MOOSE SURVEY

MAYO MOOSE MANAGEMENT UNIT

LATE-WINTER 2014

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Yukon
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Yukon Department of Environment
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SR-16-05

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Summary

- We used helicopters to conduct a late-winter intensive stratification survey of moose in the Mayo area from 28 February to 04 March 2014. The main purpose of this survey was to map the distribution and late-winter moose habitats in this area.
- We flew over the entire survey area and spent about 0.52 minutes per km² searching for moose. We found a total of 147 moose, of which 132 were adults and 15 were calves.
- Moose were widely distributed across the survey area. Most were concentrated in valleys and on lower to mid-elevation slopes overlooking the rivers and major creeks, in willow-rich habitats with shallower snow depths than in adjacent subalpine areas. Areas burned in the 1970s through 2000s with abundant willows were heavily utilised. Moose were especially concentrated in valleys in the northeastern part of the survey area where snow was deepest.
- About 10% of moose observed during the survey were calves. This may be negatively biased compared to the percentage of calves in the population because of lower sightability of cows with calves. It is a bit lower than average compared to other late-winter intensive stratification surveys, indicating that recruitment was likely at or slightly below average this year in this area.

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Introduction

This report summarizes the results of the late-winter survey of moose in the Mayo area (Map 1), conducted from 28 February to 04 March 2014. The main purpose of the survey was to map the distribution and late-winter habitats of moose in this area. Part of this region is experiencing high levels of mineral exploration and there is a proposed development of a new operating mine with an all-season access road north and northeast of Keno City.

Previous Survey

Environment Yukon has monitored populations of moose in the Mayo area since the mid-1970s, using a variety of methods and survey areas (Map 2).

We have conducted late-winter surveys to measure recruitment of calves in the Mayo area in 1989 (Larsen et al. 1989) and, over a broader area, annually from 1993 to 1999 and in 2003 (Ward and Larsen 1994, Ward and Larsen 1995, and Sinnott and O'Donoghue 2003). We have also measured late-winter recruitment of moose in the same survey area in 2001, 2002, and 2004 (Fraser et al. 2001, O'Donoghue and Sinnott 2003, and O'Donoghue 2015).

We conducted early-winter censuses of moose in the Mayo area using the stratified random block method in 1988 (Larsen et al. 1989), 1993 (Ward and Larsen 1994), 1998 (Environment Yukon 2003), 2006 (Ward et al. 2006), and 2011 (O'Donoghue et al. 2012).

