These collars are scheduled to be removed and replaced with VHF collars in March 2014.

MORTALITY

Harvest

Seasons and Bag Limits. Bag limits and season dates by regulatory year.

Unit and bag limits	Open season
RY11–RY12	
Unit 21A	
RESIDENT HUNTERS: 1 antlered bull.	5 Sep–25 Sep
NONRESIDENT HUNTERS: 1 bull with 50-inch antlers or antlers with 4 or more brow tines on at least one side.	5 Sep–20 Sep
Unit 21E	
RESIDENT HUNTERS: 1 antlered bull.	5 Sep–25 Sep
NONRESIDENT HUNTERS: 1 bull with 50-inch antlers or antlers with 4 or more brow tines on at least one side.	5 Sep–25 Sep

Alaska Board of Game Actions and Emergency Orders. In 2010 the board adopted an intensive management plan (Title 5 Alaska Administrative Code 92.124) authorizing wolf control in Unit 21E if the moose population falls below 1.0 observable moose/mi^2. The moose population is currently above this threshold and no wolf control is planned at this time.

Harvest by Hunters. General season harvest by hunters during RY08–RY12 is reported in tables 4a and 4b, this report. During this period, annual harvest in Unit 21A was lowest in RY09, and has since remained fairly stable (Table 4a). In Unit 21E, annual harvest averaged 106 moose during RY08–RY12 (Table 4b).

Beginning in RY10 a federal permit (FM2104) was issued for the Unit 21E winter hunt. This permit was available only to residents of Unit 21E and Russian Mission. Beginning in RY12, residents of Kalskag, Lower Kalskag, Aniak and Chuathbaluk were also granted a customary and traditional use determination on federal lands and a new hunt was created (FM2105). The season for this hunt overlaps with FM2104, however hunters with a FM2105 permit may only hunt in southern Unit 21E. Prior to implementing these permits a state general season harvest ticket was required for the federal winter hunt. Participation in these hunts appears to be low and on average only 8 moose have been harvested annually since the hunts began (Table 4c).

No mortuary moose (defined in 5 AAC 92.019) were reported taken in Unit 21A during RY11–RY12. Twenty-three mortuary moose (19 cows and 4 bulls) were taken in Unit 21E during RY11–RY12.

Hunter Residency and Success. There are few local hunters in Unit 21A and most hunting pressure was from nonresidents and nonlocal residents (Table 5a). In Unit 21E a large number of hunters were local residents from Anvik, Grayling, Holy Cross, and Shageluk (Table 5b), though more hunters were nonlocal Alaskans. During RY08–RY12, average reported success was 37% in Unit 21A (range = 24–46%) and 63% in Unit 21E (range = 52–69%).

Permit Hunts. Beginning in RY07, nonresident hunters in Unit 21E were required to apply for a drawing permit instead of obtaining a general season harvest ticket. Initially 60 permits were offered (48 unguided DM837 and 12 guided DM839) with the intent to take up to 30 moose. After the nonresident season was extended to 25 September in RY10, the number of permits offered was reduced to 50 (40 unguided and 10 guided). Both hunts were undersubscribed during RY07–RY11. In RY12 and RY13, DM839 was fully subscribed. Harvest by nonresidents remains well below 30 moose (Table 5b) which was identified in YIMMP as the maximum desired nonresident harvest.

Antler Size. During RY11–RY12 the average antler size of harvested bulls in Unit 21A (50.5 inches) remained larger than in Unit 21E (42.2 inches). However, Unit 21A had a high proportion of nonresident hunters, who were required to take bulls with a minimum antler size of 50 inches or at least 4 brow tines on one side. During RY11–RY12, 17 bulls ≥50 inches, 16 ≥60 inches and 1 ≥70 inches were taken in Unit 21A. During the same period in Unit 21E, 33 bulls ≥50 inches, 19 ≥60 inches, and 2 ≥70 inches were taken.

Transport Methods. During RY08–RY12, aircraft and boats were the most common methods of hunter transportation in Unit 21A (Table 6a). In Unit 21E, boats, followed by aircraft, were the most commonly used methods of transportation (Table 6b). This is consistent with previous reporting periods for both units.

