POPULATION SIZE AND COMPOSITION OF MOOSE IN THE FORT NORMAN AREA, NWT, NOVEMBER 1993

NORM MACLEAN[1]

DEPARTMENT OF RENEWABLE RESOURCES

GOVERNMENT OF THE NORTHWEST TERRITORIES

NORMAN WELLS, NWT

1994

Northwest Territories Renewable Resources

Manuscript Report No. 80

THE CONTENTS OF THIS PAPER
ARE THE SOLE RESPONSIBILITY OF THE AUTHOR

[1]CURRENT ADDRESS: GENERAL DELIVERY, MINISTRY OF ENVIRONMENT, LANDS, AND PARKS, DEASE LAKE, B.C. V0C 1L0

ABSTRACT

A stratified block survey for moose (*Alces alces andersoni*) in the Fort Norman area was conducted during 16 - 24 November, 1993. The population estimate was 203 ± 41 (90 % C.I.) moose. The coefficient of variation for the estimate was 12 %. There were 60 calves/100 cows(females ≥ 2 year old), 46 yearlings/100 cows, and 100 bulls(males ≥ 2 year old)/ 100 cows. Eight percent (1/13)of cows with calves were accompanied by twins, and the mean group size was 2.2 ± 1.1. The density was 0.08 moose/ km^2. The estimated 17 % average annual harvest has kept the population at a low density . Future management for this population should focus on determining the sustainable harvest level after more rigorous harvest information is obtained, and determine the influence of a recent large contiguous burned area.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Introduction

Moose (*Alces alces andersoni*) are an economically and culturally important species to communities within the forested portions of the Northwest Territories where caribou (*Rangifer tarandus*) are only available in the winter. In the Fort Norman area of the Mackenzie River Valley, approximately 40 - 50 moose are harvested annually (Marion pers. comm.). However, despite the importance of moose to the Sahtu area, information about the region's moose populations was poor until the mid 1980's (Treseder and Graf 1985) when oil pipeline construction in the Mackenzie Valley prompted the first systematic moose surveys to occur. Jingfors et al.(1987) reported low density moose populations with good productivity in the Norman Wells and Fort Good Hope areas in November 1984. Latour (1992) and Maclean (in prep.) resurveyed the Norman Wells and Fort Good Hope areas in 1989 and 1992 and reported similar population estimates to those of Jingfors et al. (1987), and they found continued high productivity.

The objectives of this survey were to obtain a moose population estimate, productivity data, and population composition for the Fort Norman area.

Study Area

The study area encompassed 2462.7 km^2 and its boundaries were determined by consultation with the Fort Norman Hunters and Trapper's Association (HTA) on the moose hunting patterns of people from Fort Norman, and from the habitat descriptions by Prescott et al. (1973; Fig. 1). The Fort Norman HTA felt that the areas to be surveyed should include the area north of the traditional hunting camps at Willow Lake, and the two main river drainages the community use to primarily hunt moose, and woodland caribou (*Rangifer tarandus caribou*). The study area is mainly black spruce (*Picea mariana*) boreal forest with white spruce (*Picea glauca*), balsam poplar (*Populus balsamifera*), trembling aspen (*Populus tremuloides*), and white birch (*Betula papyrifera*) on well drained sites. Willow (*Salix* spp.) and alder (*Alnus* spp.) occur in thick stands along watercourses, and along the Mackenzie River shoreline and islands in the Mackenzie River. Various aged burned areas from wildfires add to the mosaic landscape of the study area. Numerous small lakes, ponds, and bogs occur in upland areas. The mean annual temperature is +8°C and mean daily temperatures range between -34°C (January) and +22°C (July). Total annual precipitation averages 200mm of rain, and 1200mm of snow.

