MOOSE POPULATION RESEARCH AND MANAGEMENT STUDIES IN THE YUKON

Summary of Aerial Trend Surveys for Moose in 1991

Cor Smits, Torrie Hunter, David Bakica

Progress Report
PR-92-3

August 1992

Yukon
Renewable Resources
Fish and Wildlife Branch

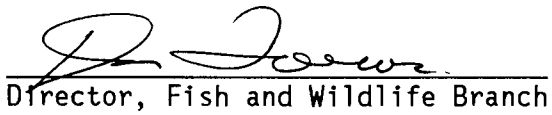
MOOSE POPULATION RESEARCH AND MANAGEMENT STUDIES IN YUKON

Summary of Aerial Trend Surveys for Moose In 1991

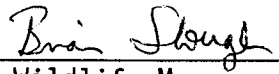
Progress Report
PR-92-3

Cor Smits, Special Projects Biologist, Fish and Wildlife Branch
Torrie Hunter, Conservation Officer, Field Services Branch
David Bakica, Conservation Officer, Field Services Branch

Yukon Department of Renewable Resources
P.O. Box 2703
Whitehorse, Yukon
Y1A 2C6



Director, Fish and Wildlife Branch



Chief, Wildlife Management Section

August, 1992

TABLE OF CONTENTS

	Page
List of Tables	2
List of Figures	2
List of Appendices	3
Abstract	4
Introduction	5
Study Area	5
Methods	5
Results	6
Fish Lake	6
North Canol	7
Frederick Lake	7
Discussion	8
Literature Cited	10
Appendices	15

LIST OF TABLES

Page

Table 1. Observation frequency and sex/age composition of moose observed during trend surveys in 1991 11

Table 2. Sex and age composition ratios from 1991 trend surveys 12

Table 3. Numbers of moose and sex and age composition ratios observed during aerial surveys in the North Canol, Fish Lake, and Frederick Lake trend survey areas, during 1990-1991 13

LIST OF FIGURES

Figure 1. Distribution of trend survey areas in Yukon 14

LIST OF APPENDICES

		Page
Appendix 1a.	Fish Lake trend survey area	15
Appendix 1b.	Survey results of the Fish Lake trend area, November 25 - December 2, 1991	16
Appendix 2a.	North Canol trend survey area	17
Appendix 2b.	Survey results of the North Canol trend area, December 7-9, 1991	18
Appendix 3a.	Frederick Lake trend survey area	19
Appendix 3b.	Survey results of the Frederick Lake trend area, November 24 - December 13, 1991	20
Appendix 4.	Summary of 1991 Trend Survey Costs	21

ABSTRACT

This report presents the results of aerial trend surveys of the North Canol, Fish Lake, and Frederick Lake areas conducted in November and December 1991. The Fish Lake trend area was surveyed from November 25 to December 2 and a total of 81 moose were observed. Mature cows, mature bulls, yearlings, and calves comprised 37%, 35%, 15%, and 14%, respectively. The North Canol trend area was surveyed from December 7-9 and a total of 116 moose were observed. Mature cows, mature bulls, yearlings, and calves comprised 37%, 32%, 14%, and 17%, respectively. The Frederick Lake trend area was surveyed from November 24 to December 13 and a total of 72 moose were observed. Mature cows, mature bulls, yearlings, and calves comprised 44%, 32%, 17%, and 7%, respectively. Both the North Canol and Fish Lake surveys yielded more moose than in 1990 (increases of 20% and 8%, respectively) while 31% fewer moose were observed in the Frederick Lake survey compared to 1990. An examination of observed sex/age categories in the 1990 and 1991 North Canol surveys suggests that the apparent increase is probably attributable mostly to an ingress of mature bulls. The low number of calves observed during the 1991 Frederick Lake survey suggests that a further decline may take place in that area.

