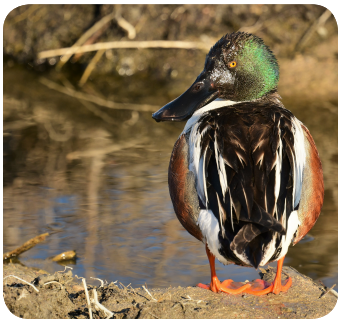
Keeyask Generation Project

Terrestrial Effects Monitoring Plan

Waterfowl Habitat Effects Monitoring Report

TEMP-2020-13



KEEYASK

Manitoba Conservation and Climate Client File 5550.00
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2019 - 2020

KEEYASK GENERATION PROJECT

TERRESTRIAL EFFECTS MONITORING PLAN

REPORT #TEMP-2020-13

WATERFOWL HABITAT EFFECTS MONITORING 2019

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 including waterfowl. 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.

Canada geese and mallard are important in the Keeyask region due to their abundance in the area and importance as a food source for local First Nations members. Spring goose hunting has occurred in traditional locations for thousands of years, providing a spring food source and supporting important community cultural activities and gatherings. Canada geese, mallard, and other species of waterfowl are relatively abundant in the Keeyask area during the spring migration. Waterfowl habitat is provided by numerous waterbodies, including the Nelson River and Gull Lake, which often support migrating waterfowl in the spring and fall. Nesting and brood-rearing (raising young birds) habitat occurs in wetlands, and along the shorelines of many ponds, creeks, rivers and lakes.

Previous waterfowl surveys have occurred in the Keeyask region as part of pre-construction and construction monitoring. Pre-construction waterfowl surveys were conducted from 2001-03, 2006 and in 2011. Construction-phase waterfowl surveys occurred in 2015 and 2017. Results from these studies showed that large numbers of waterfowl use the Keeyask region during the spring and fall migrations, and that waterfowl often use inland (off-system) lakes during these times.

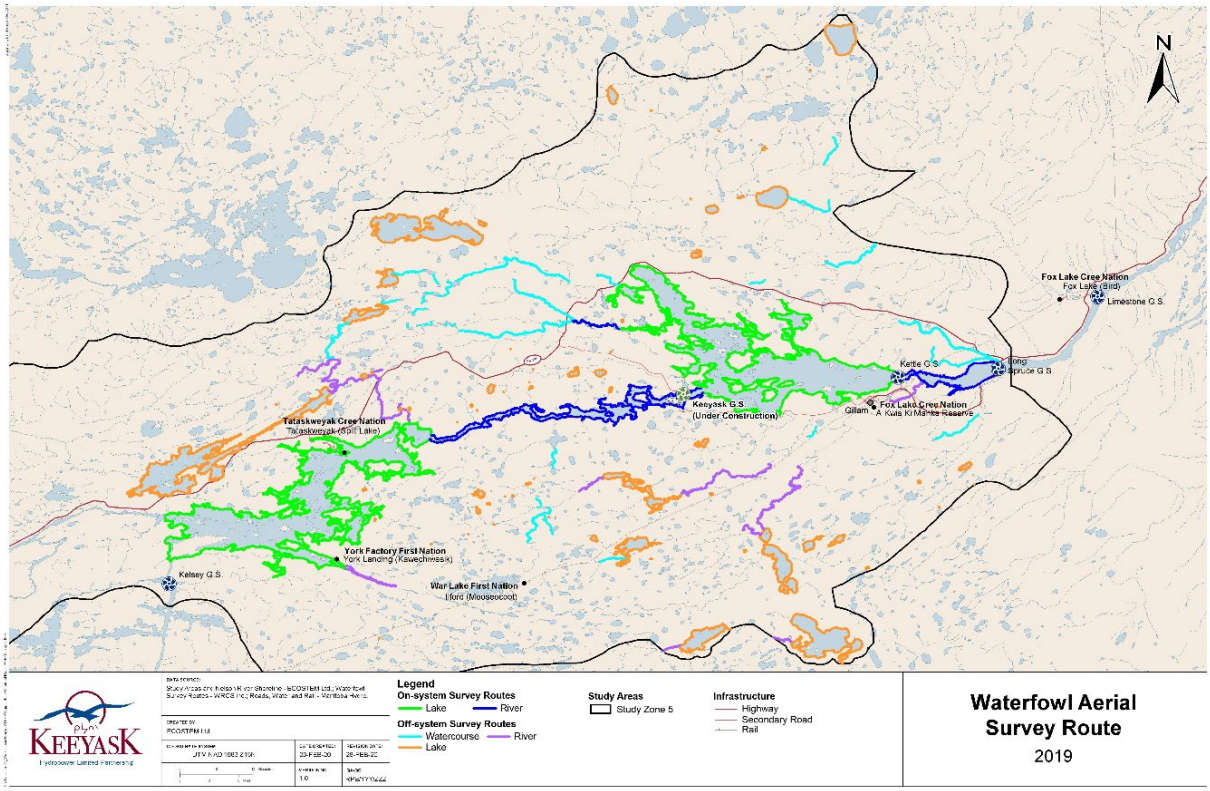
Waterfowl habitat along the shoreline of an inland lake

Why is the study being done?

According to the environmental assessment done for the Project, change to habitat availability for both staging (stopping to rest and feed during migration to and from breeding grounds further north) and breeding (which is usually limited in the Keeyask region) is the main predicted Project impact for Canada goose and mallard. Project construction is also anticipated to cause an indirect loss of waterfowl habitat due to noise and disturbance from construction activities. Project operation is anticipated to reduce the amount and quality of waterfowl habitat in the Nelson River and Gull Lake due to flooding of the reservoir. In order to assess the Project impacts of habitat loss and alteration on Canada geese, mallard, and other waterfowl species, the relative number and location of waterfowl during construction and operation will be monitored.

What was done?

A series of aerial waterfowl surveys were conducted in 2019, starting in early spring and continuing into the fall. These surveys were done along shorelines of the Nelson River between the Kelsey Generating Station (GS) and the Limestone GS and in areas that are not affected by Keeyask or other hydroelectric development (off-system), but within the regional study area (Study Zone 5 on the map below). The surveys were timed to correspond with major waterfowl life-cycle events (*i.e.,* staging, breeding, brood-rearing). Surveys for staging waterfowl in 2019 occurred on April 29-May 3 and September 12-16; breeding pair surveys were conducted on May 24-27 and June 18-22; and brood surveys were conducted on July 15-19. The survey route consisted of 3,452 km of shoreline on different waterbody types. To assess potential impacts of the Project on waterfowl in the area, waterfowl densities (number of birds/km) observed in 2019 were compared to the densities observed during pre-construction surveys and during the 2015 and 2017 construction surveys. The presence of hunting groups was also recorded during the spring waterfowl surveys to estimate the amount of harvest pressure in the area surveyed.



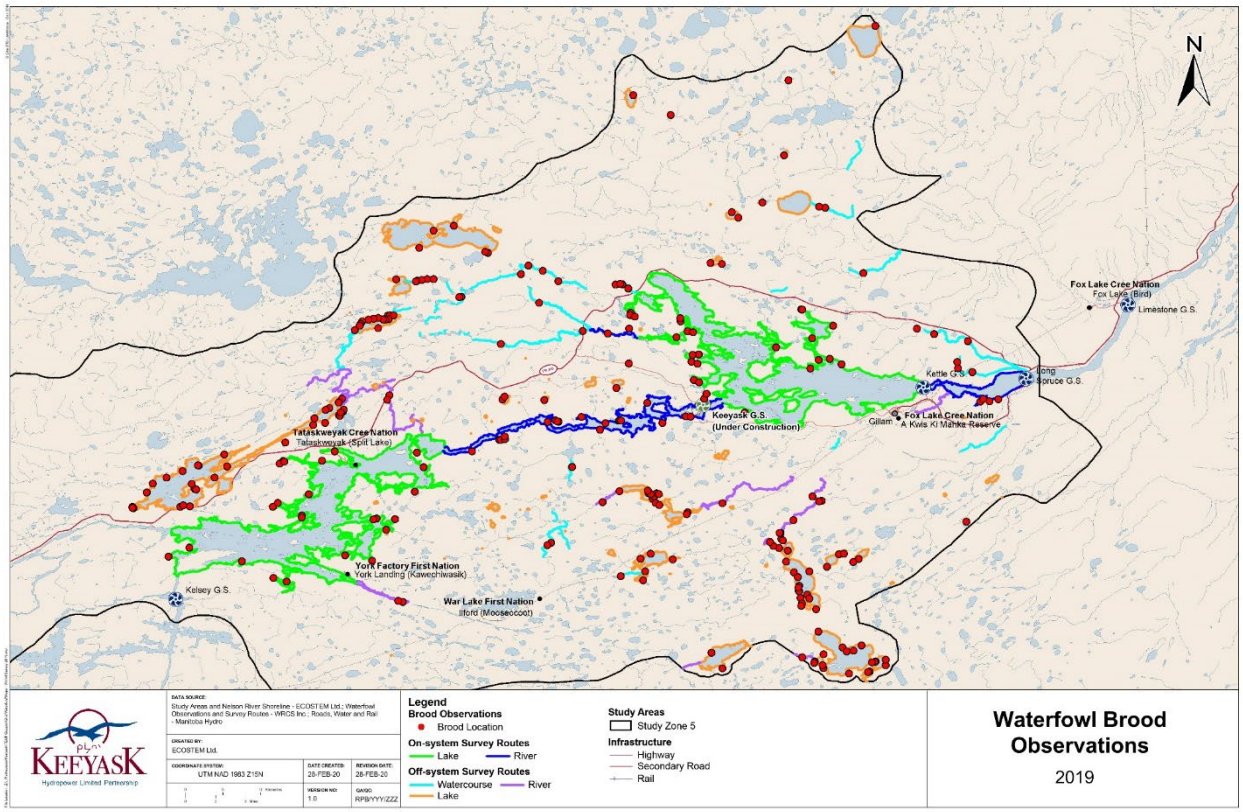
What was found?

The number of waterfowl was variable throughout the survey period from spring to fall 2019, but this trend was less noticeable in comparison to other years. More waterfowl stayed within the regional study area during the spring to breed and nest, potentially due to poor habitat conditions in southern Manitoba and elsewhere in the prairies. Large numbers of waterfowl broods, mostly Canada goose and mallard were seen in the area during the June and July surveys. In the fall, large numbers of waterfowl, particularly diving duck species, were observed in the area, highlighting how important the area surveyed is to staging waterfowl.

Waterfowl densities observed in 2019 were similar to those observed during the pre-construction surveys and the 2015 and 2017 construction surveys. This suggests that waterfowl use in the area surveyed has been relatively consistent since before the start of Project construction and construction activity does not appear to be limiting waterfowl use of habitat in the region.

A total of 26 hunting groups were observed during the 2019 waterfowl surveys, which was consistent with the number observed in 2015 and 2017.

Three Canada goose broods on an off-system lake in June 2019



What does it mean?

