Keeyask Generation Project

Terrestrial Effects Monitoring Plan

Caribou Sensory Disturbance Monitoring Report

TEMP-2021-08

KEEYASK

Manitoba Conservation and Climate Client File 5550.00
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KEEYASK GENERATION PROJECT

TERRESTRIAL EFFECTS MONITORING PLAN

REPORT #TEMP-2021-08

CARIBOU SENSORY DISTURBANCE MONITORING 2020

Prepared for

Manitoba Hydro

By

Wildlife Resource Consulting Services MB Inc.

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SUMMARY

Background

Construction of the Keeyask Generation Project (the Project) at Gull Rapids began in July 2014 and the reservoir was impounded in early September 2020. The Keeyask Hydropower Limited Partnership (KHLP) was required to prepare a plan to monitor the effects of construction and operation of the generating station on the terrestrial environment. Monitoring results will help the KHLP, government regulators, members of local First Nation communities, and the general public understand how construction and operation of the generating station will affect the environment, and whether more needs to be done to reduce harmful effects.

The ranges of three migratory caribou herds extend into the Keeyask region: the Qamanirjuaq herd (Barren-ground caribou) and the Southern Hudson Bay (formerly called Pen Islands) and Cape Churchill herds (both Eastern Migratory caribou; formerly called forest-tundra or coastal caribou). Groups from these herds occasionally overwinter in the Keeyask region and leave in spring to calve.

A small group of caribou occupies the Keeyask region in spring and summer (referred to as summer resident caribou) and is known to calve on the islands in Gull and Stephens lakes and in mainland habitat (raised treed patches surrounded by low, wet areas, which essentially act as islands). Summer resident caribou move within and likely beyond the Keeyask region in the winter months, but the extent of their core range is unknown. These caribou remain in the Keeyask region to calve, but it is unclear whether the same individuals calve in the area in consecutive years.

Predicted Project effects on summer resident caribou in the Keeyask region include the loss of physical habitat from clearing and development and the effective loss of habitat due to sensory disturbance (e.g., noise and light from construction activities). Caribou may temporarily avoid or less frequently use otherwise suitable habitat near construction sites due to the sounds, odours, and sights caused by construction activities. A lesser effect may also occur near Project infrastructure and roads during the operation phase. Caribou movement patterns in and through the Keeyask region could also be affected by the Project.

Why is the study being done?

Caribou calving on islands in lakes and in mainland habitat near the Project may be affected by the loss of effective habitat due to noise and light disturbance. The goal of this study is to monitor the effect of these disturbances on caribou distribution and relative abundance near the Project during construction and operation. At the same time, monitoring of other large mammals may provide an indication of the effects of potential changes in the distribution of alternative prey (moose) and predators (black bear and gray wolf) on the caribou population.

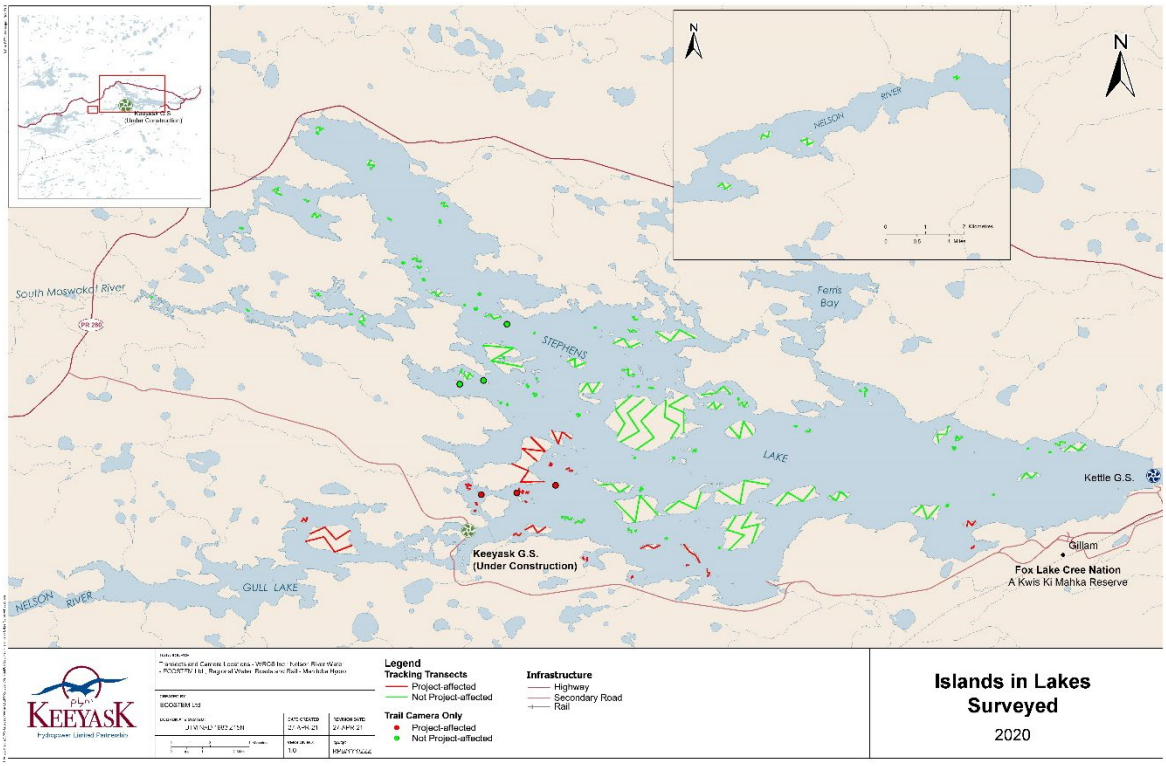
What was done?

Ground tracking transect and trail camera surveys were used to gather information on the use of islands in lakes, mainland habitat, and habitat near the North and South access roads by caribou and other large mammals. Islands in lakes and mainland areas were surveyed because these habitats are known to be used by caribou during the calving and calf-rearing period, when caribou are sensitive to disturbance. Habitat along the North and South access roads was surveyed to determine the effects of construction traffic disturbance on caribou and other large mammals.

Ground tracking transects were visited twice in 2020, timed to coincide with periods in the caribou calving and calf-rearing season. In previous years, the initial visit was in April, prior to cow arrival, to ensure animals were not disturbed during calving. In 2020, there was no ground tracking in April due to safety concerns and site restrictions related to COVID-19. The first visit was in July, to coincide with the early calf-rearing period. The second visit was in September, during the mid to late calf-rearing period. During each visit, signs (e.g., tracks and droppings) of caribou and other large mammals were recorded.

In April 2020, a trail camera was placed on most ground tracking transects on islands in lakes and within each mainland habitat surveyed. Trail cameras were placed where caribou activity was most likely to be detected (i.e., heavily used game trails, large openings). Photographs were reviewed following camera removal in September 2020, and the species, number, and sex (where possible) of photographed animals was noted. The timing of ice breakup on Gull and Stephens lakes was monitored using trail cameras deployed along the shorelines, to see how it corresponds with the use of the islands in the lakes by caribou.

Pre-impoundment surveys for caribou were conducted in late August 2020. Impoundment monitoring began September 1, 2020 and continued to September 4. Aerial surveys were conducted by helicopter over Caribou Island and within the reservoir area, where observations of caribou and other large mammals were recorded.



What was found?

Caribou occupied 56% of the islands in lakes surveyed in 2020, 8% of which were also occupied by calves. During the pre-construction period (2010 to 2014), the percentage of islands on which caribou and their calves were detected declined. The trend continued in 2015 and then reversed in 2017, when caribou and calves were detected on a greater percentage of islands than in 2015. The declining trend resumed in 2018. As predicted in the EIS, many Project-affected islands were unoccupied by caribou in 2020. However, there was also less caribou activity on unaffected islands than in previous survey years.

In 2020, the percentage of ice cover on Stephens Lake remained consistent from late March until mid- to late May and then decreased rapidly. Ice breakup was on May 26 and Stephens Lake was free of ice by June 1. Ice breakup on Gull Lake was May 28, with no ice remaining by June 3.

Caribou on an Island in Stephens Lake in 2020

Caribou occupied 56% of all surveyed mainland habitat areas, 22% of which were also occupied by calves. Caribou activity was found in a very small percentage of Project-affected mainland habitats. Caribou occupied more unburned than burned habitats. Signs of calves were only found in unburned mainland habitats.

On access road transects the density of caribou signs was greater more than 2 km from the access roads than within 2 km. No calf signs were found along these transects.

What does it mean?

While the location of caribou in Gull and Stephens lakes during spring and summer can vary from year to year, the potentially unoccupied islands near the Project site may show avoidance of habitat by some individuals due to construction-related sensory disturbances. However, some Project-affected islands continued to be occupied by caribou. As caribou can eventually get used to human disturbance, some animals may be less affected by ongoing construction activity than others. While caribou activity was found on somewhat fewer Project-affected islands in 2020 than in 2018, caribou activity on unaffected islands increased by a similar percentage, suggesting that some caribou could have been re-locating to undisturbed islands in Stephens Lake. In previous construction monitoring years, caribou activity declined on both Project-affected and unaffected islands and an overall decrease in the amount of caribou activity in the Keeyask region was documented.

Caribou activity was found in fewer Project-affected mainland habitats than in unaffected habitats and in more unburned than burned habitats. Caribou tend to avoid forest that is less than 50 years old but may pass through regenerating forest to get from one patch of more suitable habitat to another. Caribou may also use recently burned habitat in summer when they eat young, green

vegetation. The absence of calf activity in burned mainland habitat suggests that cows avoid recently burned areas when calving.

It is unclear why there appeared to be more caribou activity near the access roads than further away in 2015 and 2017 but not in 2018 or 2020. Results in 2018 and 2020 conformed to EIS predictions, as some, but not all, caribou were generally expected to avoid areas within 2 km of the access roads. As caribou can tolerate some human disturbance, some individuals may be less affected by traffic noise than others, and the extent of the noise effect may have been greater in the spring and summer of 2018 and 2020 than in previous years. Potential differences in habitat quality closer to and farther from the road, possibly related to fire or other factors, could also have influenced caribou distribution.

A caribou and calf were observed on Caribou Island on the first day of pre-impoundment monitoring (August 25, 2020) and were not seen again during continued surveys. It was presumed that they had left the island prior to reservoir impoundment, likely on August 26. No other caribou and no moose were observed during the monitoring before and during impoundment.

What will be done next?

Ground tracking transect and trail camera surveys will continue in 2021 and will include islands formed in the reservoir after impoundment. A multi-year monitoring synthesis report will provide an integrated evaluation of Project effects on caribou distribution and abundance, the availability of suitable habitat, and habitat effectiveness using results from this monitoring study as well as relevant information from other caribou monitoring programs for the Project.

STUDY TEAM

We would like to thank Sherrie Mason and Rachel Boone of Manitoba Hydro and Ron Bretecher of North/South Consultants Inc. for logistical assistance in the field. We would also like to thank James Ehnes of ECOSTEM Ltd. for GIS support and mapping. Biologists and other personnel who designed, participated in, and drafted the survey results included:

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- Andrea Ambrose, WRCS – Analysis and reporting
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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF MAPS

LIST OF PHOTOS

LIST OF APPENDICES

1.0 INTRODUCTION

Construction of the Keeyask Generation Project (the Project), a 695-megawatt hydroelectric generating station (GS) and associated facilities, began in July 2014. The Project is located at Gull Rapids on the lower Nelson River in northern Manitoba where Gull Lake flows into Stephens Lake, 35 km upstream of the existing Kettle GS. Reservoir impoundment began August 31, 2020 and was completed on September 5, 2020.

The *Keeyask Generation Project Response to EIS Guidelines* (the EIS), completed in June 2012, provides a summary of predicted effects and planned mitigation for the Project. Technical supporting information for the terrestrial environment, including a description of the environmental setting, effects and mitigation, and a summary of proposed monitoring and follow-up programs is provided in the *Keeyask Generation Project Environmental Impact Statement Terrestrial Supporting Volume* (TE SV). *The Terrestrial Effects Monitoring Plan* (TEMP) was developed as part of the licensing process for the Project. Monitoring activities for various components of the terrestrial environment were described, including the focus of this report, the use of calving and calf-rearing habitat in the Keeyask region by caribou (*Rangifer tarandus*) during Project construction.

As described in the EIS, the ranges of three migratory caribou herds extend into the Keeyask region: barren-ground caribou from the Qamanirjuaq herd and forest-tundra woodland caribou from the Pen Islands and Cape Churchill coastal caribou herds. Small groups of barren-ground caribou from the Qamanirjuaq herd will occasionally migrate from Nunavut into the Keeyask region in winter, although large numbers (10,000) have been recorded infrequently (Keeyask Hydropower Limited Partnership [KHLP] 2012). Caribou from the Cape Churchill and Pen Islands herds migrate from northern Manitoba and northern Ontario into parts of the Keeyask region in winter and return to the Hudson Bay coast in spring to calve. Larger groups of Pen Islands caribou, numbering in the hundreds, have been observed in the Keeyask region on occasion, but there are generally fewer than about 50 individuals in a typical winter (KHLP 2012).

Forest-tundra caribou have most recently been referred to as the Eastern Migratory population, and the Pen Islands herd is now called the Southern Hudson Bay subpopulation (Committee on the Status of Endangered Wildlife in Canada [COSEWIC] 2017). In April 2017, the Eastern Migratory population, which includes the Southern Hudson Bay and Cape Churchill subpopulations, was designated as Endangered by COSEWIC, mainly due to the decline in two different subpopulations in Quebec and Labrador (COSEWIC 2017). The Barren-ground caribou population was designated as Threatened by COSEWIC in 2016, as many of its subpopulations are in decline, including the Qamanirjuaq (COSEWIC 2016). Neither population is currently protected under the federal *Species at Risk Act* or *The Endangered Species and Ecosystems Act* of Manitoba.

A small number of caribou occupy the Keeyask region in spring and summer (herein referred to as summer resident caribou). These caribou are known to calve on the islands in Gull and Stephens lakes and in peatland complexes composed of treed islands – raised areas of mainland

habitat – surrounded by expansive, treeless wetlands. These islands in lakes and in peatland complexes (collectively referred to as calving habitat hereafter) are provided a physical barrier by the surrounding habitat and offer some protection from predators such as gray wolf (*Canis lupus)* and black bear (*Ursus americanus*). Summer resident caribou move within and likely beyond the Keeyask region, but their herd association and the extent of their core range are uncertain. While these caribou remain in the Keeyask region to calve, it is unclear whether the same individuals calve in the area in consecutive years. Genetic analysis of fecal samples collected in the region during construction monitoring showed that at least one female occupied islands in Stephens Lake over two consecutive summers (Wildlife Resource Consulting Services MB Inc. [WRCS] 2018a); however, it is unknown if she calved.

The Project may affect the distribution of caribou and their use of calving habitat due to habitat loss and alteration, sensory disturbance, and changes in the predator community. Predicted Project effects on caribou included the loss or alteration of winter and calving habitat and a reduction in habitat intactness (i.e., the degree to which habitat remains unaltered by fire and human disturbances) in the Keeyask region.

In addition to the loss of physical habitat, a Project-related loss of effective habitat due to sensory disturbance was anticipated. Caribou are particularly vulnerable to sensory disturbance during the calving period. Reproduction could be reduced if calving habitat, which comprises a relatively small proportion of the Keeyask region, becomes limited. Noise generated by construction activity, blasting, and vehicle traffic may result in caribou temporarily avoiding otherwise suitable habitat near these disturbances. This loss of effective habitat for summer resident caribou is predicted to occur within 4 km of the Project construction site and within 2 km of the North and South access roads (KHLP 2012). Because caribou in the Keeyask region tend to calve solitarily and in low densities on the landscape, the presence of undisturbed calving habitat is critical for successful reproduction (Leclerc et al. 2014).

Habitat alteration may also affect the vulnerability of caribou cows and calves to gray wolves and black bears. Habitat alteration, including land clearing for trails and roads, may change or facilitate predator movements and can increase predation risk (James and Stuart-Smith 2000). Habitat alteration may also result in increased populations of alternative prey such as moose (*Alces alces*), which could increase the predator population, potentially affecting caribou mortality and reproduction (James et al. 2004; Peters et al. 2012).

As part of the TEMP, ground tracking transect and trail camera surveys were conducted to monitor changes in the distribution and relative abundance of caribou near the Project due to sensory disturbance or to changes in the predator community. The distribution and relative abundance of moose, black bear, and gray wolf were also documented to estimate the amount of alternative prey and predator activity in the region. The timing of ice breakup on Gull and Stephens lakes was monitored using trail cameras because of its potential to affect the use of islands in lakes by calving caribou.

2.0 METHODS

2.1 SURVEY METHODS

2.1.1 GROUND TRACKING TRANSECTS AND TRAIL CAMERAS

Ground tracking transect and trail camera surveys were conducted to gather information on the use of islands in lakes, peatland complexes, and habitat near the North and South access roads by caribou and three other large mammal species. Ground tracking surveys for construction phase monitoring began in 2015 and continued in 2017, 2018, and 2020. Trail camera surveys were conducted annually from 2015 to 2020. Moose were included in the surveys as they are a potential attractant for wolves, which could opportunistically prey on caribou. Black bears and gray wolves were included as they are common predators of adult caribou and calves and can influence their use of habitat. Islands in lakes and peatland complexes were surveyed as these habitats are known to support caribou during the sensitive calving and calf-rearing period. Habitat along the North and South access roads was also surveyed to determine the effects of traffic disturbance on caribou and other large mammals.

Transects on islands in lakes, in peatland complexes, and near the access roads were visited twice in 2020, from July 14 to 27 and from September 9 to 21. In previous survey years, the initial visit was in April, prior to cow arrival, to ensure that animals were not disturbed during calving. The second visit was in July, to coincide with the late calving and early calf-rearing period. The third visit was in September, to coincide with the mid to late calf-rearing period (Table 1). In 2020, there was no initial visit in April due to safety concerns and site restrictions related to COVID-19.

