

MAYO MOOSE MANAGEMENT UNIT
SUMMARY OF LATE-WINTER 2002
MOOSE SURVEY

4-10 MARCH 2002



Prepared by:
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March 2003

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SUMMARY OF LATE-WINTER 2002 MOOSE SURVEY
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**Yukon Fish and Wildlife Branch
SR-03-10**

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SUMMARY

- ❖ We conducted a late-winter survey of moose in the Mayo area on March 4-10, 2002, using a Super Cub aircraft. The main purpose of this survey was to estimate the proportion of calves in the population at the end of winter.
- ❖ We counted 64 moose, of which 6 were calves. When we accounted for the proportions of low-abundance and high-abundance blocks that we surveyed in the whole area, we estimated that about 12% of the population were calves. This is lower than the 15% generally needed to maintain stable moose numbers, but the longer-term average in the Mayo area is approximately 15%.
- ❖ We calculated a population estimate of 478 moose for the area, but this is likely an underestimate. Early-winter surveys, when sightability of moose is better, will be used for our best estimates of abundance.
- ❖ Harvest of moose in the Mayo area is likely near the upper limit of the allowable rate, but we need to know the harvest by First Nation hunters to know the actual present harvest levels.

INTRODUCTION

This report summarizes the results of the late-winter survey of moose in part of the Mayo Moose Management Unit (see Map 1), conducted on March 4-10, 2002. The main purpose of this survey was to estimate the proportion of calves in the population at the end of winter.

The Yukon Fish and Wildlife Branch has monitored populations of moose in the Mayo area since the mid-1970s, using a variety of methods. During the last 2 years, we have revised the methods and survey areas we use, to allow us to monitor the health of moose populations more regularly and cost-effectively.

Previous Surveys

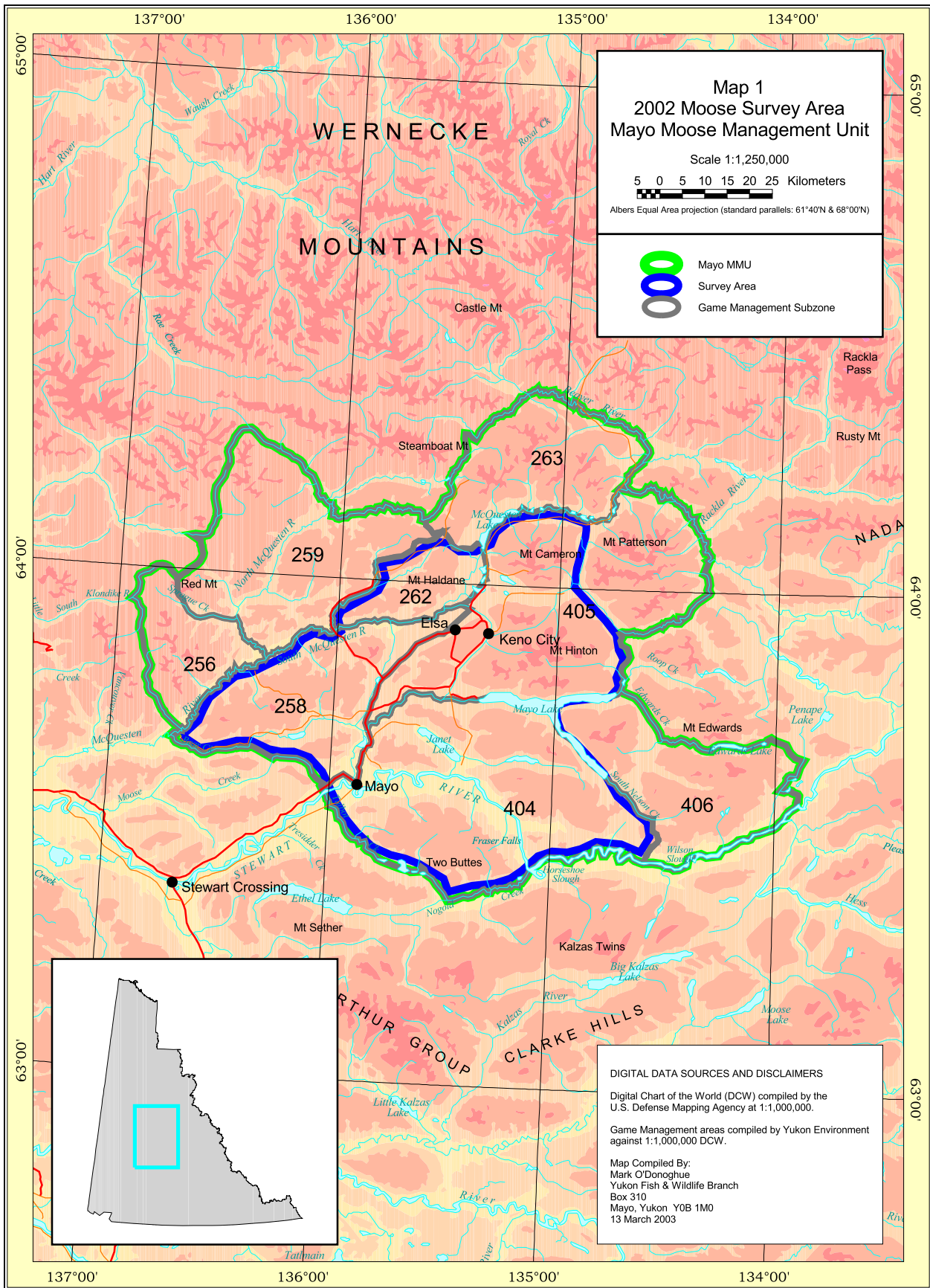
We conducted late-winter recruitment surveys in the Mayo area in 1989 (see Map 2; results in Larsen, Markel & Ward 1989), and from 1993 to 1999 (see Map 2; results in Ward and Larsen 1994, Ward and Larsen 1995, and Yukon Fish and Wildlife Branch file reports). The intent of these surveys was to provide us with a measure of annual calf survival, which affects population trend from year to year. We could not calculate estimates of abundance from these surveys.

