UPPER KLONDIKE HIGHWAY MOOSE MANAGEMENT UNIT

Summary of Early-Winter 2006 Moose Survey

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SUMMARY OF EARLY-WINTER 2006 MOOSE SURVEY

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SUMMARY

- We conducted an early-winter survey of moose in the area southwest of Mayo and north of Pelly Crossing on 12-21 November 2006, using fixed-wing aircraft. The main purposes of this survey were to map the distribution and early-winter habitats of moose in this area and to get an indication of abundance of moose.

- We flew over the entire survey area and spent about 0.6 minutes per km² searching for moose. We found a total of 711 moose, of which 198 were adult bulls, 295 were adult and yearling cows, 30 were yearling bulls, 82 were calves, and 106 were unclassified adults.

- Moose were widely distributed across the survey area. Most were seen in willow-rich habitats in the subalpine, along creeks, and in recently burned areas; relatively few remained in the main river valleys. The biggest concentrations of moose were in the hills southwest of Stewart Crossing, which were mostly burned in fires in 1998 and 1982, and on the subalpine ridges northeast of Ethel Lake.

- We saw about 0.19 moose for every minute searched in the survey area. Previous moose surveys have shown that this rate of sighting moose corresponds to a density of about 177 ± 41% moose per 1,000 km² over the whole area. This density estimate is higher than the estimate of 147 moose per km² that we had previously estimated for the area from our last survey in 2002. The 2006 estimate is only a rough indication of moose abundance though, which would need to be verified with a census

- Survival of calves was apparently good in the survey area during the past two year, based on our observations of moose. A full census would be required to accurately estimate survival rates.

- Harvest of moose in this area appears to be near the maximum sustainable levels.

INTRODUCTION

This report summarises the results of the early-winter survey of moose in a part of the Upper Klondike Highway Moose Management Unit (see Map 1), conducted on November 12-21, 2006. The main purposes of the survey were to map the distribution and early winter habitats of moose in this area and to get an indication of abundance of moose.

Previous Surveys

The Yukon Fish and Wildlife Branch has previously conducted only one other survey in the same area as this year's survey, a full census in November 2002 (results in O'Donoghue, Ward, Sinnott & Westover 2003). There have been surveys in previous years, however, in areas that overlapped with this survey area (see Map 2). We conducted early-winter surveys that included areas south and west of Mayo in 1988, 1993, and 1998 (results in Larsen, Markel & Ward 1989, Ward & Larsen 1994, and Yukon Fish and Wildlife Branch file reports), and in the Pelly Crossing area in 1995 (results in Yukon Fish & Wildlife Branch file reports). We have also monitored over-winter survival of moose calves with late-winter surveys in the Mayo area, including the northern part of the 2002 survey area, from 1993 to 2002 (results in O'Donoghue & Sinnott 2003).

Community Involvement

Residents of the Pelly Crossing and Mayo areas have consistently placed a high priority on monitoring the health of local moose populations. Concerns about high hunting pressure in this area, which is an important hunting area for both the Selkirk First Nation and First Nation of Na-Cho Nyäk Dun, led to a recommendation at the 2006 Northern Tutchone May Gathering that we conduct this survey. The need to monitor moose in this area is also noted in the *Community-based Fish and Wildlife Management Plan for the Nacho Nyak Dun Traditional Territory, 2002-2007*. Selkirk First Nation co-funded the survey, and both the Selkirk First Nation and the First Nation of Na-Cho Nyäk Dun provided staff to help conduct it.

STUDY AREA

The Upper Klondike Highway survey area was located to cover the areas most accessible and used by hunters, and to conform to the development of Yukon Moose Management Units. The survey area also includes the western portion of the Ddhaw Ghro Moose Management Unit (Game Management Subzone 4-03; see Map 1). These 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 on a regular basis, using both aerial and ground-based surveys.

The Upper Klondike Highway Moose Management Unit is about 8,690 km², and includes Game Management Subzones (GMS) 2-52, 2-53, 2-57, 3-09, 3-17, 3-18, 4-01 and 4-02 (see Map 1). The survey area within this Moose Management Unit is about 5,956 km². The north border runs east along the McQuesten River and Bear Creek. The eastern border is Talbot Creek, south to Nogold Creek, and along the western flank of the McArthur Range, south to the Macmillan River. The Macmillan and Pelly rivers are the southern border, and Lake Creek and Reid Lakes make up the western border.

