ABUNDANCE AND DISTRIBUTION OF MOOSE IN THE NORTH SLAVE RIVER LOWLANDS, NWT, NOVEMBER, 1987 & 1988

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ABSTRACT

Random, stratified, block moose surveys were conducted in November 1987 and November 1988 in the northern portion of the Slave River Lowlands; the area hunted by the people of Fort Resolution, Northwest Territories. Each year a portion of the area was stratified based on reconnaissance flights in a fixed wing aircraft and then the areas of different densities were sampled using a helicopter. Overall we sampled 23% of the area. Based on 287 moose observed from the helicopters and a sightability correction factor of 1.173, an estimate of 903 ± 89 (S.E.) was obtained with a Coefficient of Variation of 0.10. The overall density of moose ranged from 0.08 to 0.45 moose per km^2 with an average of 0.13. The observed sex ratio was 96 bulls:100 cows, while the calf ratio was 69 calves:100 cows and the twinning rate was 34%. We also observed 6 wolves, 122 bison, 10 foxes and 1 snowy owl. From this study we conclude that although the density of moose in the area is low compared to other northern areas, there is no danger of extirpation. The exact factors causing this low density are not known.

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INTRODUCTION

As a source of red meat, moose (*Alces alces*) are one of the most important wildlife species available to the people living south of the tree line in the Northwest Territories (Treseder and Graf 1985). Many parts of the Fort Smith and Inuvik regions have reasonable access to barren-ground caribou (*Rangifer tarandus groenlandicus*), but this is not so in the South Slave and Deh Cho areas. In these areas the annual fall moose hunt is considered one of the major events of the year and draws people back to the land whether they are employed in either the traditional or wage economies. In the South Slave area, the caribou do not come as close now to the communities as they used to before the notable fire seasons of the late 1970s and early 1980s, although 1990 saw the greatest harvest by Fort Resolution people in their hunting area for at least a decade. For those full-time trappers who spend several months away from the community, the moose is their main source of meat during the winter.

The Slave River Lowlands (SRL) was identified in 1983 by Hawley (pers. comm.) as an area where moose were considered moderately abundant for the Northwest Territories, but were probably being overharvested (Figure 1). Based on the above statement and the lack of good harvest data, Treseder and Graf (1985), in reviewing the status of moose in the Northwest Territories, agreed that the area should be surveyed as soon as possible to evaluate the status of the population. The SRL is hunted by two different communities, Fort Smith in the south and Fort Resolution in north. The total area would be too large to cover effectively in one survey; therefore, the south SRL was surveyed in 1986 (Graf and Case 1991) and the north SRL was surveyed in 1987 and 1988 (This report). Our objectives were to obtain estimates of abundance, sex and age ratios, calf:cow ratios, density and distribution.