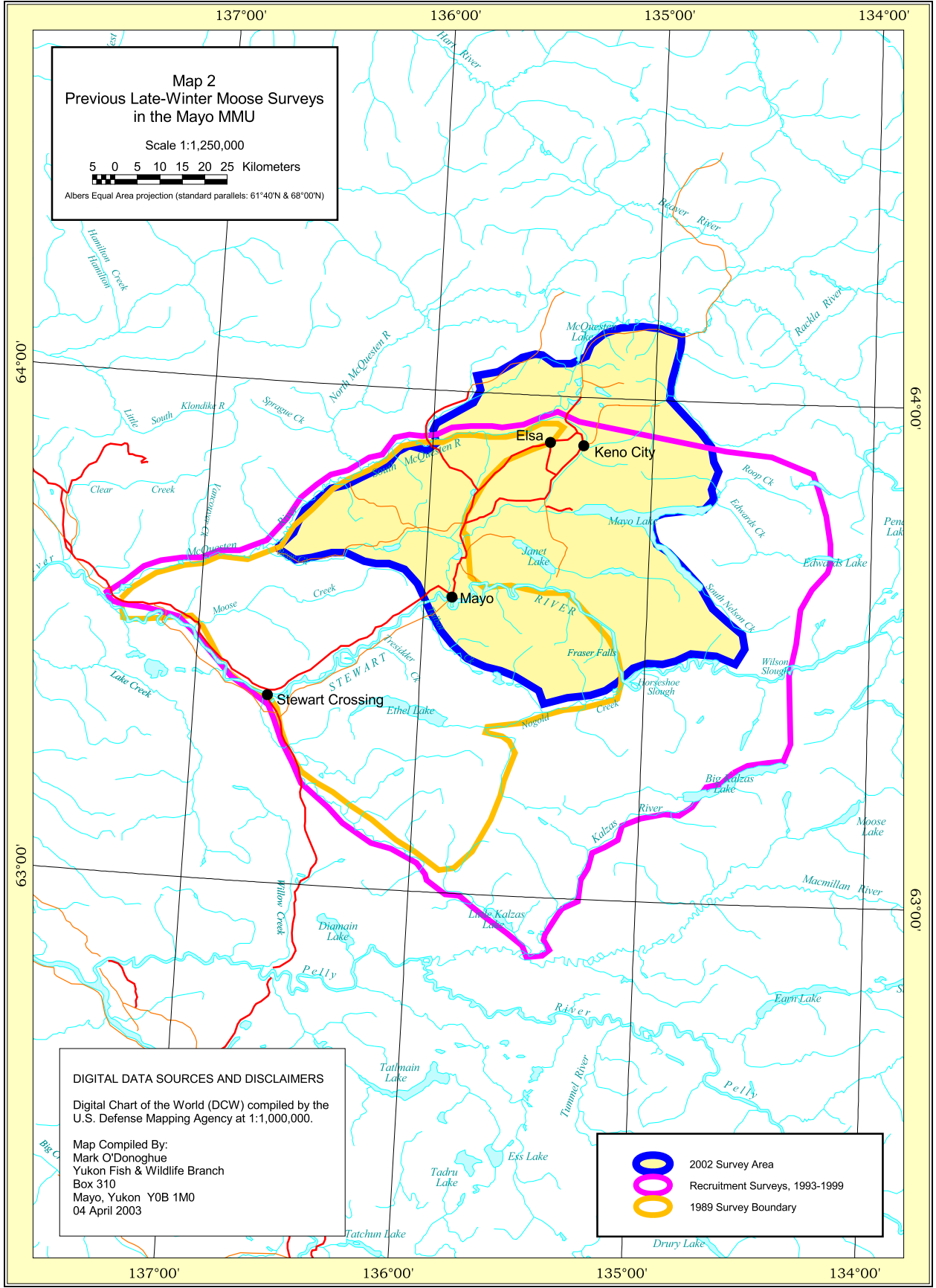
We conducted the first 30-block “low-intensity” aerial survey of moose, similar to this year’s survey, in the Mayo area in March 2001 (results in Fraser, O’Donoghue & Westover 2001). While the main purpose of the 2001 survey was also to estimate calf survival, this survey method also allows us to estimate abundance.

