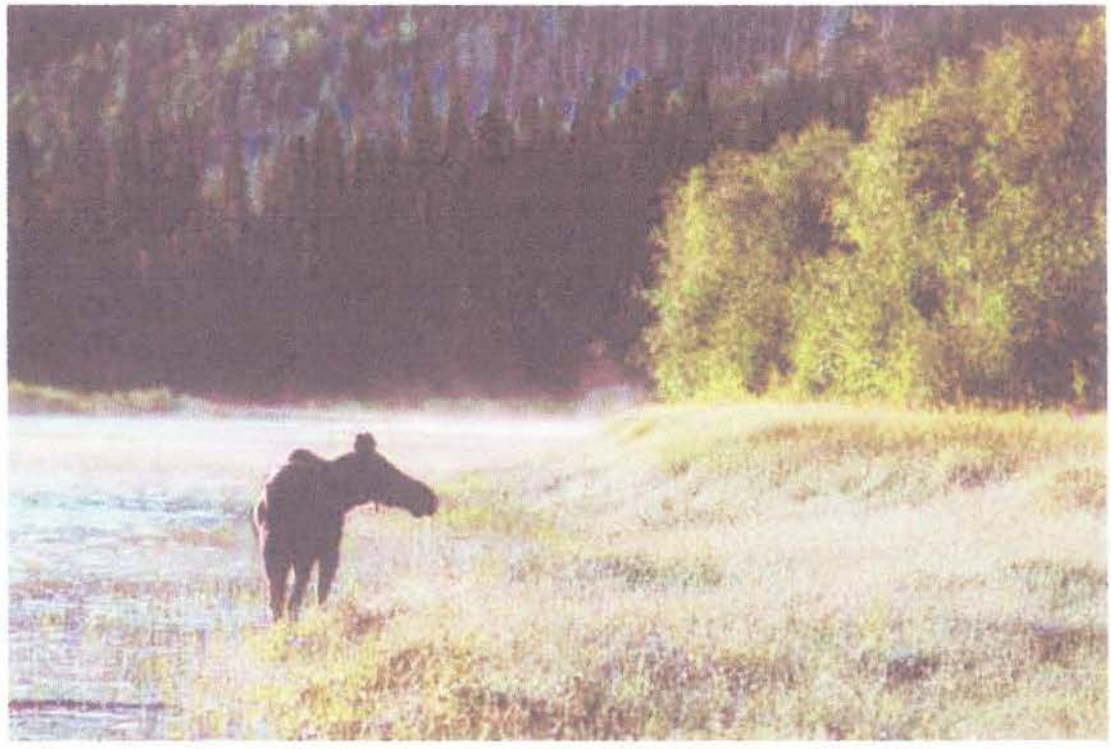
Mayo Moose Management Unit

Summary of Late-Winter 2001 Moose Survey

2-5 March 2001



Vince Fraser, Northern Tutchone Regional Technician/Conservation Officer
Mark O'Donoghue, Northern Tutchone Regional Biologist
Susan Westover, Moose Technician

Yukon Fish and Wildlife Branch
Department of Environment
Box 310
Mayo, Yukon Y0B 1M0
(867) 996-2162

SUMMARY

- We conducted a late-winter survey of moose in the Mayo area on 2-5 March 2001 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 87 moose, of which 10 were calves. Based on these sample counts, we estimated that about 13% of the population was calves. This is slightly lower than the 15% generally needed to maintain stable moose numbers, but the longer-term average of 15.4% in the Mayo area is adequate.

- We calculated a population estimate of 444 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 sustainable 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 2-5, 2001. The main purpose of this survey was to estimate the proportion of calves in the population at the end of winter.

The Yukon Department of Renewable Resources has monitored populations of moose in the Mayo area since the mid-1970s, using a variety of methods. We are presently revising the methods and survey areas we use, to allow us to monitor the health of moose populations more regularly and cost-effectively. This year's survey represents the first step in the new monitoring program.