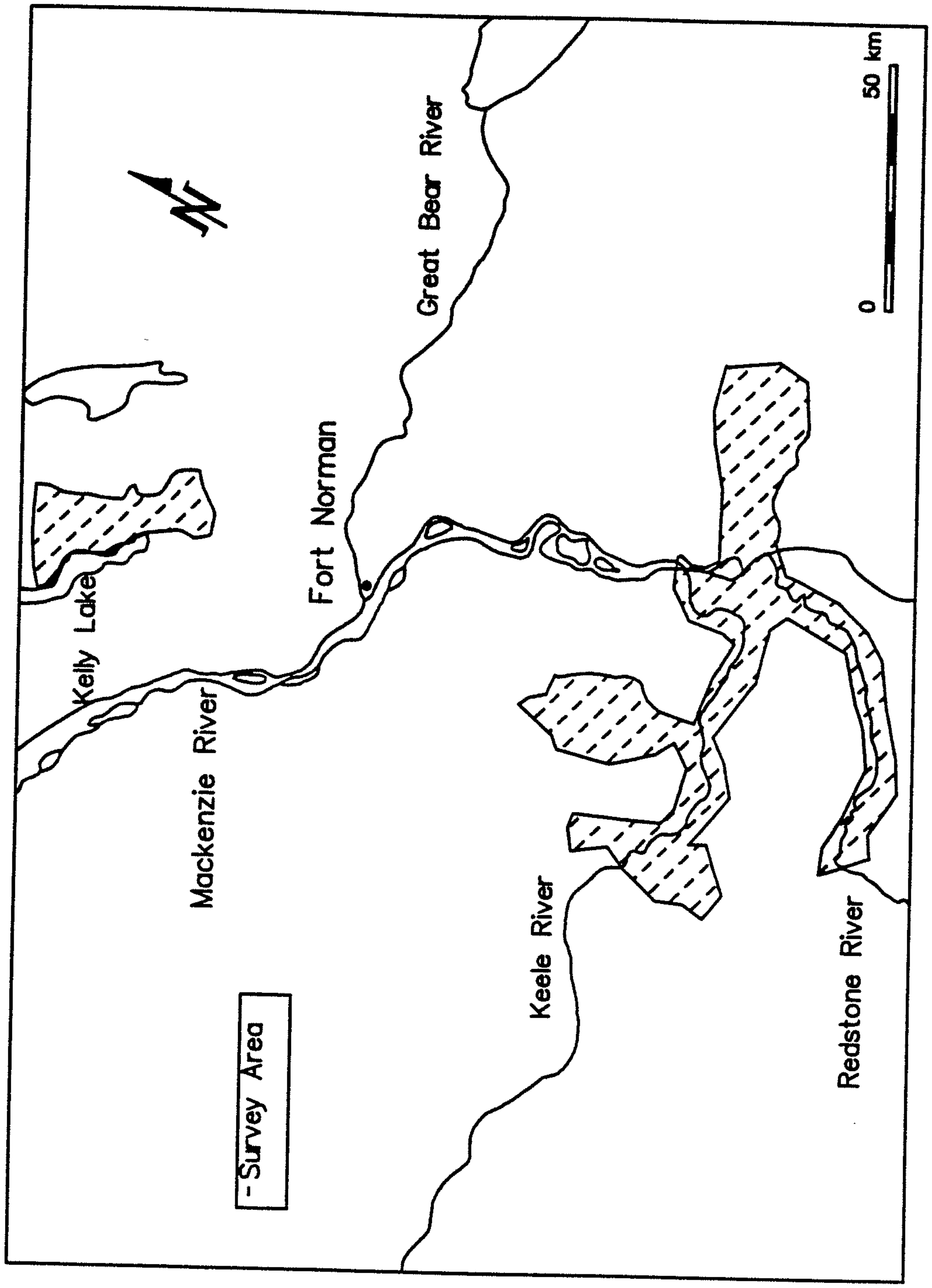

Figure 1. Fort Norman moose survey area.

Methods

The survey used the stratified block survey design designed by Gasaway et al. (1981, 1986). Sampling units were ca. 20 km^2 and were delineated by natural features wherever possible (Gasaway et al. 1986).