Our last survey of moose in the Mayo area during early winter, which is the best time of year to estimate abundance, was in 1998, using the stratified random block method (results in Yukon Fish and Wildlife Branch file reports).

Community Involvement

Residents of the Mayo area have consistently placed a high priority on monitoring the health of the local moose population. This was emphasized in the Integrated Big Game Management Plan for the Mayo Region in 1993-1996, and in the Integrated Wildlife Management Plan for the Nacho Nyak Dun Traditional Territory for 1997-2000. Both documents were developed cooperatively by the Mayo District Renewable Resources Council, the First Nation of Nacho Nyak Dun, and the Yukon Fish and Wildlife Branch. The community will again be involved with planning priorities for monitoring moose populations as a new wildlife management plan is developed in 2002.





Map 2
 Previous Late-Winter Moose Surveys
 in the Mayo MMU

Scale 1:1,250,000




5 0 5 10 15 20 25 Kilometers

Albers Equal Area projection (standard parallels: 61°40'N & 68°00'N)

DIGITAL DATA SOURCES AND DISCLAIMERS

Digital Chart of the World (DCW) compiled by the U.S. Defense Mapping Agency at 1:1,000,000.

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 04 April 2003

-  2002 Survey Area
-  Recruitment Surveys, 1993-1999
-  1989 Survey Boundary

STUDY AREA

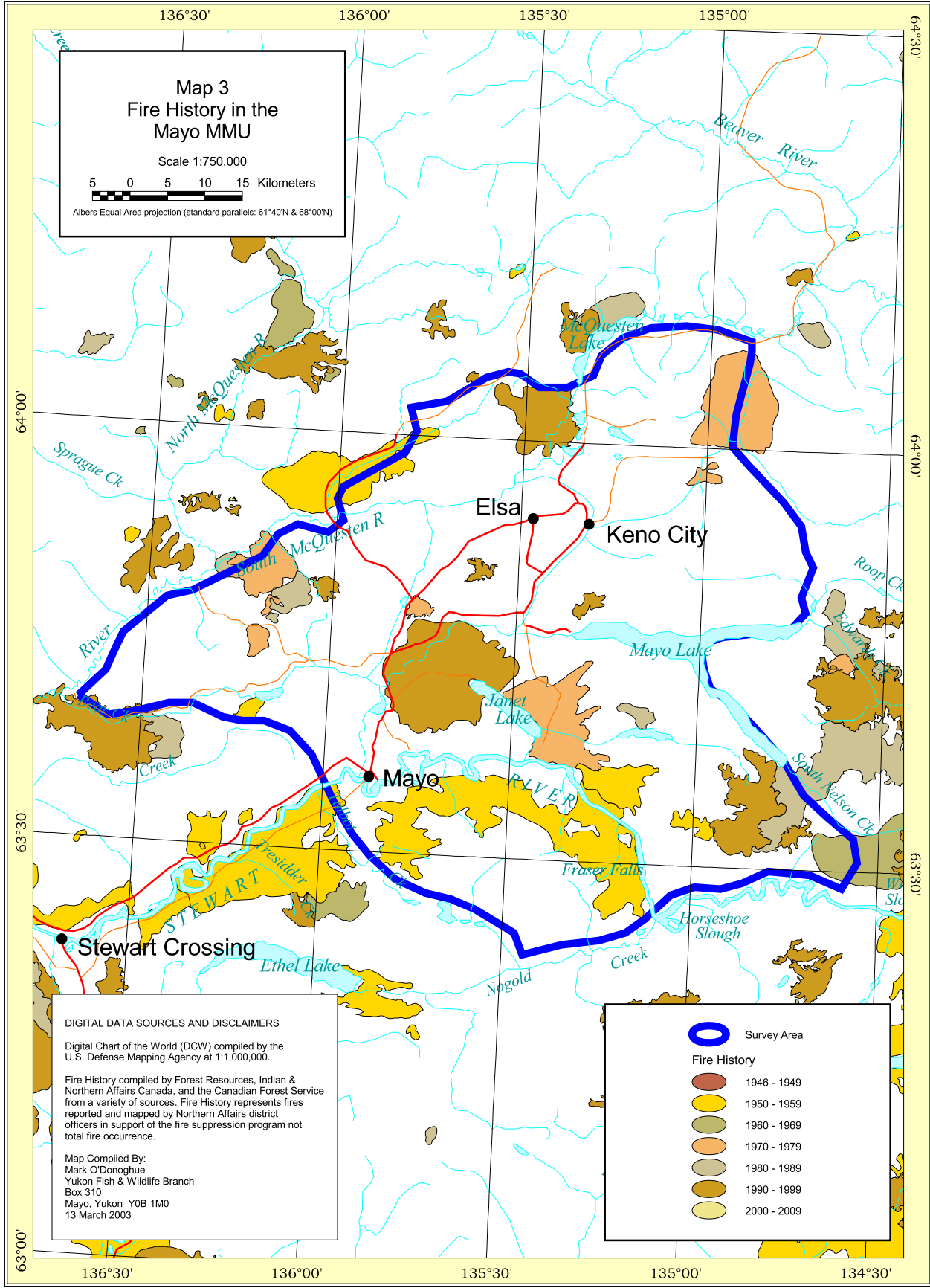
The Mayo survey area was re-located in 2001 to conform to the boundaries of Yukon Moose Management Units. These Moose Management Units were developed to help us more consistently monitor and manage moose in all areas throughout the Yukon. We plan to monitor the health of moose populations in priority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

