

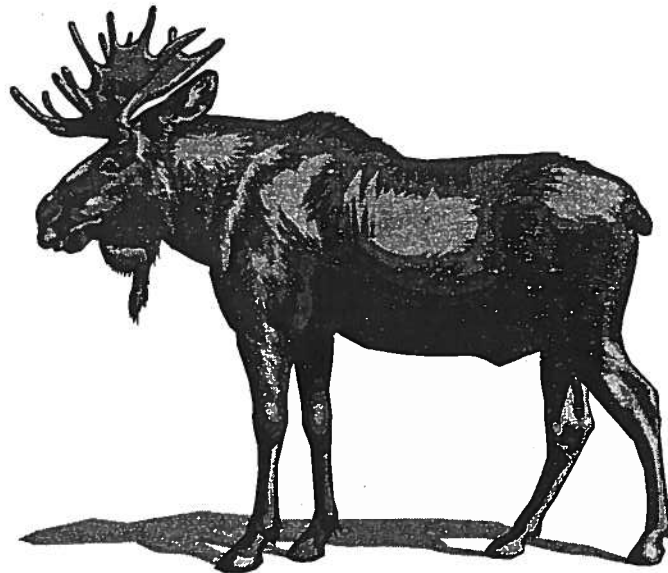
1997 AERIAL MOOSE SURVEY ALONG THE YUKON RIVER CORRIDOR,
YUKON-CHARLEY RIVERS NATIONAL PRESERVE, ALASKA

PROJECT REPORT

November, 1997

John Burch
Nick Demma

Technical Report NPS/AR/NRTR-98/33



United States Department of the Interior • National Park Service • Alaska Region



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SUMMARY:

Survey dates: November 5-13, 1997

Total area: 2757 mi² (7141 km²)

Total moose observed: 384 (197 cows, 51 calves, 136 bulls)

Sightability correction factor: 1.22

Population estimate: 737 moose +/- 148 (+/-20.02% at 90% CI)

Estimated density: 0.27 moose/mi² (0.10 moose/km²)

Estimated sex/age ratios: 28 calves:100cows, 16 yearlings:100cows, 60 bulls:100cows

INTRODUCTION:

The National Park Service conducted an aerial moose survey during November 5-13, 1997 in Yukon-Charley Rivers National Preserve (YUCH), Alaska (Fig. 1). The purpose of this survey was to estimate the moose population size and sex/age composition for the Yukon River corridor within YUCH. Moose population information is needed by preserve managers for monitoring long-term population trends and to make informed decisions regarding recently proposed changes to moose hunting regulations for this area.

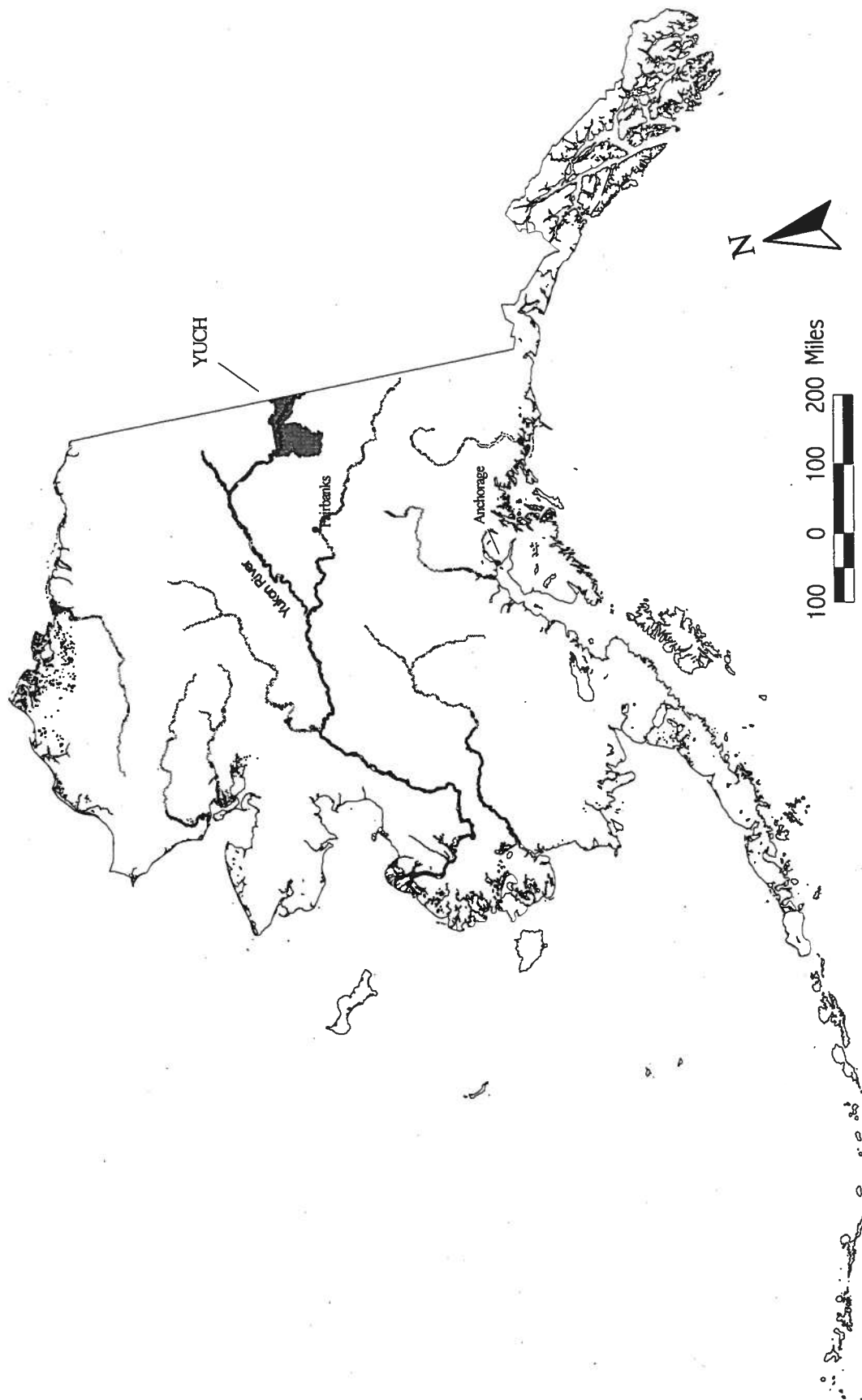


Figure 1. Location of Yukon-Charley Rivers National Preserve (YUCH), Alaska.