Most of the study area (about 5,764 km²) is considered suitable moose habitat, except for approximately 3% of the area, which includes large water bodies (more than 0.5 km²) 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 Stewart and Pelly Rivers. Most of the area is forest-covered with black and white spruce, lodgepole pine, aspen, and paper birch. Willow and dwarf birch shrub habitats, alpine tundra, and unvegetated rocky areas typify the higher plateaus, scattered throughout the study area, especially around Ethel Lake, the west flank of the McArthur Range, and the ranges north of the Macmillan River. Old and recent burns occur throughout the study area (see Map 3), and these vary in quality as moose habitat. The most recent fires were a 503 km² burn northeast of Diamain Lake in 2004, and an 804 km² burn southwest of Stewart Crossing and a 90 km² burn in the north of the survey area along Bear Creek, both in 1998.

METHODS

We used a survey method called “intensive stratification”, which gives us good information about the distribution and areas of concentration of moose over the whole survey area. It also allows us to calculate an “index” or indirect indication of abundance of moose. The technique involves the following steps:

1. The survey area is divided into uniform rectangular blocks 15-16 km² in size. We used the same survey blocks as those used in the 2002 survey.

2. Observers in fixed-wing aircraft fly over all the blocks, making about 4 passes through each block and classifying (or “stratifying”) 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 the same as the “stratification” part of a full

census survey, except that we cover the area at about four times the intensity to get more complete information.

3. We count and get a GPS location of each moose or group of moose we see. We classify all moose seen by age (adult, yearling, or calf) and sex when possible, but we do not put as much effort into this as we do in censuses when we are making estimates of population composition.

4. We estimate an index of the total number of moose in the entire survey area based on the numbers of moose we see and the amount of time we spend looking for them. An analysis of data from previous surveys showed that the number of moose seen per minute on these stratification surveys could be used to predict the actual densities of moose in the survey areas (details in Ward, Gasaway & Dehn 2000). Predicted densities are not as precise as those estimated from full censuses though, so they should only be taken as rough estimates of abundance that need to be verified with censuses in situations where close monitoring of moose populations is required.

WEATHER AND SNOW CONDITIONS

Weather conditions were variable for this survey. Temperatures ranged from -40°C to -18°C. Skies were mostly clear on three of the nine survey days and mostly cloudy on the others; on two days, low clouds and snow caused us to fly only partial days, and we were unable to fly because of weather on one day. Winds were mostly calm or light. Light conditions ranged from flat to bright and snow coverage was complete with fresh snowfalls on six survey days, so visibility was generally good for spotting moose.

RESULTS AND DISCUSSION

Coverage

It took us about 61.2 hours to count moose in the 383 blocks in our survey area, for a search intensity of 0.62 minutes per km². This is slightly higher than our target search intensity of 0.5 minutes per km², and corresponded with flying through each block about four times and circling at animal observations when needed to verify them. We needed an additional 15.9 hours to ferry to and from the survey area and fuel supplies in Mayo and Pelly Crossing. The time devoted to ferrying (about 21% of total flight time) was fairly low compared to other surveys, which often average about 30% ferry time.

Observations of Moose

We counted a total of 711 moose, 198 of them adult bulls, 295 adult and yearling cows, 30 yearling bulls, 82 calves, and 106 unclassified adults (see Table 1). We spent 3673 minutes searching the survey blocks for moose, so we saw an average of 0.19 moose per minute of survey time.

Table 1. Observations of moose during the November 2006 survey in the Upper Klondike Highway Moose Management Unit.

	Number Observed	Percentage of Moose Observed
Adult Bulls	198	28
Adult and Yearling Cows*	295	41
Yearling Bulls	30	4
Calves	82	12
Unclassified Adults	106	15

* 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.

