MOOSE SURVEY:

M'CLINTOCK AREA

LATE-WINTER INTENSIVE STRATIFICATION
2010

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Summary

- We conducted a late-winter survey of moose in the M'Clintock region east of Whitehorse 7 – 11 February 2010.
- The purpose of the survey was to map moose distribution and to identify important late-winter habitats We used fixed-wing aircraft and our search intensity was 0.48 minutes/km^2
- We counted 194 moose: 18 calves, 174 adults, and 2 moose of unknown age and sex.
- Moose were broadly distributed both geographically and elevationally across the study area. Moose were found in densely forested lowland spruce stands, open pine forests, riparian meadows, and open subalpine shrub habitats.
- 9% of the moose seen in this survey were calves. This proportion is lower than the average of 13.4% observed among 7 late winter surveys previously done in other regions.
- Based on the 1999 population estimate, harvest levels in this region may be at or above the suggested sustainable limit of 3%.

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Introduction

This report summarizes the results of a late-winter moose distribution survey in the M'Clintock River area (Figure 1) that took place between February 7 and 11, 2010. We used a fixed-wing aircraft to map moose distribution during the critical late winter period. This approach allowed us to identify potentially important late winter habitats but did not provide population estimate or composition information.

Previous Surveys

A moose population survey was done in a portion (71%) of this study area in November – December 1999 (Figure 2). A population estimate of 873 ± 189 moose was obtained using a modified "stratified random block method". This translated into an average density of 262 moose/1000 km², slightly higher than the average moose density of 205 moose/1000 km² in 26 other areas surveyed in Yukon up to that time. Survey results suggested that this was likely a stable to increasing moose population.

The 1999 survey results are not directly comparable with this study because of different study designs and the timing of the surveys but the two approaches provide complementary information. The 1999 survey assessed the overall status of the population whereas the 2010 survey identified important moose concentration areas during late winter. To assess population trends another full census survey would be needed.

Community Involvement

The parties of the Southern Lakes Wildlife Coordinating Committee voiced concern about overall declines of moose numbers in this region. They identified the need to improve our knowledge of moose habitat needs in the Southern Lakes area, particularly during the critical late-winter period. As such, this work was intended to provide important background information for any future moose recovery efforts. The Kwanlin Dün, Ta'an Kwäch'än, Teslin Tlingit and Carcross/Tagish First Nations and Laberge and Teslin Renewable Resources Councils provided community participants to work with Environment Yukon biologists.

Study Area

The M'Clintock moose survey area followed the boundaries of the 1999 survey area, with the addition of the area west of the M'Clintock River/Lakes to the City of Whitehorse. The survey area is useful for monitoring and managing moose but does not represent a discrete population.

The survey area included the land west from the Teslin River to the Alaska Highway and Lake Laberge and north from Jakes Corner to Teslin Crossing (Figure 1). It encompassed Game Management Subzones (GMS) 8-12 to 8-17 and covered a total area of about 5,010 km² of which approximately 4,835 km² (about 96%) is habitable moose range.

