Keeyask Generation Project

Terrestrial Effects Monitoring Plan

Caribou Sensory Disturbance Monitoring Report

TEMP-2018-17

KEEYASK

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KEEYASK GENERATION PROJECT

TERRESTRIAL EFFECTS MONITORING PLAN

REPORT #TEMP-2018-17

CARIBOU SENSORY DISTURBANCE MONITORING

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. 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 or not more needs to be done to reduce harmful effects.

The ranges of three migratory caribou (*Rangifer tarandus*) subpopulations extend into the Keeyask region: the Qamanirjuaq subpopulation of Barren-ground caribou, and the Southern Hudson Bay (formerly called Pen Islands) and Cape Churchill subpopulations of Eastern Migratory caribou (formerly called forest-tundra or coastal caribou). Groups from these subpopulations 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 peatland complexes (raised treed patches surrounded by low, wet areas, which essentially act as islands). Summer resident caribou likely move within and 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 susceptible to 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 transects and trail cameras were used to gather information on caribou (and other large mammal) use of islands in lakes, mainland habitat, and habitat near the north and south access roads. Islands in lakes and mainland areas were surveyed as 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 impacts of traffic disturbance on caribou and other large mammals.

Most ground tracking transects were visited three times in 2017, timed to coincide with periods in the caribou calving and calf-rearing season. The initial visit was in April, prior to cow arrival, to ensure animals were not disturbed during calving. The second visit was in July, to coincide with the early calf-rearing period. The third 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.

A trail camera was placed on most ground tracking transects on islands in lakes and within each mainland habitat surveyed during the initial visit. 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, and the species, number, and sex (where possible) of photographed animals was noted.

The timing of ice breakup in Stephens Lake was also monitored using trail cameras deployed along the shoreline, to see how it corresponds with the use of the islands in the lake by caribou.

What was found?

Caribou occupied 69% of the islands in lakes surveyed in 2017. 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, then reversed in 2017, when caribou and calves were detected on a greater percentage of islands than in 2015. As predicted in the EIS, several Project-affected islands were unoccupied by caribou in 2017. However, the percentage of Project-affected islands on which caribou were detected more than doubled (from 28% to 65%) from 2015 to 2017.

The percentage of ice cover on Stephens Lake remained consistent from mid-April until mid- to late May, and then decreased rapidly. Ice breakup was on June 2 and Stephens Lake was free of ice by June 3.

Caribou on an Island in Stephens Lake in 2017

Caribou occupied 75% of all surveyed mainland habitat areas, 19% of which were also occupied by calves. While caribou activity was detected in most Project-affected mainland habitat, the presence of caribou calves was detected in only one. Caribou occupied more unburned than burned complexes. No sign of calves was found in burned complexes.

On access road transects the density of caribou signs was greater within 2 km of the access roads than beyond 2 km. The density of calf signs was also greater within 2 km of the access roads.

What does it mean?

While the spring and summer distribution of caribou in Gull and Stephens lakes can vary from year to year, the potentially unoccupied islands near the Project site may indicate avoidance of habitat due to construction-related sensory disturbances. As caribou can eventually get used to human disturbance, some animals may be less affected by ongoing construction activity than others, or the extent of the disturbance effect (i.e., 4 km from the GS site) may be less than predicted in the EIS.

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 small proportion of mainland habitat, particularly burned area, occupied by caribou calves suggests that there is less calving activity in mainland habitat than on islands in lakes, and that cows avoid recently burned areas when calving.

It is unclear why there appears to be more caribou activity near the access roads than further away. As caribou can tolerate some human disturbance, some individuals may be less affected by traffic noise than others, or the extent of the noise effect (i.e., 2 km from the access roads) may be less than predicted in the EIS. 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.

What will be done next?

Ground tracking transects and trail camera studies conducted in 2015 and 2017 will be repeated in 2018. Information from this caribou monitoring study will be provided to the Keeyask Caribou Coordination Committee (KCCC) to support the Partnership's monitoring activities and collaborate, if requested, on the development of broader common research goals and perspectives with Manitoba Hydro, Manitoba Sustainable Development, and local stakeholders.

A five-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

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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.

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, use of calving and calf-rearing habitat in the Keeyask region by caribou (*Rangifer tarandus*) during the construction and operation phases.

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 from the Qamanirjuaq herd of barren-ground caribou will occasionally migrate from Nunavut into the Keeyask region in winter, although large numbers (10,000) have been recorded infrequently (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 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 group of caribou occupies the Keeyask region in spring and summer (herein referred to as summer resident caribou). This group is known to calve on the islands in Gull and Stephens lakes and in peatland complexes comprised of treed islands - raised areas of mainland habitat surrounded by expansive, treeless wetlands. These islands in lakes and in peatland complexes

(hereafter referred to as calving habitat) 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 likely move within and beyond the Keeyask region, but their herd association and the extent of their core range are 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.

The Project may affect the distribution of caribou and their use of calving habitat due to habitat loss and alteration, sensory disturbance, and changes to the predator community. Predicted Project effects on caribou included the loss or alteration of winter habitat, calving and calf-rearing 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 loss of effective habitat due to sensory disturbance was anticipated. Noise generated by construction activity, blasting, and vehicle traffic may cause a loss of effective habitat and result in caribou temporarily avoiding otherwise suitable habitat near these disturbances. Effective habitat loss for summer resident caribou is predicted to occur within 2 km of the north and south access roads and within 4 km of the generating station construction site (KHLP 2012).

Caribou are particularly vulnerable to sensory disturbance during the calving period and the loss of physical or effective calving habitat could result in reduced reproduction if calving habitat becomes limited. Currently, calving habitat in the Keeyask region typically consists of islands in lakes and in peatland complexes, which comprise a relatively small proportion of available habitat on the landscape. Combined with the tendency of caribou 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, 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 surveys 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, gray wolf, and black bear were also documented to estimate the amount of alternative prey and predator activity in the region. The timing of ice breakup on Stephens Lake 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 transects were surveyed to gather information on the use of islands in lakes, peatland complexes, and in habitat near the north and south access roads by caribou and three other large mammal species. Moose were included in the survey as they are a potential attractant for wolves that could opportunistically prey on caribou. Gray wolves and black bears 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 surveyed to determine the effects of traffic disturbance on caribou and other large mammals.

Most tracking transects were visited three times. During the initial visit, biodegradable thread was strung approximately 75 cm above ground level and anchored to tall vegetation (i.e., 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 Global Positioning System (GPS) units.

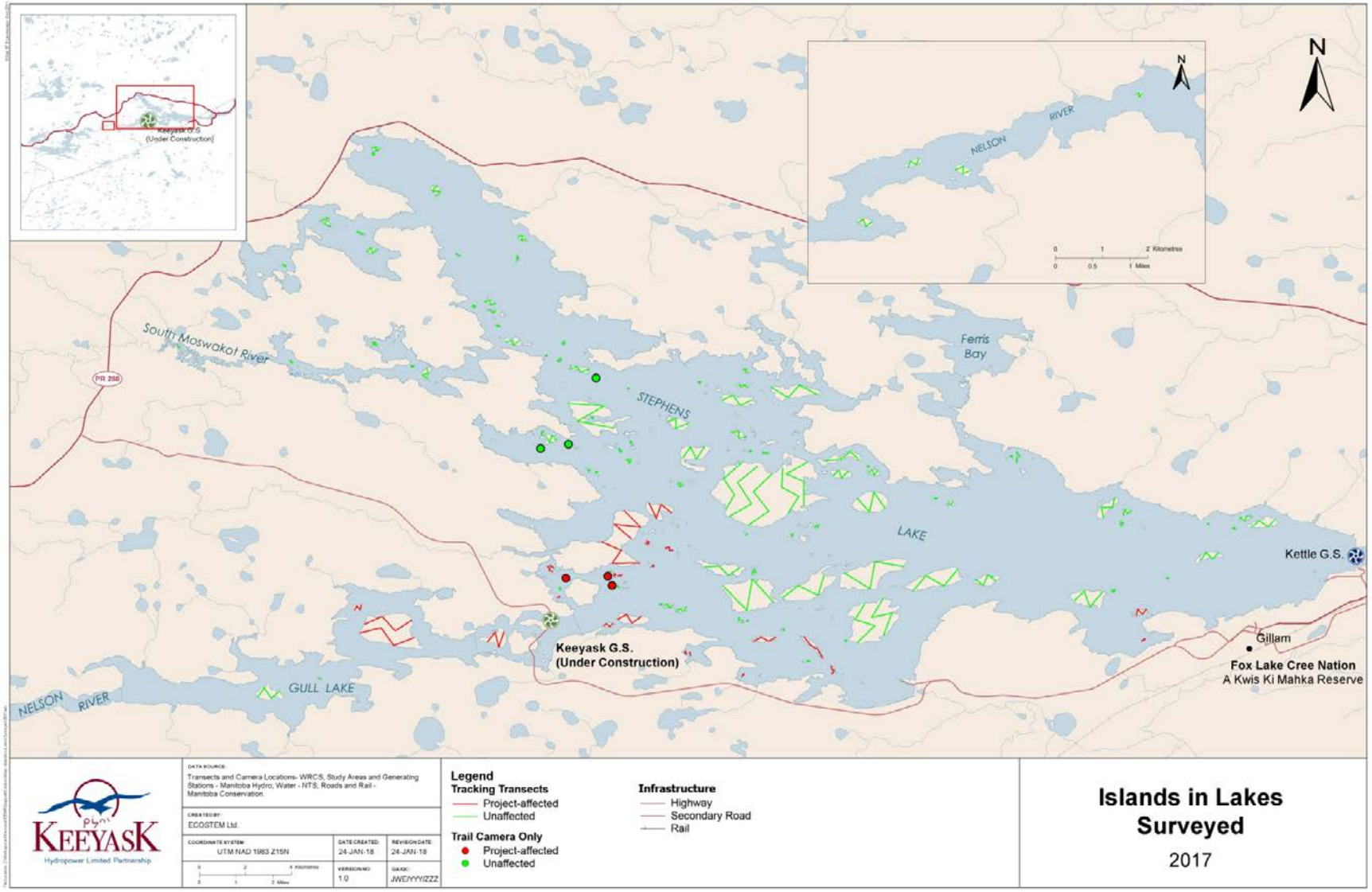
During the second and third visits, large mammal activity was identified at breaks in the thread along each transect, where possible. Thread breaks observed during the second visit were repaired to allow for re-evaluation on the third visit. The locations of all thread breaks were recorded with a GPS unit. Sign 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 further 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 construction site were "Project-affected" and those beyond were "unaffected" (KHLP 2015). A total of 125 transects on 116 islands were surveyed in Stephens and Gull lakes in 2017, three of which were not surveyed in 2015, the previous monitoring year for tracking

transects (Appendix 1, Table A-1). Twenty-five transects totalling 25.2 km in length were surveyed on 23 Project-affected islands and 100 transects totalling 101.4 km in length were surveyed on 93 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 seven island transects during the initial visit. All but two were at the same locations as in 2015 and/or 2016, the previous trail camera monitoring years for caribou (Appendix 1, Table A-2). Six cameras were placed at locations independent of transects. In all, 126 cameras were deployed on 115 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 second visit to tracking transects, and the cameras were removed during the third visit. 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 2017

2.1.1.2 PEATLAND COMPLEXES

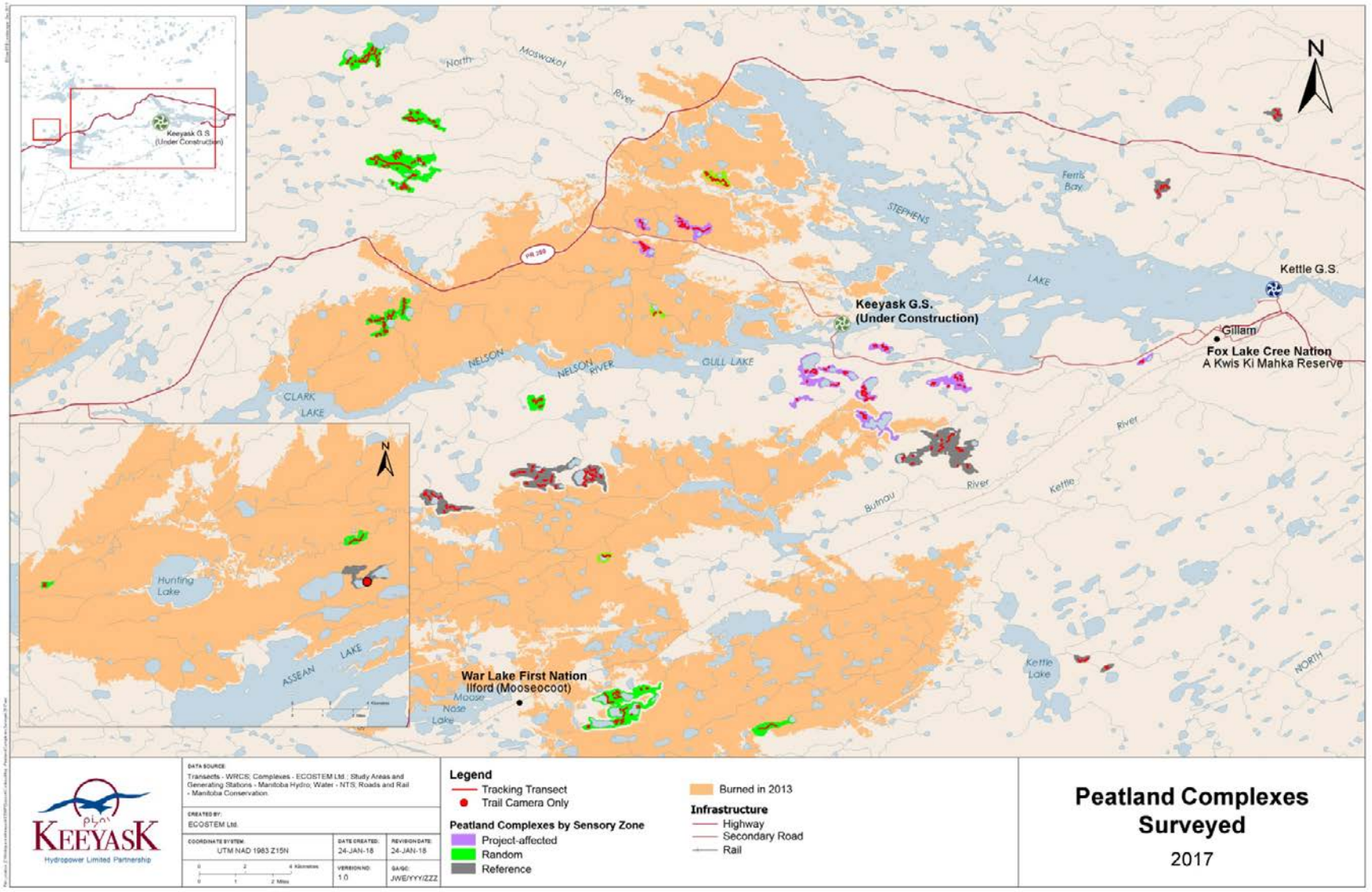
Peatland complex tracking transects were established on raised mainland habitat "islands" within a wet bog matrix. Peatland complexes were selected and categorized based on their distance to a disturbance source. Project-affected peatland complexes were within 2 km of the north or south access road or within 4 km of the generating station construction site, and where disturbance was generated only from these features. For each Project-affected peatland complex, a reference peatland complex similar in size and with similar habitat characteristics but not affected by sensory disturbance (i.e., more than 2 km from the access roads and more than 4 km from the generating station construction site) 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.

Similar to 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-eight transects were surveyed in 31 peatland complexes, totalling 108.8 km in length (Table 1, 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 254 m to 14.1 km.

A Reconyx™ PM35C31 trail camera was placed on one transect within each peatland complex during the initial visit, all but one of which were also surveyed in 2015 and/or 2016, the previous trail camera monitoring years for caribou (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 second visit, and the cameras were removed during the third visit. Photographs were reviewed following removal of memory cards, and the species, number, and sex of photographed animals was determined, where possible.