Reconnaissance flights to stratify the study area according to moose density were flown in a Cessna 206 with two observers in the rear seats, and a navigator/data recorder in the front. The aircraft flew at 100m above ground level and 160 kph. Each sampling unit was flown across twice and moose locations or tracks were recorded directly onto 1:50,000 topographic maps. After the reconnaissance survey was completed the sampling units were then stratified into high, medium, and low density strata using the criteria of Jingfors et al. (1987) and Latour (1992) (> 9 moose or tracks = high; 3-9 moose or tracks = medium; < 3 moose or tracks = low).

As a result of the stratification, no high density survey units were found so a randomly selected number of medium and low density units were surveyed at 100% coverage by the same observers in a Eurocopter AS 350B ("A-star") helicopter (Gasaway et al. 1986). Survey transects were spaced 0.5 km apart perpendicular to the long axis of each unit. The sex and age of moose was determined by presence and size of antlers, and by body size. An assumed 1:1 ratio of yearling bulls to yearling cows was used to estimate the number of yearling females (Jingfors et al. 1987; Latour 1992).

The location of each moose was described according to the following habitat categories: stunted black spruce forest, spruce forest, creek bottom, burn, willow/alder, and cutline. These habitat categories are the same as those of Latour (1992) for the Norman Wells moose survey in 1989 and MacLean (in prep.) for the Fort Good Hope survey in 1992.

A sightability correction factor was not determined because moose densities in the Sahtu area (range 0.13 moose/ km^2 - 0.17 moose/ km^2) were less than the recommended 0.36 moose/ km^2 (Gasaway et al. 1986).

The computer program MOOSEPOP was used for analysis. D. Reed of the Alaska Department of Fish and Game developed the program which utilizes the methods of Gasaway et al. (1986).

Results

Survey Characteristics

The stratification reconnaissance was conducted during 16-18 November and the block survey was conducted during 20-24 November 1993. Conditions were generally overcast with good visibility.

The snow cover was complete over the study area prior to the survey. Snow fell on several days of the survey, usually at night, and heavy snow prevented flying for 1 day. The daily temperature ranged from -30°C to -4°C.

A total of 124 sampling units comprised the study area. The reconnaissance flight required approximately 12 hours of flight time and the block survey required a total of 29 hours of flight time. Thirty six percent of the study area was covered, and the sampling intensity varied for the two strata (Table 1). The search intensity was significantly different between the two strata (Table 1; Anova, P<0.05).

Table 1. Search intensity and sampling effort during the Fort Norman area moose survey, November 1993.

	Stratum		
	Medium	Low	Totals
No. of sample units (s.u.)	17	107	124
No. of sample units sampled	14	31	45
% of s.u. sampled	82	29	36
Search intensity (min/km^2± s.d.)	0.88±0.2	0.76±0.1	0.80±0.2

Population Characteristics and Distribution

The population estimate for moose within the study area was 203 ± 41 (90% C.I.) moose and densities were 0.06 moose/km^2 in the low density stratum and 0.19 moose/km^2 in the medium density stratum (Table 2). The overall density was 0.08 moose/km^2. The proportion of cows (females $\geq$ 2 year old) in the two strata was different, with the higher proportion of cows in the low density stratum (Table 2). The proportion of calves was also higher in the low density stratum. Bulls (males $\geq$ 2 year old) were a greater proportion of the medium density strata. Overall there were 100 bulls/ 100 cows, 46 yearlings/ 100 cows, and 60 calves/ 100 cows. Eight percent (1/13) of cows with calves were accompanied by twins.

Table 2. Population estimate, densities, and sex and age ratios from the Fort Norman area moose survey, November 1993.