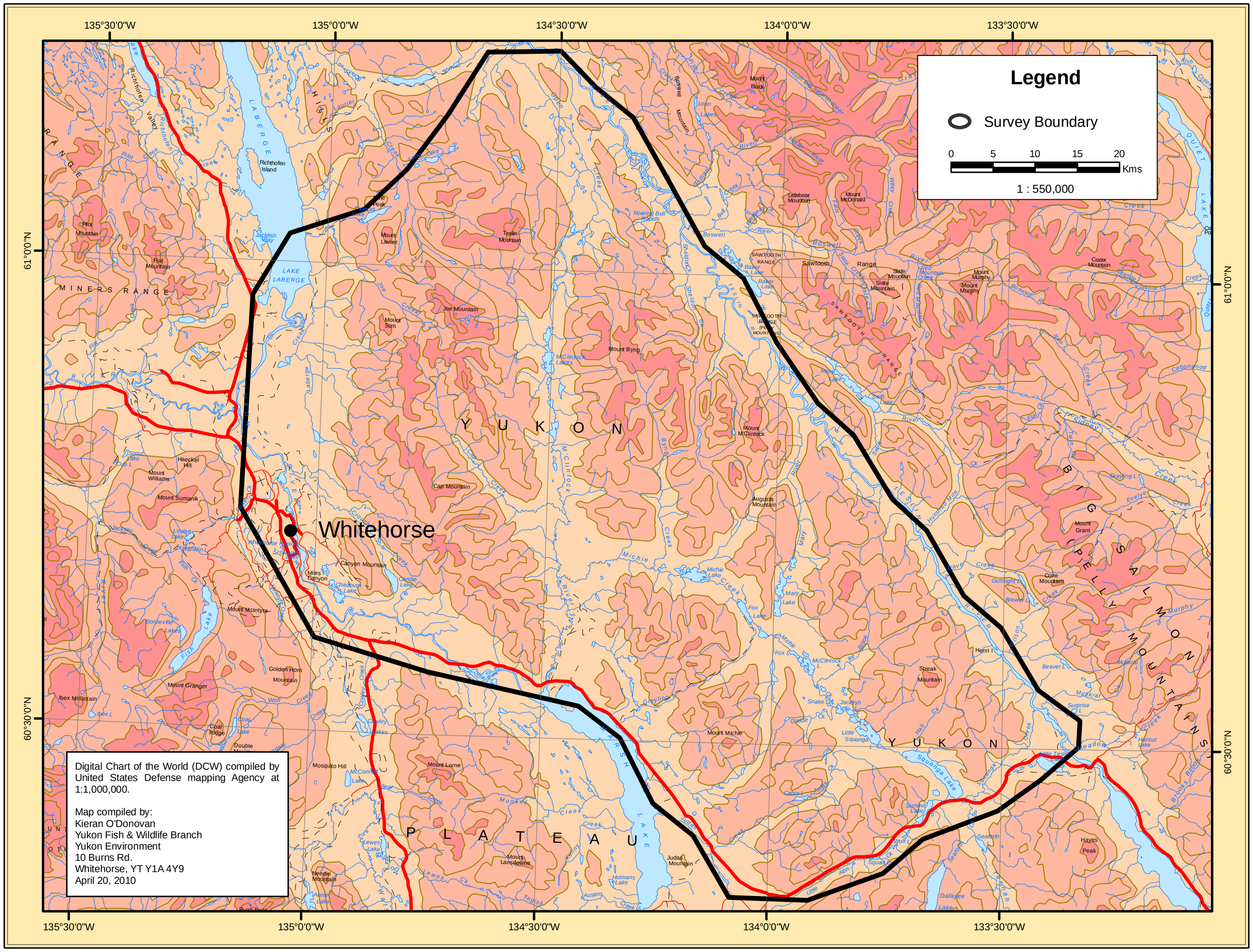

Figure 1. Late-winter intensive stratification moose survey in the M'Clintock moose survey area, February 2010.

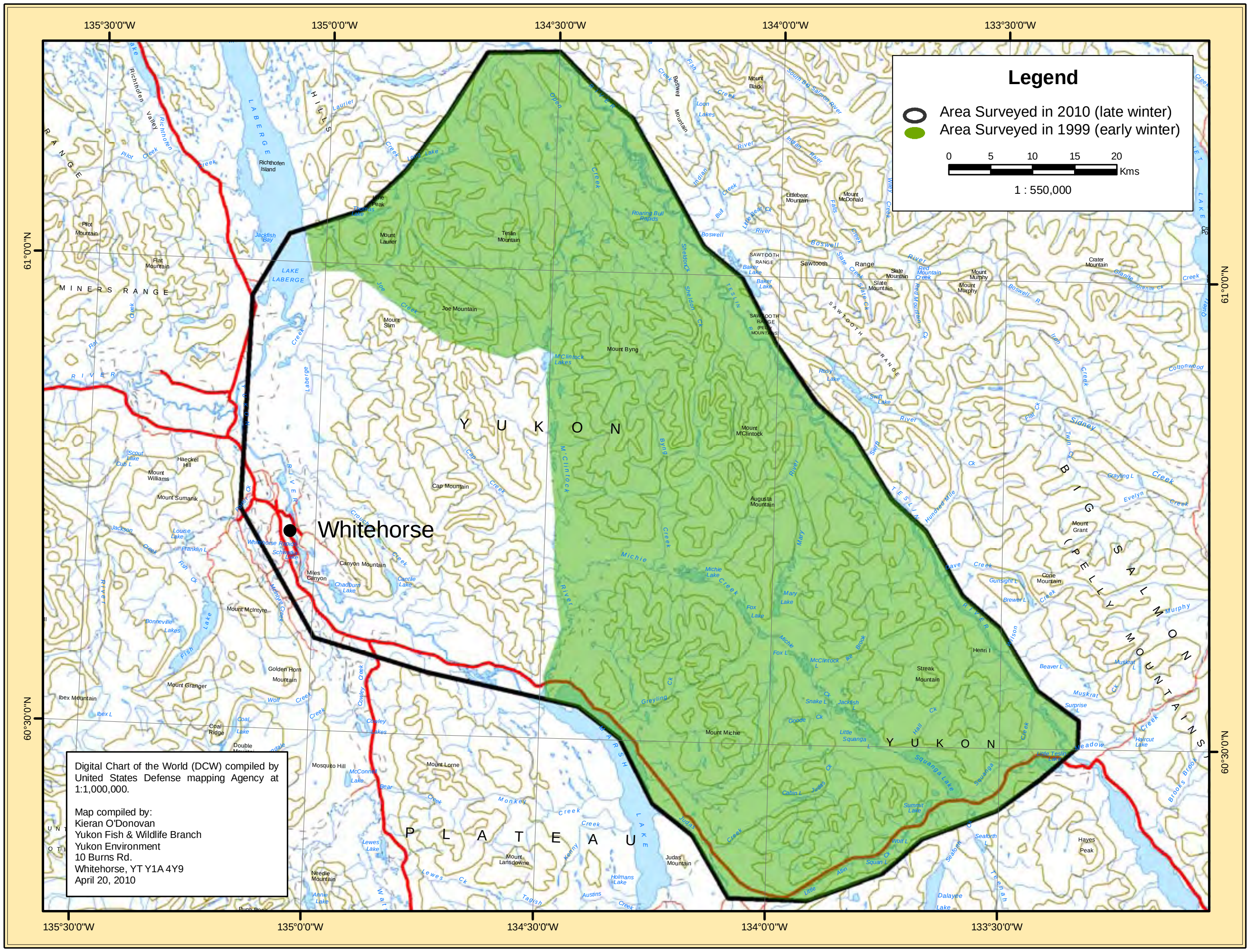

Figure 2. M'Clintock moose survey area.