Several moose surveys have been conducted within the preserve during the last 22 years. In February 1975, a general survey was conducted along the Yukon River to document winter habitat use (Boertje 1985). During 1982-1987, trend counts were conducted in the Washington Creek area as part of an Alaska Department of Fish and Game (ADF&G) study investigating the role of predation in limiting moose densities in east-central Alaska (Gasaway et al. 1992). In November 1987, a large area along the Yukon River was surveyed between Eagle and Circle within YUCH (Nowlin 1988). A winter moose habitat use survey was conducted along the lower Nation River and Hard Luck Creek in March 1991 (Knuckles 1991). The entire Charley River drainage and the Yukon River between Glenn Creek and Woodchopper Creek was surveyed in November 1994 (Demma et al. 1995). The sampling methodologies used during past surveys, varied widely and were not consistent. Consequently, the results of prior surveys are of limited use in determining long-term moose population changes in YUCH.

Recently, harvest regulation proposals have been submitted by local subsistence hunters in Eagle. These proposed changes in hunting regulations include a longer fall season and the addition of a March hunting season for qualified Federal subsistence users. The bag limit would still be 1 bull moose per regulatory year per hunter (i.e. if a hunter was successful in the fall season they could not shoot a second moose in March).

In the past, residents of local communities have relied on caribou from the Fortymile Herd (FCH) and moose for meat. The harvest limit for FCH caribou was reduced from 450 to 150 in 1996 as

a result of an interagency management plan developed to restore the caribou herd to its former range (ADF&G 1995). The recent reduction in harvest limits for caribou in the FCH has reduced the availability of caribou from this herd for all Alaska residents. Because of this harvest reduction, local residents are more dependent on moose for meat. Recently, residents of Eagle have voiced concerns of having to compete with increasing numbers of non-local hunters for area moose during regular sport hunting seasons. The issue of subsistence vs. sport hunting and rural preference for local wildlife resources is very controversial statewide. Resource conflicts of this nature will likely intensify as competition increases for limited wildlife resources in Alaska. The information provided by this survey will assist managers in effectively evaluating proposed hunting regulation changes on the moose population inhabiting YUCH.

STUDY AREA

The moose survey was conducted along a 30-40 mile (48 - 64 km) wide corridor of the Yukon River drainage within YUCH, between Eagle and Circle, Alaska (Fig. 2). The topography of the area consists mainly of rolling hills and river bluffs. Some isolated rugged terrain occurs on several eroded mountains, with peaks generally under 4000 feet (1200 meters). Vegetation is dominated by black spruce (*Picea mariana*) and several species of deciduous hardwoods including aspen (*Populus tremuloides*) and birch (*Betula papyrifera*). Ponds, sloughs and large areas of tussock tundra are common in the flats along the Yukon River and lower parts of large tributaries such as the Charley and Kandik rivers. Wild fire burns of varying sizes and ages are present throughout the study area (NPS 1985).

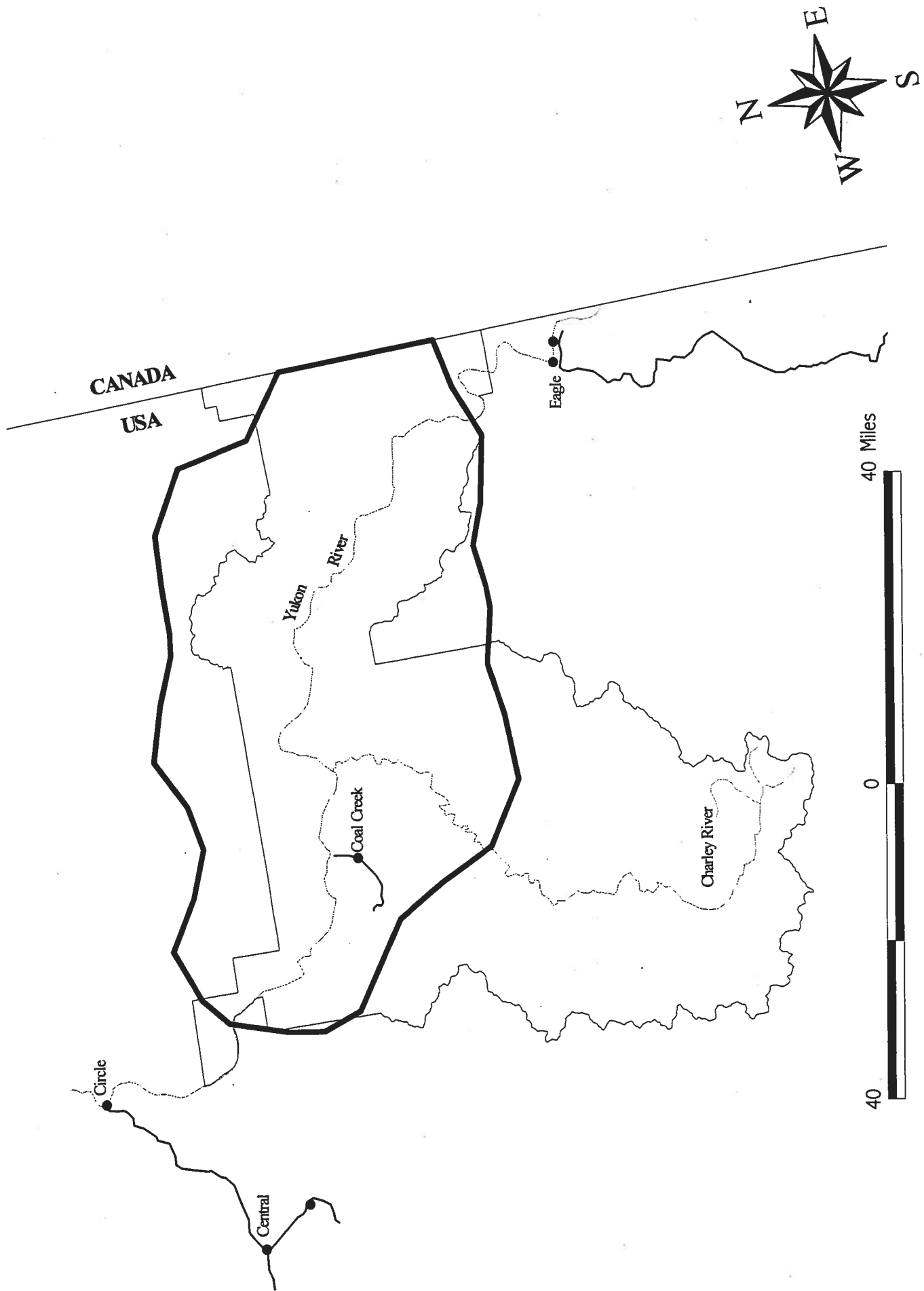


Figure 2. Moose Survey area, Yukon-Charley Rivers National Preserve, Alaska, November 1997.

METHODS

The survey used the methods described by Gasaway et al. (1986). The study area was comprised of 201 survey units (SUs) averaging 13.86 mi^2 , range 8.5 - 18.9 (35.9 km^2 , range 22.0 - 48.9).