Table 1: Start and End Dates of Survey Visits to Tracking Transects, 2020

Transect Type	Visit 1			Visit 2		
	Start Date	End Date	No. Days	Start Date	End Date	No. Days
Island in lakes	July 15	July 27	12	Sept. 10	Sept. 19	9
Peatland complex	July 14	July 27	13	Sept. 9	Sept. 21	12
Access road	July 16	July 27	11	Sept. 9	Sept. 20	11

During the initial 2020 visit in July, biodegradable thread was strung approximately 75 cm above ground level and anchored to trees or shrubs roughly every 20 m (Searing 1981; Demarchi and Searing 1997). Thread was used to ensure that surveying consistently occurred along the same line and to increase sign detectability. Breaks in the thread helped identify animal movements. All signs visible up to 1 m on either side of the transect were recorded, including tracks, trails, droppings, beds, browse or feeding sites, and visual observations. The specific locations of sign were recorded using hand-held Global Positioning System (GPS) units.

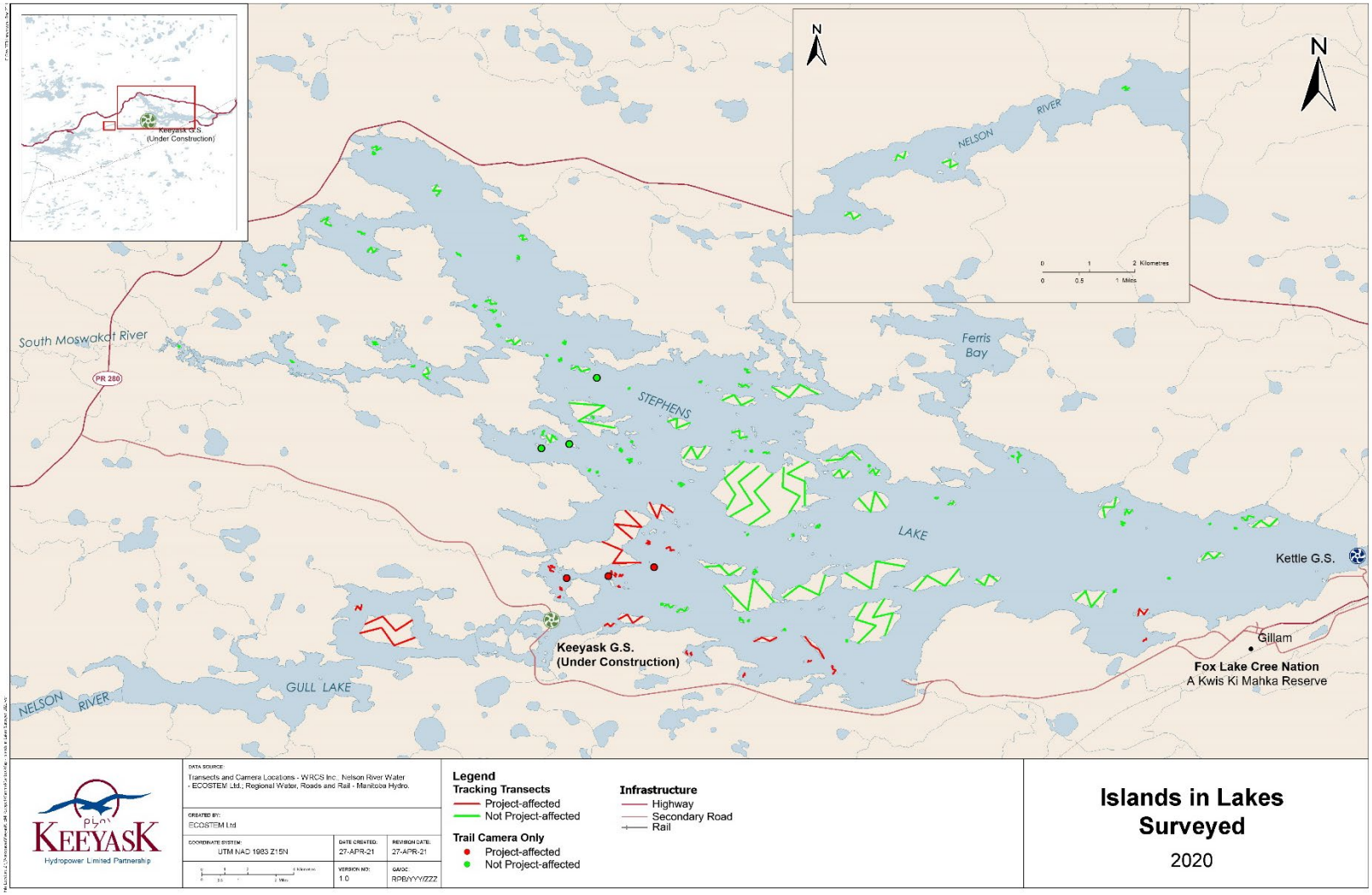
During the second 2020 visit in September, large mammal activity was identified at breaks in the thread along each transect, where possible. The locations of all thread breaks were recorded with a GPS unit. Signs such as tracks and scat were used to identify the species responsible for each thread break, where possible.

2.1.1.1 ISLANDS IN LAKES

For the tracking transect study, islands greater than 5 ha in size in Gull and Stephens lakes and upstream in the Nelson River with more than 5% tree cover were selected ("islands in lakes"). These islands were classified by their distance to Project-related disturbance, where those within 2 km of borrow areas or Project infrastructure or within 4 km of the generating station were designated as "Project-affected" and those beyond were designated as "unaffected" (KHLP 2015).

A total of 120 transects were surveyed on 111 islands in Stephens and Gull lakes in 2020, all of which were surveyed in previous years (Appendix 1, Table A-1). Twenty-four transects totalling 26.1 km in length were surveyed on 22 Project-affected islands and 98 transects totalling 101.1 km in length were surveyed on 91 unaffected islands. Transect length was proportional to island size. One transect was typically established on each island. However, six of the largest islands (>300 ha) were divided into 150-ha units, with one transect surveyed in each (Map 1). In general, "Z"-shaped transects were established across islands to maximize the detection of mammal signs (e.g., tracks and droppings).

A Reconyx™ PM35C31 trail camera was placed on all but five islands in early April 2020. All were on the same islands as in 2015, 2016, 2017, 2018, and/or 2019, the previous trail camera monitoring years for caribou (Appendix 1, Table A-2). Six cameras were placed at locations independent of transects. In all, 123 cameras were deployed on 112 islands, each where caribou activity would likely be detected (i.e., heavily used game trails, large openings). Batteries and memory cards were exchanged during the first visit to tracking transects in July, and the cameras were removed during the second visit in September. Photographs were reviewed following removal of memory cards and the species, number, and sex of photographed animals was determined, where possible.



Map 1: Islands in Lakes Surveyed in 2020

2.1.1.2 PEATLAND COMPLEXES

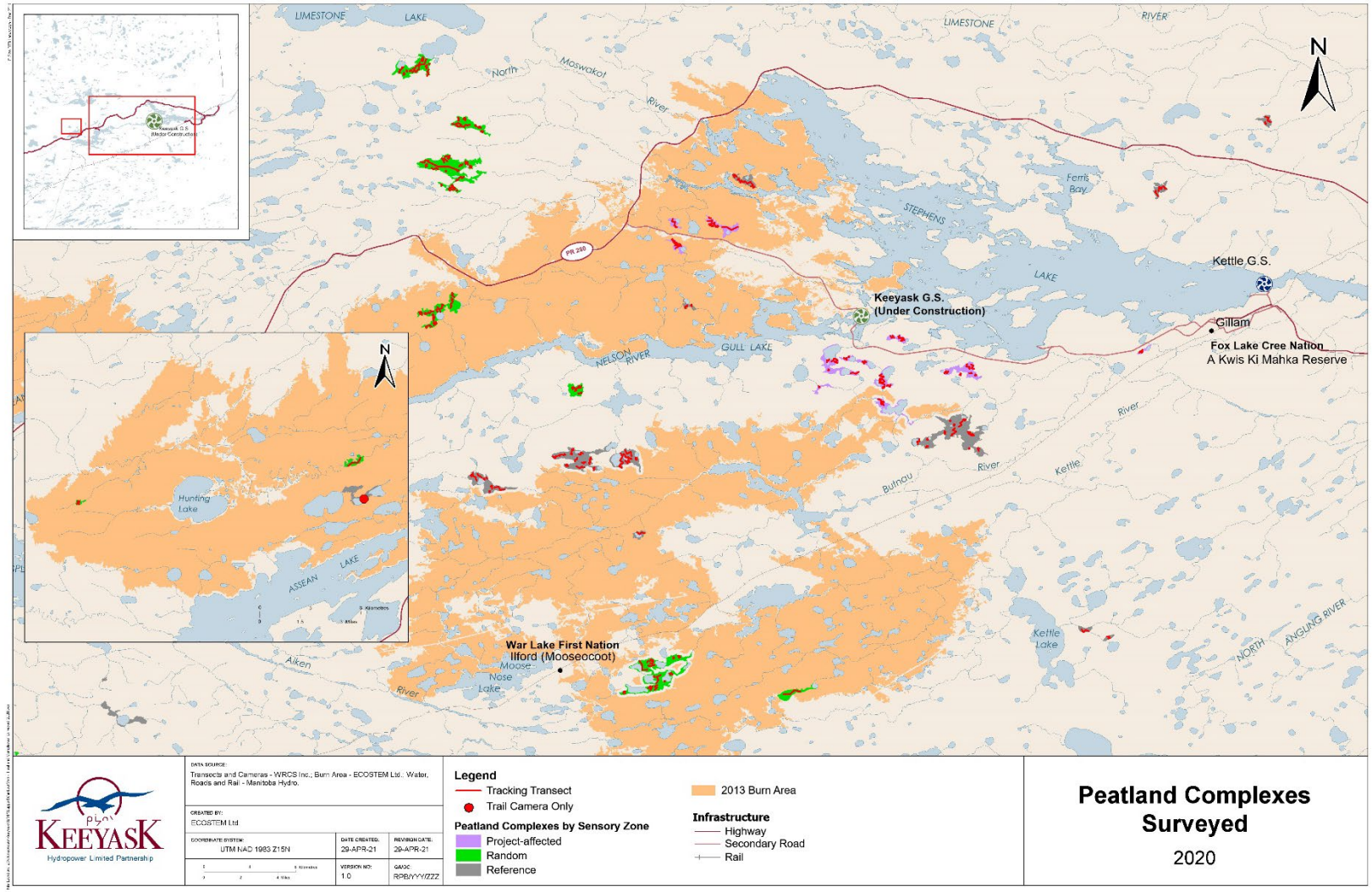
Peatland complex tracking transects were established on raised mainland habitat "islands" within a wet bog matrix. Peatland complexes were selected and categorized based on their distance to a disturbance source. Project-affected peatland complexes were within 4 km of the generating station or within 2 km of the North or South access roads, and where disturbance was generated only from these features. For each Project-affected peatland complex, a reference peatland complex similar in size and with comparable habitat characteristics but not affected by sensory disturbance (i.e., more than 4 km from the generating station and more than 2 km from the access roads) was selected. Random peatland complexes were selected randomly from undisturbed areas to act as a reference for natural variability. The state of Project-affected, reference, and random peatland complexes relative to the forest fires in 2013 (burned or unburned) was also identified.

Like the islands in lakes, tracking transects in peatland complexes were "Z" shaped and varied in length depending on habitat island size. One hundred and eighty-seven transects were surveyed in 31 peatland complexes, totalling 109.2 km in length (Table 2, Map 2). The number of transects in each peatland complex ranged from 1 to 20, and the total length of transects in complexes ranged from 145 m to 3.0 km. All transects had been surveyed in 2015, 2017 and 2018 (Appendix 1, Table A-3).

A Reconyx™ PM35C31 trail camera was placed on one transect within each peatland complex in early April 2020, all at locations surveyed in previous years (Appendix 1, Table A-4). A single trail camera was placed in a peatland complex that was not surveyed by tracking transect (Map 2). In all, 32 trail cameras were deployed where caribou activity would likely be detected (i.e., heavily used game trails, large openings). Batteries and memory cards were exchanged during the first visit to tracking transects in July, and the cameras were removed during the second visit in September. Photographs were reviewed following removal of memory cards and the species, number, and sex of photographed animals was determined, where possible.

Table 2: Peatland Complex Transects Surveyed in 2020

Complex Type	Number of Complexes	Number of Transects	Length of Transects (km)
Project-affected, burned in 2013	3	15	9.2
Project-affected, not burned in 2013	8	27	15.9
Reference, burned in 2013	3	9	5.5
Reference, not burned in 2013	8	52	29.5
Random, burned in 2013	4	20	12.4
Random, not burned in 2013	5	64	36.7
Total	31	188	109.2



Map 2: Peatland Complexes Surveyed in 2020

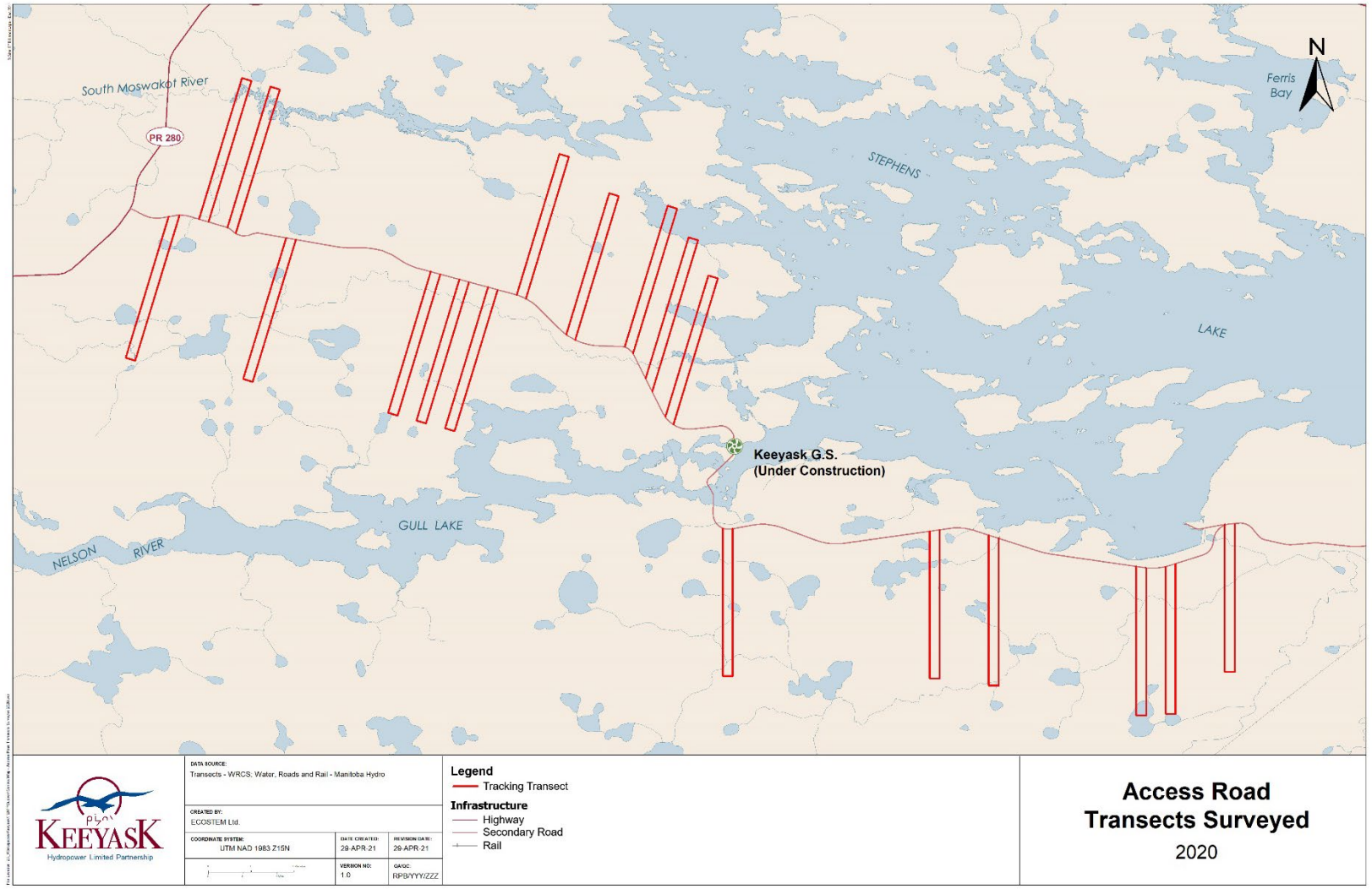
2.1.1.3 ACCESS ROAD TRANSECTS

Access road tracking transects were placed at random locations along the North and South access roads. These "U" shaped transects were perpendicular to the North and South access roads. Transects were developed to be 10.3 km long, consisting of two 5-km long portions separated by 333 m. Actual transect lengths varied due to terrain and obstacles such as water bodies or construction zones (Table 3).

Eighteen access road transects were surveyed, all of which were also surveyed in 2015, 2017, and 2018. Seven transects totalling 68.2 km in length were north of the North Access Road, five totalling 45.1 km were south of the North Access Road, and six totalling 56.1 km were south of the South Access Road (Map 3). Of the 169.4 km surveyed, 68.5 km were within 2 km of an access road, where effects of sensory disturbance on caribou were anticipated, and 100.9 km were beyond 2 km, where no sensory disturbance effects were expected.

