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Moose (*Alces alces*) Population Size and Density in the Inuvik Region of the Northwest Territories, March 2017

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ABSTRACT

A moose survey was conducted March of 2017 in the Gwich'in Settlement Area and Inuvialuit Settlement Region of the Northwest Territories. Survey blocks were chosen based on previous surveys and areas identified as of interest by local communities. The Geospatial methodology was used, with stratification conducted from expert knowledge and information from previous surveys. The overall moose density was 3.79 moose/100 km^2, however moose densities varied by survey blocks. Trends in moose densities varied by survey block. Of the seven survey blocks that had some overlap with the 2011 survey blocks, two showed a decline in moose density compared to 2011 and the remaining five showing an increase. However, due to changes in the survey areas these values cannot be directly compared to the 2011 survey results but provide an indication of the moose population health.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

Moose (*Alces alces*) are year-round residents and an important food species for many citizens of the Gwich'in Settlement Area (GSA) and Inuvialuit Settlement Region (ISR) in the Inuvik Region of the Northwest Territories (NWT). Being the northern extent of moose range, densities of moose are relatively low throughout surveyed areas of the GSA and ISR.

Concerns have been raised that there may be increased harvest pressure on moose due to limited access to caribou. Local barren-ground caribou (*Rangifer tarandus groenlandicus*) herds such as the Cape Bathurst herd are at low numbers resulting in a harvest closure of the herd in 2007 that remains in-place today (Davison 2016). The Porcupine Caribou herd (*R. t. granti*), despite being at high numbers, are not always accessible to hunters from the NWT due to distribution (PCTC 2017). This decrease in caribou harvest may transfer harvest pressure to alternate species, which may result in higher moose mortality.

Periodic moose surveys have been conducted in different study areas in the region. While the methodology has largely been consistent, comparison of previous surveys is difficult because survey area selection in the region has changed over time depending on funding and community interests. Surveys conducted prior to 2006 were restricted to various smaller portions of the region, with northern Richardson Mountains and Fort McPherson/Peel River area being the most recently surveyed in 2000 (Benn and Firth 2001). The Arctic Red River area was surveyed in 1999 and the Inuvik-Tsiigehtchic area in 1998 (Benn 1999, Chetkiewicz et al. 1998, Marshal 1999, Marshal 1998). A survey conducted in the GSA in March of 2006 found a decline in moose densities from previous surveys and an overall low density of 2.09 moose/100 km^2, with density in individual survey areas ranging from 0-3.78 moose/100 km^2 (Lambert 2006).

The most recent moose survey in the region was conducted in 2011. A total area of 3,519 km^2 was surveyed estimating a coarse overall moose density of 2.24 moose/100 km^2. The highest density, 9.66 moose/100 km^2, was found in the Ikhil Pipeline survey area. The

Arctic Red River area was found to have low densities with 0.53 moose/100 km^2 (Davison and Callaghan 2013).

Initial interest for a survey in 2017 came from the Inuvik Hunters and Trappers Committee who expressed the need for updated information on moose populations to make decisions regarding hunting access on private lands. Other communities also indicated changes in the moose population since the 2011 survey and supported a new survey.

METHODS

The stratified random sampling methods of Gasaway et al. (1986) were used to estimate moose in the survey areas using the Geospatial Population Estimator Software (Delong, 2006). The survey region was divided into 2' latitude by 5' longitude (~ 4 km x 4 km) cells using ArcGIS.

Workshops with local Renewable Resources Councils (RRCs) and Hunter and Trapper Committees (HTCs) were held in the communities of Inuvik, Aklavik, Tsiigehtchic, and Fort McPherson. RRCs and HTCs were asked to invite representatives from their councils or communities that they felt had the most knowledge of moose distribution and ecology in their area. At each workshop, we talked about the survey purpose, methodology and expected project outcomes. Workshop participants were then asked to review the proposed project survey area to suggest any modifications based on their knowledge of moose distribution at the time of the survey and their council or committee's directions. Using large maps of individual survey regions in the project area, we asked survey participants to map areas of high and low moose density. Participants were asked how they thought moose numbers had changed since the 2011 survey (Davison and Callaghan 2013).

