MOOSE POPULATION RESEARCH AND MANAGEMENT STUDIES IN YUKON

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Renewable Resources

MOOSE MANAGEMENT ANNUAL REPORT

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Southwest Yukon Moose Survey Results, November 1982

(Whitehorse North, Mt. Lorne, Teslin Burn)

R.L. Markel and D.G. Larsen, 1983

ABSTRACT

Moose were censused in two different areas in the southwestern Yukon using a stratified random block technique during aerial surveys between 3-25 November, 1982. Moose densities were higher in the southwestern survey area (0.41 moose/km^2) than in the northwestern survey area (0.17 moose/km^2). Adult females were the most abundant age/sex cohort constituting 59% of the population in the Carcross/Teslin area and 66% of the Whitehorse North population. Yearlings were the least abundant cohort making up 5% and 0.4% in the Teslin/Carcross and Whitehorse North populations respectively. The resident and non-resident harvest of moose represented 5% and 1% of the 1982 pre-hunt population estimate.

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INTRODUCTION

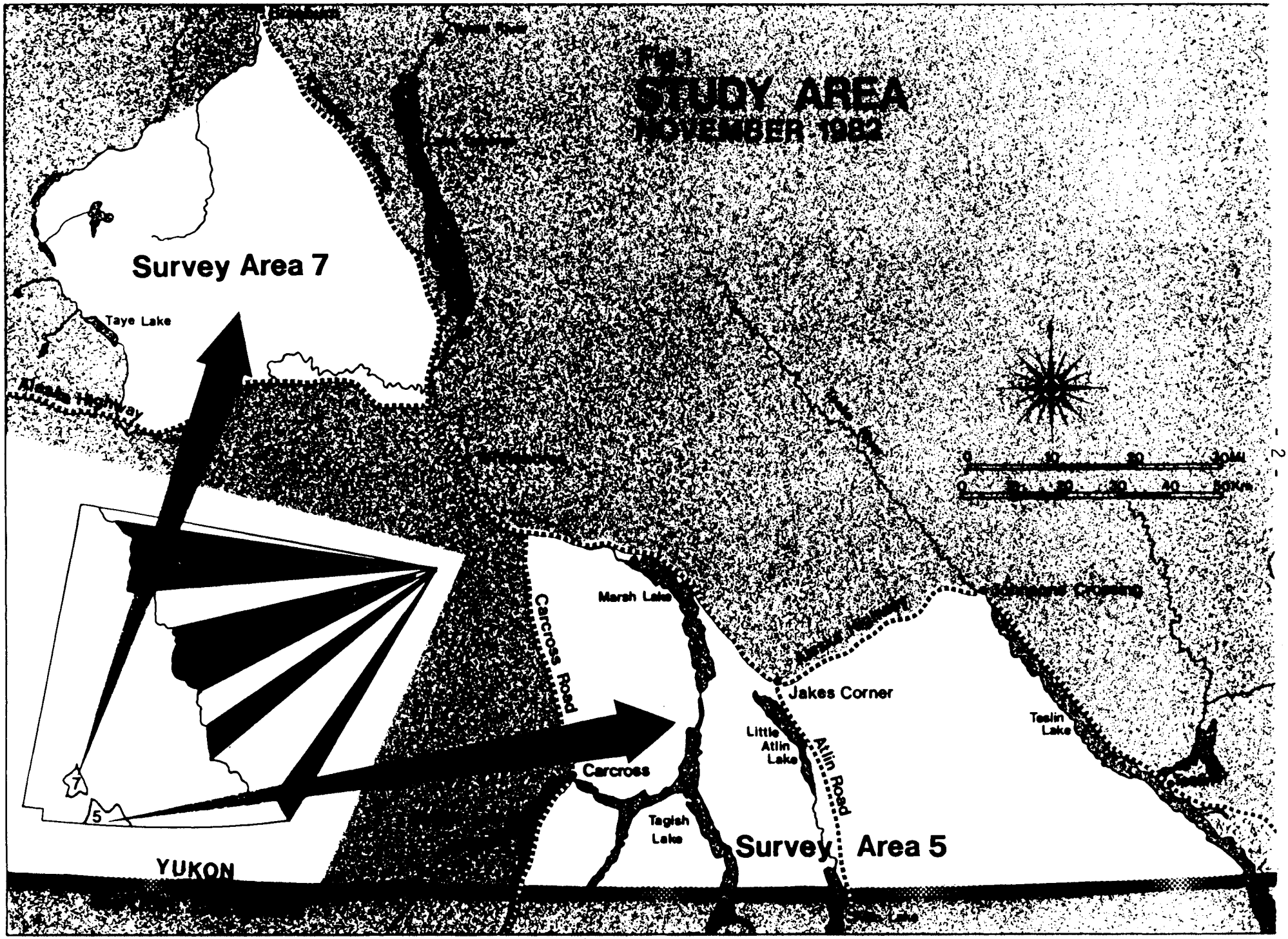
In 1981 a moose management program was implemented in the Yukon Territory by the Department of Renewable Resources. Six priority moose management areas were identified and chosen to be inventoried, based on documented hunter harvest and pressure. The objective of the inventories were to determine moose population density, distribution, composition, habitat utilization, and changes in population size over time.

