Keeyask Generation Project

Terrestrial Effects Monitoring Plan

Waterfowl Habitat Effects Monitoring Report

TEMP-2023-12

KEEYASK

Manitoba Environment and Climate Client File 5550.00
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2022 -2023

KEEYASK GENERATION PROJECT

TERRESTRIAL EFFECTS MONITORING PLAN

REPORT #TEMP-2023-12

WATERFOWL HABITAT EFFECTS MONITORING

YEAR 1 OPERATION

2022

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) began in July 2014 and the generating station was fully operational in March 2022. 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 goose and mallard were identified as Valued Environmental Components in the Project's environmental assessment and Terrestrial Effects Monitoring Plan due to their abundance in the area and importance as a food source for local First Nations members. Canada goose, mallard, and other species of waterfowl are relatively abundant in the Keeyask area during the spring and fall migration periods. Numerous waterbodies provide waterfowl habitat, 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 2001-2003 and in 2011. Construction-phase waterfowl surveys occurred in 2015, 2017, and 2019-2021. Results from these studies will be used as a comparison to operation-phase surveys to examine potential effects of Project operation on waterfowl.

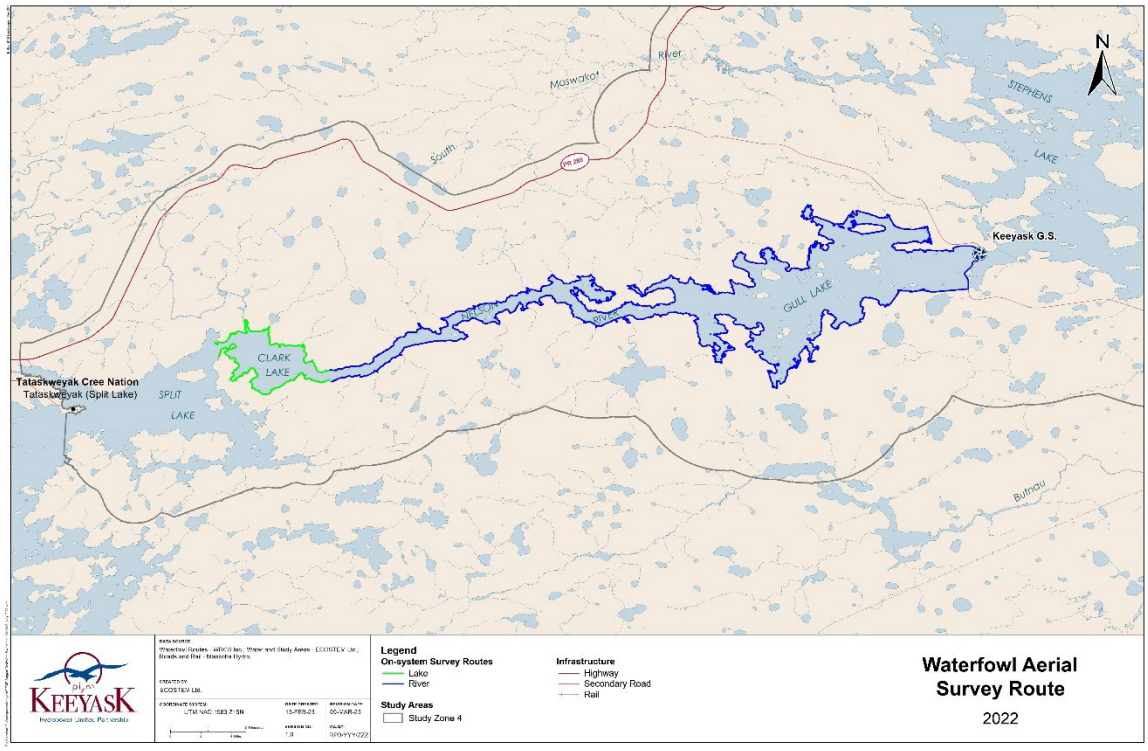
Flock of Canada Geese Observed during the Fall Migration in 2022

Why is the study being done?

Project operation was expected to cause a loss of waterfowl habitat due to the creation of the reservoir, and a reduction of waterfowl habitat quality and available food for some species due to erosion and lowered water quality. These changes were anticipated to cause a shift of waterfowl from the reservoir area to more suitable habitat elsewhere in the region. Additionally, hunting pressure was anticipated to increase due to increased access provided by the North and South Access Roads. To verify Project impacts on Canada goose, mallard, and other waterfowl species, the relative number and location of waterfowl during operation are being monitored and compared to data collected during previous pre-construction and construction-phase surveys.

What was done?

A series of aerial (helicopter) waterfowl surveys were conducted in May, June, and September 2022. The survey was focused on shorelines along the Nelson River between the former Gull Rapids and Clark Lake (*i.e.,* the reservoir area). To assess potential impacts of the Project on waterfowl in the area, waterfowl densities (number of birds/km) observed in the reservoir area in 2022 were compared to the densities observed during pre-construction surveys, conducted from 2001-2003 and in 2011, and during the construction surveys conducted in 2015, 2017, and 2019-2021.



What was found?

The number of waterfowl observed in 2022, during the first operation-phase survey, were higher than or within the ranges observed during the previous construction and pre-construction surveys. The Keeyask reservoir, flooded in early September 2020, provided areas of shallow water mixed with vegetation that several species of waterfowl, including Canada goose and mallard, were observed using for feeding.

What does it mean?

Project operation did not appear to affect waterfowl use in the area. In some surveyed areas, the shallow submerged peatlands likely created temporary waterfowl habitat for feeding. These areas are expected to disintegrate over time and will become less appealing to waterfowl.