SUs were stratified into high, medium, or low moose densities based on previous surveys (Demma et al. 1995, Nowlin 1988). During the survey, four pilot/observer teams in Piper PA-18 aircraft surveyed SUs at a rate of about 4 minutes per mi^2 . Moose observed were assigned group numbers and mapped on USGS topographic maps. Number of moose in each group were recorded and sex and age of each moose was determined. Moose were classified as either: cow, calf, yearling bull (spike or forked antlers), medium bull (antler spread > spike/fork, but < 50 inches [127 cm]), and large bull (antler spread ≥ 50 inches [127 cm]). Latitude and longitude of all groups were recorded utilizing aircraft GPS receivers.

Moose sightability was estimated by conducting intensive searches, immediately after standard searches, to detect missed moose in 2 mi^2 (5.18 km^2) plots randomly selected within SUs. Intensive searches were flown at rates of approximately 12 minutes per mi^2 (4.6 minutes per km^2), roughly 3 times the standard search rate. This process estimates how many moose were missed at the standard search intensity, and is calculated as a sightability correction factor (SCF). The SCF is multiplied by the estimate of observable moose to calculate the final population estimate. Intensive searches were usually conducted in units where 3 or more moose were found during the standard searches. Total moose, moose density and sex/age ratios were calculated using the software 'MOOSEPOP' (Reed 1989, Gasaway et al. 1986).

RESULTS AND DISCUSSION

Weather and Snow conditions

Overall, the weather conditions for flying the survey were fair. Winds of 30-40 miles per hour (48 - 64 kilometers per hour) were measured in portions of the study area on most days of the survey. We were able to find areas sheltered from the wind to work in during most of the survey, though wind speeds of 50-60 knots prevented any flying altogether for 1½ days. Snow conditions at the beginning of the survey were good with 12 to 18 inches (30 to 45 cm) of week-old snow, however the snow conditions deteriorated during the survey as temperatures reached 40 degrees Fahrenheit (5 degrees Celsius). In areas exposed to the wind and sun, enough snow melted to expose patches of bare ground.

Winds and deteriorating snow conditions undoubtedly affected sightability of moose during the survey. Some units had to be flown at altitudes higher (above ground level) than normal in order to stay out of moderate to severe turbulence near the surface. On three occasions, we found additional moose during intensive searches that we felt confident we would not have missed had we been able to search at lower altitudes. Overall, our sightability correction for detecting missed moose was estimated to be 1.22; that is, for every 100 moose observed, 22 moose are missed. Sightability correction estimates during moose surveys in GMU 20A, and other areas of interior Alaska during the past several years have ranged between 1.1 and 1.2 (B. Dale, ADF&G pers. comm.). Our sightability correction therefore, although slightly higher than other Interior surveys, does not appear to be substantially biased overall.

Standard Survey

Ninety-eight of the 201 survey units were surveyed covering 49% of the study area (Table 1, Fig. 3). A total of 5310 minutes of flight time were spent during standard searches for an average of 54.2 minutes per survey unit. Search intensity during standard searches averaged 3.9 minutes per mi^2 . A total of 384 moose were observed during the survey.

Sightability Correction and Population Estimate

Thirty-four sightability correction factor (SCF) plots were flown to estimate moose sightability. A total of 768 minutes were spent searching the SCF plots for an average of 22.6 minutes per plot and roughly 11.3 minutes per mi^2 (4.4 minutes per km^2). During intensive searches of SCF plots, 28 additional moose were found, producing an overall SCF of 1.22. Applying the SCF to the observed data generates an overall density of 0.27 moose per mi^2 (0.10 moose per km^2) and an estimate of 737 moose in the 2757 mi^2 (7141 km^2) study area (± 148 moose or $\pm 20.02\%$, 90% CI); (Table 2).

Sex and Age Composition

The sex and age composition of the 384 observed moose were as follows: 197 cows, 136 bulls, and 51 calves. Composition of the observed bulls was 15 yearling bulls, 63 medium bulls, and 58 large bulls. No single-antlered bulls were seen, therefore antler shed did not appear to be a

Table 1. November 1997 moose survey results, Yukon-Charley Rivers National Preserve