The Mayo Moose Management Unit is about 9,760 km², and includes Game Management Sub-zones (GMS) 2-56, 2-58, 2-59, 2-62, 2-63, 4-04, 4-05 and 4-06 (see Map 1). The survey area within the Mayo Moose Management Unit is about 5,013 km². The border runs northeast from the site of Forty Mile on the South McQuesten River to McQuesten Lake. From here, it roughly extends south to Roop Lakes and along Mayo Lake to the Stewart River. The Stewart River and Nogold Creek, up to Francis Creek, form the southeast boundary. The southwest boundary runs along Francis and Talbot Creeks northwest to Mayo, and back to Forty Mile.

Most of the study area (about 4,716 km²) is considered suitable moose habitat, except for approximately 6% 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 South McQuesten 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, and the mountainous area in the northeastern corner (the Keno Hill area) of the survey area. Old and recent burns occur throughout the study area (see Map 3), and these vary in quality as moose habitat. The most recent large fires were a 66 km² burn near Hanson Lakes in 1998, a 73 km² burn south of the Nelson Arm on Mayo Lake in 1994, and a 183 km² burn north and west of Janet Lake in 1990.

METHODS

In the last 2 years, we have adopted a relatively new survey technique, recently developed by Jay Ver Hoef with the Alaska Department of Fish and Game. This method is similar to the way we conducted our moose surveys in the past, except it is less expensive because we use only fixed-wing aircraft for the entire survey instead of helicopters. The technique involves five steps:



Map 3
Fire History in the
Mayo MMU

Scale 1:750,000

5 0 5 10 15 Kilometers

Albers Equal Area projection (standard parallels: 61°40'N & 68°00'N)

DIGITAL DATA SOURCES AND DISCLAIMERS

Digital Chart of the World (DCW) compiled by the U.S. Defense Mapping Agency at 1:1,000,000.