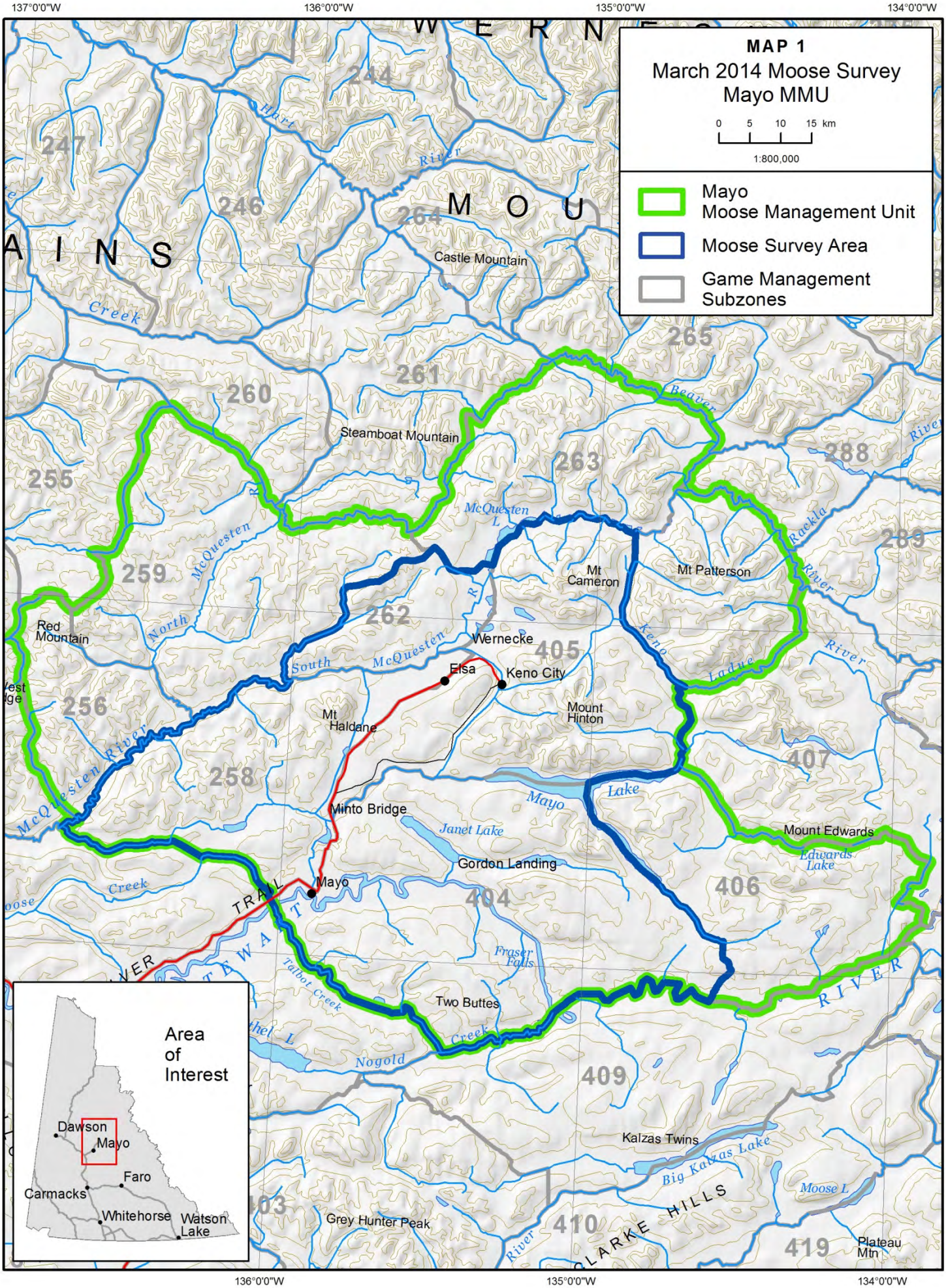
Community Involvement

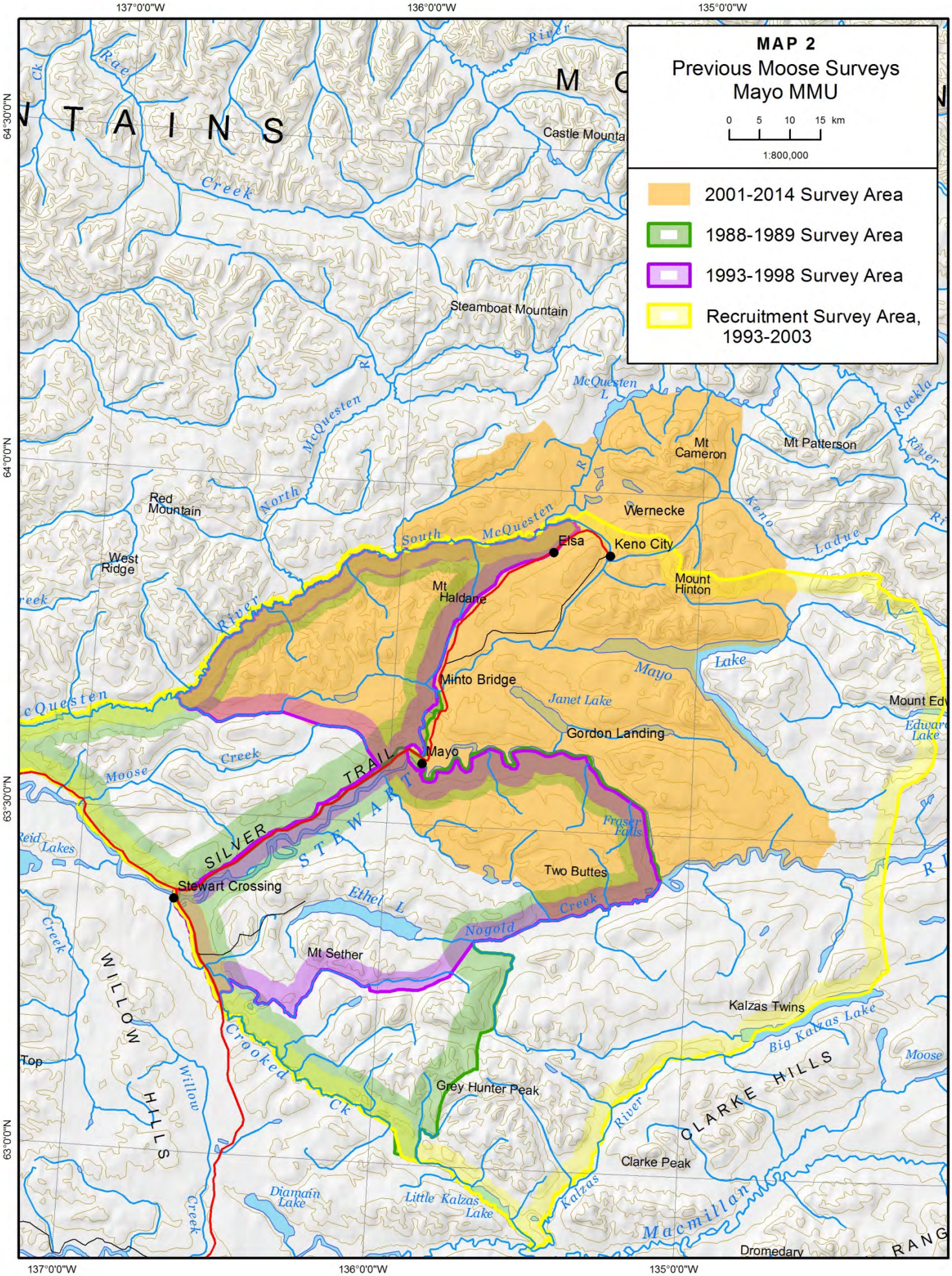
This survey was conducted because of concerns expressed about cumulative effects of mineral exploration on wildlife during planning sessions for developing the *Community-based Fish and Wildlife Management Work Plan for the Na-Cho Nyäk Dun Traditional Territory for 2008-2013*. This plan was developed cooperatively by the Mayo District Renewable Resources Council, the First Nation of Na-Cho Nyäk Dun, and Environment Yukon. The First Nation of Na-Cho Nyäk Dun provided staff to help conduct the survey.