Surveys conducted in 2019 did not indicate any unexpected effects of Project construction on waterfowl numbers or locations to date. The relatively high variability of waterfowl numbers during the different survey periods reinforced the need for multiple surveys from spring to fall, in order to monitor habitat use of waterfowl during major life-cycle events. The large number of broods observed highlights the importance of the area to breeding and nesting waterfowl when poor habitat conditions occur in their traditional nesting areas. Hunting access did not appear to be increased by Project development. Most hunting groups observed were located near existing towns or communities, or near previously established hunting camps.

What will be done next?

Depending on the timing of reservoir impoundment, an aerial waterfowl survey may be conducted in the fall of 2020. Data from the construction surveys will be used to further refine the waterfowl habitat selection model previously developed. The habitat selection model can then be used to predict the amount of habitat disturbance as a result of the Project and its potential impact on Canada goose, mallard, and other waterfowl species.

STUDY TEAM

We would like to thank Sherrie Mason and Rachel Boone of Manitoba Hydro for editorial comments, and Derek Longley of Prairie Helicopters for assistance. We would also like to thank Dr. James Ehnes, ECOSTEM Ltd., for GIS support, study design, and cartography.

Biologists and other personnel who designed, participated in, and drafted the survey results included:

- Robert Berger (M.N.R.M) – Design, analysis, and reporting
- Mark Baschuk (M.Sc.) – Survey personnel, analysis, and reporting
- Stefano Strapazzon (Env.St.) – Survey personnel
- Kevin McRae (Env.St.) – Survey personnel

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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* (TESV). The *Keeyask Generation Project 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, waterfowl habitat effects, during the construction phase.

Waterfowl surveys focused on Canada goose (*Branta canadensis*) and mallard (*Anas platyrhynchos*), which were identified as Valued Environmental Components (VECs) during the environmental assessment for the Project. These species were chosen as VECs based on their importance to local communities and their protection under the *Migratory Birds Convention Act*.

Previous waterfowl surveys have occurred in the Keeyask region as part of pre-construction and construction monitoring. Pre-construction waterfowl surveys were conducted from 2001-03, 2006 and in 2011. Waterfowl surveys during construction occurred in 2015 and 2017. Results from these studies showed that large numbers of waterfowl use the Keeyask region during the spring and fall migrations, and that waterfowl often use inland (off-system) lakes during these times WRCS 2016; WRCS 2018).

The objectives of waterfowl monitoring during Project construction are to identify changes in abundance or distribution due to construction activities. The main concerns of construction activities on waterfowl are sensory disturbance, loss of habitat, and increased hunter access. To identify potential construction effects, several components that influence waterfowl populations are being monitored, including habitat, mortality, and habitat enhancement efficacy. This report presents general findings of the waterfowl surveys conducted in 2019 and basic habitat use patterns for lakes, rivers, and watercourses. Monitoring focusing on waterfowl mortality and habitat enhancement efficacy were not done in 2019, as these studies are focused on Project components not yet in place; as such, they will be presented at a later date.

2.0 METHODS

2.1 AERIAL SURVEYS

Aerial surveys for waterfowl were conducted five times, from late April to mid-September 2019, within Study Zone 5 (Map 1). The surveys in 2019 were timed to be as similar as possible with the surveys that were conducted in 2017 and 2015.

The survey route consisted of 3,452 km of shoreline of various waterbody types (Map 1). A random, stratified design (a sample of waterbody types and size classes) was used to select waterbodies to be surveyed. Waterbodies were classified broadly as either on-system (influenced by existing or future hydroelectric operations) or off-system (unaffected by hydroelectric operations), grouped into three basic categories (lake, river, or watercourse), and grouped into five different size classes (<0.5, 0.5-1, 1-10, 10-100, 100-1,000, >1,000 ha). Lakes are defined as non-linear waterbodies with minimal water flow, rivers are large, linear water bodies with flow, and watercourses are narrow, linear waterbodies with flow (creeks and streams). The total shoreline lengths and distribution of waterbodies are presented in Table 1 and Map 1.

Table 1: Shoreline Length (km) of Waterbody Types and Size Classes Surveyed in 2019

System	Waterbody Type	Size Class (ha)						Total Shoreline Length (km)
		<0.5	0.5-1	1-10	10-100	100-1,000	>1,000	
On-system	Lake	0	0	0	0	0	1,823	1,823
	River	0	0	0	0	56	331	387
	Watercourse[1]	NA	NA	NA	NA	NA	NA	0
Off-system	Lake	9	7	15	41	130	544	746
	River	0	0	8	133	122	0	263
	Watercourse[1]	234	NA	NA	NA	NA	NA	234
Total		242	7	23	174	307	2,698	3,452

[1] Size class (area) of watercourses are not available

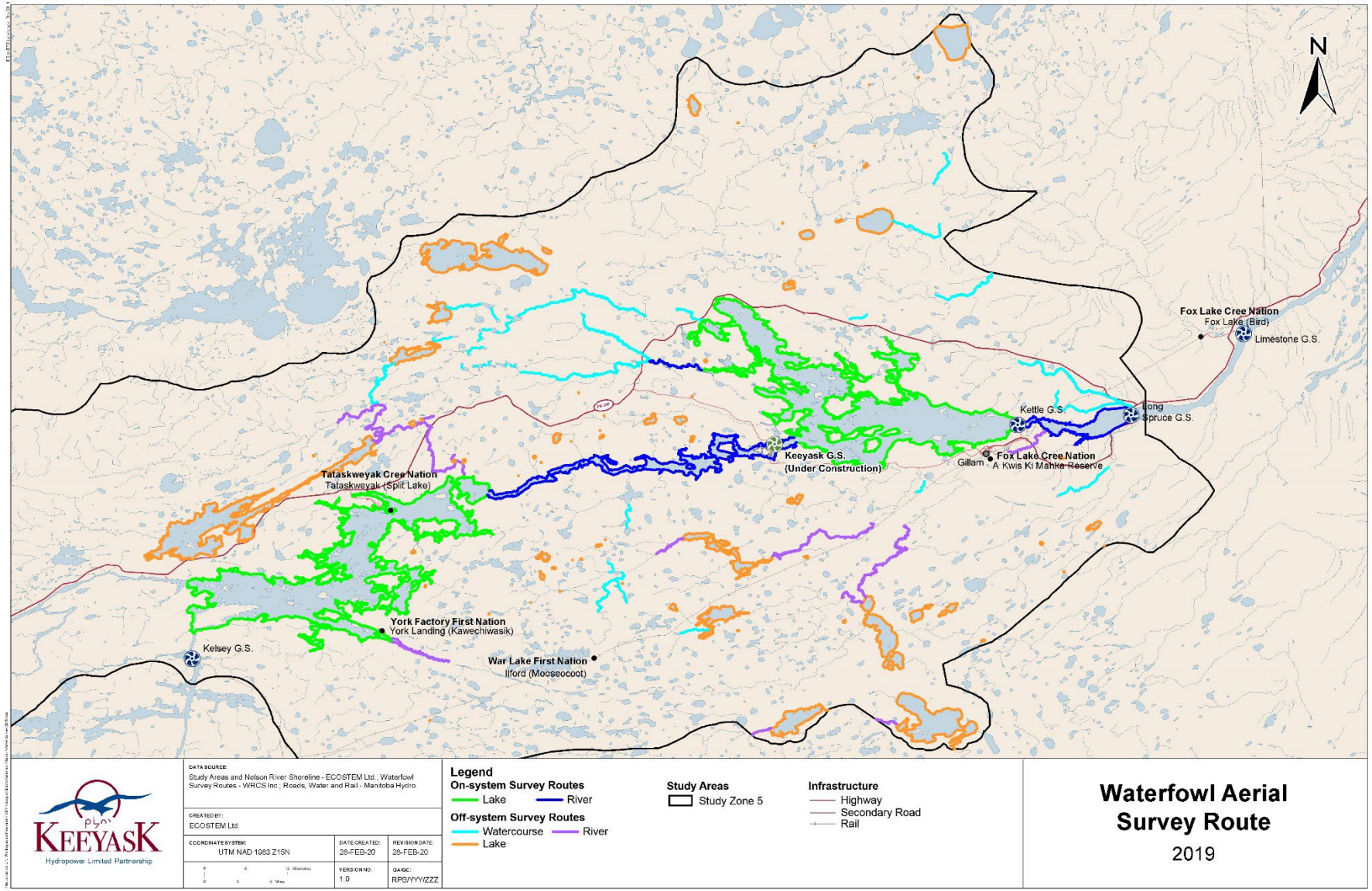
Surveys were timed to correspond with major waterfowl life-cycle events (*i.e.,* staging, breeding, brood-rearing). Surveys for staging waterfowl in 2019 occurred on April 29 - May 3 and September 12-16; breeding pair surveys were conducted on May 24-27 and June 18-22; and brood surveys were conducted on July 15-19.

Surveys were not conducted if winds exceeded 25 km/hr or if inclement weather (rain, fog, etc.) obscured visibility. All surveys were conducted from a helicopter equipped with bubble windows in the rear that travelled approximately 80 km/hr at an altitude of approximately 20-30 m, following the general contours of waterbodies. Two observers, on the left side of the aircraft (front and rear

seats), recorded all waterfowl observed using a dependent double-observer technique (Koneff *et al.* 2008). The front-seat observer recorded all waterfowl observed and indicated this through the aircraft's communication system to the rear-seat observer. The rear-seat observer recorded all waterfowl not observed by the front-seat observer. Bird species, sex, and flock arrangement (*e.g.,* pair [drake and hen], flock of three drakes and two hens, etc.) were recorded, as well as opportunistic observations of other waterbird species (*e.g.*, loons, grebes, cranes, etc).

All swans observed were classified as "unknown swans" due to the difficulty distinguishing between the trumpeter swan (*Cygnus buccinator*) and tundra swan (*Cygnus columbianus*) from a distance. Despite a relatively low probability of observing trumpeter swans in northern Manitoba, there are several areas within the regional study area containing possible breeding evidence of trumpeter swans (Manitoba Breeding Bird Atlas 2015). Similarly, greater scaup (*Aythya marila*) and lesser scaup (*Aythya affinis*) were recorded as "unknown scaup" due to the difficulty in distinguishing between the two species from a distance.

The number of hunting groups observed was recorded opportunistically in April, when local resource harvesters are actively pursuing Canada geese and other waterfowl species. A hunting group was recorded when blinds, decoys, and/or hunters were observed. Care was taken to avoid flying near active hunting groups in order to minimize disturbance.



Map 1: Overview of Waterfowl Aerial Survey Routes in 2019

2.2 DATA ANALYSIS

2.3 WATERFOWL DENSITIES

Total waterfowl densities within different waterbody types were calculated by first assigning each waterfowl observation to the nearest waterbody type. The total number of waterfowl observed and shoreline length of the waterbody type were then used to calculate the number of birds per kilometre surveyed (birds/km). Common loon (*Gavia immer*), grebe, and sandhill crane (*Grus canadensis*) observations were not included in the calculations.

To provide a comparison of waterfowl densities observed during the 2015 and 2017 construction surveys and pre-construction surveys, waterfowl densities for 2019 were calculated using data from the late May, July, and September surveys. Similar to pre-construction surveys, only observations of ducks, geese, and swans were included (all merganser, common loon, grebe, and sandhill crane observations were removed). Observations were assumed to fall within 200-m of the helicopter, and this distance was used to estimate the total area (km^2) surveyed and the waterfowl density (birds/km^2).

