MOOSE (*ALCES ALCES*) SURVEY

UPPER HYLAND

LATE-WINTER INTENSIVE STRATIFICATION 2013

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Summary

- We conducted a late-winter intensive stratification survey of moose in the upper Hyland River and Nahanni Range Road area on 9 to 14 March 2013.
- The main purpose of the survey was to map moose distribution and identify late-winter habitats in the Upper Hyland Moose Management Unit.
- The survey was conducted with a fixed-wing aircraft and the total search intensity was 0.21 min/km^2. The search time in suitable moose habitat was 0.39 min/km^2. We counted 43 moose: 42 adults and 1 calf. We also mapped observations of fresh moose tracks.
- The majority of moose (22 or 51%) were found in or on the edge of burns; of these, all but one were associated with a 2002 burn in the mid-east part of the study area. The remainder of moose (17 or 40%) were located at varied elevations in the north and northeast portion of the survey area, while in the south portion of the survey area, a small number of moose (4 or 9%) were located in valley bottoms.
- Only 2% of moose observed in the survey were calves. Although it's possible that survival of calves to 10 months of age was low in this area during the last year, it's more likely that our estimate is biased low and is not a true representation of the proportion of calves in the population.
- The results of this survey will be used to better inform Environment Yukon's responses to development applications within the Upper Hyland Moose Management Unit.

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Introduction

This report summarizes the results of a late-winter intensive stratification moose survey in the Upper Hyland Moose Management Unit (MMU, Figure 1) conducted between 9 and 14 March, 2013.

The main purpose of this survey was to obtain late-winter moose distribution information and to gain an indication of relative moose abundance. These data allow us to map key late-winter habitats and provide effective input when reviewing industry proposals.

The need to collect baseline information in this area has been highlighted by increased mineral exploration activity as a result of existing and developing exploration projects. Additionally, the Nahanni Range Road bisects the survey area and is a popular hunting corridor.

Previous Surveys

This was the first moose survey we have conducted in this area.

Community Involvement

Four community members from Watson Lake participated in the survey. Community members have not identified this region as an area of concern.

Study Area

The study area encompasses the entire Upper Hyland MMU and is located within the Logan Mountains, a sub-range of the Selwyn Mountains. The southern boundary of the survey area includes Mount Kostiuk and Dolly Varden Creek and continues north to the headwaters of the Little Hyland River (Figure 1). The western boundary follows Dolly Varden Creek, north to Tyers River and continues north to Anderson and Upper Hyland lakes. The eastern boundary follows the West Coal River north to the headwaters of the Coal River, and then merges with the Yukon/Northwest Territories border. The survey area encompasses four Game Management Subzones (GMS): 11-19, 11-24, 11-26, and 11-32 (Figure 1), and covers a total area of 4,633.9 km^2 of which 2,507.1 km^2 (54%) is habitable moose range.

The Upper Hyland survey area is within the Selwyn Mountains ecoregion. This range is rugged and consists of mountains and ridges separated by broad valleys through which numerous creeks and rivers flow (Yukon Ecoregions Working Group, 2004). A significant portion of the survey area is above treeline. Much of this area is exposed rock and alpine tundra, with lower subalpine slopes composed of shrub birch (*Betula glandulosa*) and willow (*Salix sp.*) communities. Black spruce (*Picea mariana*) and white spruce (*P. glauca*) forest, sometimes mixed with subalpine fir (*Abies lasiocarpa*), lodgepole pine (*Pinus contorta*), shrub birch and willow, are found on slope bottoms and in river and creek valleys (Yukon Ecoregions Working Group, 2004).

