

2001 NORTH CANOL MOOSE SURVEY SUMMARY



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2001 North Canol Moose Survey Summary

We conducted a moose survey in the North Canol Road area between October 31 and November 26, 2001. The survey area extended from Marjorie and Tay lakes eastward to Otter Lake, and from Mount Sheldon south to Big Timber and Otter creeks (see attached Map 1). It covers a total area of about 3,239 square kilometers (km²), of which 3,088 km² (1192 square miles) is habitable moose range. In the North Canol survey region, non-habitat areas for moose include ground higher than 5500 ft. (non-vegetated/rocky areas) and large water bodies greater than 0.5 km² in size. The survey area includes portions of Game Management Subzones (GMSs) 4-39, 4-40, 4-49, 11-02, and 11-05 to 11-07.

This survey is part of the Yukon Governments' ongoing monitoring of wolf and ungulate populations to determine the long-term effects of the Finlayson wolf control program that was carried out in this area between 1983 and 1989. The North Canol is also recognized as a popular moose hunting area with the potential for significant hunter pressure. The area was previously surveyed for moose in 1987, 1991, and 1996.

Survey Methods

We used a new, more cost-effective survey technique recently developed by Jay Ver Hoef with the Alaska Department of Fish and Game, to estimate moose abundance in the area in 2001. A detailed description of the survey technique will be prepared and distributed at a later date, but in general, the technique involves four steps. First, the entire survey area is divided into blocks or units each measuring approximately 16 square kilometers. If there is little to no moose survey data for a particular area, we use a fixed-wing aircraft with a pilot and 3 observers to quickly fly over each of the blocks to decide whether it is likely to contain few or lots of moose. The decision is based on a combination of local knowledge, number of moose seen, tracks, and habitat. This part of the survey is termed "stratification". In the North Canol area we were able to use a "dry lab" approach, where moose data collected from 1987, 1991, and 1996 surveys were used to determine which of the blocks were likely to contain "low" or "high" numbers of moose.

Next, we fly the “census” portion of the survey. We use small, maneuverable, fixed-wing aircraft like Piper Supercubs, with a pilot and one observer. We can not afford to count moose in every block so we select a sample of the blocks where we expect to see a lot of moose, and a sample of those where we expect to see few moose. We search these selected blocks intensively and attempt to count every moose within them. During the 2001 North Canol survey, we tried to count all of the moose in 62 of the 203 blocks in the entire survey area. We assume that the blocks we do not search intensively have, on average, the same number of moose as the blocks we do search. From the sample counts, we then estimate the total number of moose for the entire survey area. In this new survey technique we do not develop a sightability correction factor (SCF) to make allowance for moose not seen during our intensive searches.

We used a two-tailed Student’s *t*- test or a standard normal test (z-test) with an alpha level of 0.10, to test for significant changes in moose abundance between surveys.

Population Abundance and Composition

We estimate that there were about 659 moose in the North Canol survey area in 2001 (see Table 1). This is the mid-point of the 90% confidence range, which means that we are 90% sure that there were between 527 and 791 moose in the area. This represents an average density of approximately 213 moose for every 1000 km² of habitable moose range (203 moose per 1000 km² over the total survey area), which is above the Yukon-wide average moose density of about 150 moose for every 1000 km². It is, however, similar to the average density of approximately 203 moose per 1000 km² of moose habitat observed in 26 of the most recent areas surveyed throughout the Yukon.

Of the 659 moose estimated to occupy the North Canol survey area, 231 were mature bulls (35% of the total population), 302 were mature cows (46%), 29 were yearlings (4%), and 97 were calves (15%). No cows with twins were observed during the survey (Table 1).

Population Trend and Long Term Projection

Past changes in moose numbers in the North Canol region appear to be linked to the wolf control program that was conducted in the Finlayson Lake study area from 1983 to 1989. The Finlayson study area encompassed both the North Canol and the Frances Lake moose survey areas, allowing us to look at wolf-moose dynamics in a large, intact system. During the period of the Finlayson wolf control program, wolf numbers were reduced annually by 50% to 85% (from 9 to 3 wolves/1000 km²).

