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INTERIOR MOOSE STUDIES

by
John W. Coady

Volume II
Project Progress Report
Federal Aid in Wildlife Restoration
Project W-17-6, Jobs 1.3R, 1.4R, 1.8R and 1.11R

(Printed October 1974)

JOB PROGRESS REPORT (RESEARCH)

State: Alaska

Cooperator: John W. Coady

Project No.: W-17-6 Project Title: Big Game Investigations

Job No.: 1.3R Job Title: Evaluation of Moose Range and Habitat Utilization in Interior Alaska

Period Covered: July 1, 1973 through June 30, 1974

SUMMARY

Site characteristics, plant associations, and browse utilization by moose and hares have been studied near Fairbanks since 1972. Data will be reported in a future publication.

Eight aerial surveys were conducted on a 260 km^2 count area on the Tanana Flats between June 1973 and April 1974. Total animals observed were greatest in early summer and lowest during mid-winter. Most animals were observed in aquatic and low shrub habitats during all seasons. However, habitat use by radio-collared moose suggests a far greater preference for deciduous and coniferous tree habitats during all seasons than indicated by the aerial surveys. Therefore, a large number of moose probably occupy, and are not observed in, dense habitat types during aerial moose surveys.

CONTENTS

BACKGROUND

See Job 1.8R.

OBJECTIVES

The objectives of this study are to identify and characterize major vegetation types in the Tanana Flats and adjacent portions of Game Management Unit 20B, to evaluate browse preference and utilization in selected areas of Units 20A and 20B, and to monitor seasonal distribution and composition of populations within major habitat types in Units 20A and 20B.

PROCEDURES

Vegetation Studies

Methods used to describe site characteristics and plant associations and to evaluate browse preference and utilization by moose (*Alces alces*) and hares (*Lepus americanus*) have been described by Coady (1973).

Habitat Utilization

Aerial surveys were conducted on eight occasions between June 1973 and May 1974 in a 260 km^2 count area on the Tanana Flats (Fig. 1) to monitor seasonal distribution and composition of moose populations within different habitat types.

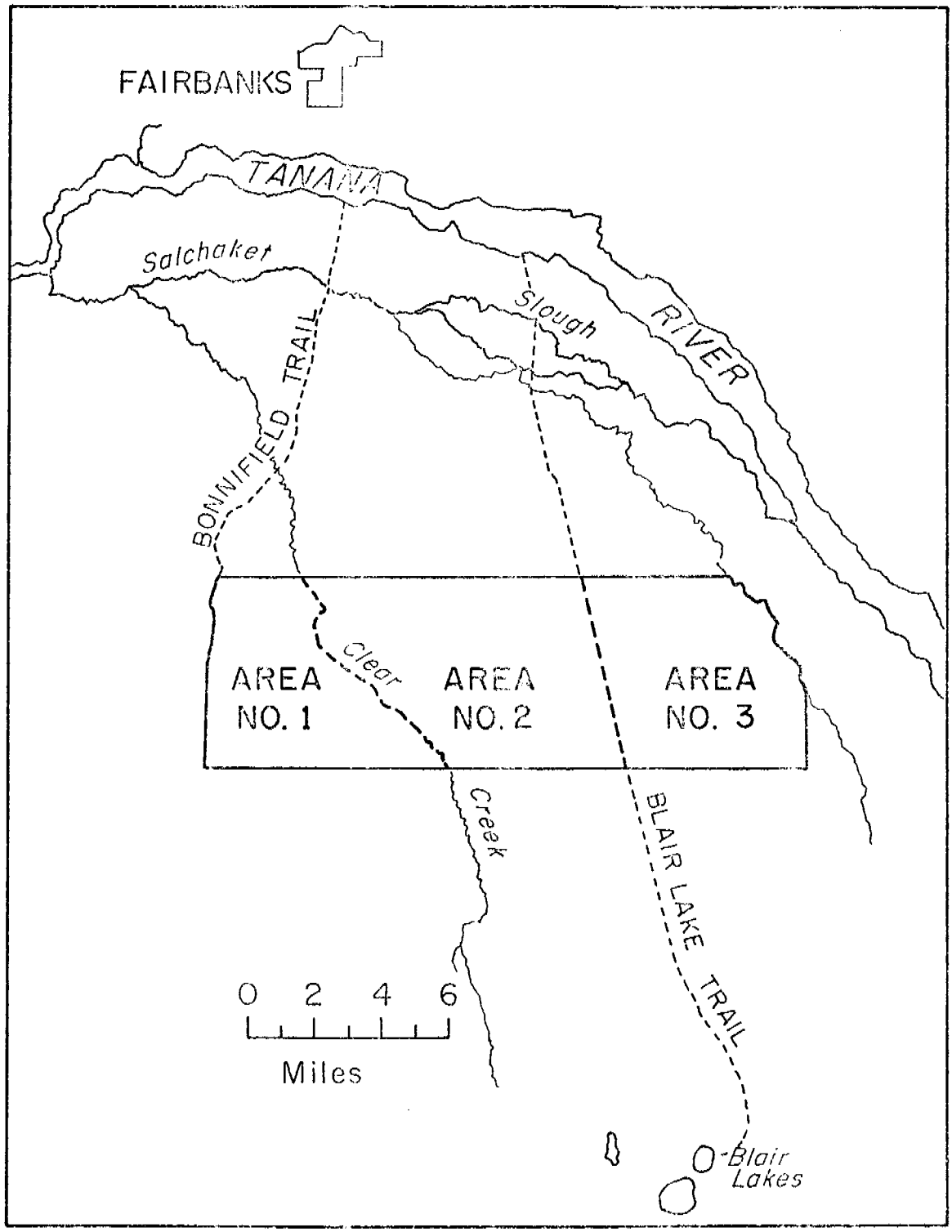
Area 1 consists primarily of a mosaic of deciduous and coniferous tree stands and small ponds. Much of Area 2 consists of low shrub and aquatic communities with relatively few large stands of trees. Most of Area 3 was burned in 1957, and consists largely of shrub regrowth and stands of unburned conifer trees.

RESULTS

Vegetation Studies

General site characteristics and floristics of aquatic, low shrub, tall shrub, deciduous tree and coniferous tree communities on the

Fig. 1. Count area on the Tanana Flats where frequent aerial surveys were conducted during 1973-74 to monitor seasonal distribution and composition of moose populations within different habitat types.



Tanana Flats have been described by Coady (1973). In summer 1972 six low shrub, six tall shrub, two deciduous tree and three coniferous tree stands on the Tanana Flats were sampled. In addition, three tall shrub stands in a 15-year-old burn on the Little Chena River were sampled. In summer 1973 two low shrub stands on the Tanana Flats and four tall shrub stands along the Little Chena River were sampled. Data for most stands have been analyzed with regard to frequency of occurrence, cover and density, and will be reported in a future publication (Coady and Simpson, in prep.).

Utilization of browse species by moose and hares in three low shrub, five tall shrub and one deciduous tree stands was evaluated on the Tanana Flats in summer 1972. Browse utilization in two low shrub stands on the Tanana Flats and in two tall shrub stands in the Little Chena River was evaluated in summer 1973. Average browse class (0 = no browsing of new leader growth during past year, 1 = 1 to 33%, 2 = 33 to 66% and 3 = 66 to 100% of new leaders browsed during past year) for several deciduous shrub and tree species on the Tanana Flats is shown in Table 1. Additional results and conclusions regarding competition between moose and hares for browse will be presented in a future publication (Coady and Simpson, in prep.).

Habitat Utilization

Total moose observed during aerial surveys on the Tanana Flats count area gradually declined from 196 in June 1973 to a low of 51 in January 1974, and then again increased to 106 in May 1974 (Fig. 2). The above data suggest a gradual emigration of moose from the Tanana Flats between mid-summer and late fall, and a return to the Flats sometime between late winter and early summer. Similar observations have been reported by Bishop (1970).

Percent of the total number of moose in each of three areas of the total count area suggests a preference for the burn regrowth of area three during fall, and for the deciduous and coniferous tree stands of area one during late winter (Fig. 2). Area two was utilized during both summer and winter. Habitat utilization in the total count area indicated by habitat type in which moose were observed suggests a preference for aquatic and low shrub types during summer, and for low shrub types all other times (Fig. 3).

Habitat utilization indicated by observations of radio-collared moose on the Tanana Flats and in the Alaska Range (Job 1.11R) suggests a far greater use of coniferous and deciduous habitats during all months than indicated by aerial surveys (Fig. 4). Except during October and December, conifer habitats were used more extensively than any other habitat type. Preliminary results suggest that bulls (Fig. 5) may prefer less dense low shrub and tall shrub habitats during fall and winter than do either lone cows (Fig. 6) or cows with calves (Fig. 7).

During November, when fall moose surveys are conducted, and during May, when spring moose surveys are conducted in the Tanana Flats and/or Alaska Range, over 50 percent of the radio-collared moose were observed in coniferous and deciduous habitats. For comparison, habitats in which

Table 1. Average browse class* for deciduous species on the Tanana Flats.

Moose		Hares	
Species	Average Browse Class	Species	Average Browse Class*
Salix lasiandra	1.60	*S. lasiandra*	2.31
S. arbusculoides	1.37	*S. interior*	2.10
S. interior	1.30	*S. monticola*	2.05
S. planifolia subsp. *pulchra*	1.23	*S. glauca*	2.02
S. alexensis	1.04	*S. alexensis*	1.95
S. novae-angliae	1.01	*S. bebbiana*	1.76
S. bebbiana	0.78	*S. scouleriana*	1.67
S. monticola	0.43	*S. novae-angliae*	1.40
S. glauca	0.37	*S. arbusculoides*	1.36
S. scouleriana	0.00	*S. planifolia* subsp. *pulchra*	0.40
Populus balsamifera	0.96	*Larix laricina*	2.90
P. tremuloides	0.40	*B. papyrifera*	2.19
Betula papyrifera	0.39	*P. balsamifera*	1.44
Alnus crispa	0.20	*A. tenuifolia*	1.36
A. tenuifolia	0.00	*P. tremuloides*	0.90
L. laricina	0.00	*A. crispa*	0.80

* Browse classes - 0 - no browsing
1 - 1-33% of new leaders browsed during past year
2 - 34-66% of new leaders browsed during past year
3 - 66-100% of new leaders browsed during past year

Fig. 2. Total number of moose and percent of total moose observed in three areas of a 260 km^2 count area on the Tanana Flats during frequent aerial surveys in 1973-74.

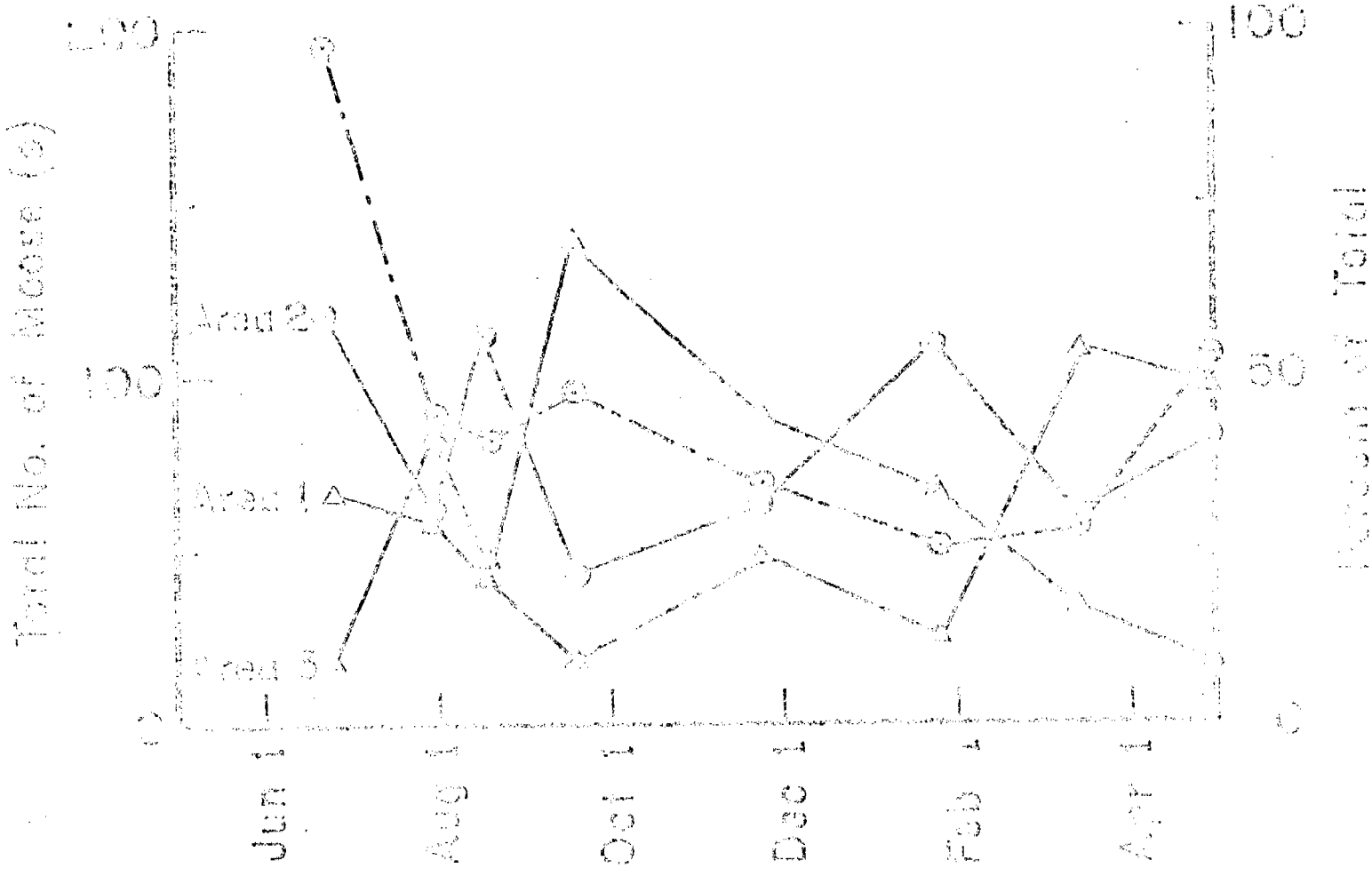


Fig. 3. Habitat utilization by all sex and age group moose determined by frequent aerial surveys in a 206 km^2 area on the Tanana Flats.

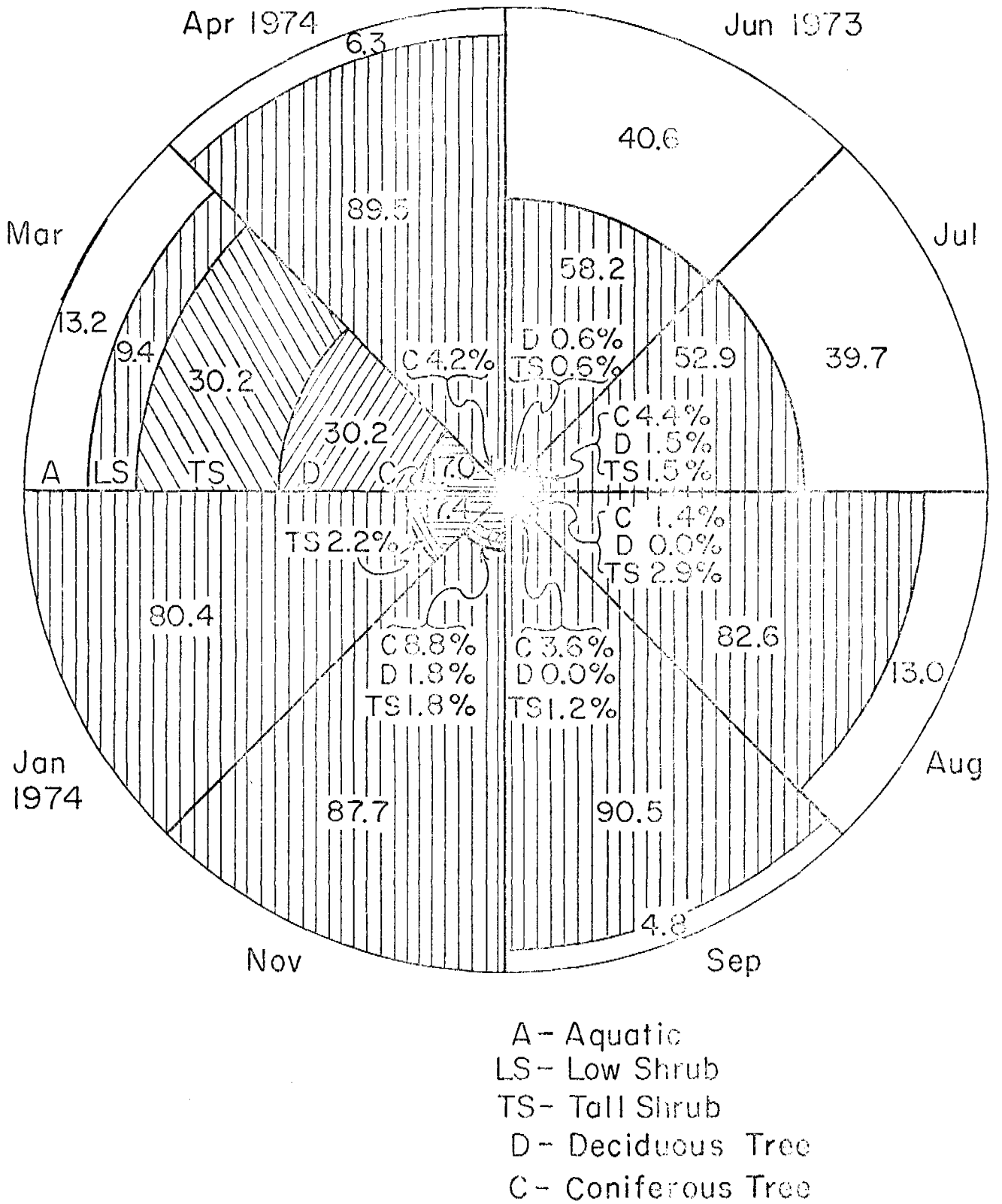


Fig. 4. Habitat utilization by all sex and age group radio-collared moose on the Tanana Flats and Alaska Range during 1973-74.

