CARMACKS WEST MOOSE MANAGEMENT UNIT

SUMMARY OF EARLY-WINTER 2003 MOOSE SURVEY

26 NOVEMBER – 16 DECEMBER 2003

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SUMMARY

- We conducted an early-winter survey of moose in the area northwest of Carmacks on November 26-December 16, 2003, using Cessna 206 and Super Cub fixed-wing aircraft. The main purposes of this survey were to estimate the abundance, distribution and population composition of the moose population.

- We counted all moose in survey blocks covering about 13% of the total area, which was only about half of the area we had intended to survey; cold temperatures and windy conditions precluded completing the survey. We found a total of 30 moose, of which 15 were adult bulls, 9 were adult and yearling cows, 5 were yearling bulls, and 1 was a calf.

- We calculated a population estimate of 215 ± 48% moose for the area, which is equal to a density of about 51 per 1,000 km^2 over the whole area, or 53 per 1,000 km^2 in suitable moose habitat. This estimate may be slightly low because we did not correct it for the number of moose that we missed during the survey. It is about the same as the estimated density of 45 moose per 1,000 km^2 in suitable habitat calculated from the last survey in 1987 in an overlapping area to the west. Poor weather prevented us from counting moose in much of the best habitat and the precision of our estimate is low, however, so these results may not be reliable.

- Sample sizes in the census were too low to calculate the estimated percentages of bulls, cows, yearlings, and calves in the population.

- Harvest of moose in this area has been closed to licenced hunters since 1987 due to low moose numbers, but there is some harvest from First Nation hunters.

INTRODUCTION

This report summarises the results of the early-winter survey of moose in the southeastern part of the Carmacks West Moose Management Unit (see Map 1), conducted on November 26-December 16, 2003. The main purposes of this survey were to estimate the abundance, distribution and population composition of the local moose population.

Previous Surveys

The Yukon Fish and Wildlife Branch has previously conducted only one other survey of moose in the area northwest of Carmacks. This was conducted in 1987 in an overlapping area to the west of this year's survey, in response to a new road and mine proposed at Casino Mountain (see Map 2; results in Markel & Larsen 1988). Early winter is the best time of year to estimate abundance of moose because they concentrate in high-altitude open habitats. Bull moose still have antlers at this time of year, so early-winter surveys also allow us to estimate the proportion of bulls in the population.

Community Involvement

Residents of the Carmacks and Pelly Crossing areas have consistently placed a high priority on monitoring the health of local moose populations. Concerns about low abundance of moose and our lack of recent information about moose populations in this area led to recommendations at the 2002 and 2003 Northern Tutchone May Gatherings that we conduct this survey. Selkirk First Nation co-funded the survey.

STUDY AREA

The Carmacks West survey area was re-located in 2001 to cover the areas most accessible and used by hunters, and to conform to the boundaries of Yukon Moose Management Units. Moose Management Units were developed to help us more consistently monitor and manage moose in all areas throughout the Yukon. We plan to monitor the health of moose populations in priority moose management units using both aerial and ground-based surveys.

The Carmacks West Moose Management Unit is about 6,710 km², and includes Game Management Sub-zones 522, 523, 524, and 526 (see Map 1). The survey area within this Moose Management Unit is about 4,206 km². The border of the survey area follows the Klondike Highway in the east, the Yukon River and Wolverine Creek in the north, Klaza River, Lonely Creek, the Nisling River and Rowlinson Creek (west to east) in the south, and extends west almost to Prospector Mountain.

Most (about 4,081 km²) of the study area is considered suitable moose habitat, except for approximately 3% of the area, which includes large water bodies (0.5 km² or greater in size) and land over 1,524 m (5,000 feet) in altitude. The study area consists mostly of rolling hills and plateaus, dissected by numerous creeks, in the drainages of the Klaza, Nisling, and Yukon Rivers. Much of the area is forest-covered with black and white spruce, aspen, and lesser amounts of lodgepole pine and paper birch; balsam poplar also grows along the Yukon River. Forest cover varies from dense mature white spruce and poplar in the main river valleys, to dense younger spruce in many lowlands, to more open mixed spruce and aspen on slopes. Many of the creek valleys have wide shrubby willow flats along them. Willow and dwarf birch shrub habitats, alpine tundra, and unvegetated rocky areas typify the higher plateaus scattered throughout the study area, especially in the mountainous area in the southwestern and western parts (including Victoria Mountain, Mount Nansen, Klaza Mountain, and Mount Pitts) of the survey area. The most recent forest fires have occurred in the northern part of the study area; the largest were two that burned a combined total of about 798 km² in 1994 and 1995 (see Map 3).