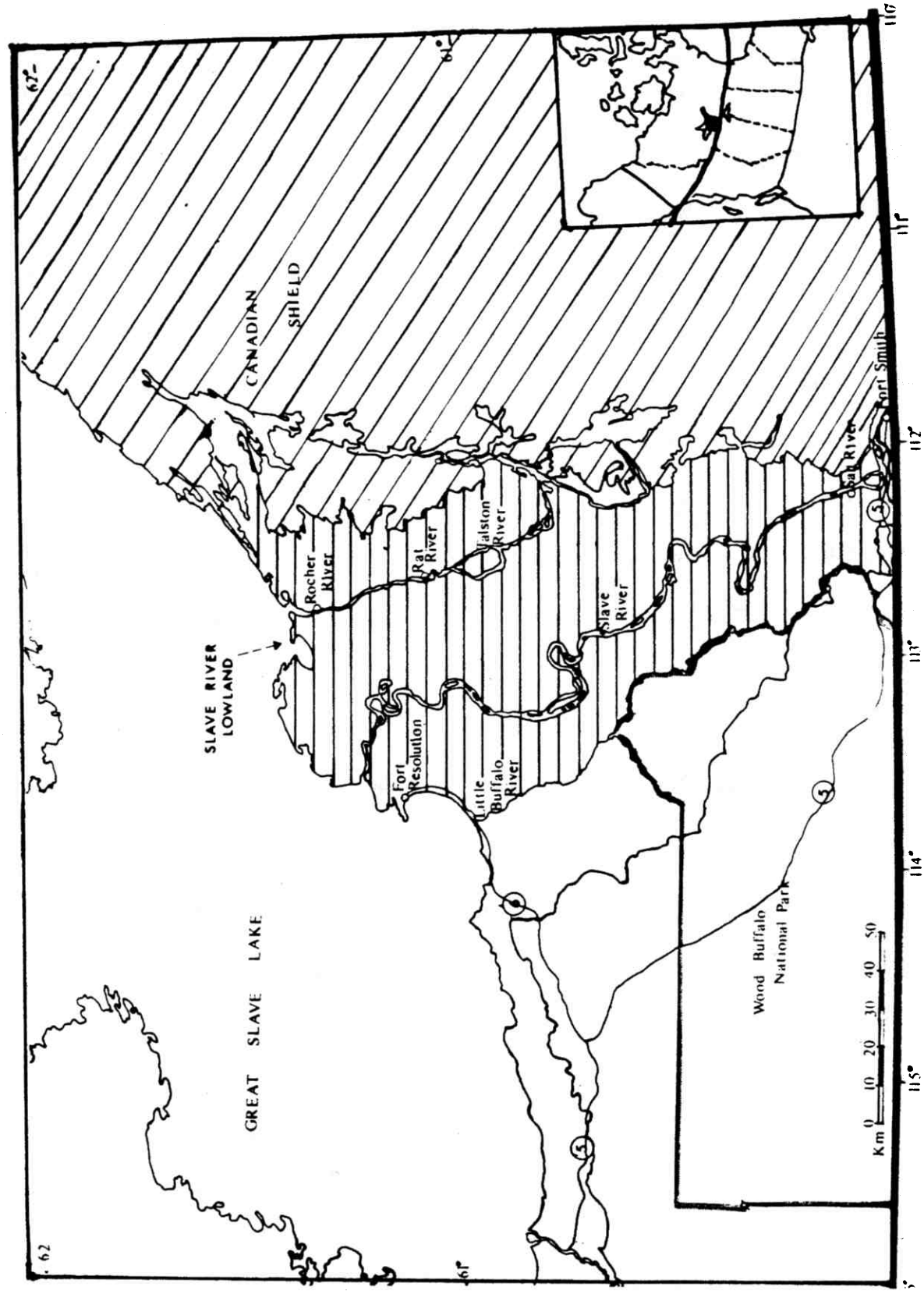

Figure 1. Location of the South Slave area and the Slave River Lowlands.

STUDY AREA

In terms of vegetation, the SRL is comparatively productive for the NWT. It encompasses a ribbon of alluvial soil, 40 to 60 km wide which straddles the Slave River from Fort Fitzgerald in northern Alberta to the delta at Fort Resolution on Great Slave Lake (Figure 1) (Day 1972). Wood Buffalo National Park and the Little Buffalo River border the SRL on the west, while the rocks of the Canadian Shield form an easily recognizable border on the east. The alluvial flats of the SRL are covered by meadows, shrublands and forest. Many tree species are found in the lowlands including white spruce (*Picea glauca*), black spruce (*P. mariana*), balsam poplar (*Populus balsamifera*), trembling aspen (*P. tremuloides*), jack pine (*Pinus banksiana*), lodgepole pine (*P. contorta*) and tamarack (*Larix laricina*) (Rowe 1972). Willows (*Salix* spp.) dominate the shrublands, while the wet and dry meadows support many different species of grasses and sedges (Rowe 1972). The lowlands are inhabited by one other large ungulate, the hybrid wood/plains bison (*Bison bison athabascae/bison*), and have both wolves (*Canis lupus*) and black bears (*Ursus americanus*) as predators. Sightings of white-tailed deer (*Odocoeleus virginianus*) and coyote (*C. latrans*) are common. In the fall of 1990 barren-ground caribou were observed at the northern end of the SRL, and were harvested at the Rocher River settlement for the first time in many years (J. MacPherson pers. comm.).