Table 3: Access Road Transects Surveyed in 2020

North Access Road		South Access Road	
Transect	**Length (km)**	**Transect**	**Length (km)**
N23	10.7	S1	7.6
N24	10.1	S10	9.6
N34	10.7	S15	9.0
N36	12.3	S16	10.6
N38	9.6	S18	8.8
N39	6.2	S8	10.5
N40	8.6		
S42	7.3		
S46	10.0		
S51	8.7		
S52	10.8		
S53	8.3		



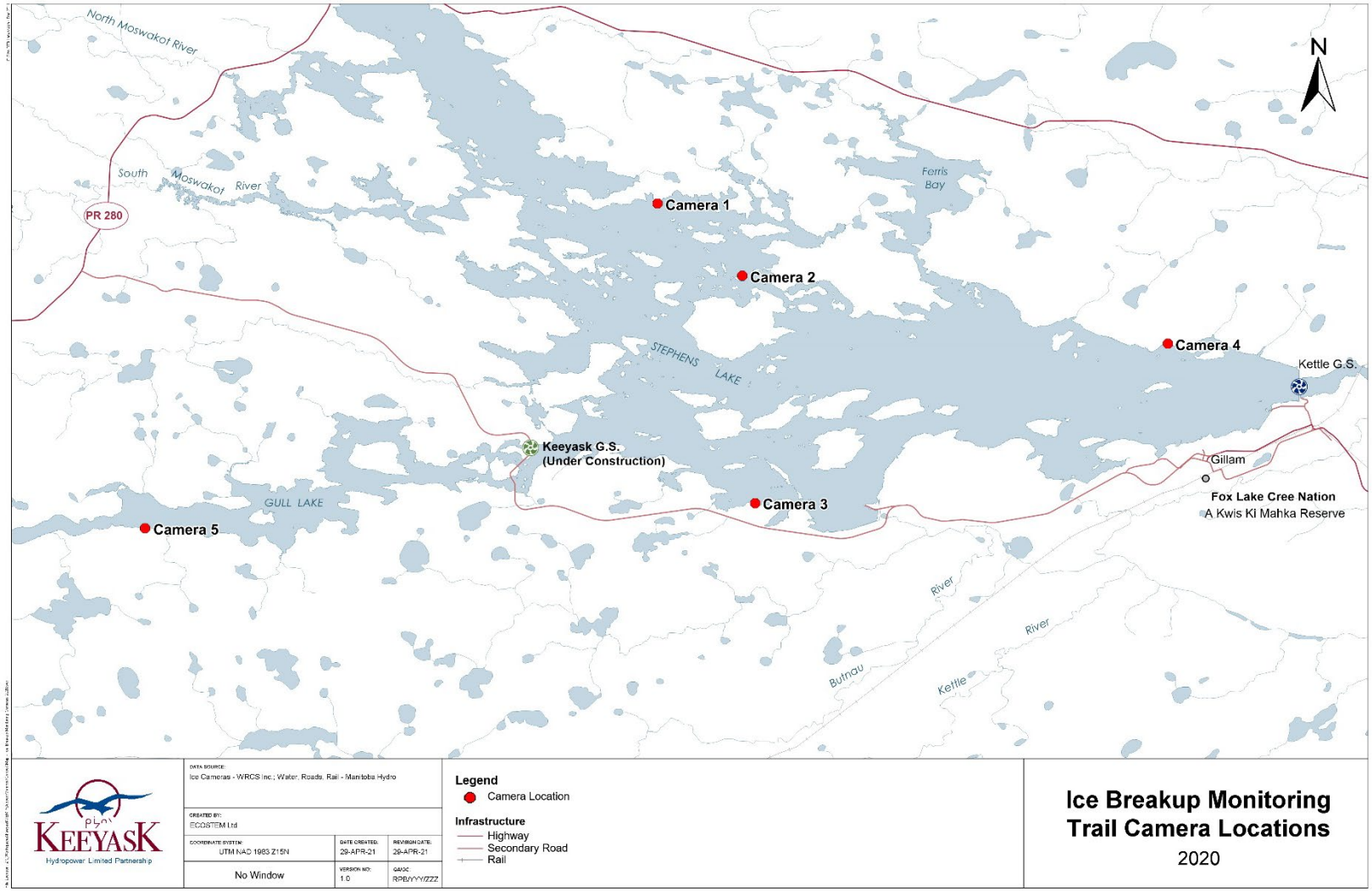
Map 3: Access Road Tracking Transects Surveyed in 2020

2.1.2 TIMING OF ICE BREAKUP

Four trail cameras were placed on the shores of Stephens Lake and one was placed on the shore of Gull Lake between March 25 and 29, 2020 to monitor the timing of ice breakup (Map 4). The trail cameras, which were set to take a picture of the lake every four hours during daylight hours, were removed between July 14 and 24, 2020. Ice coverage was estimated at 25% increments in each photograph from each camera. Ice breakup was defined as the date when all cameras indicated less than 25% ice coverage in view.

2.1.3 RESERVOIR IMPOUNDMENT MONITORING

Pre-impoundment surveys for caribou were conducted on August 25, 26, 27, and 31, 2020. Impoundment of the reservoir started in the evening on August 31, 2020. Impoundment monitoring began on September 1, 2020 and continued to September 4. Aerial surveys were conducted by helicopter over Caribou Island. Transects spaced 200 m apart were flown at 60 m above ground level. All observations of caribou and other large mammals (e.g., moose, black bear) were recorded.



Map 4: Trail Camera Locations to Monitor Ice Breakup on Gull and Stephens Lakes, 2020

2.2 DATA ANALYSIS

Ground tracking transect and trail camera data were summarized separately and then combined for a broader indication of large mammal distribution on islands in lakes and in peatland complexes in the study area. In previous survey years, only tracking data from the second and third visits in July and September were included in the combined data because signs observed during the first visit were of varying ages (dependent on time since last snowfall) and because the first visit was prior to the caribou calving season. In 2020, fresh signs observed during the first visit in July and the second visit in September were included in the combined data for relative consistency with previous years.

Using the combined tracking transect and trail camera data, the presence and general distribution of caribou, caribou calves, moose, and moose calves were examined for each island and peatland complex. A total of 117 islands in lakes and 32 peatland complexes were surveyed. Large mammals were considered present on an island or in a peatland complex where their sign was observed on one or more tracking transects and/or where they were photographed by at least one trail camera. Combined tracking transect and trail camera data were also used to identify islands in lakes and peatland complexes occupied by caribou and by moose and/or predators during the survey period, as the presence of moose, black bears, or gray wolves on islands or in peatland complexes occupied by caribou can provide an indication of the influence of predators and alternative prey (moose) on the selection of calving and calf-rearing habitat by caribou.

For access road tracking transects, sign density (signs/km) was calculated using the distance surveyed during the initial visit in July to describe large mammal activity. The activity of caribou and other large mammals within 2 km of the North and South access roads and subject to sensory disturbance (Project-affected) was compared with activity in areas further away and not subject to sensory disturbance (unaffected; KHLP 2015).

3.0 RESULTS

3.1 GROUND TRACKING TRANSECTS AND TRAIL CAMERAS

3.1.1 ISLANDS IN LAKES

Caribou signs were observed on 58 of the 111 islands on which ground tracking transects were surveyed (Table 4; Appendix 1, Table A-5). Moose were marginally more widely distributed. All caribou and moose calf signs were recorded on islands where adult signs were also found. Black bear and gray wolf signs were observed on fewer islands than either caribou or moose.

Table 4: Number of Islands in Lakes on Which Large Mammal Signs Were Observed, 2020

Species	Visit 1 (July 15–27)	Visit 2 (Sept. 10–19)	Visits 1 & 2
Caribou	44	36	58
Caribou calf	3	5	7
Moose	51	29	63
Moose calf	13	7	20
Black bear	3	3	6
Gray wolf	1	0	1

Caribou were photographed on 33 islands. The first caribou calf was photographed on June 18, 2020 (see Photo 1 for a caribou and calf). In previous survey years caribou calves were first photographed on May 25, 2015; June 19, 2016; June 6, 2017; May 21, 2018; and June 20, 2019. Moose were photographed on 18 islands. The first moose calf (see Photo 2 for a moose cow and calf) was photographed on June 13, 2020. In previous survey years moose calves were first photographed on June 3, 2015; May 29, 2016; May 31, 2017; June 12, 2018; and June 9, 2019.

The number of islands occupied by caribou and moose appeared to peak in June and June/July, respectively, and then declined in September (Table 5). Few predators (black bear and gray wolf) were captured on trail cameras. No caribou were photographed on the same islands as black bears or gray wolves. There was one instance where moose, black bear (see Photo 3 for a black bear), and gray wolf (Photo 4) were all photographed on the same island (KI124162). The bear and wolf were both photographed on May 31, 2020 and the moose was photographed September 10, 2020, 102 days later. Moose and predators were not photographed on any other of the same islands.

Table 5: Number of Islands in Lakes Occupied by Large Mammals Monthly from Trail Camera Data, 2020

Species	April	May	June	July	August	September	All
Caribou	1	2	18	13	16	9	33
Caribou calf	0	0	1	4	1	0	5
Moose	0	0	8	8	6	2	18
Moose calf	0	0	3	5	3	0	9
Black bear	0	1	2	0	1	1	5
Gray wolf	0	1	0	0	0	0	1

Photo 1: Caribou Cow and Calf on an Island in Stephens Lake on July 2, 2020

Photo 2: Moose Cow and Calf on an Island in Stephens Lake on August 18, 2020

Photo 3: Black Bear on an Island in Stephens Lake on August 21, 2020

Photo 4: Gray Wolf on an Island in Stephens Lake on May 31, 2020

When results from tracking transect and trail camera surveys were combined, large mammal activity was detected on 89 of the 117 islands surveyed in 2020. Caribou and moose occupied 48 of the same islands, 7 of which were also occupied by black bear or gray wolf (Map 5). Eighteen islands were occupied by only caribou and 18 islands were occupied only by moose.

Caribou activity was widely distributed on the islands in Stephens Lake and upstream of the Keeyask site (Map 6). Caribou occupied 56% of the islands surveyed in 2020 (Table 6). Caribou occupied a smaller percentage of Project-affected than unaffected islands and no calves were detected on Project-affected islands. Moose were also observed on a greater percentage of unaffected islands than Project-affected islands. Moose calves were observed on a somewhat greater percentage of unaffected than Project-affected islands (Map 7). Black bear and gray wolf activity was observed on few islands relative to caribou and moose (Table 6; Map 8).

Table 6: Project-affected and Unaffected Islands Occupied by Large Mammals from Combined Tracking Transect and Trail Camera Data, 2020

Species	Project-affected Islands		Unaffected Islands		All Islands	
	Number Occupied	Percentage Occupied	Number Occupied	Percentage Occupied	Number Occupied	Percentage Occupied
Caribou	9	38	57	61	66	56
Caribou calf	0	0	9	10	9	8
Moose	11	46	57	61	68	58
Moose calf	5	21	22	24	27	23
Black bear	3	13	8	9	11	9
Gray wolf	1	4	1	1	2	2

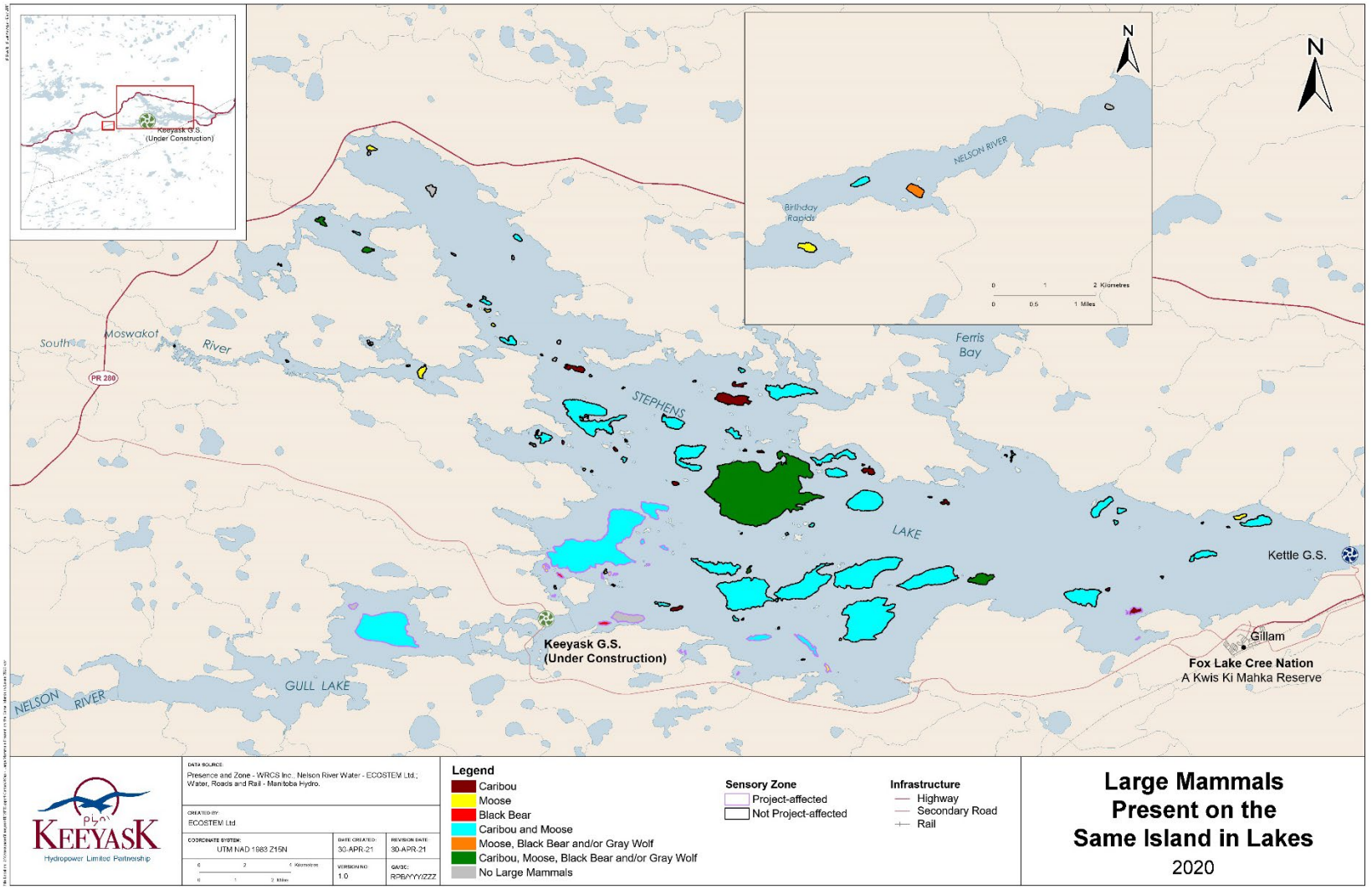
Tracking transect and trail camera surveys were conducted in 2015, 2017, 2018, and 2020, during Project construction. When tracking transect data from July and September and all trail camera data were combined, the percentage of Project-affected islands on which caribou were detected ranged from 28% in 2015 to 65% in 2017 and declined 5% from 2018 to 2020 (Table 7). The percentage of unaffected islands on which caribou were detected ranged from 58% in 2018 to 70% in 2017 and increased 5% from 2018 to 2020. Caribou calves were detected on a smaller percentage of Project-affected than unaffected islands in all four survey years; no calves were detected on Project-affected islands after 2017 in years when tracking transect and trail camera surveys were both conducted.

The percentage of Project-affected islands on which moose were observed was similar but declining in 2015, 2017, and 2018 and then declined 39% in 2020 (Table 7). The percentage of unaffected islands on which moose were observed declined over the entire survey period. Moose calves were detected on 5% more Project-affected islands in 2020 than in 2018. There was an 8% decrease in the percentage of unaffected islands on which moose calves were detected over the same period.

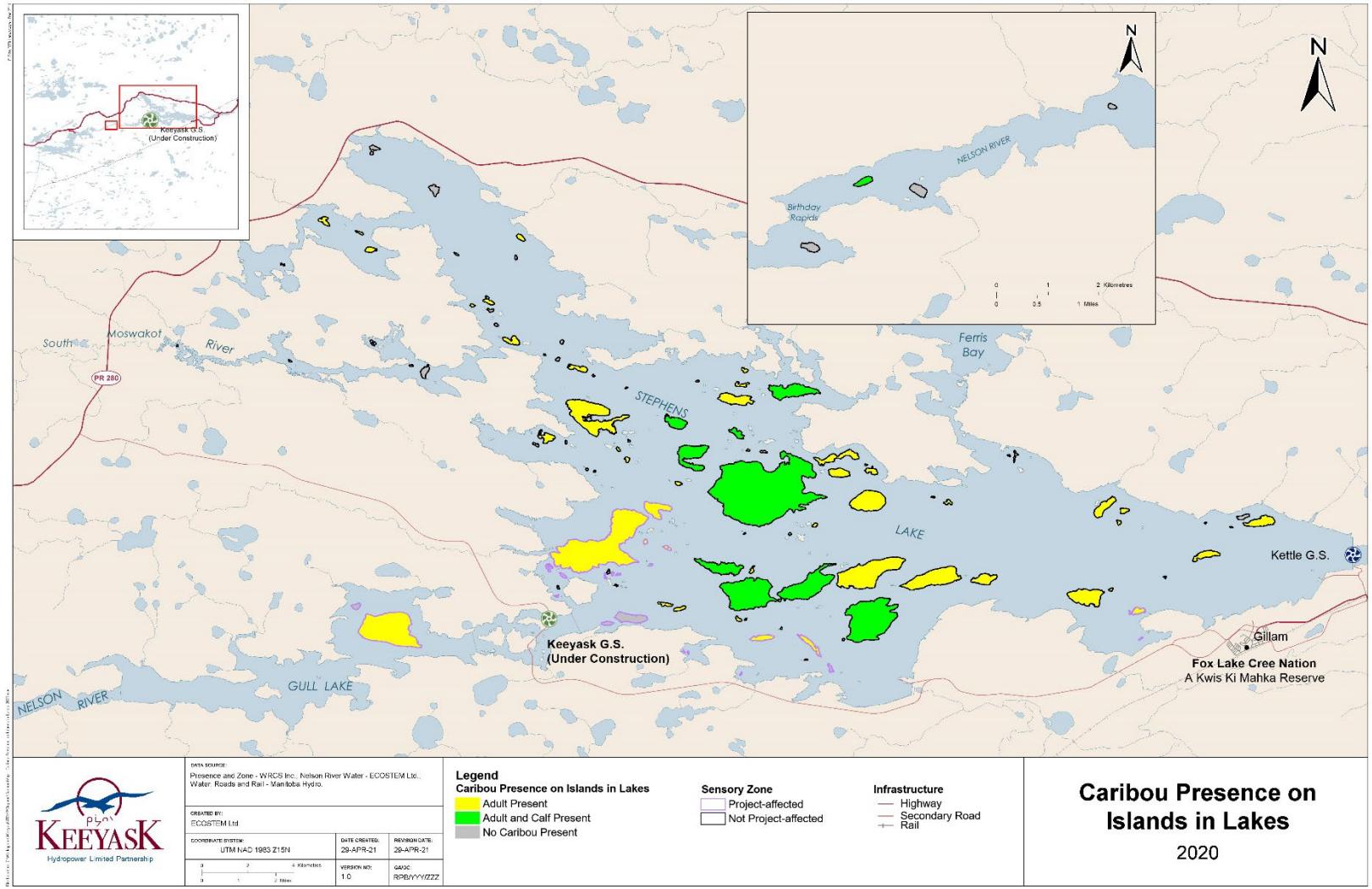
Table 7: Percentage of Project-affected and Unaffected Islands in Lakes on Which Caribou and Moose Presence Was Detected during Ground Tracking[1] and/or Trail Camera Surveys, 2015, 2017, 2018, and 2020