Other Mortality

Predation is likely an important factor affecting moose population dynamics in Units 21A and 21E, based on calf mortality studies in adjacent areas on the lower Nowitna, Koyukuk, and Kuskokwim drainages (Osborne et al. 1991, Gasaway et al. 1992, Boertje et al. 2009).

HABITAT

Assessment

In forested regions of Interior Alaska, abundant moose browse is generally associated with recent disturbance, such as flooding of riparian habitats and post-fire seral stages on upland sites. Riparian habitat in Units 21A and 21E is found along the Yukon and Innoko rivers and their tributaries. Additional riparian habitat exists along smaller creeks and around boreal lakes and ponds.

In spring 2006 ADF&G conducted a moose browse survey in Unit 21E. Staff recorded snow depth and age of dominant plant species at 77 sites. We also noted abundant felt leaf willow on

the islands and floodplain of the middle Yukon River and diamond leaf willow in extensive meadows adjacent to the Yukon and lower Innoko rivers. Browse removal was estimated at 21%, a moderate level for Interior Alaska (Paragi et al. 2008). During RY10–RY12 there were no major ice scouring events or fires.

A direct measure of carrying capacity is difficult to estimate for free-ranging wildlife populations due to variability in habitat composition at the landscape scale. Additionally, annual weather conditions influence forage production of both summer and winter range and affect winter energy expenditure. Based on browse removal rates and twinning rates in Unit 21E, nutritional status was adequate to support growth of the moose population (Boertje et al. 2007). Thus, factors other than nutrition likely play a role in limiting growth of the moose population (Boertje et al. 2009).

Enhancement

Allowing natural forces to create or rehabilitate successional forage communities used by moose is a good long-term strategy. We continued to cooperate with fire management personnel at the Alaska Department of Natural Resources-Division of Forestry to ensure that natural fires are allowed to burn wherever possible.

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

In January 2005 the Yukon–Innoko Moose Management Working Group convened to develop a plan to proactively manage moose populations in the area. YIMMP was the result of this process (ADF&G 2006).

Maintaining or improving moose habitat was recommended by the working group and habitat quality was assessed in Unit 21E in 2006. However, no habitat assessment work has been conducted in Unit 21A. Continued habitat assessments may be conducted; however twinning surveys, an index of population nutrition, will be our primary metric of habitat quality.

In 2011, ADF&G staff placed 10 snow stakes in Unit 21E to assess snow depth. Nine of the stakes fell that first winter and all were repaired in summer 2012. Seven more fell again and only 3 snow stakes remain, so we have inadequate data to report. Repairs were again made in summer 2014.

Land management in Units 21A and 21E is complex, with a mix of federal, state, and Native corporation lands. The working group identified the need to develop cooperative management programs which involve local residents and improve overall moose management in the area.

CONCLUSIONS AND RECOMMENDATIONS

Moose populations in Units 21A and 21E appear to be stable. The current population estimate for Unit 21A is 2,442 observable moose. Because this estimate is not corrected for sightability it is a conservative estimate. The current population estimate for all of Unit 21E is 6,959 moose. This is below the Unit 21E intensive management objective of at least 9,000 moose (9,000–11,000).

The objectives to maintain a minimum posthunt bull:cow ratio of 25–30 bulls:100 cows in Units 21A and 21E was met during RY11–RY12. The objective to maintain a minimum posthunt

calf:cow ratio of 30–40 calves:100 cows in Unit 21E was met in RY11 and no composition data were collected in RY12. Unit 21A has a negative finding for intensive management and there are no management actions we can take to improve calf:cow ratios in years when the objective is not met. The objective to maintain at least 20% calves in the late winter moose population in Unit 21E was not met when measured in 2012. We found 19% calves in the population during that survey.

The objective to maintain harvest of ≤4% of the estimated population in both Units 21A and 21E was met in RY11 and RY12. Winter harvest under the federal permit hunt was less than 40 antlerless moose and this objective was also met. Finally, the opportunity for Alaska residents to harvest up to 310 moose in Unit 21E does not exist. The current estimate of harvestable surplus is 278 moose. Actual harvest appears to be well below this level; however, harvest is difficult to assess because of poor reporting.