The survey area has remained relatively untouched by fire over the last 68 years of available fire data for the Yukon (Figure 2). From 1957 to 1991, there were 14 small burns that

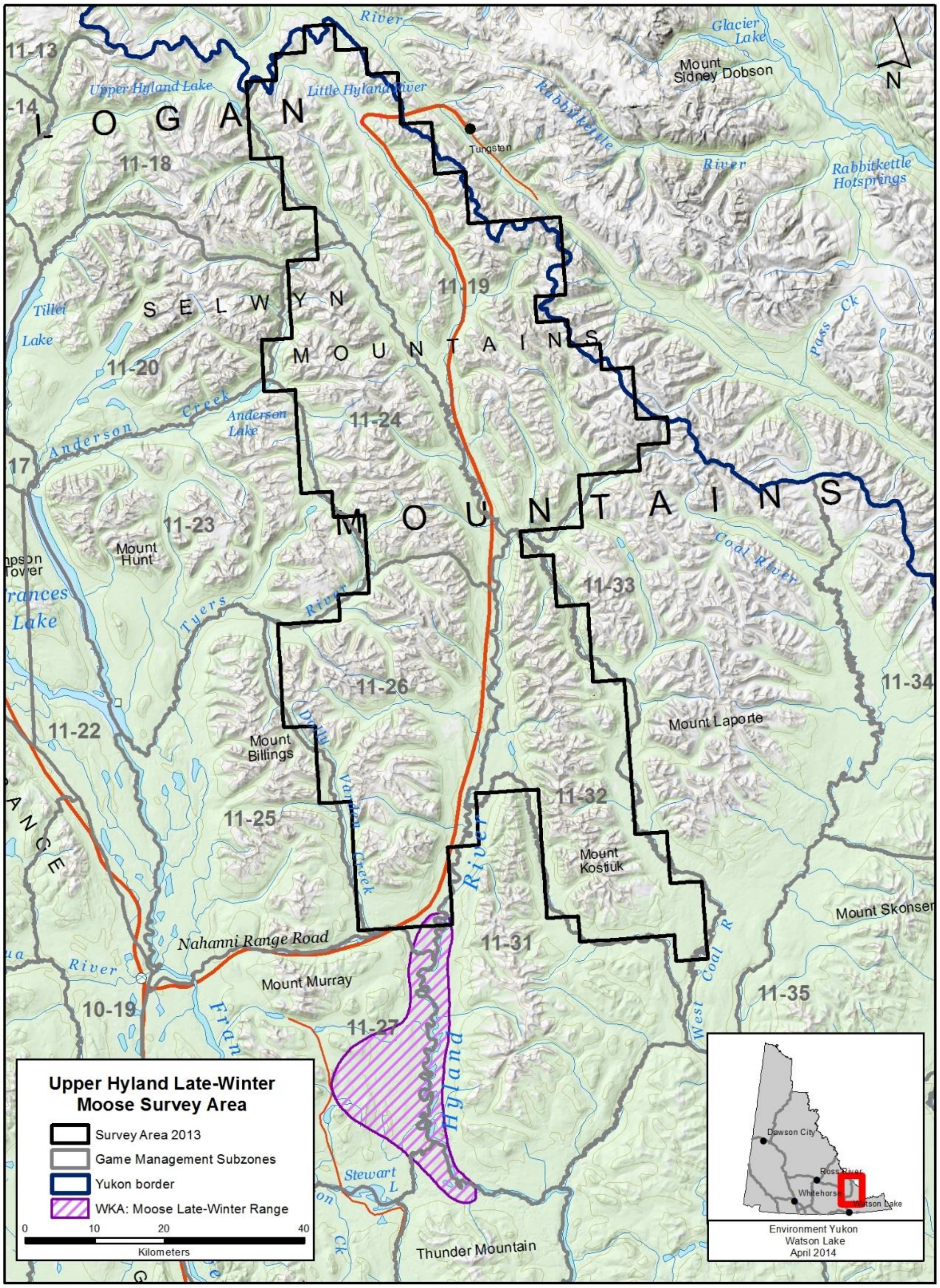

Figure 1. Upper Hyland late-winter moose survey area, southeast Yukon, 2013

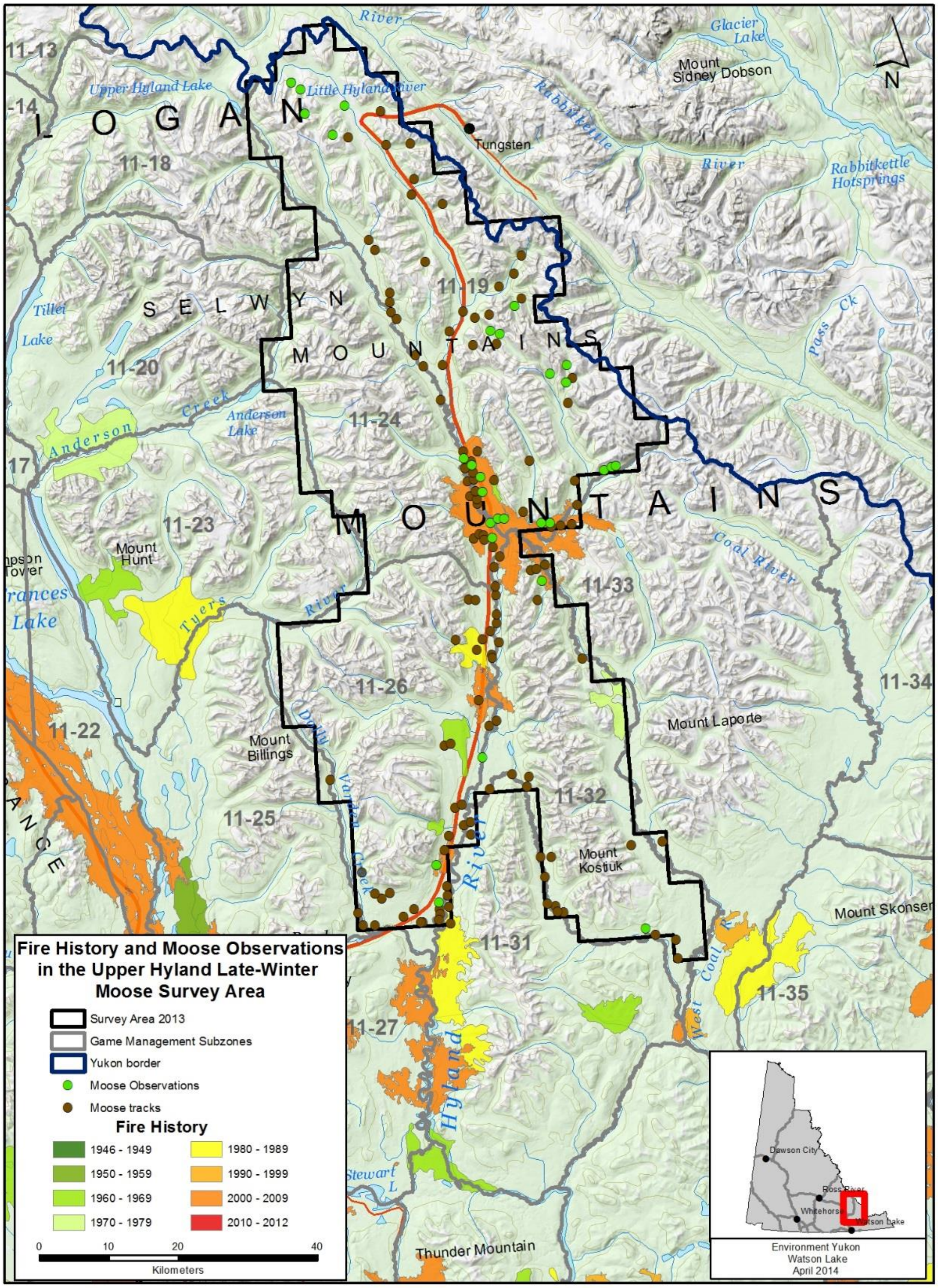

Figure 2. Fire history and moose observations in the Upper Hyland late-winter moose survey area, southeast Yukon, 2013.

ranged in size from less than 1 km^2 to just over 19 km^2. Eight fires totaling 196 km^2 burned in the 2000s, the largest of which (165 km^2) took place in 2002. Three fires, totalling less than 0.5 km^2, were classified as human-caused while the remainder were caused by lightning.