Previous Surveys

We conducted late-winter recruitment surveys in the Mayo area from 1993 to 1999 (see Map #1; results in Ward and Larson 1994, Ward and Larson 1995, and Yukon Territorial Government 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 early-winter surveys to estimate moose abundance in the Mayo area in early winter in 1988, 1993 and 1998, using the stratified random block method (see Map #2). The results of these surveys can be found in YTG technical reports (Larsen, Markel and Ward 1989; Ward and Larsen 1994) and internal file reports.

Moose were also surveyed during late winter along the Stewart River upstream of Fraser Falls in 1975 (Lortie and Jack 1976) and along the Stewart and lower McQuesten Rivers in 1979 (Larsen 1979).

Community Wildlife Management Plans

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 2001.

STUDY AREA

The Mayo survey area was re-located this year to conform to the development of Yukon Moose Management Units. These Moose Management Units are being 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 high and low-intensity 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 5013 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 4716 km²) is considered suitable moose habitat, except for approximately 6% of the area, which includes large water bodies and land over 5000 feet. 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.

METHODS

This year, 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 high-intensity 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:

1. The survey area is divided into uniform blocks approximately 15 km² in size.

2. Observers in fixed-wing aircraft fly over all the blocks quickly, and they classify ("stratify") them as having either high or low moose abundance, based on local knowledge, number of moose seen, tracks, and habitat.

3. We randomly select a sample of the high and low blocks.

4. We then attempt to count every moose within these blocks. A Super Cub fixed-wing aircraft is used for its maneuverability and low air speed. We classify all moose seen by age and, when possible, sex.

5. From these sample counts, we estimate the total number, ages, and sexes of moose in the entire survey area. We assume that the blocks we do not search have, on average, the same number of moose as the blocks we do search. We do not, however, 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

Temperatures ranged from -5°C to -25°C during the survey, and winds were generally calm. Light conditions were generally flat, with some bright periods. There was no fresh snow before the survey started. The overall snow depth for the area northeast of Mayo was above normal this winter; at the beginning of March, snow depths ranged from about 55 cm in Mayo to 77-92 cm north and east of the village (D.I.A.N.D. 2001).

RESULTS AND DISCUSSION

Identification of High and Low-Density Blocks

We stratified about 70% of the survey area by overlaying all the moose observations from previous late-winter surveys on a map with our new survey blocks, and using this information to assign each block a high or low designation. However, the northern portion of our 2001 study area was not covered during previous late-winter surveys, so we

had to fly over 102 of the blocks to stratify them into highs and lows at the start of this survey. We averaged 0.18 minutes per km² during the stratification flights.

We classified 70 (21%) of the 328 survey blocks as blocks with high moose abundance, and 258 (79%) as blocks with low moose abundance. Many of the high-abundance blocks 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).

Coverage

We counted moose in only 30 of the 328 blocks, so this survey is considered a low-intensity survey. 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 2.0 minutes per km². We needed an additional 7.5 hours to ferry between survey blocks and back and forth to Mayo. Survey costs are summarised in the Appendix.

Observations of Moose

We counted a total of 87 moose, 77 of them adults and 10 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 295 moose for every 1,000 km² in the high-abundance blocks, and 33 moose per 1,000 km² in the low blocks.

Table 1. Observations of moose during the March 2001 survey in the Mayo Moose Management Unit.

	High Blocks	Low Blocks	Total
Number of Bulls Observed	6	1	7
Number of Cows Observed	10	1	11
Number of Unidentified Adults Observed	56	3	59
Number of Calves Observed	9	1	10