In response to this reduction in wolf numbers, moose abundance in the North Canol study area increased 82% (514 to 938 moose: $P < 0.001$) between 1987 and 1991 (Table 1, Figure 1). This represents an average population growth rate of about 16% per year. Wolf numbers returned to pre-control levels (10 wolves per 1000 km²) by about 1993-94, which corresponds to the time when moose numbers in the North Canol survey area began to decline (Figure 1). A 22% drop in moose abundance was recorded between the 1991 and 1996 surveys (938 to 728 moose: $P < 0.05$). A further, yet less dramatic decline from 728 to 659 moose (9% decline in the estimated population: $P > 0.5$) occurred between 1996 and 2001, suggesting that the population may be continuing to decline, but at a slower rate.

Similar to abundance, recruitment into the moose population (calves and yearlings/100 mature cows), has shown a general downward trend since the end of the wolf control program in 1989 (Figure 1, Table 1). The proportion of calves and yearlings in the population in 1987, when wolf numbers had been reduced, were 64 calves and 50 yearlings per 100 mature cows. In 1991, two years after the wolf control program ended, the ratios declined to 52 calves and 38 yearlings per 100 mature cows. In 1996, the proportion of calves dropped significantly to 28 calves per 100 cows, whereas the yearling ratio remained about the same (41 yearlings per 100 cows). Although there was little change in the proportion of calves recorded during the 2001 survey (32 calves per 100 cows), the ratio of yearlings declined sharply to only 10 yearlings per 100 cows. About 25-30 yearlings and calves per 100 cows are generally considered necessary to maintain a stable moose population.

The mature bull: mature cow ratio initially showed a general increasing trend in the North Canol area between 1987 and 1996, and appears to have declined somewhat since then (Figure 1, Table 1). In 1987 there were 66 bulls for every 100 mature cows. The ratio increased to 90 bulls for every 100 cows in 1991, and to a peak of 102 bulls for every 100 cows in 1996. A ratio of 76 bulls per 100 cows was recorded in 2001. The average ratio, in harvested moose populations surveyed elsewhere in the Yukon, is about 69 mature bulls per 100 mature cows. Although the current survey indicates a possible declining trend since 1996, the ratio remains well above the 30 mature bulls per 100 mature cows that we generally consider to be sufficient to ensure that all cows are bred during the rut.

It seems likely that the observed declines in recruitment and moose abundance since the end of the wolf reduction program are due to increased predation rates related to the recovery of wolf numbers. Adult survival rates have also possibly declined in response to an increase in the area wolf population. Computer simulations suggest that, in the absence of measures to reduce predation, moose abundance in the North Canol and Finlayson areas will continue to decline toward pre-wolf reduction levels (Hayes 1995).

Harvest

The North Canol survey area covers portions of Game Management Subzones (GMSs) 4-39 to 4-40, 4-49, 11-02, 11-05 to 11-07 (Map 1). Although these GMSs cover a much larger region than the survey area itself, much of the harvest associated with them tends to be concentrated near the North Canol Road, and within the survey area. Between 1979 and 1989, the annual reported moose harvest for these GMSs was around 26 moose per year (Figure 2). Harvest was variable during the early to mid 1990s, with a low of 8 moose kills in 1992 and a peak of 47 kills in 1995. Since 1996, the annual reported moose harvest for this region has been relatively stable at between 28 and 33 moose per year (average = 30 moose per year). These numbers do not, however, include harvest by First Nation hunters. Information on the moose harvest patterns by First Nations in this area is limited. Data collected from the North Canol check station between 1991-1994 and 1996-1999 was intermittent, and the average First Nation harvest of 6 moose per year for these GMSs is considered an under-estimate. If we assume that the First Nation

harvest is similar to the resident harvest, then the average total annual harvest between 1996 and 2000 would be about 55 moose.

For stable moose populations of average density, we normally calculate the annual allowable harvest rate as 3% to 4% of the total population estimate. These rates apply for a bull-only harvest; harvesting cows will generally result in a reduction in the sustainable harvest. Based on this calculation, the allowable harvest in the GMSs all or partially within the North Canol survey area would be between 67 and 89 moose per year. Given that moose numbers in the North Canol area have been steadily declining since 1991, and are expected to continue to decline if no measures are taken to reduce predation rates, a lower harvest rate is more appropriate. We recommend that the allowable harvest rate be set at between 2% and 3% of the total moose population estimate. This translates to an average total harvest of between 44 and 67 moose per year. Our current estimated total annual harvest is within this range, and in the absence of more reliable information on the harvest by First Nation hunters, the harvest rate should not increase beyond current levels.