The Nahanni Range Road, used to access Tungsten Mine in the Northwest Territories, mainly runs north-south through the middle of the survey area. Numerous exploration trails, accessible by all-terrain vehicles, branch off this road and follow creek valleys up into subalpine and alpine areas.

Methods

This survey was conducted using an intensive stratification design whereby survey units are classified into high and low units of expected moose densities.

The intensive stratification technique involves the following steps:

1. The survey area is divided into uniform rectangular blocks 16 to 17 km^2 in size based on lines of latitude and longitude (2' latitude x 5' longitude).
2. Observers in a fixed-wing aircraft then fly over each block, making about four passes, striving for a search intensity of 0.5 min./km^2. Blocks with portions of non-habitat require less coverage or are not surveyed if they consist entirely of non-habitat.
3. Each block is then classified (or stratified) as having high or low expected moose abundance. This classification is based on expert opinion, local knowledge, number of moose and moose tracks seen, and habitat. A GPS location is recorded for each moose sighting or when fresh moose tracks are observed within the study area. Moose are classified by age (adult or calf) and, with the exception of cows with calves, no attempt is made to determine the sex of observed moose.

Weather and Snow Conditions

Weather conditions for this survey were variable and challenging. Temperatures ranged from -5°C to -23°C. Light snow and low visibility were frequent throughout the survey and this, combined with high winds, contributed to two days where we were unable to survey. Variable amounts of fresh snow occurred throughout the survey area; however, moose tracks were difficult to detect due to flat light. Within the Liard region, snowpack conditions were above normal and the snow water equivalent was 116 percent of normal at the Hyland River (Yukon Environment, 2013). Snow depth was 76 cm on February 28 at the Upper Hyland snow station.

Results and Discussion

Coverage

We spent 16.5 hours flying 281 blocks within the survey area. This resulted in an overall search intensity of 0.21 min./km^2. This was much lower than our target of 0.5 min./km^2 and is due to the large proportion of high elevation non-habitat (46% of study area). Coverage of habitable moose area was 0.39 min./km², which is closer to, but still lower than, our search intensity target. We needed an additional 8.2 hours (33% of total flight time) to ferry to and from the survey area and our fuel caches at the Watson Lake airport and the Tungsten Airstrip.

Identification of High and Low-Density Blocks

We divided the Upper Hyland survey area into two categories of expected moose density (Figure 3). We classified 38 (13.5%) of the 281 survey blocks as having a high expected abundance of moose, and 243 (86.5%) as having low expected moose abundance. The large proportion of non-habitat present within the study area heavily influenced the high percentage of low blocks. We located most of the blocks with higher expected numbers of moose in burns and in riparian areas with an abundance of willows and other shrubs.

Moose Observations

We counted a total of 43 moose: 42 adults and one calf (Table 1), resulting in 0.04 moose observed per minute of survey time. This is much lower than the average 0.09 moose per minute observed among 12 late-winter stratification surveys previously done in other regions in the last 10 years (Environment Yukon files).

We noted moose tracks at 122 locations (Figure 2) despite poor light conditions. The low number of moose was not unexpected considering the limited amount of available late-winter habitat (54%) within the survey area. Flight altitude was often higher than optimal because of rugged terrain which may have affected the number of moose observed. Additionally, search intensity in suitable moose habitat (0.39 min./km²) was lower than our search intensity target, and lower than other late-winter stratification surveys conducted in the Yukon, which averaged 0.48 min./km² (Environment Yukon files).

Table 1. Observations of moose in the Upper Hyland late-winter moose survey area, southeast Yukon, 2013.