Ages of Moose

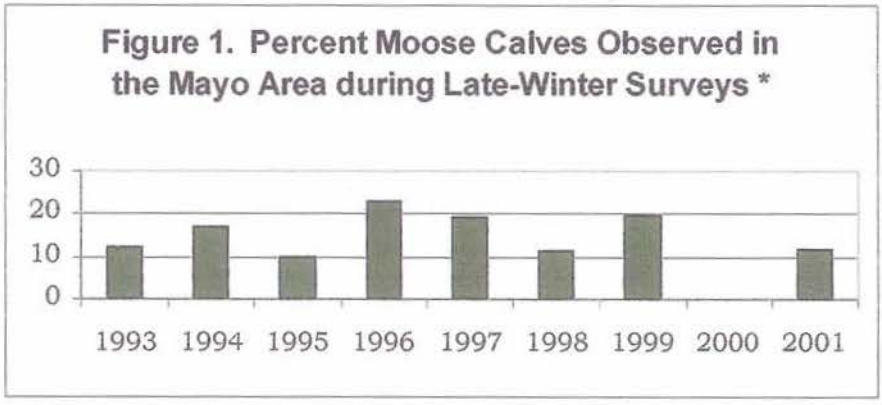
Eleven percent of moose counted were calves. We surveyed a greater percentage of the high-density than the low-density blocks though, so when we calculate our estimates of the total percentage of calves in the whole survey area, it comes out a bit higher, at 13 percent (see Table 2).

Table 2. Estimated abundance of moose and percentage of calves in the Mayo Moose Management Unit survey area in March 2001.

	Best Estimate ± 90% Confidence Interval*	Estimates within 90% Confidence Interval*
Estimated Total Number of Moose	444 ± 42%	267-632
Adults	388 ± 41%	230-545
Calves	57 ± 51%	14-99
Estimated Percentage of Calves	13 ± 51%	6-19
Density of Moose (per 1,000 km²)		
Whole Area	89	
Moose Habitat Only	94	

* 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 13% calves in the moose population in the Mayo area is slightly 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 15.4% calves in the population (see Figure 1).



* No data were collected in late winter, 2000.

Distribution and Abundance of Moose

Most moose were located at mid-elevations (600-900 m) on benches and hillsides above the river and creek bottoms. Older tracking observed at upper elevations suggests that moose moved down from higher elevation habitats, presumably due to the deep snow.

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 444 ± 42% (see Table 2). The degree of uncertainty is high (± 42%) in a low-intensity survey like this, because fewer total blocks are counted to make our estimate for the entire area. Our estimates are typically ± 20% from high-intensity surveys.

The estimated density of moose in the survey area is 94 per 1000 km² of suitable moose habitat. This is considerably lower than the last estimate of 200 per 1000 km² made in the survey area to the southwest (see Map # 2) 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 2001.

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 2002 and 2003.

Harvest

The average annual harvest of moose in the Game Management Subzones included in this survey area (GMS 2-58, 2-62, 4-04 and 4-05) from 1996 to 2000 was about 24 moose. The reported annual harvest for the whole Mayo Moose Management Unit averaged about 32 moose per year during the same period. These figures don't include harvest by First Nation hunters. Using our latest estimates of moose density (from early-winter counts), and assuming that harvest by First Nation hunters is about equal to the reported harvest, the annual harvest is presently at about 3.5% of the total moose population in the Mayo area. This is near the upper end of the recommended maximum sustainable harvest rate of 4% for the Mayo Moose Management Unit.

CONCLUSIONS AND RECOMMENDATIONS

- Moose recruitment in the Mayo area in 2001 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 2001 appears adequate.
- Harvest of moose in the Mayo area is likely near the maximum recommended sustainable rate.
- We should continue to monitor the status of the moose population in the Mayo area closely.

Acknowledgments

The Department of Renewable Resources, Government of Yukon, 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.

Literature Cited

D.I.A.N.D. 2001. Yukon Territory snow survey bulletin and water supply forecast. Water Resources Division, Indian and Northern Affairs Canada, Northern Affairs Program, Whitehorse, Yukon.

Larsen, D. G. 1979. Winter moose surveys in Game Management Zones 3-4 and a review of moose hunting seasons - 1979. Internal Report, Yukon Fish and Wildlife Branch.

Larsen, D. G., R. L. Markel, and R. M. P. Ward. 1989. Moose population characteristics in the Mayo and Pelly Crossing areas 1988-1989. Progress Report, Yukon Fish and Wildlife Branch.