Table 1: Peatland Complexes and Transects Surveyed in 2017

Complex Type	Number of Complexes	Number of Transects	Length of Transects (km)
Project-affected (burned in 2013)	3	15	7.9
Project-affected (not burned in 2013)	8	27	16.4
Reference (burned in 2013)	3	9	5.6
Reference (not burned in 2013)	8	53	28.5
Random (burned in 2013)	4	20	12.3
Random (not burned in 2013)	5	64	38.1
Total	31	188	108.8



Map 2: Peatland Complexes Surveyed in 2017

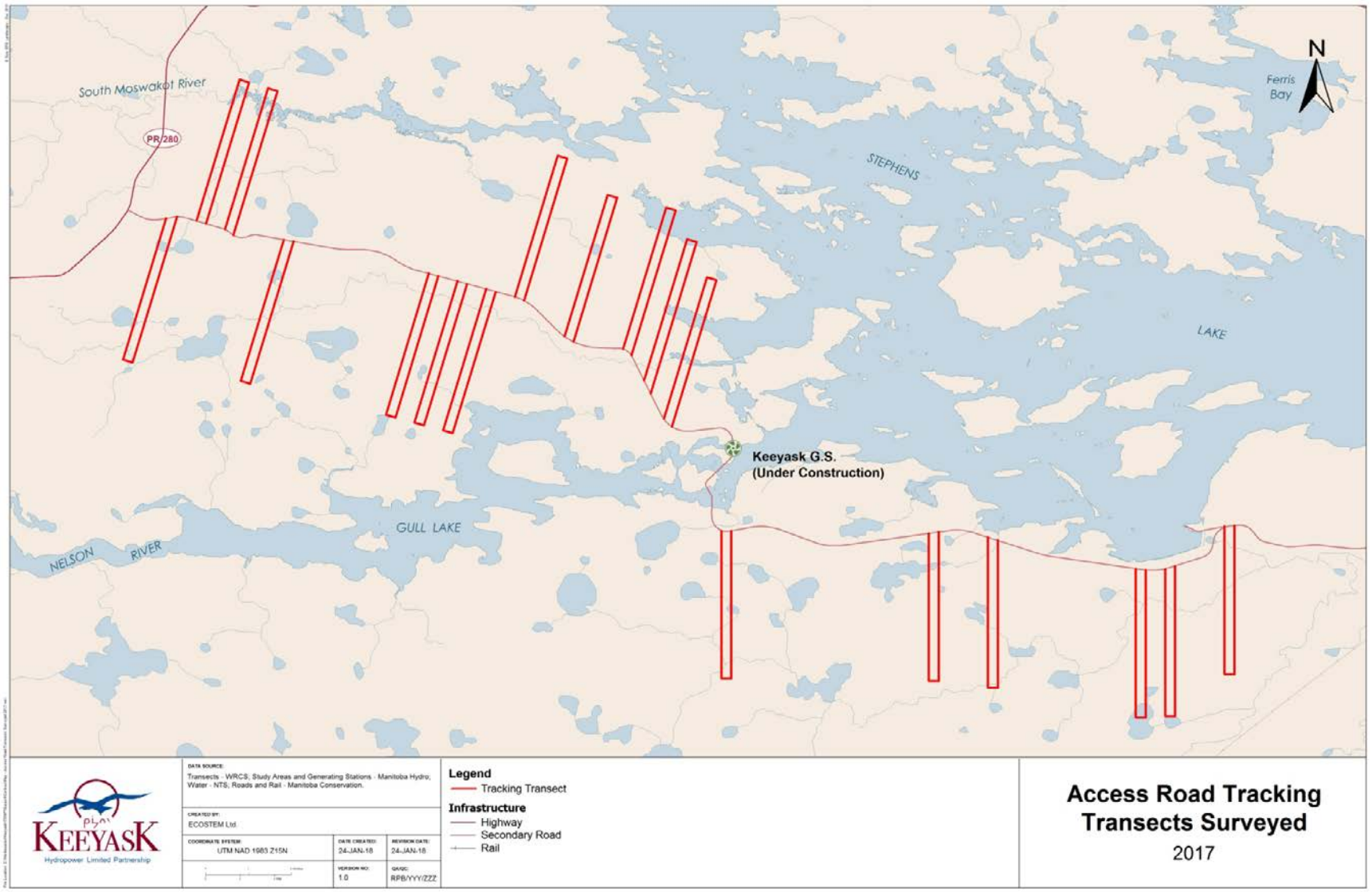
2.1.1.3 ACCESS ROAD TRANSECTS

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 2).

Eighteen access road transects were surveyed, all of which were also surveyed in 2015, the previous tracking transect monitoring year. Seven transects totalling 71.2 km in length were located along the north side of the north access road, five totalling 56.9 km were on the south side of the north access road, and six totalling 64.5 km were located on the south side of the south access road (Map 3). Of the 192.6 km surveyed, 72 km were within 2 km of an access road, where effects of sensory disturbance on caribou were anticipated, and 120.6 km were beyond 2 km, where no sensory disturbance effects were expected.

Table 2: Access Road Transects Surveyed in 2017

North Access Road		South Access Road	
Transect	**Length (km)**	**Transect**	**Length (km)**
N23	8.1	S1	11.1
N24	9.0	S10	10.2
N34	12.2	S15	10.6
N36	11.0	S16	11.0
N38	9.7	S18	10.4
N39	12.4	S8	11.2
N40	8.8		
S42	12.0		
S46	11.1		
S51	10.7		
S52	11.0		
S53	12.1		



Map 3: Access Road Tracking Transects Surveyed in 2017

Most transects on islands in lakes, in peatland complexes, and perpendicular to the access roads were visited three times in 2017; six island in lake transects and one peatland complex transect were visited once or twice. Each visit was timed to coincide with caribou calving and calf-rearing periods. 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 3).

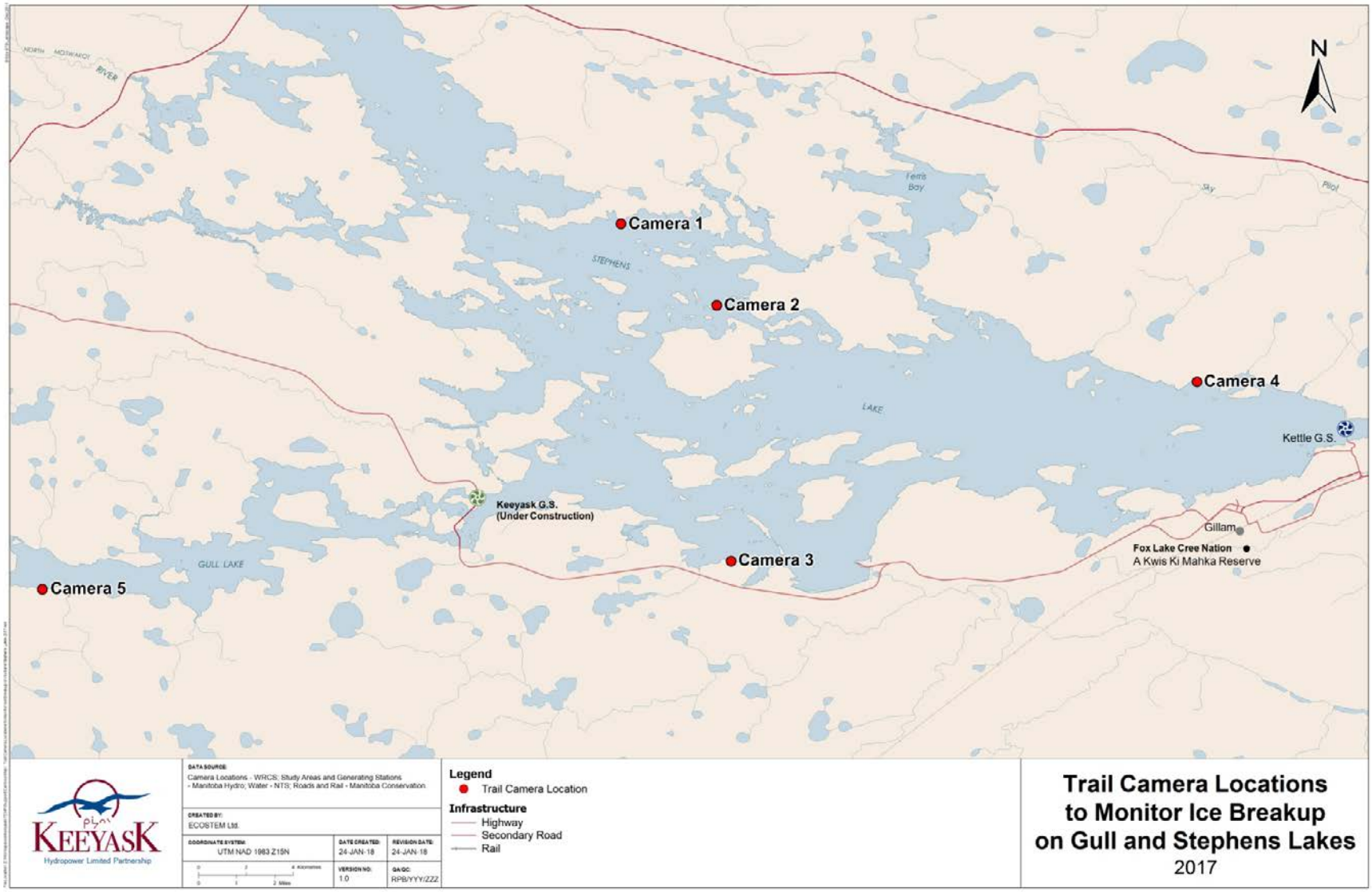
Table 3: Start and End Dates of Survey Visits to Tracking Transects, 2017

Transect Type	Visit 1			Visit 2			Visit 3		
	Start Date	End Date	No. Days[1]	Start Date	End Date	No. Days	Start Date	End Date	No. Days
Island in lakes	Apr. 7	Apr. 17	10	Jul. 7	Jul. 26	19	Sep. 6	Sep. 19	13
Peatland complex	Apr. 7	Apr. 17	10	Jul. 7	Jul. 27	20	Sep. 6	Sep. 19	13
Access road	Apr. 8	Apr. 13	5	Jul. 7	Jul. 27	20	Sep. 7	Sep. 19	12

1. Signs only visible from the last major snowfall.

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 to monitor the timing of ice breakup from April 9 to 16, 2017 (Map 4). The trail cameras were set to take a picture of the lake every four hours during daylight hours. 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.



Map 4: Trail Camera Locations to Monitor Ice Breakup on Gull and Stephens Lakes, 2017

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. Only tracking data from the second and third visits 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.

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 122 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 first visit in April to describe large mammal activity. The activity of caribou and other large mammals near 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). The portions of the transects within 2 km of the north or south access roads were considered to be Project-affected; those beyond were considered 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 84 of the 116 islands on which ground tracking transects were surveyed (Table 4; Appendix 1, Table A-5). Moose were marginally less widely distributed. Signs of all large mammal species were observed on the most islands during the second visit and on the fewest islands during the first visit. As the first visit was prior to the caribou and moose calving season, no signs of calves were observed until the second visit. Black bear and gray wolf signs were observed on fewer islands than either caribou or moose. Wolverine (*Gulo gulo*) signs were also observed on one island during the first visit.

Table 4: Number of Islands in Lakes on Which Large Mammal Sign was Observed, 2017

Species	Visit 1 (Apr. 7 to 17)	Visit 2 (Jul. 7 to 26)	Visit 3 (Sep. 6 to 19)	Visits 2 and 3 Combined	All Visits Combined
Caribou	2	76	40	84	84
Caribou calf	0	19	4	22	22
Moose	5	74	56	82	82
Moose calf	0	18	13	24	24
Black bear	0	24	7	27	27
Gray wolf	5	10	0	10	14

Caribou were photographed on 19 islands (see Photo 1 for a caribou and calf). The first caribou calf was photographed on June 6, 2017 and the first moose calf was photographed on June 2, 2017. The number of islands occupied by caribou and moose (see Photo 2 for a moose cow and calf) appeared to peak in July and June, respectively, and declined in August and September (Table 5). Few predators (gray wolf and black bear) were captured on trail cameras. Wolverine was photographed on four islands, all in April or May (Photo 3). No caribou were photographed on the same islands as black bears or gray wolves (Table 6). Wolverine was photographed on two of the same islands as caribou, two or three months apart. No gray wolves were photographed on the same islands as moose, but there was some overlap in use of islands by moose and black bears (Photo 4). The two species were generally photographed several days or weeks apart, with the exception of one island where observations were separated by two days.

Table 5: Number of Islands in Lakes Occupied by Large Mammals Monthly from Trail Camera Data, 2017

Species	April	May	June	July	August	September	All
Caribou	0	1	11	13	11	5	19
Caribou calf	0	0	5	4	5	2	9
Moose	1	3	30	22	18	6	42
Moose calf	0	1	11	7	2	1	13
Black bear	0	3	0	1	2	2	5
Gray wolf	2	1	0	1	1	0	2

Table 6: Nearest Dates on Which Caribou or Moose and Predators Were Photographed on the Same Islands in Lakes, 2017

Island	Caribou	Moose	Black Bear	Wolverine
KI122003	-	Aug. 13	Aug. 15	-
KI124019	-	Aug. 4	-	May 24
KI124044	-	Jul. 29	May 22	-
KI124083	-	Jun. 20	-	Apr. 28
KI124103	-	Aug. 15	Aug. 26	-
KI124117	-	Jun. 19	May 3	-
KI124151	Jul. 10	-	-	Apr. 19
KI124212	Jun. 24	-	-	Apr. 19

Photo 1: Caribou Cow and Calf on an Island in Stephens Lake, June 23, 2017

Photo 2: Moose Cow and Calf on an Island in Stephens Lake, July 17, 2017

Photo 3: Wolverine on an Island in Stephens Lake, April 19, 2017

Photo 4: Black Bear on an Island in the Nelson River, August 15, 2017

When results from tracking transect visits 2 and 3 and trail camera surveys were combined, large mammal activity was detected on 110 of the 122 islands surveyed. Caribou and moose occupied 65 of the same islands, 25 of which were also occupied by black bear and/or gray wolf (Map 5). Six islands were occupied by caribou and/or black bear and gray wolf, with no moose presence observed. Thirteen islands were occupied by caribou only.

Caribou activity was widely distributed on the islands in Gull and Stephens lakes (Map 6). Caribou occupied 69% of the islands surveyed in 2017 (Table 7). Caribou occupied similar percentages of Project-affected and unaffected islands and calves occupied a smaller percentage of Project-affected islands. Moose were the most widely distributed large mammal and were observed on similar proportions of Project-affected and unaffected islands. Moose calves were observed on a greater proportion of Project-affected than unaffected islands (Map 7). Black bear and gray wolf activity was observed on few islands relative to caribou and moose (Table 7; Map 8).