REFERENCES CITED

ADF&G (Alaska Department of Fish and Game). 2006. Yukon–Innoko moose management plan. Division of Wildlife Conservation, Fairbanks. http://www.adfg.alaska.gov/index.cfm?adfg=plans.species (Accessed 25 July 2014).

Boertje, R. D., M. A. Keech, D. D. Young, K. A. Kellie, and C. T. Seaton. 2009. Managing for elevated yield of moose in Interior Alaska. Journal of Wildlife Management 73:314–327.

Boertje, R. D., K. A. Kellie, C. T. Seaton, M. A. Keech, D. D. Young, B. W. Dale, L. G. Adams, and A. R. Aderman. 2007. Ranking Alaska moose nutrition: Signals to begin liberal antlerless harvests. Journal of Wildlife Management 71:1494–1506.

Gasaway, W. C., R. D. Boertje, D. V. Grangaard, D. G. Kelleyhouse, R. O. Stephenson, and D. G. Larsen. 1992. The role of predation in limiting moose at low densities in Alaska and Yukon and implications for conservation. Wildlife Monographs 120.

Gasaway, W. C., S. D. DuBois, D. J. Reed, and S. J. Harbo. 1986. Estimating moose population parameters from aerial surveys. Institute of Arctic Biology, Biological Papers of the University of Alaska, No. 22, Fairbanks.

Keech, M. A., M. S. Lindberg, R. D. Boertje, P. Valkenburg, B. D. Taras, T. A. Boudreau and K. Beckmen. 2011. Effects of predator treatments, individual traits, and environment on moose survival in Alaska. Journal of Wildlife Management 75:1361–1380.

Kellie, K. A., and R. A. DeLong. 2006. Geospatial survey operations manual. Alaska Department of Fish and Game, Division of Wildlife Conservation, Fairbanks. http://www.adfg.alaska.gov/static/home/library/pdfs/wildlife/propubs/GSPEOperationsManual.pdf (Accessed 25 July 2014).

Osborne, T. O., T. F. Paragi, J. L. Bodkin, A. J. Loranger, and W. N. Johnson. 1991. Extent, cause, and timing of moose calf mortality in western Interior Alaska. Alces 27:24–30.

Paragi, T. F., C. T. Seaton, and K. A. Kellie. 2008. Identifying and evaluating techniques for wildlife habitat management in interior Alaska: Moose range assessment. Alaska Department of Fish and Game, Division of Wildlife Conservation, Research Final Technical Report 1 July 2005–30 June 2008, Federal Aid in Wildlife Restoration Project 5.10, Juneau.

Ver Hoef, J. M. 2001. Predicting finite populations from spatially correlated data. Pages 93–98 [*In*] Proceedings of the section on statistics and the environment of the American Statistical Association, 13–17 August 2000, Indianapolis, Indiana.

Ver Hoef, J. M. 2008. Spatial methods for plot-based sampling of wildlife populations. Environmental and Ecological Statistics 15(1):3–13. doi:10.1007/s10651-007-0035-y

