

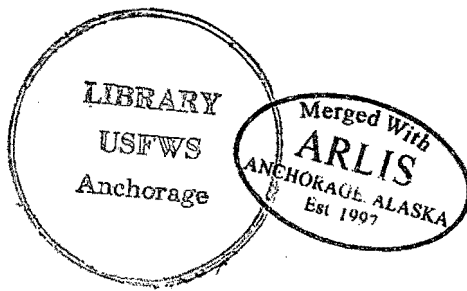
US FISH & WILDLIFE SERVICE--ALASKA



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1986 MOOSE CENSUS, LOWER NOWITNA RIVER DRAINAGE
FINAL REPORT

by Loranger, Andy



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1986 Moose Census, Lower Nowitna River Drainage
Final Report

by

Andy Loranger

Key Words: Lower Nowitna River Drainage, Moose,
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Dates: 17 - 21 November, 1986

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Abstract

A moose survey of the lower Nowitna drainage on the Nowitna National Wildlife Refuge was conducted from 17-21 November 1986. The 1986 population estimate for the study area is 783 ± 191 moose at the 90% confidence level. A 1980 survey in the study area estimated a population of 1390 ± 373 moose. The two estimates are significantly different at the 95% confidence level (two-tailed Student's t-test). Sex and age composition data were collected during the surveys and during trend area surveys in 1982, 1983 and 1985. Calf:cow ratios are indicative of adequate summer survival of calves; however poor annual recruitment in 1983, 1985 and 1986 was reflected in low yearling bull:cow ratios. Poor winter survival of calves is a potential problem in the study area.

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Introduction

An aerial moose census was conducted on the Nowitna National Wildlife Refuge (NWR) from 17-21 November 1986. The study area consisted of the lower Nowitna River drainage, and is part of a larger area surveyed by Alaska Department of Fish and Game (ADF&G) personnel in 1980. Data from the 1980 survey has been interpolated for the revised study area to allow comparisons with results of this survey. Smaller tracts within the study area were surveyed in 1982, 1983 and 1985 to provide trend data on sex and age composition and population density.

This survey was cooperatively funded by the U.S. Fish and Wildlife Service and ADF&G. We are indebted to ADF&G personnel D. Haggstrom, D. Reed and T. Osborne for providing technical expertise and assistance in data collection.

Study Area and Methods

The study area encompasses 1556 sq. mi. of the Nowitna National Wildlife Refuge (NWR) (Figure 1). It is bisected by the lower reaches of the Nowitna River, with the Yukon River forming the northern boundary. It includes the Nowitna Lowlands, a broad wetland plain of lakes, marshes and meandering streams. The southern portion of the study area includes some alpine and subalpine habitat in foothills of the Kuskokwim Mountains. Riparian areas along the lower Nowitna River and its associated drainages and along the Yukon River provide important wintering habitat for moose.