Unit	Date Surveyed	Strat	Area	yrng bull	med bull	large bull	cow 0 calf	cow 1 calf	cow 2 calf	lone calf	unknown sex/age	total	obsrvd density	scf plot?	obs std	obs int	std search time	effort min/mi ²	scf search time
1	11/5/97	high	11.57	0	0	0	0	0	0	0	0	0	0.00				53	4.58	
2	11/5/97	high	16.65	0	0	0	0	0	0	0	0	0	0.00				73	4.38	
5	11/5/97	high	11.26	0	0	1	0	0	0	0	0	1	0.00				40	3.55	
6	11/5/97	high	12.57	0	0	0	1	3	0	0	0	7	0.72	X	2	4	54	4.30	30
7	11/5/97	high	13.47	1	2	0	2	0	0	0	0	5	0.37				58	4.31	
8	11/6/97	high	14.64	1	3	0	3	0	0	0	0	7	0.48	X	4	4	60	4.10	24
10	11/6/97	high	12.75	1	2	3	1	0	0	0	0	7	0.55	X	3	3	59	4.63	16
13	11/10/97	medium	10.17	0	2	3	8	0	0	0	0	13	1.28	X	5	7	67	6.59	18
14	11/7/97	high	12.72	1	0	0	10	3	0	0	0	17	1.34	X	7	7	63	4.95	18
15	11/8/97	high	11.30	0	0	1	0	0	0	0	0	1	0.09				70	6.19	
16	11/8/97	medium	10.72	0	3	0	2	1	0	0	0	7	0.75	X	3	4	45	4.20	17
20	11/6/97	high	13.23	0	0	0	6	2	0	0	0	10	0.91	X	2	4	58	4.38	16
21	11/10/97	medium	13.99	0	0	0	1	0	0	0	0	1	0.07				50	3.57	
22	11/11/97	medium	11.71	0	0	0	0	0	0	0	0	0	0.00				49	4.18	
23	11/11/97	medium	12.57	0	0	0	1	0	0	0	0	1	0.08				51	4.06	
24	11/6/97	high	13.09	0	0	0	4	0	0	0	0	4	0.31				55	4.20	
25	11/12/97	medium	10.97	0	0	0	6	1	0	0	0	8	0.73	X	4	5	57	5.20	20
27	11/12/97	low	12.75	0	0	0	0	1	0	0	0	2	0.16	X	2	2	54	4.24	22
28	11/11/97	medium	12.39	0	1	0	0	1	0	0	0	3	0.24	X	3	3	56	4.52	16
30	11/13/97	medium	15.01	0	0	0	0	0	0	0	0	0	0.00				42	2.80	
31	11/13/97	medium	18.47	0	1	1	0	0	0	0	0	2	0.11				44	2.38	
33	11/7/97	low	17.34	0	0	0	0	1	0	0	0	2	0.12				54	3.10	
35	11/12/97	low	13.48	0	0	0	0	1	0	0	0	2	0.15				53	3.93	
36	11/10/97	medium	11.88	0	0	0	2	1	0	0	0	4	0.34	X	0	6	54	4.55	23
37	11/10/97	low	15.84	0	0	1	0	0	0	0	0	1	0.06				62	3.91	
38	11/12/97	low	16.34	0	0	0	1	0	0	0	0	1	0.06				54	3.30	
39	11/10/97	low	15.68	0	0	0	0	0	0	0	0	0	0.00				61	3.89	
52	11/6/97	high	12.02	0	3	0	3	2	0	0	0	10	0.83	X	2	2	40	3.33	20
55	11/11/97	medium	16.99	0	0	0	0	2	0	0	0	4	0.24	X	0	0	55	3.24	25
57	11/7/97	high	13.08	0	2	5	1	0	0	0	0	8	0.61	X	0	2	40	3.06	15
60	11/13/97	medium	16.66	0	5	3	5	2	2	0	0	23	1.43	X	6	8	80	4.80	20
61	11/11/97	low	14.35	0	0	0	1	0	0	0	0	1	0.07				57	3.97	
63	11/11/97	low	12.11	0	0	0	0	0	0	0	0	0	0.00				52	4.29	
73	11/12/97	low	12.83	0	0	0	0	0	0	0	0	0	0.00				54	4.21	
85	11/7/97	low	14.25	0	0	0	0	0	0	0	0	0	0.00				52	3.60	
86	11/10/97	low	13.03	0	0	0	0	0	0	0	0	0	0.00				46	3.53	
87	11/10/97	low	12.05	1	0	0	3	0	0	0	0	4	0.33	X	1	1	40	3.32	22
100	11/11/97	high	16.74	0	0	0	2	0	0	0	0	2	0.12				45	2.69	
101	11/10/97	low	14.46	0	0	0	0	0	0	0	0	0	0.00				63	4.36	
103	11/13/97	low	14.68	0	1	0	4	2	1	0	0	12	0.82	X	0	0	62	4.22	15
105	11/6/97	medium	16.84	0	0	0	3	0	0	0	0	3	0.18	X	0	0	60	3.56	20
106	11/11/97	medium	14.68	0	0	1	0	1	0	0	0	3	0.29				37	3.55	
107	11/13/97	medium	16.66	0	0	0	0	0	0	0	0	0	0.00				60	3.60	
111	11/13/97	low	18.96	0	0	0	1	0	0	0	0	1	0.05				75	3.96	
112	11/12/97	medium	12.86	1	1	1	7	4	0	0	0	18	1.40	X	8	9	75	5.85	30
114	11/12/97	medium	10.80	0	0	1	0	1	0	0	0	3	0.28	X	0	3	60	5.56	25
118	11/7/97	medium	13.63	0	1	0	1	0	0	0	0	2	0.15				61	4.48	
119	11/7/97	medium	12.61	0	0	1	1	0	0	0	0	2	0.16				55	4.36	
120	11/13/97	medium	13.44	1	2	2	8	0	0	0	0	13	0.97	X	8	9	49	3.65	20
122	11/7/97	medium	14.34	0	0	1	0	0	0	0	0	1	0.07				66	4.60	

Table 1 continued.

Unit	Date Surveyed	Strat	Area	yrng bull	med bull	large bull	cow 0 calf	cow 1 calf	cow 2 calf	lone calf	unknown sex/age	total	obsrvd density	scf plot?	obs std	obs int	stand. search time	effort min/mi ²	scf search time
124	11/11/97	medium	12.42	0	0	0	0	0	0	0	0	0	0.00				49	3.95	
127	11/6/97	medium	16.51	0	0	0	4	2	0	0	0	8	0.48	X	8	8	65	3.94	30
128	11/11/97	medium	17.77	0	2	0	8	0	0	0	0	10	0.56	X	4	4	60	3.38	30
129	11/8/97	high	14.04	0	5	2	8	1	0	0	0	17	1.21	X	8	8	60	4.27	30
132	11/10/97	low	13.36	0	0	0	1	1	0	0	0	3	0.22				56	4.19	
133	11/10/97	low	8.54	0	0	0	1	1	0	0	0	3	0.35				40	4.68	
148	11/7/97	low	12.61	0	0	0	0	0	0	0	0	0	0.00				44	3.49	
149	11/11/97	low	13.03	0	0	0	0	0	0	0	0	0	0.00				56	4.30	
150	11/13/97	low	14.54	0	0	0	0	0	0	0	0	0	0.00				43	2.96	
155	11/11/97	low	11.51	0	0	0	0	0	0	0	0	0	0.00				59	5.13	
156	11/13/97	low	13.82	0	0	0	0	1	0	0	0	2	0.14	X	2	2	44	3.18	39
164	11/8/97	low	10.68	0	0	0	0	0	0	0	0	0	0.00				42	3.60	
166	11/12/97	high	15.41	0	0	1	0	1	0	0	0	3	0.19				71	4.61	
169	11/11/97	low	13.57	0	0	0	0	0	0	0	0	0	0.00				64	4.72	
171	11/12/97	low	15.43	0	0	0	1	0	0	0	0	1	0.06				64	4.15	
179	11/6/97	medium	14.97	1	4	1	1	2	0	0	0	11	0.73	X	5	5	54	3.60	26
180	11/13/97	low	18.13	1	0	0	2	1	0	0	0	5	0.28				48	2.65	
182	11/12/97	low	16.07	2	2	3	8	1	0	0	0	17	1.06	X	12	13	64	3.98	27
183	11/5/97	high	13.72	2	13	9	7	1	0	0	0	33	2.40	X	9	9	64	4.66	25
184	11/11/97	medium	15.14	0	0	0	0	1	0	0	0	2	0.13				62	4.10	
185	11/5/97	high	11.87	0	1	3	2	1	0	0	0	8	0.67	X	5	5	47	3.96	20
186	11/5/97	high	14.82	0	0	7	3	0	0	0	0	10	0.67				33	2.21	
187	11/13/97	low	13.85	0	0	0	1	0	0	0	0	1	0.07				47	3.39	
189	11/11/97	medium	13.38	0	0	0	0	0	0	0	0	0	0.00				52	3.89	
190	11/5/97	high	11.57	1	0	0	1	0	0	0	0	2	0.17				33	2.83	
191	11/5/97	high	17.26	0	3	1	5	0	0	0	0	9	0.52				33	1.89	
192	11/7/97	medium	12.52	0	0	0	0	1	0	0	0	2	0.16				74	5.90	
194	11/13/97	low	11.99	0	0	0	0	0	0	0	0	0	0.00				49	4.09	
196	11/7/97	medium	13.45	0	0	0	0	0	0	0	0	0	0.00				76	5.70	
199	11/11/97	low	11.48	0	0	0	0	0	0	0	0	0	0.00				52	4.53	
200	11/6/97	low	12.36	0	0	0	0	0	0	0	0	0	0.00				47	3.80	
202	11/6/97	low	14.61	0	0	1	1	0	0	0	0	2	0.14				39	2.64	
203	11/6/97	medium	13.25	0	0	1	0	0	0	0	0	1	0.08	X	0	0	39	2.91	29
205	11/12/97	medium	16.02	0	0	0	0	0	0	0	0	0	0.00				59	3.68	
207	11/12/97	medium	12.93	0	0	0	0	0	0	0	0	0	0.00				43	3.33	
208	11/11/97	low	13.90	0	1	1	1	0	0	0	0	3	0.22	X	3	4	63	4.53	31
210	11/11/97	medium	13.87	0	0	0	0	0	0	0	0	0	0.00				56	4.04	
213	11/13/97	medium	15.78	0	0	1	1	1	0	0	0	4	0.25	X	1	1	68	4.31	27
216	11/10/97	low	12.63	0	0	0	0	0	0	0	0	0	0.00				59	4.70	
220	11/8/97	low	9.84	0	0	0	0	0	0	0	0	0	0.00				50	5.10	
221	11/12/97	low	16.28	0	0	0	0	0	0	0	0	0	0.00				50	3.07	
231	11/7/97	medium	15.32	1	3	2	4	0	0	0	0	10	0.65	X	6	9	47	3.10	22
237	11/11/97	medium	14.83	0	0	0	1	0	0	0	0	1	0.07				56	3.78	
245	11/10/97	medium	13.23	0	0	0	0	0	0	0	0	0	0.00				65	4.90	
246	11/13/97	low	15.65	0	0	0	0	0	0	0	0	0	0.00				58	3.71	
250	11/10/97	low	12.24	0	0	0	0	0	0	0	0	0	0.00				40	3.30	
255	11/13/97	medium	18.50	0	0	0	0	0	0	0	0	0	0.00				47	2.54	
257	11/10/97	low	12.55	0	0	0	0	0	0	0	0	0	0.00				39	3.10	