Study Area

The Mayo survey area was re-located in 2001 so it fell within the boundaries of the newly-delineated Mayo Moose Management Unit (MMU; Map 1). Yukon MMUs were developed to help us more consistently monitor and manage moose in all areas throughout the Yukon. We plan to regularly monitor the health of moose populations in priority MMUs using both aerial and ground-based surveys.

The Mayo MMU is about 9,659 km², and includes Game Management Subzones 2-56, 2-58, 2-59, 2-62, 2-63, 4-04, 4-05 and 4-06 (Map 1). The survey area within the Mayo MMU is about 5,014 km². The survey area border runs northeast along the McQuesten and South McQuesten rivers to McQuesten Lake, and south along the Keno Ladue River to Mayo Lake and the Stewart River. The Stewart River and Nogold Creek form the southeast boundary. The southwest boundary runs along Talbot


MAP 1
March 2014 Moose Survey
Mayo MMU
0 5 10 15 km
1:800,000
Mayo
Moose Management Unit
Moose Survey Area
Game Management
Subzones
137°0'0"W
136°0'0"W
135°0'0"W
134°0'0"W
64°30'0"N
64°0'0"N
63°30'0"N
Castle Mountain
Steamboat Mountain
Mt Cameron
Mt Patterson
Red Mountain
Wernecke
Elsa
Keno City
Mt Haldane
Mount Hinton
Minto Bridge
Janet Lake
Gordon Landing
Mayo
Mount Edwards
Edwards Lake
Fraser Falls
Two Buttes
Kalzas Twins
Big Kalzas Lake
Moose L
Grey Hunter Peak
Plateau Mtn
Area of Interest
Dawson
Mayo
Faro
Carmacks
Whitehorse
Watson Lake


MAP 2
Previous Moose Surveys
Mayo MMU
0 5 10 15 km
1:800,000
2001-2014 Survey Area
1988-1989 Survey Area
1993-1998 Survey Area
Recruitment Survey Area, 1993-2003
137°0'0"W
136°0'0"W
135°0'0"W
64°30'0"N
64°0'0"N
63°30'0"N
63°0'0"N
Castle Mountain
Steamboat Mountain
Mt Cameron
Mt Patterson
Red Mountain
West Ridge
Wernecke
Elsa
Keno City
Mount Hinton
Mt Haldane
Minto Bridge
Mayo
Gordon Landing
Mount Edw
Stewart Crossing
Two Buttes
Mt Sether
Kalzas Twins
Grey Hunter Peak
Clarke Peak
Dromedary
SILVER TRAIL
STEWART
WILLOW HILLS
CLARKE HILLS
Mayo Lake
Janet Lake
Fraser Falls
Ethel L
Nogold Creek
Crooked Ck
Big Kalzas Lake
Little Kalzas Lake
Diamain Lake
Moose Creek
Willow Creek
Kalzas River
Macmillan
Keno Ladue
Raekla River
McQuesten R
North McQuesten R
South McQuesten R
McQuesten L
Rae Creek
Reid Lakes
Edward Lake
Top

Creek northwest to Mayo, and back to the McQuesten River.

Most of the study area (about 4,717 km²) is considered suitable moose habitat. The remaining 6% of the area, which includes large water bodies (0.5 km² or more in size) and land at or over 1,524 m (5,000 feet) in altitude, is considered unsuitable moose habitat. 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 terrain in the northeastern corner of the survey area.