What will be done next?

The 2022 waterfowl survey was the first operation-phase survey for the Project. Waterfowl habitat effects monitoring will continue during operation over the next 10 years. The next waterfowl survey is scheduled for spring 2024.

STUDY TEAM

We would like to thank Sherrie Mason and Rachel Boone of Manitoba Hydro for editorial comments. 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, WRCS – Design, analysis, and reporting
- Mark Baschuk, WRCS – Survey personnel, analysis, and reporting
- Thomas Wood, WRCS – Survey personnel

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1.0 INTRODUCTION

The Keeyask Generation Project (the Project) is a 695-megawatt hydroelectric generating station (GS), located at the former Gull Rapids on the lower Nelson River in northern Manitoba where Gull Lake flows into Stephens Lake. Project construction began in July 2014 and the generating station was fully operational in March 2022.

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 Environment 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 operation phase.

Waterfowl surveys during operation 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*.

Reservoir creation and Project operation was anticipated to cause the loss of some waterfowl breeding and staging habitat in the reservoir footprint due to the inundation of some of the inland lakes, wetlands, and creeks (KHLP 2012). Ongoing peatland disintegration and the accumulation of woody debris along the shoreline in the reservoir were anticipated to reduce waterfowl habitat quality and water quality. It was uncertain if waterfowl would seek more optimal staging areas outside of the Regional Study Area or continue using sub-optimal staging habitat within the study area (*i.e.,* reservoirs, Stephens Lake) (KHLP 2012).

Changes in water quality during Project operation were also expected to alter the aquatic food resources for waterfowl, including reducing the availability of benthic invertebrates, which are consumed by diving duck species (*e.g.,* common goldeneye, scoter species) (KHLP 2012). This effect was anticipated to be moderate on diving ducks as benthic invertebrates will re-establish in other areas of the reservoir and may result in a temporary displacement of staging waterfowl (KHLP 2012).

Additionally, the use of the North and South Access Roads between Provincial Road 280 and the town of Gillam, once part of the provincial highway system, may result in increased hunting pressure on waterfowl on nearby creeks and inland lakes. As waterfowl abundance is predicted to decline in the reservoir during operation, increased hunter access is not anticipated to have an effect on the local waterfowl population (KHLP 2012).

Previous waterfowl surveys have occurred in the Keeyask region as part of pre-construction and construction monitoring for the Project. Results of these surveys found that waterfowl densities during Project construction, from 2015-2021, were not significantly different from those observed during pre-construction surveys conducted from 2001-2003 and in 2011 (WRCS 2022). In 2021, following the creation of the Project reservoir, some of the highest waterfowl densities were observed during any of the pre-construction or other construction surveys (WRCS 2022). The increased amount of shoreline created by reservoir filling and the inundation of peatland areas appeared to have provided increased foraging opportunities and numerous flocks of waterfowl were observed feeding in the newly submerged peatland areas (WRCS 2022).

The objectives of waterfowl monitoring during Project operation are to identify changes in abundance or distribution in the reservoir and surrounding area, including Clark Lake and the former Gull Rapids. This report provides the results of the first year of operation-phase monitoring for the Waterfowl Habitat Effects study.