total area 1357.8 ybull 15 mbull 63 lbull 58 cow0 149 cow1 45 cow2 3 calf 0 unknown 0 moose 384 std 123 int 151 min. 5310 scf min. 768
scf = sightability correction factor

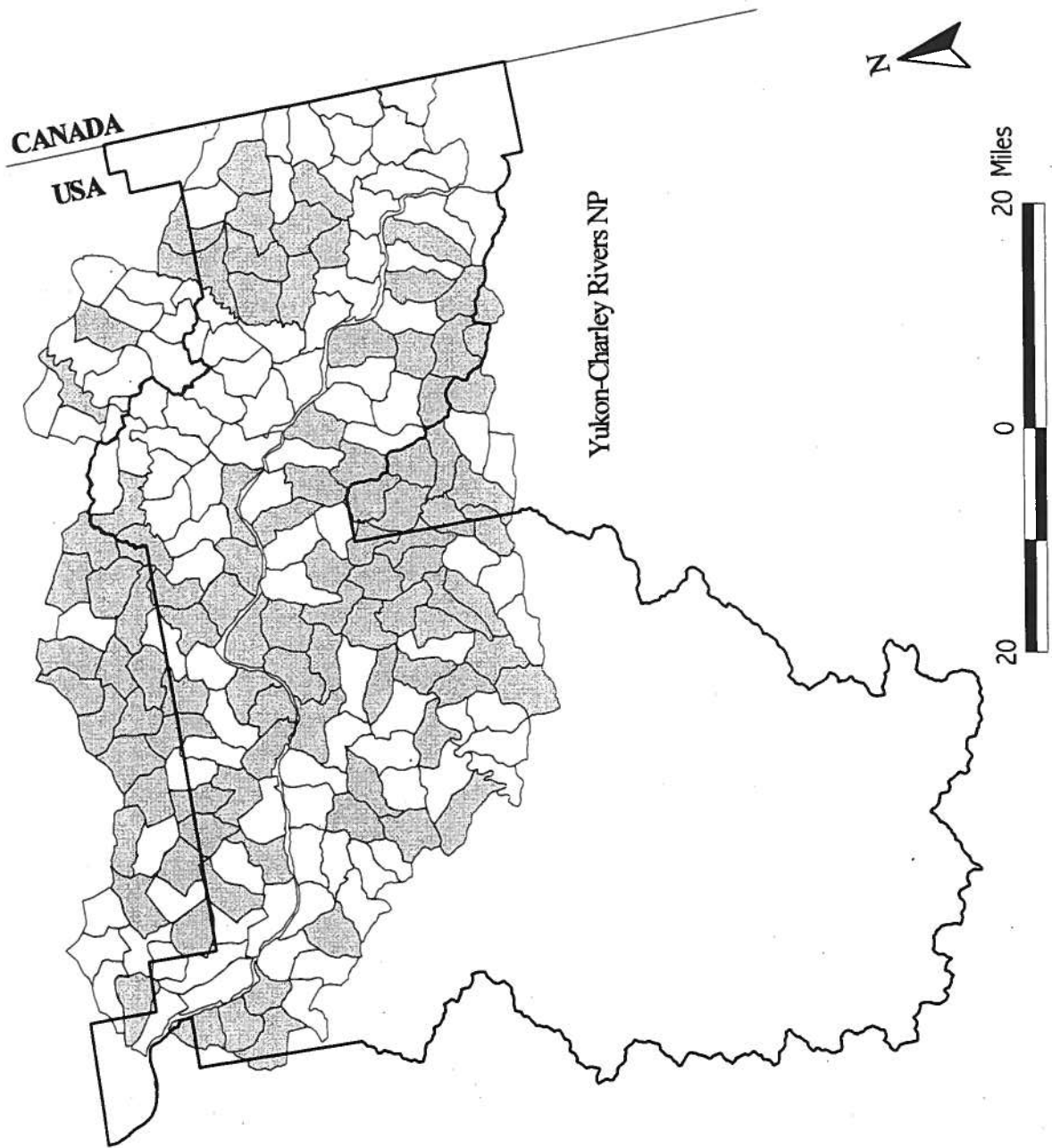


Figure 3. Study area and units surveyed (shaded) during 1997 moose survey, Yukon-Charley Rivers National Preserve, Alaska.

Table 2. November 1997 moose survey population estimate, Yukon-Charley Rivers National Preserve; Output from MOOSEPOP (Gasaway et al. 1986).