INTRODUCTION

During 1991, trend surveys for moose were flown in selected areas throughout Yukon for the fourth consecutive year. The objectives of this programme are to provide low-cost annual information on moose population trends in priority management areas (Larsen and Ward 1990). In 1991, an attempt was made to survey four areas; North Canol, Fish Lake, Frederick Lake, and Aishihik Lake. All four areas had been previously surveyed (Larsen and Ward 1990, 1992). Due to weather conditions, only the former three areas were surveyed. This report presents the results of these surveys.

STUDY AREA

Each of the trend areas surveyed in 1991 (Figure 1) was composed of 13 to 18 sample units prescribed for the regional moose census (Jingfors and Markel 1987; Jingfors 1988; Larsen and Ward 1992), and encompass approximately 250 to 400 km^2. Descriptions of the climate, topography, and habitat are provided in Oswald and Senyk (1977), Jingfors and Markel (1987), Jingfors (1988), and Larsen and Ward (1992).

METHODS

Trend surveys were flown using a Piper Supercub PA-18 (Frederick Lake) or Maule M-7 aircraft (North Canol and Fish Lake). The entire area was searched at an intensity of about 2 minutes per km^2. For a more detailed description of the survey technique, see Larsen and Ward (1990).

As in previous trend surveys, we attempted to complete each survey in a few days in order to minimize potential biases caused by shifts in moose

distribution. However, due to poor weather conditions, the Frederick Lake area survey lasted 20 days and was not completed until December 13. This delay may have biased the sex composition as antler drop may start as early as the end of November, with a substantial number of antlerless bulls by mid-December (Larsen 1982). To test for trend in the adult bull percentage during the survey period (November 24-December 13), weekly bull percentages of combined surveys were regressed on weekly periods using the REG procedure of SAS (SAS Institute Inc., 1985). The Frederick Lake trend survey area was expanded by 6 sample units (#'s 11-16) to include a proposed burn area. In order to evaluate the effects of the burn on moose abundance both pre- and post-burn surveys are planned. To enable comparison with the 1991 trend, survey results from sample units 1-10 are presented, while the results of sample units 11-16 are presented in the Appendix. Recruitment rate is defined as the rate at which 19-month-old animals are recruited into the 19+ month population and is calculated as yearlings/(yearlings + adults).

RESULTS

A summary of the 1991 trend survey results is presented in the following sections. A more detailed presentation of the results by sample unit is provided in Appendices 1 through 3. Appendix 4 contains a breakdown of the 1991 survey costs.

Fish Lake

The Fish Lake trend area was surveyed from November 25 to December 2 (Table 1). Average search intensity was 1.9 min./km^2 (S.E. = 0.51). Moose were

observed at a rate of 1 moose per 5.7 minutes. A total of 81 moose were observed.

Mature cows, mature bulls, yearlings, and calves comprised 37%, 35%, 15%, and 14%, respectively. The recruitment rate calculated from the observed yearling and adult moose was 0.17 (Table 2).

North Canol

The North Canol trend area was surveyed from December 7-9 (Table 1). Average search intensity was 2.0 min/km^2 (Table 1). Moose were seen at a rate of 1 moose per 5.3 minutes. A total of 116 moose were observed.

Mature cows, mature bulls, yearlings, and calves comprised 37%, 32%, 14%, and 17%, respectively. The recruitment rate calculated from the observed yearling and adult moose was 0.17 (Table 2).

Frederick Lake

The Frederick Lake trend area was surveyed from November 24 to December 13 (Table 1). Four sample units were surveyed at relatively low search intensity (mean = 1.0 min./km^2) as observability was much higher in these units than in the other ones (Appendix 3b). In two other sample units, small portions were not surveyed due to fog. However, these portions were relatively small and with a habitat type that moose appeared to avoid (e.g., spruce forest) and insignificant numbers, if any, of moose are anticipated to have been missed. Without these six sample units, average search intensity was 1.9 min./km^2 (S.E. = 0.05)(Table 1). Moose were seen at a rate of 1 moose per 7.1 minutes.