	Stratum		
	Medium	Low	Total
Population Estimate	66	137	203 ± 41
Variation (%)	10	17	12
Density	0.19	0.06	0.08
Population Estimate			
Bulls	40 (61%)	48 (35%)	88 ± 20
Cows	17 (26%)	55 (40%)	72 ± 21
Calves	8 (12%)	34 (25%)	43 ± 16
Ratio (/100 cows)			
Bulls (≥2 years)	206	69	100
Yearlings	70	36	46
Calves	47	62	60

The mean group size of 2.2 ± 1.11 did not differ significantly between the 2 strata (Duncan's multiple range test, $P > 0.05$). Moose were seen more frequently in burns (53 %) than in any other habitat type (Figure 2). Group size and strata were tested

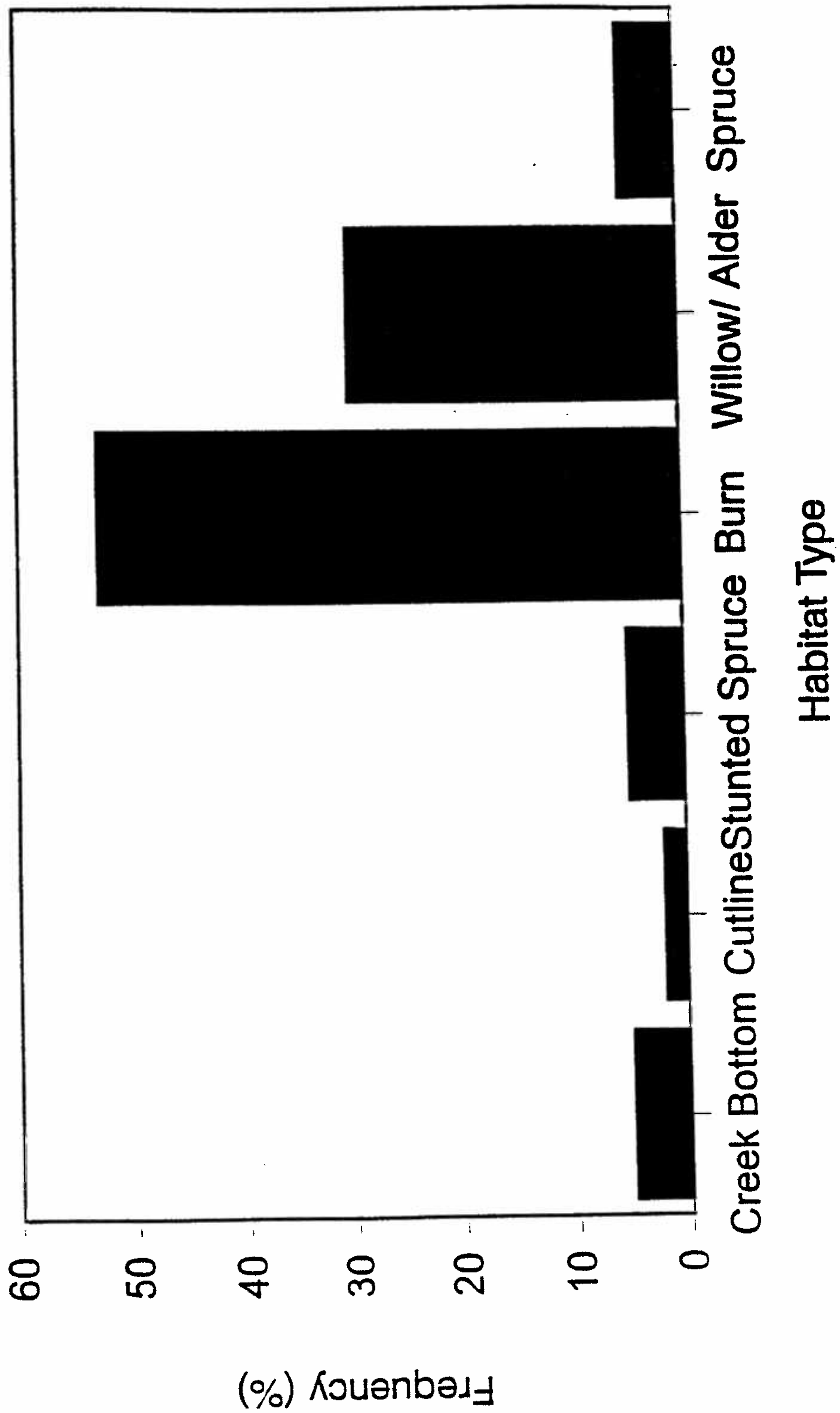

Figure 2. Frequency of moose locations by habitat type.

