MOOSE SURVEY
RACKLA AREA
LATE-WINTER 2013

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Summary

- We conducted a late-winter survey of moose in the Beaver, Rackla, and Nadaleen river watersheds along the upper Stewart River on 2-7 March 2013, using helicopters. The main purpose of this survey was to map the distribution and late-winter habitats of moose in this area.
- We flew over the entire survey area and spent about 0.56 minutes per km^2 searching for moose. We found a total of 389 moose, of which 358 were adults and 31 were calves.
- Moose were widely distributed across the survey area. Most were concentrated in valleys of the rivers and major creeks in willow-rich habitats with shallower snow depths than in the adjacent subalpine areas. Lower-altitude areas burned in the 1970s through 1990s with abundant willows were heavily used. Some moose were found in subalpine willow habitats especially in the upper Beaver River watershed in the west of the survey area, where snow depths were lower than in subalpine habitats further east.
- About 8% of moose seen in the survey were calves. This may be negatively biased because of lower sightability of cows with calves. It is, however, fairly low compared to other late-winter surveys of this type, indicating that recruitment was likely below average this year in this area.
- We also observed a concentration of caribou in the upper Rackla and East Rackla river watersheds, in an area that is south of the mapped range of the adjacent Bonnet Plume caribou herd.

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Introduction

This report summarises the results of the late-winter survey of moose in the Beaver, Rackla, and Nadaleen river watersheds along the upper Stewart River (see Map 1), conducted 2-7 March 2013. The survey included parts of the Mayo, Hart River, Wind River, and Upper Stewart River Moose Management Units. The main purpose of the survey was to map the distribution and late-winter habitats of moose in this area, which is experiencing high levels of mineral exploration and the proposed development of an operating mine and new access road.

Previous Surveys

Environment Yukon has not previously surveyed moose in this area.

Community Involvement

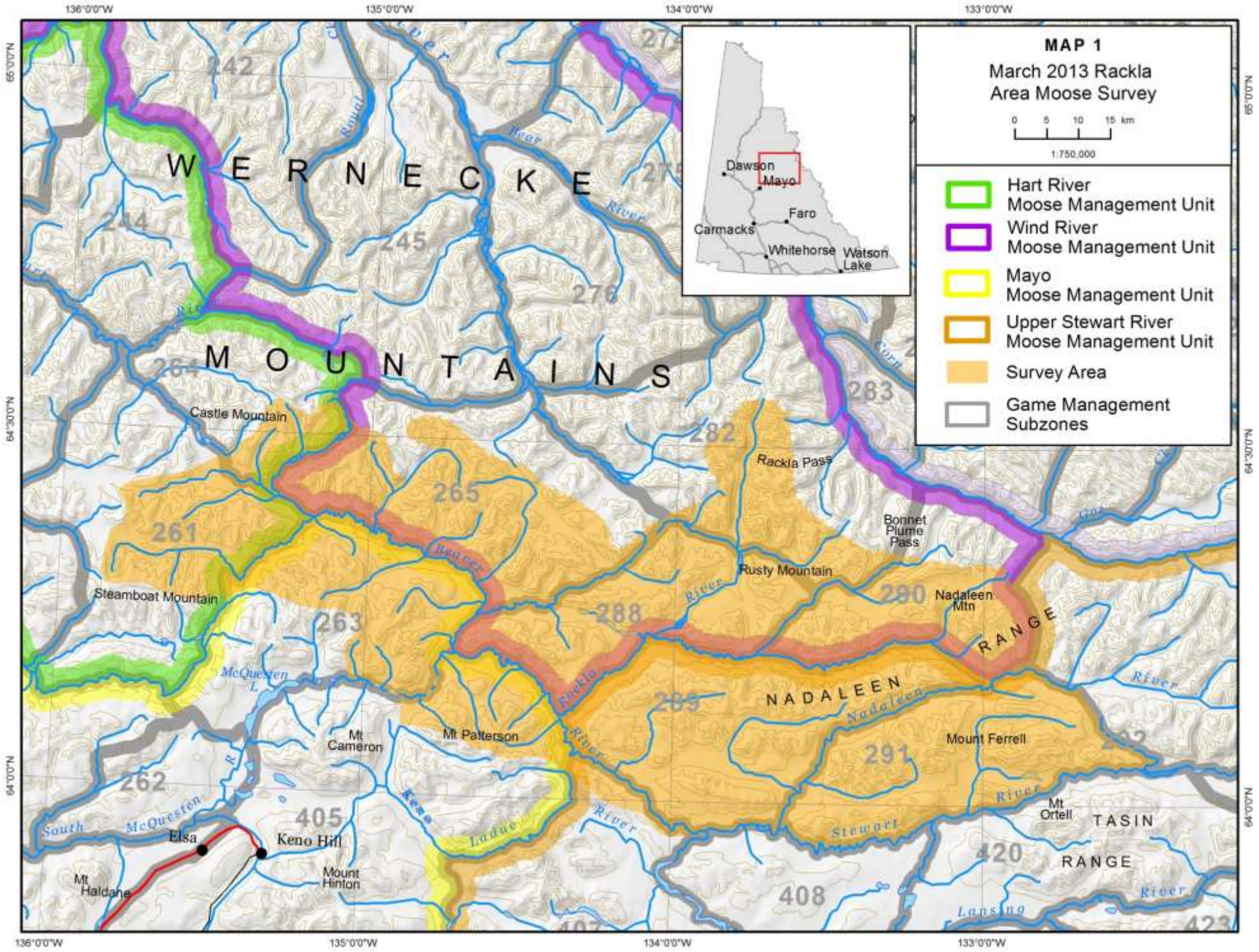
This survey was conducted because of the high level of mining exploration and staking in this area, and the resulting concerns expressed by residents of the Mayo area about cumulative effects on wildlife during planning sessions for developing the *Community-based Fish and Wildlife Management Work Plan 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 the Yukon Fish and Wildlife Branch. The First Nation of Na-Cho Nyäk Dun provided staff to help conduct the survey.