A total of 72 moose were observed in sample units 1-10. Mature cows, mature bulls, yearlings, and calves comprised 44%, 32%, 17%, and 7%, respectively, of all observed moose (Table 2). The recruitment rate calculated from the observed yearling and adult moose was 0.18. The survey results from sample units 11-16 are presented in Appendix 3.

Adult bull percentages observed in the Fish Lake, North Canol, and Frederick Lake surveys were 32.3 (total no. of moose = 89), 20.7 (total no. of moose = 102), and 40.8 (total no. of moose = 78) during the periods November 24-30, December 1-7 and December 8-13, respectively. There was no significant difference in bull percentages between periods ($p = 0.72$), suggesting that there was no significant increase in the number of mature bulls dropping their antlers during this period.

DISCUSSION

Temporal comparisons of trend survey results were only possible between 1990 and 1991. Although surveys in the North Canol and Fish Lake area were flown in 1989, the data from these surveys are highly suspect as search intensity was only half or two-thirds of that in 1990 and 1991 (Larsen & Ward 1990). Experimental work by Gasaway et. al. (1986) has shown that observability decreases substantially at these reduced levels of search effort. Both the North Canol and Fish Lake 1991 surveys yielded more moose than those in 1990 (Table 3). In the case of the North Canol area, an examination of the observed sex/age categories of both years suggests that the apparent increase is probably attributable mostly to mature bulls moving into the area (Table

3). Thus shifts in distribution may suggest increases in abundance between surveys in the relatively small trend survey area that are not likely to be representative of the whole region. The 1991 trend survey was done 5-6 weeks later in the year than the 1990 survey and this may have been responsible for the shift in distribution compared to the 1990 survey. A comparison between the 1990 and 1991 Frederick Lake trend surveys suggests that a substantial decline took place between these years (Table 3). The low number of calves observed during the 1991 trend survey suggests that a further decline may take place.

LITERATURE CITED

Gasaway, W.C., S.D. DuBois, D.J. Reed, and S.J. Harbo. 1986. **Estimating moose population parameters from aerial surveys.** Biol. Pap. Univ. Alaska no. 22. 108 pp.

Jingfors, K. and R. Markel. 1987. **Abundance and composition of moose in the Whitehorse south, Nisutlin and Liard east areas, November 1986.** Yukon Department of Renewable Resources, Unpubl. Report. Whitehorse. 55pp.

Jingfors, K. 1988. **Moose population characteristics in the North Canol and Frances Lake areas, November 1987.** Yukon Department of Renewable Resources, Unpubl. Report. Whitehorse. 35pp.

Larsen, D.G. 1982. **Moose inventory in the southwest Yukon.** Yukon Department of Renewable Resources, Unpubl. Report. Whitehorse. 26 pp.

Larsen, D.G. and R.M.P. Ward. 1990. **Summary of Yukon moose population trend survey results, 1988 and 1989.** Yukon Department of Renewable Resources, Unpubl. Report. Whitehorse. 45pp.

Larsen, D.G. and R.M.P. Ward. 1992. **Summary of Yukon moose population trend survey results, 1990.** Yukon Department of Renewable Resources, Unpubl. Report. Whitehorse. ___pp.

Oswald, E.T. and J.P. Senyk. 1977. **Ecoregions of Yukon Territory.** Fisheries and Environment Canada, Victoria. 115pp.

SAS Institute Inc. 1985. **SAS User's Guide Statistics.** SAS Inst. Inc., Cory, NC. 956pp.

Table 1. Observation frequency and sex/age composition of moose observed during trend surveys in 1991.