The 1987 and 1988 study area was bounded on the north by Great Slave Lake, on the west by the Little Buffalo River (the Park boundary), on the south by Point Brule on the Slave River and on the east by the Deskenatlata Lakes (Figure 1). In 1987 the area from Point Brule north to the Rat River community was surveyed and in 1988 the area north from the Rat River community to the Great Slave Lake was surveyed.

METHODS

The survey area was divided into Sample Units (SU's) of approximately 30 km^2 on a 1:50,000 scale map. The divisions were based on streams, rivers and roads and other recognizable topographical features. This and most other survey design features are based on Gasaway et al. (1986).

Reconnaissance flights were conducted in a Cessna 210 (Loon Air) in order to determine the relative densities of moose in the area (Figure 1). In 1987 they were conducted between 22 and 29 November, while in 1988 they were conducted from 15 to 20 November. These initial surveys were flown at an altitude of 100-150m above ground level (agl) at a speed of approximately 130 kph. In both the fixed-wing aircraft and the helicopters used subsequently, the navigator (senior author) was seated in a front seat while two observers were seated in the rear seats. We flew transects in an east/west direction approximately 4 km apart in an attempt to cross each SU twice. Each time a moose was observed we circled the animal to see whether or not it was accompanied by other moose and recorded sex and age data. We also recorded moose tracks and other animal sightings.

The survey areas were stratified into zero, low, medium and high density areas based on the above reconnaissance surveys (Figure 2). The zero areas were removed from further consideration. Using Bell 206B JetRanger helicopters (Aero Arctic in 1987 and Canadian Territorial in 1988), we counted all of the moose in selected SU's. All of the high density SU's were searched while in the medium and low density strata, SU's were randomly selected using