Fire History compiled by Forest Resources, Indian & Northern Affairs Canada, and the Canadian Forest Service from a variety of sources. Fire History represents fires reported and mapped by Northern Affairs district officers in support of the fire suppression program not total fire occurrence.

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 13 March 2003

Legend

Survey Area

Fire History

- 1946 - 1949
- 1950 - 1959
- 1960 - 1969
- 1970 - 1979
- 1980 - 1989
- 1990 - 1999
- 2000 - 2009

1. The survey area is divided into uniform blocks 15-16 km² in size.
2. Observers in fixed-wing aircraft fly over all the blocks quickly, and they classify (“stratify”) them as having either high, medium, low, or very low moose abundance, based on local knowledge, number of moose seen, tracks, and habitat.
3. We combine these categories of blocks into high and low “strata”, and then randomly select a sample of each.
4. We try to count every moose within the selected blocks (the “census” part of our survey). We use Super Cubs because of their maneuverability and low air speed. We classify all moose seen by age and, when possible, sex. In late-winter surveys, after the bulls have lost their antlers, we don’t usually determine the sexes of moose.
5. We estimate the total number, ages, and (in early-winter surveys) sexes of moose 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.

This method can be used for both low and high-intensity surveys. Generally, the more blocks that are counted (a greater proportion of the blocks are flown in high-intensity surveys), the more precise and reliable the population estimate is.

WEATHER AND SNOW CONDITIONS

The weather and snow conditions were mostly excellent for this survey. Temperatures ranged from - 33°C to - 9°C. We were able to fly on all days, although we were restricted to a half day on 1 day because of high winds, and it was windy on 3 other days. Light conditions were bright for all but 3 survey blocks. We received about 10 cm of fresh snow the day before the survey started, so snow conditions were good. The overall snow depths in the survey area were well below normal this winter; at the beginning of March, snow depths ranged from about 48 cm in Mayo to 69 cm on Galena Hill near Elsa (D.I.A.N.D. 2002).

RESULTS AND DISCUSSION

Identification of High and Low-Density Blocks

We used the same stratification this year as we did for the March 2001 survey, except that we modified the expected abundance of moose in 3 blocks based on the results of the 2001 survey (see Map 4). Last year, we stratified about 70% of the survey area by overlaying all the moose observations from previous late-winter surveys on a map with our survey blocks, and using this information to assign each block a high, medium, low or very low designation. We then flew over the remaining 102 blocks in the northern part of the survey area to classify them according to expected abundance of moose.

We classified 24 (7%) of the 328 survey blocks as high, 46 (14%) as medium, 66 (20%) as low, and 192 (59%) as very low expected abundance of moose (see Map 4), based on our flights during previous surveys. Most of the blocks with higher expected numbers of moose were associated with habitat that had been burned during the past 30 years, especially in the Janet Lake and Nelson Creek areas (see Maps 3 and 4). For the purpose of selecting blocks to count, we grouped the blocks classified as expected high and medium numbers of moose into a High stratum with 70 blocks, and considered the 258 blocks with low and very low expected numbers of moose to make up the Low stratum.

After the census was completed, we were able to fly over 180 blocks in the southern half of the survey area and re-classify them by expected abundance of moose for future surveys. We averaged 0.15 minutes per km² during these stratification flights.