The area was glaciated and is marked by eskers and kettle lakes in the valleys. From the valleys, the land slopes upwards into rolling hills and the multiple mountain peaks dominating the landscape throughout the region. A complex network of rivers and streams drains from the hills and water bodies of this study area. Wetlands and small lakes are particularly abundant in the southern portion of the study area.

Much of the area is forested with black and white spruce, aspen, and lodgepole pine. Forest cover varies from dense mature white spruce and aspen in the main river and creek valleys, to dense black spruce in many lowlands, to more open scrubby spruce on slopes. Willow and dwarf birch shrub habitats and alpine tundra typify the alpine transition zone on the higher slopes and plateaus. There are scattered wetlands throughout the study area, especially in the M'Clintock River valley as well as the nearby Michie and Byng valleys. Much of the survey area has been untouched by fire over the last 50 years (Figure 3) but a 180 km^2 fire burned in the northeast corner of the study area near Teslin Crossing in 2009 and a smaller 46 km^2 fire burned near Little Squanga Lake in 1999. The majority of the forest habitats within the study area likely represent a climax stage boreal forest.

Access into this region has increased over the last several years and while many areas (like the northern end of the M'Clintock River system) are still remote and inaccessible, many areas can be accessed via all terrain vehicle trails and 4 x 4 roads. Some of these access trails include the Michie-Byng trail which allows access across the southern end of the study area to the Teslin River while the Livingstone trail crosses the northern end of the study area from Lake Laberge to the Teslin River at Teslin Crossing.

Methods

We used an "intensive stratification" method for our survey, which gave us reliable information on the distribution and areas of concentration of moose over the whole survey area. Although the intensive stratification approach is a cost effective way of gaining valuable distribution information, it does not provide us with an estimate of population size. Greater search intensity and the ability to assess variability among sample units would be needed to estimate population size or to get detailed age/sex composition data. Data from intensive stratification surveys are most valuable for mapping important habitats, for providing an index of calf survival and for classifying the survey area according to high or low expected densities of moose for comparison with future late winter surveys.