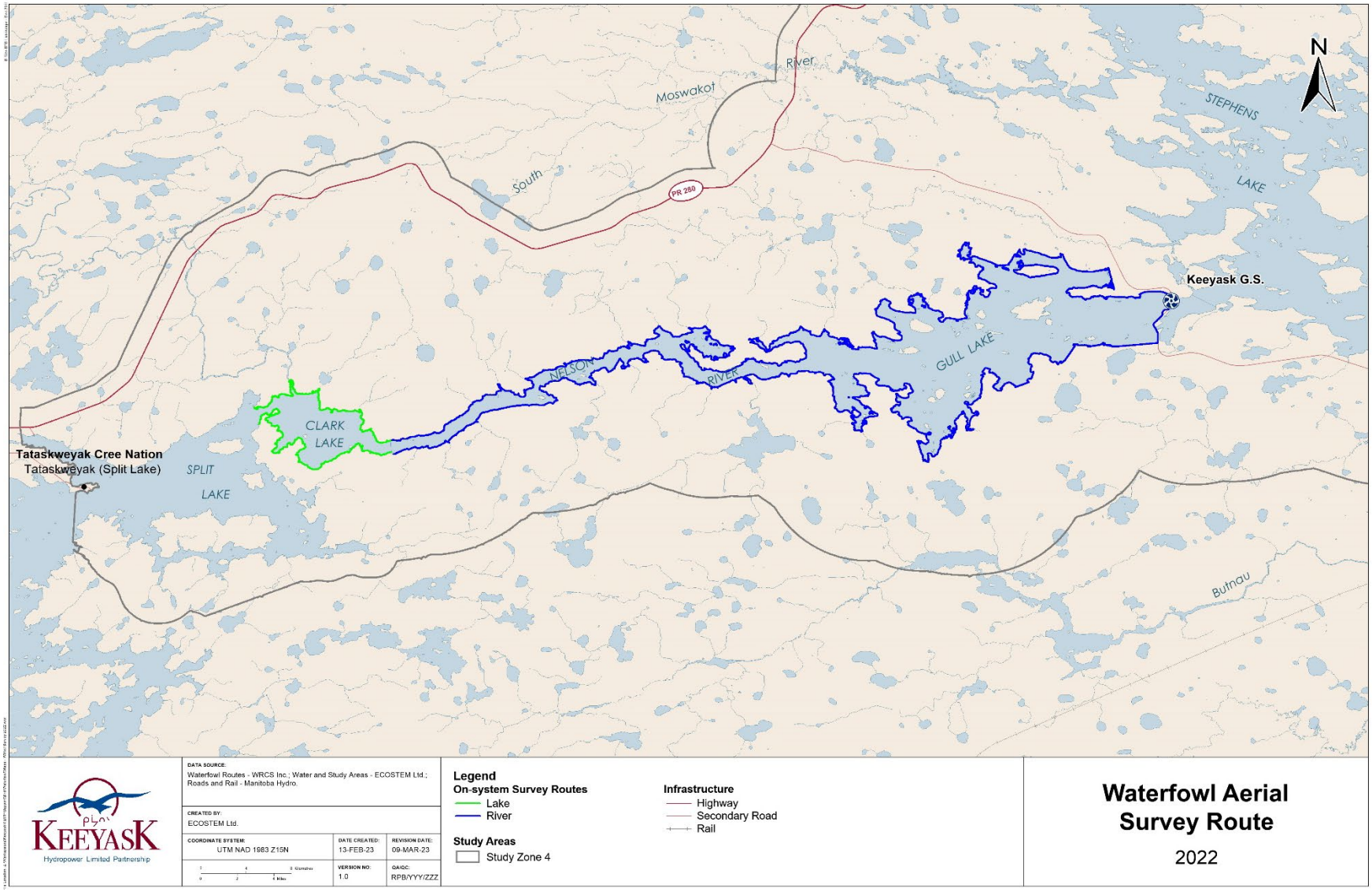
2.0 METHODS

2.1 AERIAL SURVEYS

Aerial surveys for waterfowl were conducted three times in 2022, on May 27, June 17, and September 21, within the Project reservoir and surrounding area, including Clark Lake and Gull Rapids, which consisted of 361 km of shoreline (Map 1). The surveys in 2022 were timed to be as similar as possible to previous Project surveys that were conducted from 2019-2021, 2017, and 2015, but did not include the early-spring survey or summer (July) survey.

The survey was 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. The survey route followed the general contours of the new reservoir shoreline, and areas slightly beyond the reservoir. The survey was conducted under clear weather conditions, with wind speeds below 25 km/hr and the absence of rain, fog, etc., that may obscure visibility. 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, a pair with cygnets was observed in the area in 2020 and there are several areas within the regional bird 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.



Map 1: Overview of Waterfowl Aerial Survey Route in 2022

2.2 DATA ANALYSIS

2.3 WATERFOWL DENSITIES

To assess the potential effects of Project construction on waterfowl a Mann-Whitney U test (α=0.05) was used to compare waterfowl densities (birds/km) between the pre-construction surveys (2001-2003 and 2011) and operation survey (2022), as well as between the construction surveys (2015, 2017, 2019-2021) and operation survey. Only observations of ducks, geese, and swans were included (all merganser, common loon (*Gavia immer*), grebe, and sandhill crane (*Grus canadensis*) observations were removed as these species have different habitat requirements than the most common waterfowl species observed). The length of the surveyed shoreline in and around the reservoir was calculated to be 279 km for the pre-construction surveys and the 2015, 2017, and 2019 construction surveys, prior to reservoir filling. Following reservoir filling, for the 2020-2022 surveys, the shoreline length was calculated to be 361 km.

2.4 INDICATED BREEDING PAIRS

Data from the 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 the reservoir and surrounding area. Data from the 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).

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

3.0 RESULTS

3.1 WATERFOWL DENSITIES

In 2022, during the May survey, a total of 2,160 birds, consisting of 19 species were observed (Table 1; Map 2). Unknown scaup were the most common bird observed, while unknown scoter, mallard, and green-winged teal, were also abundant (Table 1).