The survey area has abundant roads, trails, and cut lines associated with past and present mining activities throughout most of the area. The Nansen and Freegold roads and their spurs are all regularly used by miners, hunters, and others.

METHODS

We have adopted a relatively new survey technique to survey moose, developed by Jay Ver Hoef with the Alaska Department of Fish and Game (Kellie & DeLong 2006). The field sampling is similar to the way we conducted our moose surveys in the past, except that we count moose in square rather than irregularly shaped survey units. The technique involves five steps:

1. The survey area is divided into uniform rectangular blocks 15-16 km^2 in size.

2. Observers in fixed-wing aircraft fly over all the blocks quickly, and classify (or "stratify") them as having either high, medium, low, or very low expected moose abundance, based on local knowledge, number of moose seen, tracks, and habitat. This is called the "stratification" part of the survey.

3. We combine these categories of blocks into high and low "strata", and then randomly select a sample of each stratum for our census.

4. We try to count every moose within the selected blocks (the "census" part of our survey); we use Super Cub fixed-wing aircraft for their maneuverability and low air speed. We classify all moose seen by age (adult, yearling, or calf) and sex. Yearling cows are often difficult to distinguish from adults, so we classify all cows as adults, and later estimate the number of yearling cows that were present among the older cows based on the number of yearling bulls we saw.

5. We estimate the total number of moose by age and sex in the entire survey area based on the numbers of moose we see in the blocks during the census, the distribution of these blocks; and how we classified the blocks we didn't count. We do not correct these estimates for animals missed by observers during the survey. Generally, the more blocks that are searched during the census part of the survey, the more precise and reliable the resulting population estimate.

WEATHER AND SNOW CONDITIONS

Weather conditions made it difficult to fly and ultimately delayed the survey long enough that we were not able to complete it. We were completely shut down by poor flying conditions on 5 days, and had to stop flying early because of high winds on each of the 4 days that we

conducted the census part of the survey. It was mostly cloudy with flat light when we stratified the survey area, making it difficult to see tracks; light conditions were variable during the census. Temperatures ranged from - 34°C to - 18°C, and winds were strong from the southwest on most days. Snow cover was complete and less than a week old throughout the survey area, so visibility was good for spotting moose.

RESULTS AND DISCUSSION

Identification of High and Low-Density Blocks

We flew over the entire survey area in a 4-seat Cessna 206 with the pilot and 3 observers. We were unable to cover 3 survey blocks and had to fly along the edges of 7 others because of low clouds, so we classified the expected moose density in these blocks based on the habitat we could see in and around these areas. We averaged 0.15 minutes per km^2 during the stratification flights.

We classified 73 (28%) of the 262 survey blocks as high, 37 (14%) as medium, 35 (13%) as low, and 117 (45%) as very low expected abundance of moose (see Map 4), based on our observations from the air. Most of the blocks with higher expected numbers of moose were located in the subalpine areas in the Dawson Range in the southwestern part of the survey area and in the partially burned hilly areas in the northwest. For the purpose of selecting blocks for the census, we grouped the blocks classified as expected high and medium numbers of moose into a High stratum with 110 blocks, and considered the 152 blocks with low and very low expected numbers of moose to make up the Low stratum.

Coverage

We counted moose in only 33 of the 262 blocks (see Map 5). Our original intention was to count at least 60 blocks, so we randomly selected 36 blocks from the High stratum, and 24 from the Low stratum. However, we decided to end the survey early because the windy weather experienced during the census was predicted to continue and our observations suggested that moose had begun moving out of high-altitude habitats. It took us about 15.6 hours to count moose in these blocks, for a search intensity of about 1.77 minutes per km^2. Search intensity was slightly lower in low-abundance (1.68 minutes per km^2) than in high-abundance (1.84 minutes per km^2) blocks. We needed an additional 24.7 hours to ferry between survey blocks and back and forth to Carmacks. Survey costs are summarised in the Appendix.

Observations of Moose

We counted a total of 30 moose, 15 of them adult bulls, 9 adult and yearling cows, 5 yearling bulls and 1 calf (see Table 1). We observed an average of 84 moose for every 1,000 km² in the high-abundance blocks, and 27 moose per 1,000 km² in the low blocks.

Table 1. Observations of moose during the November-December 2003 survey in the Carmacks West Moose Management Unit.