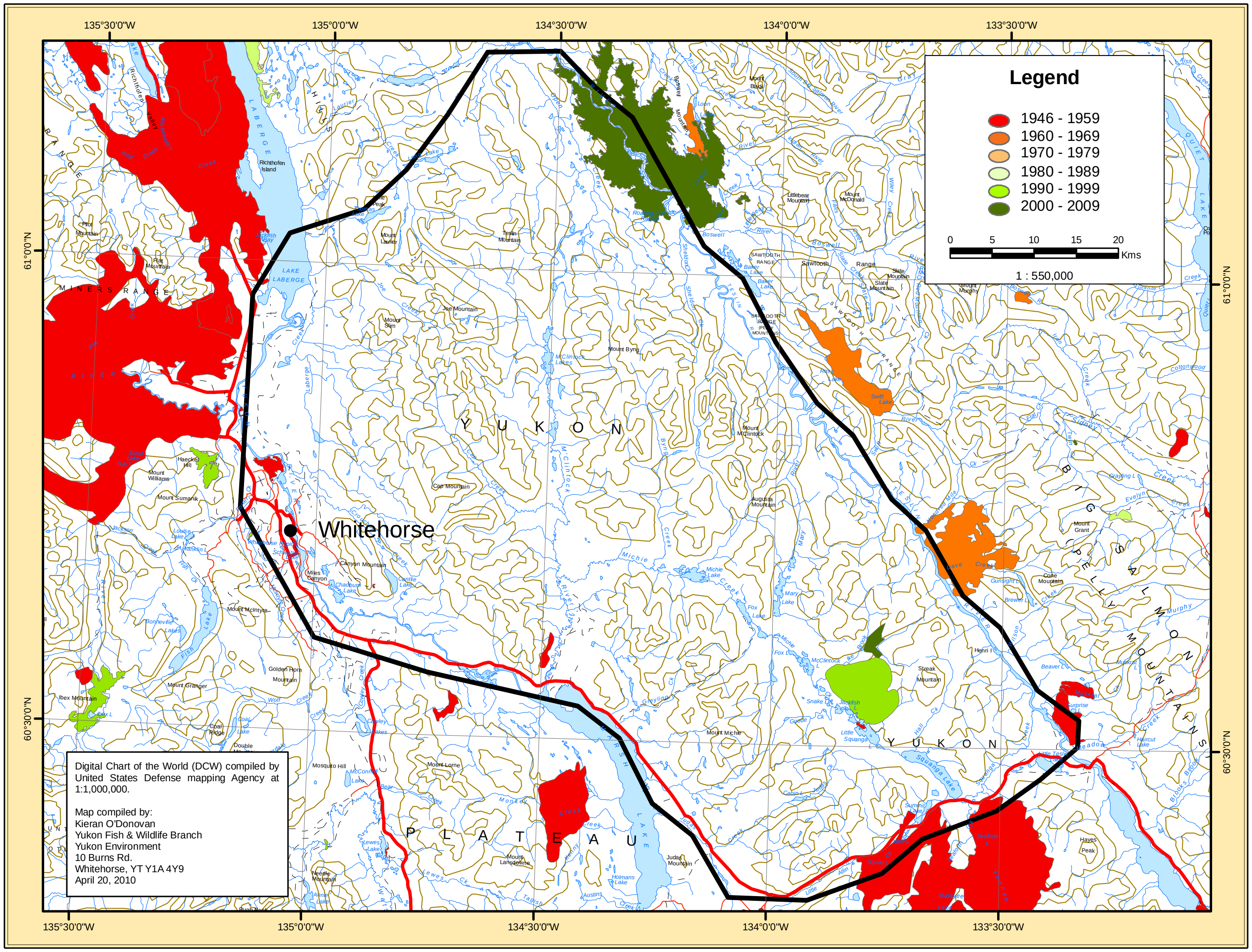

Figure 3. Fire history in the M'Clintock Moose Survey Area.

The technique involved the following steps:

1. The survey area was divided into uniform 16 to 17 km^2 rectangular blocks, or "sample units." We used the same blocks as the 1999 survey and created new blocks to include the area west of the M'Clintock River/Lakes. Observers in fixed-wing aircraft flew 4 passes over each sample unit to try and achieve a search intensity of about 0.5 minutes/km^2. We did not fly over areas that were considered to not be appropriate moose habitat, such as Lake Laberge, urban areas, and the land above the subalpine transition zone.
2. We then classified (or "stratified") each sample unit into one of 4 categories: *high*, *medium*, *low* or *very low* expected moose abundance. This classification was based on expert opinion, local knowledge, number of moose observed, tracks, and habitat. *High* and *medium*, and *low* and *very low* categories were then lumped into high or low "strata" for use in future surveys.
3. We mapped and counted each moose or group of moose we saw and, whenever possible, classified them as adult or calf. With the exception of cows with calves, we did not try to determine the sex of animals. It is too difficult to do so from a fixed-wing aircraft after bulls have dropped their antlers.
4. We field-tested a new protocol to determine our ability to use the presence of moose tracks as a measure of habitat use and late-winter distribution. This involved observing and recording the coordinates for each set of fresh moose tracks that our flight path crossed. To improve encounter rates, we included a band of about 25 to 50 m on either side of the aircraft in the area of our flight path.

Weather and Snow Conditions

Conditions for this survey were generally favourable with good visibility. Winds were high on the morning of the first day with gusts up to 50 kph in Whitehorse. For the remainder of the survey, intermittent periods of light wind and turbulence were experienced on most days, but survey efforts were able to continue each day. Average daily temperatures at the nearby Whitehorse airport ranged from -10 to 0^{o}C. Fresh snow fell 3 days before the survey began, so we were confident that the tracks we saw were indicative of the number of current individuals. No snow fell over the course of the survey.

Snow pack depth in the general Whitehorse area varied between 69 and 125% of normal with an average value of 108% of normal snowpack conditions (1971-2000; Department of Environment 2010). Average temperatures in the survey area were approximately 2 to 4^{o}C above normal (1971-2000; Department of Environment 2010). Overall, this suggests that the survey was conducted in a mild winter with an average snowpack.

Results and Discussion

Coverage

We spent 40.3 hours flying all 297 sample units within the survey area. This resulted in a search intensity of approximately 0.48 min/km^2, very close to our target of 0.5 min/km^2. We spent an additional 8.9 hours ferrying between the survey area and our Whitehorse base.

Moose Observations and Stratification

We counted 194 moose, of which 174 were adults, 18 were calves, and 2 were not classified to age or sex (Table 1), resulting in approximately 0.08 moose/minute of survey time. This was similar to the average 0.09 moose/minute observed among the 7 late-winter surveys previously done in other regions.

We classified 22 (7%) of the 297 survey blocks as high, 47 (16%) as medium, 137 (46%) as low, and 91 (31%) as very low expected abundance of moose (see Figure 4). When the survey was complete, we lumped all survey blocks into 2 final designations of “High” or “Low,” (i.e. Medium = High and Very Low = Low) with 69 (23%) High strata and 228 (77%) Low strata (Table 1).

Moose Distribution

Moose were widely distributed throughout the study area (Figures 4 and 5), except in the most northerly extent near Teslin Crossing. Moose may be avoiding this part of the study area because a forest fire in 2009 (Figure 3) destroyed much of the available browse. While fires are an important mechanism for the creation of moose habitat in the boreal forest, it is typically several years of regeneration before the vegetation becomes beneficial for moose (Maier et al. 2005). Moose may actually be displaced from recently burned areas in the short term (Gasaway and Dubois 1985, Gasaway et al. 1989). In contrast to the 2009 burn near Teslin Crossing, many moose were observed in an area near Little Squanga Lake that burned in 1999, which supports the suggestion (Maier et al. 2005) that the optimal moose habitat is found in areas burned 11 to 30 years prior.