Study Area

The 6,069 km² survey area was delineated to cover the Beaver and Rackla river watersheds, and the lower Nadaleen River watershed, which are all tributaries to the upper Stewart River (see Map 1). This area was selected because virtually all alpine and subalpine habitats in the region were staked with hard-rock mineral claims in the late 2000s and early 2010s, and we have very few relevant baseline wildlife data to use in assessing development proposals here.

The study area consisted mostly of rugged terrain, much of it above treeline, in the southern Wernecke Mountains. The highest peaks in this range are between 2,000 and 2,740 metres above sea level. The Beaver, Rackla, and Nadaleen rivers flow south into the Stewart River which is the southeastern boundary of the survey area (see Map 1). Much of the area is alpine tundra and exposed rock, with subalpine willow and birch shrub habitats on lower slopes. Black and white spruce forest, mixed in places with poplar, aspen, and birch, are found in the main river and creek valleys and on lower slopes (see Smith et al. 2004 for a full description of the area's vegetation, landforms, and geology).

The survey area is remote, with no year-round ground-based access routes. Mineral staking and exploration have greatly increased the amount of industrial human activity in the area since the mid-2000s.


MAP 1
March 2013 Rackla
Area Moose Survey
0 5 10 15 km
1:750,000
Hart River
Moose Management Unit
Wind River
Moose Management Unit
Mayo
Moose Management Unit
Upper Stewart River
Moose Management Unit
Survey Area
Game Management
Subzones
Dawson
Mayo
Faro
Carmacks
Whitehorse
Watson
Lake
136°0'0"W
135°0'0"W
134°0'0"W
133°0'0"W
65°0'0"N
64°30'0"N
64°0'0"N
WERNECKE
MOUNTAINS
NADALEEN
RANGE
TASIN
RANGE
Castle Mountain
Steamboat Mountain
Rackla Pass
Bonnet
Plume
Pass
Rusty Mountain
Nadaleen
Mtn
Mount Ferrell
Mt
Cameron
Mt Patterson
Mt
Ortell
Elsa
Keno Hill
Mt
Haldane
Mount
Hinton
McQuesten
L.
South
McQuesten
R.
Rackla
River
Nadaleen
River
Stewart
River
Ladue
River
Lansing
River
242
244
245
264
265
261
263
262
405
276
282
283
288
289
290
291
420
408

Most of the area is unburned, but there are several old and recent burns mostly in the east (see Map 2), and these vary in quality as moose habitat. The largest fires were the 130 km² 2004 burn and 102 km² 1972 burn along the lower Nadaleen River, the 124 km² 1971-1972 burns in the Rackla River watershed, and the 62 km² 2006 burn along the Stewart River north of Mount Ortell.