	High Blocks	Low Blocks	Total
Number of Blocks Counted	17	16	33
Number of Adult Bulls Observed	11	4	15
Number of Adult and Yearling Cows Observed*	8	1	9
Number of Yearling Bulls Observed	3	2	5
Number of Calves Observed	1	0	1

* Adult and yearling cows cannot always be reliably distinguished from the air, so they are counted together. Assuming that equal numbers of males and females are born and that they survive about equally well until they're yearlings, the number of yearling cows in these totals should be about the same as the number of yearling bulls observed during the survey. We used this assumption to estimate the total number of yearlings in the survey area presented in Table 2.

Distribution and Abundance of Moose

Moose were widely distributed in the survey area, and we found them in a variety of habitats. As expected for the early winter, subalpine willow flats and creek draws with abundant willows generally had the most moose in them. We saw few moose in forested lowlands and lower-elevation slopes.

Table 2. Estimated abundance of moose in the Carmacks West Moose Management Unit survey area in November-December 2003.

	Best Estimate ± 90% Confidence Interval*	Estimates within 90% Confidence Interval*
Estimated Total Number of Moose	215 ± 48%	111-320
Adult Bulls	109 ± 59%	45-174
Adult Cows	23 ± 170%	0-62
Yearlings	77 ± 69%	24-130
Calves	7 ± 161%	0-17
Density of Moose (per 1,000 km²)		
Whole Area	51	
Moose Habitat Only**	53	

* A "90% confidence interval" means that, based on our survey results, we are 90% sure that the true number lies within this range of numbers. Our best estimate is in the middle of this range.

** Suitable moose habitat is considered all areas at elevations lower than 1,524 m (5,000 ft), including water bodies < 0.5 km² in size.

The estimated number of moose in the whole survey area, based on our census counts, is 215 ± 48% (see Table 2). The high degree of uncertainty of this estimate is largely caused by the low number of blocks we were able to census. It may be lower than the actual number of animals in the survey area because we did not correct for the number of moose that we missed, and windy conditions likely affected our ability to spot animals. Poor weather also prevented us from counting moose in much of the best habitat, so these results may not be reliable.

The estimated density of moose in the entire survey area is 51 per 1,000 km², or 53 per 1,000 km² of suitable moose habitat (see Table 2). This is much lower than the Yukon-wide average of 150 moose per 1,000 km², and very similar to the estimate of 45 moose per 1,000 km² in suitable habitat calculated in the overlapping area to the west in 1987 (see Map 2).

Ages and Sexes of Moose

Our sample size of 30 moose seen during the census is too small to make reliable estimates of the composition by age and sex of the moose population in this area. The calculated numbers of bulls, cows, yearlings, and calves (see Table 2) are very imprecise, indicating a high degree of uncertainty.

The only other indication of population composition in this area is from the stratification part of this survey. Out of 119 moose that we saw when we overflew the whole survey area, 13 (11%) were calves. This is almost certainly a minimum estimate of the actual percentage of calves in the population because cows with calves typically are in smaller groups and in denser habitats than are other moose and thus are less likely to be detected on the low-intensity reconnaissance that we do during our stratification flights. Generally, 15% or more calves in a population indicates adequate juvenile survival to maintain moose numbers.

Harvest

Harvest of moose by licenced hunters has been closed in the Carmacks West Moose Management Unit since 1987 because of very low densities of moose found during that survey. There is some harvest of moose in this area by First Nation hunters, but total harvest is thought to be quite low based on discussions with hunters conducted by the Little Salmon/Carmacks First Nation and harvest surveys conducted by Selkirk First Nation. Despite the low sample sizes and high variance associated with the population estimate, results from this survey suggest that moose numbers are still too low to sustain a regular harvest in this area.

CONCLUSIONS AND RECOMMENDATIONS

- We estimate that there are about 215 moose in the survey area in the Carmacks West Moose Management Area. The estimated density is about 53 per 1,000 km^2 of suitable moose habitat, which is much lower than the Yukon-wide average and about equal to the 1987 estimate in an overlapping survey area to the west. Due to low sample sizes and our inability to survey many higher elevation areas where we expected to see more moose, the reliability of these estimates may be low.

- Our sample sizes were too low to estimate the composition by age and sex of the moose population in this area.

- Harvest of moose in the Carmacks West Moose Management Unit is presently closed to resident hunters, and these survey results suggest it should remain closed.

- We should continue discussions with affected First Nations and Renewable Resources Councils about options for managing and minimising First Nation harvest in this area.

- We should attempt to conduct another survey of the moose population in the Carmacks West Moose Management Unit within 5 years to get more accurate and precise estimates of abundance and population composition.

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MAPS