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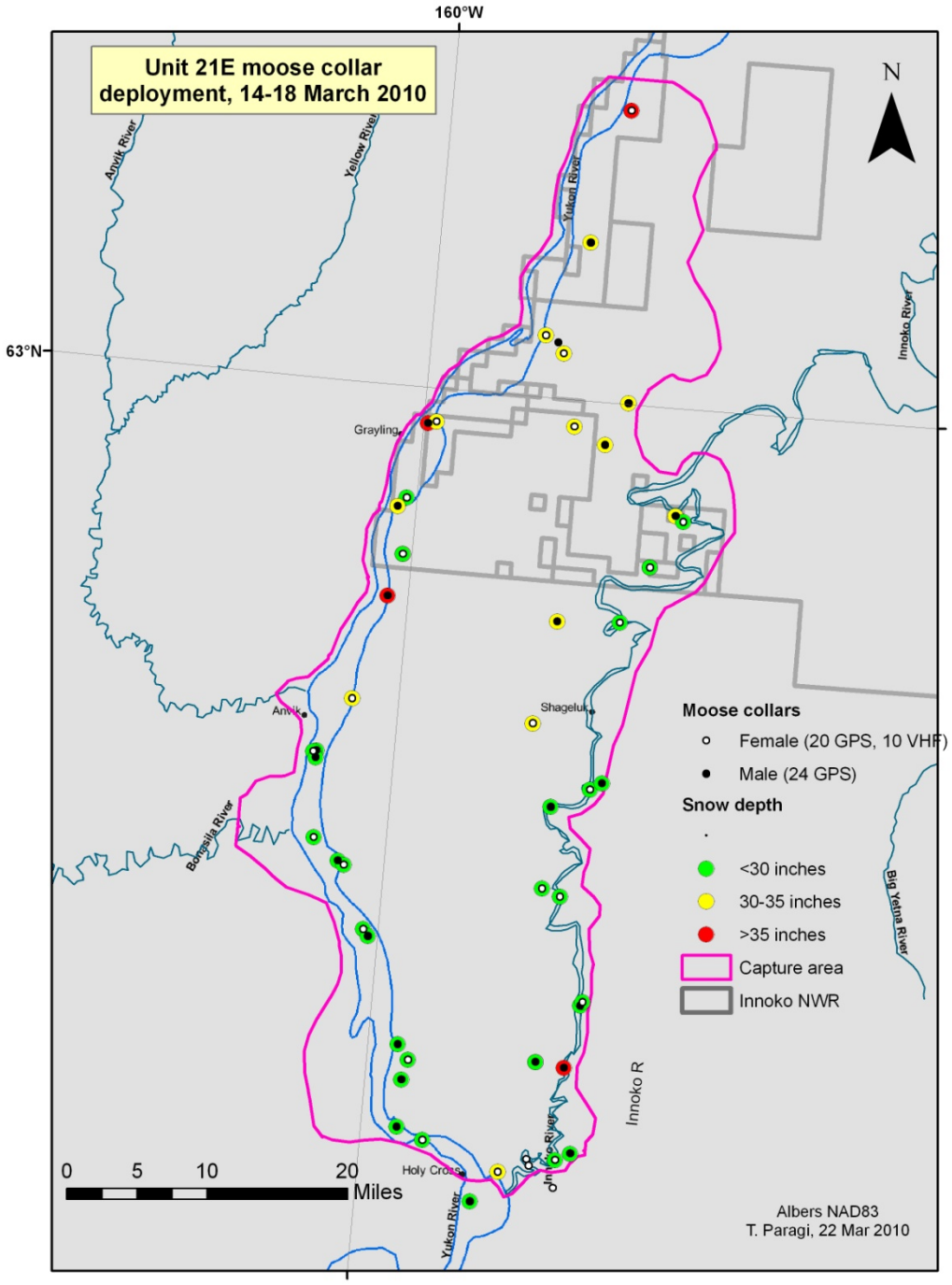

Figure 1. Locations of radio collar deployments on Unit 21E moose, 14–18 March 2010.

Table 1a. Summary of geospatial moose population estimates (GSPE) in Unit 21A.

Survey year and method[a]	Survey area (mi²)	Strata size (mi²) Low	Strata size (mi²) High	Area searched (mi²) Low	Area searched (mi²) High	Total search area (mi²)	No. of moose estimated by strata and density (moose/mi²) Low		No. of moose estimated by strata and density (moose/mi²) High		Total estimate @ 90% CI	Average density moose/mi²	No. of sample units counted
2013 GSPE	3,821	3,244	577	315	577	892	681	(0.2)	366	(0.3)	1,047±24%	0.3	150

[a] Population estimates are of observable moose and do not include a sightability correction factor.

Table 1b. Summary of geospatial moose population estimates (GSPE) in Unit 21E, 2000–2012.