Table 1. Summary of moose observations from 2010 late-winter M’Clintock moose intensive Stratification.

	High Strata	Low Strata	Entire Survey Area
Number of survey blocks	69 (23%)	228 (77%)	297
Area (km^2)	1167.7	3843.0	5010.7
Number of calves	12	6	18
Number of adults	132	42	174
Number of unknown age/sex	2	-	2
Total number of moose	146	48	194

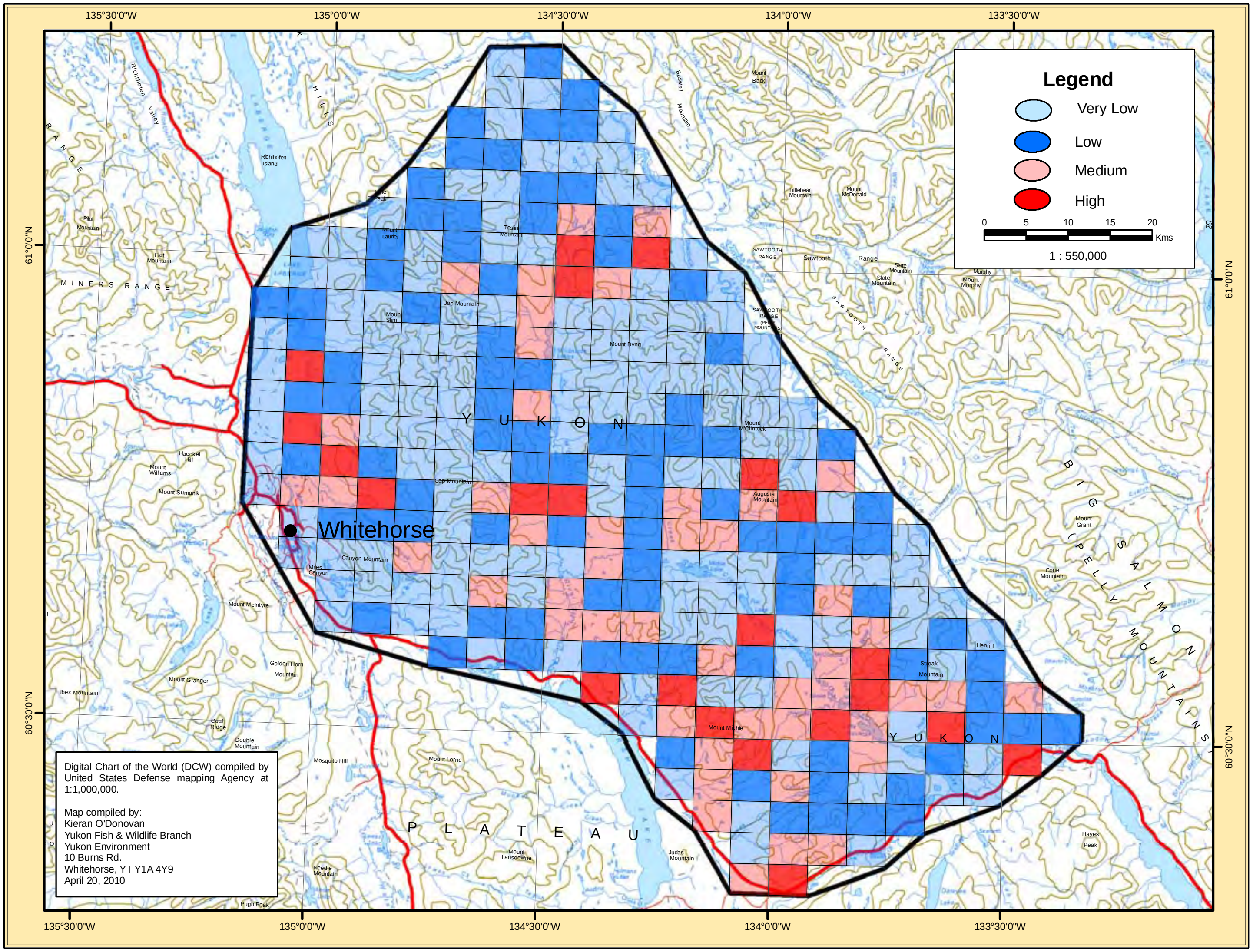

Figure 4. Stratification of survey blocks in the M'Clintock moose survey area.