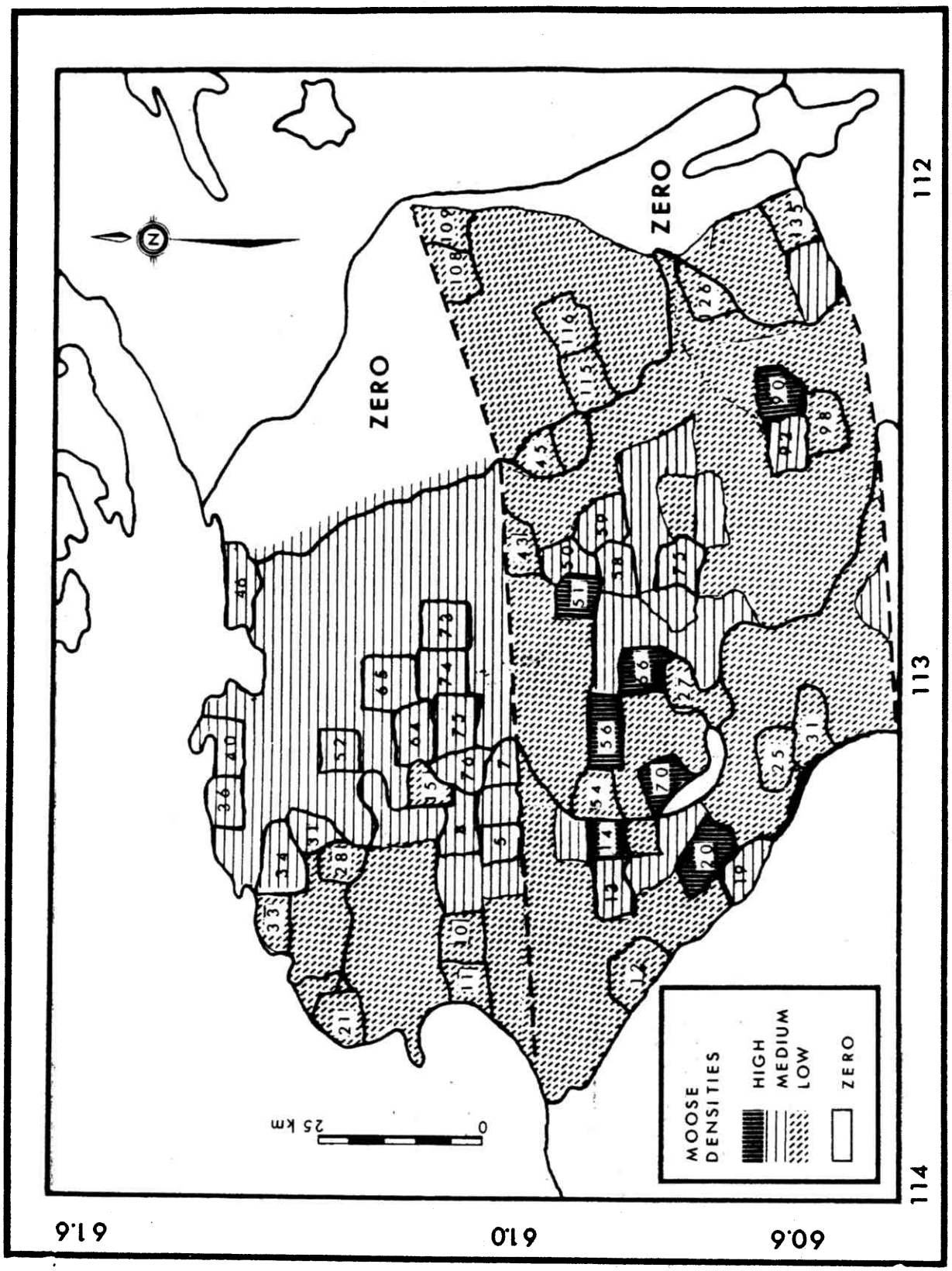

Figure 2. Stratification of the survey area and the Sample Units surveyed.

random numbers generated on an Apple computer. Once we began searching low and medium density areas, we would do an evening check of the precision of our estimate by analyzing the data on a portable Apple computer using a program based on Jolly's method 2 for unequal sample sizes (Jolly 1969). In this way we were able to determine the current Coefficient of Variation (CV). We then added our best guess of the next day's results to predict its effect on the CV. This allowed us to decide whether to expend further effort on medium or low density areas and to do a cost/benefit analysis as to whether further flying was necessary at all.

During the helicopter surveys, we would completely search a particular SU for all of the moose and other wildlife in it. This was usually accomplished by flying back and forth across the SU so that no portion was missed. When a moose was located, the animal would be circled to check for other animals and to determine its sex and age. We determined sex from antlers and vulva patches, with some reference to facial colours (Oswald 1982). Yearling bulls were identified on the basis of antler development and size (Oswald 1982). Certain broad habitat characteristics of the area in which the animals were found were also recorded and the location recorded on a 1:50,000 map.

On 24 March 1987 and on 8 - 9 March 1988 we conducted classification flights by helicopter to age and sex all moose we were able to find in the south and mid-SRL. We covered some of both the high and medium density areas, as well as all areas passed over during the ferry flights. Sex was determined by examining the vulva patch and face colour, while age was determined by size and behaviour (Oswald 1982).

RESULTS

During the 1987 survey of the mid-SRL, a total of 19.4 hours of flying time was used for reconnaissance in the fixed-wing aircraft and then a further 46.5 hours in the helicopter counting the moose within the chosen sample units (including all ferry times). The survey took from 22 November to 9 December including seven days lost to weather and other problems. During the survey the daytime temperatures ranged from -5 to -17°C. The winds were generally light, although there were several days when they became moderate. One major problem which increased the helicopter time was the difficulty in picking out the SU boundaries. Many of the creeks, etc. decided upon as boundaries in the office were almost unrecognizable in this area which had few distinctive topographical features.

The northern portion of the study area in 1988 required 15.5 hours for the reconnaissance and 21.7 hours in the helicopter (includes all ferry times). The survey took from 15 to 27 November, including five days lost to bad weather. During the survey the daytime temperatures ranged between -7 and -28°C. Cloud and fog produced flat light for about one-half of the survey making visibility difficult, although the tree cover was never too thick.