Eight areas of interest were identified based on past surveys and input from HTCs, RRCs, Gwich'in Renewable Resources Board, and Wildlife Management Advisory Council (NWT) (Figure 1). Seven of the survey blocks had some overlap to the 2011 survey (Figure 2). The Mackenzie Gas Pipeline block was established to provide baseline data during the impact review of the project (Lambert 2006). Due to other human activities and potential future development along the route, such as the Mackenzie Valley Fiber Link, there was continued community interest in monitoring the area and the survey area remained the same. The previous Inuvik-Tsiigehtchic block included both the delta and the uplands east of the delta. The area of the delta survey area was increased and split it into two blocks based on ecoregions (Ecological Stratification Working Group 1995). In order to compare 2011 results with this survey we reanalyzed the densities from the 2011 survey to fit with this

split of the survey block. The Mackenzie River block was a new survey block (Figure 1) recommended by the Tsiigehtchic RRC.

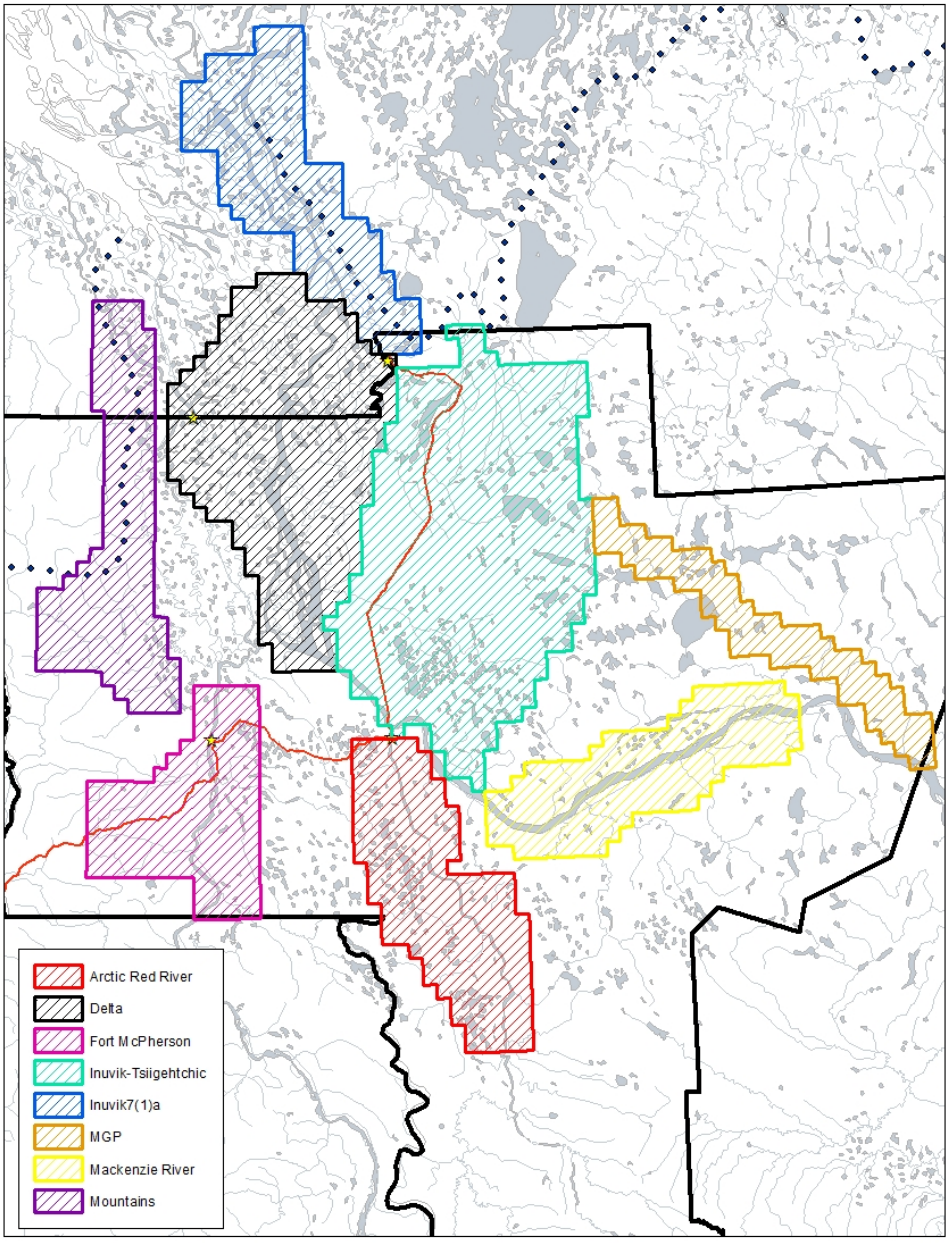

Figure 1. Survey blocks for the March 2017 moose survey. Dotted line represents the approximate limit of trees.