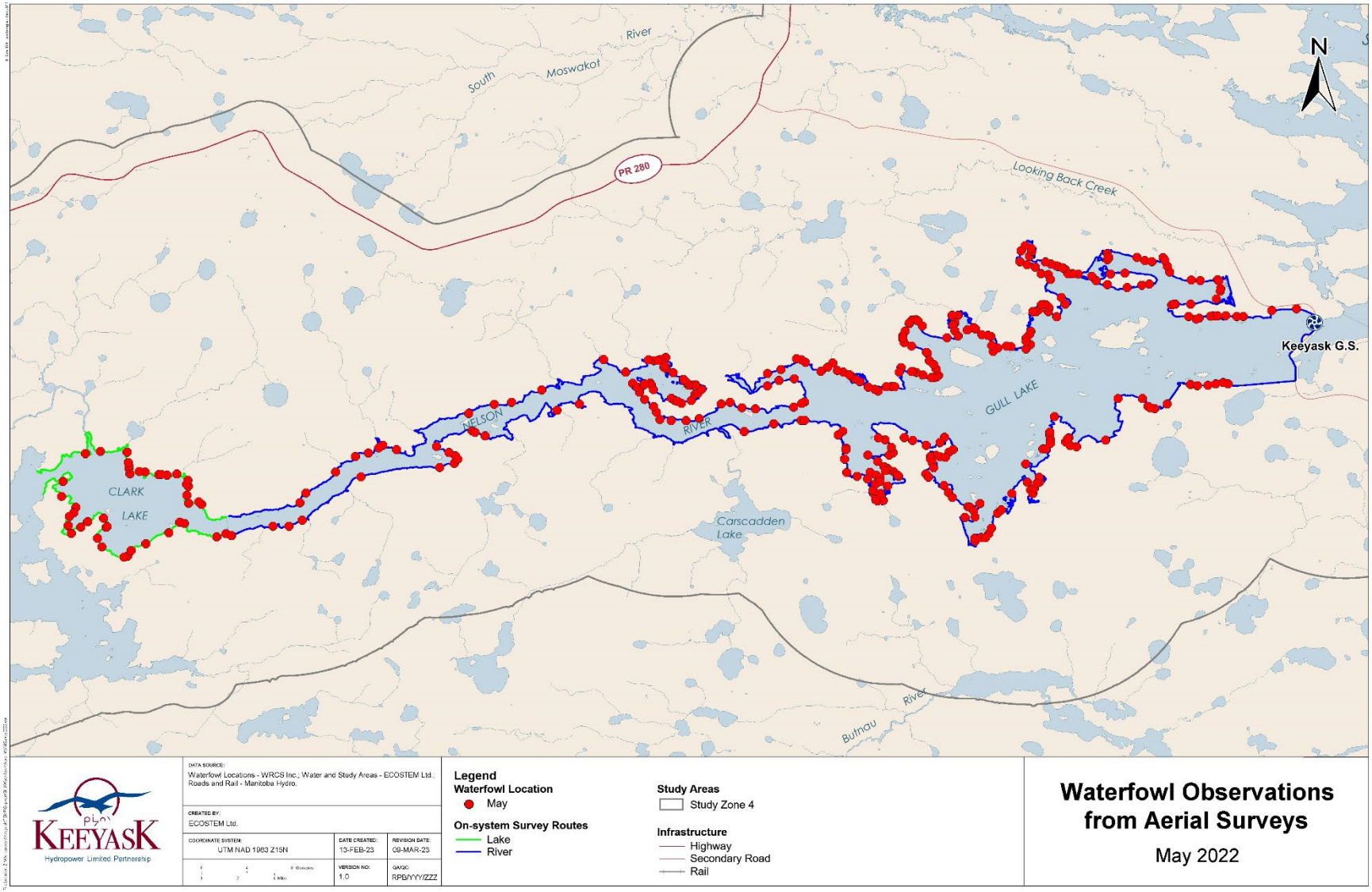
In the June survey, a total of 1,068 birds, consisting of 16 species, were observed (Table 1; Map 3). There was a large decrease of unknown scaup and unknown scoter during this survey, and an increase in the number of Canada geese observed, which consisted of 38% of the total observations (Table 1). Other common species observed included mallard, ring-necked duck, and green-winged teal (Table 1).

In the September survey, 1,203 birds, consisting of 14 different species were observed (Table 1; Map 4). Mallard and green-winged teal were the most common observations, comprising 44% and 25% of the total observations, respectively.

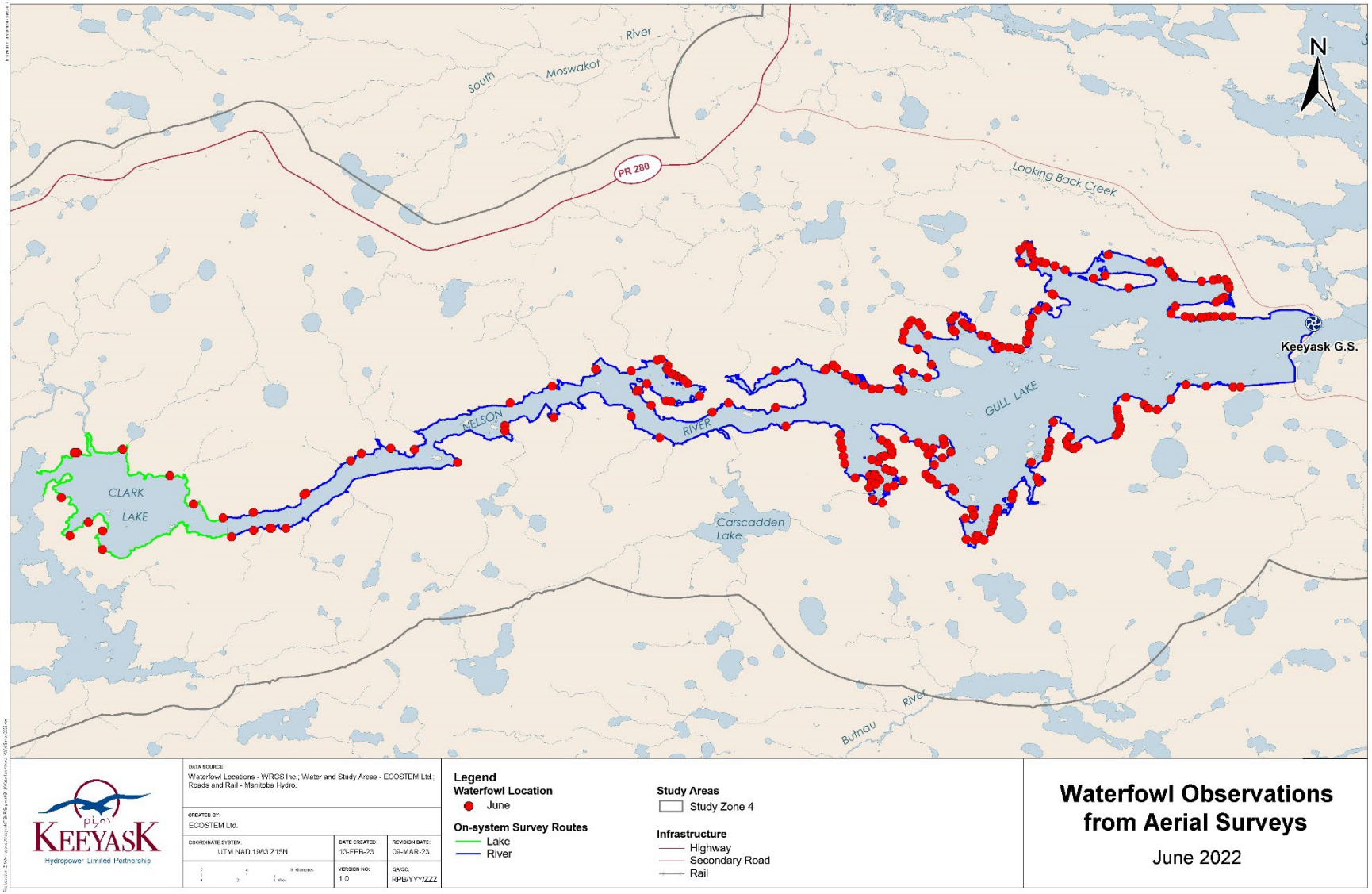
During all surveys, waterfowl observations often occurred where peatland areas had recently become submerged within the reservoir, creating shallow water areas interspersed with vegetation that many species of waterfowl prefer for feeding and roosting (Photo 1).