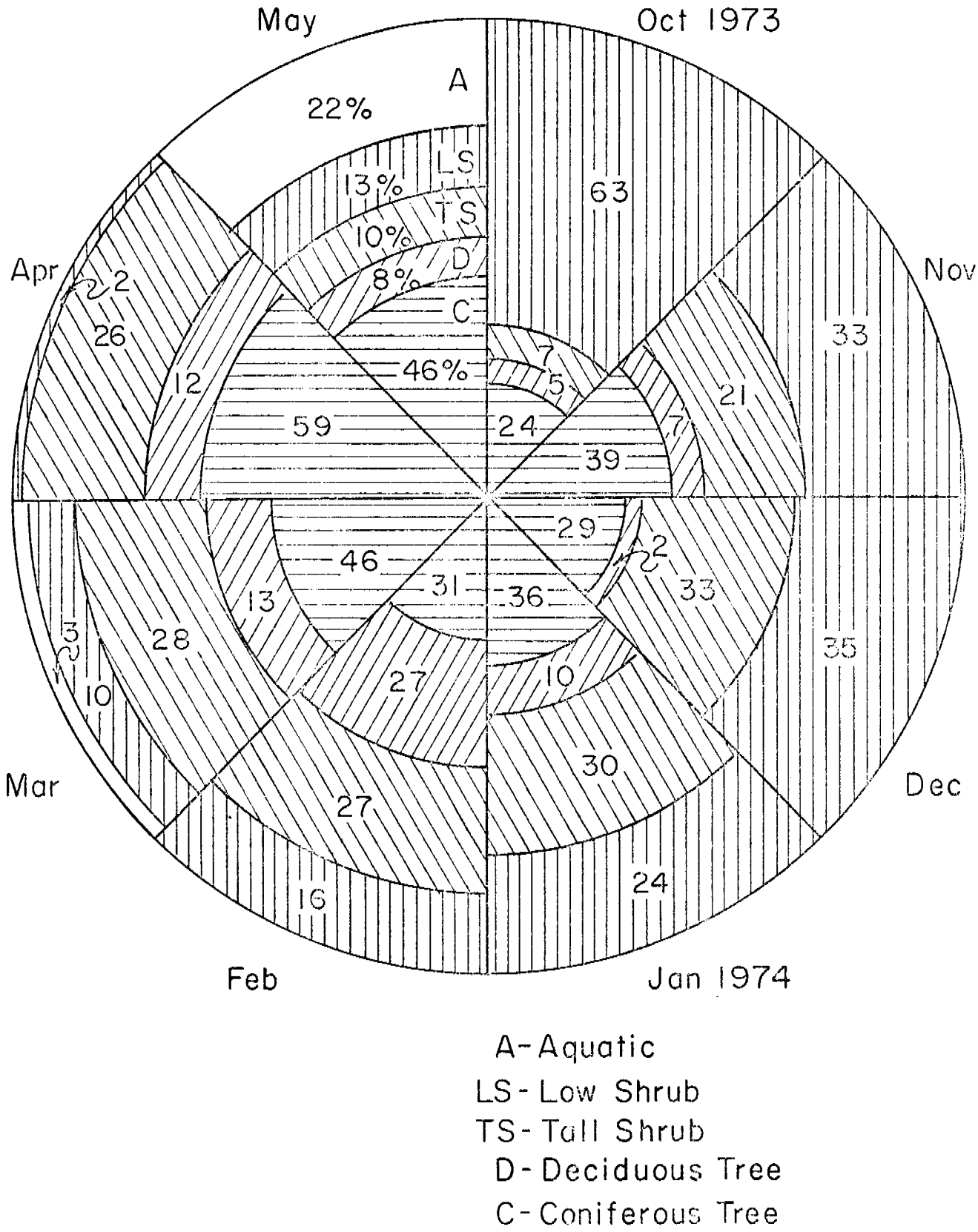


Fig. 5. Habitat utilization by radio-collared bull moose on the Tanana Flats and the Alaska Range during 1973-74.

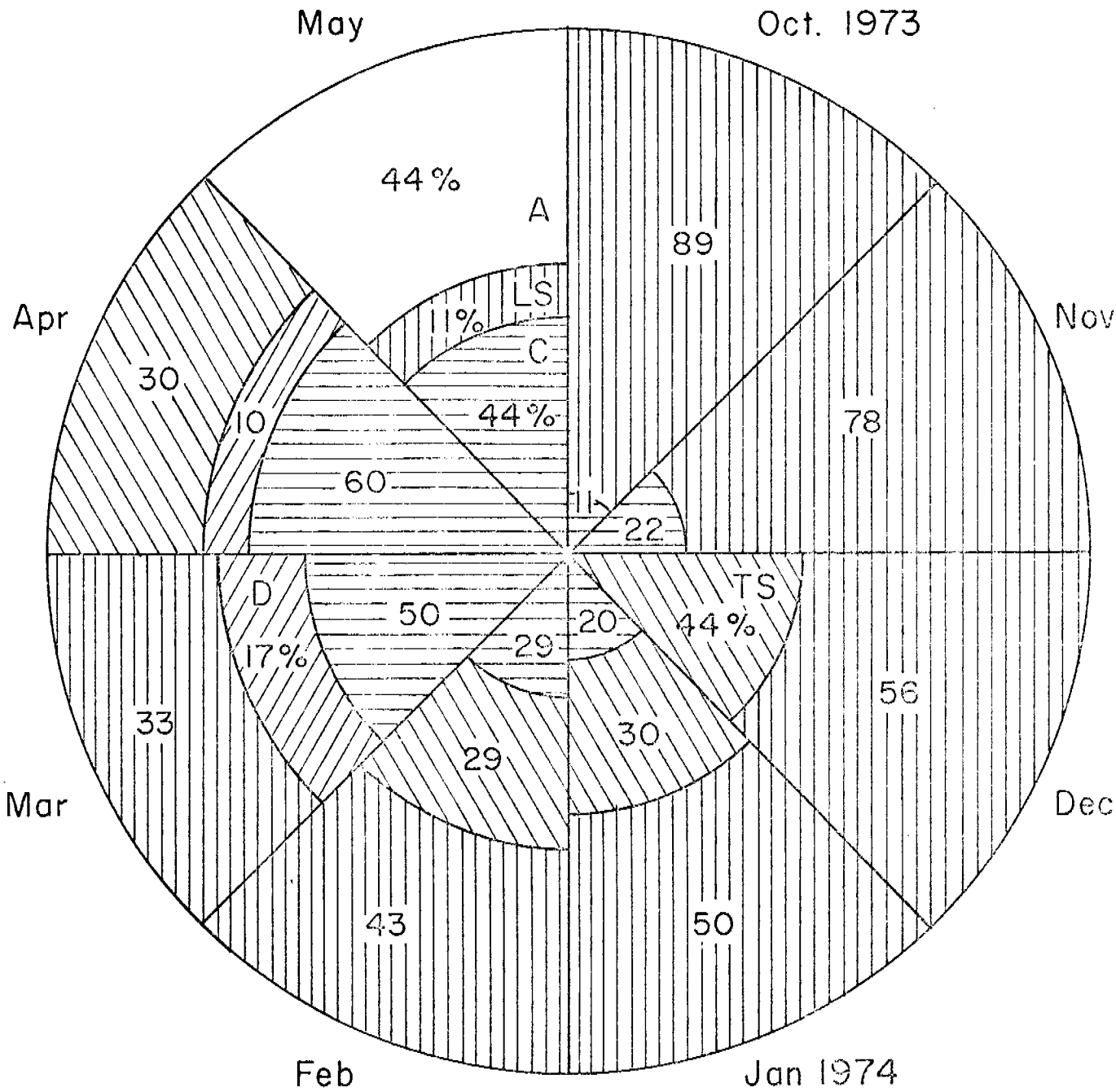


Fig. 6. Habitat utilization by radio-collared lone cows on the Tanana Flats and the Alaska Range during 1973-74.

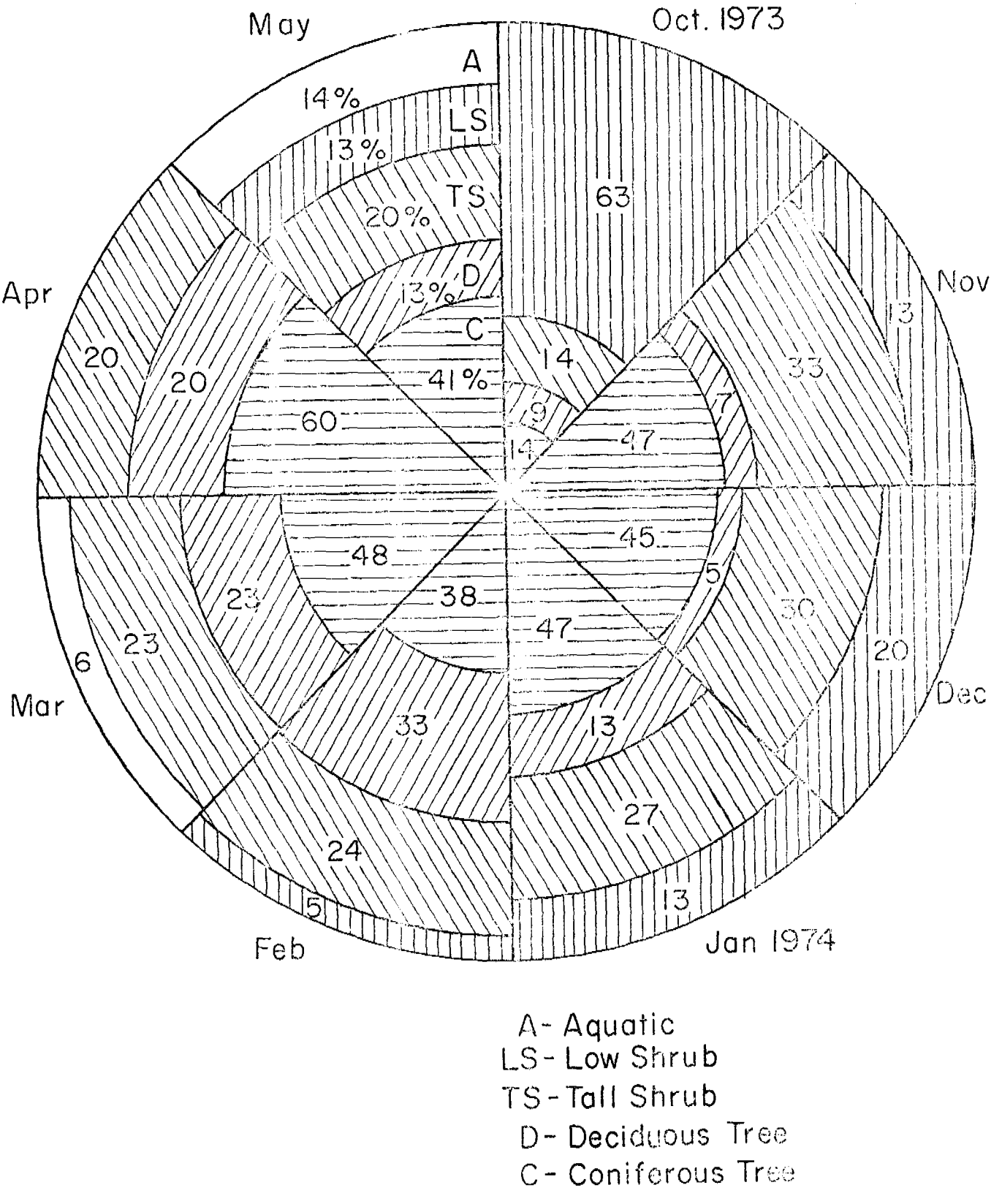
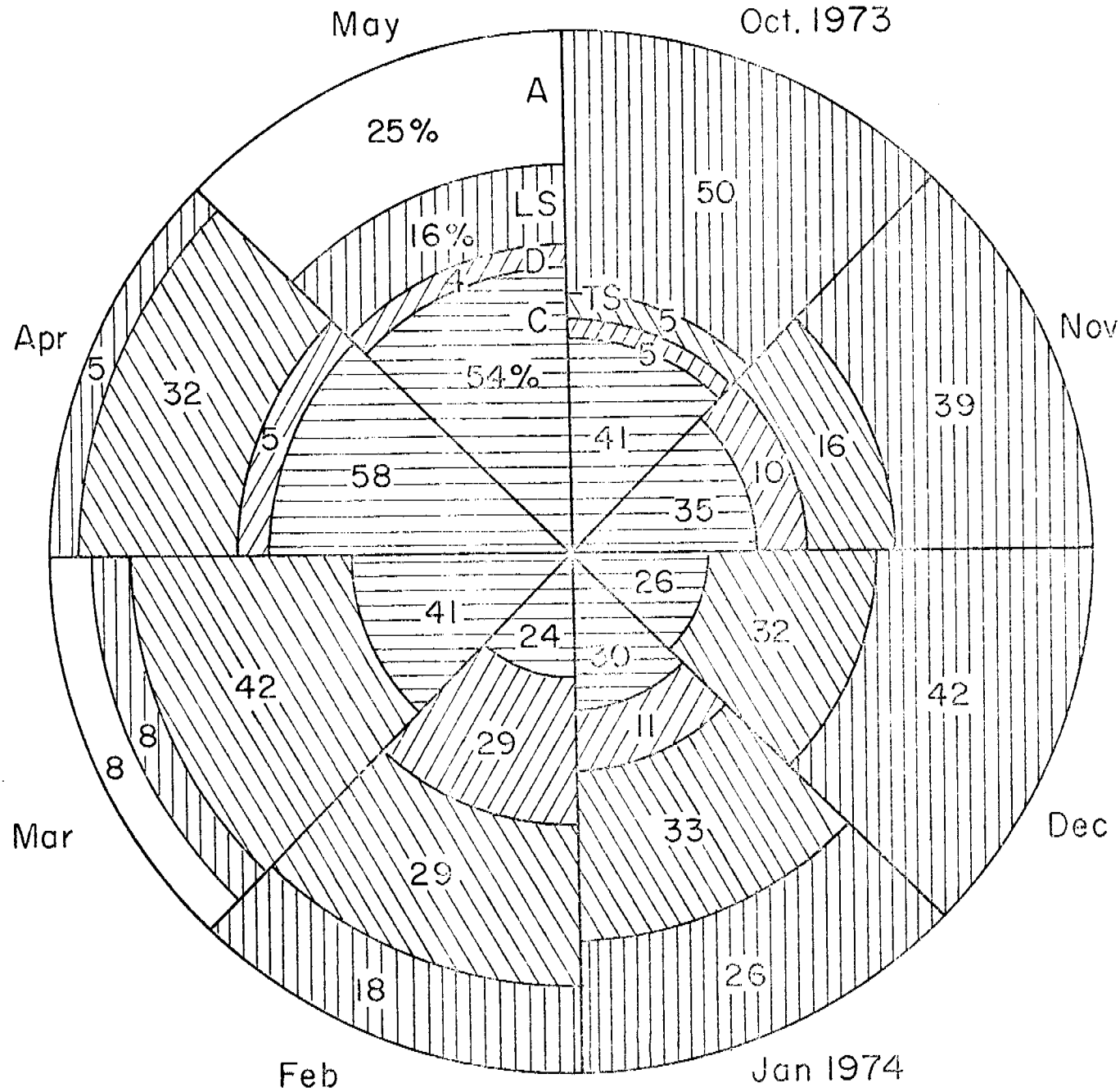


Fig. 7. Habitat utilization by radio-collared cows with calves on the Tanana Flats and the Alaska Range during 1973-74.



316 moose were observed on the Tanana Flats during spring surveys in 1974 were as follows:

Habitat Type	Total Moose	Percent of Total
Aquatic	95	30
Low shrub	171	54
Tall shrub	35	11
Deciduous	2	1
Coniferous	13	4

Spring surveys and surveys in the 260 km^2 count area were conducted during early morning when the greatest number of moose may be active in aquatic and shrub habitats. Nevertheless, comparisons of survey data with radio-collared moose observations suggest that a large number of moose occupying an area are probably not observed in deciduous and coniferous habitats during all times of the year. Habitat use by moose in the Tanana Flats and Alaska Range will be further reported in a future publication.