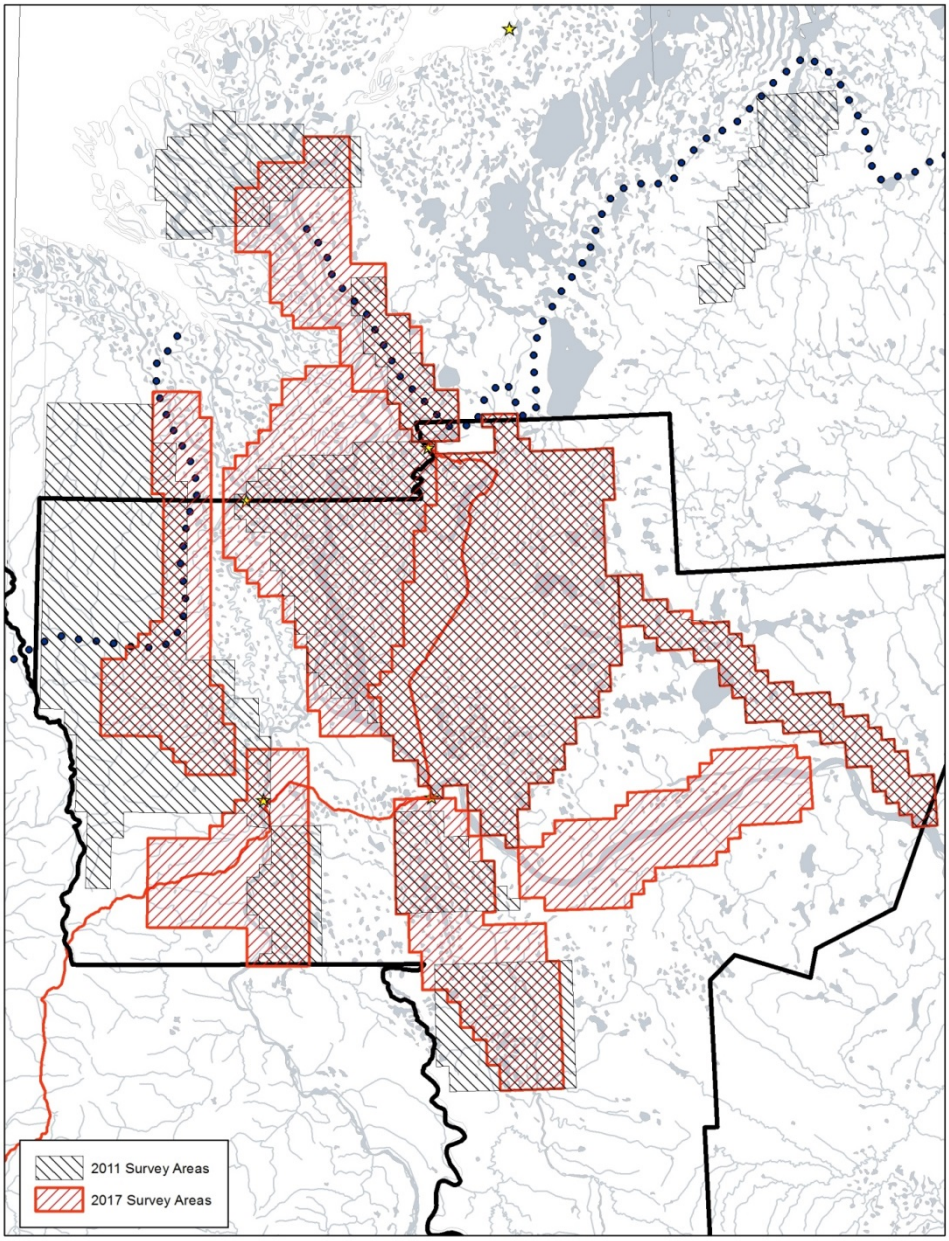

Figure 2. Study blocks used for the 2017 survey compared to blocks from the 2011 survey. Dotted line represents the approximate limit of trees.