STRATUM	LOW	MED	HIGH	TOTAL
Total no. of survey units	122	57	22	201
Total area (km ²)	1666.9	788.1	302.8	2757.8
No. of units surveyed	39	38	21	98
Area surveyed (km ²)	536.8	537.3	283.8	1357.8
# of moose seen	63	160	161	384
Density (moose/mi ²)	0.12	0.30	0.57	0.22
Total Observable (To)	195.6	234.7	171.8	602.1
Variance(Total observable)	2773.1	836.9	62.8	3672.7
degrees of freedom (To)	38	37	20	61

Sightability Correction Factor (observable)=(SCFo)=1.22448

Sampling variance(SCFo)=0.0058067772

degrees of freedom (SCFo)= 32

Population estimate after applying the sightability correction factor = Total expanded (Te)=737.3

Sampling Variance = V(Te)=7590.54

degrees of freedom = df(Te)= 32

80% Confidence Interval around Te = (623.3, 851.3) is +/- 15.46%

90% Confidence Interval around Te = (589.7, 884.9) is +/- 20.02%

95% Confidence Interval around Te = (559.8, 914.8) is +/- 24.07%

problem. The estimated sex and age ratios of the population were 28 calves:100 cows, 16 yearlings:100 cows, and 60 bulls:100 cows. The number of yearlings was estimated by doubling the number of yearling bulls (making the assumption of a 50:50 sex ratio).

The yearling component of the population is likely under-represented, because we only classified those bulls with spike or forked antlers as yearlings. Studies conducted by ADF&G indicate that yearling bulls can grow palmated antlers up to 30 inches (76.2 cm), and spike/fork bulls may represent only 40 - 60% of the yearling cohort in a given year (C.Gardner ADF&G, pers. comm.). Therefore, if we assume that spike/fork bulls represent 60% of the yearling cohort in YUCH, our ratio estimate would increase to 13 yearling bulls:100 cows, and 26 yearlings:100 cows.

Comparisons and Trends

Several moose surveys have been conducted in the past in YUCH. However, a variety of study objectives and budget constraints resulted in differing sampling techniques and/or low sample sizes. Comparisons of these data therefore, are difficult, and perhaps inappropriate, in order to avoid misleading or erroneous conclusions.

An aerial moose survey conducted in YUCH during late 1994 (Demma et al. 1995) overlapped with a 1200 mi² portion of this survey area (Fig. 4). As with this survey, the 1994 survey used techniques based on Gasaway et al. (1986). The primary difference in sampling techniques between both surveys was search intensity. The 1994 survey was conducted at a lower search intensity, as described in Dale et al. (1994). Moose density in the 1200 mi² overlap area was

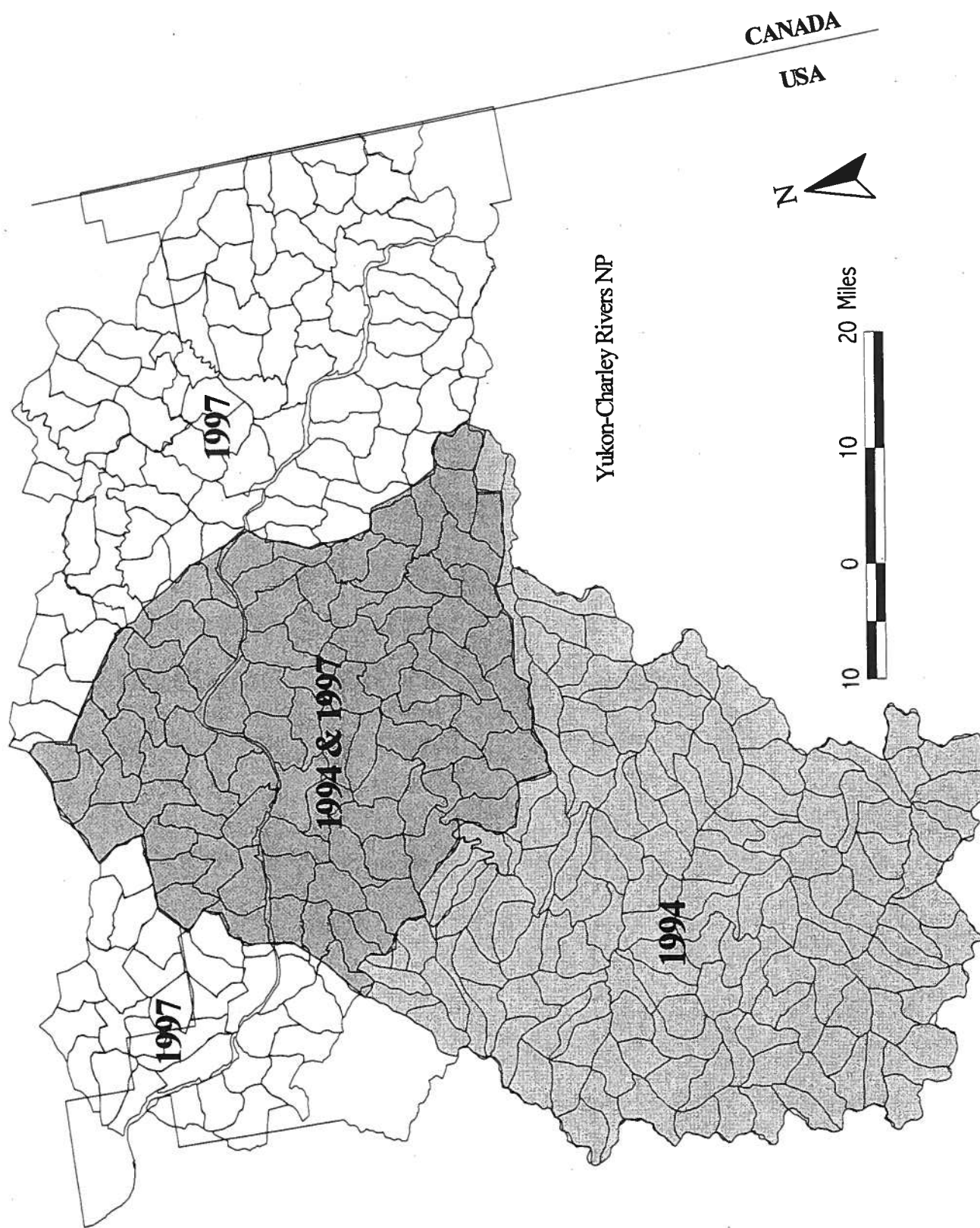


Figure 4. 1994 and 1997 survey units and area surveyed (shaded) during both years, Yukon-Charley Rivers National Preserve, Alaska.

estimated at 0.34 moose/mi² during 1994, and 0.23 moose/mi² during 1997. Assuming a decrease in moose density between 1994 and 1997 in YUCH from these comparisons, however, may be premature. Variation in local moose densities between years could be the result of many variables including immigration and emigration, snow depth, changes in habitat and forage quality (succession of preferred browse species), and harassment by predators. The best use of these data would be as the beginning of a long-term monitoring program in order to identify trends in YUCH moose densities.