Coverage

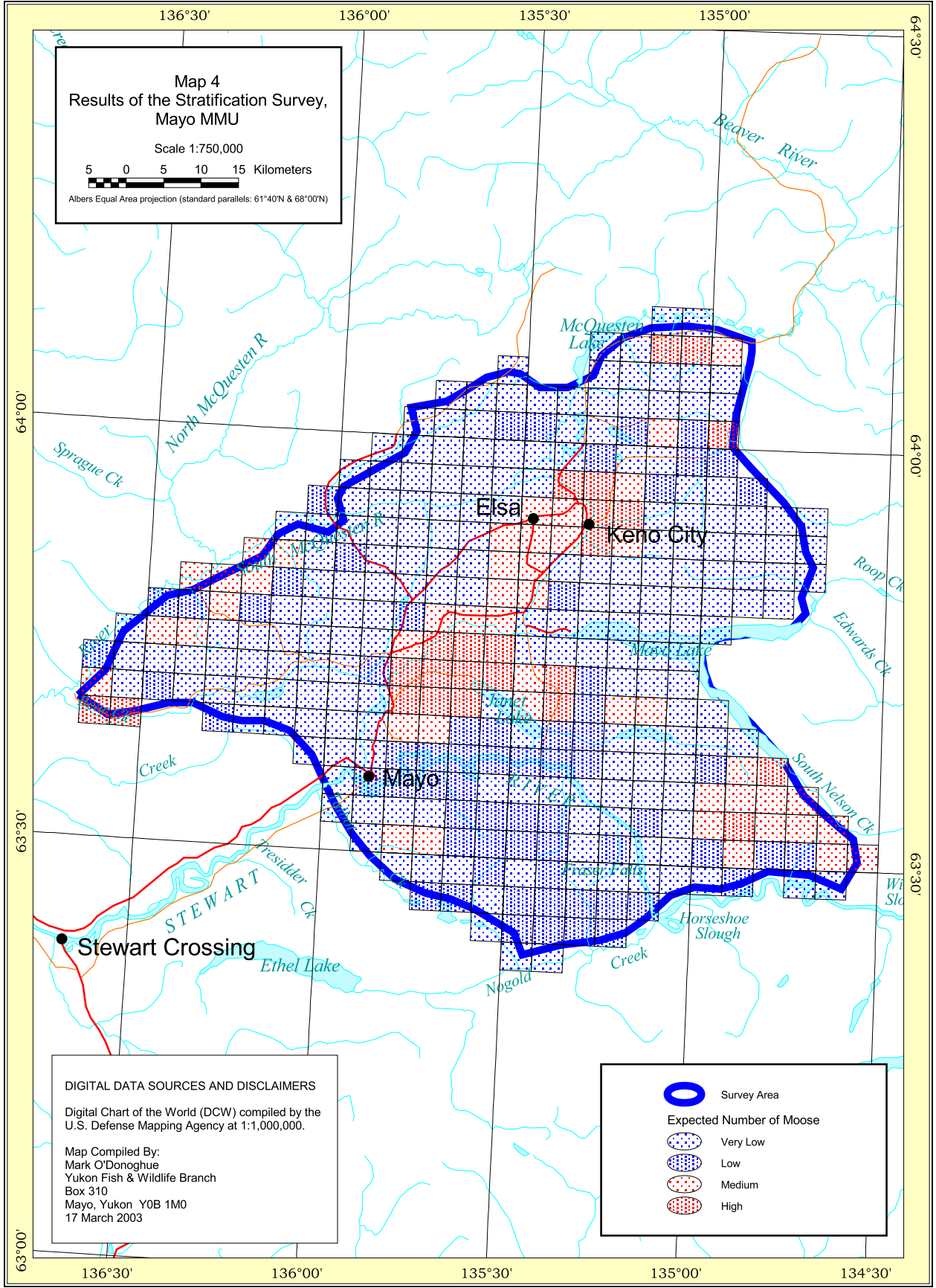
We counted moose in only 30 of the 328 blocks, so this survey is considered a low-intensity survey (see Map 5). We randomly selected and searched 18 (26%) of the 70 high-abundance blocks. It took us about 10 hours to count moose in these blocks, or about 2.2 minutes per km². We counted moose in 12 (5%) of the 258 low-abundance blocks in about 6 hours, or about 1.9 minutes per km². We needed an additional 8.3 hours to ferry between survey blocks and back and forth to Mayo.

Map 4
Results of the Stratification Survey,
Mayo MMU

Scale 1:750,000

5 0 5 10 15 Kilometers

Albers Equal Area projection (standard parallels: 61°40'N & 68°00'N)



DIGITAL DATA SOURCES AND DISCLAIMERS

Digital Chart of the World (DCW) compiled by the U.S. Defense Mapping Agency at 1:1,000,000.

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 17 March 2003

Survey Area

Expected Number of Moose

Very Low

Low

Medium

High

Observations of Moose

We counted a total of 64 moose, 58 of them adults and 6 of them calves (see Table 1). We could not determine the sex of most adults because the bulls had dropped their antlers and most moose were in forested cover, limiting our visibility. We observed an average of 186 moose for every 1,000 km² in the high-abundance blocks, and 71 moose per 1,000 km² in the low blocks.

Table 1. Observations of moose during the March 2002 survey in the Mayo Moose Management Unit.