The expected moose densities (high or low) identified in the workshop along with information on changes since the 2011 survey were used to modify the stratification done for the 2011 survey. Approximately 13% of cells in each survey block were randomly selected for surveying, with 2% of cell selections made manually to ensure good coverage and inclusion of both high and low survey blocks. Density estimates (moose/100 km^2)

were calculated for each of the eight survey blocks based on estimated total number of moose (# moose/area surveyed x 100).

Aerial survey methods generally followed those described by Kellie & Delong (2006). Surveyed cells were flown in their entirely using a Cessna 185. Search intensity varied by block based on block vegetation cover; heavily treed areas were covered more intensely than open/tundra areas. Snow tracks were circled to determine if the moose was still located in the block. A pilot, navigator, and two observers spotted and classified moose. Locations and data were recorded using GPS equipped tablets running ArcPad. Wolves and other wildlife observations were also recorded.

RESULTS & DISCUSSION

After the 2017 workshop in Aklavik (February 8), Fort McPherson (February 9), Inuvik (February 16), and Tsiigehtchic (February 24) we finalized the stratification of survey cells into high and low areas (Figure 3), and then survey cells were selected. The aerial survey was then conducted with a Cessna 185 between March 16th and 24th, 2017. Weather was good throughout the survey period. All selected cells were surveyed (Figure 4). Surveyed cells represented 22,302 km^2 and 14.3 % of all survey blocks (Table 1). A total of 145 moose were seen in selected survey blocks and 144 were seen outside survey blocks (Figure 5). Other mammals observed during the survey included 80 caribou, seven foxes, one lynx, four sheep and 15 wolves (Figure 6).

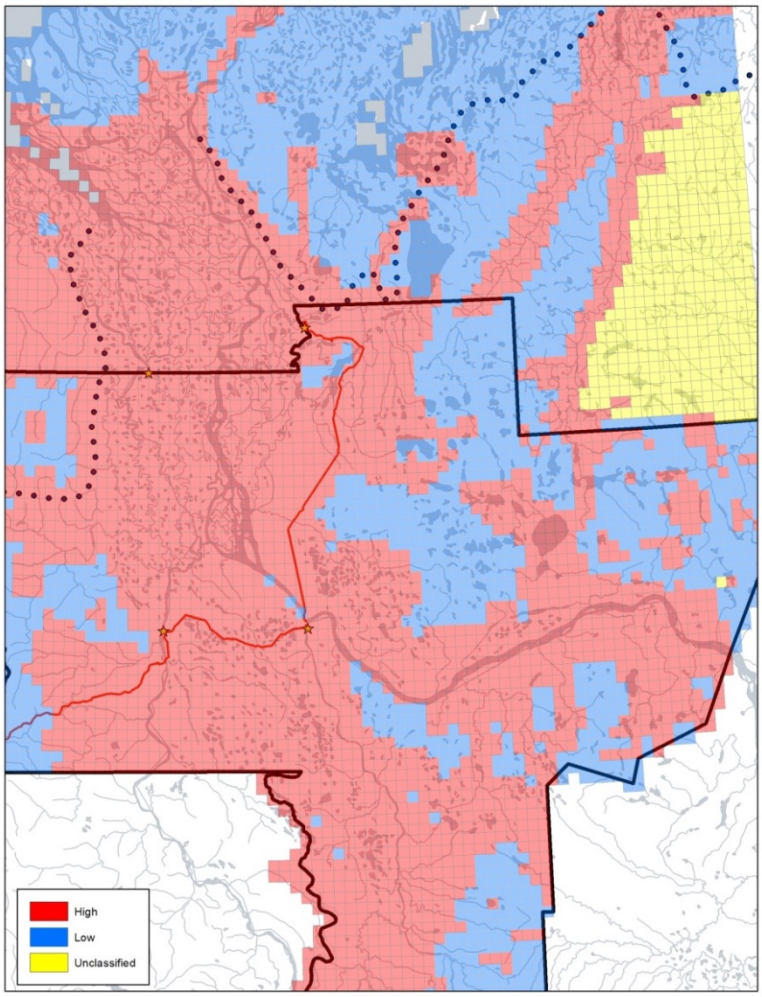

Figure 3. Stratification of the survey cells into High and Low expected moose densities. Dotted line represents the approximate limit of trees.