Lortie, G., and J. Jack. 1976. A winter moose survey on the proposed Fraser Falls Impoundment Area - Stewart River. Internal Report, Yukon Fish and Wildlife Branch.

Ward, R. M. P., and D. G. Larsen. 1994. Summary of 1993 moose surveys in the Big Salmon, Mayo, Aishihik-Onion Creek and Dawson areas. Survey Report SR-94-03, Yukon Fish and Wildlife Branch.

Ward, R. M. P., and D. G. Larsen. 1995. Summary of 1992 moose surveys in the Aishihik, Onion Creek, Big Salmon, Mayo and Dawson areas. Progress Report PR-95-02, Yukon Fish and Wildlife Branch.

Appendix. Costs of the Mayo Moose Survey

Budget Item	Cost
Fixed-wing Aircraft for Stratification, 6.9 hrs air time plus fuel*	$ 1,555
Super Cub Aircraft for Survey, 23.5 hours air time plus fuel	$ 5,295
TOTAL	$ 6,850

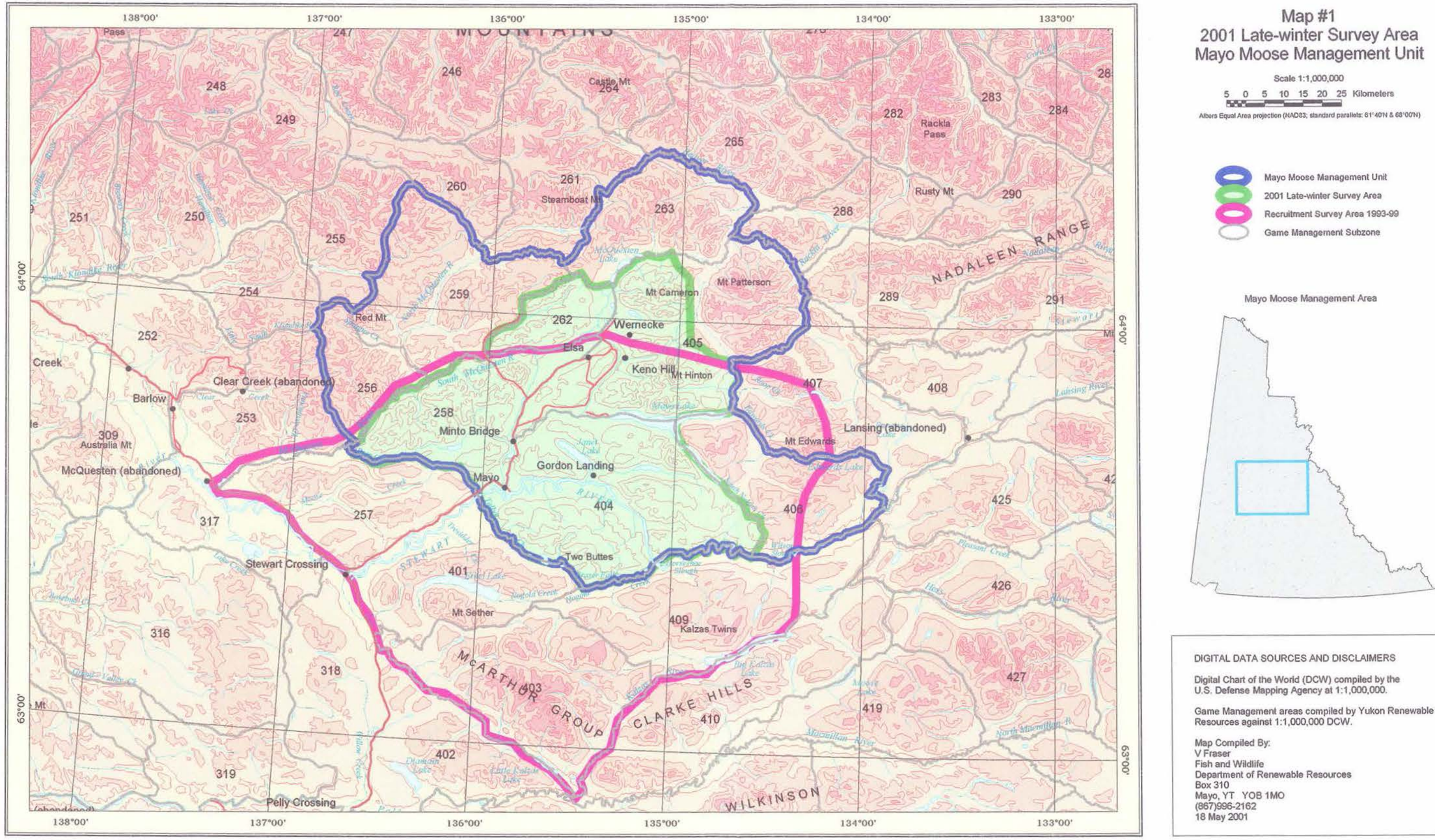
* Only 102 of the 328 survey blocks were stratified.