Table 1: Total Number of Waterfowl Observed During Aerial Surveys in 2022

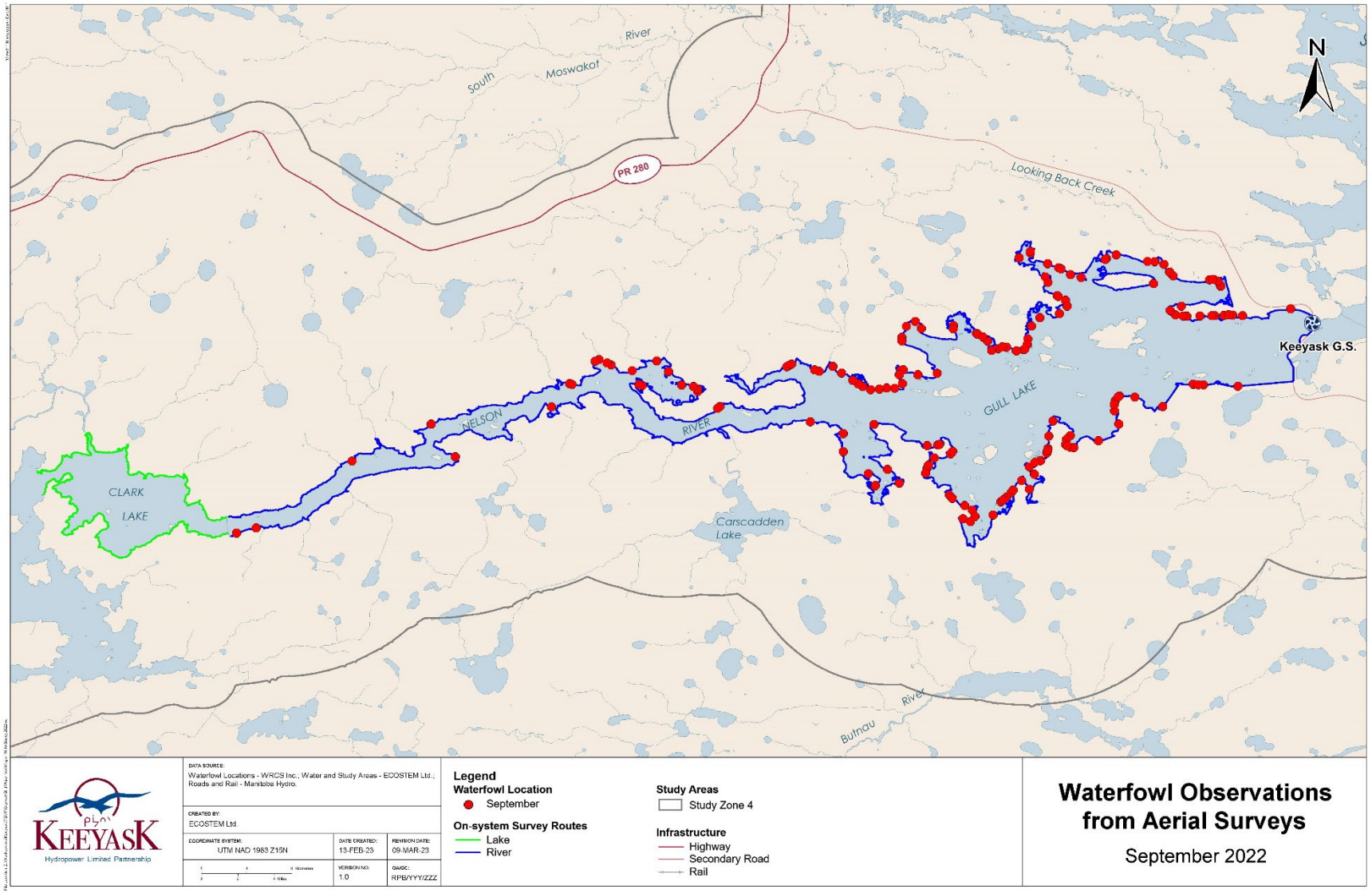
Species	27-May	17-June	21-Sept.	Total
American Black Duck (*Anas rubripes*)	0	3	2	5
American Wigeon (*Anas americana*)	114	62	10	186
Black Scoter (*Melanitta americana*)	4	0	0	4
Bufflehead (*Bucephala albeola*)	23	12	0	35
Blue-winged Teal (*Anas discors*)	44	33	29	106
Canada Goose (*Branta canadensis*)	56	409	57	522
Common Goldeneye (*Bucephala clangula*)	75	16	15	106
Common Loon (*Gavia immer*)	25	10	2	37
Common Merganser (*Mergus merganser*)	153	34	3	190
Green-winged Teal (*Anas carolinensis*)	236	100	301	637
Hooded Merganser (*Lophodytes cucullatus*)	1	0	0	1
Mallard (*Anas platyrhynchos*)	244	135	530	909
Northern Pintail (*Anas acuta*)	84	17	23	124
Northern Shoveler (*Anas clypeata*)	76	12	3	91
Red-breasted Merganser (*Mergus serrator*)	0	2	20	22
Ring-necked Duck (*Aythya collaris*)	63	107	42	212
Sandhill Crane (*Grus canadensis*)	2	2	0	4
Unknown Dabbler	42	37	119	198
Unknown Diver	37	58	35	130
Unknown Grebe	1	0	0	1
Unknown Scaup (*Aythya affinis/marila*)	553	19	12	584
Unknown Swan (*Cygnus buccinator/columbianus*)	24	0	0	24
Unknown Scoter	303	0	0	303
Total	2,160	1,068	1,203	4,431