To assess the potential effects of Project construction on waterfowl, waterfowl densities (birds/km^2) from Gull Lake and Gull Rapids were compared between pre-construction surveys (2001-2003 and 2011), the 2017 and 2015 construction surveys, and the 2019 construction survey. Gull Lake and Gull Rapids were chosen as comparison areas between years because these areas were under active construction in 2015 and 2017.

2.4 INDICATED BREEDING PAIRS

Data from the late May and June breeding surveys were used to determine the number of indicated breeding pairs (IBPs) of waterfowl, as a measure of the number of breeding waterfowl in Study Zone 5. Data from the late May survey were used to determine the number of indicated breeding pairs of early-nesting species, including mallard, northern pintail (*Anas acuta*), and Canada goose. Data from the June survey were used to determine the number of indicated breeding pairs for all other species, including American wigeon (*Anas americana*), ring-necked duck (*Aythya collaris*), scaup, and common loon.

The definition of an IBP was based on work conducted by Lemelin *et al.* (2010) and Messmer *et al.* (2015). Indicated breeding pairs of Canada geese were defined as observations of one to three birds. For dabbling ducks (*e.g.,* mallard, America wigeon, etc.), IBPs were classified as the number of males observed singly or in groups up to four individuals, including females and unsexed individuals, with the exception of groups consisting of three males and one female. For diving ducks, IBPs were classified based on the number of males observed singly or in groups up to four, including females and unsexed individuals (Lemelin *et al.* 2010; Messmer *et al.* 2015). Observations of one or two common loons were considered one IBP (Lemelin *et al.* 2010; Messmer *et al.* 2015).

Indicated breeding pair density was calculated using the same method that was used for calculating total waterfowl density.

2.5 WATERFOWL BROODS

The dates of brood observations were used to determine the approximate dates of the beginning of the nesting period. Nest initiation was approximated for individual broods by subtracting the age of the brood in days, the days required for egg incubation (28 days for mallard and Canada goose), and one day for each egg laid (number of ducklings/goslings observed) from the observation date. This information is useful for determining the timing of future breeding surveys, which ideally occur at the start of the incubation period after most migrants have left (Lemelin *et al.* 2010).

Brood density was calculated using the same method that was used for calculating total waterfowl density.

3.0 RESULTS

3.1 WATERFOWL DENSITIES

During the late April/early May survey, 3,771 birds, consisting of 12 species, were observed (Table 2). The majority of observations (79%) consisted of Canada goose, while mallard was the next most common species observed (14% of all observations). Green-winged teal (*Anas carolinensis*), American wigeon, and northern pintail were less common, and relatively few observations were made of the remaining species (Table 2).

Most waterbodies were still frozen during the late April/early May survey. The majority of waterfowl observations were concentrated at areas of open water, which occurred at creek mouths or in areas where water flow was sufficiently fast to prevent freezing. Most of these areas occurred within off-system rivers, which supported the greatest densities of waterfowl in late April/early May (Table 3; Map 2). These findings were consistent with those observed in 2017 and 2015.

During the late May survey, a total of 6,568 birds, consisting of 18 species, were observed (Table 2). There was a substantial decrease (86% decrease) in the number of Canada geese present in Study Zone 5 compared to the April survey. Common merganser were the most common bird observed and a relatively large numbers of other diving ducks, including unknown scoters (*i.e.,* likely white-winged scoter), unknown diving duck species, ring-necked duck, and unknown scaup were also observed (Table 2).

Most waterbodies were ice-free during the late May survey. Due to the preference of large, shallow waterbodies by diving ducks, which were the most common waterfowl group observed, off-system lakes supported the greatest densities of waterfowl in May (Table 3; Map 3).

In the June survey, a total of 5,261 birds, consisting of 14 species, were observed (Table 2). There was a large increase in the number of common goldeneye observed (*Bucephala clangula*), which comprised 29% of all observations in June. There was a large decrease of common merganser (*Mergus merganser*), unknown scoter and scaup (Table 2). Off-system lakes and watercourses supported the greatest densities of waterfowl in June, but densities were lower on all waterbody types in comparison to those observed in May (Table 3; Map 4).

In the July survey a total of 3,898 waterfowl, consisting of 12 species were observed (Table 2). Ring-necked duck, mallard, and Canada goose were the most common observations. Off-system lakes supported the greatest densities of waterfowl in July (Table 3; Map 5).

In the September survey, 16,617 waterfowl, consisting of 13 different species, were observed (Table 2). Unknown diving ducks and ring-necked ducks were the most common observations, comprising 34% and 17% of all observations, respectively (Table 2). Large numbers of mallard and Canada geese were also observed during this survey. Off-system lakes supported the greatest densities of waterfowl in September (Table 3; Map 6).

Table 2: Total Number of Waterfowl Observed During Aerial Surveys in 2019

Species	Month					Total
	April	May	June	July	September	
American Black Duck (*Anas rubripes*)	0	3	0	1	1	5
American Wigeon (*Anas americana*)	38	329	345	86	89	887
Blue-winged Teal (*Anas discors*)	0	0	1	0	2	3
Bufflehead (*Bucephala albeola*)	9	213	43	30	129	424
Canada Goose (*Branta canadensis*)	2,961	418	773	596	2,283	7,031
Common Goldeneye (*Bucephala clangula*)	10	45	1,529	0	1,581	3,165
Common Loon (*Gavia immer*)	0	163	105	104	68	440
Common Merganser (*Mergus merganser*)	14	1,217	197	109	209	1,746
Green-winged Teal (*Anas carolinensis*)	80	89	95	17	222	503
Hooded Merganser (*Lophodytes cucullatus*)	0	7	0	0	0	7
Mallard (*Anas platyrhynchos*)	536	657	713	696	2,672	5,274
Northern Pintail (*Anas acuta*)	25	10	8	0	0	43
Northern Shoveler (*Anas clypeata*)	2	4	0	0	0	6
Ring-necked Duck (*Aythya collaris*)	2	563	568	1,122	2,794	5,049
Sandhill Crane (*Grus canadensis*)	21	68	93	98	0	280
Surf Scoter (*Melanitta perspicillata*)	0	10	0	0	0	10
Unknown Dabbler	43	59	102	209	264	677
Unknown Diver	19	567	141	443	5,688	6,858
Unknown Duck	0	4	1	38	0	43
Unknown Grebe	0	2	0	0	0	2
Unknown Scaup (*Aythya affinis/marila*)	0	471	154	123	306	1,054
Unknown Scoter	3	1,040	338	170	96	1,647
Unknown Swan (*Cygnus buccinator/columbianus*)	8	628	55	56	213	960
White-winged Scoter (*Melanitta deglandi*)	0	1	0	0	0	1
Total	3,771	6,568	5,261	3,898	16,617	36,115

Table 3: Waterfowl Density (birds/km) within Waterbody Types in 2019

System	Waterbody Type	Survey Month				
		April	May	June	July	September
On-system	Lake	0.2	1.4	1.1	0.3	2.7
	River	0.6	1.5	0.9	0.7	2.7
	Watercourse	NA	NA	NA	NA	NA
Off-system	Lake	2.4	3.1	2.7	3.2	13.2
	River	3.8	1.1	1.0	1.3	2.3
	Watercourse	1.4	2.5	1.4	0.7	0.8

Average waterfowl densities in 2019 were consistent with the densities observed during the previous construction surveys in 2015 and 2017, with the exception of late May, which was lower (Figure 1; Table 4). Average waterfowl densities were also within the ranges observed during the pre-construction surveys, with the exception of September, which was higher in 2019.

In Gull Lake, waterfowl densities in 2019 were lower in late May compared to 2015 and 2017, but higher in September (Table 5). Waterfowl densities in 2019 were also lower in late May and September in comparison to pre-construction surveys, but had similar densities to these surveys in July (Table 5).

In Gull Rapids, waterfowl densities in 2019 were lower in late May and September compared to 2015 and 2017, but similar in July (Table 6). Waterfowl densities in 2019 were similar to those observed during pre-construction surveys in May and July, but lower than those in September (Table 6).

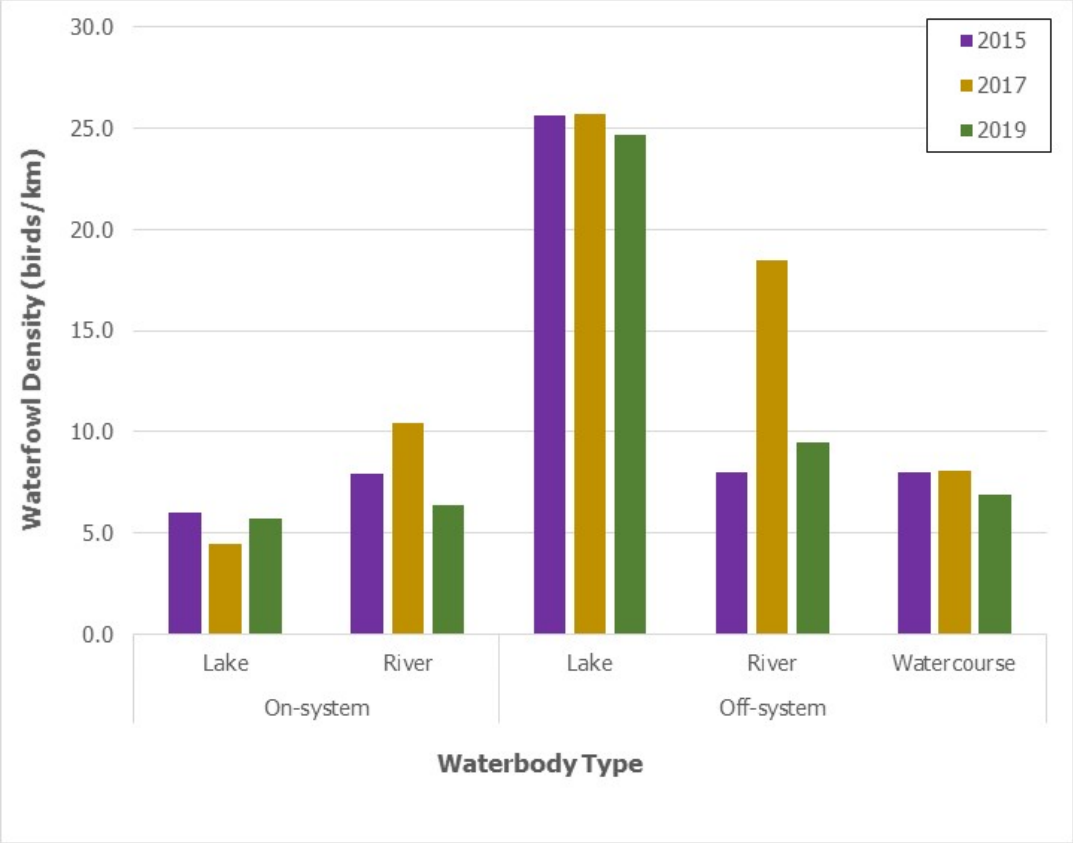


Figure 1: Waterfowl Density (birds/km) Within Different Waterbody Types During Construction Surveys (2015, 2017, 2019)