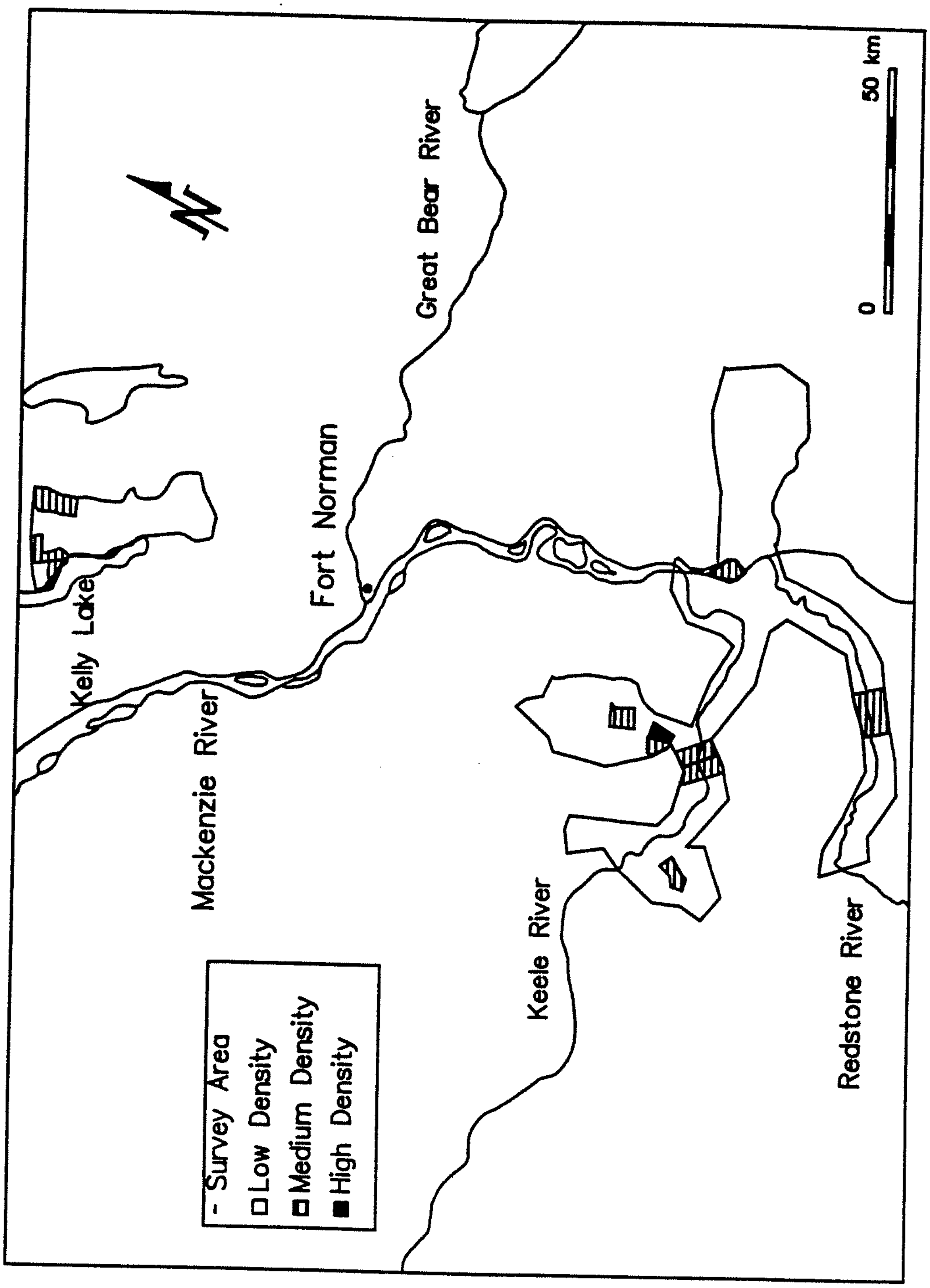

Figure 3. Density of moose in the Fort Norman survey area after the block survey was flown.

separately against the habitat types and were not significantly different (Likelihood Ratio G^2, $P > 0.05$).

Moose primarily occurred in the various aged burns or in upland areas of river drainages (Figure 3). Few moose were observed outside burns and upland areas.

Discussion

Observability and Classification

The overall search intensity for this survey (0.8 min/km²) was lower than other stratified block surveys for moose in the northern boreal forest (1.3 min/km² - 2.0 min/km²; Jingfors et al. 1987; Latour 1992). The search intensity in this survey was reduced because of the A-star that was used instead of the Bell 206B helicopter that was used in previous moose surveys in the Sahtu (Jingfors et al. 1987; Latour 1992; Maclean in prep.). The A-star helicopter carries a greater payload, can fly longer between fuelling, and can maintain consistent groundspeed better than the 206B. These factors reduce search intensity without lowering the probability of observing moose.

The complete snow cover resulted in good observability of moose. The chance of misclassification was low because all bulls had retained their antlers.

Population Characteristics

The density of moose in the Fort Norman area was lower than elsewhere in the Sahtu area (0.13 - 0.17 moose/km^2). Graf (1992) reported moose densities in the NWT range from 0.03 to 0.15 moose/km^2 (all surveys were stratified block design). Therefore, the moose density in the Fort Norman area is at the low end of the range for the NWT. A possible reason for the low population and density estimates is a large low moose density area of climax black spruce forest that comprised the eastern portion of the survey area across from the mouths of the Keele and Redstone Rivers. When this region is removed from the analysis the moose density increases to 0.10 moose/km^2. Other possible reasons for the low estimates are discussed below.