	Number Observed	Percentage of Moose Observed
Adults	42	97.6
Calves	1	2.4

Moose Distribution

We found just over half of observed moose (22 or 51%) in or on the edge of burns. Except for one moose, all were associated with the 2002 burn (11 years post fire) in the east-central part of the survey area (Figure 2). Optimum habitat successional stages for moose are 11 to 30 years after a burn in boreal forests, although the exact timing of optimal conditions is dependent on specific site conditions (e.g. tree type, elevation, soils, moisture regime) and fire intensity and duration (Kelsall et al. 1977, Maier et al. 2005). The high use of the 2002 burn versus all other burns within the study area seems to reflect this assessment. We found moose not associated with the 2002 burn in

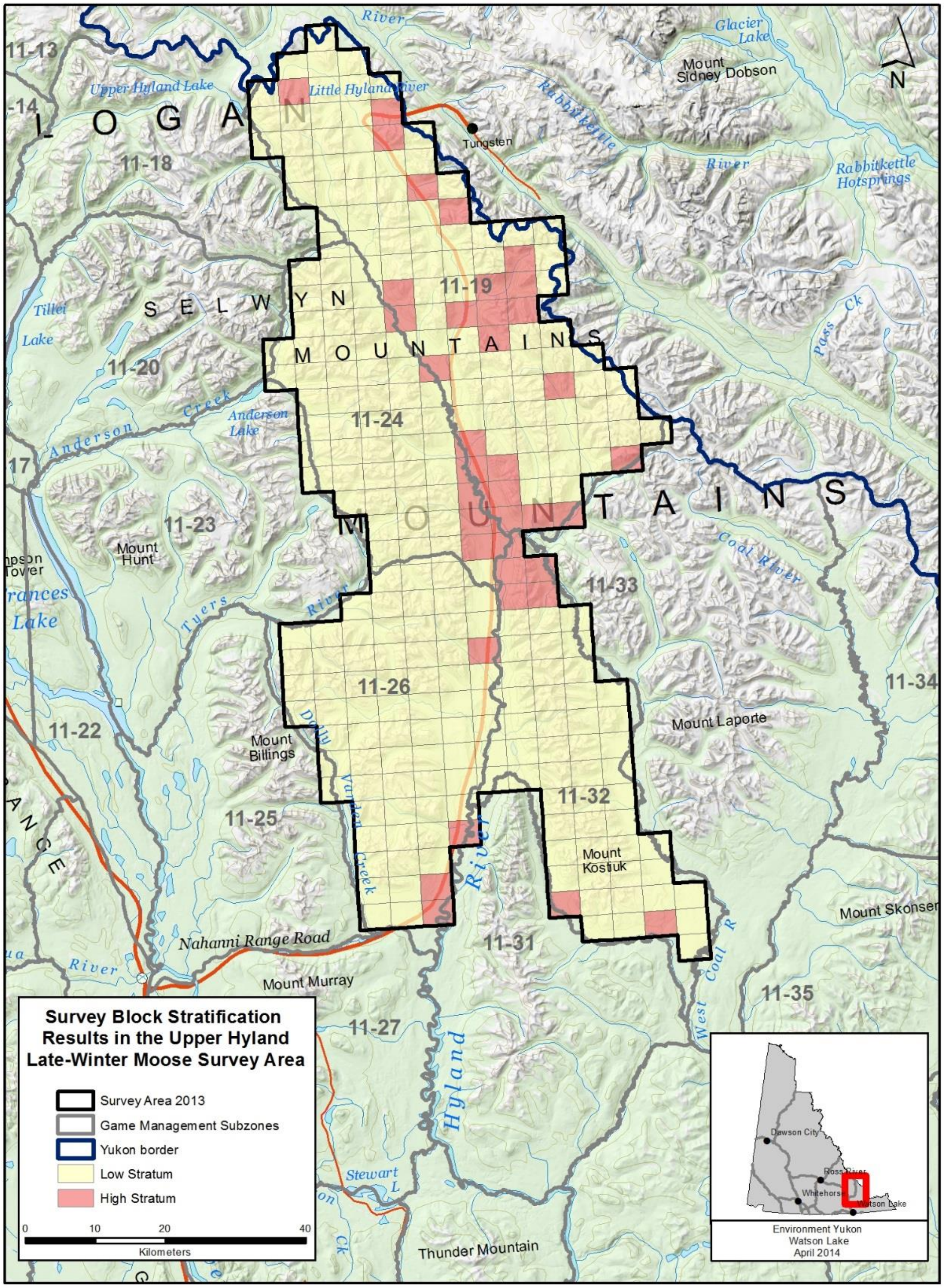

Figure 3. Survey block stratification results in the Upper Hyland late-winter moose survey area, southeast Yukon, 2013

willow and spruce riparian habitats, forested lowland spruce stands, and avalanche chutes. Most moose groups (58.6%) were associated with willow and riparian habitats.

Typically in the Yukon, as winter progresses and snow depth increases, moose move from subalpine habitats to valley bottoms (Fraser et al. 2001, O'Donoghue 2005). Local knowledge affirms that moose in this region exhibit this typical seasonal movement from higher to lower elevation as winter advances. Most of the observed moose displayed this behaviour with the exception of six moose recorded at high elevations.

Although moose are well adapted to snow environments, characteristics of snow such as temperature, density, hardness, and depth, influence moose movement and habitat use (Peek 2007). Snow depth is the most frequently studied variable and depths of 71 to 97 cm (Kelsall 1969) and 1 m (Des Meules 1964) have been shown to limit moose movement. Snow depth at the end of February was 76 cm at the Hyland River snow station (elevation 855 m) (Yukon Department of Environment 2013).

We believe that some moose residing in the survey area throughout the summer, fall, and early winter may move to higher quality late-winter habitat outside of the survey area. During travel from Watson Lake to the study area, we observed numerous moose directly south of the study area in a known moose late-winter range Wildlife Key Area along the Hyland River (Figure 1). This area has an abundance of large willow flats and other lowland and riparian community types.

Moose Age Composition