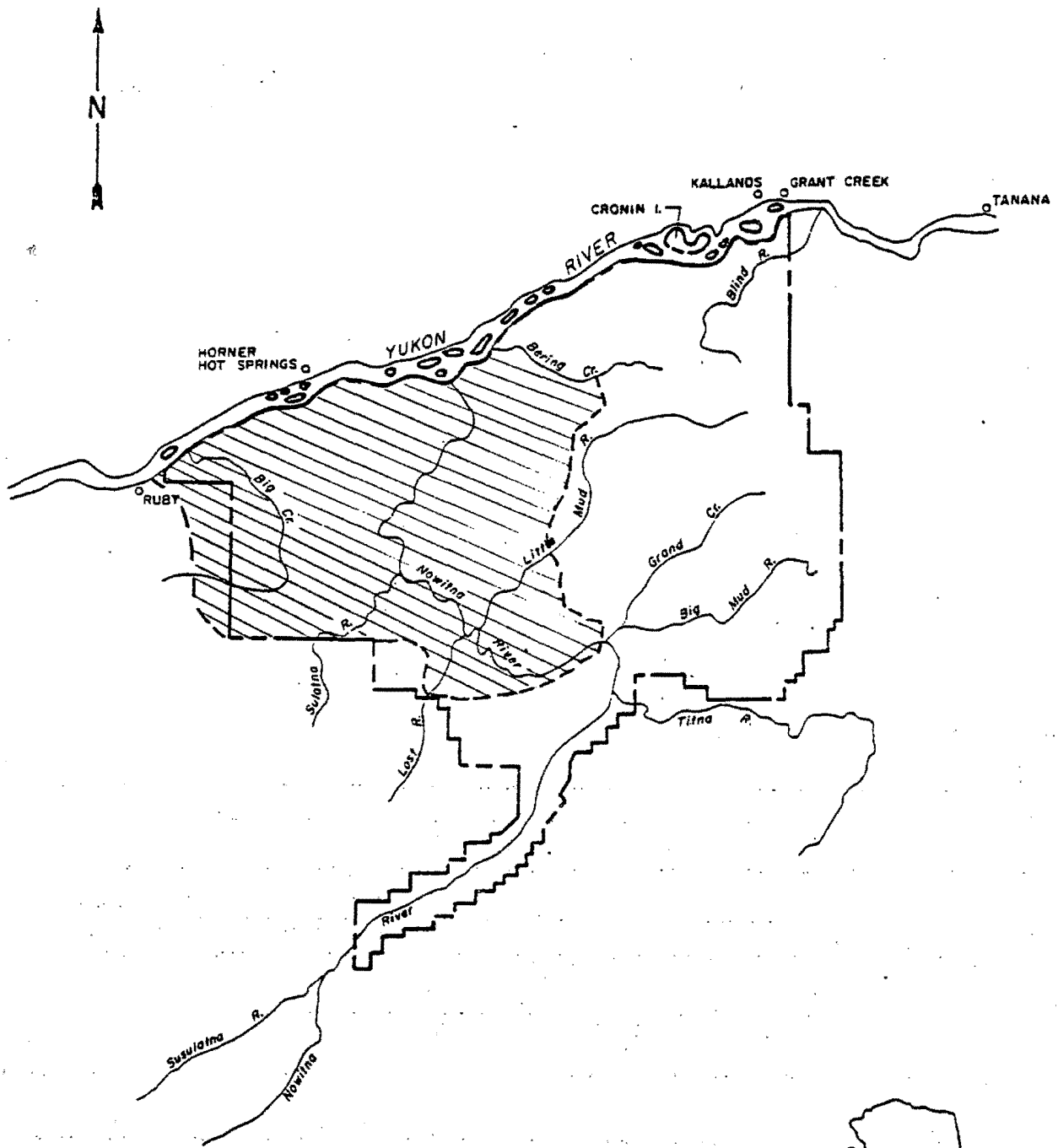
Weather conditions in 1986 were ideal for the survey. Skies were clear and temperatures ranged from -15 to -40 F. Snow cover was complete.

Study design was based on methods developed by Gasaway, et al. (1981, in press). (See these citations for a more detailed description.) The study area was divided into 124 sample units ranging from 6.2 to 17.7 sq. mi. in size, and was then stratified into low, medium, and high density strata based on moose densities observed during an aerial stratification survey. The stratification survey was flown with a ski-equipped Cessna 185 aircraft at an above-ground altitude of approximately 800' and at airspeeds of 125 - 135mph on 17 and 18 November. Sample units were randomly selected and surveyed on 18-21 November with a ski-equipped PA-18 aircraft at above-ground altitudes of 300-500' and airspeeds of 70-80 mph.

Search intensity approximated the recommended range of 4-6 min/sq.mi. Transects at approximately 0.25 mile intervals were flown over flat terrain and contour flight paths were followed in the foothills.

A standard formula for calculating optimum allocation of sampling effort was used. A sightability correction factor for the survey was determined by flying intensive searches (6-7 min/sq.mi.) in randomly

Figure 1. Moose survey study area, lower Nowitna River drainage, 1986.



Total acreage within refuge: 2,060,000 ±Ac.

0 20 40 Miles

NOWITNA
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selected 2 sq. mi. sections of surveyed sample units in the high and medium density strata.

An estimate of the study area moose population, corrected for sightability, was calculated at the 90% confidence level. Two-tailed Student's t-tests were used to detect differences between 1980 & 1986 population estimates. The rate of change for the population, based on an exponential model, was calculated and a 90% confidence interval determined.