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 entire survey area. The technique involves the following steps:

1. The survey area is divided into uniform rectangular blocks 15-16 km² (2' latitude x 5' longitude) in size.
2. Observers in aircraft fly over all the blocks, making about 4 passes through each block 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 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 of each moose or group of moose we see. We classify all moose seen 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 mixed. Temperatures ranged from -28°C to -8°C. Skies were mostly cloudy with some snow for the first 3 days of the survey, and we had difficulty getting into higher-elevation areas because of low clouds. It was mostly clear for the last half of the survey. Winds were light to moderate and presented no problems. Light conditions ranged from flat to bright and snow coverage was complete, so visibility was generally good for spotting moose.

Results and Discussion

Coverage

It took us about 56.7 hours to count moose in the 404 blocks in the survey area, for a search intensity of 0.56 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 4 times and circling animals when needed to verify sightings. We needed an additional 23.0 hours to ferry to and from the survey area and fuel supplies in Mayo and on airstrips in the survey area. The time devoted to ferrying was about 29% of the total flight time.

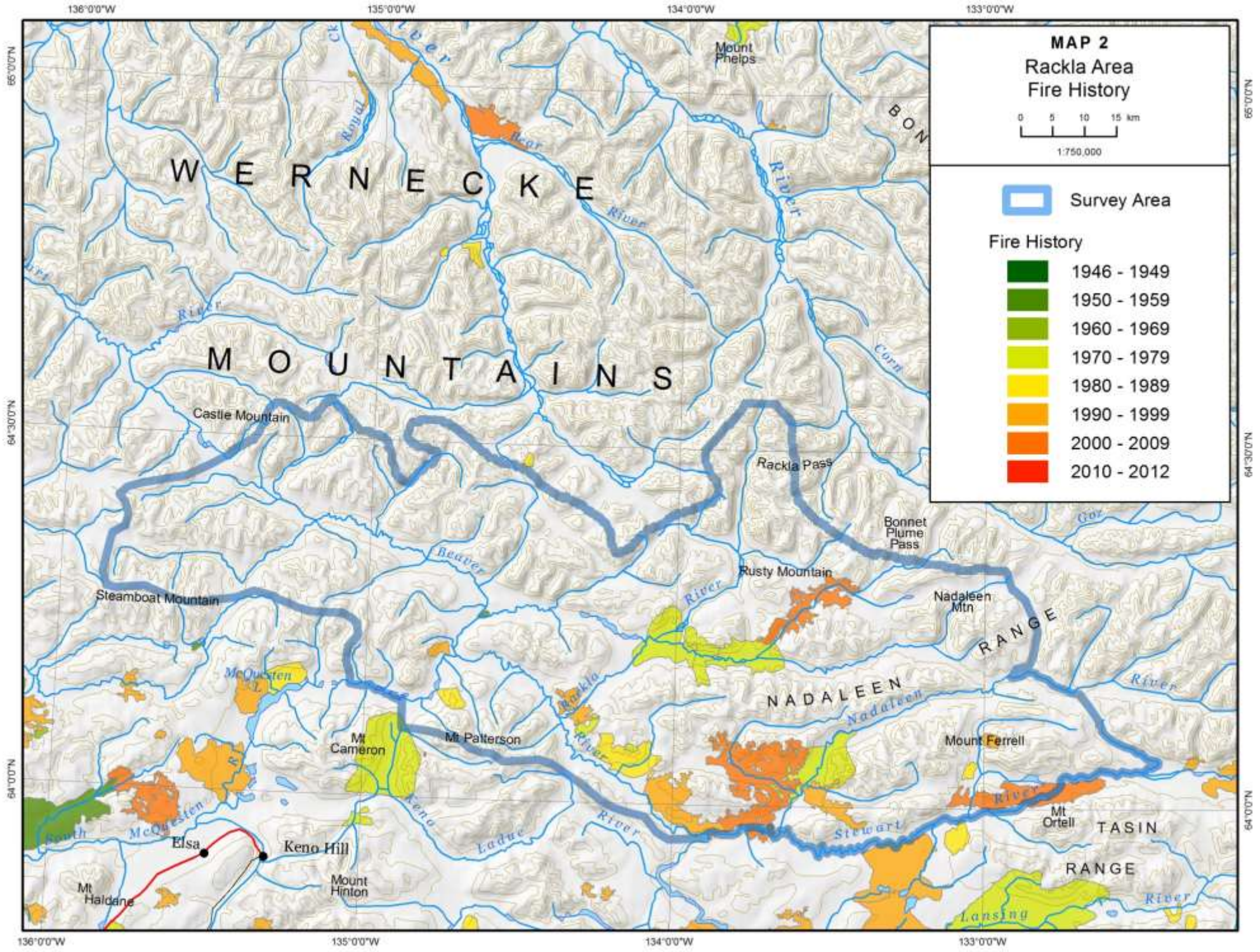

MAP 2
Rackla Area
Fire History
0 5 10 15 km
1:750,000
Survey Area
Fire History
1946 - 1949
1950 - 1959
1960 - 1969
1970 - 1979
1980 - 1989
1990 - 1999
2000 - 2009
2010 - 2012
136°0'0"W
135°0'0"W
134°0'0"W
133°0'0"W
65°0'0"N
64°30'0"N
64°0'0"N
WERNECKE
MOUNTAINS
NADALEEN
RANGE
TASIN
RANGE
Mount Phelps
Castle Mountain
Steamboat Mountain
Rackla Pass
Bonnet Plume Pass
Rusty Mountain
Nadaleen Mtn
Mt Cameron
Mt Patterson
Mount Ferrell
Mt Ortell
Elsa
Keno Hill
Mt Haldane
Mount Hinton
Beaver River
Rackla River
Nadaleen River
Stewart River
Ladue River
Keno
McQuesten
South McQuesten
Lansing
Rear
Corn

Table 1-Observations of moose during the March 2013 survey in the Rackla area.

	Number Observed	Percentage of Moose Observed
Adults	358	92
Calves	31	8

Observations of Moose