Table 7: Project-affected and Unaffected Islands Occupied by Large Mammals from Combined Tracking Transect[1] and Trail Camera Data, 2017

Species	Project-affected Islands		Unaffected Islands		All Islands	
	Number Occupied	Percentage Occupied	Number Occupied	Percentage Occupied	Number Occupied	Percentage Occupied
Caribou	17	65	67	70	84	69
Caribou calf	2	8	24	25	26	21
Moose	20	77	69	72	89	73
Moose calf	10	39	21	21	31	25
Black bear	5	19	26	27	31	25
Gray wolf	0	0	12	13	12	10

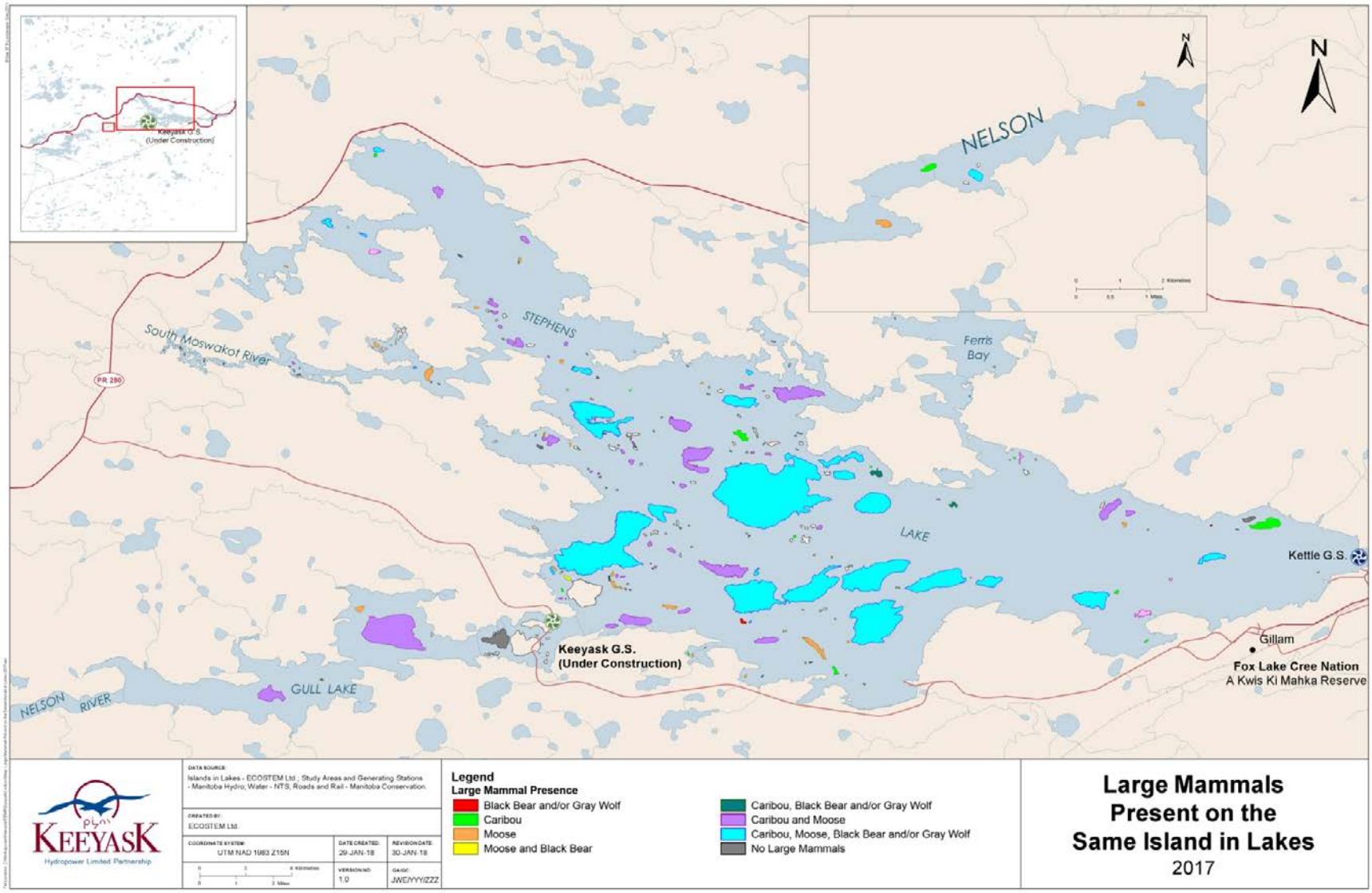
[1] Visits 2 and 3 only

The percentage of Project-affected islands on which caribou were detected more than doubled from 2015 to 2017 (Table 8). The percentage of unaffected islands on which caribou were detected also increased over the same period, but marginally so. Caribou calves were detected on a greater percentage of Project-affected and unaffected islands in 2017 than in 2015, but the increase was more pronounced on unaffected islands. There was a slight decrease in the percentage of Project-affected islands on which moose were observed from 2015 to 2017 and a greater decrease on unaffected islands. Moose calves were detected on 24% more Project-affected islands and on 47% fewer unaffected islands in 2017 than in 2015.

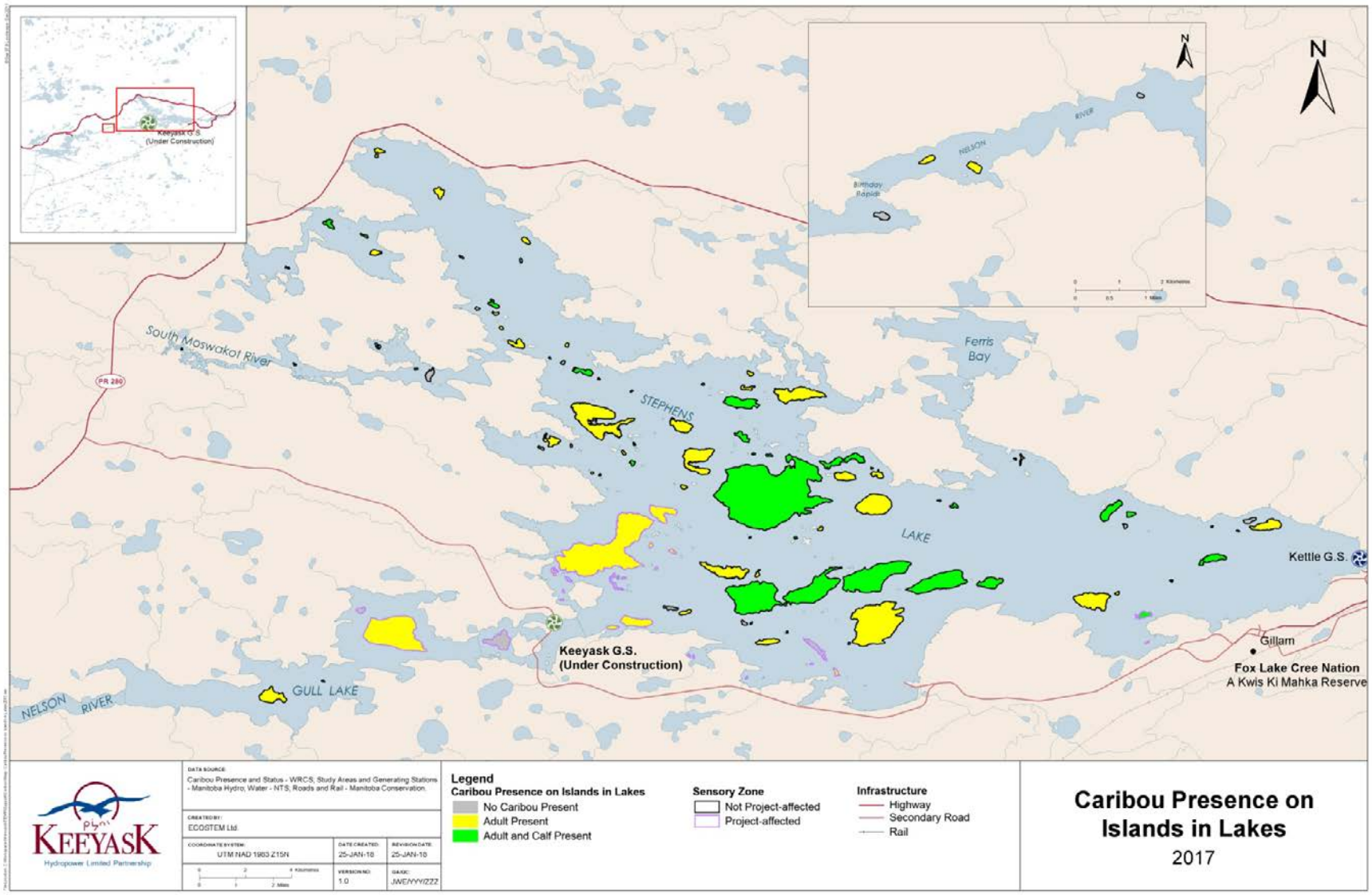
Table 8: Percentage of Project-affected and Unaffected Islands in Lakes on Which Caribou and Moose Presence was Detected during Ground Tracking[1] and/or Trail Camera Surveys, 2015 and 2017

	Project-affected Islands			Unaffected Islands		
Species	2015	2017	Percent Change	2015	2017	Percent Change
Caribou	28	65	+137	67	70	+5
Caribou calf	7	8	+12	19	25	+32
Moose	79	77	-3	91	72	-21
Moose calf	31	39	+24	41	22	-47

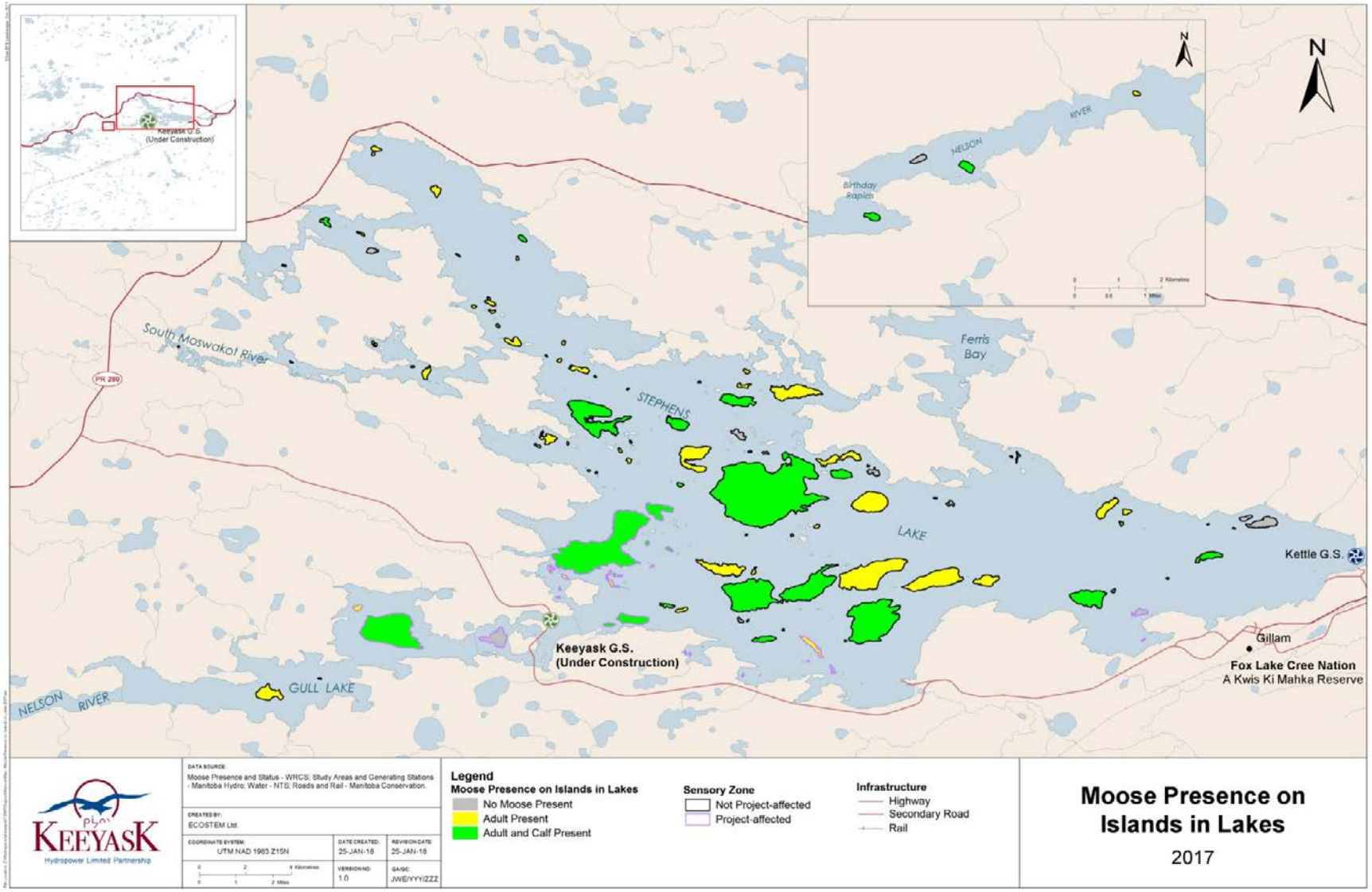
[1] Visits 2 and 3 only.



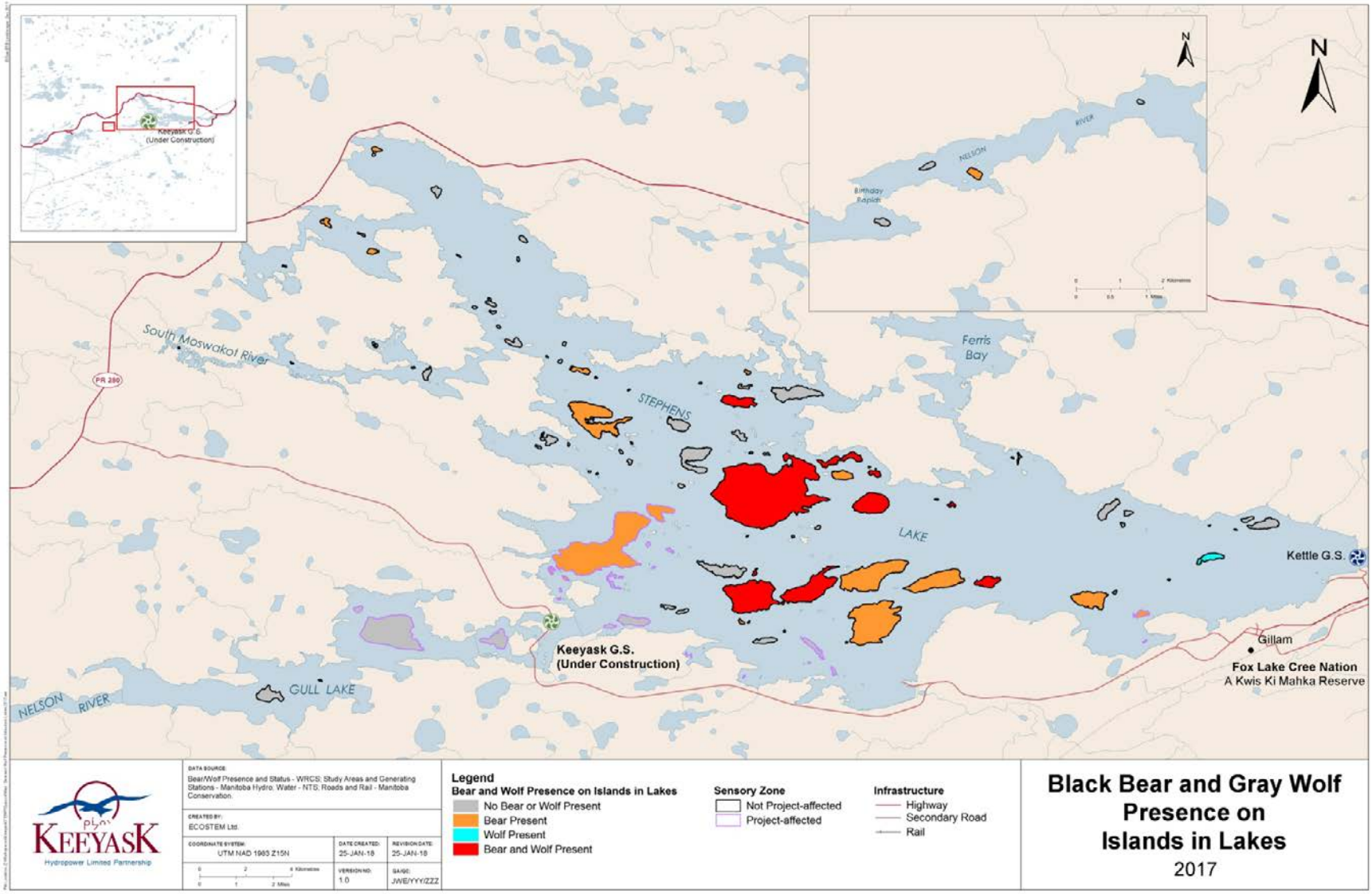
Map 5: Large Mammals Present on the Same Island in Lakes, 2017



Map 6: Caribou Presence on Islands in Lakes, 2017



Map 7: Moose Presence on Islands in Lakes, 2017



Map 8: Black Bear and Gray Wolf Presence on Islands in Lakes, 2017

3.1.2 PEATLAND COMPLEXES

Caribou signs were observed in 24 of the 31 peatland complexes in which ground tracking transects were surveyed (Appendix 1, Table A-5). Moose were marginally more widely distributed (Table 9). Signs of all large mammal species were observed in the most peatland complexes during the second visit and in the fewest complexes during the first visit. As the first visit was prior to the caribou and moose calving season, no signs of calves were observed until the second visit. Gray wolf signs were observed in fewer complexes than either caribou or moose. Wolverine signs were also observed in three peatland complexes.