Table 4: Average Waterfowl Densities (birds/km^2) in the Regional Study Area During Construction (2015, 2017, 2019) and Pre-construction (2001-2003, 2011) Surveys

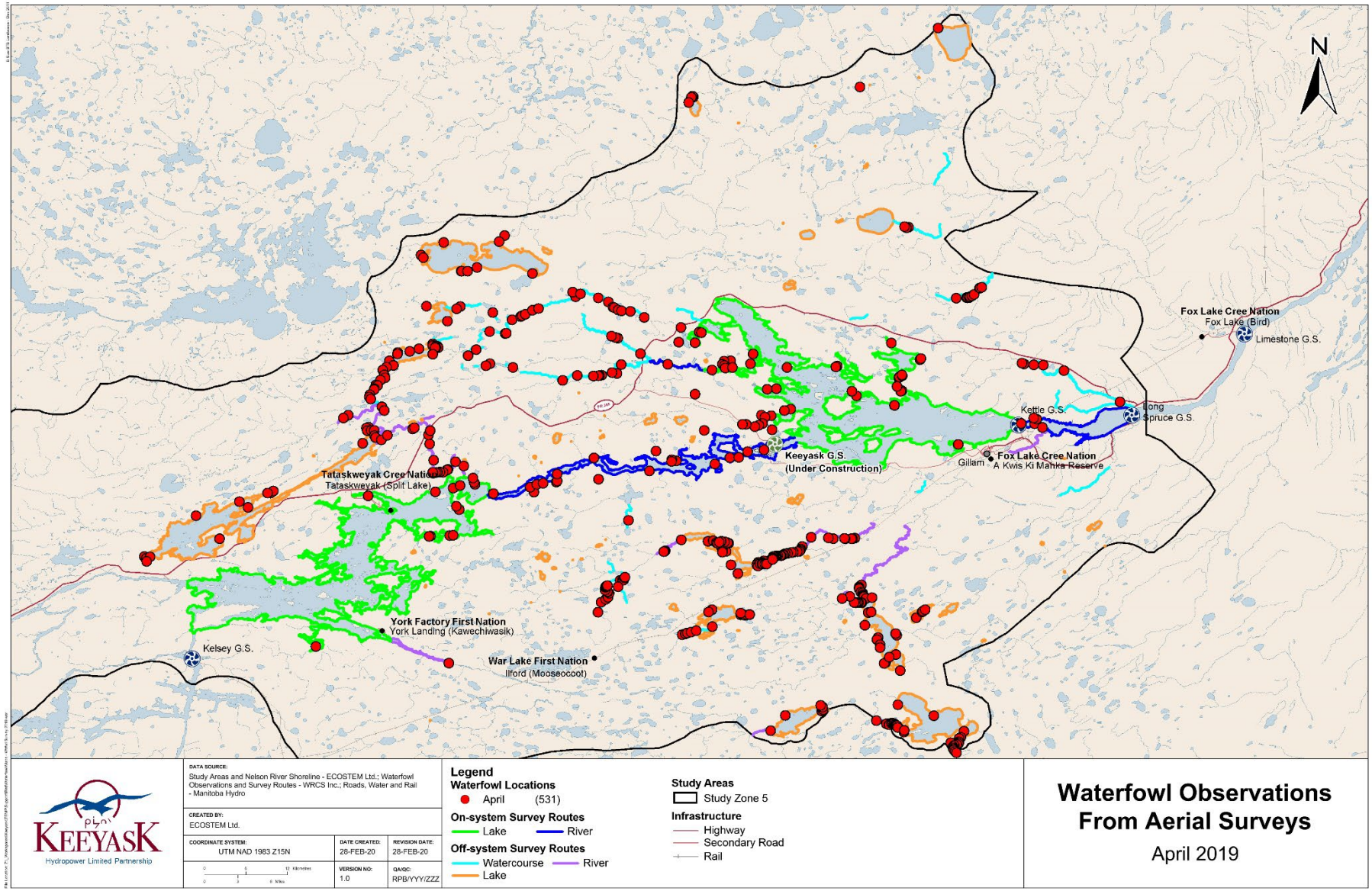
Year	May	July	September
2001	8	3	12
2002	16	6	15
2003	10	3	15
2011	12	4	NA
2015	14	6	24
2017	20	3	21
2019	9	5	24

Table 5: Average Waterfowl Densities (birds/km^2) in Gull Lake During Construction (2015, 2017, 2019) and Pre-construction (2001-2003, 2011) Surveys

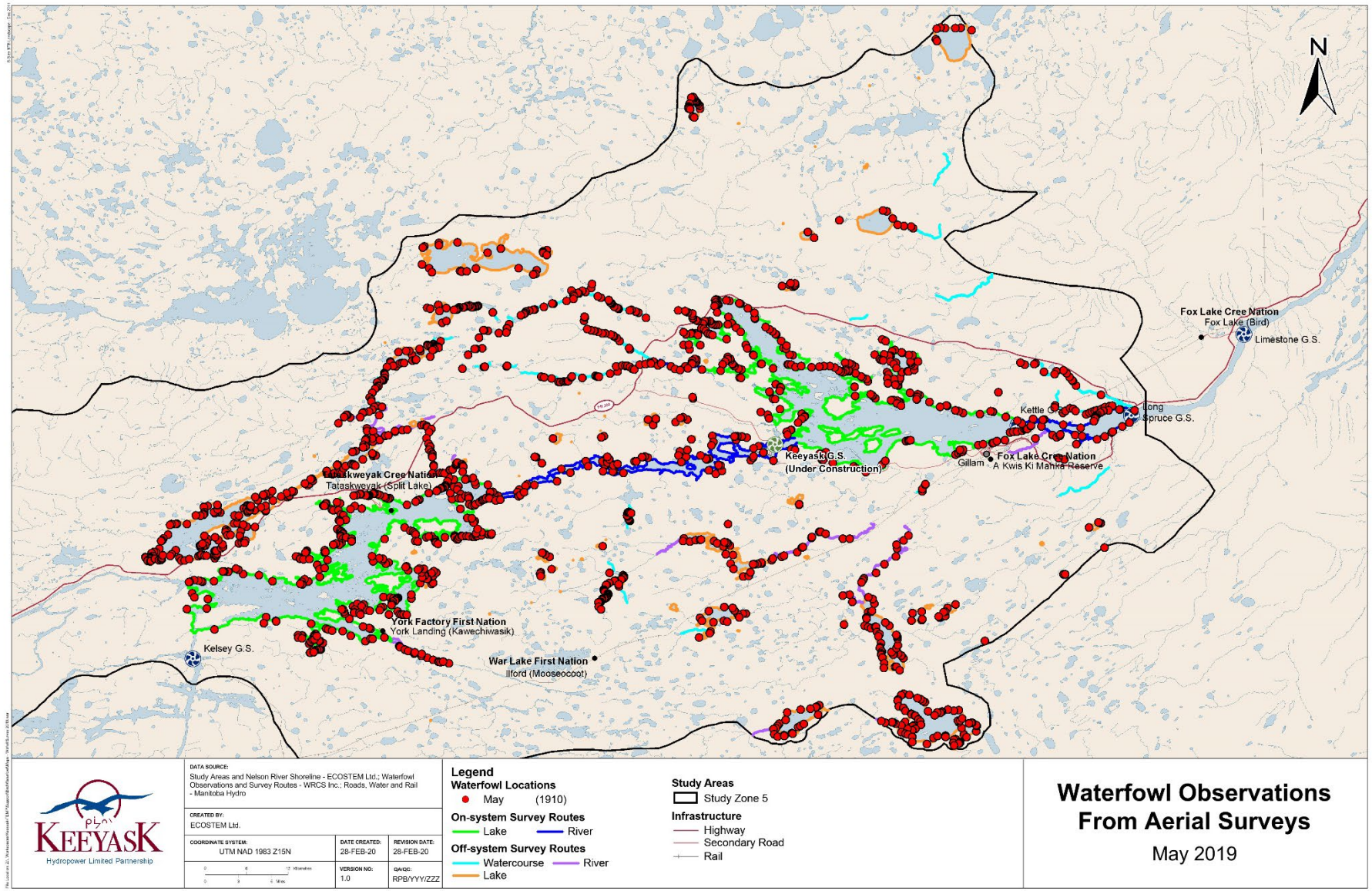
Year	May	July	September
2001	20	2	13
2002	32	6	21
2003	33	11	58
2011	37	<1	NA
2015	25	4	10
2017	24	4	6
2019	9	5	16

Table 6: Average Waterfowl Densities (birds/km^2) in Gull Rapids During Construction (2015, 2017, 2019) and Pre-construction (2001-2003, 2011) Surveys

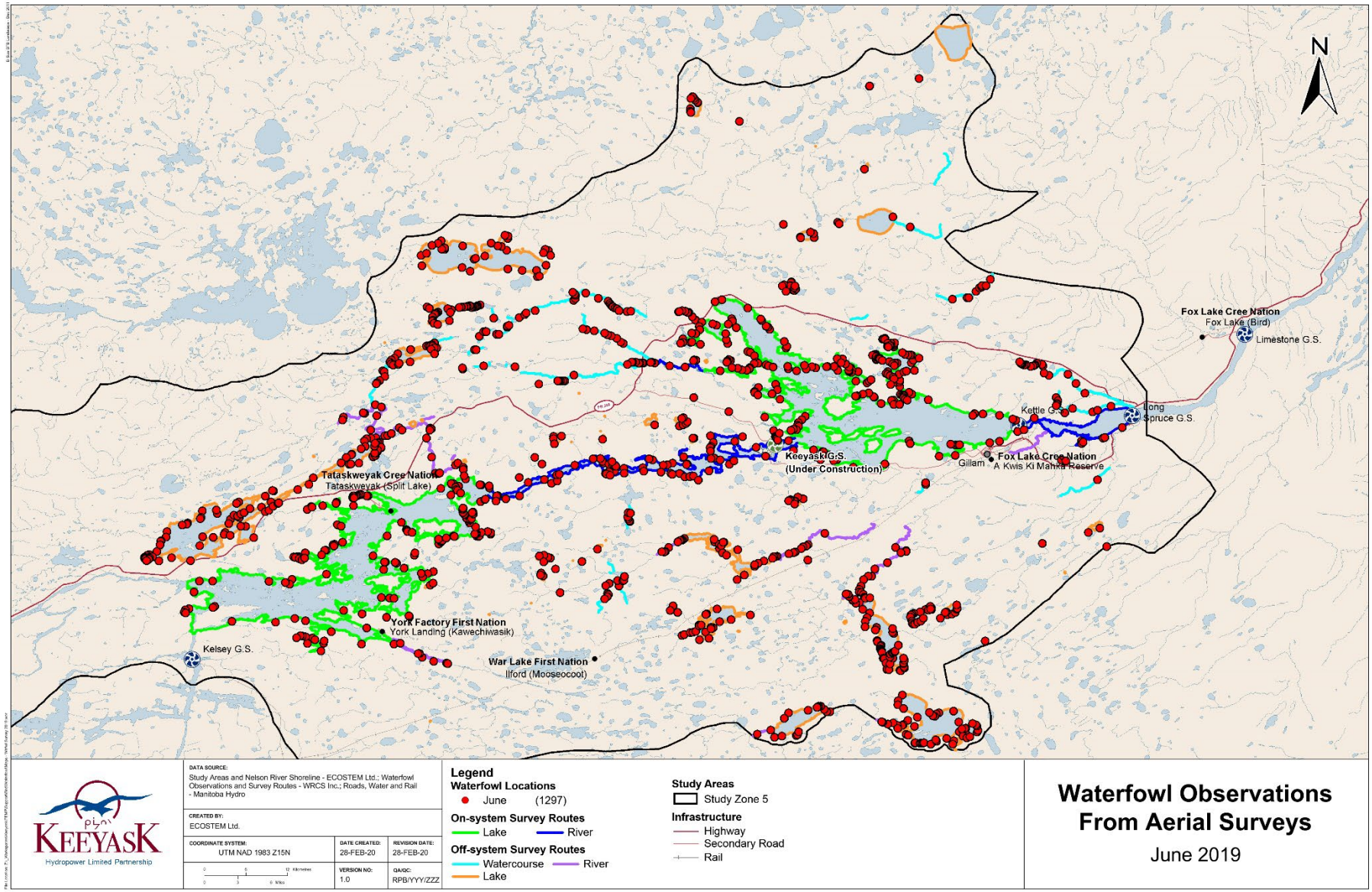
Year	May	July	September
2001	NA	NA	NA
2002	NA	NA	NA
2003	11	3	29
2011	1	5	NA
2015	3	4	7
2017	19	3	3
2019	2	4	0