We counted a total of 389 moose; 358 of them were adults and 31 were calves (see Table 1). We spent 3,403 minutes searching the survey blocks for moose, so we saw an average of 0.11 moose per minute of survey time. In addition to moose seen, we also noted fresh moose tracks at 631 locations.

Distribution of Moose

Moose were widely distributed across the survey area (see Map 3). Most were concentrated in the valleys of the Beaver, Rackla, East Rackla, Nadaleen, and Stewart rivers and major creeks, in willow-rich habitats with shallower snow depths than in the adjacent subalpine areas. Lower-altitude areas burned in the 1970s through 1990s with abundant willows, especially along the lower Beaver, East Rackla, and lower Nadaleen rivers, were heavily utilised. Some moose were found in subalpine willow habitats, especially in the upper Beaver River watershed in the western part of the survey area where snow depths were lower than in subalpine areas further east.

In the central Yukon, moose typically concentrate in river valleys during winters of deep snow, moving down from their preferred early-winter subalpine habitats when snow get too deep as the winter progresses (Fraser et al. 2001, O'Donoghue 2005). Snowfall in the Rackla area was about average during the winter of 2012-2013 (Yukon Department of Environment 2013). We opportunistically measured snow depths at 9 sites in the survey area; they ranged from 55 cm to 103 cm and averaged 77 cm. Snow depths were generally lowest in the western part of the survey area and at lower elevations. The average snow depths were greater than those that would negatively affect moose (above 70 cm; Peek 1997).

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. 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 late-winter surveys.

The observed proportions of moose of different ages 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. 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, so our observations will be biased. 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.

Our observed composition index was 8% calves in the population. Although likely biased low, 8% calves is also low compared to the percentage found in late-winter surveys of this type elsewhere in the Yukon (average of 11% calves observed), so it is likely that survival of calves to 10 months of age was fairly low 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.