Table 9: Number of Peatland Complexes Occupied by Large Mammals from Tracking Transect Data, 2017

Species	Visit 1 (Apr. 4 to 17)	Visit 2 (Jul. 7 to 27)	Visit 3 (Sep. 6 to 19)	Visits 2 and 3 Combined	All Visits Combined
Caribou	1	22	18	24	24
Caribou calf	0	4	1	5	5
Moose	9	30	29	30	30
Moose calf	0	16	8	20	20
Black bear	1	17	17	23	24
Gray wolf	6	7	4	9	13

Large mammals were photographed in relatively few peatland complexes. A single caribou calf was photographed, with a radio-collared cow (Photo 5). Moose (Photo 6) were photographed in marginally more peatland complexes than caribou or gray wolves (Photo 7), the next most widely distributed species (Table 10). Trail cameras also captured black bears in two peatland complexes. Wolverine was photographed in two peatland complexes in spring. No caribou were photographed in the same complexes as predators. Moose were photographed in one complex with black bear and in another with gray wolf (Table 11). The detection of moose and predators in the same complex was separated by at least eight days.

Table 10: Number of Peatland Complexes Occupied Monthly by Large Mammals from Trail Camera Data, 2017

Species	April	May	June	July	August	September	All
Caribou	-	-	1	2	2	1	3
Caribou calf	-	-	-	-	-	1	1
Moose	-	1	-	2	2	1	4
Moose calf	-	-	-	-	-	-	-
Black bear	-	1	-	1	-	-	2
Gray wolf	1	-	-	1	1	-	3

Table 11: Nearest Dates on Which Caribou or Moose and Predators Were Photographed in the Same Peatland Complex, 2017

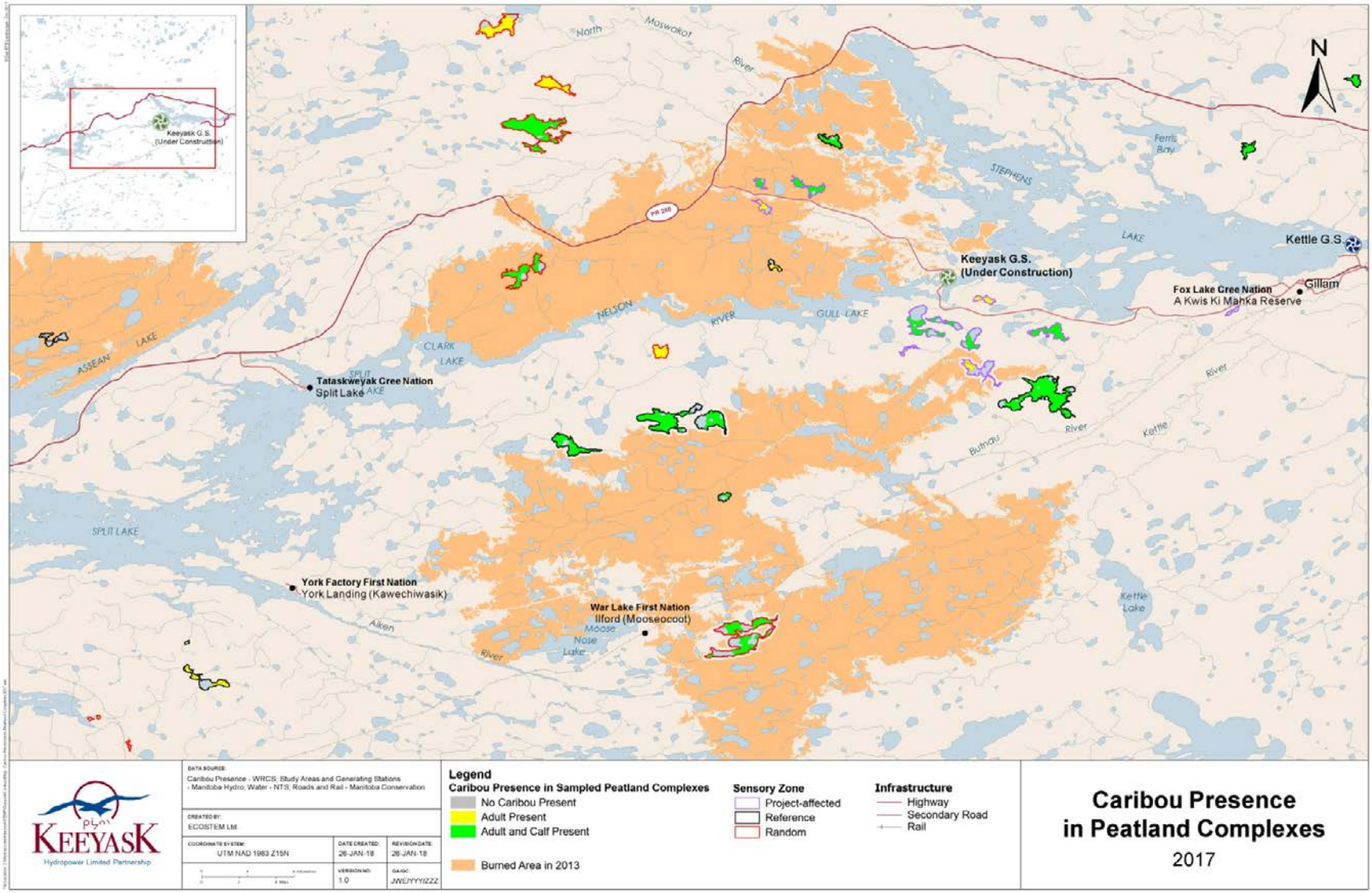
Location	Moose	Black Bear	Gray Wolf
KV062001	Aug. 27	-	Jul. 20
KV123001	May 16	May 8	-

Caribou activity was widely distributed in peatland complexes (Map 9). When results from tracking transect (visits 2 and 3) and trail camera surveys were combined, large mammal activity was detected in 30 of the 32 peatland complexes surveyed. All 24 complexes occupied by caribou were also occupied by moose, which were detected in a total of 30 complexes (Map 10). Gray wolves or black bears (Map 11) were detected in all but four of the complexes occupied by caribou (Map 12).

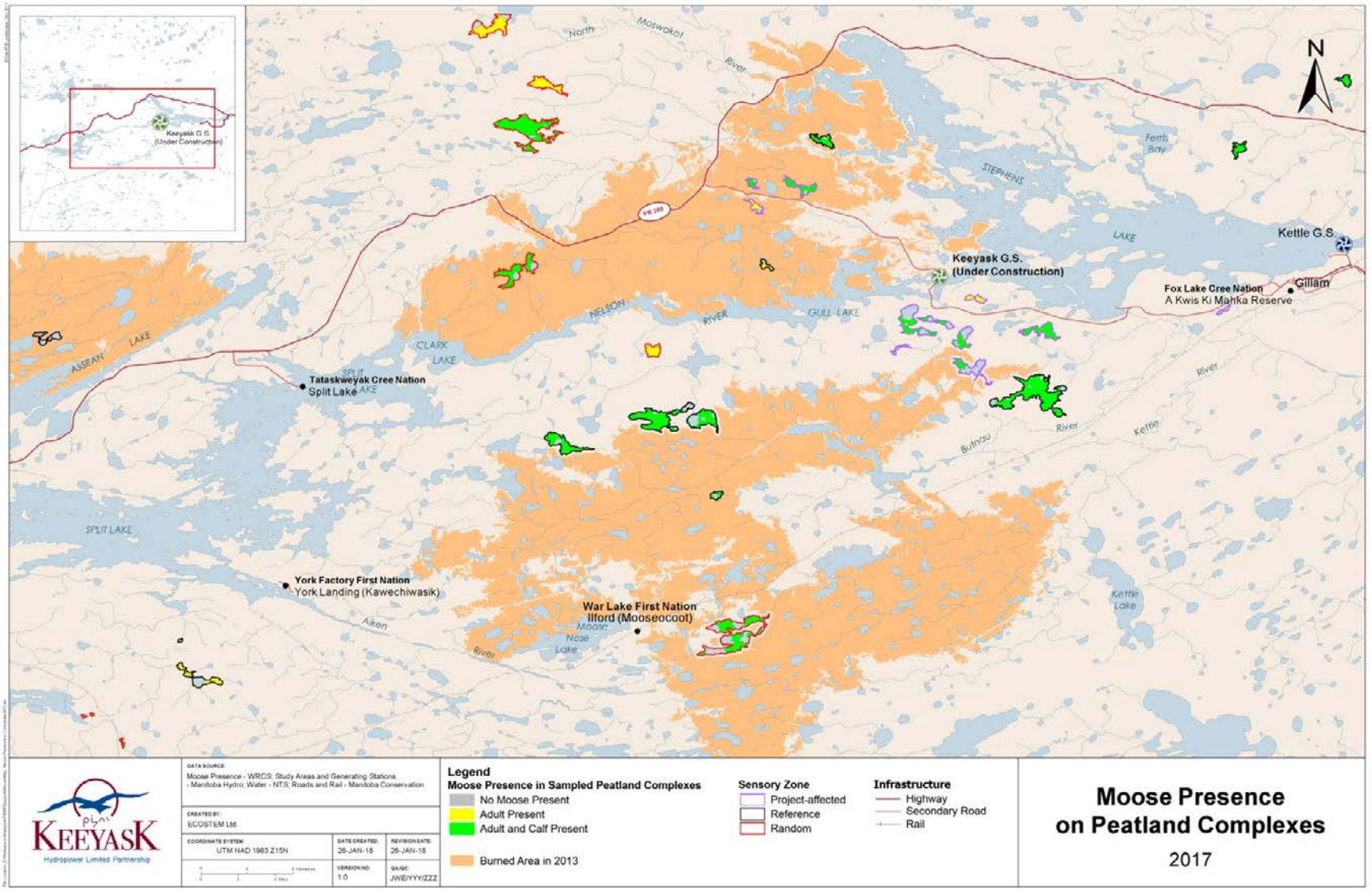
Photo 5: Caribou Cow and Calf in a Peatland Complex, September 1, 2017

Photo 6: Bull Moose in a Peatland Complex, August 19, 2017

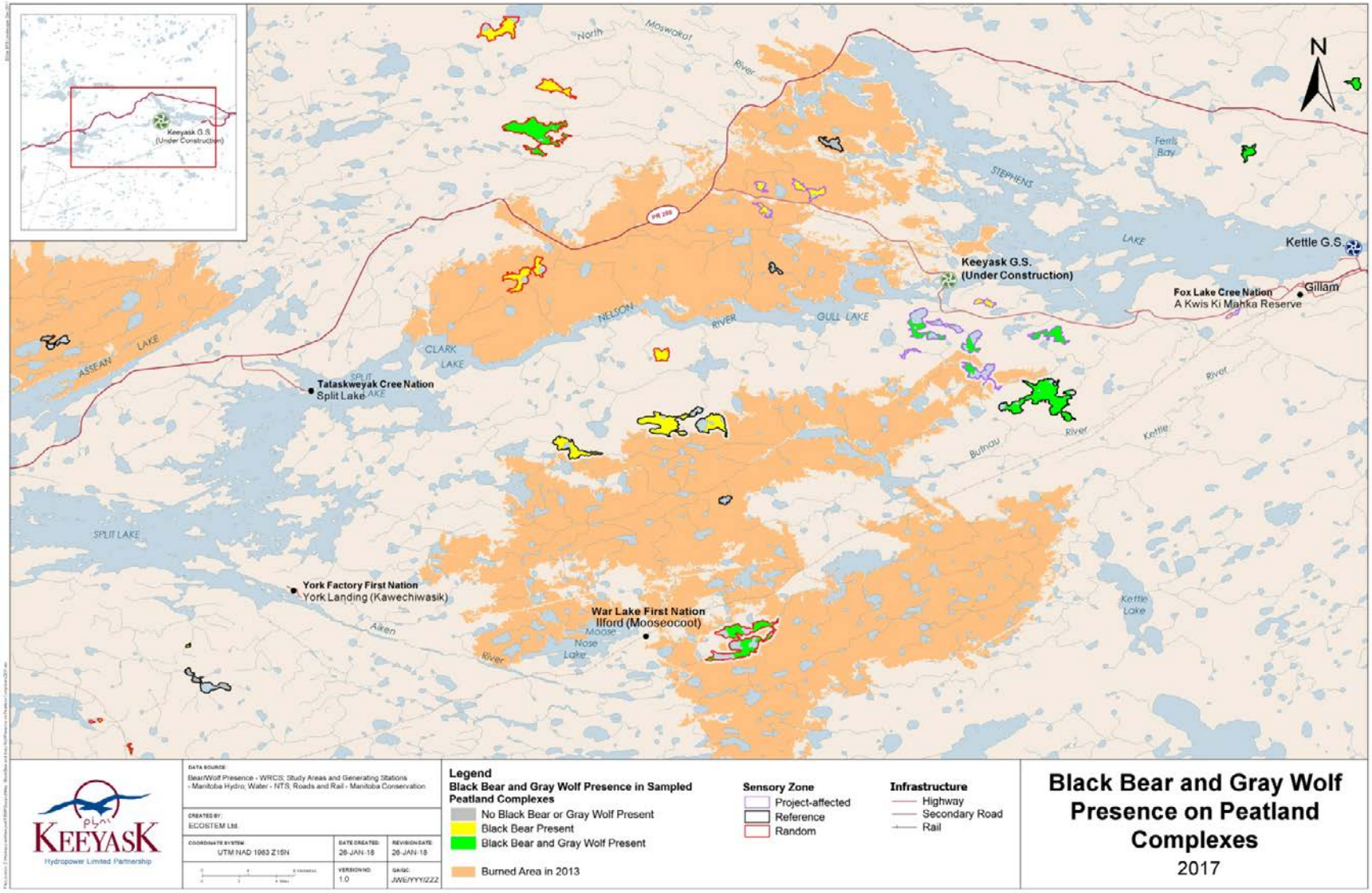
Photo 7: Gray Wolf in a Peatland Complex, April 19, 2017



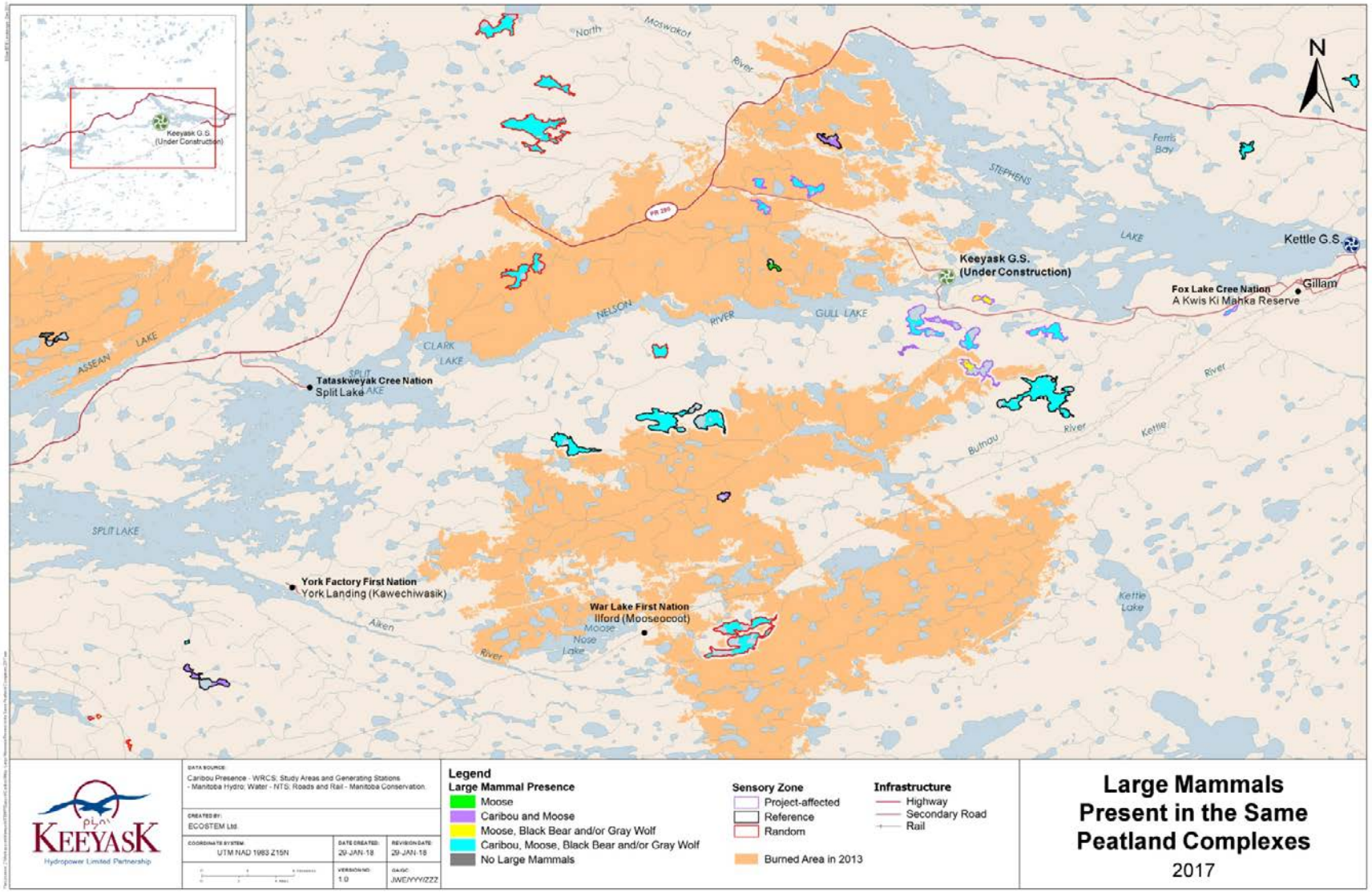
Map 9: Caribou Presence in Peatland Complexes, 2017



Map 10: Moose Presence in Peatland Complexes, 2017



Map 11: Black Bear and Gray Wolf Presence in Peatland Complexes, 2017



Map 12: Large Mammals Present in the Same Peatland Complexes, 2017

When tracking transect and trail camera data were combined, caribou were detected in the greatest percentage of reference complexes and the smallest percentage of random complexes (Table 12). Caribou were detected in a greater percentage of unburned than burned reference and random complexes, but in a greater percentage of burned than unburned Project-affected complexes. Caribou calves were detected in the greatest percentage of reference complexes and in the smallest percentage of Project-affected complexes. No calving activity was observed in burned complexes of any type. Overall, there was a 45% difference in the total number of burned and unburned peatland complexes occupied by caribou, where caribou were detected in 55% and 86% of complexes, respectively.