Old and recent burns occur throughout the study area (Map 3), and vary in quality as moose habitat. The most recent large fires were a 55 km² burn north of the South McQuesten River in 2005, a 71 km² burn southwest of McQuesten Lake in 1998, a 73 km² burn at the end of the south arm of Mayo Lake in 1994, and a 183 km² burn north and west of Janet Lake in 1990

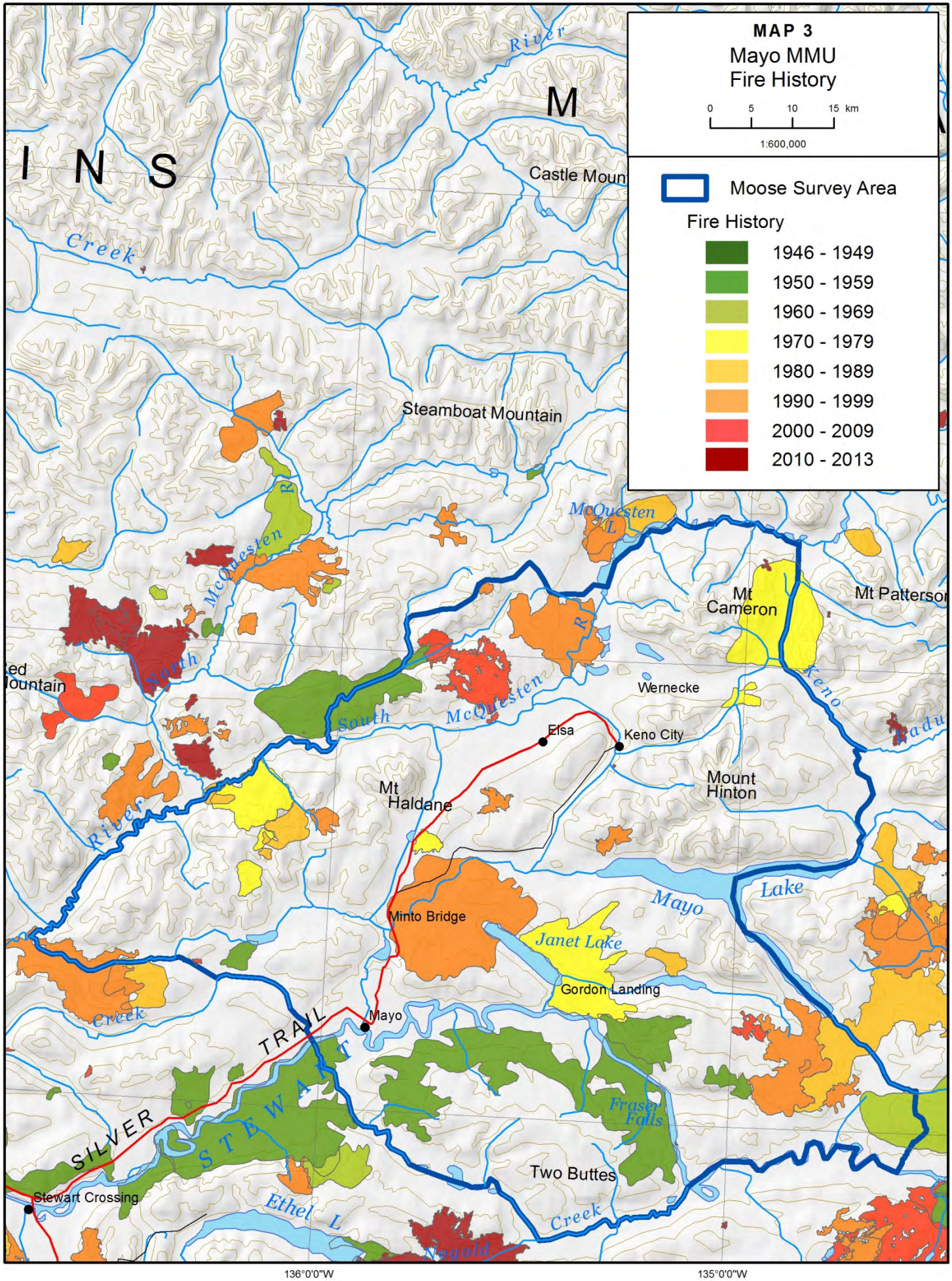
Methods

We used a survey method called "intensive stratification", which gives us good information about the distribution of moose over the entire survey area. The technique involves the following steps:

1. The survey area is divided into uniform roughly rectangular blocks 15 to 16 km² (2' latitude x 5' longitude) in size.
2. Observers in aircraft fly over all the blocks, making about 4 passes through each block. They classify (or "stratify") each block as having either high, medium, low, or very low expected moose abundance. Classification is based on local knowledge, number of moose observed, tracks, and habitat. This is the same as the "stratification" part of a full moose census survey, except that we cover the area at about four times the intensity (0.5 minutes per km²) to get more complete information.
3. We count and get a GPS location for each moose or group of moose we observe. We classify all observed moose by age (adult or calf) when possible, but we do not put as much effort into this as we do during censuses when we are making estimates of population composition. With the exception of cows with calves, we do not try to determine the sex of moose. For this survey, we also recorded a GPS location for each sighting of fresh moose tracks, in order to supplement our data from animal observations.