Additional publications associated with this job include 1) a co-authored review paper: Distribution and Habitats of Moose in Alaska (LeResche, Bishop, Coady, in press) to be published in Le Naturaliste Canadien, Volume 101; and 2) Moose Food Habits in Alaska: a preliminary study using rumen content analysis (Cushwa and Coady, ms) which will be published in the Canadian Field Naturalist after revision.

ACKNOWLEDGMENTS

Dot Simpson and Edward Kootuk provided needed field assistance, and Don McKnight and Richard Bishop offered valuable suggestions in vegetation studies. Much of the data was analyzed by Dot Simpson and Dale Haggstrom. The contribution of these individuals is gratefully acknowledged.

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Coady, J. W. 1973. Interior Moose Studies. Volume I Proj. Prog. Rep., Proj. No. W-17-4 and W-17-5. 80pp.

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JOB PROGRESS REPORT (RESEARCH)

State: Alaska

Cooperator: John W. Coady

Project No.: W-17-6 Project Title: Big Game Investigations

Job No.: 1.4R Job Title: Evaluation of Moose Browse and Rumen Fermentation in Moose in Interior Alaska

Period Covered: July 1, 1973 through June 30, 1974

Procedures, results, and conclusions associated with this job have been reported in: 1) Rumen Function and Energy Production of Moose in Interior Alaska (Coady and Gasaway, 1972; Proc. 8th Ann. N. Am. Moose Conf.) and 2) in a review paper: Review of Energy Requirements and Rumen Fermentation in Moose and Other Ruminants (Gasaway and Coady, in press) to be published in Le Naturaliste Canadien, Volume 101, and will not be reported here.

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JOB PROGRESS REPORT (RESEARCH)

State: Alaska

Cooperator: John W. Coady

Project No.: W-17-6 Project Title: Big Game Investigations

Job No.: 1.8R Job Title: Snow Characteristics in Relation to Moose Distribution in Interior Alaska

Period Covered: July 1, 1973 through June 30, 1974

SUMMARY

Properties of the snow cover, temperature, wind velocity, moose tracks and moose observed during frequent aerial surveys have been monitored in the Chena and Chatanika River drainages since 1971. Data from three winters suggest that integrated resistance of the snow cover measured with a Rammsonde penetrometer and/or wind velocity, may be more important than snow depth *per se* in influencing altitudinal moose movements during some winters. Rammsonde measurements and wind velocity, as well as snow depth should be measured in other areas to further test relationships between these factors and moose movements and distribution. Results of a spring 1974 North Slope moose survey, as well as aerial moose surveys in Game Management Unit 20A from 1958 to the present are recorded.

CONTENTS

BACKGROUND

Moose (*Alces alces*) are Holarctic in distribution (Rausch 1963), occurring in several Eurasian countries, Canada, the conterminous United States, and Alaska. Four Eurasian races (Heptner et al. 1961) and four North American races (Hall and Kelson 1959) of moose are recognized. The Alaskan moose (*A. a. gigas*) is of pre-Wisconsin age, remains having been found in Illinoian beds in the "Cripple Creek sump" near Fairbanks (Péwé and Hopkins 1967).

Moose are expanding their range throughout North America (Kelsall 1972, Kelsall and Telfer 1973). In Alaska, moose are widespread within the boreal forest zone (Alaska Department of Fish and Game 1973), although many reports suggest they are more common beyond tree line in several areas than in previous years (Rausch 1951, Bee and Hall 1956, Lutz 1960, Pruitt 1966, Chesemore 1968, and LeResche et al. 1973). Northward dispersal of moose may be due in part to an increase in riparian climax vegetation resulting from gradual Holarctic warming trends during the last half century (Leopold and Darling 1953). This apparent expansion may also result from recent increased human activity in northern regions, thereby increasing opportunity for sighting animals (Kelsall 1972).

Moose play an important economic and cultural role in Alaska. Between 1963 and 1972 an average of 7,500 moose per year were reported killed by hunters. In 1971 alone, over 8,800 moose were reported killed, 1,070 of which were from the Fairbanks region (Game Management Unit 20). Thousands of recreationists photograph and observe moose each year. The extensive distribution, large numbers and relatively visible nature of the species has made moose a symbol of Alaskan wildlife.

Since statehood in 1959 the Alaska Department of Fish and Game has actively engaged in collecting information in Interior Alaska relating to moose biology. Major emphasis has been placed on extensive aerial surveys during fall to document changes in productivity, to assess the effect of hunting on bull-cow ratios, to determine survival of moose to 1.5 years of age, and to document changes in relative abundance and distribution of moose. Annual aerial surveys have been conducted in selected areas during spring to assess survival of moose to one year of age, and to monitor changes in relative abundance and distribution of

moose. Harvest statistics and basic life history information have also been collected. In spring 1966 a moose calf tagging program was initiated on the Tanana Flats south of Fairbanks to help determine distribution, movement and population identity of moose calving in the area. Between 1966 and 1969 over 800 moose calves were tagged and locations of tagged moose continue to be recorded as sightings are made.

Major contributions to moose studies in Interior Alaska have been made by Robert A. Rausch (Rausch 1967, 1971, Rausch and Bishop 1968) and Richard Bishop (Bishop 1969, 1970, Bishop and Rausch 1973). Together these individuals conducted and directed many early studies of moose in Interior Alaska. Their work has provided the background for and continues to provide guidance in developing current moose studies.

In February 1971, during a winter of record snowfall in Interior Alaska, a moose research program was initiated at Fairbanks to further identify and quantify major factors limiting moose populations. Basic emphasis of the program centers around effects of certain relationships between snow and range conditions on the production, survival and distribution of moose in Interior Alaska. Information obtained from this project will hopefully contribute to efficient management of moose in Interior Alaska, where growth of human populations and increased demands on wildlife and land resources are expected.

OBJECTIVES

The objectives of this study are to monitor distribution, survival and productivity of moose in relation to characteristics of the snow cover in Interior Alaska.

PROCEDURES

Moose-Snow Relationships

Snow characteristics and relative abundance of moose were monitored at one-to two-week intervals at a study area in the Chatanika and Chena River drainages, about 20 miles northeast of Fairbanks. Methods of measuring characteristics of the snow cover have been described previously (Coady 1973, 1974), and will not be discussed here. Wind velocity was measured with a counting cup anemometer. The anemometer records the miles of wind which flow past the instrument, and when miles of wind are divided by hours in the recording period, average wind velocity is obtained.

Relationships between altitudinal moose movements and snow conditions have been monitored since 1971. The seven day total (counted daily) of fresh moose tracks crossing a one-half mile long transect in the Chatanika River Valley was recorded between November and May during each winter. This valley is located at 245 m elevation, and represents typical winter riparian moose habitat. The number of moose counted during frequent intensive aerial surveys in a 17-year-old, 122 km^2 upland burn in the Little Chena drainage near the valley transect was also recorded. The upland site ranges from 300 to 670 m in elevation and characteristically supports large numbers of moose during fall and early winter.

Snow depth and relative abundance of moose were monitored between October 1973 and March 1974 in Snow Mountain Gulch in the foothills of the Alaska Range. The area is approximately 50 km^2 in size, and ranges in elevation between 600 and 1000 m. Vegetation consists of conifer stands at lower elevation and upland shrub and tundra communities in higher areas. Large numbers of moose use the area during and immediately following the rut in fall and early winter.

RESULTS

Moose-Snow Relationships

The response of moose to winter weather factors in the Chatanika-Chena drainage was monitored in 1972-73 (Fig. 1) and 1973-74 (Fig. 2). Moose observed in the upland burn declined between mid-November and late March during both winters. Fresh moose tracks in the valley were most common beginning in early January in 1973, and in late January in 1974. The delay between decline in moose in the upland burn and increase in tracks in the valley is apparently the result of dispersal of many animals from the burn into adjacent upland shrub and deciduous tree habitats before immigrating to lowland areas. This pattern of fall and winter movement was demonstrated by radio-collared moose in 1972-73 (Coady 1973).

Maximum-minimum temperature, average wind velocity, snow depth and integrated Rammsonde snow hardness (R_i) were also monitored in upland and lowland areas in 1972-73 (Fig. 1) and 1973-74 (Fig. 2). Snow depths were similar in upland and lowland areas during both winters. However, both average wind velocity and integrated Rammsonde snow hardness were greatest in the upland area during both winters. Wind probably increases the hardness of snow, and during both winters an increase in average wind velocity was associated with an increase in R_i. The appearance of moose tracks in the valley in 1972-73 was associated with a sharp increase in both average wind velocity and R_i in the upland burn during mid-December (Fig. 1). An abrupt decline in moose observed in the upland burn in early December 1973 occurred during a period of strong winds in the area, while the increase in lowland moose tracks in late January and early February occurred during an increase in R_i in the upland area (Fig. 2). Similarly, a sharp decline in moose observed in an upland area and the appearance of moose tracks in the Chatanika Valley in late December 1971 occurred during a period of rapidly increasing R_i in the upland site (Coady 1973).

Total number of moose observed during aerial surveys, number of radio-collared moose and snow depth in Snow Mountain Gulch were monitored between October 1973 and March 1974 (Fig. 3). Numbers of radio-collared and unmarked moose declined rapidly between October and December, while snow depth increased from approximately 25 to 55 cm during that period. Although increasing snow depth may have stimulated emigration from the area during November, other properties of the snow cover may have been important and should be investigated in the future.

While unusually deep snows may cause an abrupt migration of moose from high to low elevation (Coady 1973), the time and magnitude of fall

Fig. 1. Relationship between moose movement between and snow and weather conditions at high and low elevations near 40 mile Steese Highway during winter 1972-73.

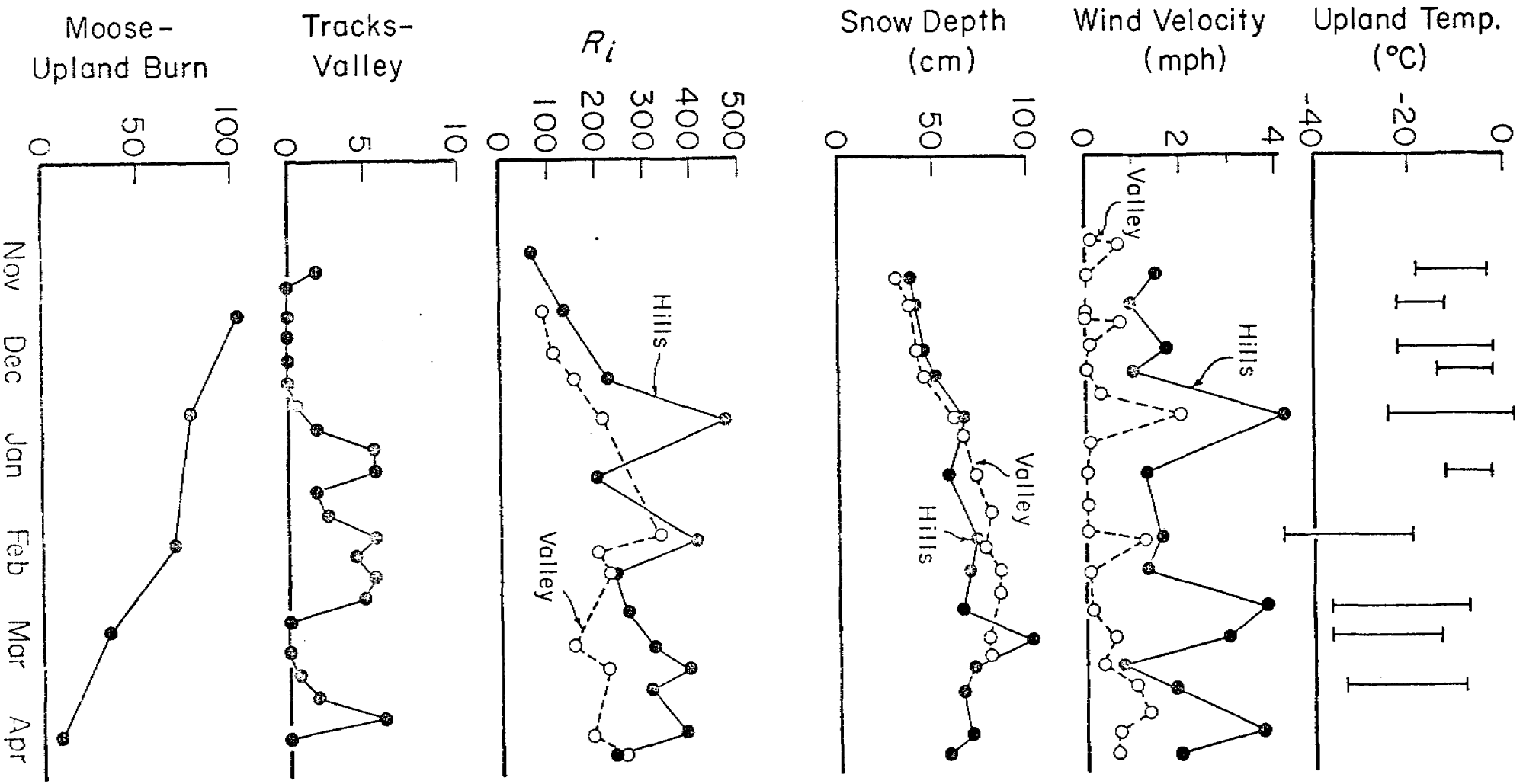


Fig. 2. Relationship between moose movement between and snow and weather conditions at high and low elevation near 40 Mile Steese Highway during winter 1973-74.