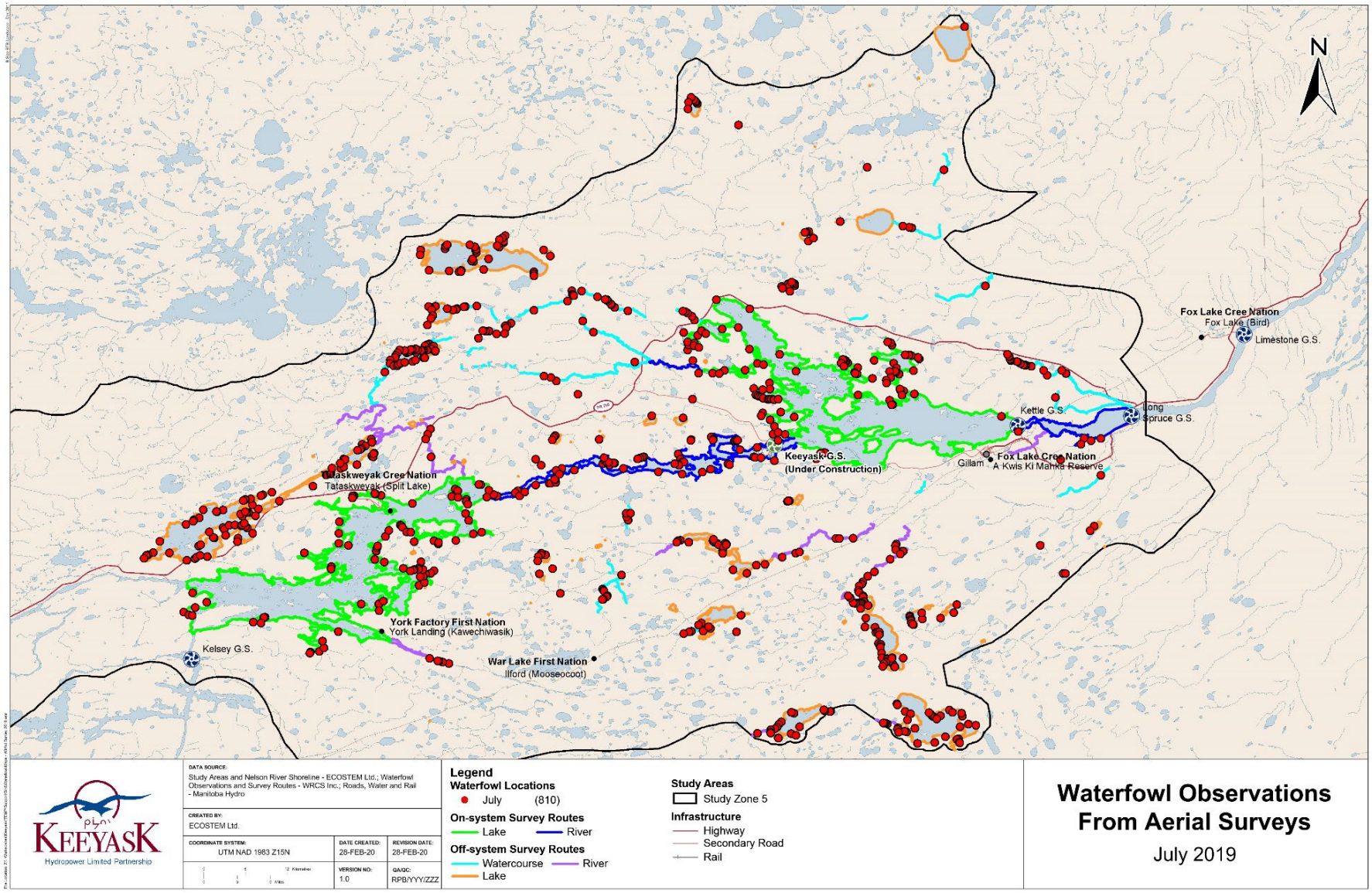
Map 2: Waterfowl Observations from Aerial Surveys in April 2019



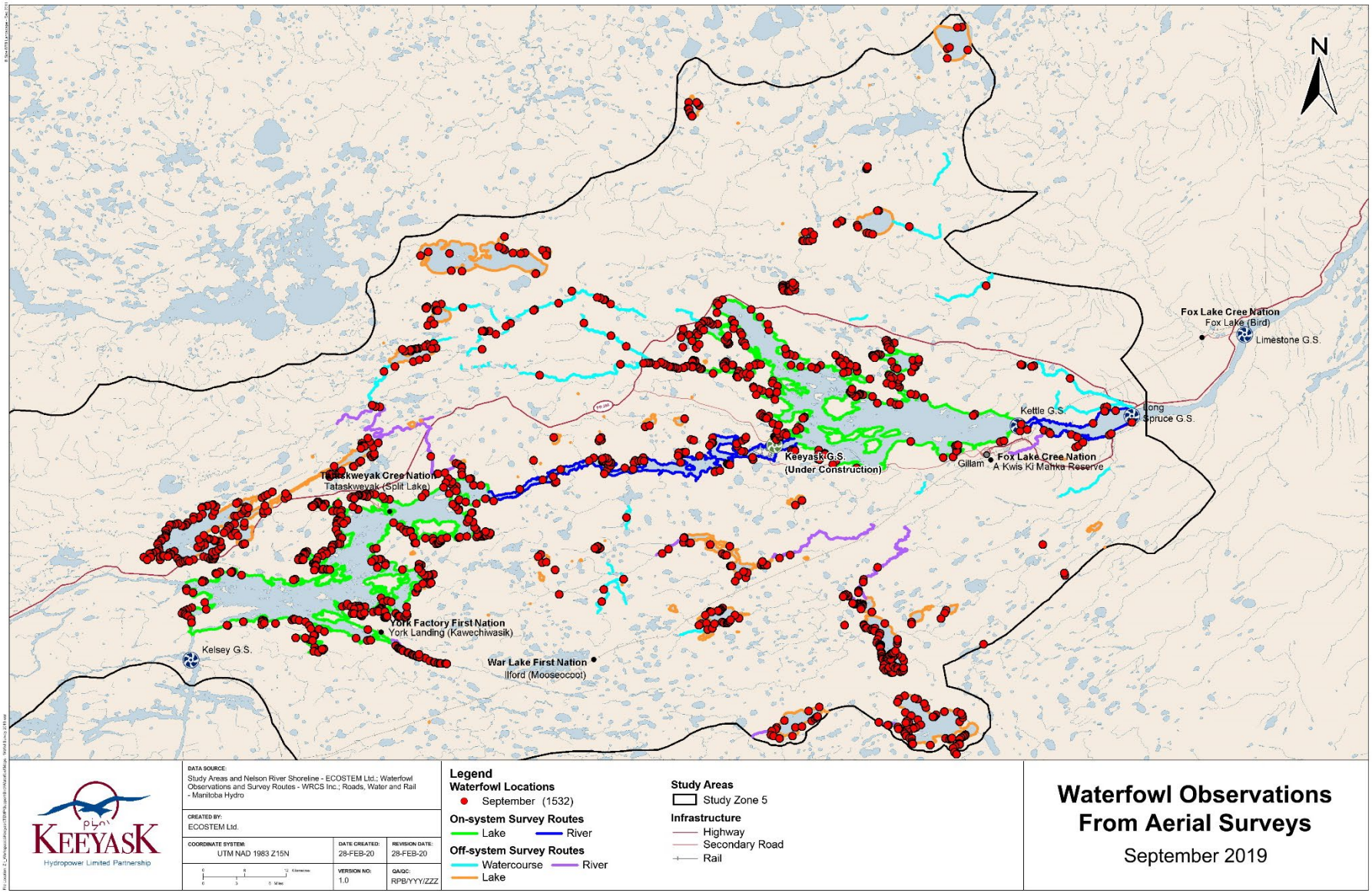
Map 3: Waterfowl Observations from Aerial Surveys in May 2019