Table 12: Peatland Complexes Occupied by Caribou by Disturbance Source and Forest Fire Influence from Combined Tracking Transect[1] and Trail Camera Data, 2017

Complex Type	Burned in 2013	Caribou		Caribou Calf	
		Number Occupied	Percentage Occupied	Number Occupied	Percentage Occupied
Project-affected	Yes	3	100	0	0
	No	5	63	1	13
	Total	8	73	1	9
Reference	Yes	2	50	0	0
	No	8	100	3	38
	Total	10	83	3	25
Random	Yes	1	25	0	0
	No	5	100	2	40
	Total	6	67	2	22
All		24	75	6	19

[1.] Visits 2 and 3 only.

Moose were detected in all random complexes, and in a somewhat smaller percentage of Project-affected and reference complexes (Table 13). Moose calves were observed in the greatest percentage of reference complexes and in the smallest percentage of random complexes. Overall, moose were detected in 91% of burned complexes and in 95% of unburned complexes, a difference of 4%.

Table 13: Peatland Complexes Occupied by Moose by Disturbance Source and Forest Fire Influence from Combined Tracking Transect[1] and Trail Camera Data, 2017

Complex Type	Burned in 2013	Moose		Moose Calf	
		Number Occupied	Percentage Occupied	Number Occupied	Percentage Occupied
Project-affected	Yes	3	100	2	67
	No	7	88	5	63
	Total	*10*	*91*	*7*	*64*
Reference	Yes	3	75	2	50
	No	8	100	6	75
	Total	*11*	*92*	*8*	*67*
Random	Yes	4	100	3	75
	No	5	100	2	40
	Total	*9*	*100*	*5*	*56*
All		30	94	20	63

[1] Visits 2 and 3 only.

Black bears were detected in the greatest percentage of random peatland complexes (Table 14). None were observed in burned reference complexes. Overall black bears were detected in 55% of burned complexes and in 86% of unburned complexes. Gray wolves were observed in the greatest percentage of Project-affected complexes and in the smallest percentage of reference complexes. Overall, gray wolves were detected in 9% of burned complexes and in 43% of unburned complexes.

Table 14: Peatland Complexes Occupied by Black Bear and Gray Wolf by Disturbance Source and Forest Fire Influence from Combined Tracking Transect[1] and Trail Camera Data, 2017

Complex Type	Burned in 2013	Black Bear		Gray Wolf	
		Number Occupied	Percentage Occupied	Number Occupied	Percentage Occupied
Project-affected	Yes	3	100	0	0
	No	6	75	4	50
	Total	*9*	*81*	*4*	*36*
Reference	Yes	0	0	0	0
	No	7	88	3	38
	Total	*7*	*64*	*3*	*27*
Random	Yes	3	75	1	25
	No	5	100	2	40
	Total	*8*	*89*	*3*	*33*
All		24	77	10	32

[1] Visits 2 and 3 only.

When tracking transect and trail camera data were combined, caribou were detected in 14% more Project-affected peatland complexes in 2017 than in 2015 (Table 15). The percentage of

burned complexes in which caribou were detected increased substantially from 2015 to 2017 and decreased in unburned complexes over the same period. There was no change in caribou calf detection in burned or unburned Project-affected complexes from 2015 to 2017. As moose were detected in all burned complexes in 2015 and 2017, there was no change in their distribution. Moose detections in unburned complexes decreased 13% and decreased 9% overall during the same period. Moose calves were detected in 33% fewer burned complexes in 2017 than in 2015, in 67% more unburned complexes, and in 17% more complexes overall.

Table 15: Percentage of Project-affected Peatland Complexes in Which Caribou and Moose Presence was Detected during Ground Tracking[1] and/or Trail Camera Surveys, 2015 and 2017

Species	Burned			Unburned			All		
	2015	2017	Percent Change	2015	2017	Percent Change	2015	2017	Percent Change
Caribou	33	100	+200	75	63	-17	64	73	+14
Caribou calf	0	0	0	13	13	0	9	9	0
Moose	100	100	0	100	88	-13	100	91	-9
Moose Calf	100	67	-33	38	63	+67	55	64	+17

[1.] Visits 2 and 3 only.

When tracking transect and trail camera data were combined, caribou were detected in the same percentage of reference peatland complexes in 2017 as in 2015 (Table 16). Caribou were detected in all burned and unburned reference complexes surveyed each year, with no change. There was no change in the percentage of burned or unburned complexes in which caribou calves were detected from 2015 to 2017. The percentage of burned reference transects in which moose were detected declined 20% from 2015 to 2017. Moose calves were detected in 33% fewer burned complexes and in 50% more unburned complexes in 2017 than in 2015, with an overall increase of 14% over all reference complexes during the survey period.

Table 16: Percentage of Reference Peatland Complexes in Which Caribou and Moose Presence was Detected during Ground Tracking[1] and/or Trail Camera Surveys, 2015 and 2017

Species	Burned			Unburned			All		
	2015	2017	Percent Change	2015	2017	Percent Change	2015	2017	Percent Change
Caribou	50	50	0	100	100	0	83	83	0
Caribou calf	0	0	0	38	38	0	25	25	0
Moose	100	75	-25	100	100	0	100	92	-8
Moose Calf	75	50	-33	50	75	+50	58	67	+14

[1.] Visits 2 and 3 only.

When tracking transect and trail camera data were combined, caribou were detected in 25% fewer random peatland complexes in 2017 than in 2015 (Table 17). Caribou were detected in 67% fewer burned complexes in 2017 than in 2015, and were observed in all unburned

complexes both survey years. Caribou calves were detected in 33% fewer unburned complexes in 2017 than in 2015, and overall. Moose were detected in all random complexes in 2015 and 2017, while moose calves were detected in 50% fewer unburned complexes and in 29% fewer total complexes in 2017 than in 2015.

Table 17: Percentage of Random Peatland Complexes in Which Caribou and Moose Presence was Detected During Ground Tracking[1] and/or Trail Camera Surveys, 2015 and 2017

Species	Burned			Unburned			All		
	2015	2017	Percent Change	2015	2017	Percent Change	2015	2017	Percent Change
Caribou	75	25	-67	100	100	0	89	67	-25
Caribou calf	0	0	0	60	40	-33	33	22	-33
Moose	100	100	0	100	100	0	100	100	0
Moose Calf	75	75	0	80	40	-50	78	56	-29

[1.] Visits 2 and 3 only.

3.1.3 ACCESS ROAD TRANSECTS

Caribou signs were observed on all 18 access road transects surveyed in 2017 (Appendix 1, Table A-7). Caribou activity was observed on three transects during the first visit and on all but one transect during the second visit (Table 18). Caribou calf signs were observed on three transects, all during the second or third visits. Moose signs were also detected on all access road transects. More moose activity than caribou activity was observed during the first visit, as moose signs were observed on 17 of the 18 transects surveyed. Signs of moose calves were observed on all transects, all during the second and third visits. Predator signs were somewhat less widely distributed than caribou and moose signs. All black bear and most gray wolf activity was observed during the second and third visits. With the exception of moose, which were detected on a similar number of transects each visit, most large mammal species' presence on access road transects appeared to peak during the second visit.

Table 18: Number of Access Road Tracking Transects with Large Mammal Sign, 2017

Species	Visit 1 (Apr. 8 to 13)	Visit 2 (Jul. 7 to 27)	Visit 3 (Sep. 7 to 19)	Visits 2 and 3 Combined	All Visits Combined
Caribou	3	17	14	17	18
Caribou calf	0	3	1	3	3
Moose	17	18	18	18	18
Moose calf	0	17	13	18	18
Black bear	0	15	12	15	15
Gray wolf	8	12	10	16	16

The density of caribou signs was greatest during the second visit to access road transects (Table 19). A total of four calf signs were observed over all three visits; sign density was low. Moose sign density was considerably greater than the sign density of all other large mammal species over all visits.

Table 19: Mammal Sign Density along Access Road Transects, 2017

Species	Visit 1		Visit 2		Visit 3		Visits 2 and 3	
	Number of Signs	Signs per km	Number of Signs	Signs per km	Number of Signs	Signs per km	Number of Signs	Signs per km
Caribou	5	0.03	308	1.60	86	0.45	394	2.05
Caribou calf	0	0	3	0.02	1	0.01	4	0.02
Moose	130	0.67	1,687	8.76	826	4.29	2,513	13.05
Moose calf	0	0	63	0.33	23	0.12	86	0.45
Black bear	0	0	99	0.51	51	0.26	150	0.78
Gray wolf	39	0.20	22	0.11	21	0.11	43	0.22

The density of caribou and caribou calf signs was greater within 2 km of the access roads than beyond 2 km during the second visit, combined second and third visits, and over all combined visits (Table 20). The density of moose and moose calf signs was generally greater within 2 km of the access roads than further away, with a bigger difference for moose calves.

Table 20: Mammal Sign Density within 2 km and More than 2 km from Access Roads, 2017

Species	Visit 1 (signs per km)		Visit 2 (signs per km)		Visit 3 (signs per km)		Visits 2 and 3 (signs per km)		All Visits (signs per km)	
	≤ 2 km	> 2 km	≤ 2 km	> 2 km	≤ 2 km	> 2 km	≤ 2 km	> 2 km	≤ 2 km	> 2 km
Caribou	0.01	0.03	1.93	1.40	0.42	0.46	1.17	0.93	0.79	0.63
Caribou calf	0	0	0.01	0.02	0.01	0	0.01	0.01	0.01	0.01
Moose	1.04	0.46	11.21	7.30	5.76	3.41	8.49	5.35	6.00	3.72
Moose calf	0	0	0.49	0.23	0.21	0.07	0.35	0.15	0.23	0.10
Black bear	0	0	0.72	0.39	0.47	0.14	0.60	0.27	0.40	0.18
Gray wolf	0.13	0.25	0.19	0.07	0.15	0.08	0.17	0.07	0.16	0.13

3.2 INCIDENTAL OBSERVATIONS

In 2017, mammal and bird species incidentally detected on islands, peatland complexes and access road transects while tracking and from trail camera photos included: American marten, arctic fox, lynx, muskrat, red fox, red squirrel, river otter, snowshoe hare, woodchuck, American robin, bald eagle, boreal chickadee, Canada goose, chipping sparrow, common raven, dark-

eyed junco, gray jay, mallard, rusty blackbird, sandhill crane, spruce grouse, sharp-tailed grouse, willow ptarmigan, and yellow warbler.

3.3 TIMING OF ICE BREAKUP

The camera on Gull Lake and a camera on Stephens Lake did not take photos in 2017. For the remaining three cameras, the percentage of ice cover remained consistent from installation in mid-April until mid- to late May, and then decreased rapidly (Table 21). Ice breakup was on June 2 and Stephens Lake was free of ice by June 3 (Photo 8 to Photo 12). In previous survey years ice breakup was observed by June 2, 2015 and May 20, 2016 (Table 22). Stephens Lake was free of ice by June 3, 2015 and by May 22, 2016.

Table 21: Timing of Ice Breakup on Stephens Lake, 2017

Percent Ice Cover	Camera 2	Camera 3	Camera 4
100	Apr. 11	Apr. 13	Apr. 16
75	May 30	May 26	May 20
50	Jun. 1	May 27	May 27
25	Jun. 2	May 29	May 27
0	Jun. 3	May 30	May 28

Table 22: Timing of Ice Breakup on Stephens Lake, 2015 and 2016

Percent Ice Cover	2015				2016			
	Camera 1	Camera 2	Camera 3	Camera 4	Camera 1	Camera 2	Camera 3	Camera 4
100	May 11	May 11	May 12	May 9	Apr. 29	Apr. 29	Apr. 27	Apr. 28
75	May 25	May 27	May 20	May 24	May 17	May 7	May 8	May 8
50	Jun. 1	May 31	May 23	May 25	May 19	May 17	May 10	May 10
25	Jun. 2	Jun. 2	Jun. 1	May 25	May 20	May 18	May 14	May 15
0	Jun. 3	Jun. 3	Jun. 2	May 26	May 22	May 19	May 18	May 18

Photo 8: Ice Cover at 100% on Stephens Lake, April 13, 2017

Photo 9: Ice Cover at 75% on Stephens Lake, May 26, 2017

Photo 10: Ice Cover at 50% on Stephens Lake, May 27, 2017

Photo 11: Ice Cover at 25% on Stephens Lake, May 29, 2017

Photo 12: Ice Cover at 0% on Stephens Lake, May 30, 2017

4.0 DISCUSSION

Results from tracking transect (visits 2 and 3) and trail camera surveys were combined for an indication of large mammal activity on islands in Gull and Stephens lakes, in peatland complexes, and on transects perpendicular to the access roads. Caribou were widely distributed on islands in lakes in 2017. The percentage of surveyed islands in lakes on which caribou and their calves were detected had declined during the pre-construction period (2010 to 2014), ranging from 100% in 2010 to 74% in 2014 for caribou and from 62% in 2010 to 28% in 2014 for calves (KHLP 2012; Wildlife Resource Consulting Services MB Inc. [WRCS] unpubl. data). The trend continued in 2015, when caribou were detected on 59% of islands and calves on 16% (WRCS 2016). The percentage of islands on which caribou and their calves were present then increased in 2017, to 69% for caribou and 21% for calves. It should be noted that 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 islands.

As predicted in the EIS, several Project-affected islands were unoccupied by caribou in 2017. Three of the largest islands at the GS construction site are no longer suitable for caribou, as they have been cleared and developed. The two most heavily developed islands were not surveyed in 2017; the third was surveyed but no sign of caribou activity was found. Caribou were found on similar percentages of Project-affected and unaffected islands and calves were found on a greater percentage of unaffected islands. The percentage of Project-affected islands on which caribou were detected more than doubled from 2015 to 2017. However, the percentage of unaffected islands on which caribou were detected increased by only 5% over the same period. While the spring and summer distribution of caribou in Gull and Stephens lakes can vary from year to year, the potentially unoccupied islands near the Project site may indicate avoidance of construction-related sensory disturbances. A considerably smaller increase in the percentage of unaffected islands occupied by caribou from 2015 to 2017 suggests that caribou were not re-locating to undisturbed islands in Stephens Lake, as may be expected. 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. Also of note is that no gray wolves were detected on Project-affected islands in 2017, and the large increase in the number of Project-affected islands on which caribou were observed from 2015 to 2017 could suggest that some caribou may have been avoiding wolves. Additional monitoring and 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 calving period. In 2017, ice breakup on Stephens Lake was in early June, in the middle of

the general calving period and a few days earlier than the first caribou calf was photographed (June 6).