Distribution of Moose

Moose were widely distributed in the survey area (see Map 4). The biggest concentrations of moose were in the hills southwest of Stewart Crossing (the Willow Hills), mostly in the areas burned in 1998 and 1982, and on the subalpine ridges northeast of Ethel Lake. We saw smaller concentrations on subalpine ridges southwest of Little Kalzas Lake and on the northwestern flanks of the McArthur Range, on the hills (mostly burned in 2004) northeast of Diamain Lake, and on the hills north of Stewart Crossing and ridges south of the McQuesten River. Moose were mostly in habitats—subalpine, open ridges, and recent burns—with abundant willow growth. We saw relatively few moose in forested lowlands and slopes that had little shrub cover and in most of

the area burned in 2004. A few moose were in the riparian willow habitats along the Stewart River, but most were at higher elevations. The area southwest of Stewart Crossing had the highest concentrations of cows with calves.

Because of the heavy forest cover, we undoubtedly missed more moose in unburned lowland habitats than we did in open burned and subalpine areas, which would bias our results towards the open habitats. However, we saw no indication from our observations of moose tracks that we were missing large aggregations of moose in forested cover. Our general conclusion that most moose were open, willow-rich habitats holds despite differences in sightability among habitats.

Abundance of Moose

We can use the number of moose we saw per minute of search time to calculate an index of abundance of moose over the whole survey area. The equation used to calculate this index is:

Estimated Density = 39.5 + (725.5 x (# Moose seen per minute))

Substituting in our results of 0.19 moose seen per minute, and using the formulas for estimating precision in Ward, Gasaway & Dehn (2000), the calculated estimated density for the survey area is 177 ± 41% moose per 1,000 km² (the "± 41%" is a 90% "confidence interval", which says that, because of the variability in different factors affecting these sorts of counts, we're 90% certain that if we went out and counted the area again that we'd end up with an estimate within 41% of 177 moose per 1,000 km²).

At a density of 177 moose per 1,000 km², the total estimated population for the survey area would be 1,020 moose, with a 90% confidence interval of 602-1,438 moose. Based on the 2002 census, our estimate of the moose population in the survey area was 846 moose (estimated average density of 147 moose per 1,000 km²). So, the 2006 survey results do not suggest any large decrease or increase in moose numbers in the survey area. Even though the estimate of abundance in 2006 is a bit higher than we had previously estimated, these stratification surveys only give us rough indices of abundance, and so they can only detect large changes in numbers. Repeated low-intensity surveys or another high-intensity census would be necessary to more closely monitor the trend in moose numbers in this area.

Ages and Sexes of Moose

We classified most of the moose we saw by age and sex, but we cannot translate these directly into estimates of the composition of the moose population in the study area. Stratification surveys such as this are aimed mostly at determining the distribution of moose in the survey area. The data are valuable for mapping important habitats and also for dividing up the survey blocks covering the area into "strata" or categories of high and low expected densities of moose for future censuses.

The observed proportions of moose of different ages and sexes that we saw were likely biased compared to those of the actual population. Previous surveys have shown that cow moose, particularly cows with calves, tend to space themselves away from other moose more than bulls do, so that there is a higher proportion of cows in low-density survey blocks than there is in high-density blocks. Early-winter low-density blocks also typically have lower sightability, because forest canopies are, on average, denser. As a result of these differences in sightability of bulls and cows, we likely miss seeing more cows than we do bulls when we search over all habitats with the same intensity, so our observations will be biased towards bulls. Census surveys, in which survey blocks are searched very intensively and counts are corrected for sightability, are more appropriate for estimating population composition than are intensive stratification surveys.

The age and sex classifications observed in this survey can be compared directly with the results from similar surveys in the future though so, for that purpose, our observed composition indices were 75 bulls per 100 adult cows, 31 calves per 100 cows, and 23 yearlings per 100 cows. Especially if they are substantially underestimated, the relatively high numbers of calves and yearlings seen in this survey indicate good survival of calves in this area in the past two years.