Species	Project-affected					Unaffected				
	2015	2017	2018	2020	% Change 2018–2020	2015	2017	2018	2020	% Change 2018–2020
Caribou	28	65	40	38	-5	67	70	58	61	+5
Caribou calf	7	8	0	0	0	19	25	11	10	-9
Moose	79	77	76	46	-39	91	72	66	61	-8
Moose calf	31	39	20	21	+5	41	22	26	24	-8

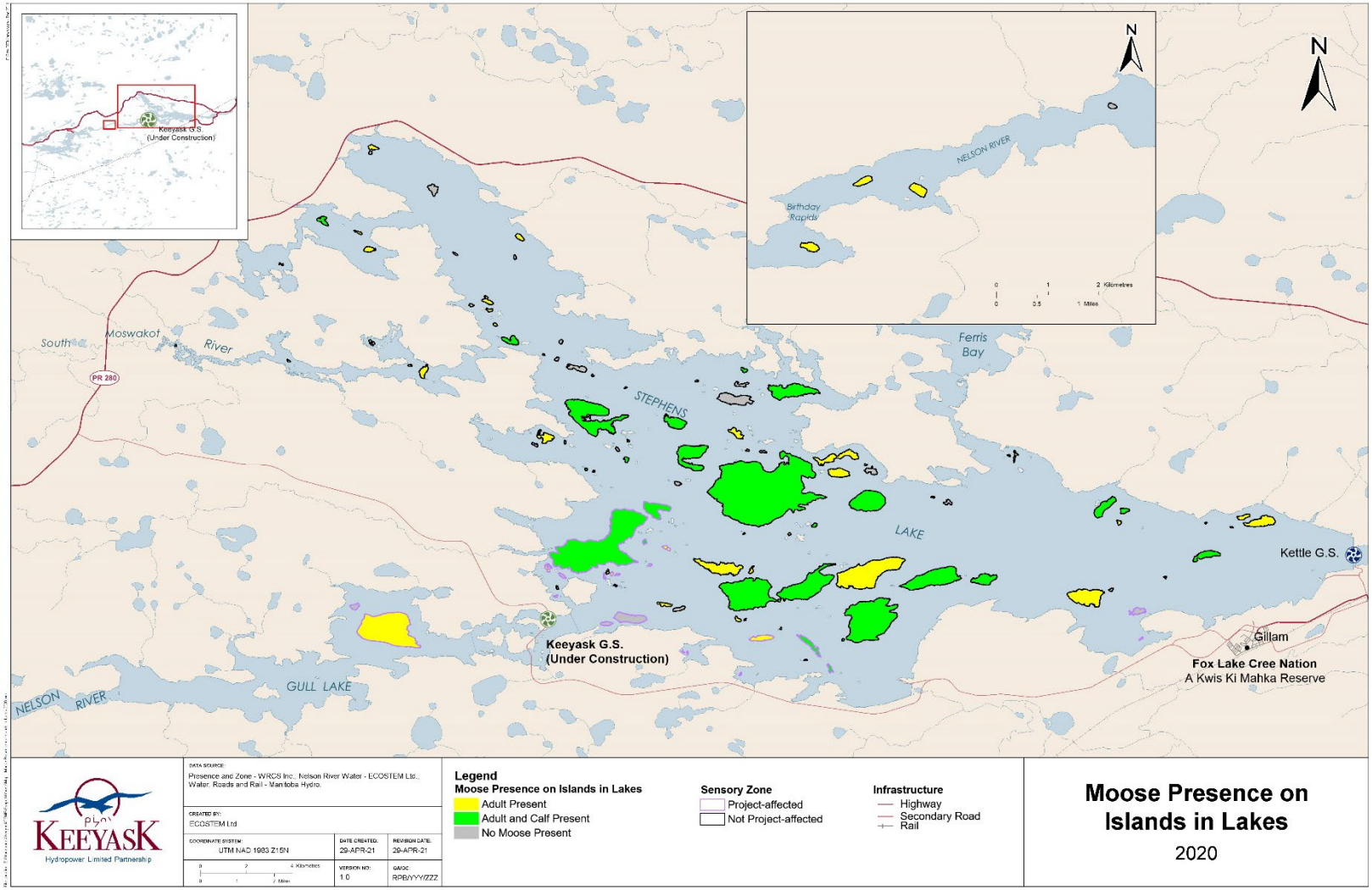
1. July and September only.



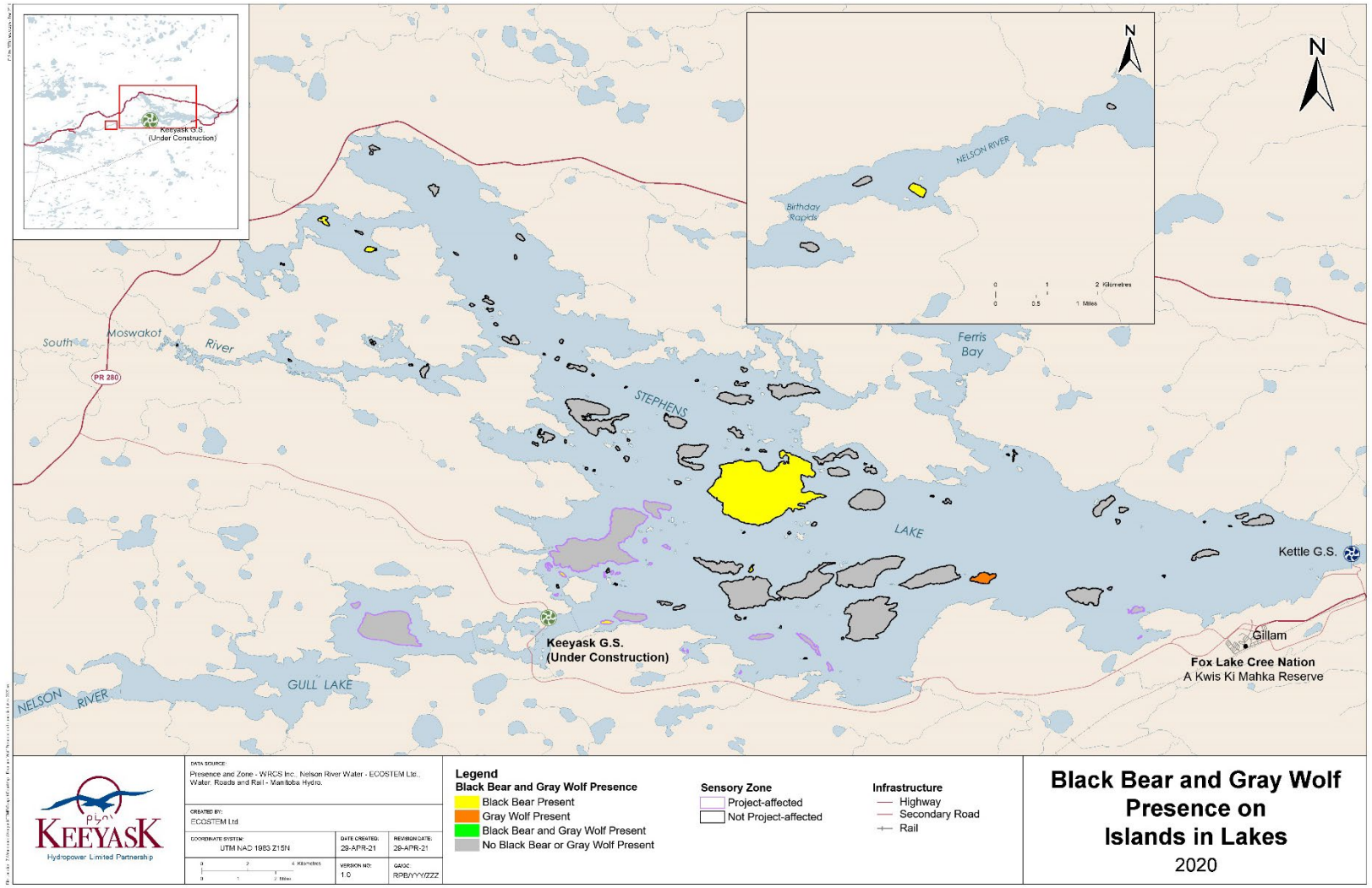
Map 5: Large Mammals Present on the Same Island in Lakes, 2020



Map 6: Caribou Presence on Islands in Lakes, 2020

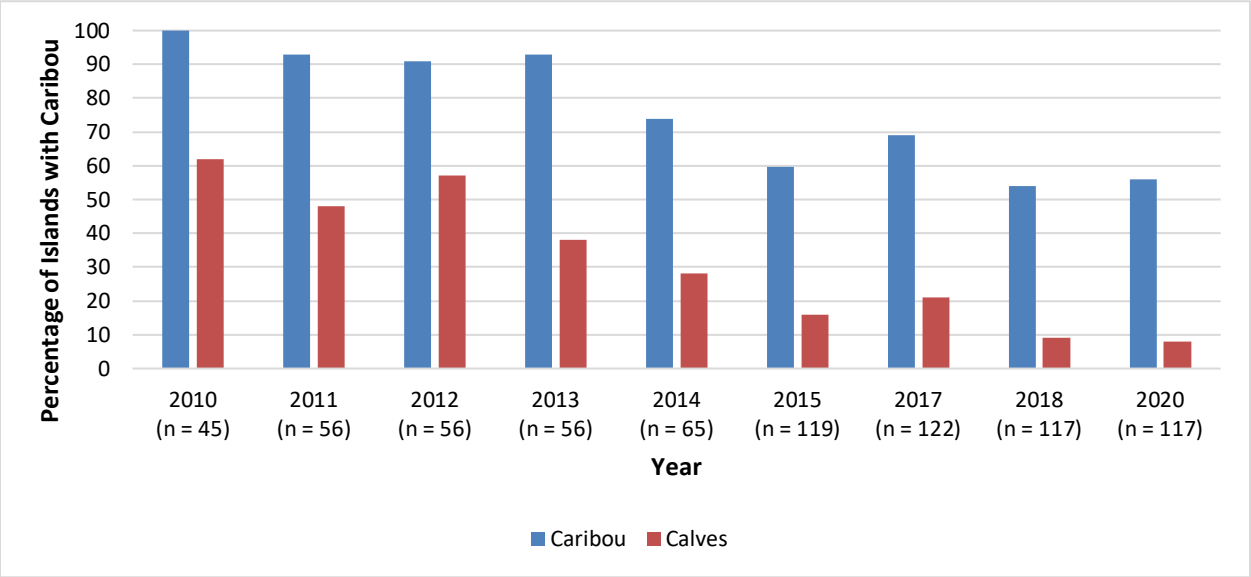


Map 7: Moose Presence on Islands in Lakes, 2020



Map 8: Black Bear and Gray Wolf Presence on Islands in Lakes, 2020

The percentage of islands in lakes on which caribou and calves were observed (from combined trail camera and ground tracking data in July and September) declined from the pre-construction (2010–2014) to construction (2015–2020) periods (Figure 1). Before construction, the percentage of surveyed islands in lakes on which they were detected decreased from 100% in 2010 to 74% in 2014 for caribou and from 62% in 2010 to 28% in 2014 for calves (KHLP 2012; WRCS unpubl. data). The declining trend continued during construction in 2015, when caribou were detected on 60% of islands and calves on 16% (WRCS 2016). The percentage of islands on which caribou and calf activity was observed increased to 69% for caribou and 21% for calves in 2017 (WRCS 2018b), then declined again in 2018 and 2019, to just over 50% for caribou and just under 10% for calves. While there was a small increase in the percentage of islands with caribou and calf activity in 2020 (to 56% and 8%, respectively), there was an overall decrease from 2015.

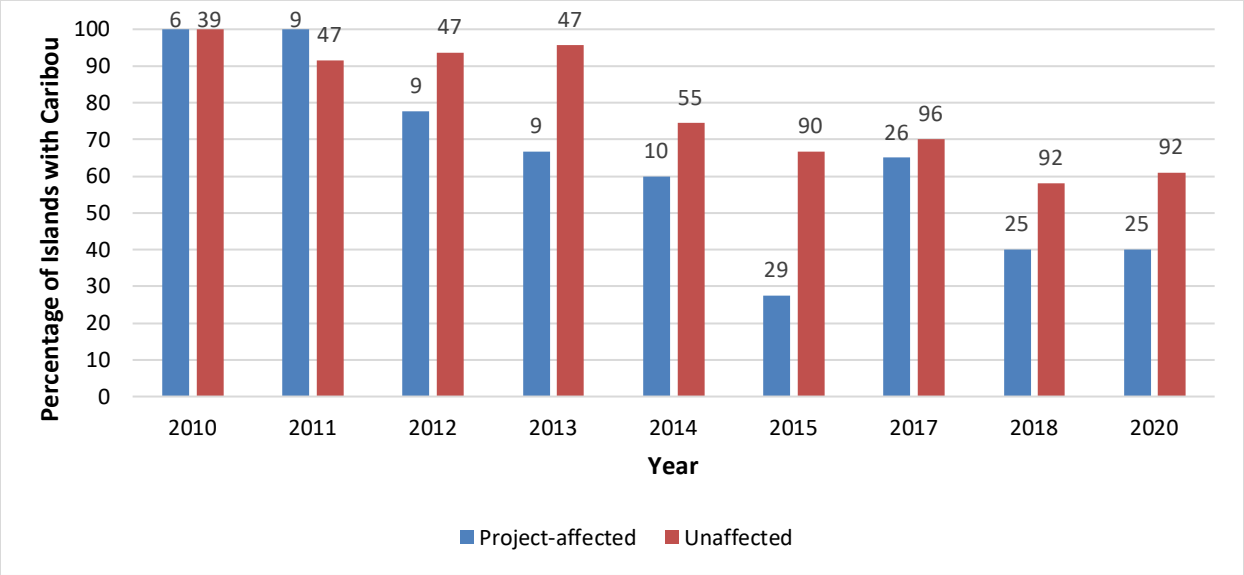


NOTE: "n" indicates the number of islands surveyed each study year.

Figure 1: Percentage of Islands in Lakes on Which Caribou Activity Was Observed from Combined Trail Camera and Tracking Transect Data, before (2010–2014) and during (2015–2020) Construction

During the 2010–2014 pre-construction period, 6 to 10 Project-affected and 39 to 55 unaffected islands were surveyed, most of which were also surveyed from 2015 to 2018. The percentage of Project-affected islands on which caribou activity was detected declined steadily before construction began, from 100% in 2010 and 2011 to 60% in 2014 (Figure 2). During construction, caribou activity continued to decline on Project-affected islands in 2015 and then increased in 2017. On unaffected islands, caribou activity was similar to or greater than activity on Project-affected islands during the pre-construction and construction periods. A decline in caribou activity from the pre-construction to construction periods was also observed on unaffected islands but was less pronounced than the decline on Project-affected islands. Before construction, caribou activity was detected on 93 to 100% of unaffected islands from 2010 to 2013, and on a somewhat

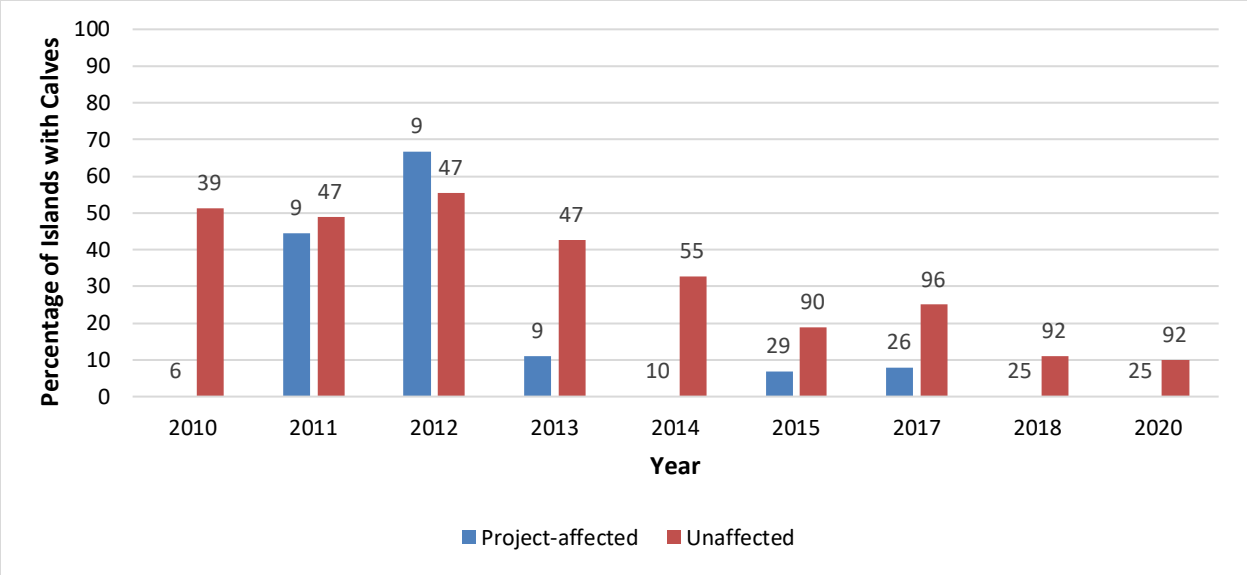
smaller percentage (75%) in 2014. During construction, caribou activity was observed on 58 to 70% of unaffected islands.



NOTE: Data labels indicate the number of Project-affected and unaffected islands surveyed each study year.

Figure 2: Percentage of Project-affected and Unaffected Islands on Which Caribou Activity Was Observed from Combined Trail Camera and Tracking Transect Data, before (2010–2014) and during (2015–2020) Construction

Caribou calves were detected on a greater percentage of unaffected than Project-affected islands in all years before and during construction except for 2012 (Figure 3). No calves were observed on Project-affected islands in 2010, 2014, 2018, or 2020. The percentage of Project-affected and unaffected islands on which calves were detected declined from the pre-construction to construction periods.



NOTE: Data labels indicate the number of Project-affected and unaffected islands surveyed each study year.

Figure 3: Percentage of Project-affected and Unaffected Islands on Which Caribou Calf Activity Was Observed from Combined Trail Camera and Tracking Transect Data, before (2010–2014) and during (2015–2020) Construction

3.1.2 PEATLAND COMPLEXES

Caribou signs were observed in 17 of the 31 peatland complexes in which ground tracking transects were surveyed (Appendix 1, Table A-6). Moose were more widely distributed (Table 8). Gray wolf and black bear signs were observed in fewer complexes than either caribou or moose.