Weather and Snow Conditions

Weather conditions for this survey were excellent. Temperatures ranged from -9°C to -34°C. Skies were clear each day and winds were mostly light. Light conditions were mostly bright


MAP 3
Mayo MMU
Fire History
0 5 10 15 km
1:600,000
Moose Survey Area
Fire History
1946 - 1949
1950 - 1959
1960 - 1969
1970 - 1979
1980 - 1989
1990 - 1999
2000 - 2009
2010 - 2013
136°0'0"W
135°0'0"W
64°30'0"N
64°0'0"N
63°30'0"N
Castle Moun
Steamboat Mountain
McQuesten L
Mt Cameron
Mt Patterso
Wernecke
Keno City
Elsa
Mount Hinton
Mt Haldane
Minto Bridge
Mayo
Lake
Janet Lake
Gordon Landing
Mayo
Fraser Falls
Two Buttes
Stewart Crossing
SILVER TRAIL
STEWART
Ethel L
Creek
River
South McQuesten R
North McQuesten R
Keno
Creek

and snow coverage was complete, so visibility was generally good for spotting moose and tracks.

Table 1 Observations of moose during the March 2014 survey in the Mayo Moose Management Unit.

	Number Observed	Percentage of Moose Observed
Adults	132	90
Calves	15	10

Results and Discussion

Coverage

It took about 43.7 hours to count moose in the 328 blocks in the survey area, for a search intensity of 0.52 minutes per km². This is about equal to our target search intensity of 0.5 minutes per km², and corresponded with flying through each block about 4 times and circling animals when needed to verify sightings. We needed an additional 11.9 hours to ferry to and from different parts of the survey area and fuel in Mayo. The time devoted to ferrying was about 21% of the total flight time.

Observations of Moose

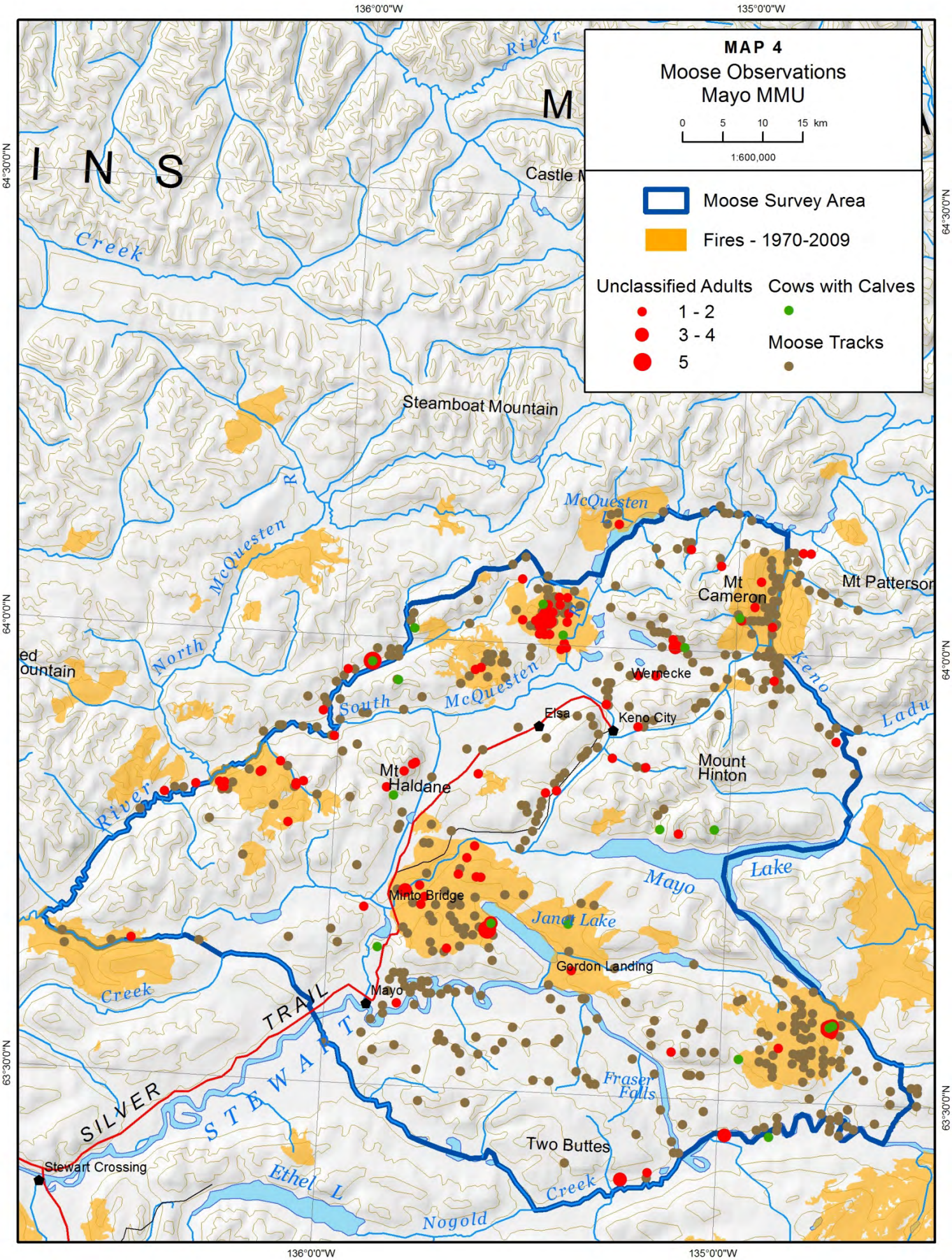
We counted a total of 147 moose; 132 were adults and 15 were calves (Table 1). We spent 2,619 minutes searching the survey blocks for moose, so we saw an average of 0.06 moose per minute of survey time. In addition to moose seen, we also noted fresh moose tracks at 456 locations.