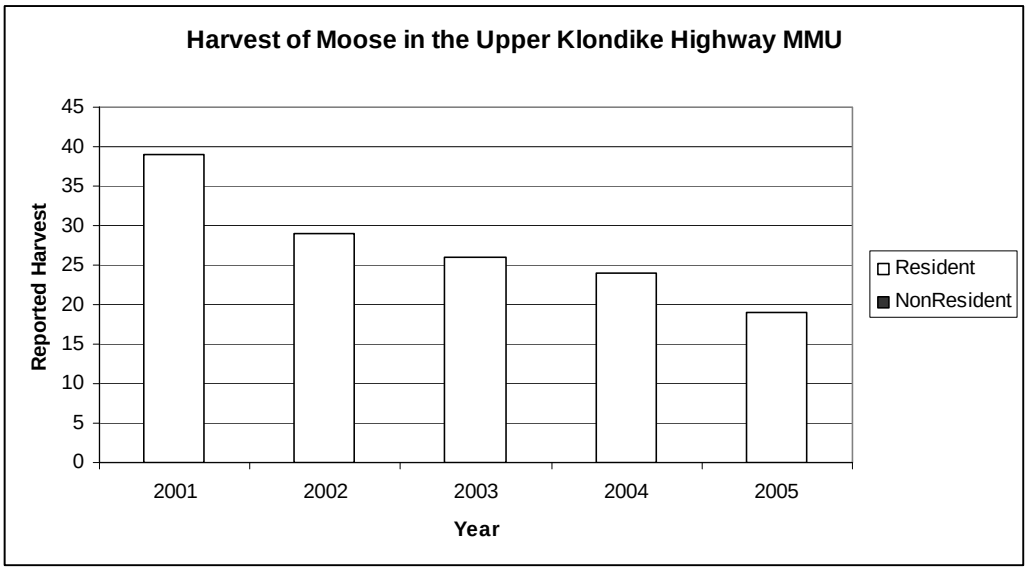
Identification of High and Low-Density Blocks

We divided the survey blocks into four categories of expected moose density, for use in future censuses of the survey area. We classified 138 (36%) of the 383 survey blocks as high, 52 (14%) as medium, 59 (15%) as low, and 134 (35%) as very low expected abundance of moose (see Map 5), based on our observations from the air and from previous surveys. Most of the blocks with higher expected numbers of moose were located in the burns where we observed high numbers of moose in this survey, in subalpine and open hilly areas, and in areas with dense willows along creeks and the Stewart River. For the purpose of selecting blocks for future censuses, we can group the blocks classified as expected high and medium numbers of moose into a High

stratum with 190 blocks, and consider the 193 blocks with low and very low expected numbers of moose to make up the Low stratum.

Harvest

The reported harvest of moose by licensed hunters in the Lower Macmillan River Moose Management Unit during the last 5 years for which we have complete records (2001 to 2005), averaged about 27 moose per year (see graph below), and harvest by licensed hunters has been steadily declining since 2001. This does not include harvest data from First Nation hunters, which are reported annually at Northern Tutchone May Gatherings. Using our best estimates of moose density and total harvest by all hunters, we estimate that the annual harvest in the Upper Klondike Highway Moose Management Unit is close to the recommended maximum sustainable harvest rate of 4% for this area. This area is an important and accessible hunting area for hunters from the Selkirk First Nation, First Nation of Na-Cho Nyäk Dun, and resident licensed hunters. We need to continue to closely monitor both harvest and the moose population in this area to ensure that the population remains healthy.



Other Wildlife Sightings

During the moose survey, we also recorded sightings of other notable observations of wildlife besides moose. We saw ten groups of caribou from the Ethel Lake herd in groups of 4-34 animals, for a total of 93 caribou (see Map 6). These were all located on the slopes of the ridges north and south of Ethel Lake.

CONCLUSIONS AND RECOMMENDATIONS

- Habitat with abundant willows in hilly terrain, subalpine ridges, and recent burns supports the highest densities of moose in this area in the early winter. The areas burned in 1982 and 1998 southwest of Stewart Crossing in the Willow Hills and the subalpine ridges north of Ethel Lake presently have the largest concentrations of moose in the area.

- The estimated density of moose in this area is about 150-180 per 1,000 km^2 of suitable moose habitat, which is slightly higher than the Yukon-wide average. We have no indication that abundance of moose in this area has changed during the past four years, but would need to do a full census to verify this.

- Present levels of harvest of moose in Upper Klondike Highway Moose Management Unit are likely near maximum sustainable levels. This area is an important and accessible hunting area for First Nation and licensed hunters.

- We should continue to monitor moose populations in this area using aerial and ground-based monitoring.

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Maps