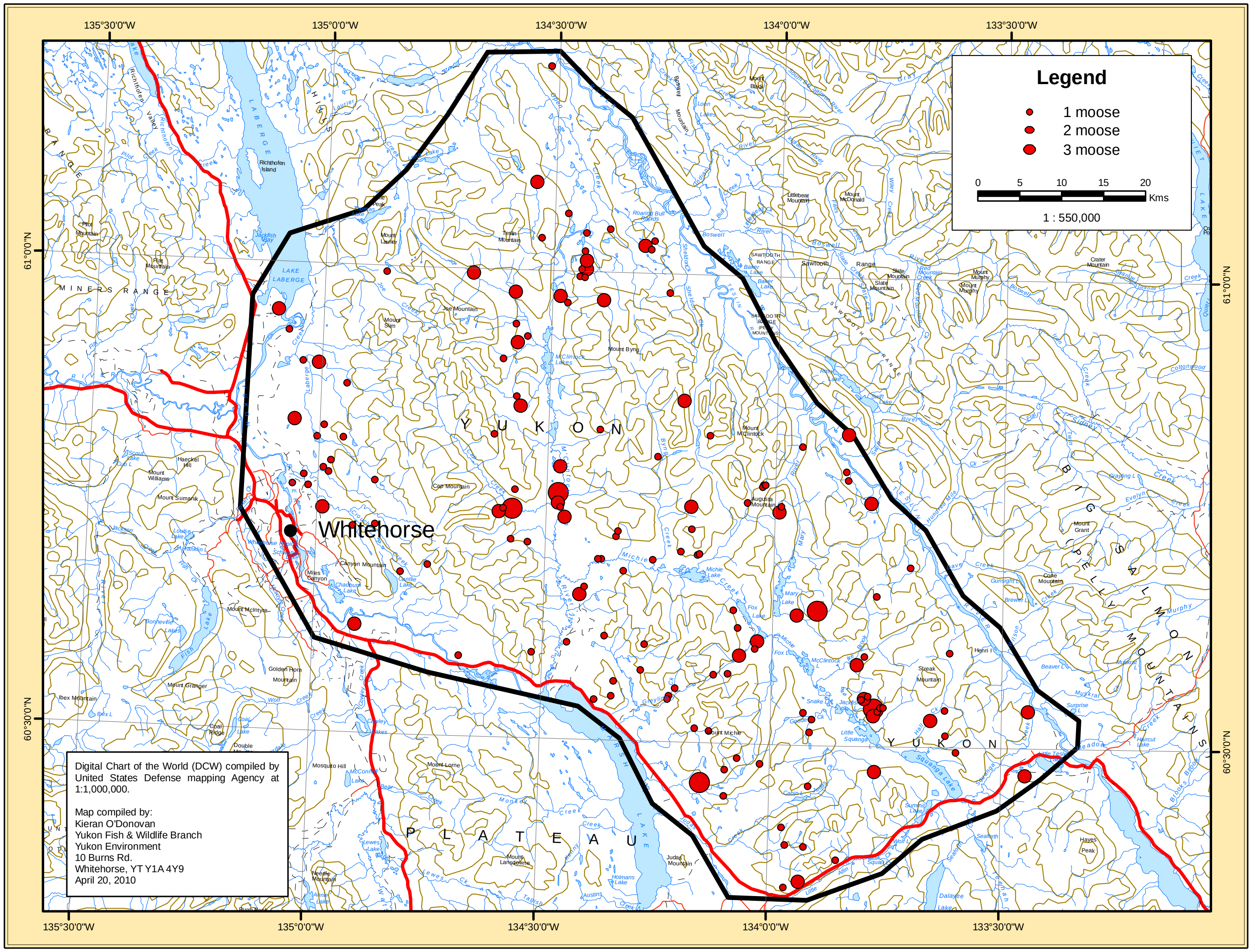

Figure 5. Moose observations in the M'Clintock Moose Survey Area.

The valley of M'Clintock Lake and River, as well as the surrounding drainages, were also areas of high moose concentrations. However, this area has not burned within the last 50 years and it may be nearing the climax seral stage, when willow abundance may become limited. The area immediately east and north of Whitehorse (GMS 8-13) which had not previously been surveyed, had a surprisingly large number of moose using the low elevation open pine forests and wetlands amongst the rolling hills and eskers of the Yukon River valley. In general, moose were spotted in most habitat types, including densely forested lowland spruce stands, open pine forests, riparian meadows, and open subalpine shrub habitats. While sightability of moose was undoubtedly higher in open habitats, generally good viewing conditions for track sighting allowed us to be fairly confident that we were not missing more moose in other habitats.

In addition to the wide geographic distribution of moose, we observed moose to be more widely distributed on an elevational basis than we had expected for a late-winter survey. We observed moose everywhere from near treeline down to valley bottoms. Moose typically move down slope in late winter to avoid the deep snow and gain access to the abundant forage available in lower elevation shrub habitats (Smits 1991, Poole and Stuart-Smith 2006, O'Donoghue and Bellmore 2009). However, variation in seasonal movements is not uncommon and in some areas movements may be in the opposite direction or may not occur at all (Johnston *et al.* 1984, Smits 1991, Ball *et al.* 2001). Because this was the first late-winter survey to assess distribution within the M'Clintock survey area, we do not know if the wide range of elevations that we observed being used by moose is typical of this region or a function of the climatic conditions and snowpack of the 2010 winter. Because the snowpack was close to average it is unlikely that snow depth was different enough to cause any deviation from typical late winter habitat associations. The warmer than average temperatures in 2010 may have allowed moose to use of a wider range of habitats, such as the higher elevations that might otherwise be too cold.