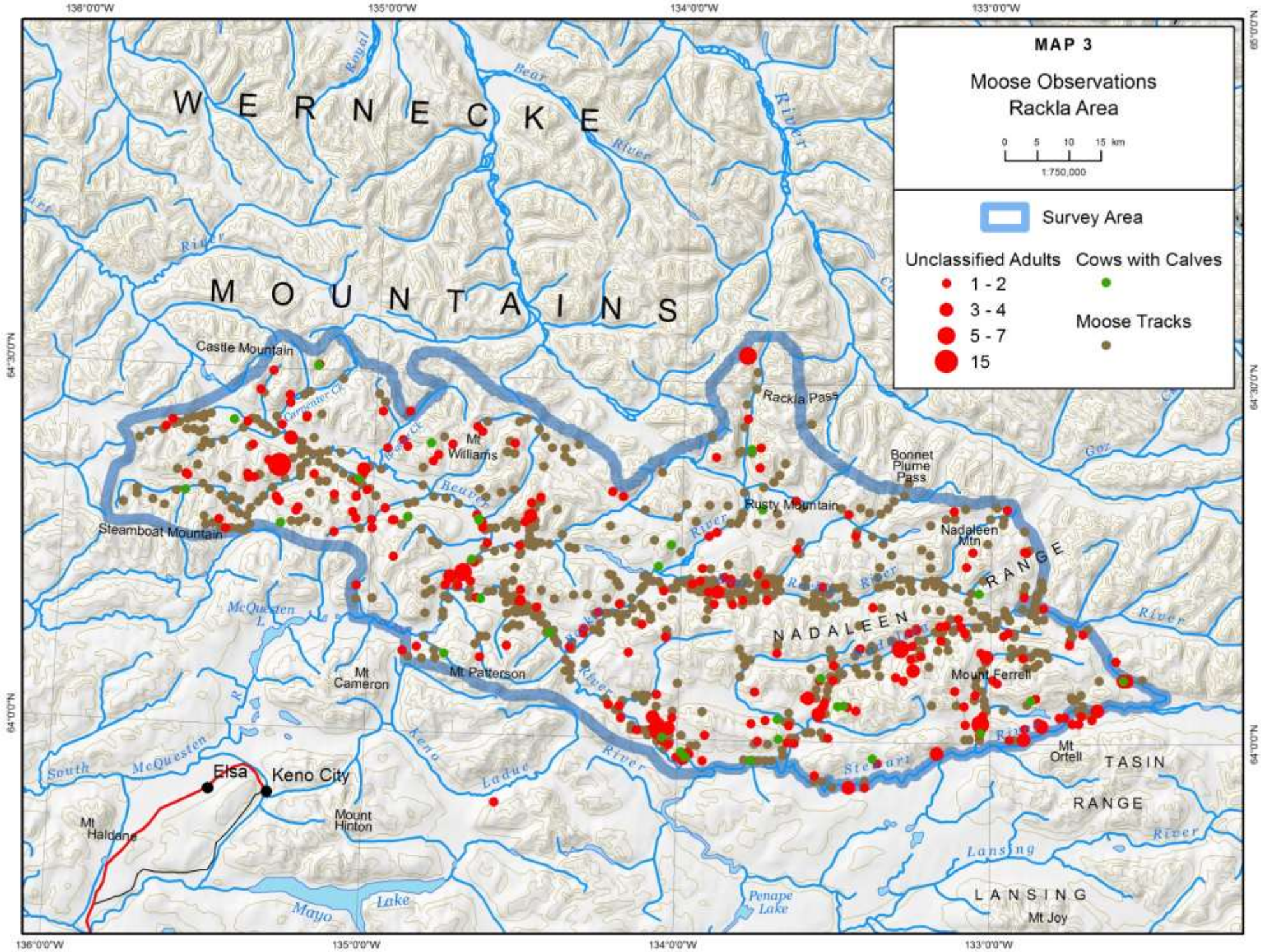
Identification of High and Low-Density Blocks