The population composition was similar to that reported elsewhere in the Sahtu and NWT (Jingfors et al. 1987; Graf 1992; Latour 1992; Maclean in prep.). Graf (1992) suggested that moose populations in the NWT have high productivity and early winter survival but are characterised by low densities. Graf (1992) does not suggest the reason for the low densities, but indicates the need for harvest studies, better information on predation, and winter nutritional stresses to better understand moose population dynamics within the NWT. Stenhouse et al. (in prep.) found high productivity and high calf survivorship for moose in the Norman Wells area. They also report that these parameters are comparable to moose population in other northern boreal areas but are lower than southern boreal areas.

Distribution

The high and medium moose densities were associated with burns and upland river drainages (Figure 3). A possible explanation for this distribution is the thermal inversion that occurred during the survey. The temperature at ca. 500 - 675 m agl was 10 to 15 degrees warmer than at ground level. The inversion lasted for 4 days during the block survey (November 20 - 24), and moose were found at upland elevations during that time. It is possible moose stayed at higher elevations or farther upstream on the river drainages surveyed and therefore were outside the study area.

Harvest Levels and Management Concerns

The estimated annual moose harvest for the Fort Norman area ranges from 40 to 50 moose with approximately 75 % (30 - 37 moose) harvested within the southern survey area. Harvesting occurs primarily in the autumn, but opportunistic harvesting occurs throughout the year (Labine pers. comm.; Marion pers. comm.). The percent of the population harvested annually ranges from 12 % to 23% (annual mean = 17 %). This level of harvest alone would keep the Fort Norman moose population at a low density in spite of high productivity. However, collection of harvest statistics for this population is still not formalized and our current knowledge is still based on estimates. With the implementation of the Sahtu Land Claim, which requires harvest studies to occur for each community, a better understanding of harvest pressure on the population can be determined. Such information is required to ensure current and future harvest levels are within suitable limits for this population.