Map 4: Waterfowl Observations from Aerial Surveys in June 2019



Map 5: Waterfowl Observations from Aerial Surveys in July 2019



Map 6: Waterfowl Observations from Aerial Surveys in September 2019

3.2 INDICATED BREEDING PAIRS

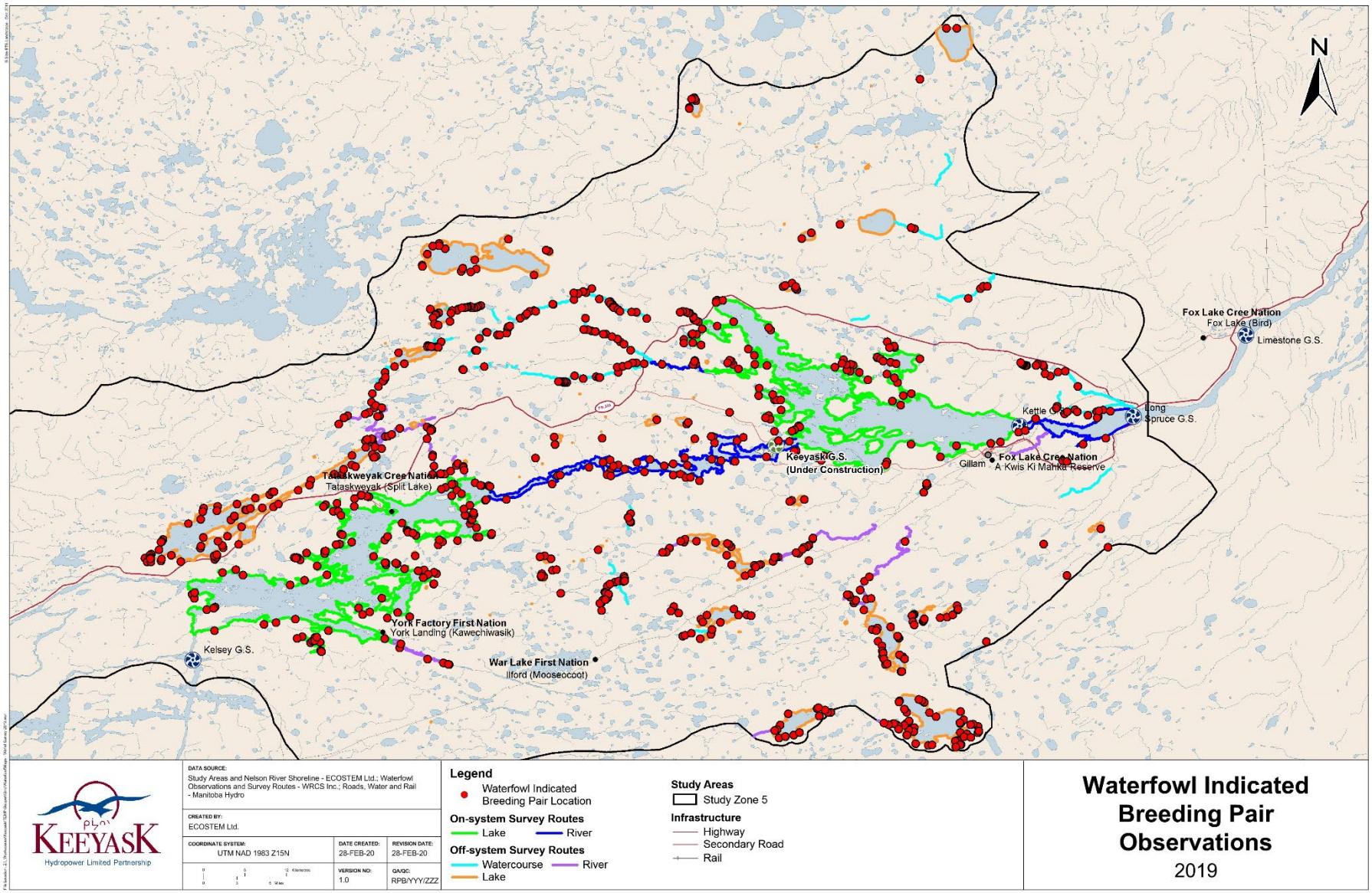
A total of 1,055 IBPs were observed in late May/June 2019 (Table 6; Map 7). Indicated breeding pairs of mallard were the most common waterfowl species observed in Study Zone 5. Indicated breeding pairs of ring-necked duck, Canada goose, and American wigeon were also relatively common (Table 6).

Total IBP densities were greatest in off-system watercourses and lakes (Table 7). On-system lakes rivers supported similar densities of IBPs (Table 7). This trend was similar to previous construction surveys conducted in 2015 and 2017 (Figure 2).

In 2019, IBP densities of mallard and Canada goose were greatest on off-system watercourses and lakes (Table 5). These findings are consistent with the observations made during the previous construction surveys in 2015 and 2017.

Table 7: Number of Indicated Breeding Pairs Observed in 2019

Species	No. Indicated Breeding Pairs
American Wigeon	132
Blue-winged Teal	1
Bufflehead	8
Canada Goose	130
Common Goldeneye	4
Common Loon	102
Common Merganser	70
Green-winged Teal	27
Mallard	383
Northern Pintail	7
Ring-necked Duck	142
Unknown Scaup	41
Unknown Scoter	8
Total	**1,055**



Map 7: Waterfowl Indicated Breeding Pair Observations from Aerial Surveys in 2019

Table 8: Density of Indicated Breeding Pairs (pairs/km) within Waterbody Types in 2019

Species	On-system			Off-system			
	Lake	River	Total	Lake	River	Watercourse	Total
American Wigeon	0.03	0.02	0.03	0.06	0.06	0.04	0.06
Blue-winged Teal	0.00	0.00	<0.01	0.00	0.00	0.00	0.00
Bufflehead	<0.01	0.00	<0.01	<0.01	0.00	0.02	<0.01
Canada Goose	0.02	<0.01	0.01	0.09	0.02	0.13	0.08
Common Goldeneye	<0.01	0.00	0.00	0.00	0.00	0.00	0.00
Common Loon	0.02	0.02	0.02	0.07	<0.01	0.05	0.05
Common Merganser	0.01	0.06	0.02	0.03	0.02	<0.01	0.02
Green-winged Teal	<0.01	<0.01	<0.01	0.01	<0.01	0.01	0.01
Mallard	0.05	0.04	0.05	0.19	0.17	0.37	0.22
Northern Pintail	0.00	0.00	0.00	<0.01	0.00	0.00	<0.01
Ring-necked Duck	<0.01	0.00	<0.01	0.03	0.06	0.36	0.10
Unknown Scaup	<0.01	0.00	<0.01	0.01	0.05	0.05	0.03
Unknown Scoter	<0.01	0.00	<0.01	<0.01	<0.01	0.00	<0.01
Total	0.15	0.16	0.15	0.51	0.40	1.04	0.59

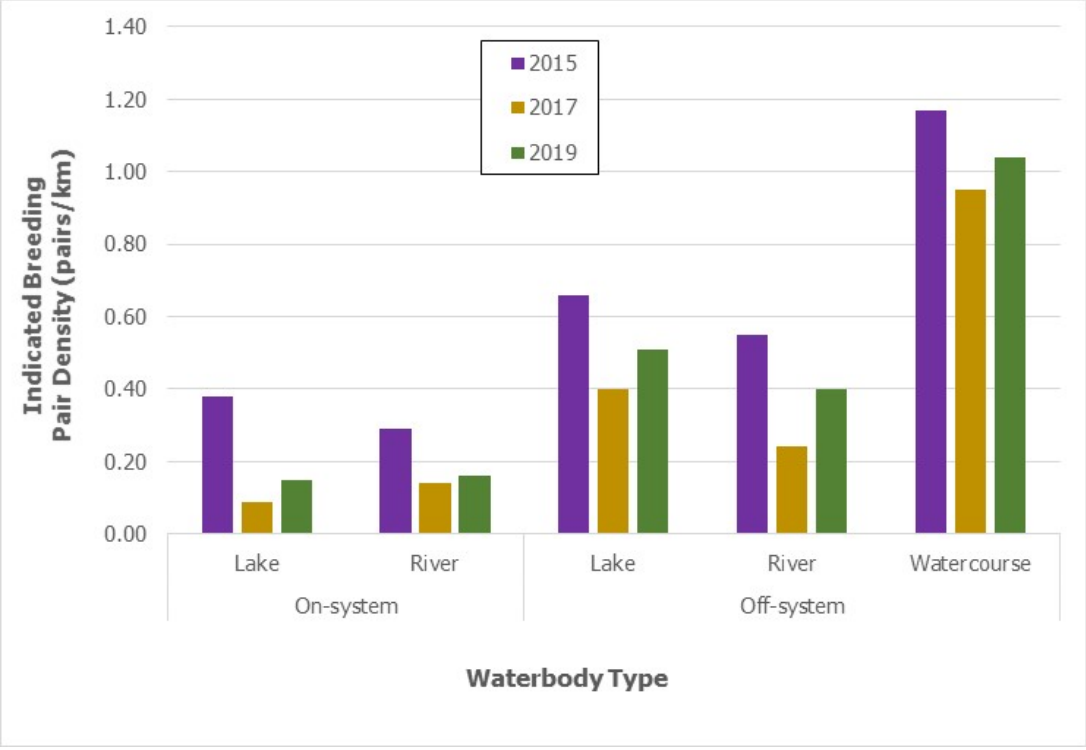


Figure 2: Breeding Pair Density (pairs/km) Within Different Waterbody Types During Construction Surveys

3.3 WATERFOWL BROODS

A total of 294 waterfowl broods were observed during the 2019 waterfowl surveys (Map 8). Canada goose was the most common species of brood observed, followed by mallard (Table 8). The number of individual Canada goose broods is likely underestimated due to numerous amalgamated broods observed. Of the 147 Canada goose broods observed, 45 broods appeared to be amalgamated as they were being attended by more than two adults. Amalgamated broods of other species were not observed.

Brood densities in 2019 were much higher than those observed in previous construction surveys (Figure 3). Brood densities were higher in all waterbody types surveyed in 2019 compared to 2015 and 2017. In 2019, off-system lakes and watercourses contained a greater density of waterfowl broods compared to on-system waterbodies (Table 9). Canada goose and mallard broods were observed in the greatest densities on off-system waterbodies. These findings are consistent with the observations made in 2015 and 2017.

The earliest mallard and Canada goose broods were observed on June 18 and 19, 2019, respectively. Backdating these observations based on the age of the broods indicates that most nests were initiated by Canada geese from April 29 to May 13, 2019, with the earliest nest initiation date of April 29, 2019. For mallard most nests were initiated from May 2-10, 2019, with the earliest nest initiation date of May 2, 2019.

The peak nest initiation date for Canada geese observed in 2019 is similar to what was estimated in 2015 (May 7) and slightly earlier than that estimated in 2017 (May 15). For mallard, peak nest initiation in 2019 was earlier than what was estimated in 2015 (May 15) and in 2017 (May 27).