Survey year and method[a]	Survey area (mi²)	Strata size (mi²) Low	Strata size (mi²) High	Area searched (mi²) Low	Area searched (mi²) High	Total search area (mi²)	No. of moose estimated by strata and density (moose/mi²) Low		No. of moose estimated by strata and density (moose/mi²) High		Total estimate @ 90% CI	Average density moose/mi²	No. of sample units counted
2000 Gasaway[b]	5,070					617					5,151±13%	1.0	100
2005 GSPE	5,070	4,015	1,055	321	604	925	1,696	(0.4)	2,977	(2.8)	4,673±17%	0.9	150
2009 GSPE	5,070	4,147	923	371	554	925	1,778	(0.4)	4,439	(4.8)	6,218±17%	1.2	150
2012 GSPE[c]	5,070	4,104	966	229	696	925	1,331	(0.3)	3,583	(3.7)	4,914±11%	1.0	150

[a] Population estimates are of observable moose and do not include a sightability correction factor.
[b] The 2000 survey was calculated using 3 strata (high, medium, low) and the Gasaway et al. (1986) technique.
[c] Corrected estimate for 5,070 mi² survey area in 2012 is 5,701±16% at 90% CI.

Table 2a. Unit 21A fall aerial moose composition counts, regulatory years[a] 2008–2012.

Regulatory year	Bulls:100 cows	Yearling bulls:100 cows	Calves: 100 cows	Calves	Percent calves	Adults	Total moose	Survey date
2008	54	21	8	2	5	37	39	18 Nov
2009	64	10	40	23	19	95	118	17 Nov
2011	82	21	44	32	20	131	163	29 Nov
2012	69	12	28	23	14	137	160	27 Nov

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2008 = 1 July 2008–30 June 2009).

Table 2b. Unit 21E fall aerial moose composition counts, regulatory years[a] 2008–2011.

Regulatory year	Bulls:100 cows	Yearling bulls:100 cows	Calves: 100 cows	Calves	Percent calves	Adults	Total moose	Survey date
2008	62	29	37	35	19	151	186	4 Nov
2009[b]	32	21	18	18	12	135	153	17 Nov
2010	61	15	51	69	24	218	287	16 Nov
2011	64	22	47	45	22	156	201	16 Nov

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2008 = 1 July 2008–30 June 2009).
[b] Partial survey.

Table 3. Unit 21E moose aerial twinning surveys, regulatory years[a] 2008–2012.

Regulatory year	Total moose	Cows with 1 calf	Cows with 2–3 calves	Percent twinning[b]	Survey date
2008	194	17	15	47	29 May
2009	182	12	12	50	27 May
2010	143	15	18	55	28 May
2011	256	32	22[b]	41	2 Jun
2012	339	38	18	32	30 May

[a] Percent of cows with calves that had twins.
[b] Two of these cows had triplets.

Table 4a. Unit 21A moose harvest, regulatory years[a] 2008–2012.

Regulatory year	Reported harvest					
	Male	(%)	Female	(%)	Unknown	Total
2008	29	(100)	0	(0)	0	29
2009	18	(100)	0	(0)	0	18
2010	35	(100)	0	(0)	0	35
2011	34	(100)	0	(0)	0	34
2012	36	(100)	0	(0)	0	36

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2008 = 1 July 2008–30 June 2009).

Table 4b. Unit 21E moose harvest, regulatory years[a] 2008–2012.

Regulatory year	Reported harvest					
	Male	(%)	Female	(%)	Unknown	Total
2008	103	(90)	10	(9)	1	114
2009	102	(96)	3	(3)	1	106
2010	107	(99)	1	(1)	0	108
2011	105	(100)	0	(0)	0	105
2012	97	(100)	0	(0)	0	97

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2008 = 1 July 2008–30 June 2009).

Table 4c. Unit 21E moose harvest for federal permits FM2104[a] and FM2105[b] regulatory years[c] 2010–2013.

Regulatory year	Permits issued	Hunted	Reported harvest					
			Male	(%)	Female	(%)	Unknown	Total
2010		25	2	(33)	4	(67)	0	6
2011	48	25	2	(33)	4	(67)	0	6
2012	46	20	3	(38)	5	(63)	1	9
2013[d]	48	21	7	(64)	4	(36)	0	11

[a] Hunt only open to residents of Grayling, Anvik, Shageluk, Holy Cross and Russian Mission.
[b] Hunt only open to residents of Kalskag, Lower Kalskag, Aniak and Chuathbaluk.
[c] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2010 = 1 July 2010–30 June 2011).
[d] Preliminary data.