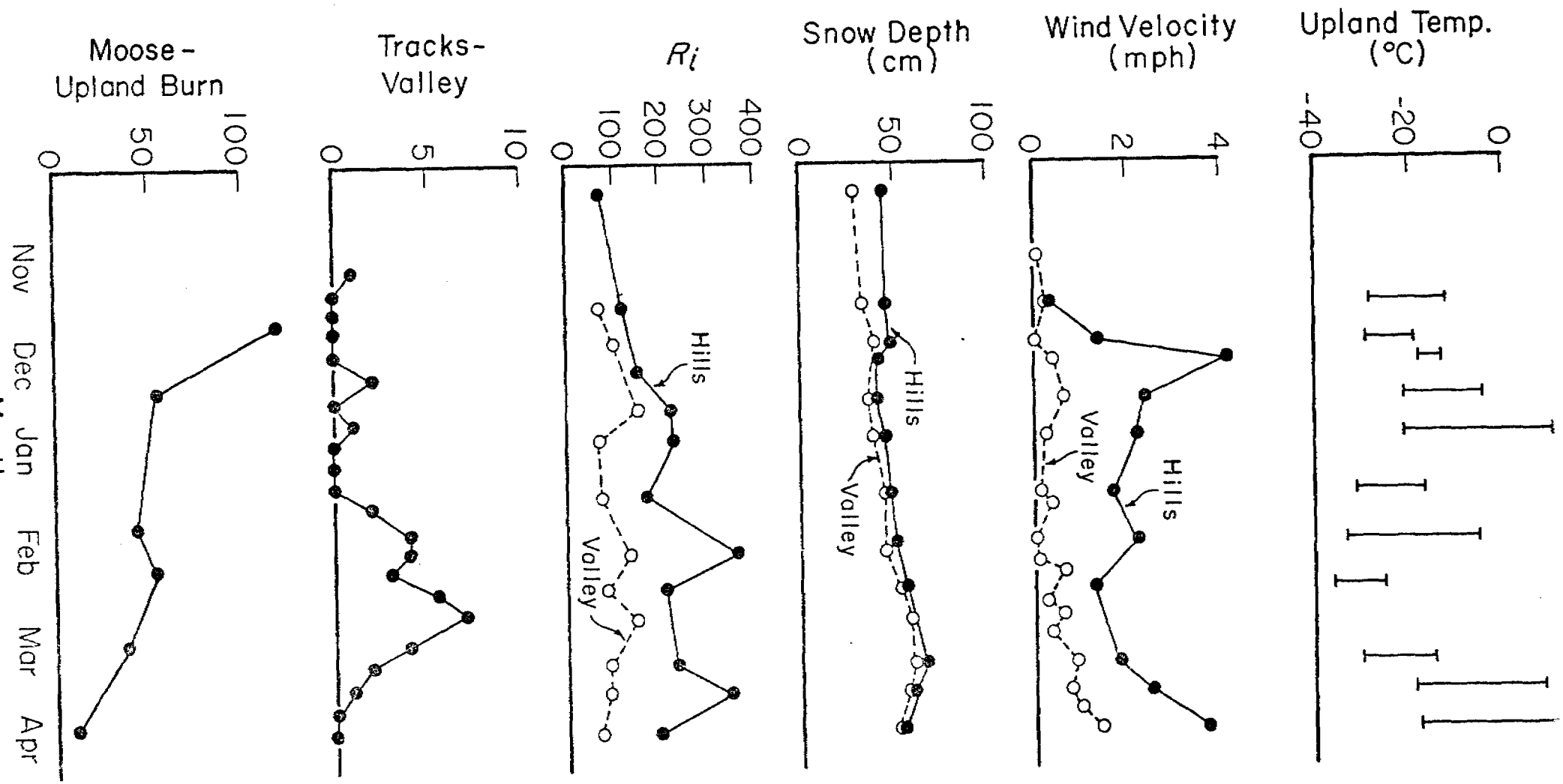
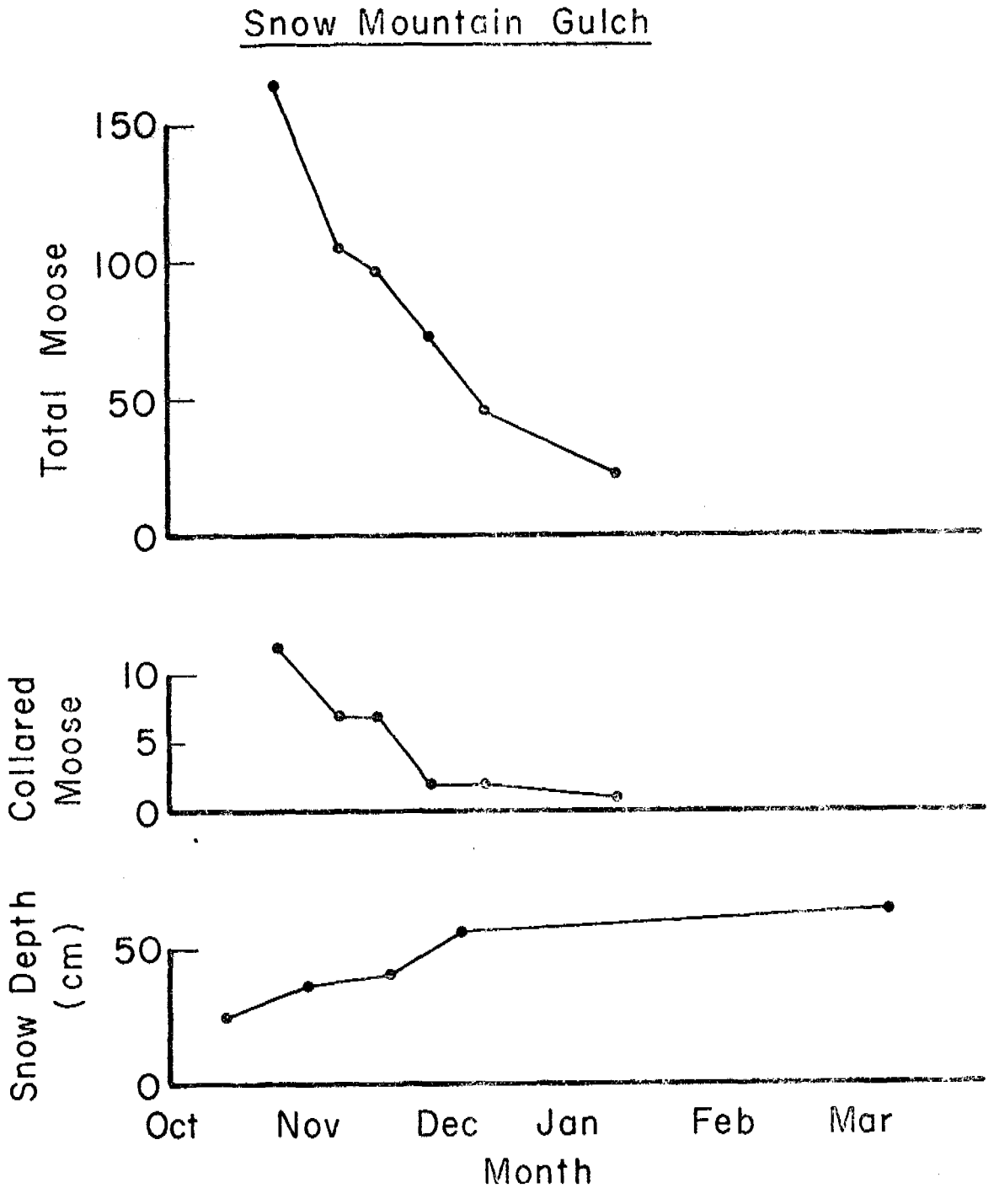


Fig. 3. Relationship between movement of marked and unmarked moose from and snow depth in Snow Mountain Gulch in the foothills of the Alaska Range during 1973-74.



and winter movements during years of moderate snow conditions may be influenced by factors other than snow depth *per se*. Average or below average snow depths occurred in the Chatanika-Chena Study Area during the winters of 1971-72, 1972-73, and 1973-74, and during each winter the timing and magnitude of the downward migration of moose in the area was most closely related to an increase in wind velocity and/or R_i.

Although analyses of additional Rammsonde and National Research Council of Canada (NRC) snow measurements are incomplete at this time, preliminary results suggest that snow depth may not be the most important factor influencing winter movements of moose under many conditions. Snow hardness indicated by Rammsonde penetrometer (and perhaps by NRC) measurements and wind velocity, as well as snow depth, are factors which should perhaps be considered when attempting to predict patterns of winter moose migrations.

Results of this study, conclusions and recommendations will be reported in a future publication.

Additional publications associated with this job include 1) a review paper: Influence of Snow on Behavior of Moose (Coady 1974) to be published in Le Naturaliste Canadien, Volume 101; and 2) a note: Late Pregnancy of a Moose in Alaska (Coady, in press) to be published in the Journal of Wildlife Management.

Moose Surveys

Between April 16 and 19, aerial moose surveys were conducted on several North Slope rivers. Riparian willow habitat was surveyed as thoroughly as possible using PA-18 aircraft, and locations of animals were plotted on USGS 1:250,000 maps. Count conditions were generally excellent.

Table 1 indicates numbers and age of moose and survey time on each river. Stephenson (ADF&G, Fairbanks) has summarized past moose surveys on the North Slope (memo dated September 20, 1973) and reported, for example, that total moose surveyed on the Chandler River in 1970, 1971, 1972, and 1973 was 180, 158, 144 and 61, respectively. Since these counts were made using C-185 aircraft, and the 1974 survey was conducted using a PA-18 aircraft, a greater proportion of the animals may have been seen in 1974 than in previous years. In any event, a decreasing trend in total animals observed on the Chandler River is apparent, in spite of modest calf production/survival. For comparison, Unit 20A spring moose surveys in 1972 and 1973 indicated 11.0 and 13.4 percent yearlings in the herd, respectively.

The approximate area of riparian moose habitat and density of moose observed along several North Slope rivers has been calculated by visually estimating the width and measuring the length of rivers on a map (Table 2). In addition to willows, however, the area includes small amounts of other vegetation types, sandbars and the river itself. Density of observed moose along the larger rivers (Colville, Anaktuvuk, and Chandalar

Table 1. North Slope moose survey April 16-19, 1974.

Location	Adults	Calves	Total	% Calves in Herd	Count Time (Hrs.)
Anaktuvuk River	93	16	109	14	2.9
Chandler River	100	21	121	17	3.5
Ayiyak River	6	2	8	-	0.9
Tuluga River	7	1	8	-	0.8
Colville River (Killik R.-Anaktuvuk R.)	247	42	289	14	8.1
Total	453	82	535	-	16.2

Table 2. Area of riparian habitat and density of moose observed along North Slope rivers, April 16-19, 1974.

Location	Length Surveyed (km)	Average Width (km)	Area (km^2)	No. of Animals	Density
Anaktuvuk River	96	1.5	144	109	0.8
Chandler River	102	1.5	153	121	0.8
Ayiyak River	51	0.5	25	8	0.3
Tuluga River	38	0.5	19	8	0.4
Colville River (Killik R.-Anaktuvuk R.)	122	3.0	366	289	0.8

Rivers) was 0.8 moose/km^2, while that along smaller rivers (Tuluga and Ayiyak Rivers) was considerably less.

Additional results and conclusions will be reported in a future publication.

Appendices 1 through 53 record both spring and fall aerial moose surveys in GMU 20A from 1958 to the present.

ACKNOWLEDGMENTS

Mike Vierthaler conducted NRC and Rammsonde snow measurements, and H. Don Draper made meticulous moose track counts and weather observations throughout the winter along the Steese Highway. Tony Smith and Spencer Linderman conducted replicate aerial moose surveys in the Alaska Range and in the Chena River drainage, respectively. Dale Haggstrom assisted in data analysis. Moose-snow relationships reported here are due largely to contributions by the above individuals. Robert LeResche, Robert Stephenson and Richard Shiedeler cooperated in conducting aerial moose surveys on the North Slope. Moose survey and inventory data reported for Interior Alaska were collected by numerous biologists, and the author accepts no credit for obtaining this information.

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Appendix 1. Summary of moose survival and production surveys, June 1962.

Date	Total Males	Total Females	F/0 Calf	F/1 Calf	F/2 Calf	F/? Calf	Yearlings (12 months old)	Single Newborn Calves	Twin Newborn Calves	Total Parturi-tions	Total Moose	Flying Time	Moose per hr.
6/8	252	174	117	44	1	12	28	44	2	45	500	4 hr. 24 min.	113.6
6/9	113	103	48	47	3	5	27	47	6	50	296	4 hr. 40 min.	63.5
6/11	172	182	72	90	7	13	48	90	14	97	506	4 hr.	126.5
6/12	208	213	75	96	15	27	54	96	30	111	601	4 hr. 20 min.	138.7
6/11 & 6/12	380	395	147	186	22	40	102	186	44	208	1107	8 hr. 20 min.	132.8

Appendix 2.Parturition counts, Tanana Flats, 1966.

Area	Date	Newborn F/0	Newborn F/1	Newborn F/2	Newborn F/?	Yearlings w/oF	Yearlings F/1	Yearlings F/2	Totals F	Totals Yrlgs.	Totals Calves	Totals M	Totals Moose	M/100F	Births/ 100F	Yrlg/ 100F	Aircraft*
I	5/17 & 5/20	206	2	0	0	3	17	2	227	24	2	116	369	51	0.9	10.6	S
	5/21	190	12	0	0	4	18	1	221	24	12	143	400	75	5.4	11.0	H
	5/25	213	28	3	0	3	10	0	254	13	34	137	438	54	12.2	5.0	S
	5/29	182	41	5	1	5	14	0	243	19	51	234	547	96	18.9	7.8	S
	Calf Tagging Operations																
	6/6	118	74	4	1	2	6	1	204	10	82	166	462	81	38.0	4.9	S
	6/10	59	41	3	0	2	4	0	107	6	47	126	286	118	41.1	5.6	S
	6/14	138	49	4	0	5	11	1	203	17	57	219	496	108	26.1	8.4	H
	6/21	96	44	3	6	4	13	0	162	17	49	178	406	148	29.0	8.9	H
TOTALS		1202	291	22	8	28	93	5	1621	130	334	1319	3404	81		8.0	
II	5/18 & 5/19	202	0	0	0	1	9	0	211	10	0	66	287	1	0.0	4.7	S
	5/27	79	22	2	0	2	2	0	115	4	26	86	231	75	22.6	3.5	S
III	5/19 & 5/20	120	0	0	0	4	5	0	125	9	0	26	160	21	0.0	7.2	S
	6/8 Count #1	34	4	2	0	0	2	1	43	3	8	52	106	121	18.8	7.0	S
	6/8	20	7	0	0	2	0	0	27	2	7	36	72	133	25.3	9.3	S

* S=Super Cub

H=Helicopter

Appendix 3. Lincoln Index estimates of calf production on the Tanana Flats, 1966.

Area	Survey Number	Date	Calves Counted	Tagged Calves Counted	Percent Tagged Counted	Calves/ 100 Cows	Total Moose	Estimated Total Calves
I	1	June 6	78	19	24	38.1	459	558
	2	June 10	47	7	15	43.9	286	913
	3	June 14	54	14	26	26.1	493	525
	4	June 21	49	11	22	30.2	406	606
III	1	June 8	8	0	0	18.8	106	-
	2	June 8	7	1	14.3	25.3	72	420

Appendix 4. Summary of moose parturition counts, Tanana Flats, 1967.

Area	Date	Newborn Calves				Yearlings				Total Calves	Total Yrlings	Total Cows	Calves/ 100 F	Yrlgs/ 100 F	Males	Total Moose	Moose/ Hour
		F/0	F/1	F/2	F/?	w/oF	F/1	F/2	Tagged								
I	5/31-6/1	117	43	6	8	2	21	0	6	55	23	195	28.2	11.8	147	420	75
II	6/4	49	33	1	5	0	7	0	1	35	7	95	36.8	7.4	129	266	78
III	6/2	18	13	0	5	1	3	0	0	13	4	39	33.4	10.3	76	132	34
Salchaket-Tanana	6/1	7	6	1	0	4	0	0	0	8	4	18	44.4	22.2	1	30	20
Totals		191	95	8	18	7	31	0	7	111	38	347	32.0	11.0	353	848	59
Proposed Fairbanks Wildlife Center																	
	5/31	11	1	0	0	0	2	0	0	1	2	14	7.1	14.2	2	19	24

Appendix 5. Summary of moose parturition counts, Tanana Flats, post-tagging, 1968.

Area	Date	Newborn Calves F/0	F/1	F/2	F/?	Yearlings w/oF	F/1	F/2	Tagged	Total Calves	Total Yrlgs	Total Cows	Calves: 100 F	Yrlgs: 100 F	Males	Total Moose	Moose/ Hour
I	6/4-6/5	79	67	8	23	5	18	1	0	83	20	201	41.2	9.9	267	571	88
										45 tagged calves							
II	6/13	31	22	1	0	0	3	0	0	24	3	57	42.7	5.2	70	154	42
										7 tagged calves							
III	6/12	18	14	6	8	1	24	0	0	26	24	71	36.6	33.8	73	194	68
										7 tagged calves							
Tanana-Salchaket	6/4	2	13	1	5	1	1	0	0	15	1	23	65.2	4.3	2	41	20
										5 tagged calves							
E. of area I, S. of Salchaket	6/4	2	7	1	0	0	2	0	0	9	2	12	75.0	16.7	1	24	26
										1 tagged calf							
Totals		132	123	17	36	7	48	1	0	157	50	364	43.4	11.0	413	984	
										65 tagged calves, total							

Appendix 6.Summary of moose parturition counts, Tanana Flats, 1969.

Area	Date	Newborn Calves F/0	F/1	F/2	F/?	Yearlings w/oF	F/1	F/2	Tagged	Total Calves	Total Yrlgs	Total Cows	Calves/ 100 F	Yrlgs/ 100 F	Males	Total Moose	Moose/ Hour
I	5/23	62	8	1	3	4	30	1	11 1 adult M tagged	10	36	105	9.5	34.3	141	292	79
II	5/25	16	7	0	2	1	3	0	0	7	4	28	25.0	14.5	44	83	55
III	5/24	20	6	4	2	0	4	0	0	14	4	34	41.1	11.8	20	72	29
Total		98	21	5	7	5	37	1	11	31	44	167	-	26.3	205	447	-

Appendix 7. Summary of moose parturition counts, Tanana Flats, 1970.*

Area	Date	Newborn Calves F/0	F/1	F/2	F/?	Yearlings w/oF	F/1	F/2	Tagged	Total Calves	Total Yrlgs	Total Cows	Calves/ 100 F	Yrlgs/ 100 F	Males	Total Moose	Moose/ Hour
I	5/19	60	9	0	0	10	28	1	10	9	40	98	9.2	40.8	55	202	61
II	5/21	44	17	4	3	7	16	1	4	25	25	85	29.4	29.4	38	173	58
III	5/20	43	11	1	0	10	11	0	1	13	21	66	19.7	31.8	41	141	61
IV	5/21	4	0	0	0	0	1	0	0	0	1	5	0.0	20.0	0	5	9
Total		151	37	5	3	27	56	2	15	47	87	254	18.5	34.3	134	521	57

% yearlings of total minus calves = $\frac{87}{521-47}$ = 18.4

* Observer - M. Buchholtz, Pilot - T. Classen

Appendix 8. Summary of moose parturition counts, Tanana Flats, 1971.

Area	Date	Newborn Calves F/0	F/1	F/2	F/?	Yearlings w/oF	F/1	F/2	Tagged	Total Calves	Total Yrlgs	Total Cows	Calves/ 100 F	Yrlgs/ 100 F	Males	Total Moose	Moose/ Hour
I	5/17-5/18	105	-	-	-	2	3	-	2	-	5	108	-	4.6	13	126	31
		5 red right ear adults observed in Area I															
II	5/24	138	15	3	-	5	5	-	-	21	10	161	13.0	6.2	49	241	80
		1 yellow left ear adult observed in Area II															
III	5/19-5/20	98	3	-	-	1	5	-	-	3	6	106	2.8	5.6	17	132	33
		2 yellow right ear adults, 1 dead left ear orange adult observed in Area III															
Total		341	18	3	-	8	13	-	2	24	21	375	6.4	5.6	79	499	45

% yearlings of total minus calves = $\frac{21}{499-24}$ = 4.4

Appendix 9. Summary of moose parturition counts, Tanana Flats, 1972.