Map 2: Waterfowl Observations from Aerial Surveys on May 27, 2022



Map 3: Waterfowl Observations from Aerial Surveys on June 17, 2022



Map 4: Waterfowl Observations from Aerial Surveys on September 21, 2022

Photo 1: Submerged Peatland in the Reservoir Providing Waterfowl with Shallow Water Interspersed with Vegetation, May 2022

There was no significant difference between the waterfowl densities from the pre-construction or construction surveys compared to the first operation survey (p=0.8 and p=0.07, respectively). The waterfowl densities observed in and around the reservoir in 2022 were within the ranges observed during previous pre-construction and construction surveys for the May and September survey, with the second highest density recorded during the June survey (Table 2). It should be noted that the waterfowl numbers from the 2001-2003 pre-construction surveys also include observations made from inland lakes that were adjacent to the future reservoir area as well as within the area that was predicted to be inundated during reservoir filling; as such, they may not be directly comparable.

Table 2: Waterfowl Densities (birds/km) During Aerial Surveys in and Around the Keeyask Reservoir Footprint from 2001-2022 (TetrES 2004; TetrES 2005a; TetrES 2005b; Stantec 2013; WRCS 2016; WRCS 2018; WRCS 2020: WRCS 2021; WRCS 2022)

Year	Period	April/May	May	June	July	August	September
2001*	Pre-construction	NA	3.95	NA	0.47	NA	2.43
2002*	Pre-construction	NA	NA	6.92	2.28	NA	6.31
2003*	Pre-construction	NA	6.05	NA	1.55	NA	5.98
2011	Pre-construction	NA	5.82	NA	0.33	0.25	0.52
2015	Construction (Pre-reservoir)	0.52	3.63	1.24	0.66	NA	1.65
2017	Construction (Pre-reservoir)	1.24	8.75	1.18	0.61	NA	1.09
2019	Construction (Pre-reservoir)	0.63	0.95	1.06	0.68	NA	2.34
2020	Construction (Reservoir present)	NA	NA	NA	NA	NA	0.84
2021	Construction (Reservoir present)	0.20	7.68	1.81	1.42	NA	4.42
2022	Operation	NA	5.48	2.83	NA	NA	3.26

*From 2001-2003, waterfowl counted on Gull Lake also included segments of inland lakes that were predicted to be inundated following reservoir filling.

3.2 INDICATED BREEDING PAIRS

A total of 379 indicated breeding pairs were observed in the reservoir and surrounding area in late May/June 2022 (Table 3; Map 7). Mallard were the most common species of indicated breeding pairs observed and northern pintail, American wigeon, green-winged teal, and ring-necked duck were also common (Table 3).