	High Blocks	Low Blocks	Total
Number of Bulls Observed	0	0	0
Number of Cows Observed	4	2	6
Number of Unidentified Adults Observed	43	9	52
Number of Calves Observed	4	2	6

Ages of Moose

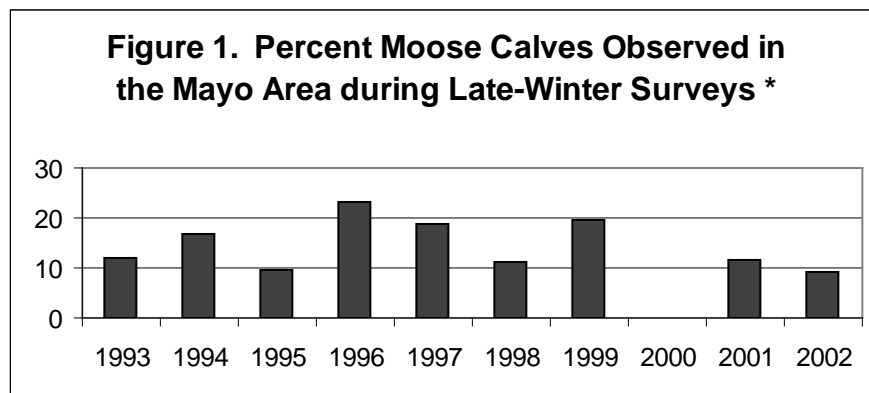
Nine percent of moose counted were calves. We surveyed a greater percentage of the high-density than the low-abundance blocks though, so when we calculate our estimates of the total percentage of calves in the whole survey area, it comes out a bit higher, at 12 percent (see Table 2).

Table 2. Estimated abundance of moose and percentage of calves in the Mayo Moose Management Unit survey area in March 2002.

	Best Estimate ± 90% Confidence Interval*	Estimates within 90% Confidence Interval*
Estimated Total Number of Moose	478 ± 33%	323-634
Adults	420 ± 34%	276-564
Calves	59 ± 88%	7-110
Estimated Percentage of Calves	12 ± 82%	2-22
Density of Moose (per 1,000 km ²)		
Whole Area	95	
Moose Habitat Only	101	

* 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, and that our best estimate is in the middle of this range.

Our estimate of 12% calves in the moose population in the Mayo area is lower than the 15% generally needed to replace adults dying in the population. Survival of calves in the Mayo area has been variable since 1993, with a long-term average of 14.7% calves in the population (see Figure 1).



* No data were collected in late winter, 2000. In 2001 and 2002, we could also calculate estimates of the total percentages of calves in the population—13% and 12%, respectively—because of revised survey methods.

Distribution and Abundance of Moose

Moose were more widely distributed this year than last, when more were concentrated near rivers and creek bottoms. Snow depths were above average last year, whereas they were considerably less this year. We spotted most moose in old burns, and on mid- and lower slopes along rivers and creek valleys.

The main purpose of late-winter surveys is to give us estimates of recruitment, or the proportion of calves surviving through their first year. With our new survey method, we can also calculate estimates of total numbers of moose as well.