Table 9: Number of Waterfowl Broods Observed Monthly in 2019

Species	Month			Total
	June	July	September	
American Wigeon	1	10	0	11
Bufflehead	1	2	0	3
Canada Goose	88	59	0	147
Common Loon	0	2	0	2
Common Merganser	0	3	0	3
Green-winged Teal	0	3	0	3
Mallard	23	78	1	102
Ring-necked Duck	0	2	0	2
Sandhill Crane	1	1	0	2
Unknown Dabbler	0	10	0	10
Unknown Diver	0	1	0	1
Unknown Duck	1	6	0	7
Unknown Swan	0	1	0	1
Total	**115**	**178**	**1**	**294**

Table 10: Density of Waterfowl Broods (broods/km) in Waterbody Types in 2019

Species	On-system			Off-system				Grand Total
	Lake	River	Total	Lake	River	Watercourse	Total	
American Wigeon	0.002	0.003	0.002	0.007	0.000	0.004	0.005	0.003
Bufflehead	0.000	0.000	0.000	0.001	0.000	0.009	0.002	0.001
Canada Goose	0.014	0.047	0.019	0.109	0.046	0.047	0.084	0.043
Common Loon	0.001	0.000	0.001	0.000	0.000	0.000	0.000	<0.001
Common Merganser	<0.001	0.000	<0.001	0.003	0.000	0.000	0.002	0.001
Green-winged Teal	0.000	0.000	0.000	0.001	0.004	0.004	0.002	0.001
Mallard	0.011	0.016	0.012	0.070	0.034	0.064	0.061	0.030
Ring-necked Duck	<0.001	0.000	<0.001	0.001	0.000	0.000	0.001	<0.001
Sandhill Crane	0.000	0.003	<0.001	0.001	0.000	0.000	0.001	<0.001
Unknown Dabbler	0.000	0.000	0.000	0.011	0.000	0.009	0.008	0.003
Unknown Diver	<0.001	0.000	<0.001	0.000	0.000	0.000	0.000	<0.001
Unknown Duck	0.002	0.005	0.002	0.000	0.004	0.004	0.002	0.002
Unknown Swan	0.000	0.000	0.000	0.001	0.000	0.000	<0.001	<0.001
Total	0.031	0.072	0.038	0.205	0.088	0.141	0.168	0.085

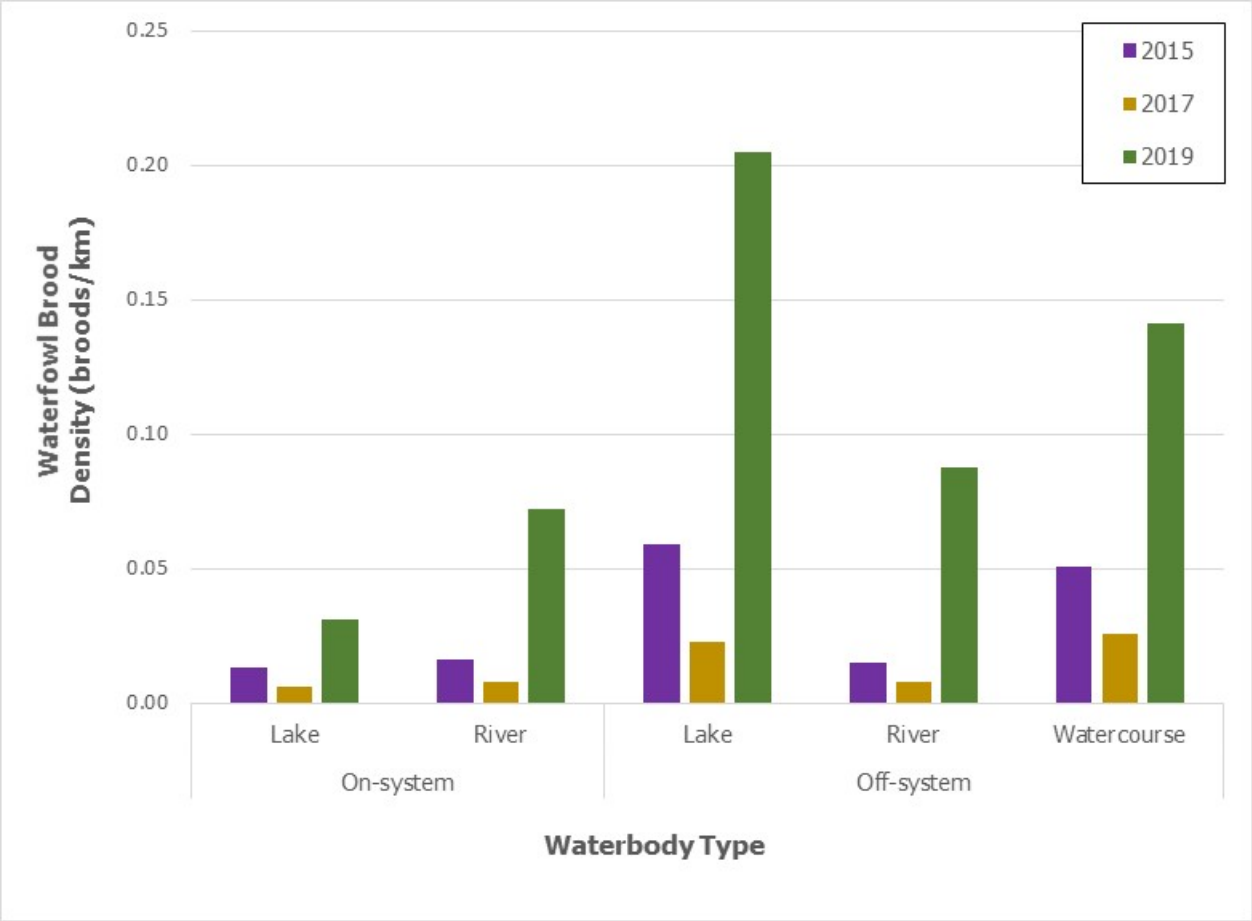
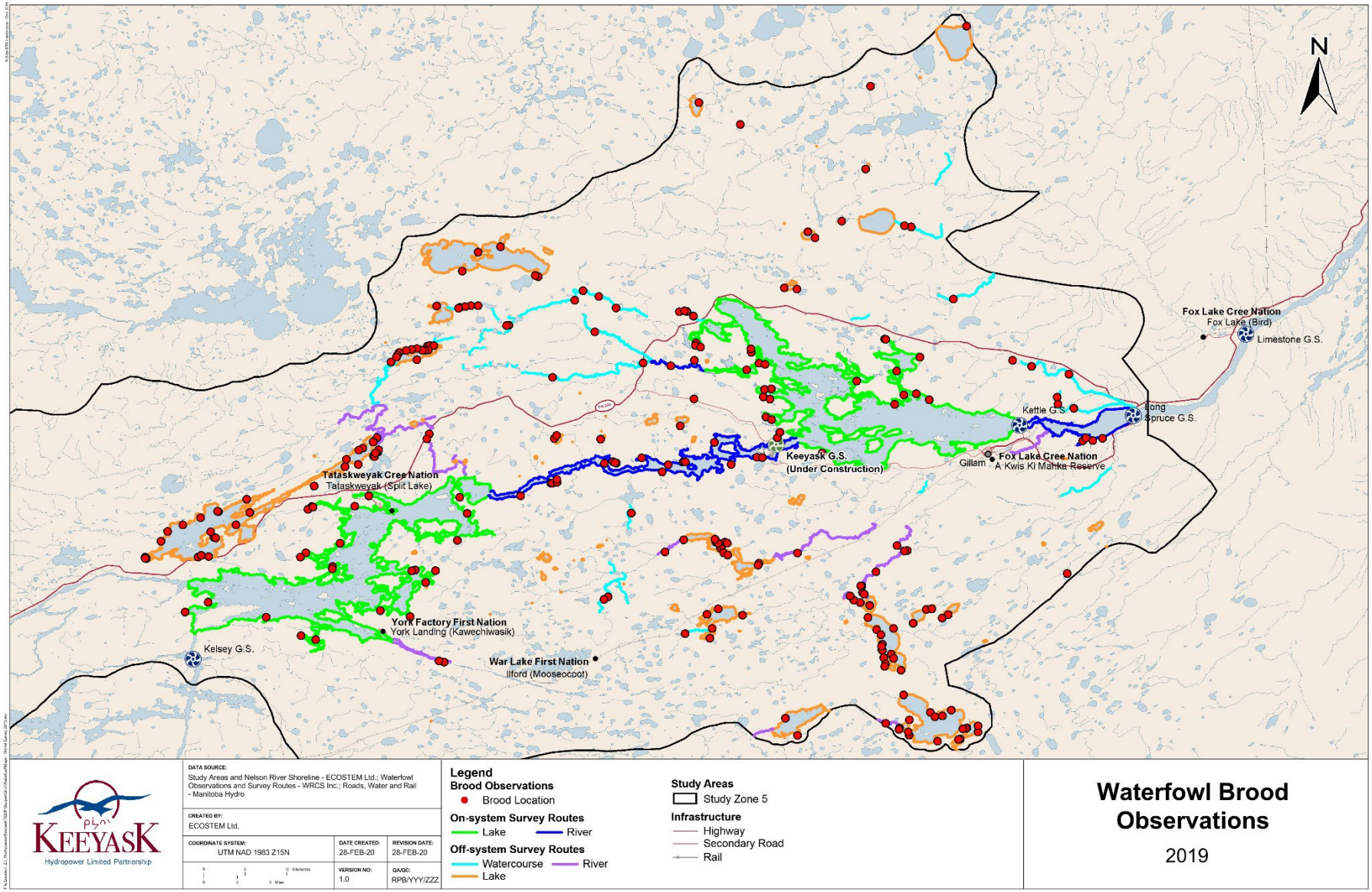


Figure 3: Waterfowl Brood Density (broods/km) Within Different Waterbody Types During Construction Surveys (2015, 2017, 2019)

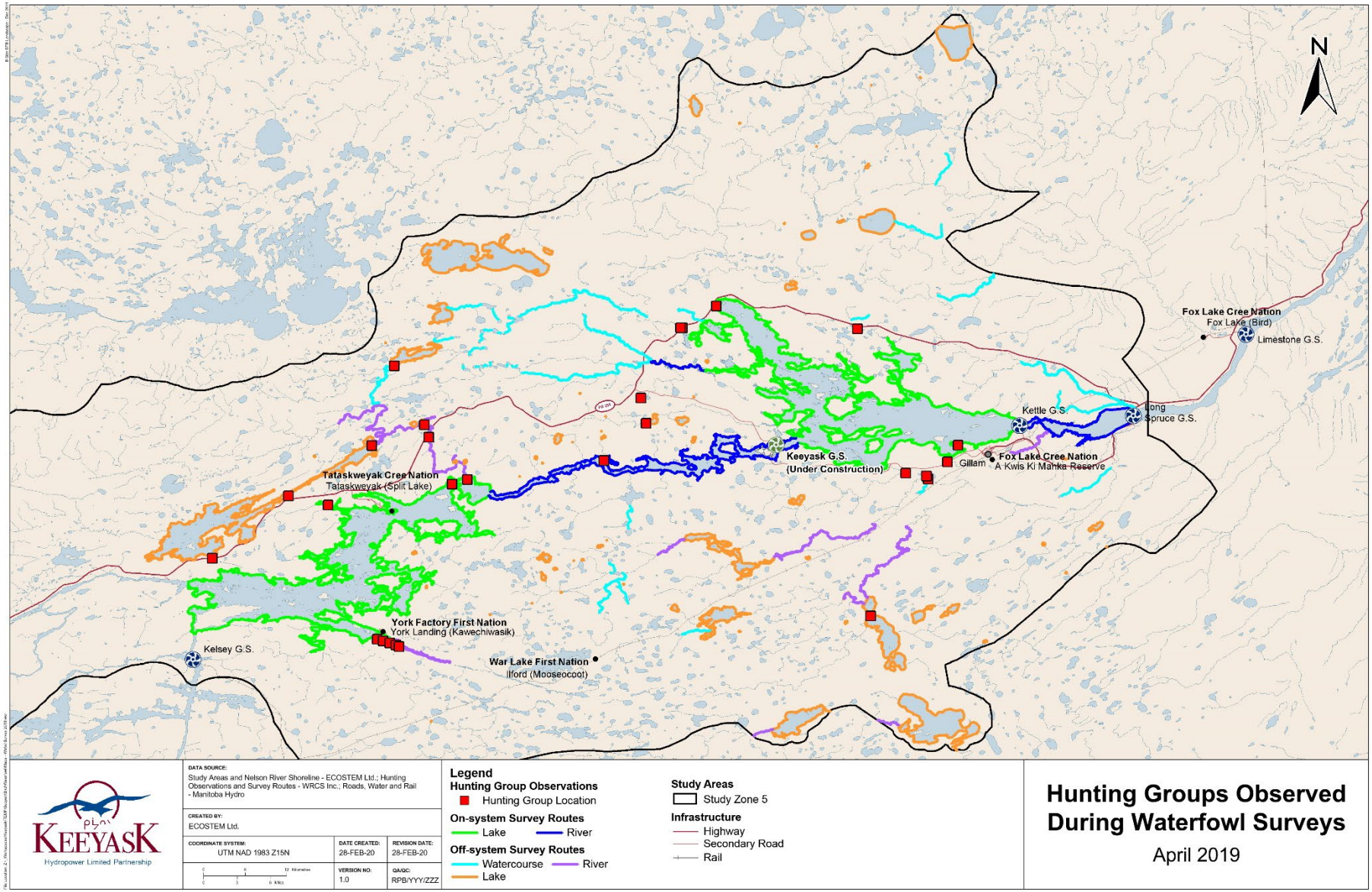


Map 8: All Waterfowl Brood Observations in 2019

3.4 HUNTING GROUPS

A total of 26 hunting groups were observed during the 2019 waterfowl surveys in late April/early May. Concentrations of numerous hunting groups near each of York Landing and Gillam were observed (Map 9). The remaining hunting groups were located throughout the regional study area and established accessible areas, including PR280.