Results and Discussion

Stratification

The low density stratum was comprised of 82 sample units (1018.8 sq. mi.), the medium density stratum of 35 sample units (448.5 sq. mi.), and the high density stratum of 7 sample units (88.7 sq. mi.). Sampling effort was allocated as follows: low density stratum -- 6 sample units (78.6 sq. mi.), medium density stratum -- 17 sample units (225.8 sq. mi.), and high density stratum -- 7 sample units (88.7 sq. mi.) (Table 1).

Stratification increases the precision of an estimate of density in an area by making the estimate a function of variability within zones or strata of relatively homogeneous density, rather than a function of the variability over the entire area, where density is heterogenous. Our classification of sample units during the stratification survey was most effective in reducing variance in the low density stratum, which required the least sampling effort but comprised 65% of the total area. It was least effective in the medium density stratum. In retrospect, two factors seem most responsible: 1) incorrect classification of some high density sample units as medium density; and 2) post-stratification movement of moose, especially egress from surveyed sample units. The small number of sample units in the high density stratum (7) allowed us to completely survey this stratum, thereby eliminating the variance.

Population Status

The 1980 moose survey included both the upper and lower Nowitna River drainages. The rationale for a smaller survey area in 1986 included approximating Nowitna NWR boundaries and limited funding and manpower. In addition, most human harvest of moose on the refuge occurs within the revised study area, specifically along the lower Nowitna River (T. Osborne, pers. comm.).

During the 1986 census, a total of 412 moose was observed during the standard survey (Table 2). Moose densities ranged from 0.0 moose/sq. mi. to 5.1 moose/sq. mi. and averaged 1.05 moose/sq. mi. for the surveyed area. Within strata, moose density averaged 0.03 moose/sq. mi. in the low, 0.97 moose/sq. mi. in the medium, and 2.15 moose/sq. mi. in the high density stratum (Table 2). Sightability correction flights were flown in 22 of 24 sample units surveyed in the

high and medium density strata. Eleven additional moose were observed during these intensive searches. The sightability correction factor (SCF) for the survey was 1.20.

The 1986 moose population estimate for the lower Nowitna River drainage, corrected for sightability, is 783 ± 191 (24% at the 90% confidence level) (Table 3). The 1980 estimate for the same area was 1390 ± 373 (27% at the 90% level). Assuming that the surveys are comparable, this represents a significant difference at the 95% level ($t' = 2.62$, d.f. = 15). The exponential rate of change for the population, based on 1980 & 1986 estimates, is .095 (90% CI: $.095 \pm .054$). A rate of decline of this magnitude is substantial.

Sex and age composition information for the population is presented in Tables 4 and 5. Interpretation of this information is difficult because of missing data (surveys were not conducted in 1981 and 1984) and because direct comparisons between years may not be possible. Nevertheless, some general inferences can be made. Calf:cow ratios in all years except 1985 are indicative of adequate calf survival during summer. Annual recruitment, however, has been poor in 1983, 1985 and 1986 (data not available for 1984), reflected in low yearling bull:cow ratios. Poor calf survival during winter may be responsible. A severe winter in 1984-85 probably did result in high calf mortality in the 1984 cohort.

Interaction between various mortality factors, including environmental conditions, predation, and harvest by man, can significantly impact moose populations (Gasaway, et al. 1983). The annual moose harvest in the lower Nowitna drainage averaged 42 animals (bulls only) from 1980 to 1985 (T. Osborne, pers. comm.). The extent to which predation and environmental conditions contributed to poor recruitment in the study area in 1983, 1985 and 1986 is not known. Nonetheless, the relative absence of these cohorts lends credence to the statistically significant difference between 1980 and 1986 population estimates.

Recommendations

Population surveys, such as those of the lower Nowitna River drainage in 1980 and 1986, which allow accurate comparisons of population levels over time are extremely valuable management tools. Improving the precision of the population estimates increases their value. The precision of the 1986 estimate may have been improved by: 1) use of an additional PA-18 aircraft (with concurrent increase in cost) to decrease the elapsed time between stratification and the actual survey, thus diminishing the effect of moose movements; and 2) providing uniform coverage to all good moose habitat in sample units during the stratification survey to avoid misclassification due to the naturally clumped distribution of moose.