Area	Date	Newborn Calves F/0	F/1	F/2	F/?	Yearlings w/oF	F/1	F/2	Tagged	Total Calves	Total Yrlgs	Total Cows	Calves/ 100 F	Yrlgs/ 100 F	Males	Total Moose	Moose/ Hour
I	5/24-5/25	162	9	1	-	9	22	-	3*	11	31	194	5.7	11.3	50	286	73
II	5/25	91	3	-	-	3	15	1	-	3	20	110	2.7	18.2	54	187	75
III	5/24	62	5	2	-	3	11	-	1*	9	14	80	11.2	17.5	35	138	40
Total		315	17	3	-	15	48	1	4*	23	65	384	6.0	16.9	139	611	62

% yearlings of total minus calves = $\frac{65}{611-23}$ = 11

* Adult females

Appendix 10. Summary of moose parturition counts, Tanana Flats, 1973.

Area	Date	Newborn Calves				Yearlings				Total Calves	Total Yrlgs	Total Cows	Calves/ 100 F	Yrlgs/ 100 F	Males	Total Moose	Moose/ Hour
		F/0	F/1	F/2	F/?	w/oF	F/1	F/2	Tagged								
I	5/16-5/17	229	2	-	-	-	73	1	6*	2	75	305	0.7	24.5	104	486	93
II	5/18	149	1	-	-	2	18	-	-	1	20	168	0.6	11.9	48	237	68
III	5/17	81	1	-	-	1	22	1	-	1	25	105	1.0	23.3	31	162	51
IV	5/18	16	-	-	-	-	1	-	-	-	1	17	-	5.3	7	25	28
Total		475	4	-	-	3	114	2	6	4	121	595	0.7	20.3	190	910	71

% yearlings of total minus calves = $\frac{121}{910-4} = 13.4$

* 6 Adults (4F, 2M)

Appendix 11. Summary of moose parturition counts, Tanana Flats, 1974.

Area	Date	Newborn Calves F/0	F/1	F/2	F/?	Yearlings w/oF	F/1	F/2	Tagged	Total Calves	Total Yrlgs	Total Cows	Calves/ 100 F	Yrlgs/ 100 F	Males	Total Moose	Moose/ Hour
I	5/16-5/17	192	7	-	-	3	29	-	4	7	32	228	3.1	14.0	115	382	52
II	5/17	106	-	-	-	-	8	-	-	-	8	114	-	7.0	14	136	47
III	5/16	42	-	1	-	2	6	-	-	2	8	49	4.1	16.3	9	68	25
Total		340	7	1	-	5	43	-	4	9	48	391	2.3	12.3	138	586	45

% yearling of total (minus calves) = $\frac{48}{586-9}$ = 8.3%

Appendix 12. Total number and age ratio of moose observed on the Tanana Flats during spring aerial surveys.

Year	Area	Total	Percent Yearlings in Herd	Calves/ 100 Cows	Count Time (Hrs.)
1974	1,2,3	586	8.2	12.3	13.0
1973	1,2,3,4	910	13.3	20.3	12.8
1972	1,2,3	611	10.6	16.9	9.8
1971	1,2,3	499	4.2	5.6	11.1
1970	1,2,3,4	521	16.7	18.5	9.1
1969	1,2,3	596	11.4	35.9	7.5
1968	1,2,3,4	984	5.1	43.4	16.0
1967	1,2,3,4	848	4.5	32.0	14.4

Appendix 13. Summary of moose population composition counts, Tanana Valley, October 27, 1958 - December 6, 1958.

Area	Male			Female				Total Calves	Total Ident. Moose	Total Unident. Moose	Total Moose	Time Obser.	Moose Seen Per Hour
	Young	Adult	Total	W/0	W/1	W/2	Total						
Tanana Valley													
Chena R., Chatanika R., Shaw Cr., Salcha R., Goodpaster R.	16	45	61	67	44	3	114	50	225	8	233	9.0	26
Tanana River (Salchaket)	21	31	52	61	32	5	98	42	192	2	194	2.8	69
Totals	37	76	113	128	76	8	212	92	417	10	427	11.8	36

Appendix 14. Sex and age ratios in moose populations, Tanana Valley, 1959.

Area	Bulls/ 100 Cows	Young Bulls/ 100 Adult Bulls	Calves/ 100 Cows	Sets of Twin Calves/ 100 Cows w/calves	Calf % of Total Herd	Young Bulls % of Total Herd	Young Bulls/ 100 Bull Calves	Young Bulls/ 100 Cows	Total Identifiable Moose
Tanana									
Chena R., Chatanika R., Goodpaster R., Salcha R., Shaw Cr.	38	36	68	15	33	5	29	10	82
Salchaket Slough area	70	28	49	26	22	7	60	15	179
Total	60	29	55	22	26	6	47	13	261

Appendix 15. Comparison of sex and age ratios in moose populations in interior Alaska.

Area	Year	Bulls/ 100 Cows	Young Bulls/ 100 Adult Bulls	Calves/ 100 Cows	Sets of Twin Calves/ 100 Cows w/calves	Calf % of Total Herd	Young Bulls % of Total Herd	Young Bulls/ 100 Bull Calves	Young Bulls/ 100 Cows	Total Moose in Sample
Tanana Valley	1959	60	29	55	22	26	6	47	13	261
	1958	53	49	43	9	22	9	80	17	419
	1957	60	32	42	2	20	7	69	15	236
	1956	83	25	47	5	20	7	71	16	405

Appendix 16. Sex and age ratios, Tanana Valley, 1960.

Area	Bulls/ 100 Cows	Young Bulls/ 100 Adult Bulls	Calves/ 100 Cows	Sets of Twin Calves/ 100 Cows w/calves	Calf % of Total Herd	Young Bulls % of Total Herd	Young Bulls/ 100 Cows	Total Moose in Sample
Tanana								
1	55	6	30	8	16	2	3	187
1	67	4	44	3	24	8	18	148
2	80	60	60	0	20	10	19	60
3	68	33	47	0	22	8	17	177
4	68	19	31	0	16	6	11	108
5	65	43	50	3	23	9	20	145
6	140	64	36	5	13	20	54	153
7	77	47	60	23	26	10	25	88
8	80	33	50	6	21	9	20	170
9	127	50	59	10	20	15	43	114
Total	77	36	43	5	20	9	20	1350

Appendix 17. Comparison of sex and age ratios in moose populations in interior Alaska during the last five years.

Area	Year	Bulls/ 100 Cows	Young Bulls/ 100 Adult Bulls	Calves/ 100 Cows	Sets of Twin Calves/ 100 Cows w/calves	Calf % of Total Herd	Young Bulls % of Total Herd	Young Bulls/ 100 Cows	Total Identifiable Moose
Tanana									
	1960	77	36	43	5	20	9	20	1328
	1959	60	29	55	22	26	6	13	261
	1958	53	49	43	9	22	9	17	419
	1957	60	32	42	2	20	7	15	236
	1956	83	25	47	5	20	7	16	405

Appendix 18. Moose composition counts, Tanana Valley, interior Alaska, Fall 1972.

Area	Date	Cows W/0 Calves	Cows W/1 Calf	Cows W/2 Calves	Lone Calves	Young Bulls	Adult Bulls	Uniden-tified	Total Moose
1	11/29	38	33	5	2	6	37	11	175
2	12/12	62	20	0	2	11	31	5	151
3	12/17	38	6	0	0	1	9	0	60
4	12/6	46	48	0	3	2	16	0	163
5	11/30	22	29	4	3	2	13	1	111
6	12/17	65	16	0	3	5	29	0	134
7	11/27	27	25	0	1	10	40	4	132
8	Omitted from 1962 counts								
9	11/27	43	20	4	5	7	29	4	140
Total		341	197	13	19	44	204	25	1066

Appendix 19. Summary of moose population composition counts, Tanana Flats, October 1963.

Area	Adult Males	Young Males	Total Males	F/0	F/1	F/2	Total Females	Total Calves	Unident. Sex and Age	Total Moose	Moose Per Hour
1	55	15	70	77	24	2	103	30	0	203	221
2	25	6	31	27	15	0	42	15	0	88	66
3	35	15	50	45	37	2	84	42	0	176	160
4	50	7	57	37	25	2	64	29	0	150	80
5	40	19	59	35	37	4	76	47	0	182	68
6	26	1	27	19	31	1	51	34	2	114	104
7	29	2	31	39	9	1	49	12	0	92	61
8	35	3	38	24	14	0	38	16	0	92	46
9	31	4	35	39	33	2	74	38	0	147	47
Total	326	72	398	342	225	14	581	263	2	1244	81

Appendix 20. Moose sex and age ratios, Tanana Flats, October 1963.

Area	Yearling Bulls/ 100 Adult Bulls	Bulls/ 100 Cows	Calves/ 100 Cows	Twin Calves/ 100 Cows w/Calf	Percent Calves in Herd	Percent Yearling Bulls in Herd	Yearling Bulls/ 100 Bull Calves	Yearling Bulls/ 100 Cows	Total Moose
1	27	68	29	8	14.8	8.7	100	15	203
2	24	73	36	0	17.0	8.2	80	14	88
3	42	59	50	5	23.9	11.2	58	18	176
4	14	89	45	7	19.3	5.8	50	11	150
5	47	77	62	10	25.8	14.1	81	25	182
6	3	52	67	3	30.4	1.3	6	2	114
7	6	63	24	10	13.0	2.5	33	4	92
8	8	100	42	0	17.4	3.9	38	8	92
9	12	47	51	6	25.8	3.7	21	5	147
Total	22	68	45	6	21.1	7.4	55	12	1244

Appendix 21. Moose population composition counts, Tanana Flats, interior Alaska, 1965.

Area	Flying Time (hrs.)	Young Bulls	Adult Bulls	Total Bulls	Cows W/1	Cows W/2	Cows W/0	Total Cows	Unid. Adults	Total Adults	Calves	Total Moose	Calf % in Herd	Moose Per Hour
2	7.7	15	73	88	35	0	126	161	0	249	36	285	13	37
3	1.9	3	13	16	18	0	34	52	0	68	18	86	21	45
4	2.0	3	15	18	3	0	33	36	1	54	3	57	5	29
5	2.8	7	19	26	29	0	40	69	0	95	29	124	23	44
6	2.9	6	30	36	14	0	46	60	0	96	14	110	13	38
7	1.8	3	4	7	2	0	37	39	0	46	4	50	8	28
8	2.3	3	17	20	14	0	46	60	1	81	14	95	15	41
9	3.3	6	19	25	34	1	83	118	0	143	39	182	22	55
Total	24.7	46	190	236	149	1	445	595	1	832	157	989	16	40

Appendix 22. Moose sex and age composition ratios, Upper Wood River, 1965.

Area	Yearling Bulls/ 100 Adult Bulls	Bulls/ 100 Cows	Calves/ 100 Cows	Twin Calves/ 100 Cows w/Calf	Percent Calves in Herd	Percent Yearling Bulls in Herd	Yearling Bulls/ 100 Bull Calves	Yearling Bulls 100 Cows	Moose per Hour	Total Moose
I										
Foothills Japan Hills	8	32	22	0	14	1	20	2	67	350
Upper Wood River	12	68	23	6	12	4	65	7	169	389
Total	11	49	22	3	13	3	41	5	98	739

Appendix 23. Moose population composition counts, Upper Wood River, 1965.

Area	Flying Time (hrs.)	Young Bulls	Adult Bulls	Total Bulls	Cows W/1	Cows W/2	Cows W/0	Total Cows	Unid. Adults	Total Adults	Calves	Total Moose	Calf % in Herd	Moose Per Hour
I														
Foothills Japan Hills	5.2	5	66	71	50	0	173	223	6	300	50	350	14	67
Upper Wood River	2.3	15	124	139	40	3	161	204	0	343	46	389	12	169
Total	7.5	20	190	210	90	3	334	427	6	643	96	739	13	98

Appendix 24. Summary of moose population composition counts, Tanana Flats, 1966.

Area	Date	Large Bulls	Small Bulls	Total Bulls	Cows W/0	Cows W/1	Cows W/2	Total Cows	Unid.	Total Adults	Lone Calves	Total Calves	Total Moose	Count Time (hrs.)	Moose/ Hour
2	10/22	40	1	41	47	15	0	62	0	103	1	16	119	3.8	31
3	10/22	4	1	5	37	19	0	56	0	61	2	21	82	1.4	59
4	10/23	53	2	55	92	19	0	111	0	166	0	19	185	3.5	53
5	10/18	12	0	12	18	20	1	39	0	51	1	23	74	2.9	26
6	10/23	22	4	26	37	4	0	41	0	67	0	4	71	1.7	42
7	10/23	21	0	21	51	10	0	61	0	82	0	10	92	1.8	51
8	10/21	27	2	29	26	12	0	38	0	67	0	12	79	2.3	34
9	10/21	27	7	34	59	18	0	77	0	111	1	19	130	2.6	50
Total		206	17	223	367	117	1	485	0	708	5	124	832	20.0	42

Appendix 25. Moose sex and age composition ratios, Tanana Flats, 1966.

Area	Yearling Bulls/ 100 Adult Bulls	Bulls/ 100 Cows	Calves/ 100 Cows	Twin Calves/ 100 Cows w/Calf	Percent Calves in Herd	Percent Yearling Bulls in Herd	Yearling Bulls/ 100 Bull Calves	Yearling Bulls/ 100 Cows	Moose per Hour	Total Moose
2	2.5	66.1	25.8	0.0	13.4	0.8	12.5	1.6	31	119
3	25.0	8.9	37.5	0.0	25.6	1.2	9.2	1.8	59	82
4	3.8	49.5	17.1	0.0	10.3	1.1	21.1	1.8	53	185
5	0.0	30.8	59.0	5.0	31.1	0.0	0.0	0.0	26	74
6	18.2	63.4	9.8	0.0	5.6	5.6	200.0	9.8	42	71
7	0.0	0.0	16.4	0.0	10.9	0.0	0.0	0.0	51	92
8	7.4	76.3	31.6	0.0	15.2	2.5	33.3	5.3	34	79
9	25.9	44.2	24.7	0.0	14.6	5.4	73.7	9.1	50	130
Total	8.3	46.0	25.6	0.8	14.9	2.0	27.4	3.5	42	832

Appendix 26. Summary of moose population composition counts, Alaska Range, 1966.

Area	Date	Large Bulls	Small Bulls	Total Bulls	Cows W/0	Cows W/1	Cows W/2	Total Cows	Unid.	Total Adults	Lone Calves	Total Calves	Total Moose	Count Time (hrs.)	Moose/ Hour
I	10/24-10/25	318	11	329	445	86	0	531	2	862	0	86	948	5.3	179
Upper Wood River	10/24	102	5	107	179	41	1	221	1	328	0	43	372	3.6	103
Rex Dome-Tatlanika Cr.	10/27	80	3	83	110	18	0	128	4	211	0	18	229	1.8	92
Ferry-Healy-Yanert	10/28	127	3	130	369	36	5	410	4	536	0	46	590	4.3	137
Total (Alaska Range East of Nenana R.)		627	22	649	1103	181	6	1290	11	1937	0	193	2139	15.0	143
Lignite-Savage	10/28	13	0	13	15	11	0	26	0	39	0	11	50	1.3	38

Appendix 27. Moose sex and age composition ratios, Alaska Range, 1966.

Area	Yearling Bulls/ 100 Adult Bulls	Bulls/ 100 Cows	Calves/ 100 Cows	Twin Calves/ 100 Cows w/Calf	Percent Calves in Herd	Percent Yearling Bulls in Herd	Yearling Bulls/ 100 Bull Calves	Yearling Bulls 100 Cows	Moose per Hour	Total Moose
I	3.5	62.0	16.2	0.0	9.1	1.2	25.6	2.1	179	948
Upper Wood River	4.9	48.4	19.5	2.4	11.6	1.3	23.3	2.3	103	372
Rex Dome-Tatlanika Cr.	3.8	64.8	14.1	0.0	7.9	1.3	33.3	2.3	92	229
Ferry-Healy-Yanert	2.4	31.7	11.2	12.2	7.8	0.5	13.0	0.7	137	590
Total (Alaska Range East of Nenana River)	3.5	50.3	15.0	3.2	9.0	1.0	22.7	1.7	143	2139
Lignite-Savage (Oct. 28)	0.0	50.0	42.3	0.0	22.0	0.0	0.0	0.0	38	50

Appendix 28. Moose sex and age ratios, Tanana Flats, 1960-1966.