The number of hunting groups observed in 2019 was consistent with the number observed during the construction surveys in 2015 and 2017, when 16 and 34 hunting groups were observed, respectively.



Map 9: Hunting Groups Observed During Waterfowl Surveys in April 2019

4.0 DISCUSSION

Disturbance of waterfowl may have occurred proximal to Project construction activities, but due to the temporal nature of disturbances and waterfowl use of potentially disturbed habitat, it is difficult to quantify. Waterfowl densities in Gull Lake in 2019 were similar to those observed during pre-construction surveys, with the exception of the May 2019 survey, when relatively low numbers of waterfowl were observed. The lower density observed at this time was likely due to the relatively ice-free conditions present throughout the region, which allowed waterfowl to disperse rather then be concentrated in areas where water currents create patches of open water, which is often observed at this time of year.

Waterfowl densities in Gull Rapids were relatively low compared to previous construction surveys and pre-construction surveys. This is likely partially due to construction disturbance in the area, but due to the relatively small area and variable use of the area by waterfowl it is difficult to determine.

Overall waterfowl densities in 2019 were consistent with the densities observed during previous construction and pre-construction surveys. For all surveys, the seasonal trends of waterfowl densities in the regional study area were similar. Densities were greatest during the fall migration, lower during the spring migrations, and lowest during the summer. The similarity of seasonal trends among survey years suggests that waterfowl use in Study Zone 5 has been relatively consistent. The temporal nature of waterfowl, particularly during the spring and fall migrations, likely accounts for some of the waterfowl density variation observed among survey years.

The monthly surveys in 2019 showed fewer peaks of waterfowl abundance and steadier numbers throughout the survey period compared to previous construction surveys. The number of waterfowl in May 2019 was lower than the numbers observed in May 2015 or 2017. The relatively low density observed at this time was likely a result of waterfowl dispersing throughout the region due to most waterbodies being relatively free of ice at this time and not confined to areas of open water created by current, such as on the Nelson River, where high densities have been observed previously. More waterfowl appeared to breed and nest in the regional study area in 2019 as indicated by the relatively high abundance of individuals observed in June and July and the high number of broods observed.

The relatively large number of broods observed in 2019 was likely due to a combination of factors in and outside of the regional study area. Annual waterfowl surveys conducted by the U.S. Fish and Wildlife Service and the Canadian Wildlife Service found poor habitat conditions for breeding waterfowl in southern Manitoba and Prairie Canada during the spring of 2019 (USFWS 2019). The estimated number of ponds, which is used as an indicator of available waterfowl breeding habitat, in Prairie Canada was 2.9 million (±0.1 million) ponds, which was 19% below the long term average of 3.5 million (±0.02 million) ponds. Waterfowl that arrived in Prairie Canada with poor breeding conditions in the spring of 2019 likely migrated further into the Parkland region and Boreal forest to find more suitable breeding habitat (Johnson and Grier 1988). This resulted in more birds settling in the regional study area, where conditions were favourable for breeding and

nesting. In the regional study area it was noted that water levels in all waterbody types were low. The relatively low water levels in the regional study area likely resulted in a greater amount of marsh habitat and exposed mudflats (Appendix A), particularly in off-system lakes, which are generally shallower compared to on-system lakes. This likely attracted waterfowl and maintained them in the area and resulted in the high numbers of broods observed.

Similar to previous construction surveys, the greatest number of waterfowl were observed during the fall migration period. During this time, large numbers of diving duck species, particularly ring-necked ducks, were found in large flocks and a relatively large number of unknown diving ducks were also observed during September. The tendency of staging diving ducks to use large water bodies and congregate away from the shoreline contributed to the relatively high number of diving ducks being unidentified in September. Diving ducks preferred off-system lakes in the fall, likely due to better foraging opportunities provided by these waterbodies (*i.e.,* submersed vegetation and relatively shallow water).

Based on the distribution of hunting groups observed in 2019, hunter access did not seem to be increased by construction activities. Most hunting groups observed were near existing towns or communities, near previously established hunting camps, or along PR280. The Project's South Access Road was open to the public in 2019, but no hunters were observed in this newly accessible area.

Data collected from the construction surveys will be used to generate a habitat selection model to predict the amount of habitat disturbance as a result of the Project and its potential impact on Canada goose, mallard, and other waterfowl species. The Project reservoir is scheduled to be surveyed for waterfowl in the fall of 2020, following impoundment.

5.0 SUMMARY AND CONCLUSIONS

Waterfowl densities observed in 2019 were similar to those observed during the pre-construction and previous construction surveys. This suggests that waterfowl use in the regional study area has been consistent since the start of construction and disturbance related to construction activities does not appear to be limiting waterfowl use.

The seasonal trend of waterfowl abundance in the regional study area was less pronounced in comparison to previous construction surveys. This was likely a result of ice-free conditions in the spring (May) and more waterfowl settling and staying in the regional study area to breed and nest due to poor habitat conditions in traditional nesting areas in southern Manitoba and in Prairie Canada.

A large number of waterfowl broods, mainly Canada goose and mallard, were observed during the June and July surveys. The greatest density of waterfowl broods were observed in off-system lakes. Water levels in the regional study area were relatively low and submergent vegetation and mudflats were common in off-system lakes, providing good waterfowl brood habitat.

Off-system waterbodies supported the greatest densities in the regional study area. Off-system lakes supported the greatest waterfowl densities during all periods, with the exception of late April/early May when off-system rivers were preferred. Off-system rivers that are ice free earlier than other waterbody types tend to be preferred in early and late spring. During the nesting, brood rearing, and fall staging period, off-system waterbodies are preferred by waterfowl. This may be due to the presence of better foraging or nesting opportunities provided by shallower water or by more diverse or abundant aquatic vegetation.

A similar number of hunters was observed in 2019 compared to 2015 and 2017. Hunting pressure in Study Zone 5 did not appear to increase due to Project construction as most hunting groups were observed near settlements, established hunting camps and existing access routes (PR 280).

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APPENDIX A: PHOTOS

Photo 1: Flock of Canada Geese on Ice Edge in April 2019

Photo 2: American Black Duck and Two Drake Mallards in May 2019

Photo 3: Three Canada Goose Broods on an Off-system Lake in June 2019

Photo 4: Flock of Common Goldeneye in June 2019

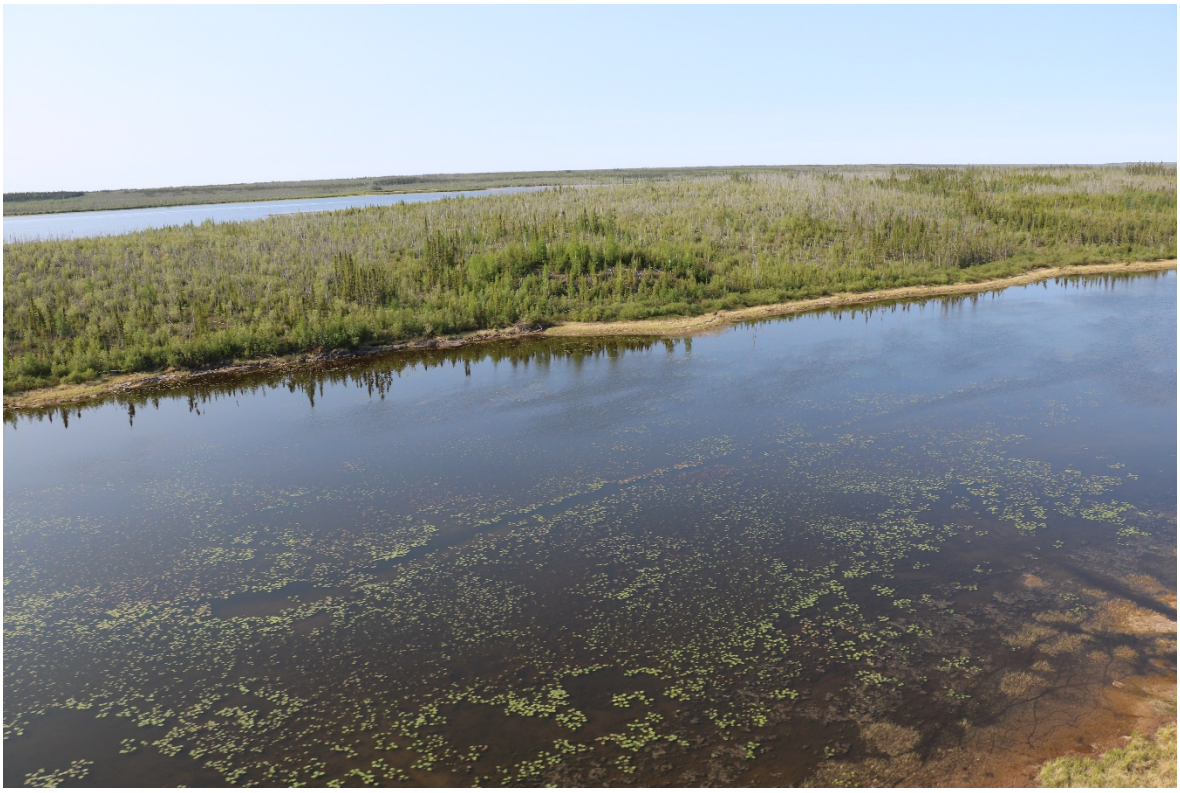

Photo 5: Submerged Vegetation Growth and Exposed Shorelines in an Off-system Lake in June 2019

Photo 6: Pair of Unknown Swans with Two Cygnets in July 2019

Photo 7: Exposed Mudflats on Off-system Lake in July 2019

Photo 8: Large Flock of Unknown Diving Ducks in September 2019