In 1981 inventories were conducted in one of the priority areas located in the southwest Yukon (Larsen 1982). This area was divided into four survey areas (SA). In 1982 surveys were repeated in two of the four areas (Johnston and McLeod 1983). As well, in the same year three new areas, were inventoried. This document is reporting on the 1982 aerial survey results from the Teslin/Carcross and Whitehorse North areas.

STUDY AREA

The study area, which consists of 9,310 km^2 total land area, lies in the southwestern Yukon (Fig. 1). The Teslin/Carcross area (SA 5) (4764 km^2) is characterized by dissected plateaus, rolling hills, mountains rising to over 2,012 meters a.s.l. and numerous large waterbodies. The Whitehorse North area (SA 7) (3145 km^2) is characterized by rolling topography with moderate to deeply incised valleys. One small mountain group, the Three Guardsmen, which rise up to 2035 meters, is included in this SA.

Treeline occurs between 1067 and 1220 meters a.s.l. Shrub birch (Betula spp.) and willow (Salix spp.) are the predominant vegetation in the subalpine zone which extends from treeline to 1542 meters. On the lower slopes, white spruce (Picea glauca) and lodgepole pine (Pinus contorta) are the dominant tree


STUDY AREA
NOVEMBER 1982
Survey Area 7
Taye Lake
Alaska Highway
Carcross Road
Marsh Lake
Jakes Corner
Little Atlin Lake
Atlin Road
Teslin Lake
Carcross
Tagish Lake
Survey Area 5
YUKON
7
5

species. In 1958 extensive burns occurred in both SAs. Approximately 40% of SA 5 and 80% of SA 7 were burnt. Most of these burns have regenerated to pine and willow (Salix spp.) of varying density and composition. Black spruce (Picea mariana), poplar (Populus spp.) and subalpine fir (Abies lasiocarpa) are scattered throughout. The physiography, climate and vegetation of these areas have been described elsewhere (Oswald and Senyk 1977).

The Yukon has been divided into 11 Game Management Zones (GMZ), which have been further divided into Game Management Subzones (GMS). Game Management Subzones 5-48, 5-49 and 5-50 comprise SA 7, while GMS 9-01 to 9-11, excluding 9-03 comprise SA 5 (Anon. 1983).

METHODS

Aerial surveys were conducted between 3-25 November 1982. This time period is preferred for moose surveys in the Yukon due to the aggregation behaviour of moose in open habitats during and immediately following the rut (Peek et al, 1974; Lynch, 1975; Rounds, 1978; Gasaway et al, 1981; Mytton and Keith, 1981; Larsen, 1982). In addition, the ground is usually covered by snow in early November. Both of these factors increase the visibility of moose on aerial surveys (Gasaway et al, 1981). The presence of antlers on males to mid-December facilitates the sexing of moose from aircraft.

A stratified random block sampling technique was used (Gasaway et al 1981) with modifications to accommodate the terrain, weather conditions, and distribution of moose in the Yukon (Larsen 1982). Briefly the technique used was as follows. Each SA was divided into sample units (SU) using natural terrain features for borders and delineated on 1:50,000 toopographical maps.