Area	Date	Bulls/ 100 Cows	Yearling Bulls/ 100 Cows	Yearling Bulls/ 100 Adult Bulls	Percent Yearling Bulls	Yearling Bulls/ 100 Bull Calves	Calves/ 100 Cows	Twin Calves/ 100 Cows w/Calf	Percent Calves	Moose/Hour	Total Moose
2	11/60	50.0	19.0	60.0	10.0	100.0	25.0	0.0	20.0	-	60
2	12/62	51.0	13.0	35.0	7.8	100.0	27.0	0.0	14.6	-	151
2	10/63	73.0	14.0	24.0	8.2	80.0	36.0	0.0	17.0	66	88
2	11/65	54.0	9.0	20.0	5.0	83.0	22.0	0.0	13.0	37	285
2	10/66	66.0	2.0	3.0	0.8	13.0	26.0	0.0	13.4	31	119
3	11/60	68.0	17.0	33.0	17.9	72.0	48.0	0.0	22.0	-	177
3	12/62	33.0	2.0	11.0	1.7	33.0	14.0	0.0	10.0	-	60
3	10/63	60.0	18.0	43.0	8.5	71.0	50.0	5.0	23.9	160	176
3	11/65	31.0	6.0	23.0	3.0	33.0	35.0	0.0	21.0	45	86
3	10/66	9.0	2.0	25.0	1.2	10.0	38.0	0.0	25.6	59	82
4	11/60	69.0	11.0	19.0	5.6	71.0	31.0	0.0	15.7	-	108
4	12/62	19.0	2.0	13.0	1.2	8.0	54.0	0.0	31.3	-	163
4	10/63	89.0	11.0	14.0	4.7	48.0	45.0	7.0	19.3	80	150
4	11/65	50.0	8.0	20.0	5.0	200.0	8.0	0.0	5.0	29	57
4	10/66	50.0	2.0	4.0	1.1	21.0	17.0	0.0	10.3	53	185
5	11/60	65.0	20.0	43.0	9.0	79.0	50.0	3.0	22.8	-	145
5	11/62	27.0	4.0	15.0	1.8	10.0	72.0	12.0	36.0	-	111
5	10/63	78.0	25.0	48.0	10.4	81.0	62.0	10.0	25.8	68	182
5	11/65	38.0	10.0	37.0	6.0	46.0	42.0	0.0	23.0	44	124
5	10/66	31.0	0.0	0.0	0.0	0.0	59.0	5.0	31.1	26	74

Appendix 28. Continued.

Area	Date	Bulls/ 100 Cows	Yearling Bulls/ 100 Cows	Yearling Bulls/ 100 Adult Bulls	Percent Yearling Bulls	Yearling Bulls/ 100 Bull Calves	Calves/ 100 Cows	Twin Calves/ 100 Cows w/Calf	Percent Calves	Moose/Hour	Total Moose
6	11/60	140.0	55.0	64.0	49.6	300.0	36.0	6.0	13.1	-	153
6	12/62	42.0	6.0	17.0	3.7	53.0	23.0	0.0	14.2	-	134
6	10/63	53.0	2.0	4.0	0.8	6.0	67.0	3.0	29.8	114	104
6	11/65	60.0	10.0	20.0	5.0	86.0	23.0	0.0	13.0	38	110
6	10/66	63.0	10.0	18.0	5.6	50.0	10.0	0.0	5.6	42	71
7	11/60	78.0	25.0	47.0	10.2	78.0	64.0	24.0	26.1	-	88
7	11/62	96.0	19.0	25.0	7.6	77.0	50.0	0.0	19.7	-	132
7	10/63	63.0	4.0	7.0	2.2	33.0	24.0	10.0	13.0	61	92
7	11/65	18.0	8.0	75.0	6.0	150.0	10.0	0.0	8.0	28	50
7	10/66	34.0	0.0	0.0	0.0	0.0	16.0	0.0	10.9	51	92
8	11/60	80.0	20.0	33.0	8.2	80.0	50.0	6.0	20.6	-	170
8	1962	Not Surveyed									
8	10/63	100.0	8.0	9.0	3.3	38.0	42.0	0.0	17.4	46	92
8	11/65	33.0	5.0	18.0	3.0	43.0	23.0	0.0	15.0	41	95
8	10/66	76.0	5.0	7.0	2.5	33.0	32.0	0.0	15.2	34	79
9	11/60	127.0	43.0	52.0	14.0	145.0	59.0	10.0	19.3	-	114
9	11/62	54.0	7.0	24.0	5.0	42.0	49.0	16.7	23.5	-	140
9	10/63	47.0	5.0	13.0	2.7	21.0	51.0	6.0	25.8	47	147
9	11/65	21.0	5.0	32.0	3.0	30.0	33.0	2.8	22.0	55	182
9	10/66	44.0	9.0	26.0	5.4	74.0	25.0	0.0	14.6	50	130

Appendix 29. Moose sex and age ratio, Tanana Flats, 1956-1966.

Area	Date	Bulls/ 100 Cows	Yearling Bulls/ 100 Cows	Yearling Bulls/ 100 Adult Bulls	Percent Yearling Bulls	Yearling Bulls/ 100 Bull Calves	Calves/ 100 Cows	Twin Calves/ 100 Cows w/Calf	Percent Calves	Moose/Hour	Total Moose
Tanana Flats*	10-11 1956	84.2	15.8	23.1	6.8	65.2	48.4	0.0	20.8	-	221
Total Tanana Flats* and Wood River	1956	89.8	14.5	19.3	6.3	73.0	39.8	0.0	17.3	-	427
Tanana River* Salchaket S.	10-12 1957	43.9	7.3	20.0	4.1	40.0	36.6	0.0	20.3	37	74
Tanana River* Salchaket S.	10-12 1958	53.1	21.4	67.7	10.8	100.0	42.9	13.5	21.6	69	194
Tanana River* Salchaket S.	11/59	69.5	14.6	26.7	6.7	60.0	48.8	25.8	22.2	-	180
Total, 2-9	1960	83.0	25.0	43.0	10.6	107.0	47.0	5.0	19.8	-	1015
Total, 2-9	1962	43.0	8.0	23.0	4.3	39.0	22.0	4.7	22.1	-	891
Total, 2-9	1963	69.0	12.0	21.0	5.5	49.0	49.0	6.0	22.4	72	1041
Total, 2-9	1965	40.0	8.0	24.0	5.0	58.0	26.0	0.7	16.0	40	989
Total, 2-9	1966	42.0	4.0	8.0	2.0	27.0	26.0	0.8	14.9	42	832

* Area counted in 1956-59 is only part of area counted from 1960-66.

Appendix 30. Moose sex and age ratios, Alaska Range, 1956-1966.

Area		Date	Bulls/ 100 Cows	Yearling Bulls/ 100 Cows	Yearling Bulls/ 100 Adult Bulls	Percent Yearling Bulls	Yearling Bulls/ 100 Bull Calves	Calves/ 100 Cows	Twin Calves/ 100 Cows w/Calf	Percent Calves	Moose/Hour	Total Moose
Foothills, Alaska Range	1	11/60	60.0	9.0	18.0	4.5	52.0	36.0	5.0	18.2	-	335
	1	11/62	57.0	8.0	16.0	3.4	27.0	59.0	13.0	25.7	-	175
	1	10/63	27.0	15.0	27.0	8.7	100.0	29.0	8.0	14.8	221	203
	1	11/65	32.0	2.0	8.0	1.0	20.0	22.0	0.0	14.0	67	350
	1	10/66	62.0	2.1	3.5	1.2	25.6	16.2	0.0	9.1	179	948
Wood River		10/56	95.6	13.2	16.0	5.8	85.7	30.8	0.0	13.6	-	260
Upper Wood River		11/65	68.0	7.0	12.0	4.0	65.0	23.0	6.0	12.0	169	389
Upper Wood River		10/66	48.4	2.3	4.9	1.3	23.3	19.5	2.4	11.6	103	372
Rex Dome-Tatlanika Creek		10/66	64.8	2.3	3.8	1.3	33.3	14.1	0.0	7.9	92	229
Ferry-Healy-Yanert		10/66	31.7	0.7	2.4	0.5	13.0	11.2	12.2	7.8	137	590
Total, Alaska Range, Unit 20A (Foothills-Wood River)		11/65	49.0	5.0	11.0	3.0	41.0	22.0	3.0	13.0	98	739
Total, Alaska Range (East of Nenana River)		10/66	50.3	1.7	3.5	1.0	22.7	15.0	3.2	9.0	143	2139
Lignite-Savage River		10/66	50.0	0.0	0.0	0.0	0.0	42.0	0.0	22.0	38	50

Appendix 31. Summary of moose population composition counts, Tanana Flats, 1967.

Area	Date	Large Bulls	Small Bulls	Total Bulls	Cows W/0	Cows W/1	Cows W/2	Total Cows	Unid.	Total Adults	Lone Calves	Total Calves	Total Moose	Count Time (hrs.)	Moose/ Hour
2	10/26-10/27	35	3	38	68	15	0	83	0	121	0	15	136	3.1	44
3	10/25	10	4	14	35	16	1	52	0	66	0	18	84	1.8	47
4	10/27	22	0	22	19	5	0	24	0	46	0	5	51	3.0	18
5	10/25	9	2	11	12	7	0	19	0	30	0	7	37	2.1	18
6	10/25	18	5	23	30	5	0	35	0	58	0	5	63	1.7	37
7	10/28, 10/30	14	0	14	14	3	0	17	1	31	0	3	35	2.5	14
8	10/30	4	0	4	14	2	0	16	0	20	0	2	22	1.3	17
9	10/27-10/28	20	6	26	33	20	0	53	0	79	1	21	100	3.6	29
Total		132	20	152	225	73	1	299	1	451	1	76	528	19.1	28

Appendix 32. Moose sex and age ratios, Tanana Flats, 1967.

Area	Date	Bulls/ 100 Cows	Yearling Bulls/ 100 Cows	Yearling Bulls/ 100 Adult Bulls	Percent Yearling Bulls	Yearling Bulls/ 100 Bull Calves	Calves/ 100 Cows	Twin Calves/ 100 Cows w/Calf	Percent Calves	Moose/Hour	Total Moose
2	10/26-10/27	45.8	3.6	8.6	2.2	40.0	18.1	0.0	11.0	44	136
3	10/25	26.9	7.7	40.0	4.8	44.4	34.6	5.9	21.4	47	84
4	10/27	91.6	0.0	0.0	0.0	0.0	20.8	0.0	9.8	18	51
5	10/25	57.9	10.5	22.2	5.4	57.1	36.8	0.0	18.9	18	37
6	10/25	65.7	14.3	27.8	7.9	200.0	14.3	0.0	7.9	37	63
7	10/28 10/30	82.4	0.0	0.0	0.0	0.0	17.6	0.0	8.6	14	35
8	10/30	25.0	0.0	0.0	0.0	0.0	12.5	0.0	9.1	17	22
9	10/27-10/28	49.1	11.3	30.0	6.0	57.1	39.6	0.0	21.0	29	100
Total		50.8	6.7	15.2	3.8	52.6	25.4	1.4	14.4	28	528

Appendix 33. Summary of moose population composition counts, Tanana Flats, 1968.

Area	Date	Large Bulls	Small Bulls	Total Bulls	Cows W/0	Cows W/1	Cows W/2	Total Cows	Unid.	Total Adults	Lone Calves	Total Calves	Total Moose	Count Time (hrs.)	Moose/ Hour
2	11/13	48	9	57	62	29	1	92	0	149	2	33	184	1.7	108
		Tagged calves: 1 male, 1 female													
3	11/12-11/13	2	7	9	25	25	0	50	0	59	1	25	84	2.1	40
		Tagged calves: 2 females													
4	11/14	51	8	59	71	32	3	106	0	165	2	40	205	3.0	68
		Tagged calves: 7 males, 5 females, 1 sex unknown													
5	11/12	23	13	36	69	23	1	93	0	129	0	25	154	3.3	47
		Tagged calves: 5 females													
6	11/13	20	7	27	18	7	0	25	0	52	0	7	59	1.4	42
		Tagged calves: 1 female													
7	11/15	10	2	12	19	2	0	21	1	34	0	2	36	2.2	16
		Tagged calves: none													
8	11/17	7	0	7	4	14	0	18	2	27	0	14	41	2.4	17
		Tagged calves: 1 male													
9	11/14	15	4	19	39	32	4	75	0	94	0	40	134	2.3	58
		Tagged calves: 2 males													
Total		176	50	226	307	164	9	480	3	709	5	186	897	18.4	49
		Tagged calves: 11 males, 14 females, 1 sex unknown													

Appendix 34. Summary of moose population composition counts, Tanana Valley, 1968.

Area	Date	Large Bulls	Small Bulls	Total Bulls	Cows W/0	Cows W/1	Cows W/2	Total Cows	Unid.	Total Adults	Lone Calves	Total Calves	Total Moose	Count Time (hrs.)	Moose/ Hour
Fairbanks Wildlife Center	11/18	0	0	0	4	6	0	10	0	10	1	7	17	0.5	34
Goldstream (Martin Siding to Steese Hwy)	11/17	0	0	0	1	4	0	5	0	5	0	4	9	1.7	5

Appendix 35. Moose sex and age ratios, Tanana Flats, 1968.

Area	Date	Bulls/ 100 Cows	Yearling Bulls/ 100 Cows	Yearling Bulls/ 100 Adult Bulls	Percent Yearling Bulls	Yearling Bulls/ 100 Bull Calves	Calves/ 100 Cows	Twin Calves/ 100 Cows w/Calf	Percent Calves	Moose/Hour	Total Moose
2	11/13	62.0	9.8	18.8	4.9	54.5	35.9	3.3	17.9	108	184
3	11/12-11/13	8.0	14.0	350.0	8.3	56.0	50.0	0.0	29.8	40	84
4	11/14	55.7	7.5	15.7	3.9	40.0	37.7	8.6	19.5	68	205
5	11/12	38.7	14.0	56.5	8.4	104.0	26.9	4.2	16.2	47	154
6	11/13	108.0	28.0	35.0	11.9	200.0	28.0	0.0	11.9	42	59
7	11/15	57.1	9.5	20.0	4.9	28.6	9.5	0.0	5.6	16	36
8	11/17	38.9	0	0	0	0	77.8	0.0	34.1	17	41
9	11/14	25.3	5.3	26.7	3.0	20.0	53.3	11.1	29.9	58	134
Total		47.1	10.4	28.4	5.6	53.8	38.8	5.2	20.1	49	897

Appendix 36. Summary of moose population composition counts, 1969.

Area	Date	Large Bulls	Small Bulls	Total Bulls	Cows W/0	Cows W/1	Cows W/2	Total Cows	Unid.	Total Adults	Lone Calves	Total Calves	Total Moose	Count Time (hrs.)	Moose/ Hour	Yearlings
Tanana Flats (pre-tagging) Area I	5/15	-	-	60	85	38	1	124	0	184	-	-	227	2.75	83	43
Tanana Flats (post-tagging) Area I	6/4 6/6	-	-	169	49	29	3	112	-	281	-	35	359	3.7	97	43
Tanana Flats (post-tagging) Area II	6/7	-	-	54	28	9	3	54	-	108	-	15	137	1.8	76	14
Tanana Flats (post-tagging) Area III	6/7	-	-	25	16	14	5	40	-	65	-	24	100	2	50	11

Appendix 37. Moose sex and age ratios, 1969.

Area	Date	Bulls/ 100 Cows	Yearling Bulls/ 100 Cows	Yearling Bulls/ 100 Adult Bulls	Percent Yearling Bulls	Yearling Bulls/ 100 Bull Calves	Calves/ 100 Cows	Twin Calves/ 100 Cows w/Calf	Percent Calves	Moose/Hour	Total Moose	% Yrlgs.
Tanana Flats (post-tagging) Area I	6/4 6/6	150.8	-	-	-	-	31.2	9.3	9.7	97	359	11.9
Tanana Flats (post-tagging) Area II	6/7	100.0	-	-	-	-	27.7	33.3	10.9	76	137	10.2
Tanana Flats (post-tagging) Area III	6/7	62.5	-	-	-	-	60.0	26.3	24.0	50	100	11.0

Appendix 38. Summary of moose population composition counts, Tanana Flats, 1970.

Area	Date	Large Bulls	Small Bulls	Total Bulls	Cows W/0	Cows W/1	Cows W/2	Total Cows	Unid.	Total Adults	Lone Calves	Total Calves	Total Moose	Count Time (hrs.)	Moose/ Hour
1	12/9-11	42	13	55	187	58	1	246	27	301	-	60	388	7.8	50
2	12/9	12	2	14	19	7	-	26	2	40	-	7	49	2.6	19
3	11/11	3	6	9	13	4	-	17	-	26	1	5	31	1.2	26
4	12/7	2	1	3	20	16	-	36	1	39	1	17	57	1.5	38
5	11/10-11	13	13	26	45	24	1	70	-	96	1	27	123	3.0	41
6	12/7	1	-	1	3	2	-	5	-	6	-	2	8	0.8	10
7	12/10	7	-	7	39	10	-	49	1	56	-	10	67	2.5	27
8	12/8	-	-	-	14	5	-	19	-	19	-	5	24	2.0	12
9	11/12	24	5	29	62	23	1	86	-	115	1	26	141	2.5	56
Total		104	40	144	402	149	3	554	31	698	4	159	888	23.9	37
Areas 2-9 only		62	27	89	215	91	2	308	4	397	4	99	500	16.1	31

Appendix 39. Moose sex and age ratios, Tanana Flats, Alaska Range Foothills, 1970.