Summary

We estimate that there are about 659 moose (213 moose per 1000 km² of moose habitat) in the 2001 North Canol moose survey area. This density of moose is average to slightly above average by Yukon standards. Moose abundance and recruitment have declined since 1991. Increased wolf predation is likely the cause of the moose population decline in the area, and in the absence of measures to reduce the predation rate, it is likely that moose numbers will continue to decline. The reported harvest during the latter half of the 1990s has been relatively stable at about 30 moose per year. If we assume that the First Nation harvest is similar to the resident harvest, we estimate the total average harvest is about 55 moose per year – at or near our maximum recommended allowable harvest of between 44 and 67 moose per year. In addition, we recommend that moose population monitoring continue in this area to assess the long-term effectiveness of the wolf reduction program.

Other Wildlife

In addition to moose, we observed and recorded several other species during the survey. A total of 35 wolves were seen in or just outside the survey area. One wolf kill site, one pack of 6 wolves, and a second very large pack of 21 wolves were observed in the south end of the study region in the Orchie and Marjorie lakes area. A pack of 7 wolves and one lone wolf was located west of Jackfish Lake and southeast of Lewis Lake respectively.

Few caribou were seen within the study area. Five were located south of Jackfish Lake, and one adult was recorded at the north edge of the survey area east of Sheldon Lake. A very large grizzly bear was observed on a moose kill near the Prevost River southeast of Lewis Lake, and a lynx was seen on the North Canal Road northeast of Orchie Lake. Two Mule deer were sighted on the bluffs north of the Ross River town site, but the amount of tracking in the area suggests more of them are likely present. One Bald Eagle, two Gyrfalcons, and various flocks of Ptarmigan were also observed throughout the survey region.

Literature Cited:

Hayes, R.D. 1995. Numerical and Functional Responses of Wolves, and Regulation of Moose in the Yukon. MSc. Thesis, Simon Fraser University, British Columbia. 132pp.

Table 1. Summary of North Canol Moose Survey Results and Characteristics from Early Winter 1987, 1991, 1996 and 2001 (Note: no sightability correction factor has been incorporated).

POPULATION CHARACTERISTICS	1987¹	1991	1996	2001
Estimated Abundance ²				
Total Moose (90% Confidence Range) ³	514 (427-602)	938 (811-1064)	728 (604-851)	659 (527-791)
Density (moose per 1000 km ² of moose habitat)	186	317	246	213
Estimated Composition (90% Confidence Range) ³				
Adult Bulls (≥ 30 months)	121 (94-149)	301 (240-362)	275 (210-339)	231 (169-293)
Adult Cows (≥ 30 months)	184 (142-227)	336 (279-393)	268 (223-313)	302 (236-369)
Yearlings ⁴ (Approx. 18 months)	92 (66-117)	127 (96-158)	109 (71-147)	29 (8-50)
Calves (≤ 12 months)	117 (89-146)	174 (140-207)	76 (55-98)	97 (70-123)
Estimated Population Ratios (90% Conf. Range) ³				
Mature Bulls per 100 Mature Cows	66 (48-84)	90 (71-108)	102 (80-125)	76 (50-103)
Yearlings per 100 Mature Cows	50 (33-66)	38 (26-50)	41 (27-55)	10 (2-17)
Calves per 100 Mature Cows	64 (52-75)	52 (45-58)	28 (22-35)	32 (21-43)
Mature Bulls: Percent of Total Population	24% (19-28)	32% (28-36)	38% (32-43)	35% (26-44)
Mature Cows: Percent of Total Population	36% (32-40)	36% (32-39)	37% (33-41)	46% (36-55)
Yearlings: Percent of Total Population	18% (13-22)	14% (10-17)	15% (11-19)	4% (1-8)
Calves: Percent of Total Population	23% (19-26)	18% (16-21)	10% (8-13)	15% (10-19)
Twinning Rate ⁵	9%	9%	8%	0%
SURVEY CHARACTERISTICS				
Stratification				
Survey Dates	Nov. 7-11	Nov. 5-8	Nov. 2-6	No strat. flown ⁶
Total Survey Area (Km ²)	3,050	3,050	3,050	3,239 ⁷
Habitable Moose Range within Survey Area (Km ²)	2,759	2,954	2,954	3,088
Total Flight Time used during Stratification (min.)	not avail.	1,553	1,496	NA
Survey Time used during Stratification (min.)	1,207	1,131	1,047	NA
Search Intensity (min. per Km ²)	0.44	0.38	0.35	NA
Number of Moose Seen	244	408	303	NA
Moose Seen per Minute	0.20	0.36	0.29	NA
Census				
Survey Dates	Nov. 12-16	Nov. 8-14	Nov. 6-10	Oct 31-Nov 26
Number of Sample Blocks Searched	58	65	62	62
Area Searched (Km ²)	971	1,138	1,091	990
Percentage of Habitable Moose Range Searched	35%	39%	37%	32.0%
Total Flight Time used during Census (min.)	not avail.	~3,761	3,794	3,835
Survey Time used during Census (min.)	1,714	2,235	2,063	1,965
Search Intensity (min. per Km ²)	1.77	1.96	1.89	1.99
Number of Moose Seen	239	535	420	234
Moose Seen per Minute	0.14	0.24	0.20	0.12