Age and Sex Composition

The sex and age ratios that we observed were likely biased estimates. Previous surveys have shown that cow moose, particularly cows with calves, tend to space themselves away from other moose more so than bulls, so that there is a higher proportion of cows in low-density survey blocks than in high-density blocks. Low-density blocks also typically have lower sightability, because forest canopies are, on average, denser. Because of these differences in sightability, it is likely that we missed more cows and calves than bulls.

While the proportion of calves observed in this survey is likely not the true proportion in the population, it can be used as an index for comparison with similar surveys in other areas and years. Approximately 9% of the moose observed in this survey were calves. While this is not the lowest proportion of calves seen during previous similar surveys across Yukon, it is at the low end of the range of values (4.8 to 24.5%) and less than the average (13.4%). However, more than one year of data is needed to make a reliable assessment of population status and trends.

Harvest

Over the 10 years prior to the survey (2000 to 2009) the number of moose reported killed in the M'Clintock moose survey area (including 5 road kills) ranged between 19 and 28 moose per year (Figure 6). Based on the 1999 population estimate of 873 moose, and assuming no change in the population, in most years the reported harvest was near 3% of the population. This does not include any moose harvested by non-licensed First Nation hunters. If the moose population has remained at 1999 levels, or decreased, then harvest is likely near, or above, the upper range of the 2 to 4% annual harvest limit set out in the Yukon Moose Management Guidelines (Yukon Fish and Wildlife Branch 1996).

Access issues are becoming increasingly important in the management of moose in this area. Because of its proximity to Whitehorse and the profusion of off-road vehicle (ORV) trails into the region, more hunters have increased access to more of the area and are able to harvest moose in greater numbers. To ensure the long-term viability of moose populations in this region, harvest and numbers of moose must be closely monitored and the need for more collaborative harvest management should be considered.

Track Counts

Our efforts to use the number of moose tracks per sample unit was an attempt to develop another tool to determine late winter distribution. More work is needed to refine the technique and future efforts will benefit from what we learned:

1. Begin the survey soon after a snowfall, but allow enough time (about 2 to 4 days if possible) for moose to move around through the area.
2. Standardize how track GPS waypoints are recorded. Only record tracks that are actually bisected by the flight path, with a buffer on either side. We recommend a buffer width of 25 m on either side of the aircraft.

3. Classify and record tracks as single, double, or multiple.
4. Ensure observers are well-trained and able to distinguish moose tracks from others.
5. Develop a new datasheet with room to include track observations that will link up with the larger database. Analyze track counts across similar surveys (if data are collected consistently) to evaluate the usefulness of these data with respect to moose distributions.

Other wildlife sightings

In addition to moose, we recorded 98 caribou in 21 groups distributed across the study area. Caribou were primarily in low-lying habitats typically associated with open pine forests. We also saw 2 mule deer off the southwest corner of Canyon Mountain (known locally as Grey Mountain). Two moose kill sites were observed, one near Little Squanga Lake and another on Cantlie Lake; the Cantlie Lake kill site was later confirmed to be a hunter harvest.