Area	Date	Bulls/ 100 Cows	Yearling Bulls/ 100 Cows	Yearling Bulls/ 100 Adult Bulls	Percent Yearling Bulls	Yearling Bulls/ 100 Bull Calves	Calves/ 100 Cows	Twin Calves/ 100 Cows w/Calf	Percent Calves	Moose/Hour	Total Moose
1	12/9-11	22.4	5.3	31.0	3.4	43.3	24.4	1.7	15.5	50	388
2	12/9	53.8	7.7	16.7	4.1	57.1	26.9	-	14.3	19	49
3	11/11	52.9	35.3	200.0	19.3	240.0	29.4	-	16.1	26	31
4	12/7	8.3	2.8	50.0	1.8	11.8	47.2	-	29.8	38	57
5	11/10-11	37.1	18.6	100.0	10.6	96.3	38.6	4.0	23.0	41	123
6	12/7	20.0	-	-	-	-	40.0	-	25.0	10	8
7	12/10	14.3	-	-	-	-	20.4	-	14.9	27	67
8	12/8	-	-	-	-	-	26.3	-	26.3	12	24
9	11/12	33.7	5.8	20.8	3.5	38.5	30.2	4.2	18.4	56	141
Total		26.0	7.2	38.5	4.5	50.3	28.7	2.0	17.9	37.2	888
Areas 2-9 only		28.9	8.8	43.5	5.4	54.5	32.1	2.2	19.8	31	500

Appendix 40. Summary of moose population composition counts, Tanana Flats, Alaska Range Foothills, Upper Wood R., 1971.

Area	Date	Large Bulls	Small Bulls	Total Bulls	Cows W/0	Cows W/1	Cows W/2	Total Cows	Unid.	Total Adults	Lone Calves	Total Calves	Total Moose	Count Time (hrs.)	Moose/ Hour
1	11/9,10 11,13, & 15	171	19	190	434	130	5	569	-	759	3	143	902	14.9	60
Upper Wood River	11/15, & 16	56	3	59	123	28	4	155	-	214	-	36	250	4.4	57
3	11/10	3	-	3	12	8	-	20	-	23	-	8	31	1.3	24
4	11/11	22	-	22	26	12	-	38	-	60	-	12	72	3.0	24
5	11/12	4	-	4	10	15	-	25	-	29	-	15	44	3.3	13
2, 6	11/11	64	3	67	87	38	-	125	-	192	-	38	230	2.9	79
7	11/10	7	-	7	12	3	-	15	-	22	-	3	25	2.0	12
8	11/10	17	1	18	37	10	-	47	-	65	1	11	76	2.5	30
9	11/9	16	1	17	43	13	1	57	-	74	-	15	89	3.3	27
Flats total (2-9)		133	5	138	227	99	1	327	-	465	1	102	567	18.3	31
Flats, 1, Upper Wood		360	27	387	784	257	10	1051	-	1438	4	281	1719	37.6	46

Appendix 41. Moose sex and age ratios, Tanana Flats, Alaska Range Foothills, Upper Wood River, 1971.

Area	Date	Bulls/ 100 Cows	Yearling Bulls/ 100 Cows	Yearling Bulls/ 100 Adult Bulls	Percent Yearling Bulls	Yearling Bulls/ 100 Bull Calves	Calves/ 100 Cows	Twin Calves/ 100 Cows w/Calf	Percent Calves	Moose/Hour	Total Moose
1	11/9,10 11,13,15	30.0	3.3	11.1	2.1	26.6	25.1	3.7	15.8	60	902
Upper Wood River	11/15-16	38.1	1.9	5.4	1.2	16.7	23.2	12.5	14.4	57	250
3	11/10	15.0	-	-	-	-	40.0	-	25.8	24	31
4	11/11	57.9	-	-	-	-	31.6	-	16.7	24	72
5	11/12	16.0	-	-	-	-	60.0	-	34.1	13	44
2, 6	11/11	53.6	2.4	4.7	1.3	15.8	30.4	-	16.5	79	230
7	11/10	46.7	-	-	-	-	20.0	-	12.0	12	25
8	11/10	38.3	2.1	5.9	1.3	18.2	23.4	-	14.5	30	76
9	11/9	29.8	1.8	6.2	1.1	13.3	26.3	7.1	16.8	27	89
Flats Total (2-9)		42.2	1.5	3.8	0.9	9.8	31.2	1.0	18.0	31	567
Flats, 1, Upper Wood R.		36.8	2.6	7.5	1.6	19.2	26.7	3.7	16.3	46	1719

Appendix 42. Summary of moose population composition counts, Tanana Flats, Alaska Range Foothills, Upper Wood R., 1972.

Area	Date	Large Bulls	Small Bulls	Total Bulls	Cows W/0	Cows W/1	Cows W/2	Total Cows	Unid.	Total Adults	Lone Calves	Total Calves	Total Moose	Count Time (hrs.)	Moose/ Hour
1 Foothills	11/20-22	72	11	83	184	51	-	235	-	318	2	53	371	12.8	29
Upper Wood	11/22	19	4	23	71	11	-	82	-	105	-	11	116	4.2	28
2	11/17	51	12	63	62	27	-	89	-	152	-	27	179	3.2	56
3	11/16	8	6	14	15	13	-	28	-	42	-	13	55	2.3	24
4	11/18	9	1	10	17	6	-	23	-	33	-	6	39	2.7	14
5	11/15	4	6	10	7	15	-	22	-	32	-	15	47	3.2	15
6	11/16	7	1	8	30	7	-	37	-	45	-	7	52	1.5	35
7	11/16	9	1	10	18	9	-	27	-	37	-	9	46	2.3	20
8	11/16	9	1	10	25	3	-	28	-	38	-	3	41	2.0	20
9	11/14	28	10	38	46	44	4	94	-	132	1	53	185	3.7	50
Flats, Foothills, Upper Wood total		216	53	269	475	186	4	665	-	934	3	197	1131	37.9	30
Flats (2-9)		125	38	163	220	124	4	348	-	511	1	133	644	20.9	31

Appendix 43. Moose sex and age ratios, Tanana Flats, Alaska Range Foothills, Upper Wood River, 1972.

Area	Date	Bulls/ 100 Cows	Yearling Bulls/ 100 Cows	Yearling Bulls/ 100 Adult Bulls	Percent Yearling Bulls	Yearling Bulls/ 100 Bull Calves	Calves/ 100 Cows	Twin Calves/ 100 Cows w/Calf	Percent Calves	Moose/Hour	Total Moose
1 Foothills	11/20-22	35.3	4.7	15.3	3.0	41.5	22.6	-	14.3	29	371
Upper Wood	11/22	28.0	4.9	21.0	3.4	72.7	13.4	-	9.5	28	116
2	11/17	70.8	13.5	23.5	6.7	88.9	30.3	-	15.1	56	179
3	11/16	50.0	21.4	75.0	10.9	92.3	46.4	-	23.6	24	55
4	11/18	43.5	4.4	11.1	2.6	33.3	26.1	-	15.4	14	39
5	11/15	45.4	27.3	150.0	12.8	80.0	68.2	-	31.9	15	47
6	11/16	21.6	2.7	14.3	1.9	28.6	18.9	-	13.5	35	52
7	11/16	37.0	3.7	11.1	2.2	22.2	33.3	-	19.6	20	46
8	11/16	35.7	3.6	11.1	2.4	66.7	10.7	-	7.3	20	41
9	11/14	40.4	10.6	35.7	5.4	37.7	56.4	8.3	28.6	50	185
Flats, Foothills, Upper Wood Total		40.4	8.0	24.5	4.7	53.8	29.6	2.1	17.4	30	1131
Flats (2-9)		46.8	10.9	30.4	5.9	57.1	38.2	3.1	20.6	31	644

Appendix 44. Summary of moose population composition counts, Unit 20A, 1973.

Area	Date	Large Bulls	Small Bulls	Total Bulls	Cows W/0	Cows W/1	Cows W/2	Total Cows	Unid.	Total Adults	Lone Calves	Total Calves	Total Moose	Count Time (hrs.)	Moose/ Hour
Foothills E. Wood River (Area 1)	11/13-11/16	73	7	80	75	23	2	100	-	180	-	27	207	8.1	26
Foothills W. Wood River (Area 1)	11/12-11/16	36	16	52	214	60	5	279	-	331	1	71	402	6.9	58
Flats, Foothills, Delta River to Delta Creek	11/13	16	1	17	35	9	-	44	-	61	-	9	70	3.0	23
2, 6	11/16	25	11	36	54	9	-	63	-	99	-	9	108	4.0	27
3	11/13	-	1	1	5	4	-	9	-	10	-	4	14	1.2	12
4	11/23	6	2	8	19	6	-	25	-	33	-	6	39	3.6	11
5	11/13	8	3	11	12	5	-	17	-	28	-	5	33	2.6	13
7	11/15	15	4	19	24	2	-	26	-	45	-	2	47	3.0	16
8	11/14	8	-	8	19	6	-	25	-	33	-	6	39	2.9	13
9	11/12	6	1	7	23	11	-	34	-	41	-	11	52	3.6	14
Flats (2-9) Total		68	22	90	156	43	-	199	-	289	-	43	332	20.9	16
Foothills Total		125	24	149	324	92	7	423	-	572	1	107	679	18.0	38
Upper Wood River (cumulative total from 2 replicate counts)		66	5	71	165	35	-	200	-	271	-	35	306	9.8	31
20A Totals		259	51	310	645	170	7	822	-	1132	1	185	1317	48.7	27

Appendix 45. Moose sex and age ratios, Unit 20A, 1973.

Area	Date	Bulls/ 100 Cows	Yearling Bulls/ 100 Cows	Yearling Bulls/ 100 Adult Bulls	Percent Yearling Bulls	Yearling Bulls/ 100 Bull Calves	Calves/ 100 Cows	Twin Calves/ 100 Cows w/Calf	Percent Calves	Moose/Hour	Total Moose
Foothills, E. Wood River (Area 1)	11/13-11/16	80.0	7.0	9.6	3.4	51.8	27.0	8.0	13.0	26	207
Foothills, W. Wood River (Area 1)	11/12-11/16	18.6	5.7	44.4	4.0	45.1	25.4	7.7	17.7	58	402
Flats, Foothills, Delta River to Delta Creek	11/13	38.6	2.2	6.2	1.4	22.2	20.4	-	12.8	23	70
2, 6	11/16	57.1	17.5	44.0	10.2	244.4	14.3	-	8.3	27	108
3	11/13	11.1	11.1	-	7.1	50.0	44.4	-	28.6	12	14
4	11/23	32.0	8.0	33.3	5.1	66.7	24.0	-	15.4	11	39
5	11/13	64.7	17.6	37.5	9.1	120.0	29.4	-	15.2	13	33
7	11/15	73.1	15.4	26.7	8.5	400.0	7.7	-	4.3	16	47
8	11/14	32.0	-	-	-	-	24.0	-	15.4	13	39
9	11/12	20.6	2.9	16.7	1.9	18.2	32.4	-	21.2	14	52
Flats (2-9) Total		45.2	11.1	32.4	6.6	102.3	21.6	-	13.0	16	332
Foothills Total		35.2	5.7	16.1	3.5	44.9	25.3	7.1	15.8	38	679
Upper Wood River (cumulative total from 2 replicate counts)		35.5	2.5	7.6	1.6	28.6	17.5	-	11.4	31	306
20A Total		37.7	6.2	19.7	3.9	55.1	22.5	4.0	14.0	27	1317

Appendix 46. Summary of moose population composition counts, Unit 20A, Upper Wood River, 1973.

Area	Date	Large Bulls	Small Bulls	Total Bulls	Cows W/0	Cows W/1	Cows W/2	Total Cows	Unid.	Total Adults	Lone Calves	Total Calves	Total Moose	Count Time (hrs.)	Moose/ Hour
Drainages on either side of Wood River upstream from Threemile Creek on the east to Wood River headwaters, and upstream from the south drainages of Cody Creek on the west to Wood River headwaters. Drainages on west side of Wood River between Cody Creek and Threemile Creek not included.															
	11/8, 11/21	35	2	37	91	19	-	110	-	147	-	19	166	4.8	35
Drainages on either side of Wood River upstream from Threemile Creek to Kansas Creek on the east, and western drainages upstream from a point due west of Threemile Creek to Wood River headwaters. Eastern and northern drainages between Virginia Creek and Wood River headwaters not included.															
	11/8	31	3	34	74	16	-	90	-	124	-	16	140	5.0	28

Appendix 47. Moose sex and age ratios, Unit 20A, Upper Wood River, 1973.

Area	Date	Bulls/ 100 Cows	Yearling Bulls/ 100 Cows	Yearling Bulls/ 100 Adult Bulls	Percent Yearling Bulls	Yearling Bulls/ 100 Bull Calves	Calves/ 100 Cows	Twin Calves/ 100 Cows w/Calf	Percent Calves	Moose/Hour	Total Moose
Drainages on either side of Wood River upstream from Threemile Creek on the east to Wood River headwaters, and upstream from the south drainages of Cody Creek on the west to Wood River headwaters. Drainages on west side of Wood River between Cody Creek and Threemile Creek not included.											
	11/8, 11/21	33.6	1.8	5.7	1.2	21.1	17.3	-	11.4	35	166
Drainages on either side of Wood River upstream from Threemile Creek to Kansas Creek on the east, and western drainages upstream from a point due west of Threemile Creek to Wood River headwaters. Eastern and northern drainages between Virginia Creek and Wood River headwaters not included.											
	11/8	37.8	3.3	9.7	2.1	37.5	17.8	-	11.4	28	140

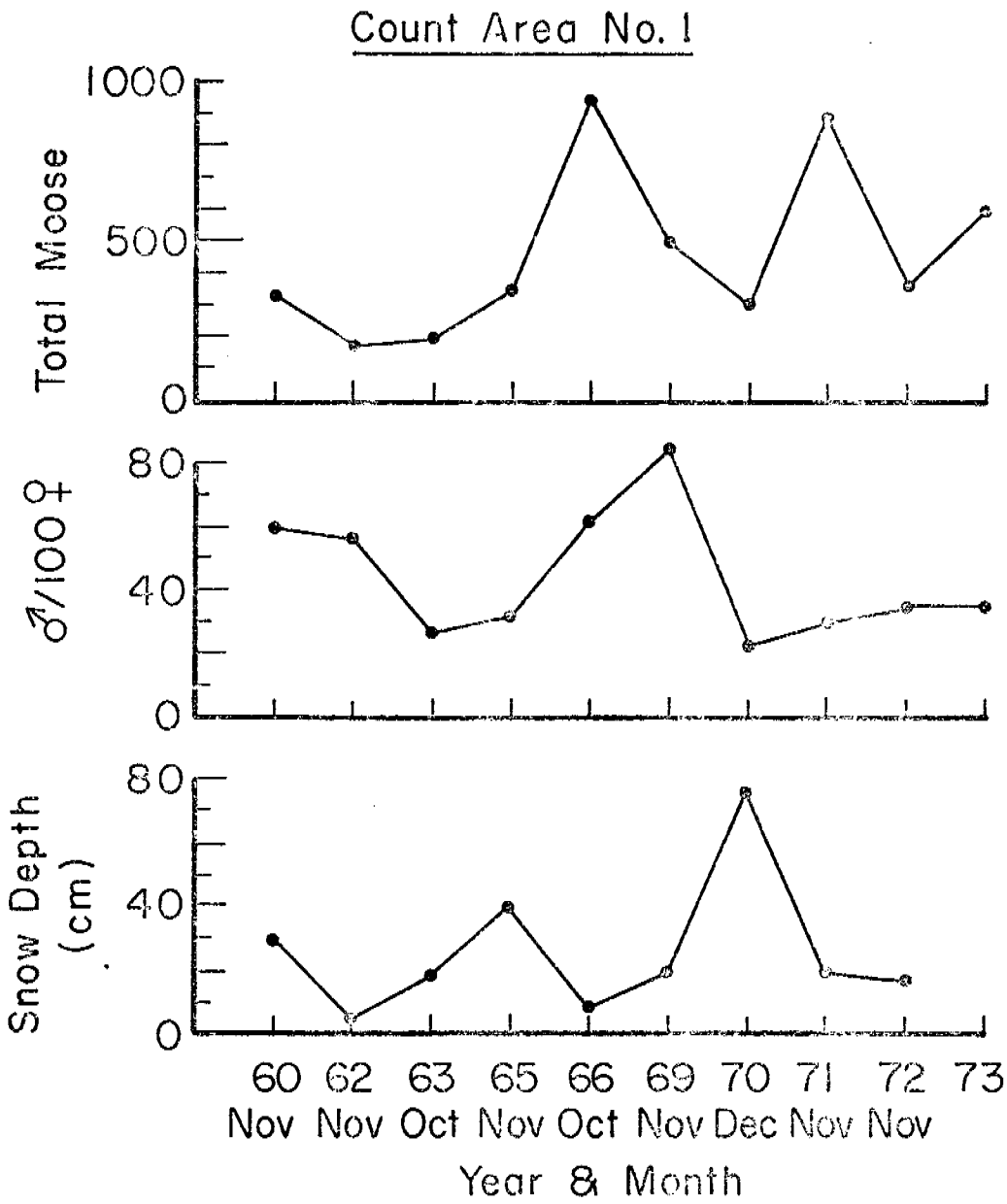
Appendix 48. Bull:cow and calf:cow ratios in foothills of the Alaska Range, east and west of the Wood River from 1965 to 1973.