¹ 1987 values differ from those given in past reports due to corrections made to the 1987 database.

² To allow for comparison across years, no sightability correction factor is included in estimates provided.

³ This means that we are 90% sure that the true number of moose in the area lies within the range of moose numbers given in the brackets.

⁴ To account for yearling cows that cannot be identified from the air, the total number of yearlings is assumed to equal 2x estimated number of yearling bulls in the population.

⁵ Twinning Rate = the number of cows with 2 calves divided by the total number of cows with calves; pre 1988 survey data was recorded differently, so the twinning rate was not calculated.

⁶ We used past stratification data to stratify the area into High and Low strata blocks (called a "Dry Lab Stratification").

⁷ The 2001 survey area was slightly larger than past surveys because of changes in our survey technique (see Methods section).

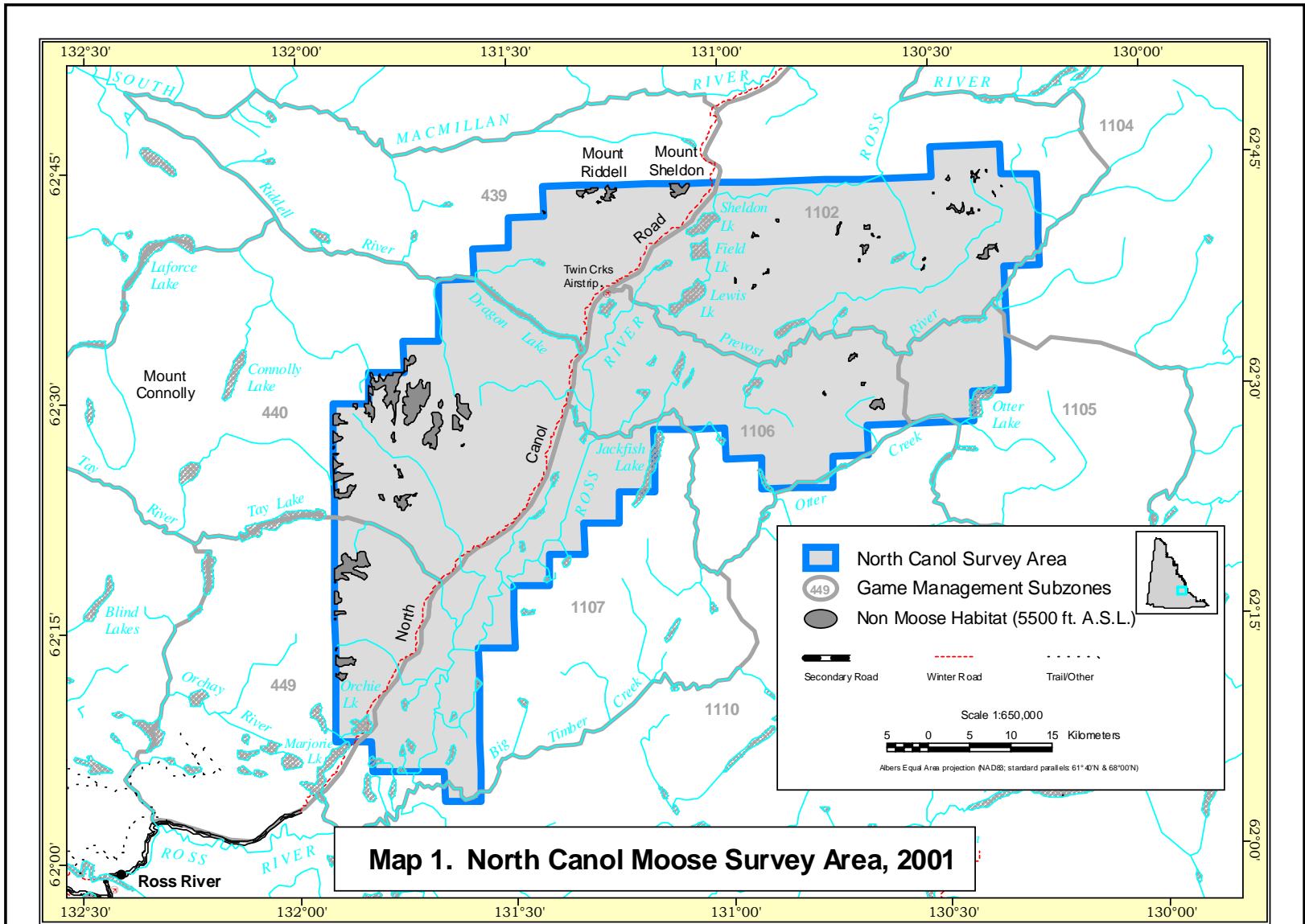
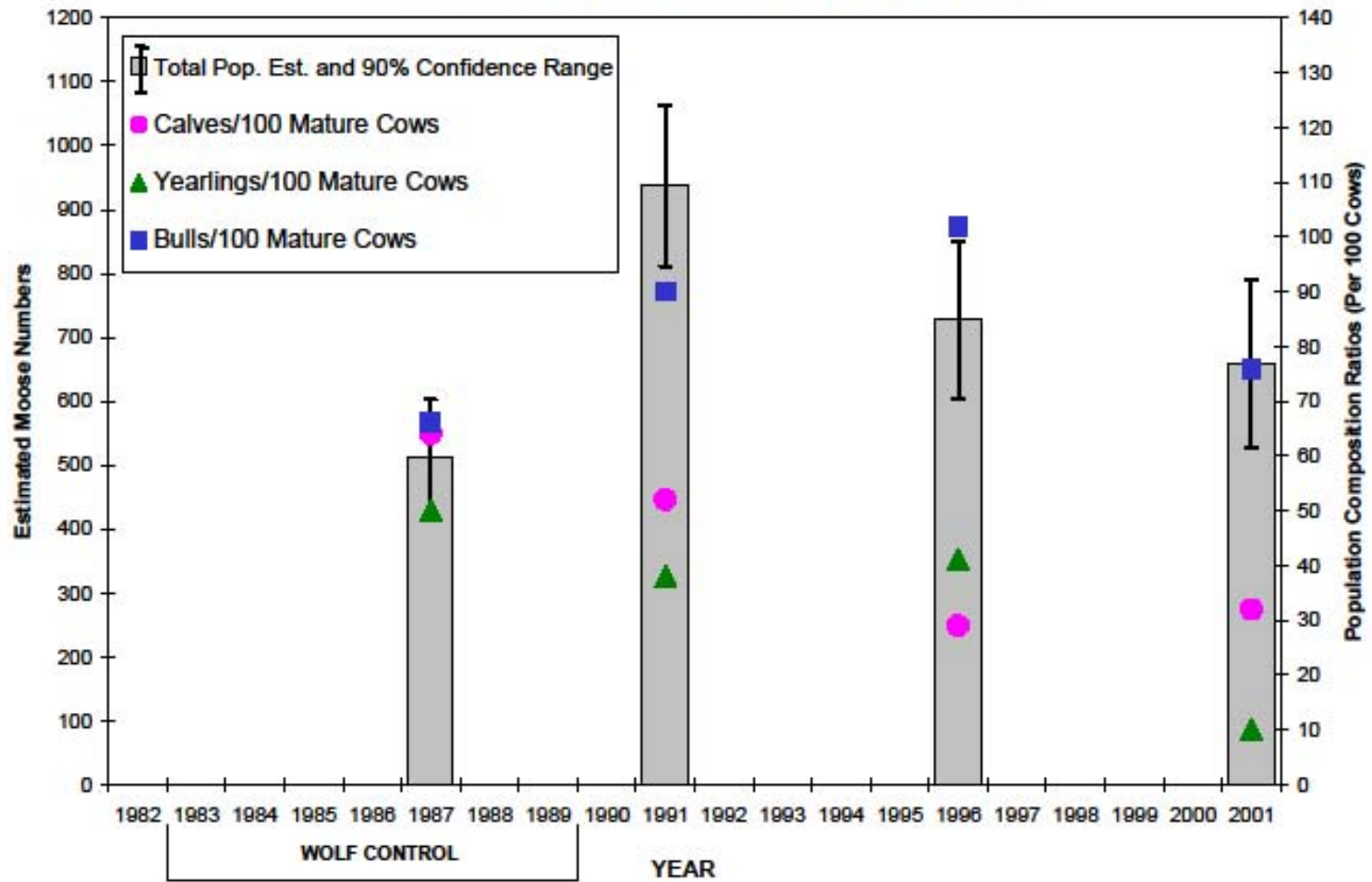
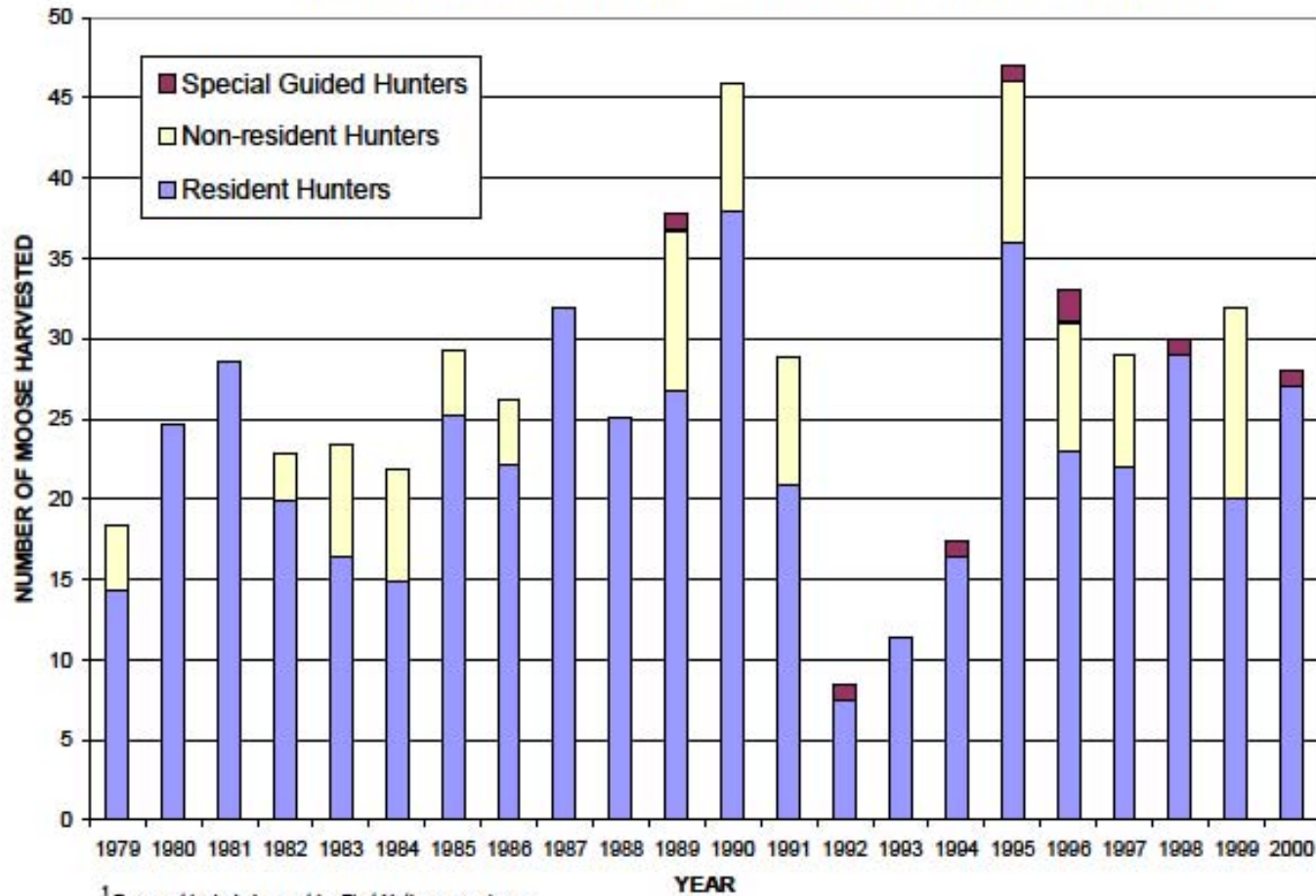


Figure 1. Summary of North Carol Moose Survey Data



**Figure 2: Annual Reported Moose Harvest in 2001 North Canol Moose Survey Area¹
(Game Management Subzones: 4-39 to 4-40, 4-49, 11-02, 11-05 to 11-07)**



¹ Does not include harvest by First Nations members