Based on the reconnaissance, we stratified the whole study area into zero, low, medium and high density moose areas. The zero area included the eastern portion of the study area on the Canadian Shield (Figure 2 and Table 1). We counted all the moose in a total of 49 SU's (23%) and calculated an estimate of 903 ± 89 (S.E.) with a CV of 0.10 (Table 1). Densities ranged from 0.08 to 0.45 moose per km^2 in the low and high density areas, respectively, and averaged 0.16 moose per km^2 for the 6,649 km^2 study area (excluding the zero areas). We found that

Table 1. Characteristics of the north Slave River Lowlands moose population, November 1987 and 1988.

Characteristic	Stratum			Totals[a]
	High	Medium	Low	
Area (km^2)	276.6	257.4	3796.8	6,648.8
# of SU's	8	83	120	211
# of SU's sampled	8	22	19	49
% of SU's sampled	100	26.5	15.8	23.2
Search Int. (min/km^2)	1.6	1.5	1.4	1.5
Pop'n Est.	105	516	282	903
Variance[b]	0	3,355	4,658	7,993.2
Std. Error[b]	0	54.8	68.2	89.4
Coeff. of Var.[b]	0	0.11	0.24	0.10
Density	0.45	0.23	0.08	0.16
Bulls:100 cows[c]	97.4	83.9	142.9	96.3
Calves:100 cows[c]	78.9	60.7	78.6	69.4
Twinning Rate[d] (sets of twins)	42.9 (9)	25.9 (7)	37.5 (3)	33.9 (19)

[a] Does not include areas stratified as "zero" (1,610 km^2, 54 SU's).

[b] Not adjusted for sightability.

[c] Based on animals observed, not estimated.

[d] Proportion of cows with twins to total cows with calfs.

52% of the adult cows were accompanied by calves. The ratio of calves to cows averaged 69:100 for the whole area with a twinning rate of 34% (the proportion of cows with twins compared to the total number of cows with calves). The ratio of bulls (including yearlings) to cows was 96:100 (Table 1). If one excludes yearlings the ratio was 88:100.

We also observed a total of six wolves, four of which were feeding on a dead moose which we presume they pulled down. We saw 122 bison, which included a red calf (newborn) on 2 December 1987. We also observed 2 bison calves of normal size and 4-5 yearling bison. Other wildlife sightings included 1 snowy owl (*Nyctea scandiaca*) and 10 foxes (*Vulpes vulpes*).

DISCUSSION

In both years the visibility was adequate, but often the light was flat making tracks and certain topographical features difficult to pick out. Snow cover was complete and of sufficient depth to provide contrast as much of the ground vegetation and low willows were covered. Ice fog and cloud associated with the open water from the rapids in the Slave River and from open water on Great Slave Lake caused much of the flat light and most of the 12 weather days on which we could not fly safely.

The distribution of moose provided some strong contrasts. Much of the eastern portion of the study area, especially that part located on the rocky Canadian Shield was stratified as zero moose density, as occurred in the southern SRL in 1986 (Graf and Case 1991). Local hunters and trappers have reported moose in these zero areas at other times of the year, so perhaps seasonal movements are responsible for the extreme, low densities we have found in early winter on the eastern edge of the lowlands.

The obvious correlation between high moose densities and areas which were recently burned did not occur in this study area as it had in the southern SRL (Graf and Case 1991). We found high density areas only in the 1987 survey and none in the northern areas in 1988. A more detailed comparison of densities to fire history and habitat types in all of the Slave River Lowlands is being conducted.

Our search intensity of 1.5 minutes per km^2 is within the range recommended by Gasaway et al. (1986) and is higher than that used in 1986 in the southern SRL (Graf and Case 1991). This was likely caused by the denser forests found in the northern and mid-portions of the SRL.

The density of moose in this study area (0.16 moose/km^2), is similar to densities found

elsewhere in the NWT, but generally lower than other northern areas (Table 2). We have used the sightability correction factor (SCF) of 1.173 determined to be suitable for areas of low moose density in Graf and Case (1991).