Table 5a. Unit 21A moose hunter residency and success, regulatory years[a] 2008–2012.

Regulatory year	Successful					Unsuccessful					Total hunters
	Local resident[b]	Nonlocal resident	Nonresident	Unk	Total (%)	Local resident[b]	Nonlocal resident	Nonresident	Unk	Total (%)	
2008	1	19	9	0	29 (31)	2	32	27	3	64 (69)	93
2009	0	14	4	0	18 (24)	7	30	20	0	57 (76)	75
2010	3	24	7	1	35 (40)	3	33	15	1	52 (60)	87
2011	2	19	12	1	34 (43)	2	29	14	1	46 (58)	80
2012	2	17	15	2	36 (46)	3	29	9	2	43 (54)	79

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2008 = 1 July 2008–30 June 2009).
[b] Local resident from Anvik, Grayling, Holy Cross, Shageluk, McGrath, or Takotna.

Table 5b. Unit 21E moose hunter residency and success, regulatory years[a] 2008–2012[b].

Regulatory year	Successful					Unsuccessful					Total hunters
	Local resident[c]	Nonlocal resident	Nonresident[d]	Unk	Total (%)	Local resident[c]	Nonlocal resident	Nonresident[d]	Unk	Total (%)	
2008	29	57	10	18	114 (52)	25	44	32	5	106 (48)	220
2009	34	64	7	1	106 (62)	14	32	19	0	65 (38)	171
2010	47	50	10	1	108 (64)	17	29	14	1	61 (36)	169
2011	39	56	9	1	105 (69)	10	24	14	0	48 (31)	153
2012	33	52	12	0	97 (69)	10	21	11	2	44 (31)	141

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2008 = 1 July 2008–30 June 2009).
[b] Does not include data from federal hunts.
[c] Local resident from Anvik, Grayling, Holy Cross or Shageluk.
[d] Drawing permits DM837 and DM839.

Table 6a. Unit 21A moose harvest percent by transport method of successful hunters, regulatory years[a] 2008–2012.

Regulatory year	Harvest percent by transport method									*n*
	Airplane	Horse	Boat	3- or 4-wheeler	Snowmachine	Other ORV	Highway vehicle	Airboat	Unknown	
2008	21 (72)	0 (0)	6 (21)	0 (0)	0 (0)	0 (0)	2 (7)	0 (0)	0 (0)	29
2009	18 (90)	0 (0)	2 (10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	20
2010	25 (71)	0 (0)	6 (17)	2 (6)	0 (0)	1 (3)	1 (3)	0 (0)	0 (0)	35
2011	19 (56)	0 (0)	7 (21)	2 (6)	1 (3)	1 (3)	3 (9)	0 (0)	1 (3)	34
2012	22 (61)	0 (0)	13 (36)	0 (0)	0 (0)	0 (0)	1 (3)	0 (0)	0 (0)	36

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2008 = 1 July 2008–30 June 2009).

Table 6b. Unit 21E moose harvest percent by transport method of successful hunters, regulatory years[a] 2008–2012.

Regulatory year	Harvest percent by transport method[b]									*n*
	Airplane	Horse	Boat	3- or 4-wheeler	Snowmachine	Other ORV	Highway vehicle	Airboat	Unknown	
2008	11 (10)	1 (1)	88 (77)	0 (0)	11 (10)	0 (0)	0 (0)	0 (0)	3 (3)	114
2009	9 (8)	0 (0)	93 (88)	1 (1)	3 (3)	0 (0)	0 (0)	0 (0)	0 (0)	106
2010	12 (11)	0 (0)	93 (86)	0 (0)	2 (2)	0 (0)	0 (0)	0 (0)	1 (1)	108
2011	10 (10)	0 (0)	91 (87)	1 (1)	1 (1)	1 (1)	0 (0)	0 (0)	1 (1)	105
2012	10 (10)	0 (0)	85 (88)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	97

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2008 = 1 July 2008–30 June 2009).
[b] Does not include data from federal hunts.