Forest fires have resulted in a mosaic of forest types of different ages in the Sahtu. In other Sahtu moose surveys, burned areas and early succession areas were selected by moose (Jingfors et al. 1987; Latour 1992; MacLean in prep.). In this survey burned and early succession areas were also favoured by moose (Figure 3). During the summer of 1994, a large contiguous area of climax boreal forest was burned, including the eastern portion of the southern study area. Moose will move into burns after several years, and select them over other habitat types (Gasaway et al. 1988). The burned areas will have higher quantity and quality of preferred moose browse species than other mature forest stands (Davis and Franzman 1979). It is possible, therefore that a population increase could occur as a result of this new large burn within the next several years.

Management of the Fort Norman area moose population should focus on obtaining better harvest information and on determining the impact of the new large burn on the moose population. The next moose survey should occur in 1998 to determine the population status with the current harvest level; the burn would have aged enough to indicate its impact on the population; and the community harvest studies should be near completion.

Personal Communication

Labine, M. Renewable Resource Officer, Fort Liard, NWT, April 1991.

Marion, L. Renewable Resource Officer, Fort Norman, NWT, September 1994.

Acknowledgements

I would like to thank all the observers for their assistance during the survey. I would like to thank the Fort Norman Hunters and Trapper's Association for their assistance in determining the study area, and organizing people interested in being observers for this survey. I would like to thank Louis Marion (Renewable Resources Officer, Fort Norman) for his valuable assistance and hospitality. Ursus Aviation and Canadian Helicopters provided proficient service with their aircraft. I would like to thank Richard Popko and Alasdair Veitch for reviewing this report.

Literature Cited

Davis J.L. and A.W. Franzmann. 1979. Fire-moose-caribou interrelationship: a review and assessment. Alces. 15:80-118.

Gasaway W., S. Dubois, and S. Harbo. 1981. Estimating moose abundance and composition. Alaska Dept. of Fish and Game, Fairbanks.

Gasaway W., S. Dubois, D. Reed, and S. Harbo. 1986. Estimating moose population parameters from aerial surveys. Biol. Pap. Univ. Alaska, No. 22.

Gasaway W., S. Dubois, R.D. Boertje, D. Reed, and D. T. Simpson. 1989. Response of radio-collared moose to a large burn in central Alaska. Can. J. Zool. 67:325-329.

Graf R. 1992. Status and management of moose in the Northwest Territories, Canada. Alces supplement pp. 1-7.

Jingfors K., R. Buillon and R. Case. 1987. Abundance and population composition of moose along the Mackenzie River, November 1984. File rep 70. Dept. of Renewable Resources. Yellowknife, NWT.

Latour P. 1992. Population size and composition of moose west of Norman Wells. Manuscript report 42. Dept. of Renewable Resources. Yellowknife, NWT.

MacLean N. *in prep*. Population size and composition of moose in Fort Good Hope area, Northwest Territories, November 1993. Manuscript report. Dept. of Renewable Resources.Yellowknife, NWT. 18 pp.

Prescott T.H., G.L. Erickson, L.E. Walton, and D.G. Smith. 1973. Atlas of moose habitat maps: part of a wildlife habitat inventory of the Mackenzie Valley and northern Yukon. Can. Wildl. Serv.,Environ. Soci. Progr., Northern Pipelines.

Stenhouse G.B., P.B. Latour, L. Kutny, N. MacLean, and G.J. Glover. *in prep*. Productivity and movements of female moose in a low density population in the western Northwest Territories. 24 pp.

Treseder L. and R. Graf. 1985. Moose in the Northwest Territories-a discussion paper. Dept. of Renewable Resources. Yellowknife, NWT.