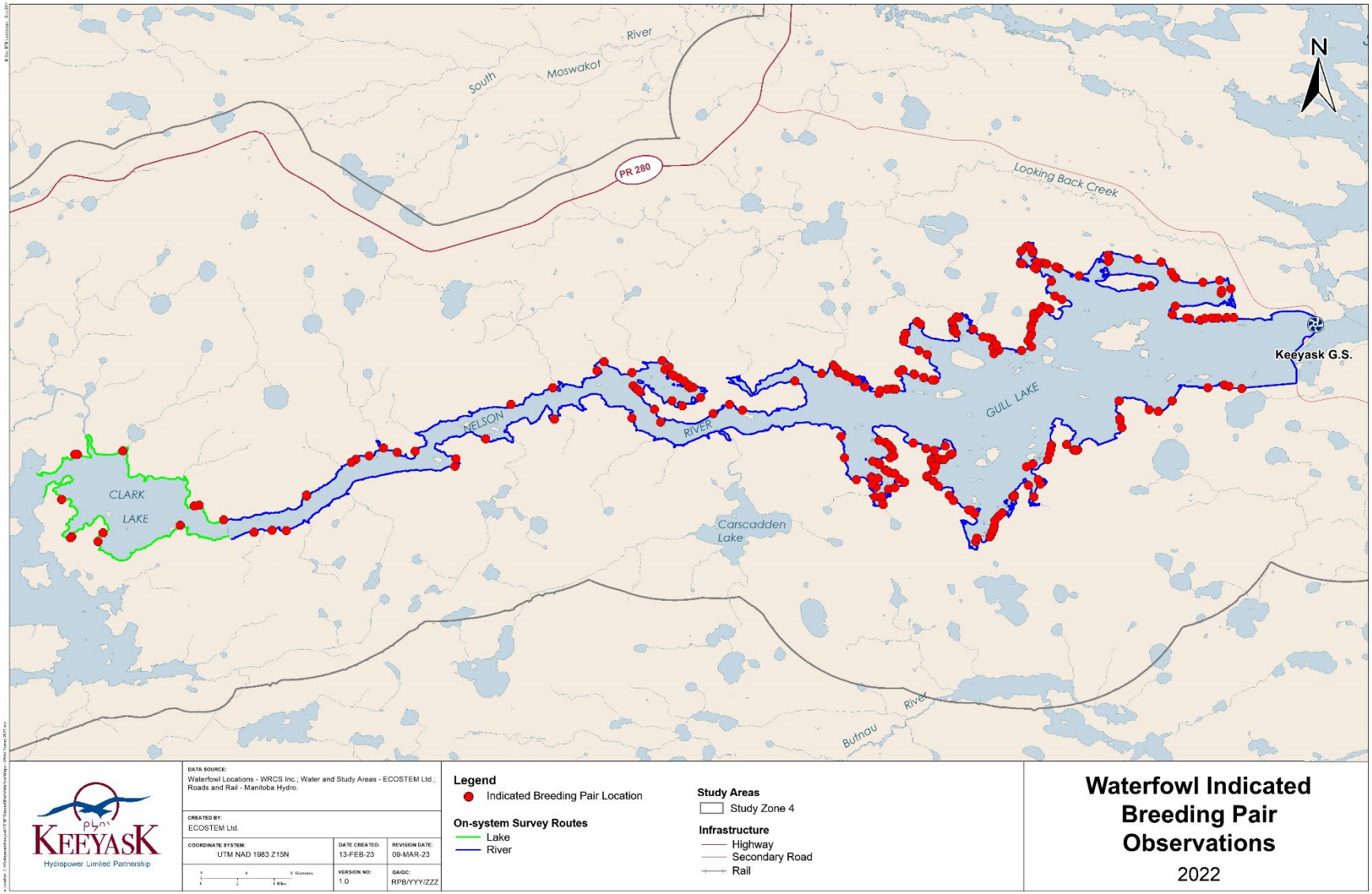
Table 3: Number of Indicated Breeding Pairs Observed in the Reservoir and Surrounding Area (Clark Lake and Gull Rapids) in 2022

Species	No. Indicated Breeding Pairs
American Black Duck	1
American Wigeon	33
Bufflehead	7
Blue-winged Teal	16
Canada Goose	19
Common Goldeneye	4
Green-winged Teal	34
Mallard	144
Northern Pintail	50
Northern Shoveler	12
Ring-necked Duck	44
Unknown Scaup	15
Total	379

The density of indicated breeding pairs ranged from 0.14-0.36 breeding pairs/km of shoreline during pre-construction surveys, increasing to 0.67 breeding pairs/km of shoreline in 2021 after reservoir filling, and further increased in 2022, during operation, to 1.05 breeding pairs/km of shoreline (Table 4).

Table 4: Indicated Breeding Pair Density (Indicated Breeding Pairs/km Shoreline) Observed during the Construction and Operation Periods from 2015-2022

Year	Period	Indicated Breeding Pairs/km Shoreline
2015	Construction (Pre-reservoir)	0.36
2017	Construction (Pre-reservoir)	0.14
2019	Construction (Pre-reservoir)	0.16
2021	Construction (Reservoir present)	0.67
2022	Operation	1.05



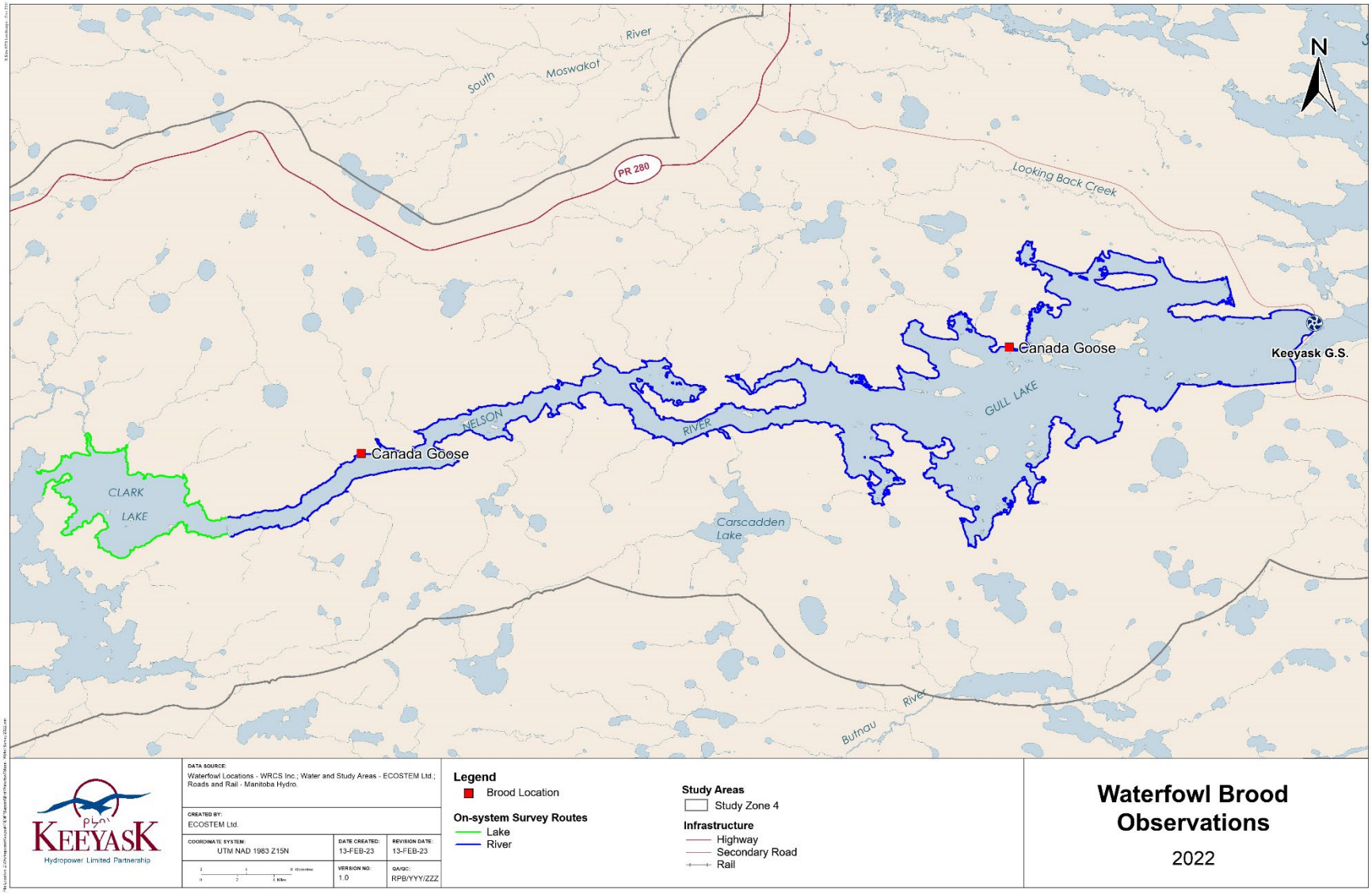
Map 5: Waterfowl Indicated Breeding Pair Observations from Aerial Surveys in 2022