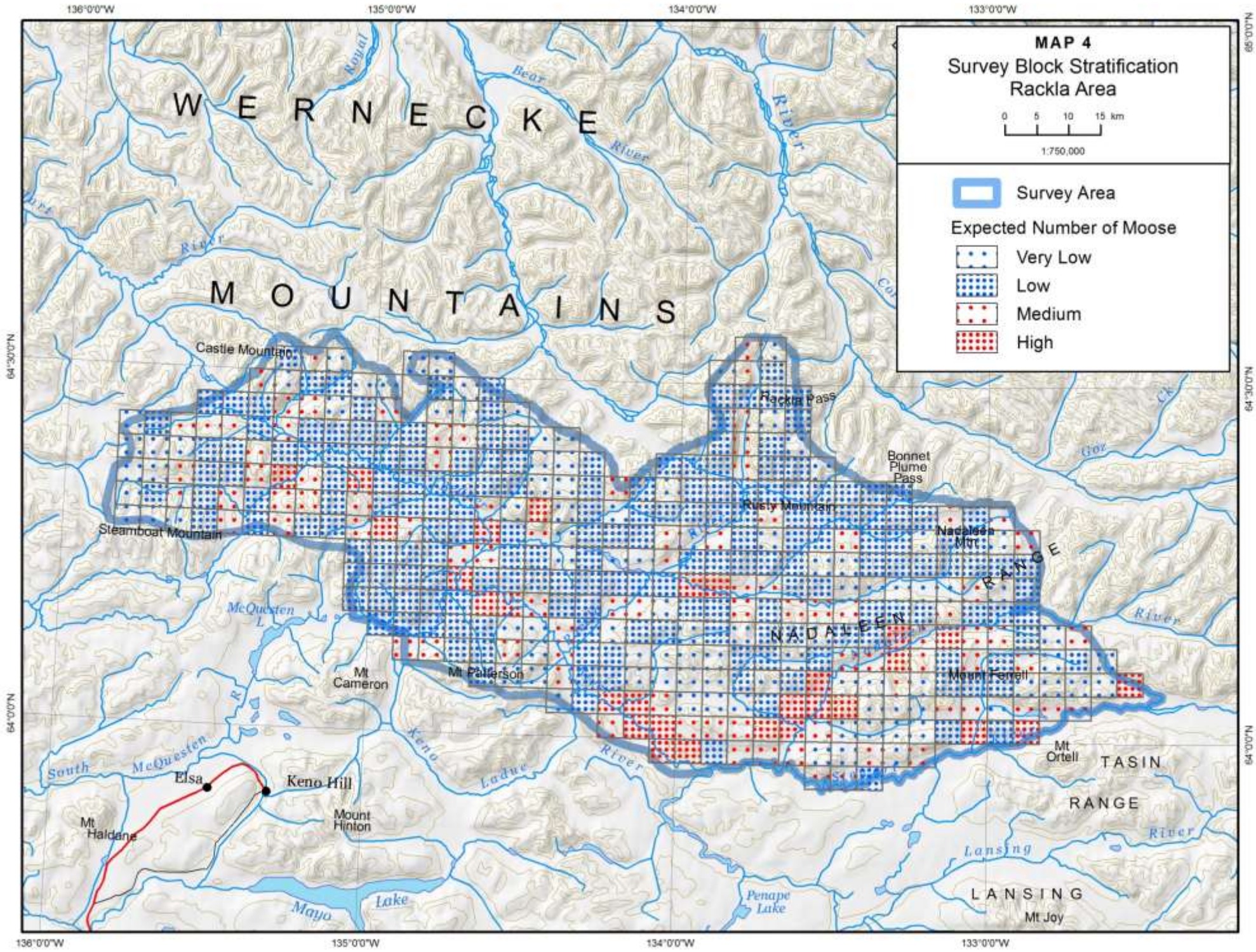
We divided the survey blocks into 4 categories of expected moose density, for use in future late-winter surveys of the area. We classified 28 (7%) of the 404 survey blocks as high, 88 (22%) as medium, 191 (47%) as low, and 97 (24%) as very low expected abundance of moose (see Map 4), based on our observations from the air. Most of the blocks with higher expected numbers of moose were located along the main river and creek valleys.