Trend area surveys should be conducted in established areas year after year to facilitate understanding shifts in sex and age composition and density. In addition, trend areas must be sufficiently

large so as to be representative of the population in question. Available data will be analyzed to determine optimal size and location of trend areas on the Nowitna NWR.

Available information suggests that winter calf mortality may be excessive. Consideration should be given to a telemetry study involving placement of radio collars on moose calves to determine the extent of the problem and the factors responsible. Relationships between environmental conditions and population status are also poorly understood. Information on range condition is needed and annual browse surveys are recommended. Finally, predator surveys should be continued and expanded.

The causes in the apparent decline of the moose population in the lower Nowitna drainage are presently unclear. All indications are, however, that the decline is real and requires the attention of management agencies.

Literature Cited

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Table 1. Stratification results, sampling effort and average search intensity, by stratum, during 1980 and 1986 aerial moose surveys of the lower Nowitna River drainage, Alaska.

Stratum	Total S.U.	S.U. Surveyed	Total Area (mi. ²)	Area Surveyed (mi. ²)	Search Intensity (min./mi. ²)
<u>1980</u>					
Low	42	9	531.0	112.5	
Medium	56	11	712.9	133.1	
High	23	7	312.1	86.2	
Totals	121	27	1556.0	331.8	
<u>1986</u>					
Low	82	6	1018.8	78.6	2.72
Medium	35	17	448.5	225.8	4.22
High	7	7	88.7	88.7	4.98
Totals	124	30	1556.0	393.1	

Table 2. Observed and estimated numbers of moose and average density, by stratum, during 1980 and 1986 aerial surveys of the lower Nowitna River drainage, Alaska.

Stratum	No. Moose Observed ¹	Stratum Estimate	Average Density (moose/mi. ²)
<u>1980</u>			
Low	28	132	0.25
Medium	97	525	0.74
High	149	539	1.73
Total	274		
<u>1986</u>			
Low	2	29	0.03
Medium	219	446	0.97
High	191	191	2.15
Total	412		

¹ Does not include additional moose observed during intensive SCF surveys.

Table 3. Moose population estimates from 1980 and 1986 aerial surveys of the lower Nowitna River drainage, Alaska.

Year	SCF	T_o	T_e	90%CL	90%CL
1980	1.16	1197	1390±27%	1016	1763
1986	1.20	652	783±24%	591	974

T_o = Observable population estimate

T_e = Expanded population estimate (corrected for sightability)

Table 4. Observed sex and age composition ratios during 1980 & 1986 moose surveys of the lower Nowitna River drainage, Alaska.

Year	Total Moose	Density ⁽¹⁾ (Moose/Mi ²)	Total M 100 F	Yrlng. M. 100 F	Yrlng. M. 100 F ≥ 2 yrs.	% Yrlng. in Herd	Calves 100 F	Calves 100 F ≥ 2 yrs.	Twins 100 Cows w/ Calves	% Calves in Herd
1980	280	1.21	46	11	12	6.0	35	39	5	19.0
1986	423	1.13	38	6	6	3.3	40	42	5	22.4

(1) Average density = $\frac{\text{Total Moose Observed}}{\text{Total Area Surveyed}}$

Table 5. Observed sex and age composition ratios, 1980-1986, lower Nowitna River drainage, Alaska.

Year	Total Moose	Total M 100 F	Yrlng. M. 100 F	Yrlng. M. 100 F ≥ 2 yrs.	% Yrlng. in Herd	Calves 100 F	Calves 100 F ≥ 2 yrs.	Twins 100 Cows w/ Calves	% Calves in Herd
1980 ¹	280	46	11	12	6.0	35	39	5	19.0
1981	-	-	-	-	-	-	-	-	-
1982 ²	215	52	21	27	11.6	24	30	0	13.0
1983 ²	229	36	8	9	4.4	43	52	7	26.0
1984	-	-	-	-	-	-	-	-	-
1985 ²	225	24	5	5	3.6	5	5	0	4.0
1986 ¹	423	38	6	6	3.3	40	42	5	22.4

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