Distribution of Moose

Moose were widely distributed across the survey area (see Map 4). Most were concentrated in willow-rich habitats in valleys and on lower to mid-elevation slopes overlooking the rivers and major creeks, where snow depths were shallower than in the adjacent subalpine areas. Areas burned in the 1970s through 2000s with abundant willows were heavily utilised. Moose were especially concentrated in valleys in the northeastern part of the survey area, where snow was deepest.

Moose typically concentrate in river valleys in the central Yukon during winters of deep snow, moving down from their preferred early-winter subalpine habitats when snow gets too deep (Fraser et al. 2001, O'Donoghue 2005, O'Donoghue 2015). Snowfall in the Mayo area was about average during the winter of 2013-2014 (Environment Yukon 2014); snow depths at regularly monitored stations were 53 to 82 cm. Snow depths were highest in the northeastern part of the survey area in the Keno area. The average snow depths there were greater than those that typically negatively affect moose (above 70 cm; Peek 1997).

In the area north and northeast of Keno City, where all-season access to mineral claims has been proposed, moose were especially concentrated in the Rankin Creek valley north of the Keno Ladue River between Mount Cameron and Mount Patterson.



MAP 4
Moose Observations
Mayo MMU
0 5 10 15 km
1:600,000
Moose Survey Area
Fires - 1970-2009
Unclassified Adults
1 - 2
3 - 4
5
Cows with Calves
Moose Tracks
136°0'0"W
135°0'0"W
64°30'0"N
64°0'0"N
63°30'0"N
Steamboat Mountain
Castle M
Creek
River
McQuesten
North
South
McQuesten
Mt Cameron
Mt Patterson
Wernecke
Keno
Ladu
Elsa
Keno City
Mount Hinton
Mt Haldane
River
Mayo
Lake
Minto Bridge
Janet Lake
Gordon Landing
Creek
Mayo
SILVER TRAIL
STEWART
Fraser Falls
Two Buttes
Stewart Crossing
Ethel L
Nogold
Creek

Ages of Moose

We classified all of the moose we saw by age, but we cannot translate these directly into estimates of the composition of the moose population in the study area

The proportions of moose of different ages that we observed were likely biased compared to those in 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. Low-density blocks also typically have lower sightability, because forest canopies are, on average, denser. As a result of these differences in sightability, we likely miss seeing more cows and calves than we do bulls when we search over all habitats with the same intensity. Census surveys, in which survey blocks are searched more intensively and counts are corrected for sightability, are more appropriate for estimating population composition than are intensive stratification surveys.

Ten percent of the moose we observed in this survey were calves. As noted above, this is likely biased low compared to the actual percentage of calves in the population, so we cannot directly compare it to the results of previous surveys aimed at estimating recruitment. We can, however, compare it to the average (11% calves seen) found in late-winter surveys of this same type elsewhere in the Yukon, and this suggests that survival of calves to 10 months of age was at or slightly below average in this area during the last year. The age classifications observed in this survey can be compared directly with the results from similar late-winter surveys in the future.