Table 8: Number of Peatland Complexes Occupied by Large Mammals from Tracking Transect Data, 2020

Species	Visit 1 (July 14–27)	Visit 2 (Sept. 9–21)	Visits 1 & 2
Caribou	15	9	17
Caribou calf	5	1	6
Moose	29	23	30
Moose calf	7	0	7
Black bear	4	2	5
Gray wolf	4	2	5

Large mammals were photographed in 16 of the 32 peatland complexes in which trail cameras were placed. No gray wolves were observed. Caribou were photographed in seven complexes and moose (Photo 5) and black bears (Photo 6) were each photographed in six (Table 9). One caribou calf was photographed in a peatland complex, with a radio-collared cow (Photo 7), on June 28, 2020. A radio-collared cow with a calf was also photographed in 2016, 2017, and 2018. One moose calf was photographed. No caribou were photographed in the same complex as

predators. Moose were photographed in two complexes with black bear, 9 and 55 days apart (Table 10).

Table 9: Number of Peatland Complexes Occupied Monthly by Large Mammals from Trail Camera Data, 2020

Species	April	May	June	July	August	September	All
Caribou	2	2	3	2	3	0	7
Caribou calf	0	0	1	0	0	0	1
Moose	2	2	1	1	1	1	6
Moose calf	0	1	0	0	0	0	1
Black bear	0	3	3	0	0	0	6

Table 10: Nearest Dates on Which Caribou or Moose and Predators Were Photographed in the Same Peatland Complex, 2020

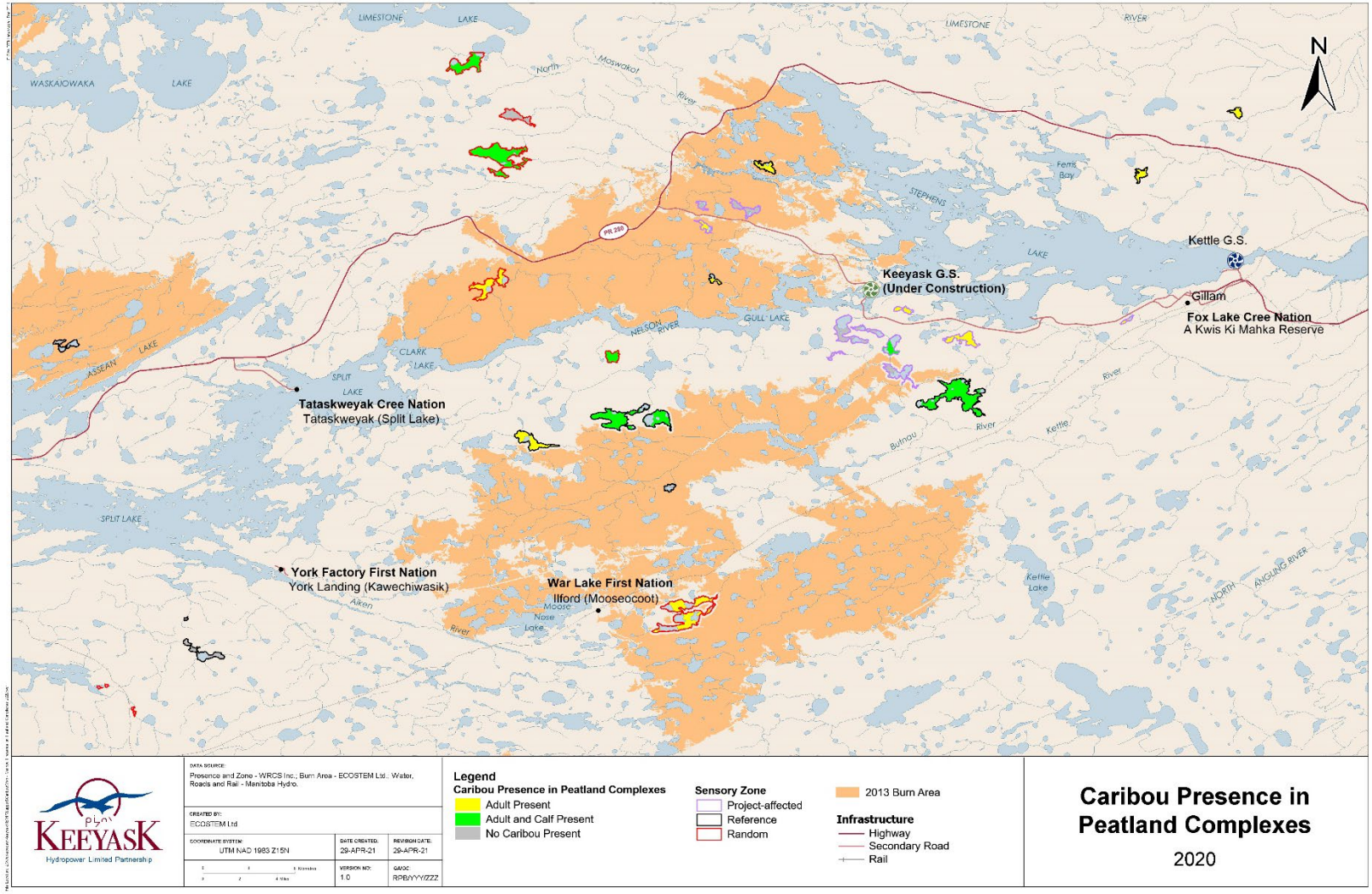
Complex	Caribou	Moose	Black Bear
KV022000	-	April 6	May 31
KV116000	-	May 18	May 27

Photo 5: Bull Moose in a Peatland Complex on August 4, 2020

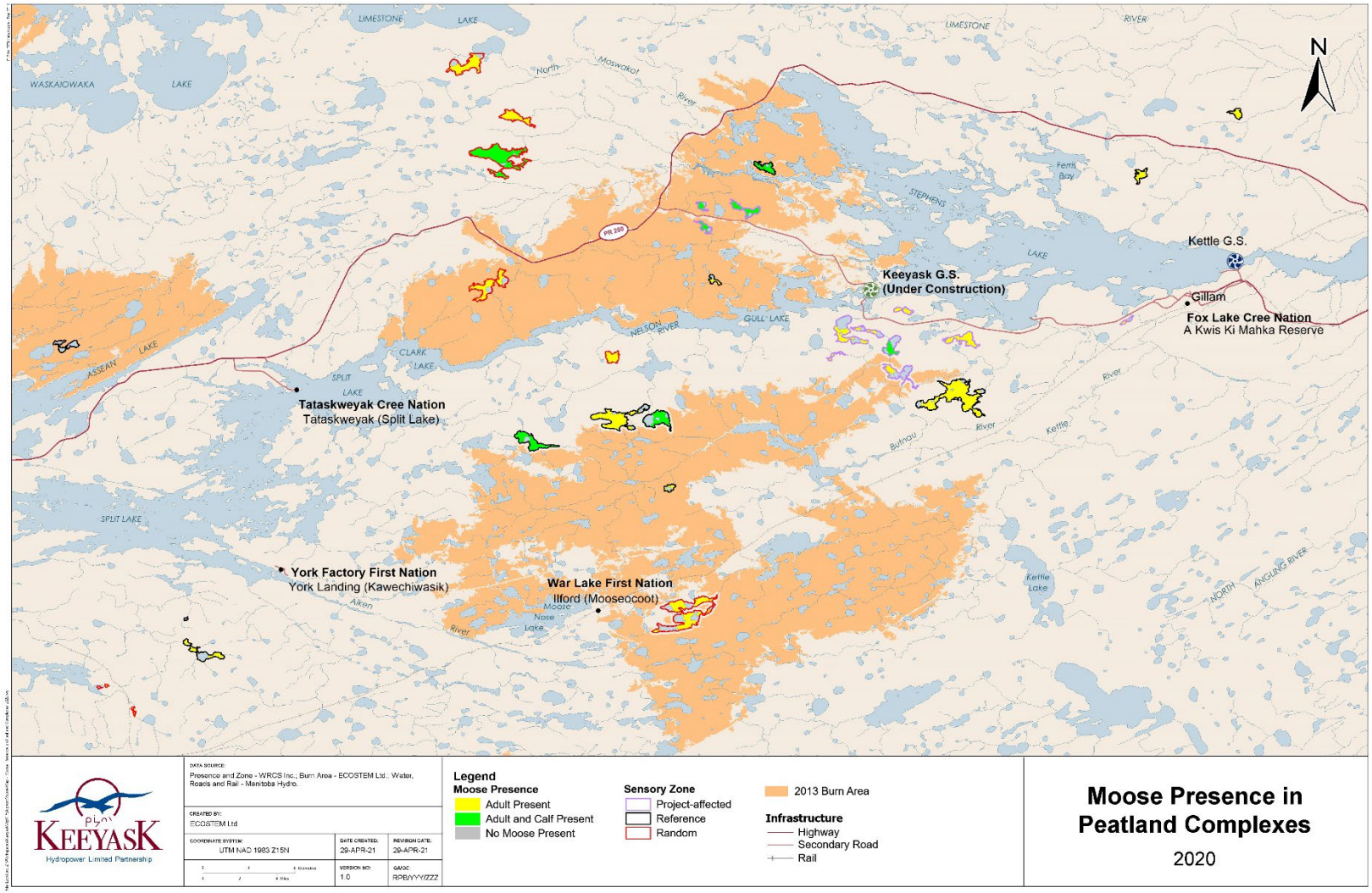
Photo 6: Black Bear in a Peatland Complex on August 4, 2020

Photo 7: Radio-collared Caribou Cow with Calf in a Peatland Complex on June 6, 2020

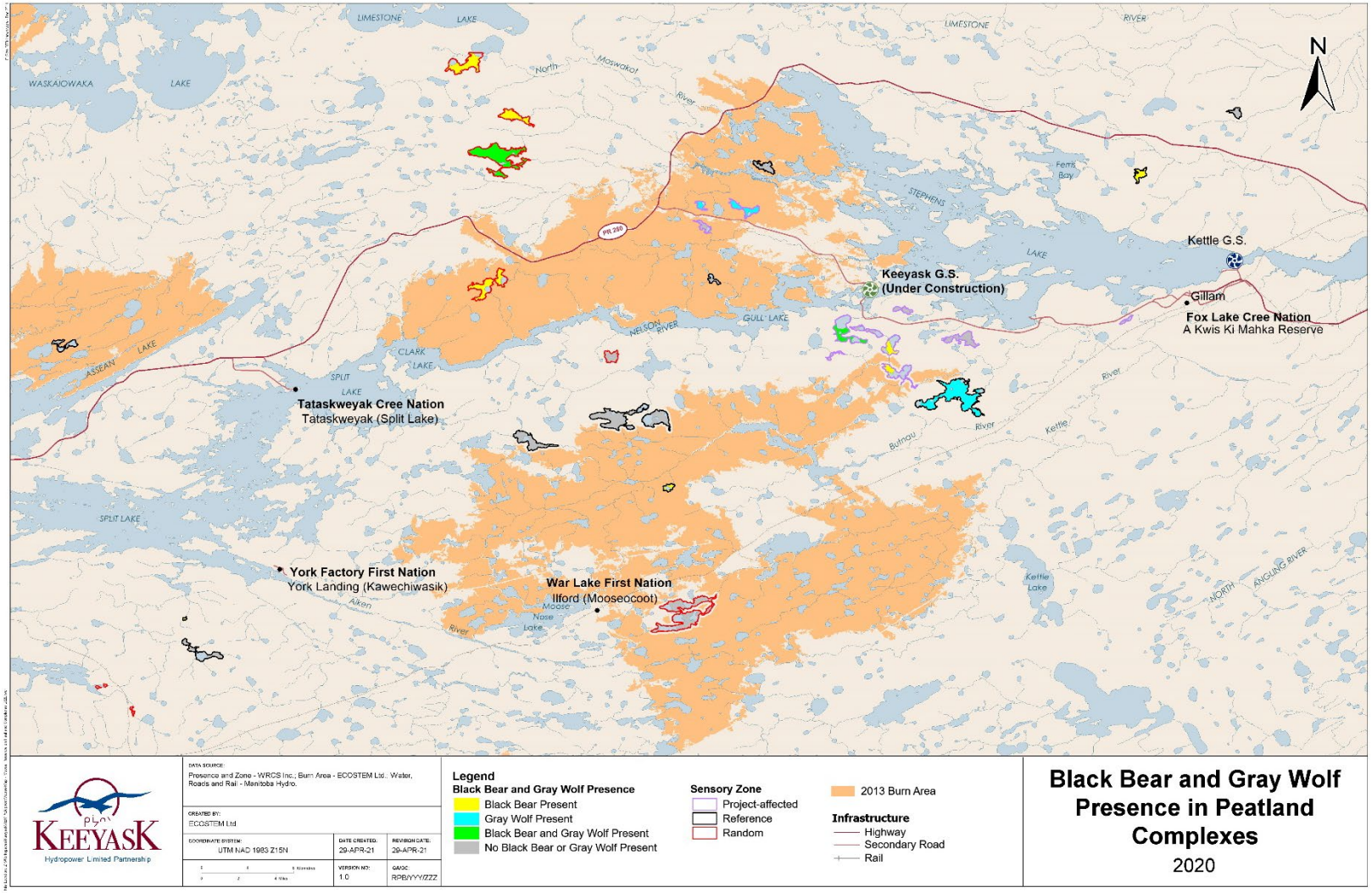
When results from tracking transect and trail camera surveys were combined, large mammal activity was detected in 31 of the 32 peatland complexes surveyed in 2020. Caribou activity was widely distributed in peatland complexes (Map 9). All 18 complexes occupied by caribou were also occupied by moose, which were detected in a total of 30 complexes (Map 10). Gray wolves and/or black bears (Map 11) were detected in six of the complexes occupied by both caribou and moose and in six of the complexes occupied only by moose (Map 12).



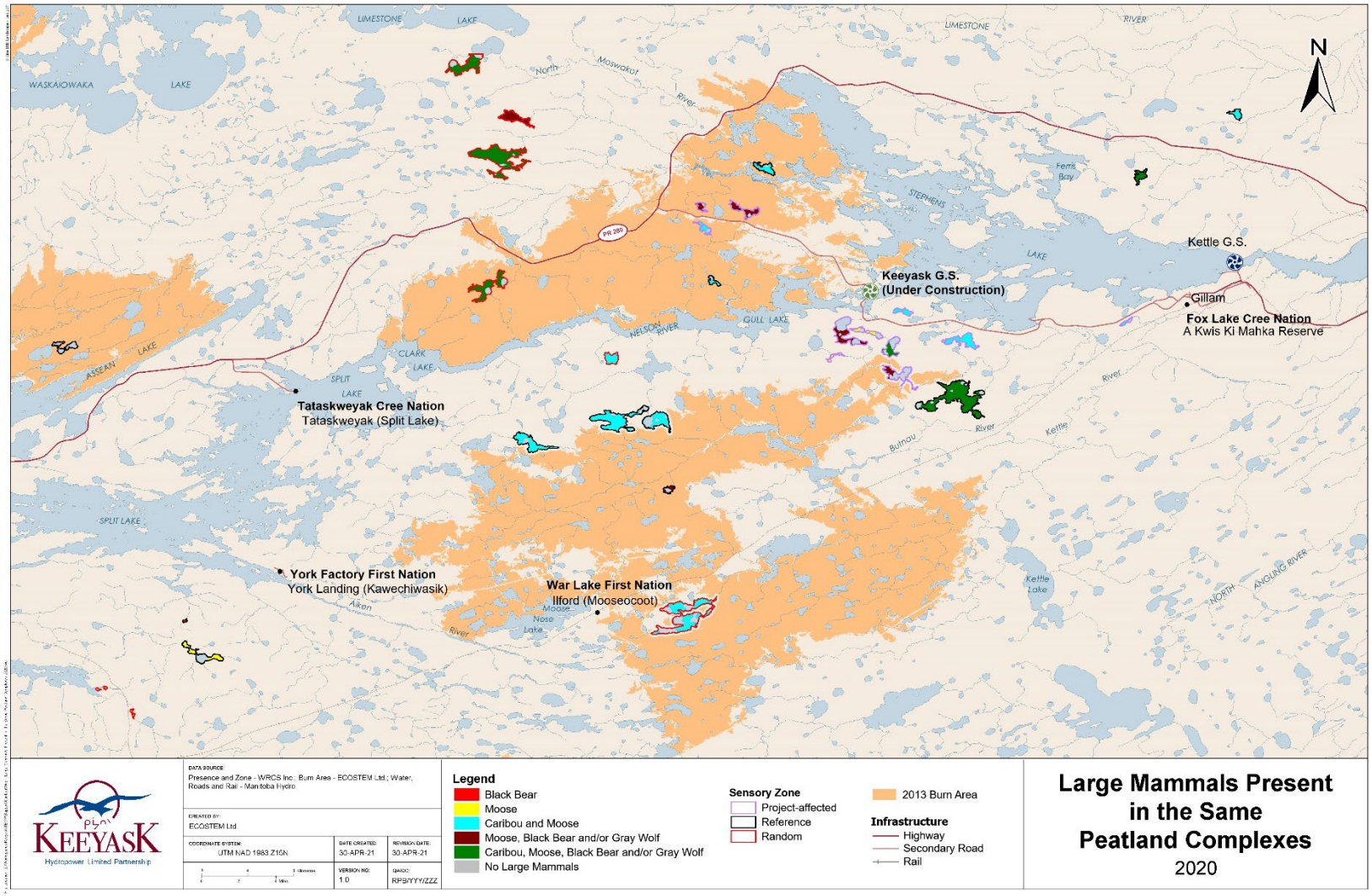
Map 9: Caribou Presence in Peatland Complexes, 2020



Map 10: Moose Presence in Peatland Complexes, 2020



Map 11: Black Bear and Gray Wolf Presence in Peatland Complexes, 2020



Map 12: Large Mammals Present in the Same Peatland Complexes, 2020

When tracking transect and trail camera data were combined, caribou were detected in a greater percentage of reference peatland complexes and a smaller percentage of Project-affected complexes (Table 11). Caribou were detected in a greater percentage of unburned than burned Project-affected, reference, and random complexes. Overall, there was a 60% difference in the total number of burned and unburned peatland complexes occupied by caribou, where they were detected in 36% and 67% of complexes, respectively. Caribou calves were detected in a larger percentage of random complexes and in a smaller percentage of Project-affected complexes (Table 11). No signs of calf presence were found in burned complexes.