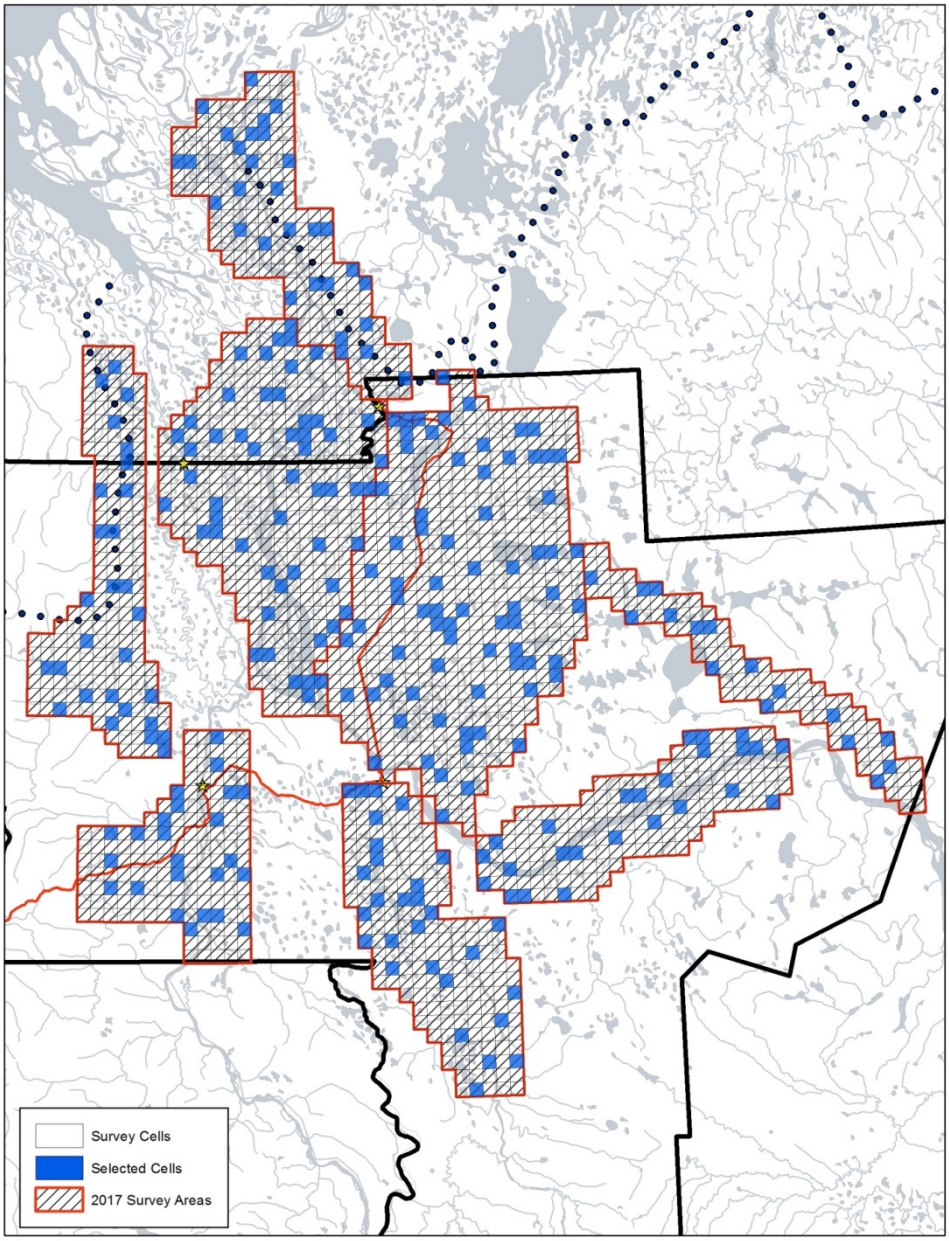

Figure 4. Selected and surveyed cells from the March 2017 moose survey. Dotted line represents the approximate limit of trees.