SURVEY AREA	AREA (km^2)	DATE	SEARCH INTENSITY (min/km^2)	SURVEY TIME/ MOOSE SEEN (min.)	COWS (≥19mo)	CALVES	YEARLING BULLS*	MATURE BULLS	TOTAL MOOSE SEEN	TOTAL MOOSE DENSITY (moose/km^2)
Fish Lake	249.1	Nov.25 -Dec.2	1.9	5.7	36	11	6	28	81	0.33
North Canol	317.6	Dec. 7-9	2.0	5.3***	51	20	8	37	116	0.37
Frederick Lake	242.6	Nov.24 - Dec.13	1.4 (1.9)**	4.8	38	5	6	23	72	0.30

* The number of yearling cows was assumed to equal yearling bulls, therefore, total yearlings = 2x yearling bulls.

** Between parentheses: search intensity when sample units searched incompletely or at lower search intensity are deleted.

*** Excluding sample unit number 120 (survey time of this sample unit not known).

Table 2. Sex and age composition ratios from 1991 trend surveys.

SURVEY AREA	% MATURE	% MATURE	% YEARLINGS	% CALVES	MOOSE/100 MATURE COWS (≥30 mo)			RECRUITMENT RATE
					CALVES	YEARLINGS	MATURE BULLS	$\frac{\text{YEARLINGS}}{\text{YEARLINGS + ADULTS}}$
Fish Lake	37	35	15	14	37	40	93	0.17
North Canol	37	32	14	17	47	37	86	0.17
Frederick Lk.	44	32	17	7	16	38	72	0.18

Table 3. Numbers of moose and sex and age composition ratios observed during aerial surveys in the North Canol, Fish Lake, and Frederick Lake trend survey areas, during 1990-1991.

NUMBER AND SEX/ AGE COMPOSITION OBSERVED	TREND SURVEY AREA					
	NORTH CANOL		FISH LAKE		FREDERICK LAKE	
	1990* (Oct.29-Nov.2)	1991 (Dec.7-9)	1990* (Nov. 11-16)	1991 (Nov.25-Dec.2)	1990* (Nov.27, 28)	1991 (Nov.24-Dec.13)
					SU1-10	SU1-10
Mature Bulls (≥30 mo.)	17	37	23	28	25	23
Yearling bulls	8	8	11	6	14	6
Cows (≥19 mo.)	41	51	27	36	50	38
Calves	31	20	14	11	16	5
Bull/100 cows (≥30mo)	52	86	144	93	69	72
Calf/100 cows "	94	47	88	37	44	16
Yearlings/100 cows "	48	37	138	40	78	38
Recruitment rate	0.24	0.17	0.36	0.17	0.31	0.18
TOTAL	97	116	75	81	105	72