Age and sex ratios of the moose population in YUCH are typical of other low density populations in interior Alaska, while densities appear to be among the lowest reported in the region. In the rest of GMU 20E (of which most of YUCH is a part) the overall moose density in 1995 was 0.54 with 22 calves and 73 bulls per 100 cows (Gardner 1996). In Denali National Park Meier et al. (1991) reports an overall density of 0.58 moose per square mile and 23 calves, and 81 bulls per 100 cows. In GMUs 25A, 25B, 25D (down river from YUCH) moose densities are about 0.6 moose per square mile with 30 calves and 50 bulls per hundred cows (Stephenson 1996). This is in contrast with GMU 20A south of Fairbanks where moose densities are much higher at 2.7 moose per square mile and 52 calves and 35 bulls per 100 cows (Dale 1996).

Harvest

Moose harvest and hunter success from 1983 to 1996 was summarized from harvest reports compiled by ADF&G during that period (Table 3 and Figure 5). The area this data is gathered

from includes all Uniform Coding Units (UCUs) within the 3 GMU subunits that comprise YUCH (Figure.6).

Table 3. Reported moose harvest, number of hunters, hunter success and effort in Yukon-Charley Rivers National Preserve during 1983 to 1996.

Year	Moose Harvested	Number of Hunters	Hunter Days	Hunter Effort (Days/Moose)	Percent Success
1983	21	52	538	26	40
1984	18	45	321	18	40
1985	15	33	196	13	45
1986	11	39	207	19	28
1987	11	46	338	31	24
1988	14	56	372	27	25
1989	14	49	384	27	29
1990	31	70	472	15	44
1991	29	83	699	24	35
1992	10	87	629	63	11
1993	30	74	590	20	41
1994	28	98	695	25	29
1995	27	73	587	22	37
1996	17	68	563	33	25
Total	276	873	6591	363	453
Mean	19.7	62.4	470.8	25.9	32.4

Moose harvest in YUCH averaged 20 bulls over the 14 year period (range 10-31). Although there is not a significant trend in moose harvest overall ($R^2 = 0.175$, $F=2.54$, $p=0.136$, $\alpha =0.05$) the mean moose harvest for the first seven years is 14.86 which is significantly different from the mean from the last seven years 24.57 ($t=2.95$, $p=0.0122$, $\alpha =0.05$) indicating a significant increase in the number of moose harvested since 1990.

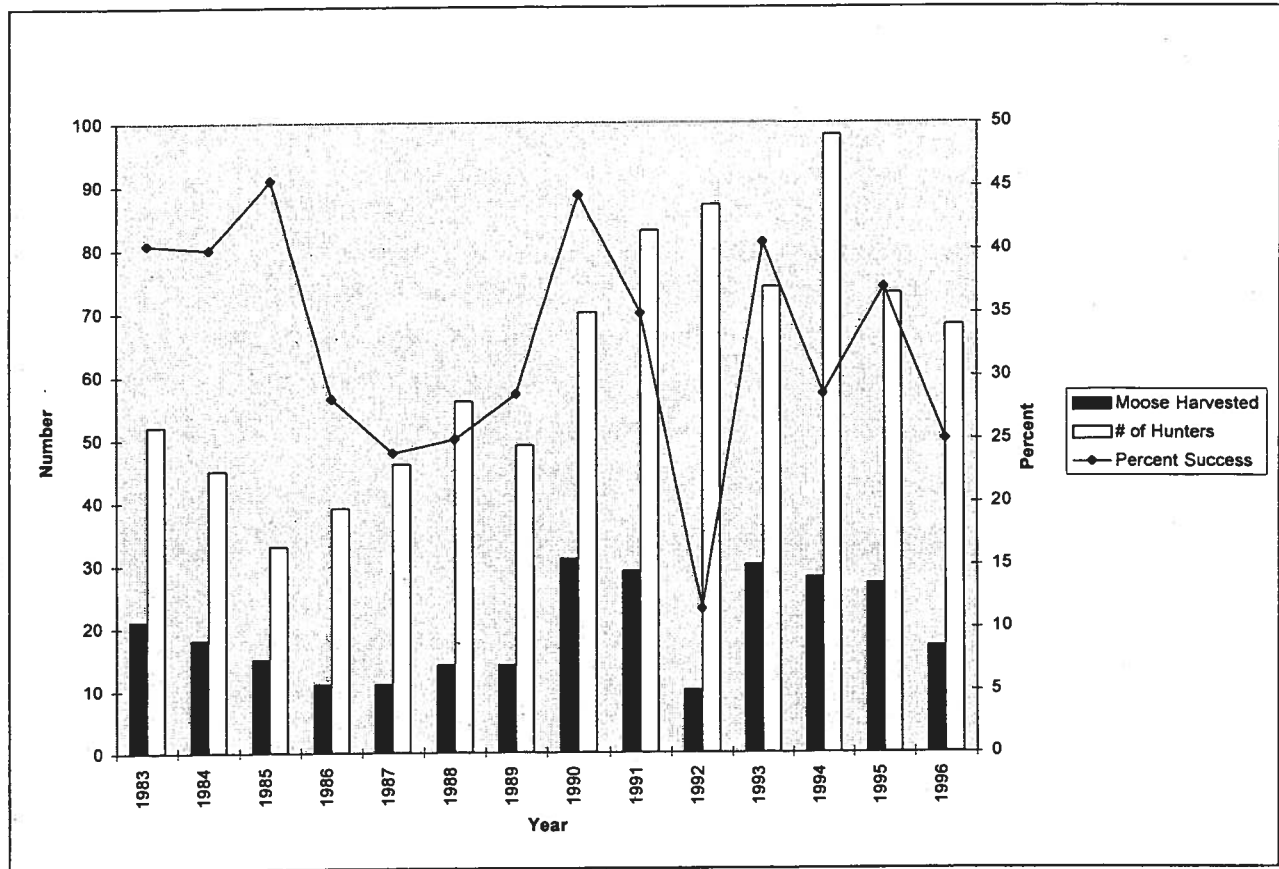


Figure. 5. Reported moose harvest, number of hunters, and hunter success in Yukon-Charley Rivers National Preserve during 1983-1996.

During 1983 - 1996, an average of 62 hunters (range 33-98) have hunted moose in the preserve each year spending an average of about 7.5 days hunting. Comparing the mean number of hunters from the first 7 years (45.7) to the last 7 years (79.0) indicates a significant increase in the number of people hunting ($t=-6.602$, $p=0.0000253$, $\alpha=0.05$). Furthermore there is also a significant trend in the increase in the number of hunters over the entire 14 years ($R^2=0.607$, $F=18.548$, $p=0.00101$, $\alpha=0.05$).