Map #1
2001 Late-winter Survey Area
Mayo Moose Management Unit

Scale 1:1,000,000

5 0 5 10 15 20 25 Kilometers

Albers Equal Area projection (NAD83; standard parallels: 61°40'N & 68°00'N)



Mayo Moose Management Unit
2001 Late-winter Survey Area
Recruitment Survey Area 1993-99
Game Management Subzone

Mayo Moose Management Area

DIGITAL DATA SOURCES AND DISCLAIMERS

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

Game Management areas compiled by Yukon Renewable Resources against 1:1,000,000 DCW.

Map Compiled By:
V Fraser
Fish and Wildlife
Department of Renewable Resources
Box 310
Mayo, YT YOB 1MO
(867)996-2162

18 May 2001

Map ID: Map #1

Map #2
Early Winter Survey Areas
Mayo Moose Management Unit

Scale 1:1,000,000

5 0 5 10 15 20 25 Kilometers

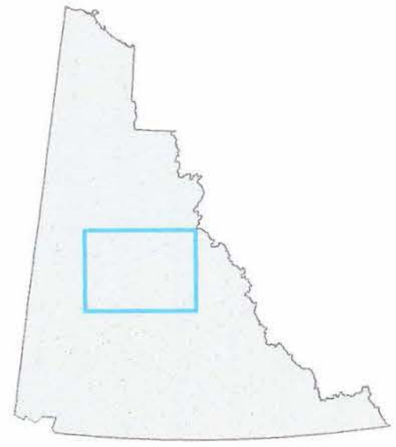
Albers Equal Area projection (NAD83; standard parallels: 61°40'N & 68°00'N)