Fixed-wing aircraft were used to stratify SUs into high, medium, low and extra low strata based on the number of moose and tracks seen in the SU. Areas above 1542 meters elevation, waterbodies larger than 0.8 km^2 and precipitous slopes were considered uninhabitable for moose and were not surveyed. Areas above 1,542 meters consisted of primarily talus slopes with little to no vegetation.

Helicopters were employed to census the SUs within 48 hours of completing the stratification. SUs to be surveyed were randomly selected. Total counts of moose were made within each SU surveyed. Search patterns varied from parallel overlapping transects and following contour lines, to tight circling depending upon the terrain and wind. A detailed description of the techniques can be found in Gasaway et al, (1981) and Larsen, (1982). Nine hundred and ninety six km^2 or 17% of SA 5 and 402.9 km^2 or 11% of SA 7 were considered uninhabitable for moose.

Moose observations included information on the number of animals in each aggregation, their age (calves, yearlings and adults) and sex. Habitat characteristics at each observation were classified according to vegetation (herbaceous, shrub, shrub-conifer, conifer and deciduous), elevation and aspect. Each SU that was censused was visually divided into these broad vegetation classes and proportions of each were assessed. Since these SUs were randomly selected, the percent cover values for the vegetation classes were used to determine the availability of the vegetative types in the SAs.

Moose harvest data were tabulated by GMS from questionnaires returned by licenced reident and non-resident hunters. Annual harvest (non-native) was estimated for each survey area using Kale (1982). Information on non-licenced (native) harvest was not available.

RESULTS AND DISCUSSION

Search and Sampling Intensity

Search intensity averaged 0.22 min./km^2 and 0.33 min./km^2 for stratification in SAS 5 and 7 respectively. During the census intensity increased to 3.2 min/km^2 for SA 5 and 2.2 min./km^2 for SA 7. There was no appreciable difference in search intensity among strata during the census.

The overall sampling intensity regardless of SA or stratum averaged 17%, with an intensity of 13% and 26% in SA 5 and 7 respectively (Table 1). All of the high strata SUs were surveyed, while 40% of the medium, 15% of the low and 9% of the extra-low strata were surveyed. The high and medium strata combined constituted 12% of the SAs with the remainder (88%) in the low and extra-low stratum. A total of 90 SUs averaging 15.9 km^2 in size were surveyed in the combined SAs.

Population Estimate, Density and Composition

The population estimates were 1,933 and 533 moose for SA 5 and 7 respectively (Table 2). The precision of the overall population estimates were $\pm$ 26% for SA 5 and $\pm$ 22% for SA 7.

Moose densities were much higher (0.41 moose/km^2) in SA 5 than in SA 7 (0.17 moose/km^2). This apparent trend in decreasing densities from southeast to northwest was consistent with results from 1981 (Larsen 1982).

Adult females ($\geq$30 mo.) were the largest single cohort in both SAs ranging from 59% (SA 5) to 66% (SA 7) of the overall population estimate (Table 2). Adult males ($\geq$30 mo.) represented the next largest cohort with 27% in SA 5 and 29% in SA 7. Very few yearlings were observed, representing only 1-5% of the estimated population while calves ranged from 4-9% of the population (Table 2).

Table 1. Sampling Intensity by Stratum and Survey Area, November 1982.

Survey Area	Sample Units	STRATA				
		High	Medium	Low	Extra-Low	Total
5 CARCROSS/ TESLIN	No. of SU (%)	9 (3)	21 (6)	159 (48)	145 (43)	334 (100)
	SU surveyed (% sampled)	9 (100)	10 (48)	14 (9)	11 (8)	44 (13)
7 WHITE-HORSE NORTH	No. of SU (%)	6 (3)	22 (12)	129 (69)	29 (16)	186 (100)
	SU surveyed (% sampled)	6 (100)	7 (32)	28 (22)	5 (17)	46 (25)
COMBINED SURVEY AREAS	No of SU (%)	15 (3)	43 (8)	288 (55)	174 (34)	520 (100)
	SU surveyed (% sampled)	15 (100)	17 (40)	42 (15)	16 (9)	90 (17)

Table 2. Moose population abundance and composition by survey area, November 1982.