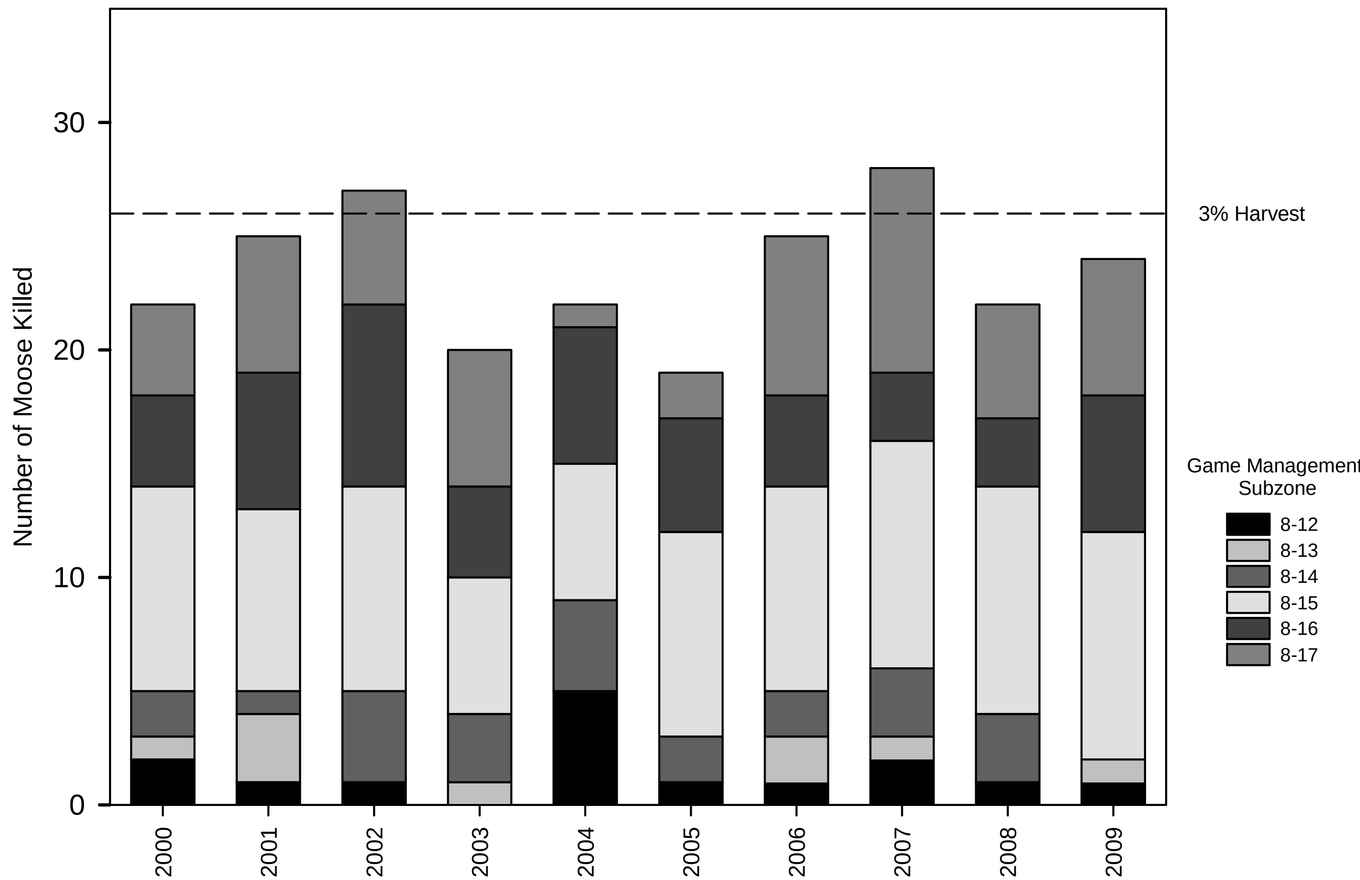

Figure 6. Reported moose harvest[1] in the M'Clintock moose survey area (Game Management Subzones 8-12 to 8-17), 2000–2009.

[1] Does not include harvest by non-licensed First Nations members.

Conclusions

- Moose were broadly distributed across habitat types within our study area, using densely forested lowland spruce stands, open pine forests, riparian meadows and open subalpine shrub habitats at all elevations below the alpine.
- Moose did not exhibit the typical late winter preference for lower elevation habitats that we expected but were instead broadly distributed across elevations, despite average snow depths for the region.
- Fire history likely played an important role in moose distribution; we observed very few moose in a one-year-old burn while moose were densely clumped in a 10-year-old burn near Little Squanga Lake.
- Compared with similar late winter moose intensive stratification surveys, the proportion of calves observed in this region (9%) was low.
- Based on the 1999 population estimate, licensed harvest in this region is near, or possibly above the 2 to 4% allowable harvest limit and should therefore be closely monitored. The combination of licensed harvest with unreported subsistence harvest by First Nations likely consistently exceeds the 4% limit every year.

Literature Cited

BALL, J. P., C. NORDENGREN, AND K. WALLIN. 2001. Partial migration by large ungulates: characteristics of seasonal moose *Alces alces* ranges in northern Sweden. Wildlife Biology 7:39–47.

DEPARTMENT OF ENVIRONMENT. 2010. Yukon snow survey bulletin and water supply forecast. Water Resources Branch, Dept of Environment. Government of Yukon. Whitehorse, Yukon.

GASAWAY, W. C., AND S. D. DUBOIS. 1985. Initial response of moose (*Alces alces*) to a wildfire in interior Alaska. Canadian Field-Naturalist 99:135–140.

GASAWAY, W. C. , S. D. DUBOIS, R. D. BOERTJE, D. J. REED, AND D. T. SIMPSON. 1989. Response of radio-collared moose to a large burn in central Alaska. Canadian Journal of Zoology 67:325–329.

JOHNSTON, W. G., D. G. LARSEN, H. A. MCLEOD, AND C. A. MCEWEN. 1984. Moose population dynamics and habitat use, southern Yukon River basin. Yukon Fish and Wildlife Branch Report TRC-84-3, Whitehorse, Yukon, Canada

MAIER, J. A. K., J. M. VER HOEF, A. D. MCGUIRE, R. T. BOWYER, L. SAPERSTEIN, AND H. A. MAIER. 2005. Distribution and density of moose in relation to landscape characteristics: effects of scale. Canadian Journal of Forest Research 35:2233–2243.

O'DONOGHUE, M. AND J. BELLMORE. 2009. Nordenskiold River Moose Management Unit: Summary of late winter 2009 moose survey. Yukon Fish and Wildlife Branch unpublished report. Mayo, Yukon.

POOLE, K. G., AND K. STUART-SMITH. 2006. Winter habitat selection by female moose in western interior montane forests. Canadian Journal of Zoology 84:1823–1832.

SMITS, C. M. M. 1991. Status and seasonal distribution of moose in the northern Richardson mountains. Yukon Fish and Wildlife Branch Report TR-91-2.

YUKON FISH AND WILDLIFE BRANCH. 1996. Moose management guidelines. Yukon Department of Renewable Resources.