Moose were slightly more widely distributed on islands in lakes than caribou in 2017. Most 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 a sufficient source of primary prey for gray wolves.

The presence of caribou calves was detected in a single Project-affected peatland complex, possibly indicating avoidance of construction-related sensory disturbances during the calving period. Caribou occupied 45% more unburned than burned complexes. No calves were found in 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 (up to five years) habitat in summer, when they eat regenerating herbs and deciduous browse (Schaefer and Pruitt 1991). Caribou occupied 75% of all surveyed peatland complexes, only 19% of which were also occupied by calves, suggesting that there is less calving activity in peatland complexes than on islands in lakes, and that cows avoid burns when calving. Moose and moose calves occupied more peatland complexes than caribou; moose were detected in 94% of all surveyed complexes and calves were detected in 63%. Calves were detected in burned and unburned complexes, possibly indicating that moose select a wider range of habitats for calving than caribou.

On access road transects, the density of caribou and moose signs was greater within 2 km of the access roads than beyond 2 km. The density of calf signs was also greater within 2 km of the access roads, with a greater difference for moose calves than for caribou calves. It is unclear why there appears to be more activity, particularly caribou activity, closer to the access roads. 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. Potential differences in habitat quality near and farther from the road, possibly related to fire or other factors, could also have influenced caribou distribution. Additional monitoring and a multi-year analysis of results may identify trends in caribou activity nearer or farther from disturbance on the access roads.

5.0 SUMMARY AND CONCLUSIONS

In 2017, caribou were present on most of the islands and peatland complexes surveyed in the Keeyask region. Caribou did not avoid all islands or peatland complexes within 4 km of the GS 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 within 4 km of the GS or within 2 km of the access road, but other areas within the predicted disturbance zones were largely 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. Additional monitoring and a multi-year analysis of results may identify trends in caribou activity nearer or farther from disturbance at the GS construction site and near the access roads.

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APPENDIX 1:
TABLES

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

Island	Transect	Number of Times Surveyed 2017	Number of Times Surveyed 2015
KI122001	KI122001	3	3
KI122003	KI122003	3	3
KI122005	KI122005	3	3
KI122006	KI122006	3	3
KI123005	KI123005	2	3
KI123008	KI123008	2	3
KI123010	KI123010	3	3
KI123012	KI123012	3	3
	KI123012_001	3	3
KI124003	KI124003	3	3
KI124004	KI124004	2	3
KI124005	KI124005	3	3
KI124007	KI124007	3	3
KI124009	KI124009	3	3
KI124010	KI124010	3	3
KI124013	KI124013	3	3
KI124015	KI124015	3	3
KI124016	KI124016	3	3
KI124017	KI124017	3	3
KI124018	KI124018	3	3
KI124019	KI124019	3	3
KI124020	KI124020	3	3
KI124022	KI124022	3	3
KI124024	KI124024	3	3
KI124026	KI124026	3	3
KI124029	KI124029	3	3
KI124030	KI124030	3	3
KI124035	KI124035	3	3
KI124037	KI124037	3	3
KI124038	KI124038	3	3
KI124040	KI124040	3	3
KI124041	KI124041	3	3
KI124042	KI124042	3	3
KI124043	KI124043	3	3
KI124044	KI124044	3	3
KI124045	KI124045	3	3
KI124046	KI124046	3	3
KI124047	KI124047	3	3
KI124050	KI124050	3	3

Island	Transect	Number of Times Surveyed 2017	Number of Times Surveyed 2015
KI124052	KI124052	3	3
KI124053	KI124053	3	3
KI124055	KI124055	3	3
KI124056	KI124056	3	3
KI124057	KI124057	3	3
KI124058	KI124058	3	3
KI124060	KI124060	3	3
KI124063	KI124063	3	3
KI124065	KI124065	3	3
KI124066	KI124066	3	3
	KI124066_001	3	3
KI124069	KI124069	3	3
KI124070	KI124070	3	3
KI124072	KI124072	3	3
KI124075	KI124075	3	3
KI124079	KI124079	3	3
KI124080	KI124080	3	3
KI124082	KI124082	3	3
KI124083	KI124083	3	3
KI124086	KI124086	3	3
KI124088	KI124088	3	3
KI124089	KI124089	3	3
KI124090	KI124090	3	3
KI124091	KI124091	3	3
KI124092	KI124092	3	3
	KI124092_001	3	3
KI124094	KI124094	3	3
KI124096	KI124096	3	3
KI124097	KI124097	3	3
KI124100	KI124100	2	0
KI124102	KI124102	3	3
KI124103	KI124103	0	3
KI124105	KI124105	3	3
KI124111	KI124111	0	3
KI124115	KI124115	3	3
KI124117	KI124117	3	3
KI124120	KI124120	3	3
KI124124	KI124124	3	3
KI124125	KI124125	3	3
KI124128	KI124128	3	3

Island	Transect	Number of Times Surveyed 2017	Number of Times Surveyed 2015
KI124129	KI124129	3	3
KI124133	KI124133	3	3
KI124136	KI124136	3	3
KI124141	KI124141	3	3
KI124145	KI124145	3	3
KI124146	KI124146	0	3
KI124147	KI124147	3	3
KI124150	KI124150	3	0
KI124151	KI124151	3	3
KI124152	KI124152	0	3
KI124153	KI124153	3	3
KI124155	KI124155	3	3
KI124156	KI124156	3	3
KI124158	KI124158	3	3
KI124162	KI124162	3	3
KI124163	KI124163	3	0
KI124164	KI124164	3	3
KI124165	KI124165	3	3
KI124166	KI124166	3	3
KI124167	KI124167	3	3
KI124170	KI124170	3	3
KI124173	KI124173	3	3
KI124176	KI124176	3	3
KI124178	KI124178	3	3
KI124180	KI124180	3	3
	KI124180_001	3	3
KI124181	KI124181	3	3
KI124182	KI124182	3	3
KI124186	KI124186	3	3
	KI124186_001	3	3
	KI124186_002	3	3
	KI124186_003	3	3
	KI124186_004	3	3
KI124192	KI124192	3	3
KI124193	KI124193	3	3
KI124194	KI124194	3	3
KI124196	KI124196	3	3
KI124197	KI124197	3	3
KI124202	KI124202	3	3

Island	Transect	Number of Times Surveyed 2017	Number of Times Surveyed 2015
KI124205	KI124205	3	3
	KI124205_001	3	3
KI124206	KI124206	3	3
KI124209	KI124209	3	3
KI124210	KI124210	3	3
KI124212	KI124212	3	3
KI124214	KI124214	3	3
KI124217	KI124217	3	3
KI124227	KI124227	3	3
KI126011	KI126011	0	3
KI126016	KI126016	1	3
KI126017	KI126017	0	3
KI126020	KI126020	1	3

Table A-2: Trail Cameras on Islands in Lakes, 2015 to 2017

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

Island	Number of Cameras 2017	Number of Cameras 2016	Number of Cameras 2015
KI124047	1	1	1
KI124050	1	1	1
KI124051	0	1	0
KI124052	1	1	1
KI124053	1	1	1
KI124055	1	1	1
KI124056	1	1	1
KI124057	1	1	1
KI124058	1	1	1
KI124060	1	1	1
KI124063	1	1	1
KI124065	1	1	1
KI124066	2	2	2
KI124069	1	1	1
KI124070	1	1	1
KI124072	1	1	1
KI124075	1	1	1
KI124077	0	1	0
KI124079	1	1	1
KI124080	1	1	0
KI124082	1	1	1
KI124083	1	0	1
KI124086	1	1	1
KI124088	1	1	1
KI124089	1	1	1
KI124090	1	1	1
KI124091	1	1	1
KI124092	2	2	2
KI124094	1	1	1
KI124096	1	1	1
KI124097	1	1	1
KI124100	0	0	0
KI124102	1	1	1
KI124103	0	1	1
KI124105	1	1	1
KI124111	1	1	1
KI124113	0	1	0

Island	Number of Cameras 2017	Number of Cameras 2016	Number of Cameras 2015
KI124115	1	2	1
KI124117	1	1	1
KI124120	1	1	1
KI124124	1	1	1
KI124125	1	1	1
KI124128	1	1	1
KI124129	1	1	1
KI124131	0	1	0
KI124133	1	1	1
KI124136	1	1	1
KI124141	1	1	1
KI124145	1	1	1
KI124146	0	1	1
KI124147	1	1	1
KI124150	1	0	0
KI124151	1	1	1
KI124152	0	1	1
KI124153	1	1	1
KI124155	1	1	1
KI124156	1	1	1
KI124158	1	1	1
KI124162	1	1	1
KI124163	0	0	0
KI124164	1	1	1
KI124165	0	1	1
KI124166	1	1	1
KI124167	1	1	1
KI124170	1	1	1
KI124173	1	1	1
KI124176	1	1	1
KI124178	1	1	1
KI124180	2	3	2
KI124181	1	0	0
KI124182	1	1	1
KI124186	5	6	4
KI124192	1	1	1
KI124193	1	1	1

Island	Number of Cameras 2017	Number of Cameras 2016	Number of Cameras 2015
KI124194	1	1	1
KI124196	1	1	1
KI124197	1	1	1
KI124202	1	1	1
KI124205	2	2	1
KI124206	1	1	1
KI124209	1	1	1
KI124210	1	1	1
KI124212	1	1	1
KI124214	1	1	1
KI124217	1	1	1
KI124227	1	0	1
KI126011	0	0	0
KI126016	0	1	1
KI126017	0	0	1
KI126020	0	1	1

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

Complex	Transect	Number of Times Surveyed 2017	Number of Times Surveyed 2015
KV022000	KV022001	3	3
	KV022002	3	3
	KV022003	3	3
	KV022004	3	3
	KV022005	3	3
	KV022006	3	3
	KV022007	3	3
	KV022008	3	3
	KV022009	3	3
	KV022010	3	3
	KV022011	3	3
	KV022012	3	3
	KV022013	3	3
	KV022014	3	3
	KV022015	3	3
KV023000	KV023001	3	3
	KV023002	3	3
KV036000	KV036001	3	3
	KV036002	3	3
	KV036003	3	3
	KV036004	3	3
	KV036005	3	3
	KV036006	3	3
	KV036007	3	3
	KV036008	3	3
	KV036009	3	3
	KV036010	3	3
	KV036011	3	3
	KV036012	3	3
	KV036013	3	3
	KV036014	3	3
	KV036015	3	3
	KV036016	3	3
	KV036017	3	3
KV037000	KV037001	3	3
	KV037002	3	3
	KV037003	3	3
	KV037004	3	3

Complex	Transect	Number of Times Surveyed 2017	Number of Times Surveyed 2015
KV038000	KV038001	3	3
	KV038002	3	3
	KV038003	3	3
	KV038004	3	3
	KV038005	3	3
	KV038006	3	3
	KV038007	3	3
	KV038008	3	3
	KV038009	3	3
	KV038010	3	3
	KV038011	3	3
	KV038012	3	3
	KV038013	3	3
	KV038014	3	3
	KV038015	3	3
	KV038016	3	3
	KV038017	3	3
	KV038018	3	3
	KV038019	3	3
	KV038020	3	3
KV039000	KV039001	3	3
KV044000	KV044001	3	3
	KV044002	3	3
	KV044003	3	3
	KV044004	3	3
	KV044005	3	3
	KV044006	3	3
	KV044007	3	3
	KV044008	3	3
	KV044009	3	3
	KV044010	3	3
KV047000	KV047001	3	3
	KV047002	3	3
	KV047003	3	3
	KV047004	3	3
	KV047005	3	3
	KV047006	3	3
KV050000	KV050001	2	3
	KV050002	3	3

Complex	Transect	Number of Times Surveyed 2017	Number of Times Surveyed 2015
KV050000	KV050003	3	3
	KV050004	3	3
	KV050005	3	3
	KV050006	3	3
	KV050007	3	3
	KV050008	3	3
KV058000	KV058001	3	3
	KV058002	3	3
	KV058003	3	3
	KV058004	3	3
	KV058005	3	3
	KV058006	3	3
	KV058007	3	3
	KV058008	3	3
	KV058009	3	3
	KV058010	3	3
	KV058011	3	3
	KV058012	3	3
	KV058013	3	3
	KV058014	3	3
KV061000	KV061001	3	3
	KV061002	3	3
	KV061003	3	3
KV062000	KV062001	3	3
	KV062002	3	3
KV063000	KV063001	3	3
	KV063002	3	3
	KV063003	3	3
	KV063004	3	3
	KV063005	3	3
	KV063006	3	3
KV066000	KV066001	3	3
	KV066002	3	3
	KV066003	3	3
KV069000	KV069001	3	3
	KV069002	3	3
	KV069003	3	3
	KV069004	3	3
	KV069005	3	3

Complex	Transect	Number of Times Surveyed 2017	Number of Times Surveyed 2015
KV071000	KV071001	3	3
KV094000	KV094001	3	3
	KV094002	3	3
	KV094003	3	3
	KV094004	3	3
	KV094005	3	3
	KV094006	3	3
	KV094007	3	3
KV097000	KV097001	3	3
	KV097002	3	3
	KV097003	3	3
	KV097004	3	3
	KV097005	3	3
	KV097006	3	3
	KV097007	3	3
	KV097008	3	3
	KV097009	3	3
	KV097010	3	3
	KV097011	3	3
	KV097012	3	3
	KV097013	3	3
KV098000	KV098001	3	3
	KV098002	3	3
KV101000	KV101001	3	3
	KV101002	3	3
	KV101003	3	3
	KV101004	3	3
	KV101005	3	3
KV102000	KV102001	3	3
	KV102002	3	3
KV103000	KV103001	3	3
	KV103002	3	3
	KV103003	3	3
	KV103004	3	3
	KV103005	3	3
	KV103006	3	3
KV107000	KV107001	3	3
	KV107002	3	3
	KV107003	3	3

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

Table A-4: Trail Cameras in Peatland Complexes, 2015 to 2017

Complex	Transect	Number of Cameras 2017	Number of Cameras 2016	Number of Cameras 2015
KV022000	KV022002	1	1	1
KV023000	KV023001	1	1	1
KV036000	KV036006	1	0	0
	KV036016	0	1	1
KV037000	KV037003	1	1	1
KV038000	KV038008	1	1	1
KV039000	KV039001	1	1	1
KV044000	KV044001	1	1	1
KV047000	KV047001	1	1	1
KV050000	KV050006	1	1	1
KV58000	KV058014	1	1	1
KV061000	KV061003	1	1	1
KV062000	KV062001	1	1	1
KV063000	KV063005	1	1	1
KV066000	KV066002	1	1	1
KV069000	KV069005	1	1	1
KV071000	KV071001	1	1	1
KV094000	KV094002	1	1	1
KV097000	KV097002	1	1	1
KV098000	KV098001	1	1	1
KV101000	KV101005	1	1	1
KV102000	KV102002	1	1	1
KV103000	KV103001	1	1	1
KV107000	KV107007	1	1	1
KV113000	KV113005	1	1	1
KV116000	KV116001	1	1	1
KV119000	KV119005	1	1	1
KV120000	KV120001	1	1	1
KV121000	KV121001	1	1	1
KV122000	KV122001	1	1	1
KV123000	KV123001	0	1	1
KV124000	KV124001	1	1	1
KV597000	KV597000	0	1	1

Table A-5: Number of Large Mammal Signs Detected During Three Visits to Tracking Transects on Islands in Lakes, 2017

Species	Transect	Visit 1	Visit 2	Visit 3	Total
Caribou	KI122001	0	4	0	4
	KI122003	0	5	6	11
	KI123005	0	0	1	1
	KI123012_001	0	0	1	1
	KI124003	0	6	0	6
	KI124010	0	11	0	11
	KI124013	0	14	0	14
	KI124015	0	1	0	1
	KI124016	0	2	13	15
	KI124017	0	14	0	14
	KI124020	0	22	0	22
	KI124022	0	16	0	16
	KI124024	0	0	3	3
	KI124026	0	1	0	1
	KI124029	0	3	0	3
	KI124030	0	1	0	1
	KI124035	0	9	11	20
	KI124037	0	88	8	96
	KI124038	0	4	0	4
	KI124040	0	10	5	15
	KI124041	0	3	0	3
	KI124042	0	6	0	6
	KI124043	0	6	0	6
	KI124044	0	8	0	8
	KI124045	0	1	1	2
	KI124046	0	6	15	21
	KI124050	0	25	0	25
	KI124055	0	2	0	2
	KI124056	0	14	0	14
	KI124057	0	0	1	1
	KI124058	0	42	0	42
	KI124060	0	1	0	1
	KI124063	0	20	0	20
	KI124065	0	0	2	2
	KI124066	0	3	0	3
	KI124072	0	6	0	6
	KI124075	0	15	1	16
	KI124079	0	21	0	21