Area	Parameter	STRATUM High	Med.	Low	Extra-Low	Total (90% C.I.)
5 Carcross/ Teslin	A. Abundance					
	Estimated total moose	286	235	970	442	1933 ± 26%
	density (moose/km²)[a]	2.38	0.78	0.43	0.21	0.41
	B. Composition					
	Adult bulls (> 30 mo.)	76	90	225	138	529 ± 37%
	Adult cows (> 30 mo.)	189	130	650	180	1150 ± 28%
	Yearlings (18 mo.)[b]	8	4	24	55	91 ± 76%
	Calves	13	11	71	69	164 ± 41%
	Bulls/100 cows (> 30 mo.)	40	69	35	62	44 ± 40%
	Yearlings/100 cows	3	4	4	31	8 ± 76%
	Calves/100 cows	7	15	11	38	15 ± 30%
7 Whitehorse North	A. Abundance					
	Estimated total moose	118	166	229	20	533 ± 22%
	density (moose/km²)[a]	0.91	0.45	0.11	0.04	0.17
	B. Composition					
	Adult bulls (> 30 mo.)	45	50	55	7	157 ± 26%
	Adult cows (> 30 mo.)	67	113	165	7	352 ± 28%
	Yearlings (18 mo.)[b]	2	--	--	--	2[c]
	Calves	5	3	8	7	23 ± 63%
	Bulls/100 cows (> 30 mo.)	67	44	33	100	45 ± 33%
	Yearlings/100 cows					1[c]
	Calves/100 cows	6	3	5	100	6 ± 66%

[a] Density is calculated on habitable moose range.
[b] Yearling males are assumed to equal yearling females in numbers.
[c] The sample was too small to generate a confidence interval.

Calf:cow ratios of 15 calves/100 cows (> 30 months) and 6 calves/100 cows (> 30 months) were observed for SA 5 and SA 7 respectively. Bull: cow ratios were similar in both SAs with 46 bulls/100 cows in SA 5 and 45 bulls/100 cows in SA 7 (Table 2).

Distribution and Group Size

Moose in both SAs had a clumped distribution as reflected by the proportion of the moose population within each stratum (Fig. 2-3). In SA 5 and 7 the high and medium density strata comprised 9% and 15% of the habitable moose range respectively (Table 1) and accounted for 27% and 53% of the moose (Table 2).

In both SAs over 65% of the calves occurred in the low and extra-low strata, with cow-calf groups appearing to avoid high density areas (Table 3). Adult and yearling females occurred most frequently in the low stratum, in both SAs, whereas bulls were evenly distributed amongst the high, medium and low stratum in SA 7, but were strongly skewed towards the low and extra-low stratum in SA 5.

Table 3. Percent Frequency of of Age/Sex Classes by Stratum and Survey Area November 1982.

Survey Area	Stratum	Males	Females	Calves
Carcross/Teslin 5	High	14	16	8
	Medium	16	11	7
	Low	41	55	43
	Extra Low	29	18	42
	TOTAL:	100	100	100
Whitehorse North 7	High	29	19	18
	Medium	32	32	14
	Low	35	47	36
	Extra Low	4	2	32
	TOTAL:	100	100	100

Fig. 2 : Moose Distribution in the Teslin/Carcross Area (SA 5), November 1982.