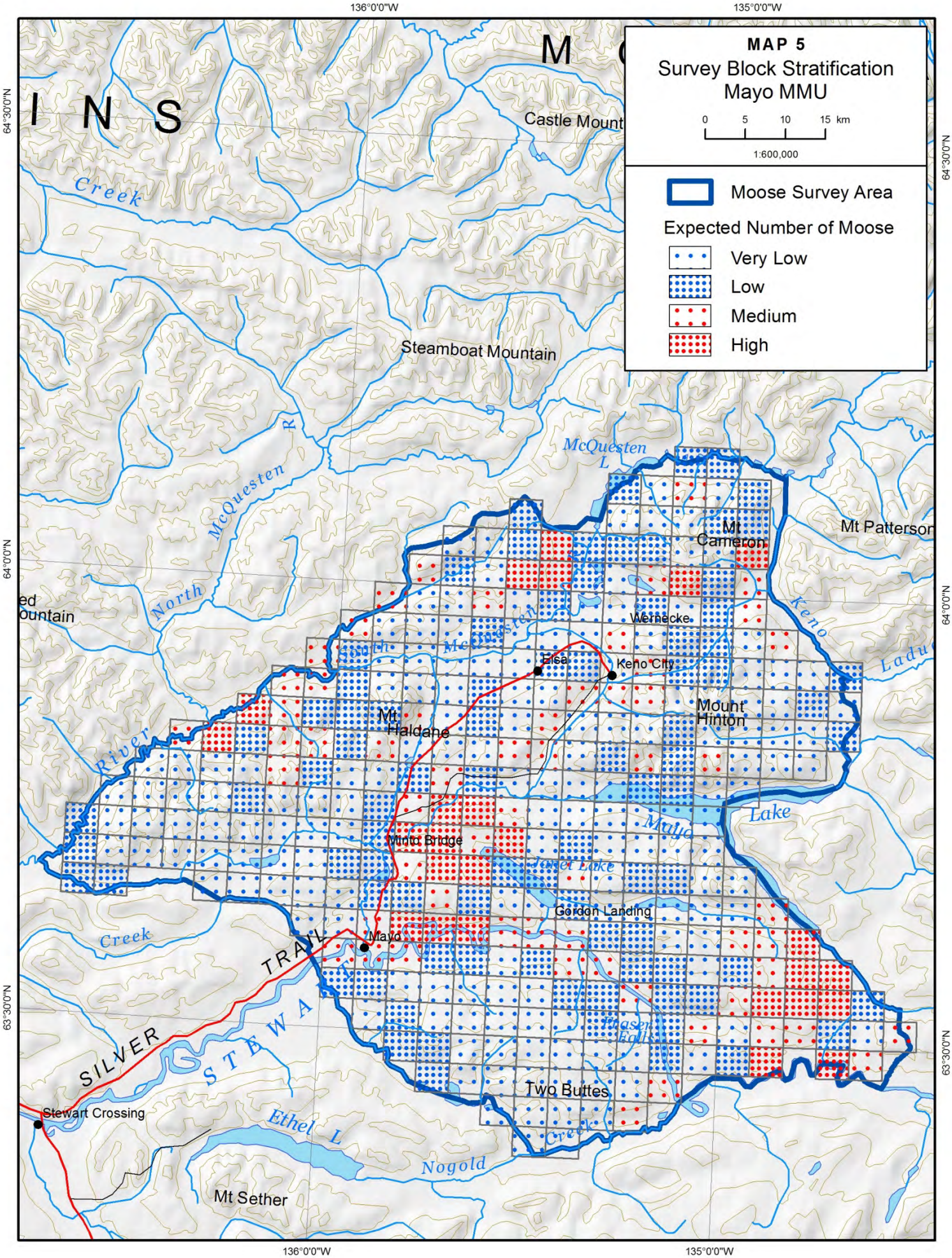
Identification of High and Low-Density Blocks

We divided the survey blocks into 4 categories of expected moose density, for use in future late-winter surveys of the area. We classified 25 (8%) of the 328 survey blocks as high, 58 (18%) as medium, 86 (26%) as low, and 159 (48%) as very low expected abundance of moose (see Map 5), based on our observations from the air. Most of the blocks with higher expected numbers of moose were located along the main river and creek valleys and in recent burns.