Species	Transect	Visit 1	Visit 2	Visit 3	Total
Caribou	KI124080	0	2	0	2
	KI124082	0	10	12	22
	KI124086	0	5	0	5
	KI124088	0	5	0	5
	KI124089	0	50	1	51
	KI124091	0	4	2	6
	KI124092	0	7	9	16
	KI124092_001	0	3	6	9
	KI124094	0	2	0	2
	KI124100	0	1	0	1
	KI124105	0	4	0	4
	KI124115	4	27	20	51
	KI124117	0	35	8	43
	KI124120	0	8	5	13
	KI124124	0	0	5	5
	KI124128	0	36	0	36
	KI124129	0	1	0	1
	KI124133	0	3	1	4
	KI124136	0	27	0	27
	KI124141	0	4	0	4
	KI124145	0	4	4	8
	KI124147	0	19	1	20
	KI124151	0	9	0	9
	KI124153	0	4	0	4
	KI124155	0	9	0	9
	KI124158	0	6	0	6
	KI124164	0	0	3	3
	KI124165	0	5	0	5
	KI124166	0	2	4	6
	KI124170	0	2	0	2
	KI124173	0	13	20	33
	KI124176	0	15	1	16
	KI124178	0	3	1	4
	KI124180	0	21	12	33
	KI124180_001	1	3	0	4
	KI124181	0	11	2	13
	KI124182	0	19	1	20
	KI124186	0	0	4	4
	KI124186_001	0	8	5	13
	KI124186_002	0	73	9	82

Species	Transect	Visit 1	Visit 2	Visit 3	Total
Caribou	KI124186_003	0	46	9	55
	KI124186_004	0	5	9	14
	KI124192	0	6	3	9
	KI124193	0	25	5	30
	KI124196	0	10	2	12
	KI124202	0	1	0	1
	KI124206	0	0	1	1
	KI124209	0	3	0	3
	KI124210	0	10	10	20
	KI124212	0	6	19	25
	KI124214	0	11	1	12
	KI124217	0	1	0	1
	Total	5	974	263	1242
Caribou calf	KI124010	0	2	0	2
	KI124013	0	1	0	1
	KI124016	0	0	6	6
	KI124017	0	1	0	1
	KI124022	0	1	0	1
	KI124035	0	0	3	3
	KI124037	0	3	2	5
	KI124038	0	1	0	1
	KI124043	0	2	0	2
	KI124046	0	1	0	1
	KI124055	0	1	0	1
	KI124056	0	1	0	1
	KI124075	0	1	0	1
	KI124089	0	4	0	4
	KI124117	0	1	0	1
	KI124136	0	1	0	1
	KI124155	0	1	0	1
	KI124173	0	0	3	3
	KI124176	0	1	0	1
	KI124180	0	1	0	1
	KI124182	0	1	0	1
	KI124186_001	0	3	0	3
	KI124186_003	0	4	0	4
	Total	0	32	14	46
Moose	KI122003	0	32	19	51
	KI122006	1	20	3	24
	KI123005	0	0	3	3

Species	Transect	Visit 1	Visit 2	Visit 3	Total
Moose	KI123010	0	3	0	3
	KI123012	0	78	33	111
	KI123012_001	0	31	23	54
	KI124010	0	4	0	4
	KI124018	0	22	0	22
	KI124019	0	4	3	7
	KI124022	0	0	2	2
	KI124024	0	8	1	9
	KI124026	0	7	0	7
	KI124035	0	27	4	31
	KI124037	0	2	0	2
	KI124038	0	10	0	10
	KI124041	0	1	2	3
	KI124044	0	1	3	4
	KI124045	0	1	0	1
	KI124046	0	5	2	7
	KI124047	0	24	31	55
	KI124050	0	0	2	2
	KI124053	0	8	3	11
	KI124056	0	3	9	12
	KI124057	0	15	11	26
	KI124060	0	13	17	30
	KI124063	0	2	0	2
	KI124065	0	21	10	31
	KI124066	0	30	3	33
	KI124066_001	0	19	4	23
	KI124069	0	4	0	4
	KI124070	0	1	0	1
	KI124072	0	5	0	5
	KI124075	0	0	4	4
	KI124079	0	5	3	8
	KI124082	0	1	9	10
	KI124083	0	1	7	8
	KI124086	0	1	0	1
	KI124088	0	1	0	1
	KI124089	1	4	5	10
	KI124090	0	2	0	2
	KI124091	0	1	2	3
	KI124092	26	58	35	119
	KI124092_001	0	42	24	66

Species	Transect	Visit 1	Visit 2	Visit 3	Total
Moose	KI124094	0	2	0	2
	KI124096	0	17	2	19
	KI124102	0	1	1	2
	KI124105	0	7	0	7
	KI124115	0	22	16	38
	KI124117	0	2	2	4
	KI124124	0	6	2	8
	KI124125	0	0	1	1
	KI124128	0	11	4	15
	KI124129	0	3	1	4
	KI124133	0	1	0	1
	KI124136	0	2	0	2
	KI124145	0	0	2	2
	KI124147	0	7	1	8
	KI124150	3	10	3	16
	KI124151	0	4	0	4
	KI124153	0	0	1	1
	KI124155	1	10	1	12
	KI124158	0	4	0	4
	KI124162	0	0	1	1
	KI124163	0	4	1	5
	KI124164	0	20	7	27
	KI124165	0	7	1	8
	KI124166	0	5	0	5
	KI124170	0	2	4	6
	KI124176	0	2	1	3
	KI124180	0	13	16	29
	KI124180_001	0	19	4	23
	KI124182	0	10	10	20
	KI124186	0	16	32	48
	KI124186_001	0	17	0	17
	KI124186_002	0	12	33	45
	KI124186_003	0	7	0	7
	KI124186_004	0	47	4	51
	KI124192	0	34	4	38
	KI124193	0	20	21	41
	KI124194	0	2	0	2
	KI124196	0	45	7	52
	KI124197	0	2	0	2
	KI124202	0	1	0	1

Species	Transect	Visit 1	Visit 2	Visit 3	Total
Moose	KI124205	0	2	1	3
	KI124205_001	0	6	1	7
	KI124209	0	29	2	31
	KI124210	0	8	22	30
	KI124212	0	17	0	17
	KI124214	0	6	2	8
	KI124217	0	5	0	5
	KI124227	0	10	1	11
	Total	32	994	489	1515
Moose calf	KI122003	0	4	2	6
	KI122006	0	1	1	2
	KI123012	0	3	5	8
	KI123012_001	0	1	3	4
	KI124010	0	1	0	1
	KI124018	0	4	0	4
	KI124024	0	1	0	1
	KI124035	0	1	2	3
	KI124060	0	0	1	1
	KI124066_001	0	2	0	2
	KI124072	0	1	0	1
	KI124079	0	0	1	1
	KI124092	0	2	1	3
	KI124145	0	0	1	1
	KI124151	0	1	0	1
	KI124155	0	1	0	1
	KI124180	0	1	0	1
	KI124180_001	0	2	1	3
	KI124182	0	0	1	1
	KI124186	0	4	0	4
	KI124186_001	0	4	0	4
	KI124186_002	0	0	1	1
	KI124186_004	0	2	0	2
	KI124192	0	3	0	3
	KI124193	0	0	6	6
	KI124197	0	1	0	1
	KI124205_001	0	1	0	1
	KI124209	0	5	0	5
	KI124210	0	0	2	2
	Total	0	46	28	74

Species	Transect	Visit 1	Visit 2	Visit 3	Total
Black bear	KI124013	0	4	0	4
	KI124016	0	0	2	2
	KI124024	0	5	0	5
	KI124029	0	6	0	6
	KI124035	0	5	0	5
	KI124037	0	14	0	14
	KI124038	0	5	0	5
	KI124040	0	1	0	1
	KI124041	0	3	0	3
	KI124043	0	2	0	2
	KI124046	0	2	0	2
	KI124058	0	7	0	7
	KI124063	0	5	0	5
	KI124066_001	0	1	0	1
	KI124075	0	2	0	2
	KI124079	0	2	1	3
	KI124088	0	1	0	1
	KI124089	0	2	0	2
	KI124092	0	0	1	1
	KI124115	0	0	1	1
	KI124147	0	4	0	4
	KI124158	0	1	0	1
	KI124167	0	3	0	3
	KI124180	0	12	1	13
	KI124180_001	0	5	0	5
	KI124182	0	2	1	3
	KI124186_004	0	11	2	13
	KI124193	0	1	0	1
	Total	0	106	9	115
Gray wolf	KI124003	1	0	0	1
	KI124009	1	0	0	1
	KI124010	17	1	0	18
	KI124037	0	2	0	2
	KI124043	0	1	0	1
	KI124058	0	2	0	2
	KI124063	0	1	0	1
	KI124089	0	7	0	7
	KI124124	1	0	0	1
	KI124147	0	1	0	1
	KI124166	3	0	0	3

Species	Transect	Visit 1	Visit 2	Visit 3	Total
Gray wolf	KI124180	0	5	0	5
	KI124182	0	1	0	1
	KI124186_002	0	1	0	1
	KI124186_004	0	3	0	3
	Total	23	25	0	48

Table A-6: Number of Large Mammal Signs Detected During Three Visits to Tracking Transects in Peatland Complexes, 2017

Species	Complex	Transect	Visit 1	Visit 2	Visit 3	Total
Caribou	KV022000	KV022001	0	1	0	1
		KV022003	0	10	0	10
		KV022005	0	10	0	10
		KV022008	0	1	0	1
		KV022009	0	0	2	2
		KV022010	0	0	2	2
		KV022011	0	1	0	1
		KV022012	0	0	1	1
		KV022014	0	2	0	2
		Total	0	25	5	30
	KV023000	KV023001	0	6	0	6
		KV023002	0	4	1	5
		Total	0	10	1	11
	KV036002	KV036002	0	0	3	3
		KV036010	0	0	1	1
		KV036012	0	4	0	4
		KV036013	0	0	3	3
		KV036015	0	0	4	4
		KV036017	0	0	1	1
		Total	0	4	12	16
	KV037000	KV037001	0	0	3	3
		KV037002	0	3	3	6
		KV037003	0	3	3	6
		KV037004	0	3	2	5
		Total	0	9	11	20
	KV038001	KV038001	0	9	0	9
		KV038002	0	83	2	85
		KV038003	0	13	6	19
		KV038004	0	1	0	1
		KV038005	0	5	2	7
		KV038006	0	0	5	5
		KV038008	0	0	1	1
		KV038009	0	3	6	9
		KV038011	0	5	5	10
		KV038013	0	6	0	6
		KV038014	0	5	1	6
		KV038015	0	18	0	18
		KV038016	0	3	1	4

Species	Complex	Transect	Visit 1	Visit 2	Visit 3	Total
Caribou	KV03800	KV038017	0	17	3	20
		KV038018	0	3	1	4
		KV038019	0	0	1	1
		KV038020	0	7	3	10
		Total	0	178	37	215
	KV039000	KV039001	0	1	0	1
	KV044000	KV044001	0	1	2	3
		KV044002	0	6	0	6
		KV044003	0	3	2	5
		KV044004	0	2	1	3
		KV044006	0	10	0	10
		KV044008	0	3	0	3
		KV044009	0	3	1	4
		KV044010	0	1	1	2
		Total	0	29	7	36
	KV047000	KV047001	0	2	1	3
		KV047002	0	1	3	4
		KV047003	0	1	3	4
		KV047004	12	0	1	13
		KV047005	0	0	2	2
		KV047006	0	1	1	2
		Total	12	5	11	28
	KV050000	KV050002	0	0	1	1
		KV050003	0	8	2	10
		KV050004	0	0	2	2
		KV050005	0	14	4	18
		KV050006	0	13	2	15
		KV050007	0	3	3	6
		KV050008	0	4	0	4
		Total	0	42	14	56
	KV058000	KV058001	0	10	0	10
		KV058003	0	1	0	1
		KV058004	0	6	0	6
		KV058005	0	2	0	2
		KV058007	0	3	0	3
		KV058008	0	1	0	1
		KV058012	0	5	0	5
		Total	0	28	0	28
	KV063000	KV063001	0	11	3	14
		KV063002	0	0	3	3

Species	Complex	Transect	Visit 1	Visit 2	Visit 3	Total
Caribou	KV063000	KV063003	0	2	0	2
		KV063004	0	5	1	6
		KV063005	0	0	3	3
		KV063006	0	0	1	1
		Total	0	18	11	29
	KV006000	KV066002	0	2	11	13
		KV066003	0	0	1	1
		Total	0	2	12	14
	KV069000	KV069001	0	4	0	4
		KV069004	0	1	0	1
		KV069005	0	4	3	7
		Total	0	9	3	12
	KV094000	KV094002	0	2	0	2
	KV097000	KV097001	0	3	0	3
		KV097002	0	4	1	5
		KV097003	0	3	0	3
		KV097004	0	0	3	3
		KV097005	0	0	1	1
		KV097006	0	1	0	1
		KV097007	0	2	0	2
		KV097008	0	5	0	5
		KV097010	0	2	1	3
		KV097011	0	6	0	6
		KV097012	0	0	1	1
		KV097013	0	4	0	4
		Total	0	30	7	37
	KV101000	KV101001	0	0	5	5
		KV101002	0	7	5	12
		KV101003	0	10	6	16
		KV101004	0	0	10	10
		KV101005	0	0	5	5
		Total	0	17	31	48
	KV102000	KV102002	0	0	1	1
	KV103000	KV103001	0	3	0	3
		KV103002	0	0	1	1
		KV103003	0	1	1	2
		KV103005	0	3	0	3
		KV103006	0	4	0	4
		Total	0	11	2	13

Species	Complex	Transect	Visit 1	Visit 2	Visit 3	Total
Caribou	KV107000	KV107001	0	1	2	3
		KV107004	0	0	1	1
		KV107005	0	0	3	3
		KV107006	0	0	1	1
		KV107007	0	17	0	17
		KV107009	0	1	5	6
		Total	0	19	12	31
	KV113000	KV113001	0	6	0	6
		KV113002	0	4	0	4
		KV113003	0	0	1	1
		KV113004	0	0	1	1
		KV113006	0	0	1	1
		KV113011	0	8	0	8
		KV113012	0	0	1	1
		Total	0	18	4	22
	KV116000	KV116001	0	1	0	1
	KV119000	KV119002	0	0	1	1
		KV119006	0	0	1	1
		Total	0	1	2	2
	KV120000	KV120001	0	7	0	7
		KV120002	0	1	0	1
		Total	0	8	0	8
	KV121000	KV121001	0	2	0	2
	Total		12	468	183	663
Caribou calf	KV038000	KV038002	0	3	0	3
		KV038011	0	1	0	1
		Total	0	4	0	4
	KV058000	KV058007	0	1	0	1
	KV069000	KV069005	0	0	1	1
	KV097000	KV097002	0	1	0	1
		KV097008	0	1	0	1
		Total	0	2	0	2
	KV113000	KV113001	0	1	0	1
		KV113011	0	1	0	1
		Total	0	2	0	2
	Total		0	9	1	10
Moose	KV022000	KV022001	0	8	2	10
		KV022002	0	4	0	4
		KV022003	0	46	16	62
		KV022004	0	2	1	3