We classified 42 moose as adults (98%); one moose was classified as a calf (2%). Two percent of calves is low when compared to the mean results of the 12 other late-winter intensive stratification surveys (9.8%). Although it's possible that survival of calves to 10 months of age was low in this area during the last year, it's more likely that our estimate is biased low and is not a true representation of the proportion of calves in the population. Cow moose with calves generally select denser cover in late-winter, are more secretive than other age groups, and tend to disassociate themselves from other moose (Peek 2007). As well, census surveys, in which survey blocks are searched very intensively and counts are corrected for sightability, are more appropriate for estimating population composition than are intensive stratification surveys (O'Donoghue 2012). Additionally, it was challenging to spot all groups of animals due to less than ideal survey conditions.

Other Wildlife Sightings

We recorded 2 mountain goats (*Oreamnos americanus*) in the northeastern portion of the survey area. Two moose kill sites (presumably killed by wolves [*Canis lupus*]) were recorded in the 2002 burn in the mid-east part of the study area. We observed a third unidentified kill site with wolf sign on the edge of the Hyland River in the southern part of the survey area.

Outside of the survey area boundary an adult moose was observed within the 2002 burn. In transit between the Watson Lake airport and the survey area, numerous moose (unrecorded) were observed in the willow flats and other lowlands south of the study area.

Conclusions and Recommendations

- Fire history appeared to play an important role in late-winter moose distribution in the Upper Hyland survey area. Just over half of observed moose were located in the 2002 burn.
- The majority of moose not associated with the 2002 burn were observed in riparian or willow habitats. The remaining moose were in spruce stands and avalanche chute areas.
- These data provide a baseline on moose distribution and habitat use to better inform environmental assessments and monitoring plans associated with development proposals.
- The number of calves was low when compared to other late-winter surveys. This may reflect a low recruitment rate but is more likely due to factors related to sightability.
- A second year of data would increase our knowledge of variability in late-winter moose distribution in this area.

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