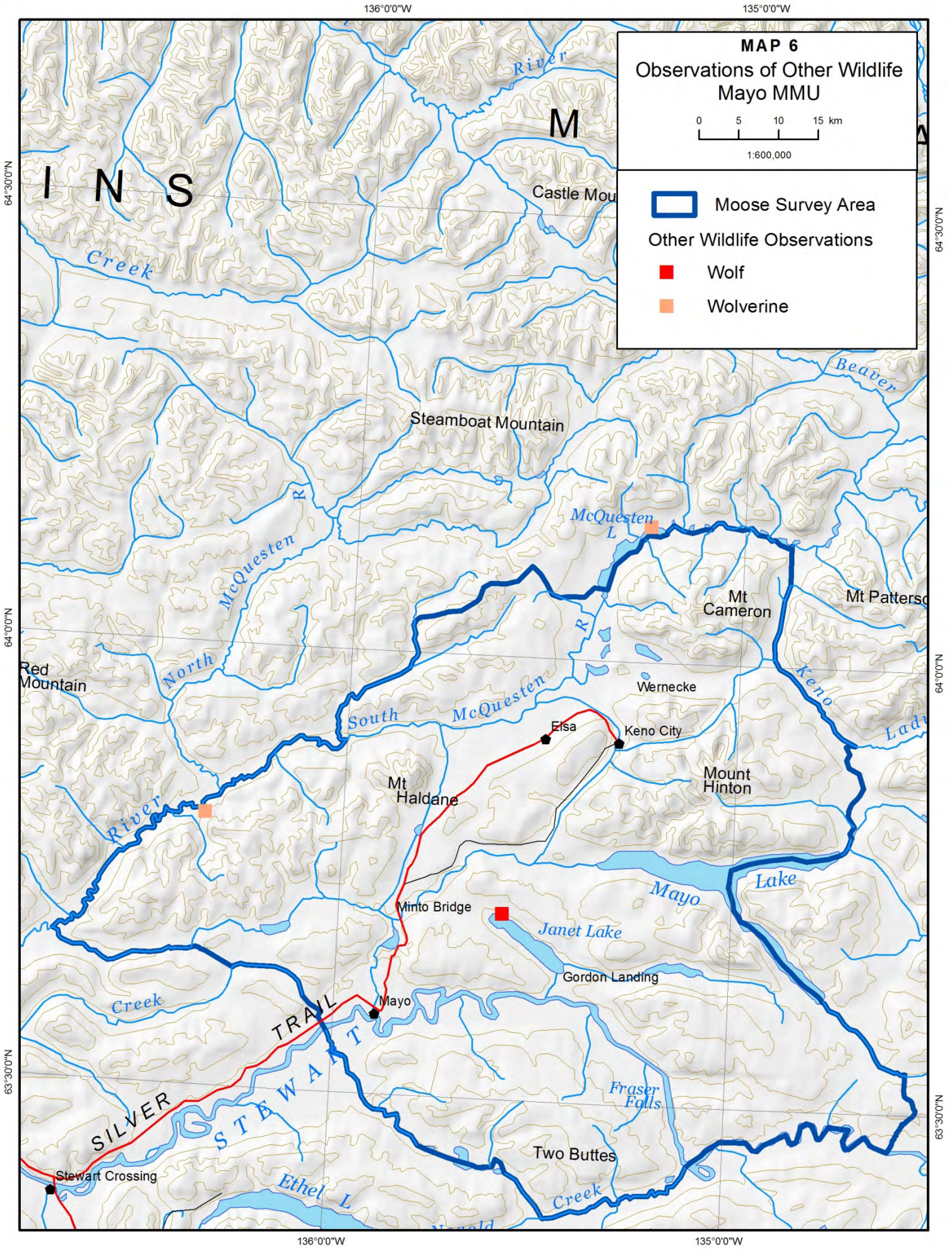
Other Wildlife Sightings

In addition to the 147 moose we counted in our survey blocks, we also observed another 26 moose just outside the survey area boundary or during our ferries to fuel (included in Map 4).

During the survey, we also recorded sightings of other notable wildlife (see Map 6). We saw a pack of 11 wolves near a site of a moose kill on Janet Lake. We also saw 2 lone wolverines near McQuesten Lake and along the McQuesten River.



MAP 5
Survey Block Stratification
Mayo MMU
0 5 10 15 km
1:600,000
Moose Survey Area
Expected Number of Moose
Very Low
Low
Medium
High
136°0'0"W
135°0'0"W
64°30'0"N
64°0'0"N
63°30'0"N
Castle Mount
Steamboat Mountain
McQuesten L
Mt Cameron
Mt Patterson
Wernecke
Elsa
Keno City
Mount Hinton
Mt Haldane
Minto Bridge
Janet Lake
Gordon Landing
Mayo
Two Buttes
Stewart Crossing
Mt Sether
SILVER TRAIL
STEWART
Creek
North McQuesten R
South McQuesten
River
Keno
Mayo Lake
Ethel L
Nogold Creek


MAP 6
Observations of Other Wildlife
Mayo MMU
0 5 10 15 km
1:600,000
Moose Survey Area
Other Wildlife Observations
Wolf
Wolverine
136°0'0"W
135°0'0"W
64°30'0"N
64°0'0"N
63°30'0"N
Steamboat Mountain
McQuesten L
McQuesten R
North McQuesten R
South McQuesten R
Mt Cameron
Mt Patterso
Red Mountain
Wernecke
Elsa
Keno City
Keno
Mount Hinton
Mt Haldane
Minto Bridge
Janet Lake
Mayo Lake
Gordon Landing
Mayo
TRAIL
STEWART
SILVER
Stewart Crossing
Ethel L
Two Buttes
Fraser Falls
Beaver
River
Creek

Conclusions and Recommendations

- We found the highest densities of moose in habitats with abundant willows along the main river and creek valleys, and elsewhere in the survey area on lower and mid-elevation slopes in areas burned during the past 40 years.
- Moose were especially concentrated along creeks and in lowland burns in the northeastern part of the survey area, near Keno. This area has relatively deep snow and local knowledge indicates that moose there typically move into the river and creek valleys by mid- to late-winter.
- Recruitment of moose appears to have been at or slightly below average in this area during the past year.
- These data provide a baseline on moose distribution and important habitats and should be used in environmental assessments and monitoring plans associated with development proposals.
- We should gather a second year of baseline data on moose distribution to examine the amount of variation among years before development of new access roads or operational mines proceeds in this area.

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