Mayo Early-winter Survey Area 1988 + Late-winter 1989

Mayo Early-winter Survey Area 1993 and 1998

Game Management Subzone

Mayo Moose Management Area



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V Fraser
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Department of Renewable Resources
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(867)996-2162
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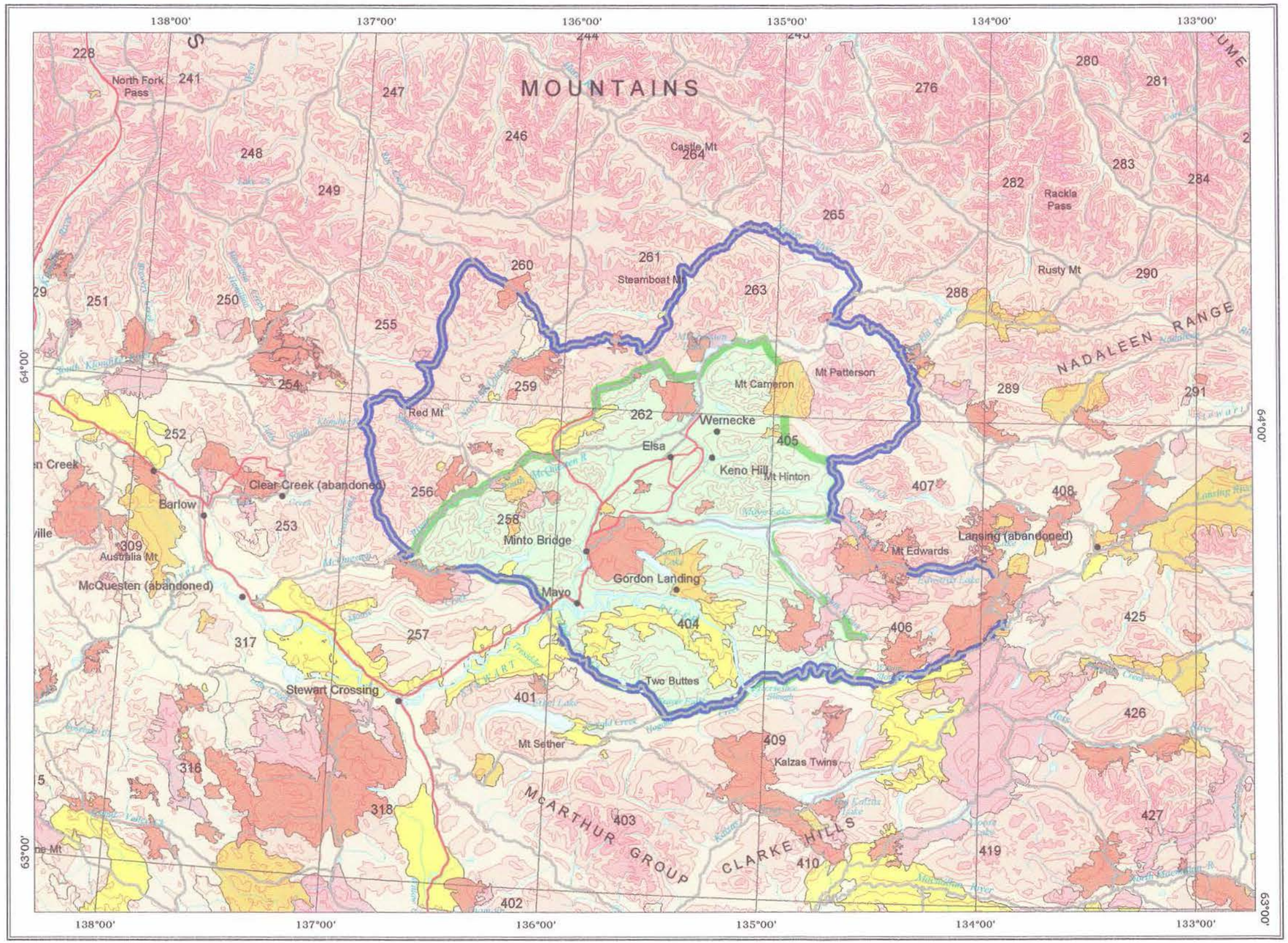
Map ID: Map #2

Map #3
Forest Fire History
Mayo Moose Management Unit



Scale 1:1,000,000

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Albers Equal Area projection (NAD83; standard parallels: 61°40'N & 68°00'N)

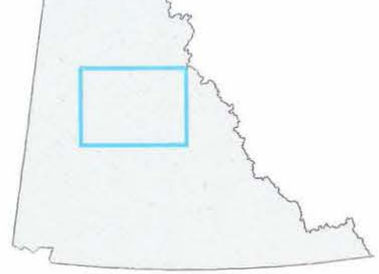
Mayo Moose Management Unit

2001 Late-winter Survey Area

Fire history

- 1946 - 1948
- 1950 - 1959
- 1960 - 1969
- 1970 - 1979
- 1980 - 1989
- 1990 - 1999

Mayo Moose Management Unit



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Department ofRenewable Resources
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Mayo, YT YOB 1MO
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Map #4
Mayo Late-winter Survey 2001
High and Low Density Blocks

Scale 1:1,000,000

5 0 5 10 15 20 25 Kilometers

Albers Equal Area projection (NAD83; standard parallels: 61°40'N & 68°00'N)

High Density Blocks

Low Density Blocks

Mayo Moose Management Unit

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Mayo, YT YOB 1MO
(867)996-2162
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