Table 1. Number of moose observed, population estimates, and moose densities by survey block for the March 2017 survey and comparison to historic densities.

	Total Area (km^2)	% Survey	# Cells Surveyed	Area Surveyed (km^2)	Total Moose	Population Estimate	Standard Error	Density (moose/100 km^2)		
								2017	2011[1]	2006[2]
Inuvik 7(1)(a)	2,315.72	14.0	26	325.18	**11**	91.17	66.6	**3.94**	9.66	---
Delta	4,212.82	14.1	46	592.64	**33**			**5.57**	2.87	
Inuvik-Tsiigehtchic	5,871.63	14.0	63	820.07	**26**	214.39	76.59	**3.65**	0.85	1.62
MGP route	1,288.5	14.3	14	183.84	**2**	11.77	7.01	**0.91**	3.33	2.31
Mackenzie River	2,052.65	14.3	22	292.96	**39**	287.07	77.33	**13.99**	N/A	
Arctic Red River	2,386.97	15.2	27	363.4	**11**	77.14	33.86	**3.23**	0.53	0.0
Fort McPherson/ Peel River	1,965.09	15.6	23	307.23	**10**	69.07	27.14	**3.51**	0.00	0.84
Richardson Mountains	2,208.86	14.1	24	312.01	**13**	94.58	35.97	**4.28**	2.23	3.54

[1] The only survey block that did not change between the two surveys was the MGP route. Details available in Davison and Callaghan 2013 or below for Delta Inuvik-Tsiigehtchic.

[2] Lambert 2006.