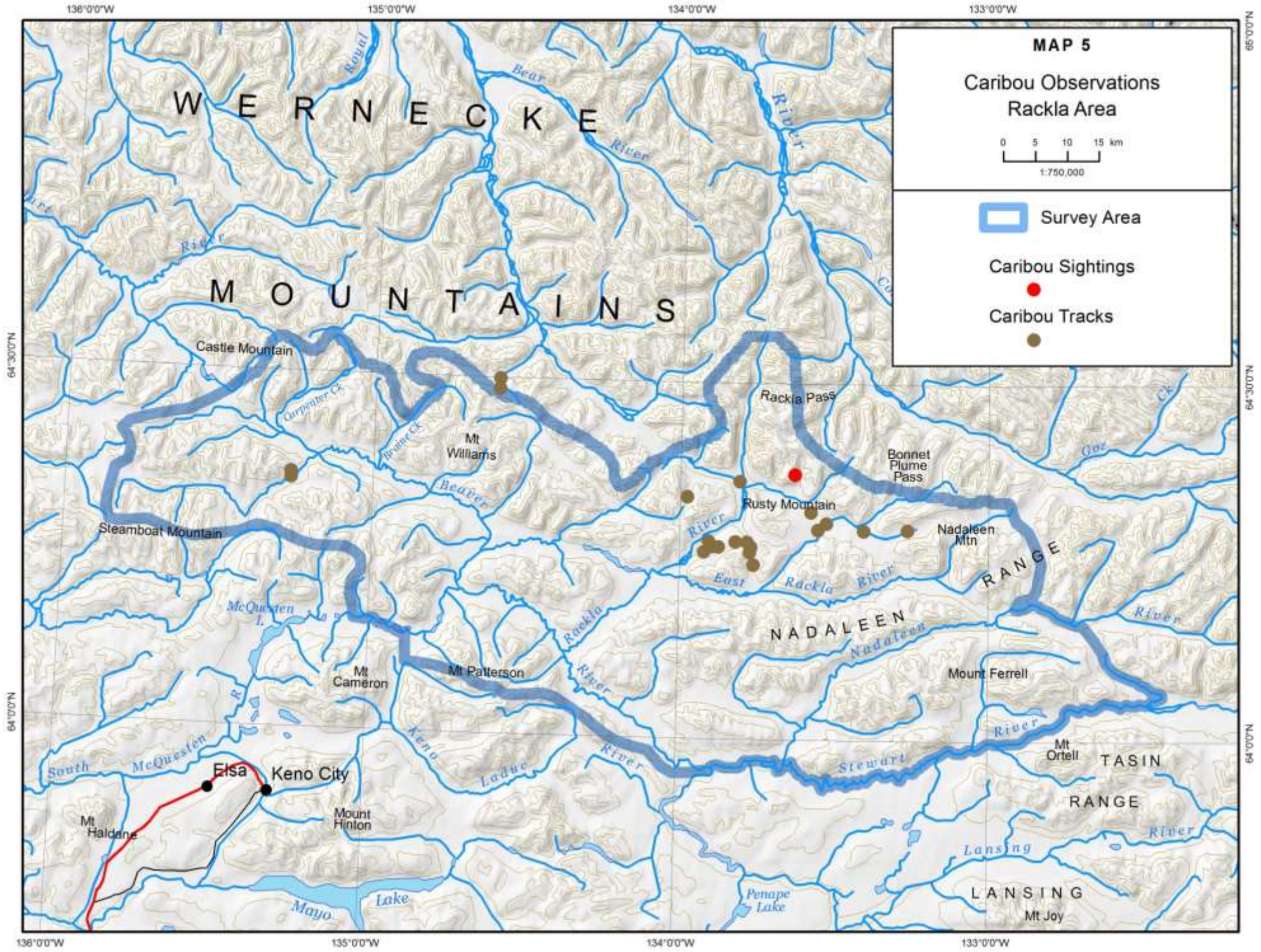
Other Wildlife Sightings

In addition to the 389 moose we counted in our survey blocks, we also observed 32 moose just outside the survey area boundary or during our ferries to fuel (included in Map 3).