* from Larsen and Ward 1991

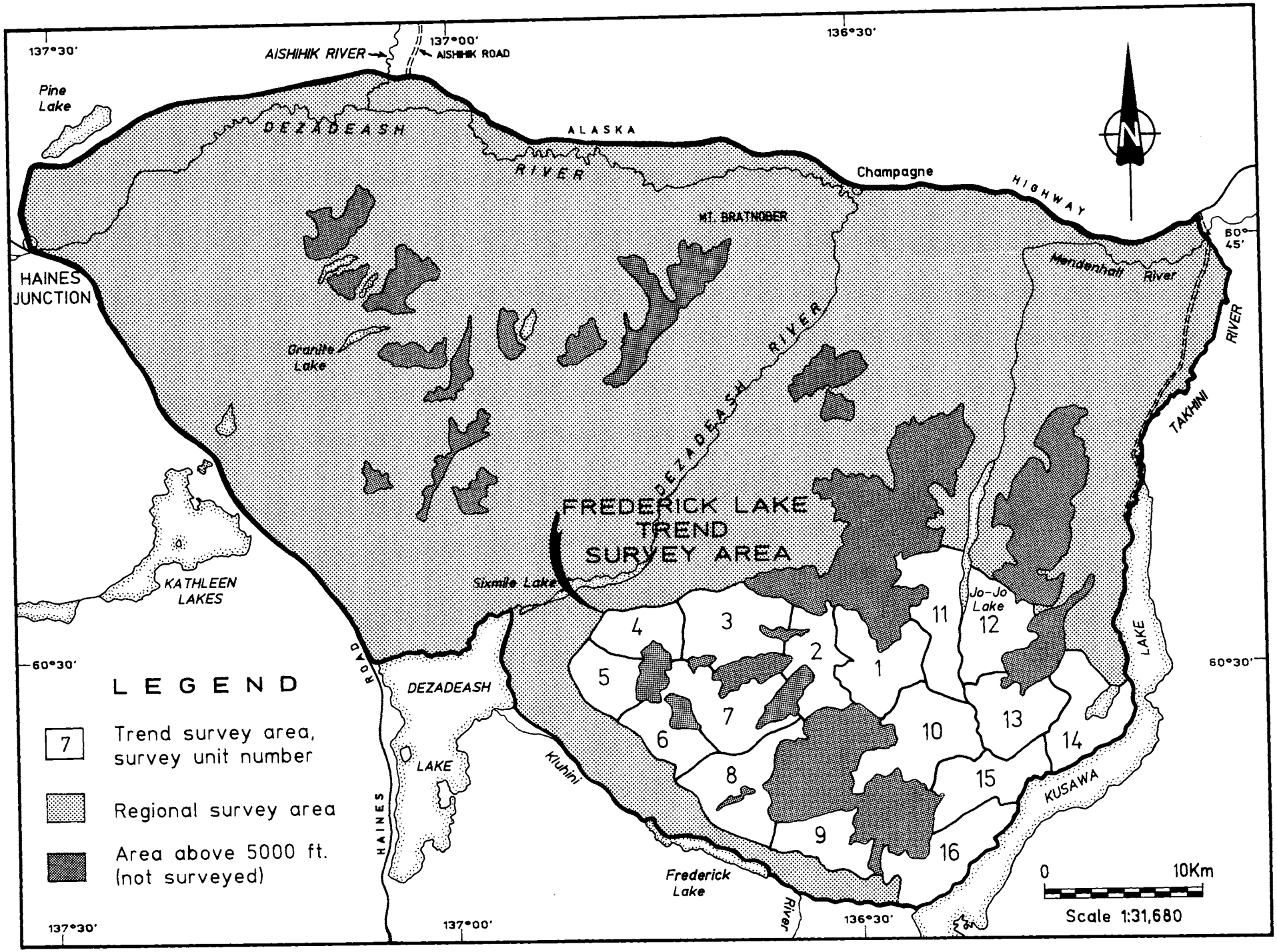
Appendix 1b. Survey results of the Fish Lake trend area, November 25-December 2, 1991.

SAMPLE UNIT	AREA (km^2)	SEARCH INTENSITY (min./km^2)	SEARCH TIME (min.)	LONE COWS	COWS WITH 1 CALF	COWS WITH 2 CALVES	YEARLING BULLS	MATURE BULLS	TOTAL MOOSE SEEN
151	16.6	2.5	41	5	0	0	0	1	6
155	28.2	1.9	54	4	0	0	2	5	11
156	26.4	1.9	49	3	3	0	4	8	21
165	19.9	2.3	45	4	1	0	0	2	8
166	17.9	1.9	34	0	0	0	0	1	1
167	17.9	2.1	38	5	5	0	0	4	19
173	19.2	1.7	33	1	0	0	0	0	1
174	18.1	1.9	35	0	1	0	0	0	2
175	19.7	1.5	30	0	0	0	0	1	1
186	14.0	2.1	29	0	0	0	0	5	5
187	15.5	1.3	20	0	0	0	0	0	0
188	17.6	1.9	34	2	1	0	0	1	5
200	18.1	1.1	20	1	0	0	0	0	1
All Sample Units	249.1	1.9	462	25	11	0	6	28	81

Appendix 2b. Survey results of the North Canol trend area, December 7-9, 1991.