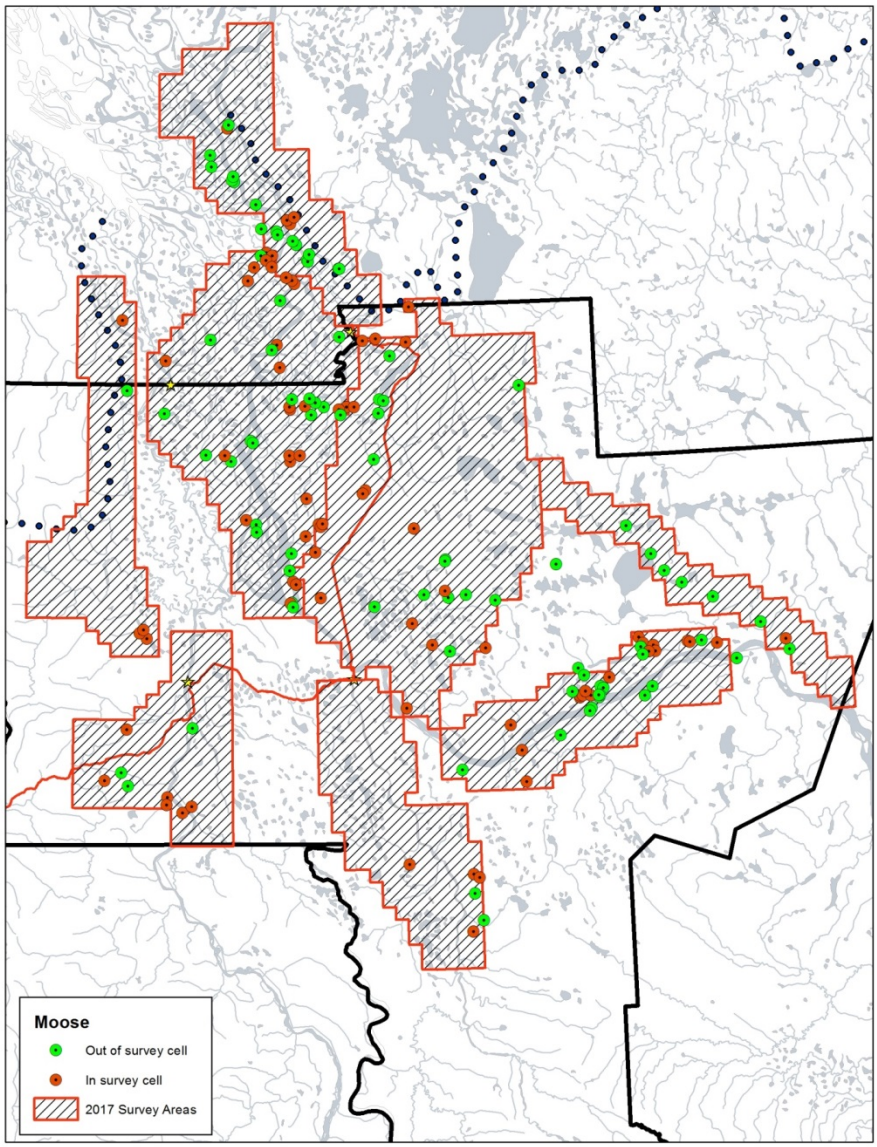

Figure 5. Moose observed both in selected survey cells and outside selected survey cells during March 2017 survey. Dotted line represents the approximate limit of trees.

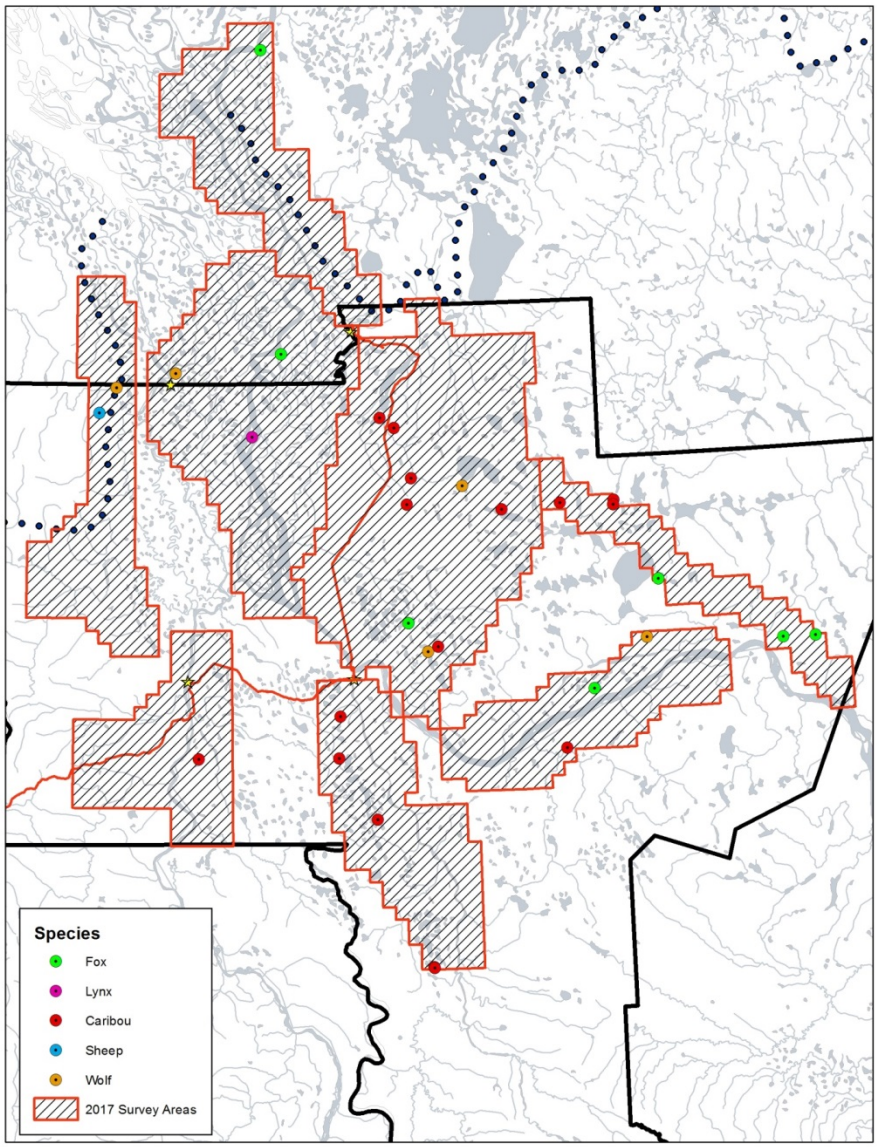

Figure 6. Other wildlife observed during the March 2017 moose survey. Dotted line represents the approximate limit of trees.