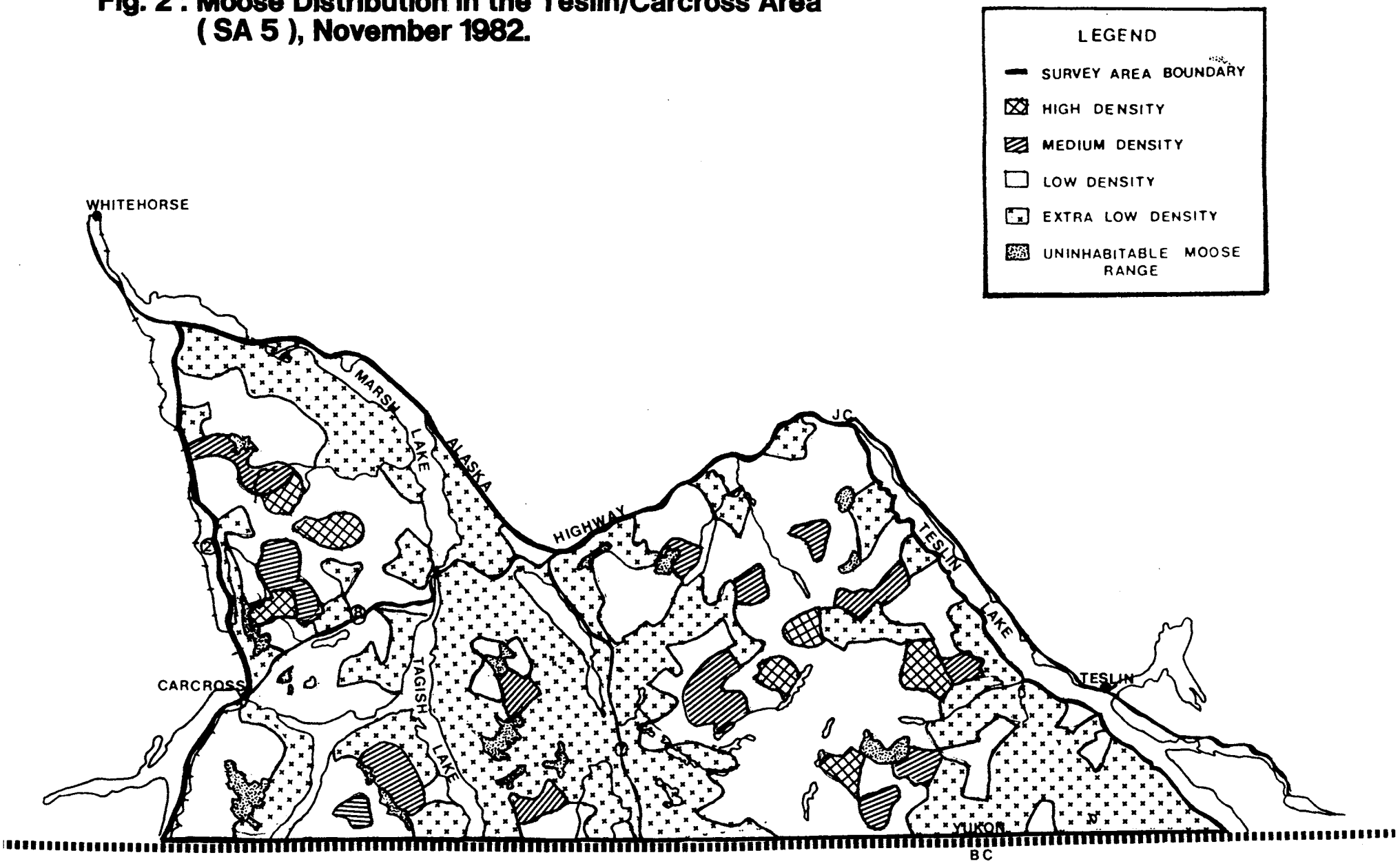
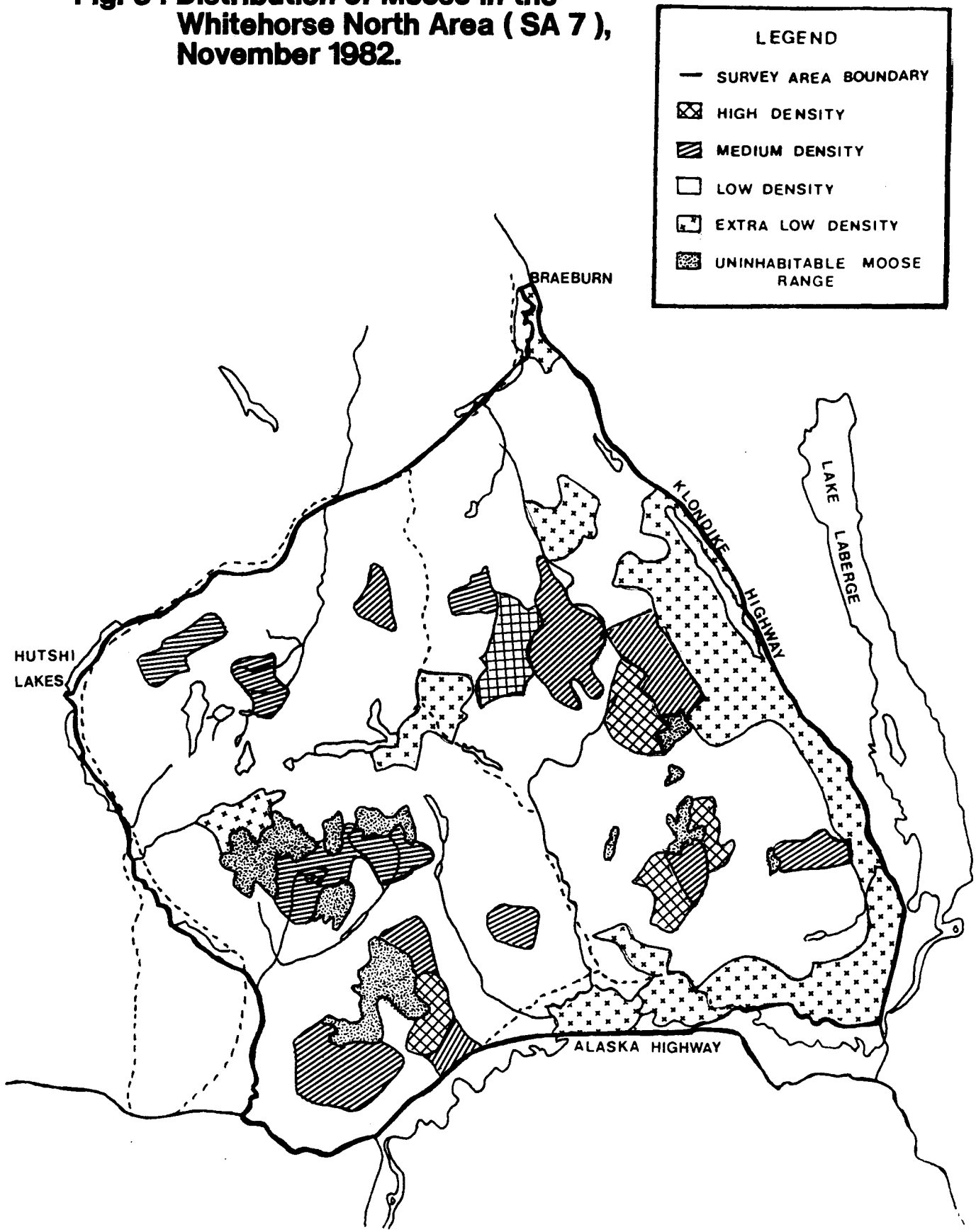