Table 11: Peatland Complexes Occupied by Caribou by Disturbance Source and Forest Fire Influence from Combined Tracking Transect and Trail Camera Data, 2020

Complex Type	Burned in 2013	Caribou		Caribou Calf	
		Number Occupied	Percentage Occupied	Number Occupied	Percentage Occupied
Project-affected	Yes	1	33	0	0
	No	4	50	1	13
	Total	*5*	*45*	*1*	*9*
Reference	Yes	2	50	0	0
	No	6	75	3	38
	Total	*8*	*67*	*3*	*25*
Random	Yes	1	25	0	0
	No	4	80	3	60
	Total	*5*	*56*	*3*	*33*
All		18	56	7	22

Moose were detected in all Project-affected and random peatland complexes and in a somewhat smaller percentage of reference complexes (Table 12). Overall, moose were detected in 91% of burned complexes and in 95% of unburned complexes, a difference of 4%. Moose calves were observed in a greater percentage of Project-affected complexes and in a smaller percentage of random complexes (Table 12).

Table 12: Peatland Complexes Occupied by Moose by Disturbance Source and Forest Fire Influence from Combined Tracking Transect and Trail Camera Data, 2020

Complex Type	Burned in 2013	Moose		Moose Calf	
		Number Occupied	Percentage Occupied	Number Occupied	Percentage Occupied
Project-affected	Yes	3	100	3	100
	No	8	100	1	13
	Total	*11*	*100*	*4*	*36*
Reference	Yes	3	75	1	25
	No	7	88	2	25
	Total	*10*	*83*	*3*	*25*
Random	Yes	4	100	0	0
	No	5	100	1	20
	Total	*9*	*100*	*1*	*11*
All		30	94	8	25

Black bears were detected in a greater percentage of random peatland complexes and in a similar percentage of Project-affected and reference complexes (Table 13). Overall, black bears were detected in 18% of burned complexes and in 38% of unburned complexes. Gray wolves were observed in a greater percentage of Project-affected complexes and in a smaller percentage of reference and random complexes (Table 13). Overall, gray wolves were detected in 18% of burned complexes and in 14% of unburned complexes.

Table 13: Peatland Complexes Occupied by Black Bear and Gray Wolf by Disturbance Source and Forest Fire Influence from Combined Tracking Transect and Trail Camera Data, 2020

Complex Type	Burned in 2013	Black Bear		Gray Wolf	
		Number Occupied	Percentage Occupied	Number Occupied	Percentage Occupied
Project-affected	Yes	0	0	2	67
	No	3	38	1	13
	Total	*3*	*27*	*3*	*27*
Reference	Yes	1	25	0	0
	No	2	25	1	13
	Total	*3*	*25*	*1*	*8*
Random	Yes	1	25	0	0
	No	3	60	1	20
	Total	*4*	*44*	*1*	*11*
All		10	31	5	16

Tracking transect and trail camera surveys were conducted in 2015, 2017, 2018, and 2020, during Project construction. When tracking transect data from July and September and all trail camera data were combined, the percentage of burned Project-affected peatland complexes in which caribou were detected fluctuated over the survey period, ranging from 0% in 2018 to 100% in

2017 (Table 14). There was a general decline in the percentage of unburned Project-affected complexes in which caribou were detected after 2015, with a plateau in 2018 and 2020. There was no change in caribou calf detection in burned Project-affected complexes from 2015 to 2020 because none were observed in any survey year. Calves were detected in 13% of unburned complexes in 2015, 2017, and 2020 and in none in 2018. As moose were detected in all burned Project-affected complexes from 2015 to 2020, there was no change in their distribution. Moose detections in unburned complexes increased 33% from 2018 to 2020 after declining from 2015 to 2018. The percentage of burned Project-affected complexes in which moose calves were observed ranged from 67% in 2017 and 2018 to 100% in 2015 and 2020. The percentage of unburned complexes in which moose calves were detected was unchanged from 2018 to 2020.

Table 14: Percentage of Project-affected Peatland Complexes in Which Caribou and Moose Presence Was Detected during Ground Tracking[1] and/or Trail Camera Surveys, 2015, 2017, 2018, and 2020

	Burned					Unburned				
Species	**2015**	**2017**	**2018**	**2020**	**% Change 2018–2020**	**2015**	**2017**	**2018**	**2020**	**% Change 2018–2020**
Caribou	33	100	0	33	–	75	63	50	50	0
Caribou calf	0	0	0	0	0	13	13	0	13	–
Moose	100	100	100	100	0	100	88	75	100	+33
Moose calf	100	67	67	100	+49	38	63	13	13	0

1. July and September only.

When tracking transect and trail camera data were combined, caribou were typically detected in 50% of the burned reference peatland complexes over the survey period, with the exception of 2018 (Table 15). The percentage of unburned reference complexes in which caribou were detected declined after 2017. There was no change in the percentage of burned or unburned complexes in which caribou calves were detected from 2015 to 2018. The percentage of burned reference complexes in which moose were detected alternated between 75% and 100% over the survey period. There was a 12% decline in the percentage of unburned reference complexes in which moose were detected from the first three years of the survey to 2020. The percentage of burned reference complexes in which moose calves were observed declined over the survey period, from 75% in 2015 to 25% in 2020. Moose calves were detected in 34% fewer unburned reference complexes in 2020 than in 2018.

Table 15: Percentage of Reference Peatland Complexes in Which Caribou and Moose Presence Was Detected during Ground Tracking[1] and/or Trail Camera Surveys, 2015, 2017, 2018, and 2020

	Burned					Unburned				
Species	**2015**	**2017**	**2018**	**2020**	**% Change 2018–2020**	**2015**	**2017**	**2018**	**2020**	**% Change 2018–2020**
Caribou	50	50	67	50	-25	100	100	88	75	-14
Caribou calf	0	0	0	0	0	38	38	38	38	0
Moose	100	75	100	75	-25	100	100	100	88	-12
Moose calf	75	50	33	25	-24	50	75	38	25	-34

1. July and September only.

When tracking transect and trail camera data were combined, the percentage of burned random peatland complexes in which caribou were detected alternated between 75% and 25% over the survey period (Table 16). Caribou were detected in all unburned random complexes for the first three survey years, followed by a 20% decline in 2020. Caribou calves were only detected in burned random complexes in 2018. Moose were detected in all burned and unburned random complexes in 2015, 2017, and 2020, but in fewer complexes in 2018. The percentage of burned random peatland complexes in which moose calves were detected declined after 2017; none were observed in 2020. The percentage of unburned random complexes in which moose calves were detected fluctuated over the survey period and was also lowest in 2020.

Table 16: Percentage of Random Peatland Complexes in Which Caribou and Moose Presence Was Detected during Ground Tracking1 and/or Trail Camera Surveys, 2015, 2017, 2018, and 2020

	Burned					Unburned				
Species	**2015**	**2017**	**2018**	**2020**	**% Change 2018–2020**	**2015**	**2017**	**2018**	**2020**	**% Change 2018–2020**
Caribou	75	25	75	25	-67	100	100	100	80	-20
Caribou calf	0	0	25	0	-100	60	40	40	60	+50
Moose	100	100	75	100	+33	100	100	40	100	+150
Moose calf	75	75	40	0	-100	80	40	50	20	-60

1. July and September only.

3.1.3 ACCESS ROAD TRANSECTS

Caribou signs were observed on 11 of the 18 access road transects surveyed in 2020 (Table 17; Appendix 1, Table A-7). No caribou calf signs were observed. Moose signs were detected on all access road transects and moose calf signs were observed on seven transects over both visits. Predator signs were less widely distributed than caribou and moose signs.

Table 17: Number of Access Road Tracking Transects on Which Large Mammals Were Detected, 2020

Species	Visit 1 (July 16–27)	Visit 2 (Sept. 9–20)	Visits 1 & 2
Caribou	8	5	11
Caribou calf	0	0	0
Moose	17	16	18
Moose calf	7	1	7
Black bear	4	2	6
Gray wolf	2	2	4

The density of caribou signs was somewhat greater during the second visit to access road transects than the first (Table 18). Moose sign density was considerably greater than that of all other large mammal species over both visits and was greater during the first visit than the second.

Table 18: Mammal Sign Density along Access Road Transects, 2020

Species	Visit 1		Visit 2		Visits 1 & 2	
	Number of Signs	Signs per km	Number of Signs	Signs per km	Number of Signs	Signs per km
Caribou	18	0.11	22	0.13	40	0.12
Caribou calf	0	0	0	0	0	0
Moose	353	2.08	239	1.41	592	1.75
Moose calf	9	0.05	1	0.01	10	0.03
Black bear	15	0.09	7	0.04	22	0.06
Gray wolf	3	0.02	3	0.02	6	0.02

The density of caribou signs was greater further than 2 km from the access roads than within 2 km during both visits (Table 19). The density of moose and moose calf signs was greater within 2 km of the access roads than further away, with a bigger difference for adult moose.

Table 19: Mammal Sign Density within 2 km and More Than 2 km from Access Roads, 2020

Species	Visit 1 (signs per km)		Visit 2 (signs per km)		Visits 1 and 2 (signs per km)	
	≤2 km	>2 km	≤2 km	>2 km	≤2 km	>2 km
Caribou	0.09	0.12	0.12	0.14	0.10	0.13
Caribou calf	0	0	0	0	0	0
Moose	1.53	2.46	1.23	1.54	1.38	2.00
Moose calf	0.04	0.06	0	0.01	0.02	0.03
Black bear	0.12	0.07	0.09	0.01	0.10	0.04
Gray wolf	0.01	0.02	0.04	0	0.03	0.01

3.1.4 INCIDENTAL OBSERVATIONS

In 2020, mammal and bird species incidentally detected on islands, in peatland complexes, and along access road transects while tracking and from trail camera photos included: American beaver, American crow, American marten, American robin, bald eagle, Canada goose, Canada jay, Canada lynx, common raven, dark-eyed junco, hermit thrush, magnolia warbler, North American river otter, red fox, red squirrel, sandhill crane, snowshoe hare, spruce grouse, sharp-tailed grouse, and willow ptarmigan.

3.2 TIMING OF ICE BREAKUP

Four cameras were placed at Stephens Lake and one camera (#5) was placed at Gull Lake to monitor the timing of ice breakup in 2020. On Stephens Lake, the percentage of ice cover remained consistent from installation in late March until mid- to late May and then decreased rapidly (Table 20). Ice breakup was on May 26 and Stephens Lake was free of ice by June 1 (Photo 8 to Photo 12). Ice breakup was May 28 on Gull Lake, with no ice remaining on June 3.

In previous survey years ice breakup on Stephens Lake was observed by June 2, 2015; May 20, 2016; June 2, 2017; June 2, 2018; May 27, 2018; and May 23, 2019. Stephens Lake was free of ice by June 3, 2015; May 22, 2016; June 3, 2017; June 4, 2018; and May 25, 2019 (Table 21).

Table 20: Timing of Ice Breakup on Stephens and Gull Lakes, 2020

Percent Ice Cover	Stephens Lake				Gull Lake
	Camera 1	Camera 2	Camera 3	Camera 4	Camera 5
100	March 25	March 26	March 27	March 28	March 29
75	April 29	April 29	April 30	April 30	May 20
50	May 24	May 24	May 26	May 20	May 22
25	May 25	May 25	May 26	May 25	May 28
0	June 1	May 31	May 31	May 28	June 3

Table 21: Timing of Ice Breakup on Stephens Lake, 2015–2019

Percent Ice Cover	2015 Cameras 1–4	2016 Cameras 1–4	2017 Cameras 2–4	2018 Cameras 1–4	2019 Cameras 1–4
100	May 9–12	April 27–29	April 11–16	April 7–11	April 6–7
75	May 20–27	May 8–17	May 20–31	May 20–24	April 20–28
50	May 23–June 1	May 10–19	May 27–June 1	May 22–24	May 18–20
25	May 25–June 2	May 14–20	May 27–June 2	May 23–27	May 19–23
0	May 26–June 3	May 18–22	May 28–June 3	May 28–June 4	May 21–25

Photo 8: Ice Cover at 100% on Stephens Lake on March 28, 2020

Photo 9: Ice Cover at 75% on Stephens Lake on April 30, 2020

Photo 10: Ice Cover at 50% on Stephens Lake on May 20, 2020

Photo 11: Ice Cover at 25% on Stephens Lake on May 25, 2020

Photo 12: Ice Cover at 0% on Stephens Lake on May 28, 2020

3.3 RESERVOIR IMPOUNDMENT MONITORING

On August 25, 2020, the first day of pre-impoundment monitoring, a caribou cow and calf were observed on Caribou Island (Photo 13). They were not seen again during pre-impoundment or impoundment monitoring surveys, and it was presumed that they had left the island prior to impoundment, likely on August 26. No other caribou and no moose were observed during the surveys before or during impoundment. A black bear was noted along the reservoir shoreline just west of Kapowny Bay on September 2, during impoundment monitoring surveys.

Photo 13: Caribou Cow and Calf on Caribou Island on August 25, 2020

4.0 DISCUSSION

As predicted in the EIS, several Project-affected islands were unoccupied by caribou in 2020. Two of the largest islands at the Project construction site have been cleared and developed and are no longer suitable for caribou habitat; as such, they were not surveyed in 2020. Two additional islands in Gull Lake have been partially cleared; caribou signs were found on the largest (Caribou Island) during ground transect surveys. Of the 66 islands in lakes occupied by caribou, only 14% were Project-affected. As in 2018, no signs of caribou calves were observed on Project-affected islands during ground tracking transect or trail camera surveys. The apparent absence of caribou activity on most Project-affected islands could indicate that caribou were generally avoiding construction-related sensory disturbance. However, there was adult caribou activity on several Project-affected islands, and a cow and calf were observed on Caribou Island during pre-impoundment monitoring surveys. As caribou can habituate to human disturbance, some individuals may be less affected by ongoing construction activity than others (Haskell et al. 2006), or the extent of the disturbance effect (i.e., 4 km from the GS site) may be less than predicted in the EIS. It should be noted that these field studies can document animals' presence in an area but cannot confirm their absence; as such, it cannot be known for certain that there were no caribou on some of the surveyed islands.

There was less caribou activity on Project-affected islands in lakes during construction than during the pre-construction period, as predicted in the EIS. While caribou activity was found on somewhat fewer Project-affected islands in 2020 than in 2018, caribou activity on unaffected islands increased by a similar percentage, suggesting that some caribou could have been re-locating to undisturbed islands in Stephens Lake. In previous construction monitoring years, caribou activity declined on Project-affected and unaffected islands and there may have been an overall decrease in the amount of caribou and calf activity in the Keeyask region from 2010 to 2020. A multi-year analysis of results may identify trends in the occupancy of Project-affected and unaffected islands in lakes by caribou.

The specific timing of caribou calving in the area is uncertain but likely occurs from May 1 to June 30, based on data collected on calving caribou in Stephens Lake from 2010 to 2014 and from studies on boreal woodland caribou at roughly the same latitude (Rettie and Messier 2001; Ferguson and Elkie 2004). Caribou cows may avoid islands if there is ice on the lakes during the early calving period. In 2020, ice breakup on Stephens Lake was in late May, in the middle of the general calving period and three weeks earlier than the first caribou calf was photographed (June 18).

Moose were slightly more widely distributed than caribou on islands in lakes in 2020. Most (73%) of the islands occupied by caribou were also occupied by moose. Predators were more likely to occupy islands on which only moose were found than those on which only caribou were found. The abundance and distribution of moose signs in the Keeyask region suggests that enough habitat is available to sustain a moose population, which is likely an adequate source of primary prey for gray wolves.

There was little caribou and calf activity in Project-affected peatland complexes, possibly indicating avoidance of construction-related sensory disturbances during the calving period. Caribou occupied 60% more unburned than burned complexes. Caribou tend to avoid forest that is less than 50 years old (Schaefer and Pruitt 1991) but may pass through regenerating forest to get from one patch of more suitable habitat to another. Caribou may also use recently burned (within five years) habitat in summer, when they eat regenerating herbs and deciduous browse (Schaefer and Pruitt 1991). The percentage of Project-affected peatland complexes in which caribou activity was observed increased slightly from 2018 to 2020. A small decrease in caribou activity was observed in reference and random complexes over the same period. The general decline in caribou activity in peatland complexes in addition to islands in lakes may suggest that fewer caribou occupied the Keeyask region in 2020 than in earlier monitoring years.

A radio-collared caribou cow was photographed with a calf in peatland complexes from 2016 to 2018 and in 2020; it is unknown if it was the same individual. Review of the radio-collar data (from a Manitoba Agriculture and Resource Development-led Pen Islands caribou collaring program) would identify the cow or cows that are known to have calved in the Keeyask region, either confirming that the same individual calved in the same general area in consecutive years or that more than one individual calved in the peatland complexes south of the Nelson River.

Moose and moose calves occupied more peatland complexes than caribou. Moose calves were detected in more burned complexes than caribou calves over the construction monitoring period, possibly indicating that moose select a wider range of habitats for calving than caribou.

On access road transects, the density of caribou signs in 2020 was lower within 2 km of the access roads than beyond 2 km, as predicted in the EIS. In 2015 and 2017, the reverse was generally observed- there was more caribou activity closer to the roads than farther away (WRCS 2016, 2018b). As caribou can habituate to human disturbance, some individuals may be less affected by traffic noise than others, or the extent of the disturbance effect (i.e., 2 km from the access roads) may be less than predicted in the EIS. There was also less moose and moose calf activity within 2 km of the access roads than further away in 2020. Moose are as widely distributed in the Keeyask region as caribou. However, substantially more moose signs were found nearer the access roads than caribou signs, suggesting that moose may be more tolerant of sensory disturbances or may habituate more readily to human disturbance than caribou. A multi-year analysis of results may identify trends in caribou activity closer to or farther from disturbance on the access roads.

5.0 SUMMARY AND CONCLUSIONS

In 2020, caribou were present on just over half of the islands in lakes and peatland complexes surveyed in the Keeyask region. Caribou did not avoid all islands or peatland complexes within 4 km of the Project construction site, or all areas within 2 km of the access roads. As predicted in the EIS, sensory disturbance from construction and traffic may have caused some individuals to avoid areas nearer the Project construction site or access roads, but some areas within the predicted disturbance zones were occupied by caribou and calves. These caribou may have habituated to the construction disturbance, or the zone of disturbance may be smaller than predicted in the EIS.