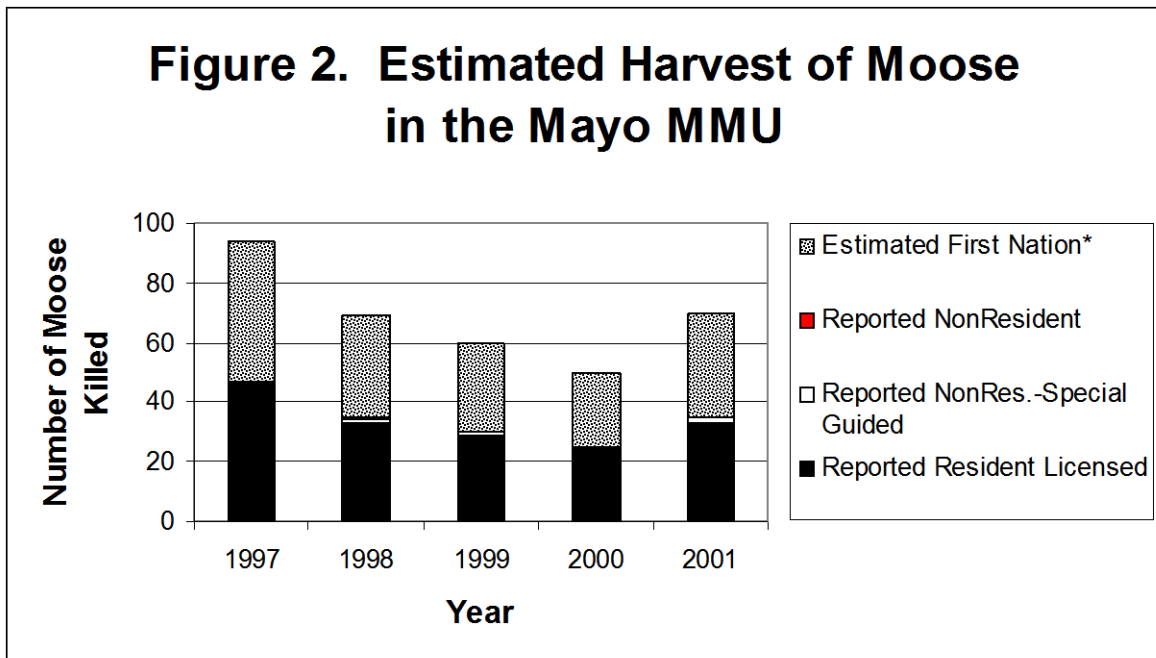
The estimated number of moose in the whole survey area is $478 \pm 33\%$ (see Table 2). This is approximately the same as the estimate of abundance from the March 2001 survey ($444 \pm 42\%$). The degree of uncertainty is high ($\pm 33\text{-}42\%$) in low-intensity surveys like this, because fewer total blocks are counted to make our estimates for the entire area. Our estimates are typically $\pm 20\%$ from high-intensity surveys.

The estimated density of moose in the survey area is 101 per 1,000 km² of suitable moose habitat. This is considerably lower than the last estimate of 200 per 1,000 km² made in the Mayo survey area (which included areas to the southwest of this year's survey; see Ward & Larsen 1994) in early winter 1998. These estimates, however, are not directly comparable. The sightability of moose during late-winter surveys, when moose are mostly in forested cover, is lower than in early winter, when they concentrate in open subalpine areas. As we do not correct our estimates of density for sightability, this year's estimate is likely an underestimate of the true density. Also, the survey areas were different between 1998 and 2002.

Late-winter surveys, such as we conducted this year, will be used primarily to gather information about recruitment, and we will rely on early-winter surveys for our best estimates of abundance. The next early-winter surveys of moose in the Mayo area are planned in 2002 (Upper Klondike Moose Management Unit, to the south and west of Mayo), and 2006 (Mayo Moose Management Unit). We will also conduct late-winter surveys to measure recruitment in 2003 and 2004.

Harvest

The reported harvest of moose by licensed hunters in the Mayo Moose Management Unit, during the last 5 years for which we have complete records (1997 to 2001), averaged about 34 moose per year (see Figure 2). We don't have complete harvest data from First Nation hunters. For the purpose of estimating total harvest levels though, we can assume that harvest by First Nation hunters is about equal to that by resident licenced hunters—based on local knowledge, this is probably approximately the case. Using our latest estimates of moose density from early-winter surveys, we estimate that the annual harvest is presently at about 3.8% of the total moose population in the Mayo Moose Management Unit. This is near the recommended maximum allowable harvest rate of 4% for this area. In addition, estimated harvest in 3 GMS's is above the recommended maximum allowable level of 5% for an individual GMS—GMS 2-56 (7.4%), GMS 2-62 (7.9%), and GMS 4-05 (5.2%). Given that we do not have complete data on harvest by First Nation hunters, these estimates of harvest may not be accurate. This does, however, point out the need for gathering good harvest data in this area so we can make sure that harvest remains within sustainable limits.



* Harvest by First Nation hunters estimated to be equal to that of licenced resident hunters.

CONCLUSIONS AND RECOMMENDATIONS

- ❖ Moose recruitment in the Mayo area in 2002 was slightly lower than the level generally considered necessary to maintain stable numbers. Annual calf survival has varied considerably in the Mayo area, however, and the longer-term average from 1993 to 2002 appears adequate.
- ❖ Harvest of moose in the Mayo area is likely near the maximum recommended allowable rate.
- ❖ We should continue to monitor the status and harvest of the moose population in the Mayo area closely.

Acknowledgments

The Yukon Fish & Wildlife Branch provided the funding and staff required for this survey. We thank Michel Menelon for safe, efficient flying, his keen eyesight, and vast knowledge of the area.

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