Fig. 3 : Distribution of Moose in the Whitehorse North Area (SA 7), November 1982.



The estimated mean group size for the SA 5 was 2.4 moose, whereas in SA 7, it was 1.8. Survey area 5 was surveyed first, in early November, followed by SA 7 in late November. This decrease in group size may be accounted for by the breakup of the post-rut aggregations.

Groups of 3 to 9 animals were most common in both areas with 45% and 40% of the estimated population occurring in this class in SA 5 and 7, respectively (Table 4). Calves primarily occurred in solitary cow/calf groups, 89% in SA 5 and 96% in SA 7. The largest group observed was 37 animals.

Table 4. Group Size by Composition of Moose by Survey Area, November 1982

	Teslin/Carcross (SA 5) Composition				Whitehorse North (SA 7) Composition			
	Bulls	Cows	Calves	Total	Bulls	Cows	Calves	Total
Solitary	93 (16%)	191 (16%)	0 (0%)	284 (15%)	62 (39%)	111 (32%)	0 (0%)	174 (33%)
Pair	185 (32%)	340 (28%)	147 (89%)	672 (35%)	16 (30%)	97 (27%)	21 (96%)	134 (25%)
3-9	273 (47%	593 (49%)	18 (11%)	884 (45%)	74 (47%)	140 (40%)	1 (4%)	215 (40-%)
10+	27 (5%)	80 (7%)	0 (0%)	107 (5%)	5 (3%)	5 (1%)	0 (0%)	10 (2%)
Total	578 (100%)	1204 (100%)	165 (100%)	1946 (100%)	158 (100%)	353 (100%)	22 (100%)	533 (100%)

Habitat

The shrub dominated vegetative class was most commonly occupied by all sex/age groups with 75% and 90% of the estimated population occurring in this type for SAs 5 and 7 respectively (Table 5a & b). Shrub communities made up 29% and 38% of SA 5 and 7 respectively. A chi-square test was performed on the use of vegetative cover by the entire moose population and proved to be significantly different then one would expect through random selection at the .05 level. This resulted in a rejection of the null hypothesis, that moose were distributed proportionately to the availability of vegetative cover. The shrub vegetative class was used more than expected according to the class's availability, whereas all of the other classes were used less. The herbaceous class was used the least followed by the decidous and coniferous classes.