	East of Wood River		West of Wood River	
Year	M/100 F	Calf/100 F	M/100 F	Calf/100 F
1965	27	17	32	26
1966	87	19	51	15
1969	155	55	70	34
1970	68	23	12	25
1971	42	27	28	24
1972	56	26	23	30
1973	80	27	19	25

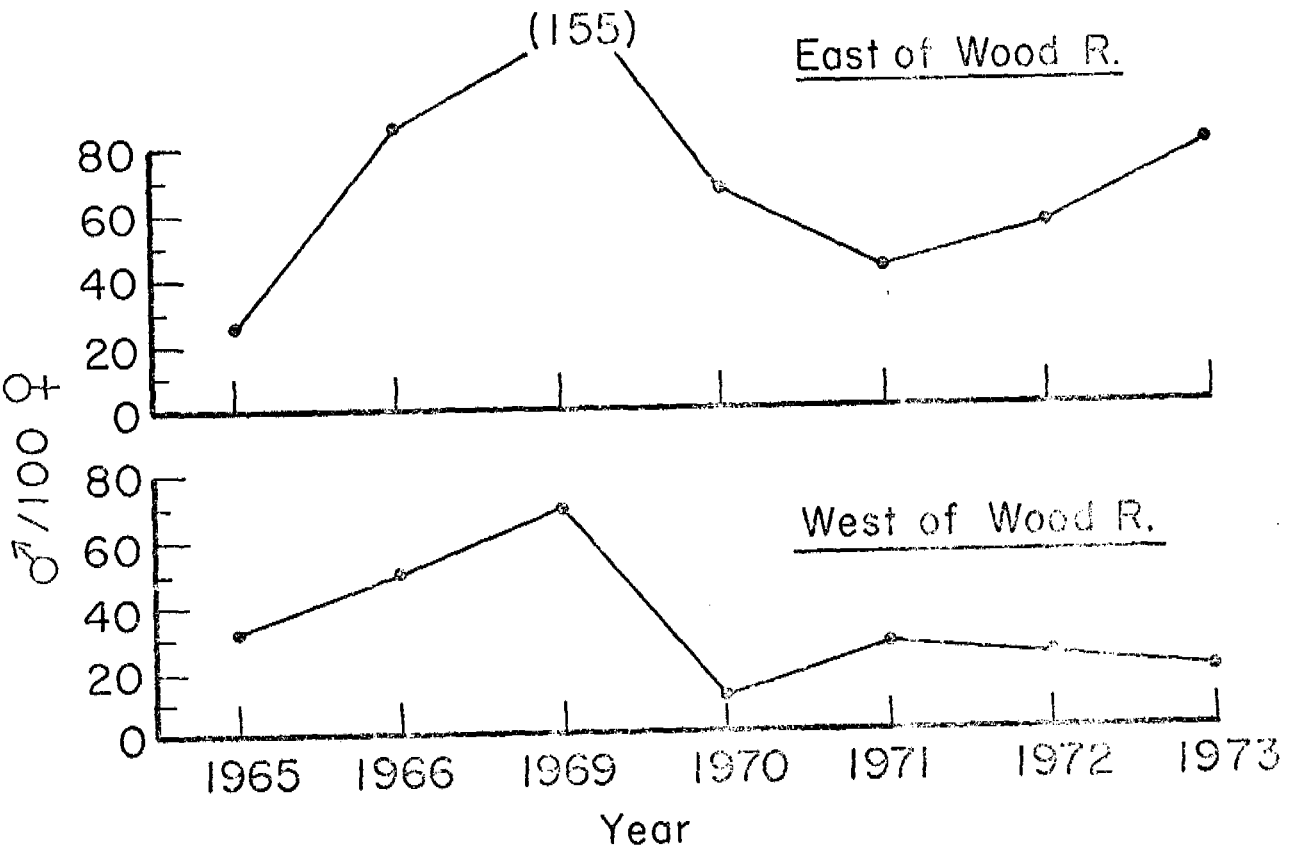
Appendix 49. Total number and age ratio of moose observed on the Tanana Flats during fall aerial surveys.

Year	Area	Total	Percent Yearlings in Herd	Calves/ 100 Cows	Count Time (Hrs.)	Harvest
1973	1-9	1011	4.5	24	38.9	710
1973	2-9	332	6.6	22	20.9	-
1972	1-9	1015	4.8	32	33.7	484
1972	2-9	644	5.9	38	20.9	-
1971	1-9	1469	1.6	27	33.2	350
1971	2-9	567	0.9	31	18.3	-
1970	1-9	888	4.5	29	29.3	306
1970	2-9	500	5.4	32	16.1	-
1969	1-9	1254	6.9	42	24.0	255
1969	2-9	752	9.2	44	18.0	-
1968	2-9	897	5.6	39	18.4	258
1967	2-9	528	3.8	25	19.1	210

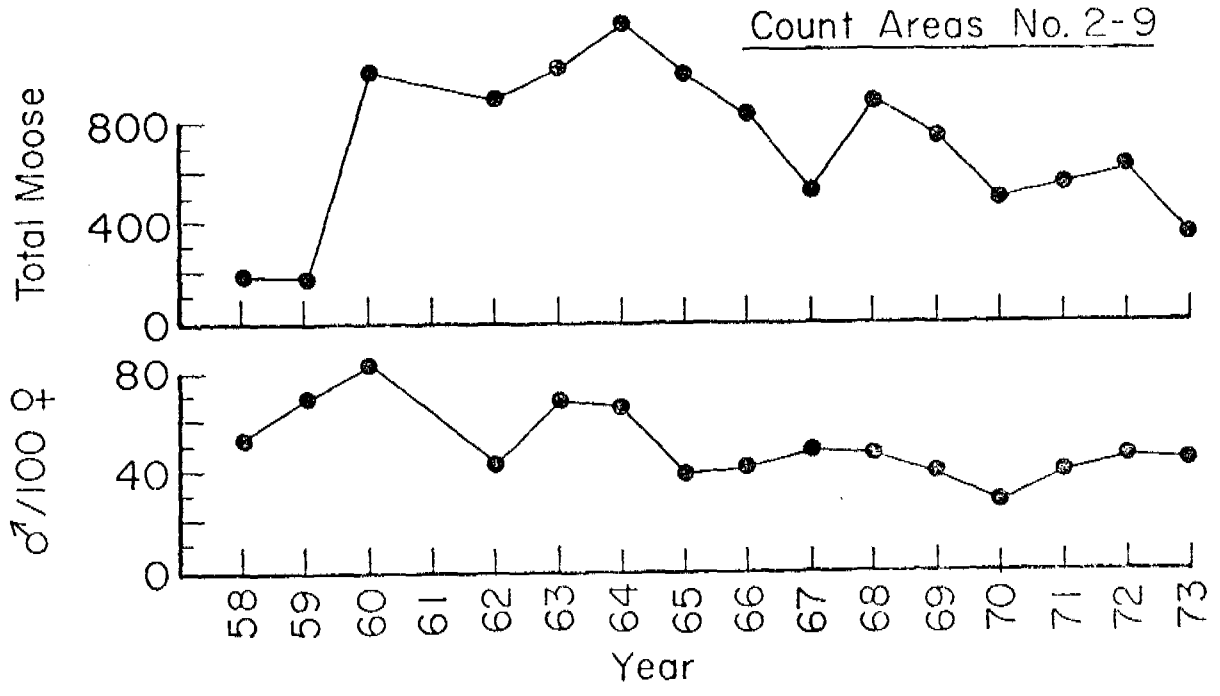
Appendix 50. Total number and sex ratio of moose observed and snow depth on ground (U.S. Weather Bureau records for Fairbanks, Alaska) during fall aerial surveys in count area no. 1 (foothills of Alaska Range) of GMU 20A.



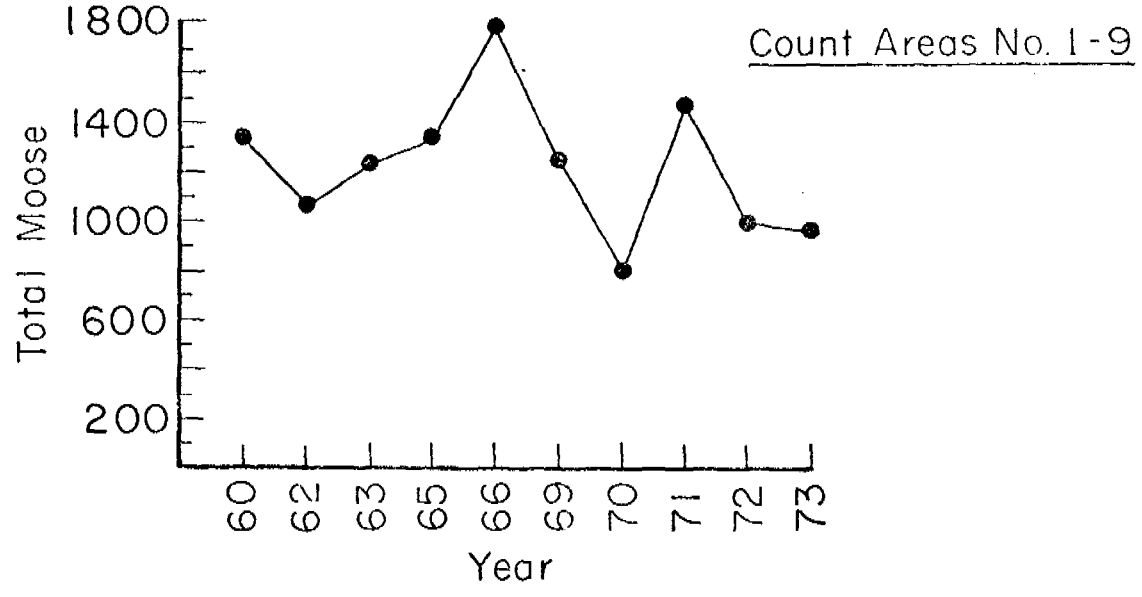
Appendix 51. Sex ratios of moose observed during fall aerial surveys east and west of the Wood River in count area no. 1 (foothills of Alaska Range) of GMU 20A.



Appendix 52. Total number and sex ratio of moose observed during fall aerial surveys in count areas no. 2-9 (Tanana Flats) of GMU 20A.



Appendix 53. Total moose observed during fall aerial surveys in count areas no. 1-9 of GMU 20A.



JOB PROGRESS REPORT (RESEARCH)

State: Alaska

Cooperator: John W. Coady

Project No.: W-17-6 Project Title: Big Game Investigations

Job No.: 1.11R Job Title: Seasonal Movement and Distribution of Moose Breeding in the Alaska Range Foothills

Period Covered: July 1, 1973 through June 30, 1974

SUMMARY

Twenty adult moose were radio-collared in the Alaska Range during October 1973. All animals were located weekly, and search time required to visually sight animals, habitat, activity, and association with other animals were recorded. Approximately 575 locations have been obtained since the animals were collared, and data will be reported in a future publication.

CONTENTS

BACKGROUND

See Job 1.8R.

OBJECTIVES

The objectives of this study are to determine the annual loyalty of animals to particular breeding sites, and thereby the extent to which moose (*Alces alces*) rutting in restricted areas constitute discrete populations; to determine the influence of weather and habitat on the movement and distribution of moose, and on the visibility of moose from an aircraft; and to monitor the influence of hunting and wolves (*Canis lupus*) on the behavior of moose in the Alaska Range foothills.

PROCEDURES

Seventeen adult cows and three adult bulls were radio-collared between October 8 and 13, 1973 in Snow Mountain Gulch and Gold King Creek in the foothills of the Alaska Range.

Snow Mountain Gulch is located 90 km south of Fairbanks. The area forms a gentle bowl in the foothills of the Alaska Range and ranges in elevation from 600-1200 m. Conifer and tall shrub stands at lower elevations merge into treeless low shrub communities and herbaceous meadows in higher areas. Gold King Creek flows north from the Alaska Range, approximately 100 km south of Fairbanks. The creek flows through a relatively narrow, steep-sided valley in the mountains, ranging in elevation from 600 to 1200 m. Vegetation in the valley bottom is dominated by conifers, while that on the valley sides consists largely of stands of low and tall shrubs.

Helicopter darting techniques were used to capture animals and will not be further described here. Each animal was color-coded with ear streamers, an incisor tooth for aging and a hair sample for mineral analysis were collected and standard body measurements were obtained at the time the radio collar was attached.

Radio collars were designed and constructed by Ocean Applied Research Corporation (OAR), San Diego, California. These units, weighing 8.8 kg, transmit a pulsed CW signal (1 pulse per 2 to 2.5 seconds) on frequencies between 150.800 to 151.075 MHz. Signal detection range is approximately 160 km ground to air, and life expectancy is 1 or more years.

A LA-12 telemetry receiver constructed by AVM Instrument Company, Champaign, Illinois, and a three-element Yagi antenna, constructed by Hy-Gain Electronics Corporation, Lincoln, Nebraska, are being used.

All animals are located weekly from the air. Both a PA-18-150 with the antenna mounted facing forward on the struts, and a Helio-Courier with the antenna mounted facing forward on the wing have been satisfactorily used. Both pilot and observer wear earphones, and the plane (and antenna) is flown in the direction in which signal reception is loudest until the transmitter and moose are located. Location of each animal is plotted on 1:63360 USGS maps or on vegetation type maps constructed by ADF&G (Job 1.3R). Search time required to visually sight the moose after its location is determined electronically, as well as time of day, habitat (aquatic, low shrub, tall shrub, deciduous tree, coniferous tree), activity (bedded, standing, traveling, feeding), grazing with other moose, temperature and approximate snow depth are recorded (Fig. 1).

RESULTS

The history of the radio-collared moose, in chronological order, is as follows:

October 8-13, 1973 - 20 moose radio-collared and 2 moose visually collared; one bull killed by overdose of drug; one cow killed in self defense.

November 1 - Moose #93455 (radio #14) found dead, apparently from effects of drug; about one-half of animal eaten by wolves and ravens (*Corvus corax*); instrument moose #93594 with radio #14.

November 8 - Signals from radios #2 and #15 lost.

November 15 - Moose #93466 and #93527 (radios #2 and #15, respectively) shot by hunters and collars turned in to ADF&G.

December 11 - Instrument moose #93694 and #93697 with radios #2 and #15, respectively.

December 13 - Calf of moose #93451 (radio #5) disappeared.

January 10, 1974 - Moose #93457 (radio #9) and her calf partially consumed and probably killed by wolves. Radio-collar retrieved.

February 14 - Moose #93451 (radio #5) partially consumed and probably killed by wolves. Radio-collar retrieved.

March 7 - Calf of moose #93460 (radio #18) disappeared; possibly wolves, since tracks of a pack of three and a pack of six wolves were seen in the area.

April 3 - Signal from moose #93463 (radio #20) lost; moose later spotted and confirmed that transmitter was inoperative.

April 18 - Signal from moose #93460 (radio #18) lost; possibly wolves since fresh wolf tracks were seen in area where moose was last located.

May 6 - Moose #93468 (radio #4) totally consumed and probably killed by wolves; radio-collar retrieved.

June 7 - Signal from moose #93456 (radio #16) lost; unknown cause.

To summarize, of the 20 adult moose originally radio-collared, two were killed by hunters, three were consumed and probably killed by wolves, one may have been killed by wolves, one transmitter has failed and the fate of three transmitters (and moose) is unknown. As of August 1, 1974 twelve radio-collars were operative on instrumented moose, and three radio-collars were operative and being stored at the ADF&G office in Fairbanks.

Movement data have not been analyzed and will not be reported in detail here. However, approximately 575 locations have been determined as of August 1, 1974 on the Tanana Flats and in the Alaska Range.

Most collared as well as unmarked moose emigrated from alpine habitat in the foothills of the Alaska Range during late fall and early winter (see Fig. 3, Job 1.3R). Approximately 14 collared animals moved north to deciduous and coniferous tree and shrub habitat on the Tanana Flats, while the remaining moose shifted to riparian willow habitat in the foothills or further south into the Alaska Range. During early spring collared moose wintering in the foothills and mountains migrated north onto the Tanana Flats, where most of the marked animals spent early summer. By late June, some individuals were slowly moving back toward the foothills of the Alaska Range.

Search time, activity and grouping data have been partially analyzed, but will not be reported here. Preliminary results of habitat utilization were reported under Job 1.3R of this report. Results of this study will be reported in two or three future publications.

ACKNOWLEDGMENTS

Bill Giffin, John Trent, and Spencer Linderman made valuable contributions to radio-collaring and locating moose. The assistance and enthusiasm of John J. Burns in collaring all moose and the ability, persistence and interest of Tony Smith in locating radio-collared moose on numerous occasions are especially appreciated. Richard Bishop and Robert LeResche made helpful suggestions and provided stimulating discussions. Dale Haggstrom analyzed portions of the data. Contributions by the above biologists have made this study possible.

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