Where possible to calculate, population estimates for survey areas are reported in Table 1. There was no population estimate available for the Delta survey area as the entire area was stratified as high density. However, moose density results are the most meaningful results, as it is easily compared to previous surveys (as survey areas change) and regions. Overall moose density was 3.79 moose/100 km^2. However, moose densities varied by survey blocks; 0.9 moose/100 km^2 in the MGP block to 14 moose/100 km^2 in the Mackenzie river

block (Table 1). While overall moose density in 2011 was 2.24 moose/100 km^2 in a total area of 3,519 km^2, due to changes in the survey areas it is not possible to directly compare these values for an overall trend analysis.

Of the seven survey blocks that had some overlap with the 2011 survey blocks, two showed a decline in moose density compared to 2011 and the remaining five showing an increase (Table 1). Again, due to changes in the survey areas these values cannot be directly compared but provide an indication of the moose population health. In one case, the Mackenzie Gas Project (MGP) block was identical to the block surveyed in 2011 and results indicate a substantial decline in moose densities from 3.33 moose/100 km^2 in 2011 to 0.91 moose/100 km^2 in 2017.

The Inuvik 7(1)(a) block, which includes the Ikhil pipeline block from the 2011 survey and had a moose density of 9.66 moose/100 km^2 in 2011 (Davison and Callaghan 2013), had a lower overall density of 3.94 moose/100 km^2 in this survey. The moose density for just the Ikhil area in 2017 was also lower than the 2011 densities, with 6.33 moose/100 km^2.

The Richardson Mountain block of this survey was a smaller area then was surveyed in 2011 when the moose density was found to be 2.23 moose/100 km^2 compared to 4.29 this survey.

The Fort McPherson/Peel River and Arctic Red River blocks were adjusted from the 2011 survey but there is overlap of areas surveyed both years. There were no moose seen in surveyed cells in the Fort McPherson/Peel River block in 2011, where this survey found an increase to 3.51 moose/100 km^2. The adjusted Arctic Red River block also had a substantial increase in moose densities from 0.53 moose/100 km^2 in 2011 to 3.23 found this survey.

The Delta and Inuvik-Tsiigehtchic blocks were very similar to the areas surveyed in 2011, with the exception of increased survey area on the west side of the delta block in 2017. In 2011, these blocks were considered together (Davison and Callaghan 2013) so the data was reanalyzed to better reflect the two blocks used this survey. For 2011, the Delta block had a density of 2.82 moose/100 km^2 and the Inuvik-Tsiigehtchic block had a density of 0.97

moose/100 km^2 (Table 2). This is lower than the moose densities found in 2017 of 5.57/100 km^2 and 3.65/100 km^2 for the Delta and Inuvik-Tsiigehtchic blocks, respectively.

Table 2. Reanalyzed 2011 data for the Delta and Inuvik-Tsiigehtchic blocks including number of moose observations, moose densities, and population estimates.

2011 Reanalyzed	Total Area (km^2)	% Survey	Cells Selected & Surveyed	Area Surveyed (km^2)	Total	Population Estimate	Standard Error	Density (moose/100 km^2)
Delta	2,789.08	16.2	35	452.45	13	78.64	21.13	**2.87**
Inuvik-Tsiigehtchic	5,871.63	16.0	72	936.86	8	53.74	24.61	**0.85**

There was no correction done for sightability, which will vary by season, snow cover and habitat (Gasaway et al 1986). However, with the complete snow cover in March and habitat that ranged from alpine/tundra to semi-open coniferous forest, we believe that our sightability was high and we have no reason to think it varied between surveys.

The most substantial change observed in moose density was the MGP block. While additional moose were observed outside of the survey cells, only two moose were observed in selected cells giving a low density estimate compared to 2011 (0.91 compared to 3.33 moose/100 km^2 in 2011 to 0.91 moose/100 km^2). The Mackenzie Valley Fiber Link construction occurred between 2015 and 2017 (mvflproject.com) which may have impacted the distribution of moose, displacing them while human activity was occurring. However, now that construction is complete, moose are quite likely to move back into the area as they take advantage of new shrub growth in disturbed areas (Telfer 1978).

Densities in the region are similar to other areas of the NWT (Cluff 2005, Swallow et al 2003) and were consistent with what we would expect in the region. Most of the study areas in this survey showed an increase moose densities from 2011.

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