The sex and age composition of the observed moose did not vary with density as had occurred in the south SRL. Although the 96 bulls:100 cows is the same as that found in the south, the highest ratio was found in the low density area rather than in the high density area. Similarly, the almost identical calf:cow ratios (69:100 in 1987/88 and 64:100 in 1986) were in complete contrast as this study found the lowest calf crop in the medium density areas while in the 1986 survey the medium density areas provided the highest calf:cow ratios (Graf and Case 1991). There seems to be no trend in the data for the SRL or the Mackenzie River areas (Jingfors et al. 1987).

As was found in the southern SRL, the calf:cow ratios, which provide an combined index of calf production and calf survival to early winter, were found to be equal to or higher than most other northern populations (Table 2). These data would suggest that low nutritional levels and/or high summer and early winter calf mortality may not be the cause of the observed low densities.

If we are not finding high mortality in the most vulnerable cohort, those moose less than a year old, this would suggest that high adult mortality is also probably not occurring. This assumption is important in our analysis because, if adults were disappearing at the same rate as calves, our monitoring technique of looking at calf:cow ratios would not detect any changes in mortality; even very dramatic ones. Only an observed change in density would provide such information.

Table 2. Comparison of moose population characteristics in the Northwest Territories and adjacent areas.

Area	Time of Survey	Density (moose/km^2)	Bulls: 100 Cows	Calves: 100 Cows	Twinning Rate (%)	Source
Northwest Territories:						
North SRL	Nov (87&88)	0.16	96	69	34	This study
South SRL	Nov (86)	0.09	96	67	72	Hawley pers. comm.
SRL (all)[b]	Dec (81)	0.05	120	64	?	Graf and Case 1991
Norman Wells	Nov (84)	0.15	76	44	10	Jingfors et al 1987
Ft. Good Hope	Nov (84)	0.13	79	61	18	Jingfors et al 1987
Liard Valley	Nov (85)	0.12	100	81	40	Case pers. obs.
Liard Valley	Feb (79)	0.13	?	31	?	Donaldson and Fleck 1980
Alberta:						
Northeast	Jan (76)	0.22	35	25[c]	0	Hauge and Keith 1981
Yukon:						
Francis Lake	Nov (87)	0.19	55	69	5	Jingfors 1988
Liard East	Oct-Dec	0.14	79	51	13	Jingfors and Markel 1987
Alaska:						
Tanana Flats	Nov (78)[d]	0.18	?	61[c]	14	Gasaway et al 1983
Tanana Flats	Nov (82)[e]	0.44	36	40[c]	?	Jennings 1985

[a] The proportion of cows with twins to total cows with calves.
[b] Based on a sample of 70 moose.
[c] Based on cows≥ 30 months and, thus, excludes yearling cows.
[d] Before wolf removal.
[e] After wolf removal.

As far as management concerns and suggestions, we would like to duplicate the exact text composed for the southern SRL (Graf and Case 1991: 21), as follows:

> Hunting mortality can often be a major cause of low moose densities (Hauge and Keith 1981, Gasaway et al. 1983). Unfortunately, we have insufficient harvest data available on this population to reach a conclusion, although several current hunting practices are worth examining as they relate to impact. There are no restrictions on the sex or age of moose which may be harvested. Although many bulls are probably taken early in the rut, as the rut progresses more hunters begin to choose cows in order to avoid the comparatively unpalatable meat of the bull in full rut. By the end of the rut the bulls have lost much of their fat and the cows would still seem to be preferred. These practices are possibly being reflected in the almost equal sex ratio found in this population of moose (96 bulls:100 cows). The taking of more bulls rather than cows would likely result in a higher density of moose.

There are no immediate management concerns with the "north" Slave River Lowlands moose population. Hawley (pers. comm.) may have been correct in suggesting that the moose are being held at low densities because of a high harvest and the kill still may be too heavy for the population to increase. We cannot support or refute the hypothesis that the harvest is too heavy or directed towards the inappropriate age/sex groups because the harvest data are not available. The moose are being totally hunted out only in the immediate vicinity of the community - a situation one would expect to find throughout the Northwest Territories. In the study area, the moose are not in danger of being extirpated; however the densities in some parts of the study area could probably be increased if the users wished to do so.

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