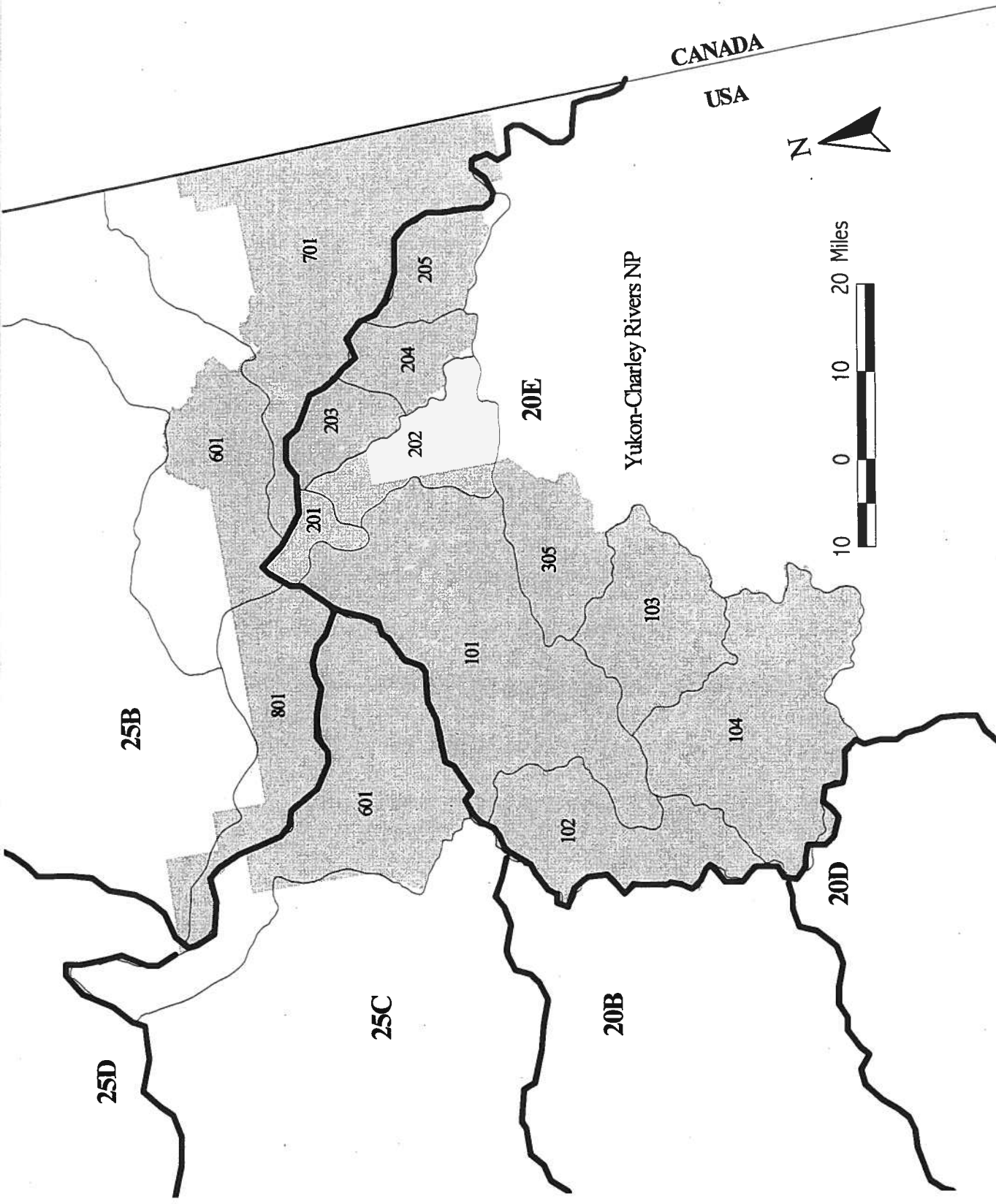


Figure 6. Game management subunits and uniform coding units (UCUs) comprising Yukon-Charley Rivers National Preserve, Alaska.

Reported hunter success rates have averaged 32% (range 11-45%) during this 14 year period.

Average hunter success during the first 7 years (33.07) is not significantly different from the last 7 years (31.68) ($t=0.2610$, $p=0.79845$, $\alpha=0.05$). Although there appears to be a slight downward trend in overall hunter success when viewing figure 5 the trend is not statistically significant ($R^2=0.0916$, $F=1.21$, $p=0.2928$, $\alpha=0.05$).

These data indicate an increase in the number of hunters, but the success rate of hunters has remained the same. Therefore it is an increase in the number of hunters that has caused the resulting increase in the number of moose harvested, and not an increase in hunter success.

Hunting pressure in the preserve occurs primarily along navigable waters such as the Yukon, Kandik, Nation, and Charley Rivers. Hunters can also access several airstrips within YUCH. Most of the preserve, however, is relatively inaccessible by aircraft and boats. Therefore, the effects of current hunting pressure and harvest levels, although it may decrease the number of bulls locally available along rivers and around airstrips during hunting season, probably will not adversely affect the YUCH moose population.

CONCLUSIONS AND RECOMMENDATIONS

The overall density of 0.27 moose/mi^2 is among the lowest reported in interior Alaska (Gasaway et al. 1992). The sex and age composition of the YUCH moose population appears consistent with that of a stable population. There is some indication that the bull:cow ratio in YUCH has decreased during the last 10 years. The current bull:cow ratio, however, of 60 bulls:100 cows is

healthy for a hunted population (Dale 1996, Gardner 1996, Gasaway et al. 1992). Other hunted populations in interior Alaska are managed at 30 bulls:100 cows and are stable or increasing (Dale 1998, personal communication). The current bulls-only hunting season in the preserve does not appear to be threatening the bull component of the herd.

Both the number of hunters and harvest increased during the early 1990s, however, hunter success rates remained comparable to the long-term average. Proposals to lengthen hunting seasons on bulls within and adjacent to the preserve have been submitted and could take effect during fall 1998. Although the YUCH moose population is probably not currently at maximum sustainable harvest levels, extended hunting seasons and subsequent additional harvest have the potential to adversely affect the population.

Another problem in managing the moose population in YUCH is our lack of knowledge of moose movements in and adjacent to YUCH. Studies of other moose populations in interior Alaska have documented significant moose movements (Gasaway 1992, Hobgood and Durtsche 1990). Some of these movements are migratory in nature and occur seasonally. Other anecdotal information suggests that snow and other factors may influence the timing and magnitude of movements. These movements may substantially affect the results of surveys. Information on the timing and extent of moose movements in and adjacent to YUCH is critical for managers to develop, implement, and make management decisions based on an appropriate monitoring protocol.

Available moose population information for YUCH is inadequate for current and future management needs. We suggest that a long-term monitoring program with consistent sampling techniques be implemented to track the status of the YUCH moose population. An annual trend/composition survey would cost approximately \$15,000. A full scale population survey modeled after Gasaway et al. (1986) should be conducted at least every 3 years, and would cost about \$35,000. This monitoring level would provide managers with statistically reliable population estimates and a consistent means to estimate sex and age composition. In addition, a study of moose movements in YUCH would provide valuable information that would assist in determining an appropriate population monitoring protocol and allow managers to make informed decisions regarding moose management to maintain a healthy population and sustainable harvest levels.

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