The majority (>72%) of the moose population in both SAs was located between 1097 and 1524 m (Table 7). These elevations approximate a subalpine shrub zone which extends from treeline to non-vegetated talus slopes at higher elevations. The distribution of moose among aspect classes varied among the two SAs (Table 6). Moose were evenly distributed in SA 7 with the exception of low use of 91-180° slopes and relatively high use of flat areas. The moose population in SA 5 occurred least often on flat land and slopes of 0-90° and most often on slopes of 91-180° (Table 6).

The availability of the various elevation and aspect classes were not calculated. Consequently comparisons between availability and utilization were not attempted.

Table 5a. Percent Frequency of Vegetation Classes Used by the Total Population in the Southwest Yukon, 1982.

	STUDY AREA			
	Carcross/Teslin (SA 5)		Whitehorse North (SA 7)	
Vegetation Class	Used	Available	Used	Available
Shrub*	75	29	90	38
Conifer	19	55	7	44
Deciduous	5	11	2	12
Herbaceous	1	5	1	6

*Includes all shrub dominated communities (i.e. shrub, shrub-Krummholz).

Table 5b. Percent Frequency of Vegetation Classes Used by Moose Sex/Age Classes in the Southwest Yukon, 1982.

	Carcross/Teslin (SA 5)			Whitehorse North (SA 7)		
Vegetative	Bulls	Cows	Calves	Bulls	Cows	Calves
Shrub	80%	75%	56%	95%	90%	100%
Conifer	19%	18%	27%	1%	10%	-
Deciduous	-	6%	17%	-	-	-
Herbaceous	1%	1%	-	4%	-	-
Total	100%	100%	100%	100%	100%	100%

Table 6. Distribution (% frequency) of Moose among Habitat Classes by Survey Area, November 1982.

Habitat Parameter	Carcross/Teslin (SA 5)	Whitehorse North (Sa 7)
Elevation		
457 - 1096 m	28	17
1097 - 1401 m	54	73
1402 - 1524 m	18	10
	100%	100%
Aspect		
0 - 90° (N-E)	16	18
91 - 180° (E-S)	28	10
181 - 290° (S-W)	24	20
291 - 360° (W-N)	22	20
Flat	10	32
	100%	100%

Hunter Harvest

The 1982 harvest of 103 moose in SA 5 repreents 5% of the 1982 pre-hunt population, while the 6 mooe harvested in SA 7 represent only 1% (Table 7). The composition of the harvest in SA 7 was 91% males and 6% females, while in SA 5 it was 69% males and 29% females. These differences are partially a result of the larger female hunting season in SA 5 (30 days) compared to SA 7. (10 days).

Table 7. 1982 Moose Harvest by Survey Area.[a]

SA	HARVEST			1982 Post-hunt pop'n. estimate	1982 Pre-hunt pop'n. estimate	% of Pre-hunt pop'n. estimate
	Resi-dent	Resi-dent	Total			
Carcross/Teslin GMS (9-01, 9-02, 9-04 to 9-11)	2	101	103	1946	2049	5.0%
Whitehorse North GMS (5-48 to 5-50)	--	6	6	533	539	1.1%
TOTAL:	2	107	109	2479	2588	4.2%

[a] Does not include native harvest.

Cost

The survey cost, including personnel, aircraft rental, fuel and accommodation was $65,000.00 or $8.22/km^2 of habitable moose range. Rental of aircraft contributed most to overall cost (54% helicopter and 14% fixed wing), while labour (including food and lodging) added 30% to the total budget (Table 8). The price of fuel was incorporated into the aircraft rental cost.

Table 8. Cost Breakdown for the 1982 Moose Surveys.

Item	Cost
Fixed-wing (stratification)	$ 8,800.00
Helicopter (census)	34,200.00
Personnel: - already on staff	9,300.00
- newly hired	7,500.00
Food and lodging	2,500.00
Miscellaneous (vehicle cost, supplies, phone, etc.)	1,200.00
Total Cost	$63,500.00

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