During the survey, we also recorded sightings of other notable wildlife besides moose and recorded the locations of caribou tracks. We saw 1 group of 6 caribou and 20 sites with caribou tracks, mostly concentrated around the upper Rackla and East Rackla rivers (see Map 5). This area is well south of the mapped winter range of the adjacent Bonnet Plume caribou herd, and it is uncertain if these animals are a part of that herd. Low numbers of caribou have been seen in this area during winter surveys since 2007 and are apparently resident here (O'Donoghue 2013). We also spotted 2 sheep during this survey—a young ram near Carpenter Creek and another just south of Mount Patterson.


MAP 3
Moose Observations
Rackla Area
0 5 10 15 km
1:750,000
Survey Area
Unclassified Adults
1 - 2
3 - 4
5 - 7
15
Cows with Calves
Moose Tracks
136°0'0"W
135°0'0"W
134°0'0"W
133°0'0"W
64°30'0"N
64°0'0"N
WERNECKE
MOUNTAINS
Castle Mountain
Carpenter Ck
Beaver Ck
Mt Williams
Steamboat Mountain
Rackla Pass
Bonnet Plume Pass
Rusty Mountain
Nadaleen Mtn
NADALEEN RANGE
McQuesten L.
Mt Cameron
Mt Patterson
Mount Ferrell
Mt Ortell
TASIN RANGE
Elsa
Keno City
Mt Haldane
Mount Hinton
Mayo Lake
Penape Lake
LANSING RANGE
Mt Joy
Bear River
Royal River
Goz
Ladue
Lansing
Stewart
South McQuesten
Keno


MAP 4
Survey Block Stratification
Rackla Area
0 5 10 15 km
1:750,000
Survey Area
Expected Number of Moose
Very Low
Low
Medium
High
136°0'0"W
135°0'0"W
134°0'0"W
133°0'0"W
65°0'0"N
64°30'0"N
64°0'0"N
WERNECKE
MOUNTAINS
Castle Mountain
Steamboat Mountain
Rackla Pass
Bonnet Plume Pass
Rusty Mountain
Nacalsea Mtn
NADAHEN RANGE
Mt Patterson
Mt Cameron
Mount Terrell
Mt Ortell
TASIN RANGE
LANSING
Mt Joy
McQuesten L.
South McQuesten R.
Elsa
Keno Hill
Mt Haldane
Mount Hinton
Mayo Lake
Penape Lake
Keno
Ladue
Lansing
River


MAP 5
Caribou Observations
Rackla Area
0 5 10 15 km
1:750,000
Survey Area
Caribou Sightings
Caribou Tracks
136°0'0"W
135°0'0"W
134°0'0"W
133°0'0"W
64°30'0"N
64°0'0"N
WERNECKE
MOUNTAINS
Castle Mountain
Steamboat Mountain
Mt Williams
Rackla Pass
Bonnet Plume Pass
Rusty Mountain
Nadaleen Mtn
NADALEEN RANGE
Mt Cameron
Mt Patterson
Mount Ferrell
Mt Ortell
TASIN RANGE
LANSING
Mt Joy
Elsa
Keno City
Mt Haldane
Mount Hinton
Mayo Lake
Penape Lake
Royal River
Bear River
Carpenter Ck
Beaver River
East Rackla River
Rackla River
Nadaleen River
Stewart River
Keno Ladue River
Lansing River
South McQuesten R
McQuesten L
Goz Ck

Conclusions and Recommendations

- Habitat with abundant willows along the main river and creek valleys supported the highest densities of moose in this area in late winter 2013. This area typically has relatively deep snow by late winter because southern storm systems tend to drop precipitation when they hit the Wernecke Mountains. Local knowledge indicates that moose in this area typically concentrate more in the larger river valleys by mid- to late winter.
- Recruitment of moose appears to have been fairly low in this area during the past year.
- These data provide a baseline on moose distribution and important habitats for use in environmental assessments and monitoring plans associated with development proposals.
- Before development of new access roads or operational mines proceeds in this area, we should gather a second year of baseline data on moose distribution to examine the amount of variation among years.

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