Ground tracking transect and trail camera surveys will continue in 2021 and will include islands formed in the reservoir after impoundment. Additional construction phase monitoring and a multi-year analysis of all construction phase results may identify trends in caribou activity nearer or farther from disturbance at the Project construction site and near the access roads.

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APPENDIX 1:
TABLES

Table A-1: Transects Surveyed on Islands in Lakes, 2015, 2017, 2018, and 2020

Island	Transect	Number of Times Surveyed 2020	Number of Times Surveyed 2018	Number of Times Surveyed 2017	Number of Times Surveyed 2015
KI122001	KI122001	2	3	3	3
KI122003	KI122003	2	3	3	3
KI122005	KI122005	2	3	3	3
KI122006	KI122006	2	3	3	3
KI123005	KI123005	0	0	2	3
KI123008	KI123008	0	0	2	3
KI123010	KI123010	2	3	3	3
KI123012	KI123012	2	3	3	3
	KI123012_001	2	3	3	3
KI124003	KI124003	2	3	3	3
KI124004	KI124004	2	2	2	3
KI124005	KI124005	2	3	3	3
KI124007	KI124007	2	3	3	3
KI124009	KI124009	2	3	3	3
KI124010	KI124010	2	3	3	3
KI124013	KI124013	2	2	3	3
KI124015	KI124015	2	3	3	3
KI124016	KI124016	2	3	3	3
KI124017	KI124017	2	3	3	3
KI124018	KI124018	2	3	3	3
KI124019	KI124019	2	3	3	3
KI124020	KI124020	2	3	3	3
KI124022	KI124022	2	3	3	3
KI124024	KI124024	2	3	3	3
KI124026	KI124026	2	3	3	3
KI124029	KI124029	2	3	3	3
KI124030	KI124030	2	3	3	3
KI124035	KI124035	2	3	3	3
KI124037	KI124037	2	3	3	3
KI124038	KI124038	2	3	3	3
KI124040	KI124040	2	3	3	3
KI124041	KI124041	2	3	3	3
KI124042	KI124042	2	3	3	3
KI124043	KI124043	2	3	3	3
KI124044	KI124044	2	3	3	3
KI124045	KI124045	2	3	3	3
KI124046	KI124046	2	3	3	3

Island	Transect	Number of Times Surveyed 2020	Number of Times Surveyed 2018	Number of Times Surveyed 2017	Number of Times Surveyed 2015
KI124047	KI124047	2	3	3	3
KI124050	KI124050	2	3	3	3
KI124052	KI124052	2	3	3	3
KI124053	KI124053	2	3	3	3
KI124055	KI124055	2	3	3	3
KI124056	KI124056	2	3	3	3
KI124057	KI124057	2	3	3	3
KI124058	KI124058	2	3	3	3
KI124060	KI124060	2	3	3	3
KI124063	KI124063	2	3	3	3
KI124065	KI124065	2	3	3	3
KI124066	KI124066	2	3	3	3
	KI124066_001	2	3	3	3
KI124069	KI124069	2	3	3	3
KI124070	KI124070	2	3	3	3
KI124072	KI124072	2	3	3	3
KI124075	KI124075	2	3	3	3
KI124079	KI124079	2	3	3	3
KI124080	KI124080	2	3	3	3
KI124082	KI124082	2	3	3	3
KI124083	KI124083	2	2	3	3
KI124086	KI124086	2	3	3	3
KI124088	KI124088	2	3	3	3
KI124089	KI124089	2	3	3	3
KI124090	KI124090	2	3	3	3
KI124091	KI124091	2	3	3	3
KI124092	KI124092	2	3	3	3
	KI124092_001	2	3	3	3
KI124094	KI124094	2	2	3	3
KI124096	KI124096	2	3	3	3
KI124097	KI124097	2	3	3	3
KI124100	KI124100	2	3	2	0
KI124102	KI124102	2	3	3	3
KI124103	KI124103	0	0	0	3
KI124105	KI124105	2	3	3	3
KI124111	KI124111	0	0	0	3
KI124115	KI124115	2	3	3	3
KI124117	KI124117	2	3	3	3

Island	Transect	Number of Times Surveyed 2020	Number of Times Surveyed 2018	Number of Times Surveyed 2017	Number of Times Surveyed 2015
KI124120	KI124120	2	3	3	3
KI124124	KI124124	2	3	3	3
KI124125	KI124125	2	3	3	3
KI124128	KI124128	2	3	3	3
KI124129	KI124129	2	3	3	3
KI124133	KI124133	2	3	3	3
KI124136	KI124136	2	3	3	3
KI124141	KI124141	2	3	3	3
KI124145	KI124145	2	3	3	3
KI124146	KI124146	0	0	0	3
KI124147	KI124147	2	3	3	3
KI124150	KI124150	2	3	3	0
KI124151	KI124151	2	3	3	3
KI124152	KI124152	0	0	0	3
KI124153	KI124153	2	3	3	3
KI124155	KI124155	2	3	3	3
KI124156	KI124156	2	3	3	3
KI124158	KI124158	2	3	3	3
KI124162	KI124162	2	3	3	3
KI124163	KI124163	2	3	3	0
KI124164	KI124164	2	3	3	3
KI124165	KI124165	2	3	3	3
KI124166	KI124166	2	3	3	3
KI124167	KI124167	2	3	3	3
KI124170	KI124170	2	3	3	3
KI124173	KI124173	2	3	3	3
KI124176	KI124176	2	3	3	3
KI124178	KI124178	2	3	3	3
KI124180	KI124180	2	3	3	3
	KI124180_001	2	3	3	3
KI124181	KI124181	2	2	3	3
KI124182	KI124182	2	3	3	3
KI124186	KI124186	2	3	3	3
	KI124186_001	2	3	3	3
	KI124186_002	2	3	3	3
	KI124186_003	2	3	3	3
	KI124186_004	2	3	3	3
KI124192	KI124192	2	3	3	3

Island	Transect	Number of Times Surveyed 2020	Number of Times Surveyed 2018	Number of Times Surveyed 2017	Number of Times Surveyed 2015
KI124193	KI124193	2	3	3	3
KI124194	KI124194	2	3	3	3
KI124196	KI124196	2	3	3	3
KI124197	KI124197	2	3	3	3
KI124202	KI124202	0	3	3	3
KI124205	KI124205	2	3	3	3
	KI124205_001	2	3	3	3
KI124206	KI124206	2	3	3	3
KI124209	KI124209	2	3	3	3
KI124210	KI124210	2	3	3	3
KI124212	KI124212	2	3	3	3
KI124214	KI124214	2	3	3	3
KI124217	KI124217	2	3	3	3
KI124227	KI124227	2	3	3	3
KI126011	KI126011	0	0	0	3
KI126016	KI126016	0	0	1	3
KI126017	KI126017	0	0	0	3
KI126020	KI126020	0	3	1	3

Table A-2: Number of Trail Cameras on Islands in Lakes, 2015 to 2020

Island	2020	2019	2018	2017	2016	2015
KI122001	1	1	1	1	1	1
KI122003	1	1	1	1	1	1
KI122005	1	1	1	1	1	1
KI122006	1	1	1	1	1	1
KI123005	0	0	0	0	1	1
KI123008	0	0	0	0	1	1
KI123010	1	1	1	1	1	1
KI123012	1	2	2	2	2	2
KI124003	1	1	1	1	1	1
KI124004	1	1	1	0	1	1
KI124005	1	1	1	1	1	1
KI124007	1	1	1	1	1	1
KI124009	1	1	1	1	1	1
KI124010	1	1	1	1	1	1
KI124013	0	1	1	1	1	1
KI124015	1	1	1	1	1	1
KI124016	1	1	1	1	1	1
KI124017	1	1	1	1	1	1
KI124018	1	1	1	1	1	1
KI124019	1	1	1	1	1	1
KI124020	1	1	1	1	1	1
KI124022	1	1	1	1	1	1
KI124024	1	1	1	1	1	1
KI124026	1	1	1	1	1	1
KI124029	1	1	1	1	1	1
KI124030	1	1	1	1	1	1
KI124035	1	1	1	1	1	1
KI124037	1	1	1	1	1	1
KI124038	1	1	1	1	1	1
KI124040	1	1	1	1	1	1
KI124041	1	1	1	1	1	1
KI124042	1	1	1	1	1	1
KI124043	1	1	1	1	1	1
KI124044	1	1	1	1	1	1
KI124045	1	1	1	1	1	1
KI124046	1	1	1	1	1	1

Island	2020	2019	2018	2017	2016	2015
KI124047	1	1	1	1	1	1
KI124050	1	1	1	1	1	1
KI124051	0	0	0	0	1	0
KI124052	1	1	1	1	1	1
KI124053	1	1	1	1	1	1
KI124055	1	1	1	1	1	1
KI124056	1	1	1	1	1	1
KI124057	1	1	1	1	1	1
KI124058	1	1	1	1	1	1
KI124060	1	1	1	1	1	1
KI124063	1	1	1	1	1	1
KI124065	1	1	1	1	1	1
KI124066	1	2	2	2	2	2
KI124069	1	1	1	1	1	1
KI124070	1	1	1	1	1	1
KI124072	1	1	1	1	1	1
KI124075	1	1	1	1	1	1
KI124077	1	1	1	0	1	0
KI124079	1	1	1	1	1	1
KI124080	1	1	1	1	1	0
KI124082	1	1	1	1	1	1
KI124083	1	1	1	1	0	1
KI124086	1	1	1	1	1	1
KI124088	0	1	1	1	1	1
KI124089	1	1	1	1	1	1
KI124090	1	1	1	1	1	1
KI124091	1	1	1	1	1	1
KI124092	1	2	2	2	2	2
KI124094	1	1	1	1	1	1
KI124096	1	1	1	1	1	1
KI124097	1	1	1	1	1	1
KI124102	1	1	1	1	1	1
KI124103	1	1	1	0	1	1
KI124105	1	1	1	1	1	1
KI124111	0	0	0	1	1	1
KI124113	1	1	1	0	1	0
KI124115	1	1	1	1	2	1

Island	2020	2019	2018	2017	2016	2015
KI124117	1	1	1	1	1	1
KI124120	1	1	1	1	1	1
KI124124	1	1	1	1	1	1
KI124125	1	1	1	1	1	1
KI124128	1	1	1	1	1	1
KI124129	1	1	1	1	1	1
KI124131	1	1	1	0	1	0
KI124133	1	1	1	1	1	1
KI124136	1	1	1	1	1	1
KI124141	1	1	1	1	1	1
KI124145	1	1	1	1	1	1
KI124146	1	1	1	0	1	1
KI124147	1	1	1	1	1	1
KI124150	0	0	0	1	0	0
KI124151	1	1	1	1	1	1
KI124152	0	1	1	0	1	1
KI124153	1	1	1	1	1	1
KI124155	1	1	1	1	1	1
KI124156	1	1	1	1	1	1
KI124158	1	1	1	1	1	1
KI124162	1	1	1	1	1	1
KI124164	1	1	1	1	1	1
KI124165	1	1	1	0	1	1
KI124166	1	1	1	1	1	1
KI124167	1	1	1	1	1	1
KI124170	1	1	1	1	1	1
KI124173	1	1	1	1	1	1
KI124176	1	1	1	1	1	1
KI124178	1	1	1	1	1	1
KI124180	2	3	3	2	3	2
KI124181	1	1	1	1	0	0
KI124182	1	1	1	1	1	1
KI124186	5	6	6	5	6	4
KI124192	1	1	1	1	1	1
KI124193	1	1	1	1	1	1
KI124194	1	1	1	1	1	1
KI124196	1	1	1	1	1	1

Island	2020	2019	2018	2017	2016	2015
KI124197	1	1	1	1	1	1
KI124202	1	1	1	1	1	1
KI124205	1	2	2	2	2	1
KI124206	1	1	1	1	1	1
KI124209	1	1	1	1	1	1
KI124210	1	1	1	1	1	1
KI124212	1	1	1	1	1	1
KI124214	1	1	1	1	1	1
KI124217	1	1	1	1	1	1
KI124227	1	1	1	1	0	1
KI126016	0	0	0	0	1	1
KI126017	0	0	0	0	0	1
KI126020	0	0	0	0	1	1

Table A-3: Transects Surveyed in Peatland Complexes, 2015, 2017, 2018, and 2020

Complex	Transect	Number of Times Surveyed 2020	Number of Times Surveyed 2018	Number of Times Surveyed 2017	Number of Times Surveyed 2015
KV022000	KV022001	2	3	3	3
	KV022002	2	3	3	3
	KV022003	2	3	3	3
	KV022004	2	3	3	3
	KV022005	2	3	3	3
	KV022006	2	3	3	3
	KV022007	2	3	3	3
	KV022008	2	3	3	3
	KV022009	2	3	3	3
	KV022010	2	3	3	3
	KV022011	2	3	3	3
	KV022012	2	3	3	3
	KV022013	2	3	3	3
	KV022014	2	3	3	3
	KV022015	2	3	3	3
KV023000	KV023001	2	3	3	3
	KV023002	2	3	3	3
KV036000	KV036001	2	3	3	3
	KV036002	2	3	3	3
	KV036003	2	3	3	3
	KV036004	2	3	3	3
	KV036005	2	3	3	3
	KV036006	2	3	3	3
	KV036007	2	3	3	3
	KV036008	2	3	3	3
	KV036009	2	3	3	3
	KV036010	2	3	3	3
	KV036011	2	3	3	3
	KV036012	2	3	3	3
	KV036013	2	3	3	3
	KV036014	2	3	3	3
	KV036015	2	3	3	3
	KV036016	2	3	3	3
	KV036017	2	3	3	3
	KV037001	2	3	3	3
	KV037002	2	3	3	3
	KV037003	2	3	3	3

Complex	Transect	Number of Times Surveyed 2020	Number of Times Surveyed 2018	Number of Times Surveyed 2017	Number of Times Surveyed 2015
KV037000	KV037004	2	3	3	3
KV038000	KV038001	2	3	3	3
	KV038002	2	3	3	3
	KV038003	2	3	3	3
	KV038004	2	3	3	3
	KV038005	2	3	3	3
	KV038006	2	3	3	3
	KV038007	2	3	3	3
	KV038008	2	3	3	3
	KV038009	2	3	3	3
	KV038010	2	3	3	3
	KV038011	2	3	3	3
	KV038012	2	3	3	3
	KV038013	2	3	3	3
	KV038014	2	3	3	3
	KV038015	2	3	3	3
	KV038016	2	3	3	3
	KV038017	2	3	3	3
	KV038018	2	3	3	3
	KV038019	2	3	3	3
	KV038020	2	3	3	3
KV039000	KV039001	2	3	3	3
KV044000	KV044001	2	3	3	3
	KV044002	2	3	3	3
	KV044003	2	3	3	3
	KV044004	2	3	3	3
	KV044005	2	3	3	3
	KV044006	2	3	3	3
	KV044007	2	3	3	3
	KV044008	2	3	3	3
	KV044009	2	3	3	3
	KV044010	2	3	3	3
KV047000	KV047001	2	3	3	3
	KV047002	2	3	3	3
	KV047003	2	3	3	3
	KV047004	2	3	3	3
	KV047005	2	3	3	3
	KV047006	2	3	3	3

Complex	Transect	Number of Times Surveyed 2020	Number of Times Surveyed 2018	Number of Times Surveyed 2017	Number of Times Surveyed 2015
KV050000	KV050001	2	3	2	3
	KV050002	2	3	3	3
KV050000	KV050003	2	3	3	3
	KV050004	2	3	3	3
	KV050005	2	3	3	3
	KV050006	2	3	3	3
	KV050007	2	3	3	3
	KV050008	2	3	3	3
KV058000	KV058001	2	3	3	3
	KV058002	2	3	3	3
	KV058003	2	3	3	3
	KV058004	2	3	3	3
	KV058005	2	3	3	3
	KV058006	2	3	3	3
	KV058007	2	3	3	3
	KV058008	2	3	3	3
	KV058009	2	3	3	3
	KV058010	2	3	3	3
	KV058011	2	3	3	3
	KV058012	2	3	3	3
	KV058013	2	3	3	3
	KV058014	2	3	3	3
KV061000	KV061001	2	3	3	3
	KV061002	2	3	3	3
	KV061003	2	3	3	3
KV062000	KV062001	2	3	3	3
	KV062002	2	3	3	3
KV063000	KV063001	2	3	3	3
	KV063002	2	3	3	3
	KV063003	2	3	3	3
	KV063004	2	3	3	3
	KV063005	2	3	3	3
	KV063006	2	3	3	3
KV066000	KV066001	2	3	3	3
	KV066002	2	3	3	3
	KV066003	2	2	3	3
KV069000	KV069001	2	3	3	3
	KV069002	2	3	3	3

Complex	Transect	Number of Times Surveyed 2020	Number of Times Surveyed 2018	Number of Times Surveyed 2017	Number of Times Surveyed 2015
KV069000	KV069003	2	3	3	3
	KV069004	2	3	3	3
	KV069005	2	3	3	3
KV071000	KV071001	2	3	3	3
KV094000	KV094001	2	3	3	3
	KV094002	2	3	3	3
	KV094003	2	3	3	3
	KV094004	2	3	3	3
	KV094005	2	3	3	3
	KV094006	2	3	3	3
	KV094007	2	3	3	3
KV097000	KV097001	2	3	3	3
	KV097002	2	3	3	3
	KV097003	2	3	3	3
	KV097004	2	3	3	3
	KV097005	2	3	3	3
	KV097006	2	3	3	3
	KV097007	2	3	3	3
	KV097008	2	3	3	3
	KV097009	2	3	3	3
	KV097010	2	3	3	3
	KV097011	2	3	3	3
	KV097012	2	3	3	3
	KV097013	2	3	3	3
KV098000	KV098001	2	3	3	3
	KV098002	2	3	3	3
KV101000	KV101001	2	3	3	3
	KV101002	2	3	3	3
	KV101003	2	3	3	3
	KV101004	2	3	3	3
	KV101005	2	3	3	3
KV102000	KV102001	2	3	3	3
	KV102002	2	3	3	3
KV103000	KV103001	2	3	3	3
	KV103002	2	3	3	3
	KV103003	2	3	3	3
	KV103004	2	3	3	3
	KV103005	2	3	3	3