3.3 WATERFOWL BROODS

In 2022, two Canada goose broods were observed in the reservoir and surrounding area, including Clark Lake and the former Gull Rapids (Table 5; Map 8). It should be noted that the summer (July) survey was not conducted in 2022, when most broods have been typically observed in previous surveys.

Table 5: Species and Number of Broods Observed in the Reservoir and Surrounding Area (Clark Lake and Gull Rapids) from 2015-2022

Year	American Wigeon	Canada Goose	Common Merganser	Mallard	Unknown Spp.	Total
2015	1	1	0	4	0	6
2017	0	1	0	0	0	1
2019	1	13	0	8	2	24
2021	0	0	1	1	0	2
2022	0	2	0	0	0	2
Total	2	17	1	13	2	35



Map 6: Waterfowl Brood Observations from Aerial Surveys in 2022

3.4 HUNTING GROUPS

No waterfowl hunting groups were observed during 2022 in any of the areas surveyed. Access to the reservoir area is limited as the North and South Access Roads remained closed to the public in 2022.

4.0 DISCUSSION

Project operation was anticipated to cause the direct loss of some waterfowl habitat in the reservoir and cause a reduction of waterfowl habitat quality and water quality due to ongoing peatland disintegration (KHLP 2012). The water quality changes were expected to reduce the availability of benthic invertebrates, which are an important food source for many diving duck species and potentially result in waterfowl using more suitable habitat outside of the Regional Study Area (KHLP 2012). Additionally, hunting pressure was anticipated to increase due to the increased access provided by the North and South Access Roads (KHLP 2012). These anticipated effects were not apparent in 2022 and reservoir creation has appeared to have created some temporary areas of foraging habitat for waterfowl.

The waterfowl densities observed during Project operation in 2022 were not significantly different from those observed during the pre-construction period from 2001-2011 or during the construction period from 2015-2021. In June 2022, the second greatest waterfowl density of any monitoring year was recorded. These results suggest that despite changes to the waterfowl habitat that occurred in the reservoir due to its creation, waterfowl densities were not negatively affected. As was observed during the 2021 construction-phase survey, the increased amount of shoreline created, and the inundation of peatland areas appeared to have provided increased foraging opportunities for waterfowl and a short-term benefit. Similar to 2021, waterfowl were frequently observed feeding in the newly submerged peatland areas, which consisted of shallow water interspersed with vegetation that many waterfowl species prefer. In the long term, as the inundated peatland areas disintegrate over time these areas will become less attractive to waterfowl and fewer numbers will be observed in the reservoir.

The number of indicated breeding pairs and broods observed in the reservoir and surrounding area during the first year of operation also suggests that Project construction did not have a large impact on available nesting habitat. The density of indicated breeding pairs in 2022 was the greatest observed compared to any of the previous surveys. In 2021, the next highest density of indicated breeding pairs was observed in the reservoir and surrounding area. The relatively high density of indicated breeding pairs suggests that more waterfowl may be breeding and nesting in the survey area.

Increased hunter access and pressure did not occur in 2022 as access along the North and South Access Roads remained restricted to the public. It is possible that waterfowl hunting pressure may increase in these areas once they are accessible by the public and become part of the Provincial highway system. Ongoing waterfowl surveys during Project operation will continue to monitor for changes in hunting pressure.

5.0 SUMMARY AND CONCLUSIONS

Waterfowl densities observed in 2022 were not significantly different from those observed during the pre-construction or construction periods. This suggests that waterfowl use in the general reservoir area continues to be consistent and the changes to waterfowl habitat are not negatively affecting the local population. The shallowly flooded peatlands in the reservoir provided habitat for waterfowl and high densities of indicated breeding pairs were observed, suggesting an increase in the numbers of waterfowl breeding and nesting in the area.

The 2022 waterfowl survey was the first operation-phase survey for the Project. Waterfowl habitat effects monitoring will continue during operation over the next 10 years. The next waterfowl survey is scheduled for spring 2024.

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