SAMPLE UNIT	AREA (km^2)	SEARCH INTENSITY (min./km^2)	SEARCH TIME (min.)	LONE COWS	COWS WITH 1 CALF	COWS WITH 2 CALVES	YEARLING BULLS	MATURE BULLS	TOTAL MOOSE SEEN
98	18.7	2.0	38	3	1	0	0	0	5
110	16.2	2.0	33	0	0	0	0	0	0
111	18.6	1.9	36	5	3	1	0	1	15
112	17.3	2.1	36	5	2	0	0	5	14
113	15.5	2.1	33	2	0	0	2	1	5
114	16.3	2.1	34	3	1	0	0	1	6
117	16.9	2.0	34	1	4	0	0	8	17
118	16.9	2.0	34	1	0	0	1	1	3
119	18.7	1.7	32	1	0	0	0	0	1
120	15.8	?	?	3	0	0	1	0	4
121	16.8	2.0	34	3	0	0	1	7	11
122	15.8	2.0	31	1	0	0	1	0	2
123	17.3	1.8	32	2	3	0	0	0	8
124	16.8	2.1	35	0	1	0	0	0	2
125	19.3	2.0	38	2	1	0	0	0	4
133	18.1	1.9	35	1	0	0	1	4	6
134	18.1	1.9	35	0	0	1	1	7	11
136	24.5	2.0	48	0	0	0	0	2	2
All Sample Units	317.6	2.0*	>598	33	16	2	8	37	116

*Excluding sample unit number 20.



Appendix 3a. Frederick Lake trend survey area.

Appendix 3b. Survey results of the Frederick Lake trend area, November 24-December 13, 1991.

SAMPLE UNIT	AREA (km^2)	SEARCH INTENSITY (min./km^2)	SEARCH TIME (min.)	LONE COWS	COWS WITH 1 CALF	COWS WITH 2 CALVES	YEARLING BULLS	MATURE BULLS	TOTAL MOOSE SEEN
1	24.4	0.9*	21	8	0	0	0	6	14
2	20.4	0.6*	12	0	0	0	0	0	0
3	29.2	1.1*	33	1	0	0	0	2	3
4	18.8	1.8	33	2	0	0	1	0	3
5	19.4	1.8	34	4	1	0	0	2	8
6	24.2	1.8	43	1	1	0	0	0	3
7	25.0	1.4*	35	5	1	0	3	8	18
8	29.5	1.5**	43	2	2	0	1	2	9
9	20.8	1.3**	27	8	0	0	1	2	11
10	30.9	2.0	61	2	0	0	0	1	3
11	29.1	2.0	57	0	0	0	0	0	0
12	28.2	1.9	54	10	0	1	1	3	17
13	25.1	2.3	58	0	0	0	1	0	1
14	25.5	2.0	51	2	0	0	0	0	2
15	25.2	1.8	45	0	1	0	0	0	2
16	29.1	2.0	59	0	0	0	0	0	0
All Sample Units	404.8	1.6	666	45	6	1	8	26	94

* Substantial portions of these sample units were surveyed at lower search intensity. However, observers were confident that all moose in these areas were seen as observability was considered excellent due to absence of obscuring vegetation.
** Part of the sample unit was not surveyed.

Appendix 4. Summary of 1991 Trend Survey Costs.

Survey Area	Aircraft Type	Charter Rate	Hours Flown	Charter Cost	Fuel Cost	Total
Frederick Lk.	Piper Supercub	$157.00/hour	20.9	$3,281.30	$621.78	$3,903.08
North Canol	Maule M-7	$248.00/hour	19.5	$5,163.58	Included	$5,163.58
Fish Lake	Maule M-7	$220.00/hour	14.1	$3,102.00	Included	$3,102.00
Total			54.5	$11,546.88	$621.78	$12,168.66