Species	Complex	Transect	Visit 1	Visit 2	Visit 3	Total
Moose	KV022000	KV022005	0	3	0	3
		KV022006	0	9	1	10
		KV022007	0	9	2	11
		KV022008	0	7	4	11
		KV022009	9	14	2	25
		KV022010	0	4	1	5
		KV022011	0	24	4	28
		KV022012	0	13	0	13
		KV022013	0	0	2	2
		KV022014	0	10	11	21
		KV022015	0	2	5	7
		Total	9	155	51	215
	KV023000	KV023001	0	14	4	18
		KV023002	0	5	0	5
		Total	0	19	4	23
	KV0036000	KV036001	0	22	5	27
		KV036002	2	5	0	7
		KV036003	0	26	2	28
		KV036004	0	4	0	4
		KV036005	0	3	0	3
		KV036006	0	10	3	13
		KV036007	1	4	2	7
		KV036008	0	12	1	13
		KV036009	0	10	5	15
		KV036010	0	5	0	5
		KV036011	0	0	3	3
		KV036012	0	6	3	9
		KV036013	0	9	0	9
		KV036014	0	6	2	8
		KV036015	0	7	2	9
		KV036016	0	1	1	2
		KV036017	0	9	0	9
		Total	3	139	29	171
	KV037000	KV037001	0	3	0	3
		KV037002	0	4	2	6
		KV037003	0	15	1	16
		KV037004	0	7	0	7
		Total	0	29	3	32
	KV038000	KV038001	0	7	5	12
		KV038002	0	19	14	33

Species	Complex	Transect	Visit 1	Visit 2	Visit 3	Total
Moose	KV038000	KV038003	0	5	1	6
		KV038004	0	4	0	4
		KV038005	0	8	1	9
		KV038006	0	5	2	7
		KV038007	0	18	7	25
		KV038009	0	7	1	8
		KV038010	0	6	6	12
		KV038011	0	9	0	9
		KV038012	0	4	0	4
		KV038013	0	0	1	1
		KV038014	0	2	0	2
		KV038015	0	3	0	3
		KV038016	0	7	4	11
		KV038017	0	14	1	15
		KV038018	0	6	1	7
		KV038019	2	0	0	2
		KV038020	0	10	0	10
		Total	2	134	44	180
	KV039000	KV039001	0	4	4	8
	KV044000	KV044001	0	9	0	9
		KV044002	1	2	3	6
		KV044003	0	3	0	3
		KV044004	0	2	0	2
		KV044005	0	5	1	6
		KV044006	0	19	12	31
		KV044007	0	8	5	13
		KV044008	0	6	5	11
		KV044009	3	7	4	14
		KV044010	0	10	0	10
		Total	4	71	30	105
	KV047000	KV047001	0	0	4	4
		KV047002	0	0	8	8
		KV047003	0	6	6	12
		KV047004	0	0	1	1
		KV047005	0	2	3	5
		KV047006	0	0	8	8
		Total	0	8	30	38
	KV005000	KV050001	0	5	0	5
		KV050002	0	10	0	10
		KV050003	0	17	27	44

Species	Complex	Transect	Visit 1	Visit 2	Visit 3	Total
Moose	KV005000	KV050004	0	8	5	13
		KV050005	0	1	0	1
		KV050006	0	4	1	5
		KV050007	0	8	0	8
		KV050008	0	6	6	12
		Total	0	59	39	98
	KV058000	KV058001	0	6	2	8
		KV058002	0	1	1	2
		KV058004	0	2	2	4
		KV058005	0	0	2	2
		KV058006	0	1	0	1
		KV058007	0	0	2	2
		KV058009	0	14	3	17
		KV058010	0	8	0	8
		KV058013	0	5	6	11
		Total	0	37	18	55
	KV061000	KV061001	0	10	1	11
		KV061002	0	3	1	4
		KV061003	0	11	0	11
		Total	0	24	2	26
	KV062000	KV062001	0	5	8	13
		KV062002	2	11	12	25
		Total	2	16	20	38
	KV063000	KV063001	0	9	10	19
		KV063002	0	7	0	7
		KV063003	0	2	10	12
		KV063004	11	11	2	24
		KV063005	0	4	4	8
		KV063006	0	8	4	12
		Total	11	41	30	82
	KV066000	KV066001	0	0	6	6
		KV066002	0	12	2	14
		KV066003	0	2	0	2
		Total	0	14	8	22
	KV069000	KV069002	0	30	9	39
		KV069003	0	2	8	10
		KV069004	0	13	12	25
		KV069005	0	15	11	26
		Total	0	60	40	100

Species	Complex	Transect	Visit 1	Visit 2	Visit 3	Total
Moose	KV094000	KV094001	0	3	5	8
		KV094002	0	8	19	27
		KV094003	0	0	4	4
		KV094004	0	1	3	4
		KV094005	0	9	1	10
		KV094006	0	1	0	1
		KV094007	0	2	7	9
		Total	0	24	39	63
	KV097000	KV097001	0	6	6	12
		KV097002	0	7	7	14
		KV097003	0	9	2	11
		KV097004	0	4	0	4
		KV097005	0	6	2	8
		KV097006	0	4	1	5
		KV097007	0	8	1	9
		KV097008	0	5	5	10
		KV097009	3	10	2	15
		KV097010	0	26	5	31
		KV097011	0	6	4	10
		KV097012	0	26	2	28
		KV097013	0	1	0	1
		Total	3	118	37	158
	KV098000	KV098001	0	4	6	10
		KV098002	0	8	9	17
		Total	0	12	15	27
	KV101000	KV101001	0	9	6	15
		KV101002	0	2	2	4
		KV101003	0	3	5	8
		KV101004	0	4	7	11
		KV101005	0	5	8	13
		Total	0	23	28	51
	KV102000	KV102001	0	6	3	9
		KV102002	0	15	10	25
		Total	0	21	13	34
	KV103000	KV103001	0	3	5	8
		KV103002	1	7	12	20
		KV103003	0	2	1	3
		KV103004	0	0	3	3
		KV103005	0	0	1	1
		KV103006	0	2	4	6

Species	Complex	Transect	Visit 1	Visit 2	Visit 3	Total
Moose	KV103000	Total	1	14	26	41
	KV107000	KV107001	0	4	1	5
		KV107003	0	1	2	3
		KV107004	0	5	2	7
		KV107005	2	7	7	16
		KV107006	0	0	4	4
		KV107007	0	12	9	21
		KV107009	0	5	5	10
		Total	2	34	30	66
	KV113000	KV113001	0	0	5	5
		KV113002	0	5	3	8
		KV113003	0	8	6	14
		KV113004	0	33	6	39
		KV113005	0	6	3	9
		KV113006	0	16	7	23
		KV113007	0	24	3	27
		KV113008	0	21	4	25
		KV113009	0	2	0	2
		KV113010	0	1	2	3
		KV113011	0	3	5	8
		KV113012	0	4	0	4
		KV113014	0	2	3	5
		Total				
	KV116000	KV116001	0	17	8	25
	KV119000	KV119001	0	12	0	12
		KV119002	0	20	0	20
		KV119003	0	24	5	29
		KV119004	0	8	3	11
		KV119005	0	14	0	14
		KV119006	0	12	5	17
		Total	0	90	13	103
	KV120000	KV120001	0	5	6	11
	KV121000	KV121001	0	4	0	4
	KV122000	KV122001	0	8	13	21
	KV123000	KV123001	0	19	19	38
	KV124000	KV124001	0	12	4	16
	Total		37	1,336	650	2,023
Moose calf	KV023000	KV023001	0	1	0	1
		KV023002	0	1	0	1
		Total	0	2	0	2

Species	Complex	Transect	Visit 1	Visit 2	Visit 3	Total
Moose calf	KV039000	KV036003	0	0	1	1
		KV036010	0	1	0	1
		KV036011	0	0	1	1
		KV036015	0	2	0	2
		KV036017	0	1	0	1
		Total	0	4	2	6
	KV037000	KV037003	0	1	0	1
	KV038000	KV038002	0	1	2	3
		KV038006	0	1	0	1
		KV038011	0	1	0	1
		Total	0	4	2	6
	KV047000	KV047001	0	0	1	1
	KV050000	KV050002	0	1	0	1
	KV058000	KV058009	0	2	0	2
		KV058010	0	1	0	1
		KV058013	0	2	0	2
		Total	0	6	0	6
	KV062000	KV062001	0	1	0	1
		KV062002	0	1	0	1
		Total	0	2	0	2
	KV063000	KV063002	0	1	0	1
	KV066000	KV066001	0	0	1	1
		KV066002	0	1	0	1
		Total	0	1	1	2
	KV069000	KV069002	0	2	0	2
		KV069003	0	0	2	2
		KV069004	0	1	2	3
		Total	0	3	4	7
	KV094000	KV094002	0	1	0	1
		KV094005	0	2	0	2
		Total	0	3	0	3
	KV097000	KV097007	0	2	0	2
		KV097012	0	2	0	2
		Total	0	4	0	4
	KV102000	KV102002	0	2	0	2
	KV107000	KV107005	0	0	1	1
	KV113000	KV113004	0	1	0	1
		KV113007	0	1	0	1
		KV113012	0	1	0	1
		Total	0	3	0	3

Species	Complex	Transect	Visit 1	Visit 2	Visit 3	Total
Moose calf	KV116000	KV116001	0	0	2	2
	KV119000	KV119003	0	0	1	1
		KV119004	0	0	1	1
		KV119006	0	0	1	1
		Total	0	0	3	3
	KV122000	KV122001	0	1	0	1
	KV123000	KV123001	0	4	0	4
	Total		0	40	16	56
Black bear	KV022000	KV022001	0	1	0	1
	KV023000	KV023001	0	6	0	6
		KV023002	0	1	0	1
		Total	0	7	0	7
	KV036000	KV036011	0	1	0	1
		KV036012	0	1	0	1
		KV036000	0	2	0	2
	KV037000	KV037003	0	7	0	7
		KV037004	0	5	0	5
		Total	0	12	0	12
	KV038000	KV038002	0	2	1	3
		KV038005	0	3	0	3
		KV038006	0	0	1	1
		KV038008	0	1	0	1
		KV038018	0	1	0	1
		KV038019	0	3	0	3
		Total	0	10	2	12
	KV039000	KV039001	0	0	1	1
	KV044000	KV044005	0	1	0	1
		KV044006	0	0	1	1
		Total	0	1	1	2
	KV047000	KV047001	0	2	2	4
		KV047003	0	0	2	2
		KV047004	0	0	1	1
		KV047005	0	0	3	3
		Total	0	2	8	10
	KV050000	KV050006	0	2	0	2
		KV050008	0	0	1	1
		Total	0	2	1	3
	KV058000	KV058001	0	4	0	4
		KV058002	0	0	1	1
		KV058003	0	0	2	2

Species	Complex	Transect	Visit 1	Visit 2	Visit 3	Total
Black bear	KV058000	KV058004	0	1	0	1
		KV058009	0	0	1	1
		Total	0	5	4	9
	KV061000	KV061002	0	1	0	1
	KV062000	KV062001	0	0	2	2
		KV062002	0	0	1	1
		Total	0	0	3	3
	KV063000	KV063001	0	2	0	2
		KV063002	0	1	1	2
		KV063003	0	4	0	4
		Total	0	7	1	8
	KV069000	KV069004	0	0	4	4
		KV069005	0	1	0	1
		Total	0	1	4	5
	KV094000	KV094002	0	1	0	1
		KV094006	0	0	1	1
		Total	0	1	1	2
	KV097000	KV097002	0	0	1	1
		KV097013	0	1	0	1
		Total	0	1	0	1
	KV101000	KV101004	0	0	2	2
		KV101005	0	0	2	2
		Total	0	0	4	4
	KV102000	KV102001	0	0	1	1
	KV103000	KV103002	0	3	0	3
		KV103003	0	0	1	1
		KV103005	0	1	0	1
		KV103006	0	0	1	1
		Total	0	4	2	6
	KV107000	KV107004	0	0	1	1
	KV113000	KV113001	0	0	1	1
		KV113004	0	4	1	5
		KV113007	0	1	0	1
		KV113008	0	1	0	1
		Total	0	6	2	8
	KV120000	KV120001	0	2	0	2
	KV122000	KV122001	0	0	3	3
	KV124000	KV124001	1	0	0	1
	Total		1	65	40	106

Species	Complex	Transect	Visit 1	Visit 2	Visit 3	Total
Gray wolf	KV023000	KV023001	0	1	0	1
	KV037000	KV037001	0	1	0	1
		KV037003	0	1	0	1
		Total	0	2	0	2
	KV038000	KV038002	1	0	0	1
		KV038004	0	1	0	1
		KV038005	0	1	1	2
		KV038015	1	0	0	1
		Total	2	2	1	5
	KV047000	KV047002	0	0	1	1
	KV058000	KV058005	0	0	1	1
		KV058009	0	1	0	1
		Total	0	1	1	2
	KV061000	KV061003	1	0	0	1
	KV062000	KV062001	0	3	0	3
		KV062002	0	3	0	3
		KV062000	0	6	0	6
	KV066000	KV066002	1	0	0	1
	KV069000	KV069002	0	1	0	1
	KV094000	KV094002	11	0	0	11
		KV094005	2	0	0	2
		Total	13	0	0	13
	KV113000	KV113001	1	0	0	1
		KV113004	1	0	0	1
		KV113008	4	0	0	4
		KV113012	0	1	0	1
		Total	6	1	0	7
	KV122000	KV122001	0	0	1	1
	KV123000	KV123001	2	0	0	2
	Total		25	14	4	43

Table A-7: Number of Large Mammal Signs Detected During Three Visits to Access Road Tracking Transects, 2017

Species	Access Road	Transect	Visit 1	Visit 2	Visit 3	Total
Caribou	North	N-23	0	1	1	2
		N-24	0	5	7	12
		N-34	2	0	0	2
		N-36	0	8	4	12
		N-38	0	3	6	9
		N-39	0	12	1	13
		N-40	1	5	0	6
		S-42	0	20	5	25
		S-46	0	1	3	4
		S-51	0	8	4	12
		S-52	0	7	0	7
		S-53	0	46	12	58
	South	S-1	0	7	10	17
		S-10	2	65	0	67
		S-15	0	24	1	25
		S-16	0	6	10	16
		S-18	0	23	2	25
		S-8	0	70	21	91
	Total		5	311	87	403
Caribou calf	South	S-10	0	1	0	1
		S-18	0	1	0	1
		S-8	0	1	1	2
		Total	0	3	1	4
Moose	North	N-23	3	113	41	157
		N-24	1	75	56	132
		N-34	21	112	44	177
		N-36	20	147	92	259
		N-38	8	53	32	93
		N-39	7	137	52	196
		N-40	6	115	35	156
		S-42	11	123	45	179
		S-46	17	183	86	286
		S-51	6	90	34	130
		S-52	3	64	51	118
		S-53	2	126	63	191
	South	S-1	2	80	61	143
		S-10	5	61	31	97
		S-15	2	36	18	56

Species	Access Road	Transect	Visit 1	Visit 2	Visit 3	Total
Moose	South	S-16	14	67	17	98
		S-18	10	122	81	213
		S-8	0	46	11	57
	Total		138	1,750	850	2,738
Moose calf	North	N-23	0	3	1	4
		N-24	0	2	1	3
		N-34	0	2	0	2
		N-36	0	16	2	18
		N-38	0	4	0	4
		N-39	0	2	5	7
		N-40	0	2	0	2
		S-42	0	0	2	2
		S-46	0	2	1	3
		S-51	0	3	1	4
		S-52	0	3	2	5
		S-53	0	3	3	6
	South	S-1	0	3	1	4
		S-10	0	6	1	7
		S-15	0	2	2	4
		S-16	0	7	0	7
		S-18	0	2	1	3
		S-8	0	1	0	1
	Total		0	63	23	86
Black bear	North	N-23	0	8	3	11
		N-24	0	1	2	3
		N-36	0	1	6	7
		N-38	0	3	6	9
		N-39	0	4	0	4
		N-40	0	1	0	1
		S-42	0	6	7	13
		S-46	0	24	6	30
		S-52	0	1	1	2
	South	S-1	0	5	10	15
		S-10	0	5	1	6
		S-15	0	9	0	9
		S-16	0	13	1	14
		S-18	0	11	3	14
		S-8	0	7	5	12
	Total		0	99	51	150

Species	Access Road	Transect	Visit 1	Visit 2	Visit 3	Total
Gray wolf	North	N-23	0	4	1	5
		N-24	2	1	0	3
		N-34	1	1	0	2
		N-36	2	0	4	6
		N-38	0	2	0	2
		N-39	0	3	0	3
		S-42	23	0	2	25
		S-46	1	0	4	5
		S-52	5	1	1	7
		S-53	3	0	3	6
	South	S-1	2	2	1	5
		S-10	0	2	1	3
		S-15	0	1	1	2
		S-16	0	1	0	1
		S-18	0	2	3	5
		S-8	0	2	0	2
	Total		39	22	21	82