Complex	Transect	Number of Times Surveyed 2020	Number of Times Surveyed 2018	Number of Times Surveyed 2017	Number of Times Surveyed 2015
KV103000	KV103006	2	3	3	3
KV107000	KV107001	2	3	3	3
	KV107002	2	3	3	3
	KV107003	2	3	3	3
	KV107004	2	3	3	3
	KV107005	2	3	3	3
	KV107006	2	3	3	3
	KV107007	2	3	3	3
	KV107008	2	3	3	3
	KV107009	2	3	3	3
KV113000	KV113001	2	3	3	3
	KV113002	2	3	3	3
	KV113003	2	3	3	3
	KV113004	2	3	3	3
	KV113005	2	3	3	3
	KV113006	2	3	3	3
	KV113007	2	3	3	3
	KV113008	2	3	3	3
	KV113009	2	3	3	3
	KV113010	2	3	3	3
	KV113011	2	3	3	3
	KV113012	2	3	3	3
	KV113013	2	3	3	3
	KV113014	2	3	3	3
KV116000	KV116001	2	3	3	3
KV119000	KV119001	2	3	3	3
	KV119002	2	3	3	3
	KV119003	2	3	3	3
	KV119004	2	3	3	3
	KV119005	2	3	3	3
	KV119006	2	3	3	3
KV120000	KV120001	2	3	3	3
	KV120002	0	3	3	3
KV121000	KV121001	2	3	3	3
KV122000	KV122001	2	0	3	3
KV123000	KV123001	2	3	3	3
KV124000	KV124001	2	3	3	3

Table A-4: Number of Trail Cameras in Peatland Complexes, 2015 to 2020

Complex	Transect	2020	2018	2017	2016	2015
KV005000	KV005814	0	0	0	1	0
KV006600	KV006602	0	0	0	1	0
KV022000	KV022002	1	1	1	1	1
KV023000	KV023001	1	1	1	1	1
KV036000	KV036006	1	1	1	1	1
KV037000	KV037003	1	1	1	1	1
KV038000	KV038008	1	1	1	1	1
KV039000	KV039001	1	1	1	1	1
KV044000	KV044001	1	1	1	1	1
KV047000	KV047001	1	1	1	1	1
KV050000	KV050006	1	1	1	1	1
KV580000	KV058014	1	1	1	1	1
KV061000	KV061003	1	1	1	1	1
KV062000	KV062001	1	1	1	1	1
KV063000	KV063005	1	1	1	1	1
KV066000	KV066002	1	1	1	1	1
KV069000	KV069005	1	1	1	1	1
KV071000	KV071001	1	1	1	1	1
KV094000	KV094002	1	1	1	1	1
KV097000	KV097002	1	1	1	1	1
KV098000	KV098001	1	1	1	1	1
KV101000	KV101005	1	1	1	1	1
KV102000	KV102002	1	1	1	1	1
KV103000	KV103001	1	1	1	1	1
KV107000	KV107007	1	1	1	1	1
KV113000	KV113005	1	1	1	1	1
KV116000	KV116001	1	1	1	1	1
KV119000	KV119005	1	1	1	1	1
KV120000	KV120001	1	1	1	1	1
KV121000	KV121001	1	1	1	1	1
KV122000	KV122001	1	1	1	1	1
KV123000	KV123001	1	1	0	1	1
KV124000	KV124001	1	1	1	1	1
KV597000	–	1	1	0	1	1

Table A-5: Number of Large Mammal Signs Detected during Two Visits to Tracking Transects on Islands in Lakes, 2020

Species	Transect	Visit 1[1]	Visit 2	Total
Caribou	KI122001	3	0	3
	KI123012	3	1	4
	KI123012_001	0	1	1
	KI124003	0	1	1
	KI124010	5	0	5
	KI124015	1	0	1
	KI124016	0	1	1
	KI124017	2	1	3
	KI124020	1	0	1
	KI124022	3	8	11
	KI124024	1	0	1
	KI124029	9	8	17
	KI124030	2	0	2
	KI124035	0	1	1
	KI124037	2	0	2
	KI124038	0	2	2
	KI124040	0	1	1
	KI124043	2	0	2
	KI124045	1	0	1
	KI124046	10	1	11
	KI124053	0	1	1
	KI124055	3	2	5
	KI124056	5	0	5
	KI124058	0	1	1
	KI124063	0	2	2
	KI124066	5	0	5
	KI124066_001	5	0	5
	KI124072	1	0	1
	KI124075	4	0	4
	KI124079	1	1	2
	KI124089	10	6	16
	KI124091	1	6	7
	KI124092_001	1	3	4
	KI124102	1	0	1
	KI124115	7	0	7
	KI124117	5	0	5
	KI124120	3	2	5
	KI124128	10	8	18

Species	Transect	Visit 1[1]	Visit 2	Total
Caribou	KI124136	4	5	9
	KI124147	0	1	1
	KI124151	0	2	2
	KI124153	0	1	1
	KI124156	2	0	2
	KI124158	0	2	2
	KI124163	1	0	1
	KI124166	2	0	2
	KI124170	0	2	2
	KI124173	23	15	38
	KI124176	7	2	9
	KI124180	6	8	14
	KI124180_001	0	1	1
	KI124181	3	0	3
	KI124182	3	0	3
	KI124186	25	11	36
	KI124186_001	15	24	39
	KI124186_002	13	24	37
	KI124186_003	7	27	34
	KI124186_004	6	10	16
	KI124192	1	0	1
	KI124193	3	3	6
	KI124196	5	5	10
	KI124209	0	2	2
	KI124210	2	8	10
	KI124212	1	5	6
	KI124214	1	1	2
	Total	237	217	454
Caribou calf	KI122001	2	0	2
	KI124066_001	2	0	2
	KI124128	0	1	1
	KI124173	0	1	1
	KI124186_001	2	0	2
	KI124186_003	1	3	4
	KI124210	0	4	4
	KI124212	0	1	1
	Total	7	10	17
Moose	KI122001	0	1	1
	KI122003	6	2	8
	KI122006	1	0	1

Species	Transect	Visit 1[1]	Visit 2	Total
Moose	KI123012	7	0	7
	KI124003	1	0	1
	KI124005	1	0	1
	KI124010	4	0	4
	KI124013	1	0	1
	KI124017	1	0	1
	KI124018	7	0	7
	KI124019	0	2	2
	KI124022	5	0	5
	KI124024	3	0	3
	KI124026	1	0	1
	KI124029	5	0	5
	KI124030	3	0	3
	KI124035	1	8	9
	KI124037	1	0	1
	KI124038	4	4	8
	KI124040	0	1	1
	KI124041	1	0	1
	KI124044	0	1	1
	KI124046	5	0	5
	KI124047	2	0	2
	KI124056	1	0	1
	KI124057	2	2	4
	KI124063	4	5	9
	KI124065	2	3	5
	KI124066	8	4	12
	KI124066_001	5	2	7
	KI124069	1	0	1
	KI124072	9	0	9
	KI124075	1	0	1
	KI124079	2	0	2
	KI124080	2	0	2
	KI124082	9	2	11
	KI124083	3	0	3
	KI124086	1	0	1
	KI124088	1	0	1
	KI124089	0	31	31
Moose	KI124091	6	0	6
	KI124092	8	19	27
	KI124092_001	18	20	38

Species	Transect	Visit 1[1]	Visit 2	Total
Moose	KI124102	2	0	2
	KI124115	1	29	30
	KI124120	1	0	1
	KI124124	0	1	1
	KI124128	0	17	17
	KI124129	3	0	3
	KI124145	1	6	7
	KI124147	0	2	2
	KI124150	0	2	2
	KI124155	0	2	2
	KI124158	0	2	2
	KI124167	1	0	1
	KI124173	2	1	3
	KI124180	12	32	44
	KI124180_001	13	0	13
	KI124186	0	7	7
	KI124186_001	5	3	8
	KI124186_002	3	6	9
	KI124186_003	2	0	2
	KI124186_004	3	21	24
	KI124192	5	0	5
	KI124193	8	10	18
	KI124196	7	0	7
	KI124205_001	1	0	1
	KI124209	0	1	1
	KI124210	6	1	7
	KI124212	4	29	33
	Total	223	279	502
Moose calf	KI124010	1	0	1
	KI124017	1	0	1
	KI124022	3	0	3
	KI124035	0	1	1
	KI124037	1	0	1
	KI124046	1	0	1
	KI124063	1	0	1
	KI124065	0	1	1
	KI124066_001	1	0	1
	KI124080	1	0	1
	KI124091	1	0	1
	KI124092	0	2	2

Species	Transect	Visit 1[1]	Visit 2	Total
Moose calf	KI124102	1	0	1
	KI124115	0	2	2
	KI124128	0	1	1
	KI124180	1	0	1
	KI124186_001	0	1	1
	KI124186_004	0	1	1
	KI124193	0	2	2
	KI124210	1	0	1
	KI124212	3	0	3
	Total	17	11	28
Black bear	KI124030	1	0	1
	KI124035	0	1	1
	KI124040	2	0	2
	KI124147	0	1	1
	KI124181	2	0	2
	KI124186_002	0	1	1
	Total	5	3	8
Gray wolf	KI124037	1	0	1
	Total	1	0	1

1. Fresh signs only.

Table A-6: Number of Large Mammal Signs Detected during Three Visits to Tracking Transects in Peatland Complexes, 2020

Species	Complex	Transect	Visit 1	Visit 2	Total
Caribou	KV022000	KV022002	3	0	3
		KV022004	4	0	4
		KV022005	2	0	2
		KV022006	1	0	1
		KV022008	3	0	3
		KV022009	1	0	1
		KV022013	2	0	2
	KV023000	KV023002	1	0	1
	KV036000	KV036002	1	0	1
		KV036005	2	0	2
		KV036007	1	0	1
		KV036009	1	0	1
		KV036010	2	0	2
		KV036011	2	0	2
		KV036015	2	0	2
	KV037000	KV037002	2	3	5
		KV037003	0	2	2
	KV038000	KV038002	4	4	8
		KV038005	1	0	1
		KV038007	0	2	2
		KV038015	0	1	1
		KV038017	3	0	3
		KV038020	1	0	1
	KV047000	KV047006	0	5	5
	KV050000	KV050004	1	0	1
		KV050006	1	0	1
	KV058000	KV058002	2	0	2
		KV058004	2	0	2
		KV058005	1	0	1
		KV058006	1	0	1
		KV058007	7	0	7
		KV058008	4	0	4
		KV058009	2	3	5
		KV058010	2	0	2
		KV058013	4	0	4
	KV061000	KV061001	1	0	1
	KV063000	KV063001	2	1	3
		KV063003	1	0	1

Species	Complex	Transect	Visit 1	Visit 2	Total
Caribou	KV063000	KV063005	1	0	1
		KV063006	2	0	2
	KV097000	KV097001	0	2	2
		KV097002	0	1	1
		KV097003	0	1	1
		KV097008	0	2	2
		KV097011	0	1	1
		KV097012	0	1	1
	KV101000	KV101001	1	0	1
	KV103000	KV103001	1	0	1
	KV107000	KV107002	0	1	1
		KV107004	1	1	2
		KV107007	2	5	7
	KV113000	KV113001	3	12	15
		KV113002	6	0	6
		KV113005	1	0	1
		KV113009	2	1	3
		KV113011	2	0	2
	KV119000	KV119003	1	0	1
	KV121000	KV121001	2	2	4
	Total		95	51	146
Caribou calf	KV022000	KV022002	1	0	1
	KV038000	KV038002	1	0	1
	KV058000	KV058005	2	0	2
		KV058008	2	0	2
	KV063000	KV063006	1	0	1
	KV097000	KV097008	0	1	1
		KV097011	0	2	2
	KV107000	KV107007	1	0	1
	Total		8	3	11
Moose	KV022000	KV022001	1	0	1
		KV022002	2	0	2
		KV022005	1	0	1
		KV022006	1	0	1
		KV022007	3	0	3
		KV022008	1	0	1
		KV022011	1	0	1
		KV022014	2	0	2
		KV022015	1	0	1
	KV023000	KV023001	1	0	1

Species	Complex	Transect	Visit 1	Visit 2	Total
Moose	KV036000	KV036002	5	0	5
		KV036003	0	2	2
		KV036006	2	0	2
		KV036007	3	0	3
		KV036009	1	0	1
		KV036012	2	2	4
		KV036013	2	0	2
		KV036015	1	0	1
		KV036016	1	0	1
		KV036017	1	0	1
	KV037000	KV037001	1	0	1
		KV037002	1	0	1
		KV037003	2	1	3
		KV037004	0	1	1
	KV038000	KV038001	0	2	2
		KV038002	15	7	22
		KV038005	1	0	1
		KV038007	2	7	9
		KV038009	1	0	1
		KV038010	2	1	3
		KV038011	4	0	4
		KV038012	0	1	1
		KV038013	0	1	1
		KV038014	1	0	1
		KV038015	1	2	3
		KV038016	1	4	5
		KV038017	4	0	4
		KV038018	3	0	3
	KV039000	KV039001	7	5	12
	KV044000	KV044006	2	1	3
		KV044009	0	3	3
		KV044010	0	1	1
	KV047000	KV047001	3	2	5
	KV050000	KV050003	6	0	6
		KV050004	1	0	1
		KV050005	2	0	2
		KV050006	1	0	1
		KV050007	2	0	2
		KV050008	1	0	1
	KV058000	KV058001	4	0	4

Species	Complex	Transect	Visit 1	Visit 2	Total
Moose	KV058000	KV058000	7	0	7
		KV058004	3	0	3
		KV058005	1	2	3
		KV058007	0	1	1
		KV058009	3	0	3
		KV058010	4	3	7
		KV058011	1	0	1
		KV058013	4	1	5
	KV061000	KV061001	1	0	1
		KV061003	2	2	4
	KV062000	KV062001	3	0	3
		KV062002	4	0	4
	KV063000	KV063001	4	0	4
		KV063003	3	0	3
		KV063004	1	0	1
		KV063005	1	0	1
		KV063006	1	0	1
	KV066000	KV066001	1	4	5
		KV066002	1	0	1
	KV069000	KV069002	3	0	3
		KV069003	3	5	8
		KV069004	2	0	2
	KV071000	KV071001	2	2	4
	KV094000	KV094001	3	0	3
		KV094002	7	2	9
		KV094003	1	1	2
		KV094004	2	0	2
		KV094005	3	1	4
		KV094006	1	0	1
		KV094007	3	0	3
	KV097000	KV097001	2	0	2
		KV097002	2	0	2
		KV097005	2	0	2
		KV097006	1	0	1
		KV097010	0	2	2
		KV097011	5	0	5
		KV097012	1	0	1
	KV098000	KV098002	0	1	1
	KV101000	KV101001	0	1	1
		KV101002	1	0	1

Species	Complex	Transect	Visit 1	Visit 2	Total
Moose	KV101000	KV101005	0	1	1
	KV102000	KV102001	6	2	8
		KV102002	1	0	1
	KV103000	KV103001	2	0	2
		KV103002	3	1	4
		KV103003	0	1	1
		KV103005	2	2	4
	KV107000	KV107001	1	0	1
		KV107007	2	0	2
		KV107009	0	1	1
	KV113000	KV113001	2	0	2
		KV113003	1	0	1
		KV113004	4	0	4
		KV113006	4	0	4
		KV113007	3	0	3
		KV113008	2	0	2
		KV113009	2	0	2
		KV113010	1	0	1
		KV113012	2	0	2
		KV113013	1	0	1
		KV113014	2	0	2
	KV116000	KV116001	1	4	5
	KV119000	KV119001	0	1	1
		KV119002	0	2	2
		KV119003	1	3	4
		KV119004	2	0	2
		KV119005	0	2	2
		KV119006	3	2	5
	KV121000	KV121001	2	0	2
	KV122000	KV122001	1	3	4
	KV123000	KV123001	2	17	19
	KV124000	KV124001	3	6	9
	Total		245	119	364
Moose calf	KV038000	KV038018	1	0	1
	KV050000	KV050003	1	0	1
	KV063000	KV063001	1	0	1
		KV063006	1	0	1
	KV094000	KV094001	2	0	2
		KV094006	1	0	1
	KV102000	KV102002	1	0	1

Species	Complex	Transect	Visit 1	Visit 2	Total
Moose calf	KV107000	KV107007	1	0	1
	KV119000	KV119003	1	0	1
	Total		10	0	10
Black bear	KV036000	KV036012	1	0	1
	KV037000	KV037002	1	1	2
	KV062000	KV062001	2	0	2
	KV063000	KV063001	1	0	1
	KV069000	KV069003	0	12	12
	Total		5	13	18
Gray wolf	KV038000	KV038016	0	1	1
	KV058000	KV058003	1	0	1
		KV058009	4	0	4
		KV058013	1	0	1
	KV069000	KV069003	1	1	2
	KV094000	KV094002	1	0	1
	KV102000	KV102001	1	0	1
	Total		9	2	11

Table A-7: Number of Large Mammal Signs Detected during Three Visits to Access Road Tracking Transects, 2020

Species	Access Road	Transect	Visit 1	Visit 2	Total
Caribou	North	N-24	2	0	2
		N-36	2	0	2
		N-38	0	1	1
		S-42	3	0	3
		S-51	0	2	2
		S-53	2	3	5
	South	S-1	1	0	1
		S-10	3	8	11
		S-15	1	0	1
		S-16	0	8	8
		S-18	4	0	4
	Total		18	22	40
Caribou calf	Total	–	0	0	0
Moose	North	N-23	10	13	23
		N-24	31	11	42
		N-34	43	18	61
		N-36	35	10	45
		N-38	23	18	41
		N-39	3	2	5
		N-40	40	6	46
		S-42	29	0	29
		S-46	10	17	27
		S-51	0	37	37
		S-52	8	12	20
		S-53	12	10	22
	South	S-1	2	34	36
		S-10	18	8	26
		S-15	31	11	42
		S-16	49	18	67
		S-18	8	15	23
		S-8	10	0	10
	Total		362	240	602
Moose calf	North	N-23	2	0	2
		N-34	2	0	2
		N-36	1	0	1
		N-39	1	0	1
		S-42	1	0	1
	South	S-15	1	0	1

Species	Access Road	Transect	Visit 1	Visit 2	Total
Moose calf	South	S-16	1	1	2
	Total		9	1	10
Black bear	North	N-24	6	0	6
		N-36	5	0	5
		N-38	0	6	6
		S-46	0	1	1
		S-51	2	0	2
		S-53	2	0	2
	Total		15	7	22
Gray wolf	North	N-36	1	0	1
		N-38	0	2	2
		N-40	2	0	2
	South	S-1	0	1	1
	Total		3	3	6