



Keeyask Generation Project  
Terrestrial Effects Monitoring Plan

**Waterfowl Habitat Effects Monitoring Report**

TEMP-2021-10



# **KEEYASK GENERATION PROJECT**

## **TERRESTRIAL EFFECTS MONITORING PLAN**

REPORT #TEMP-2021-10

## **WATERFOWL HABITAT EFFECTS 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 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 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 geese, mallard, and other species of waterfowl are relatively abundant in the Keeyask area during the spring and fall migration periods. 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 and in 2011. Construction-phase waterfowl surveys occurred in 2015, 2017, and 2019. 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.



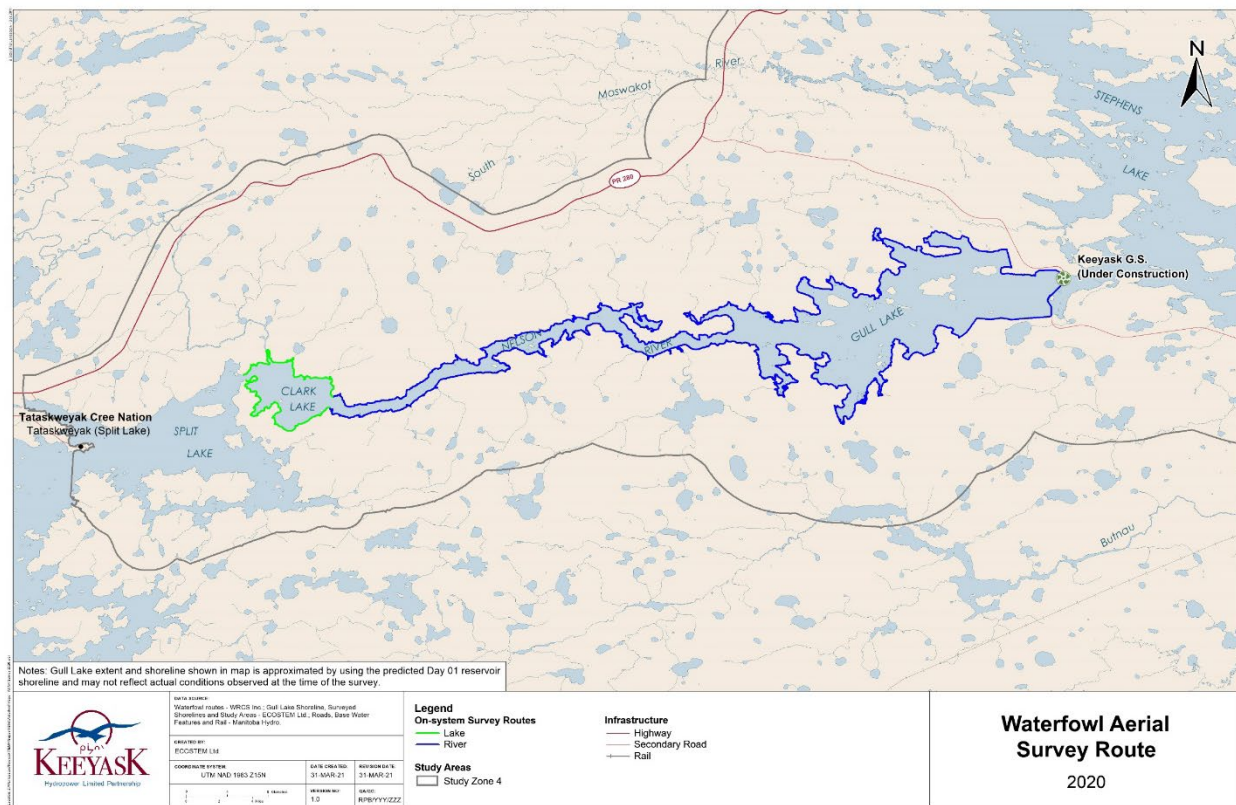
## Why is the study being done?

According to the environmental assessment done for the Project, change to habitat availability is the main predicted Project impact for Canada goose and mallard. Project construction is anticipated to cause an indirect loss of waterfowl habitat due to noise and disturbance caused by 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?

An aerial (helicopter) waterfowl survey was conducted in the fall of 2020, following reservoir impoundment, on the Nelson River, between Gull Rapids and Clark Lake. To assess potential impacts of the Project on waterfowl in the area, waterfowl densities (number of birds/km) observed in the reservoir area in fall of 2020 were compared to the densities observed in the fall during pre-construction surveys, conducted from 2001-2003 and in 2011, and during the construction surveys conducted in 2015, 2017, and 2019.

Additional wildlife surveys were conducted before and during reservoir impoundment in late August and into September 2020, by helicopter, boat, and vehicle to confirm predicted effects of impoundment on wildlife, including waterfowl.



**What was found?**

The number of waterfowl observed in the fall of 2020 was within the ranges observed during the previous construction and pre-construction surveys. The newly created reservoir provided areas of shallow water mixed with vegetation that several species of waterfowl, including the Canada goose and mallard, were observed using for feeding. Trumpeter swans, a species at risk that has recently expanded its range into northern Manitoba, were observed raising young on a small lake south of Birthday Rapids.

**What does it mean?**

Project construction, including the filling of the reservoir did not appear to affect waterfowl use of the area. In some areas, the shallow submerged peatlands likely created good waterfowl habitat for feeding. These areas are expected to disintegrate over time and will become less appealing to waterfowl.

**What will be done next?**

Additional aerial surveys for waterfowl will be conducted in the reservoir during the spring, summer, and fall of 2021 to examine if and how waterfowl may be affected by the newly created reservoir and operation of the Project. The data will also 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 loss and 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, WRCS – Design, analysis, and reporting
- Mark Baschuk, WRCS – Survey personnel, analysis, and reporting
- Kevin McRae, WRCS – Survey personnel
- Marissa Berard, WRCS – 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. Reservoir impoundment began August 31, 2020 and was completed on September 5, 2020.

The *Keeyask Generation Project Response to EIS Guidelines* (the EIS), completed in June 2012, provides a summary of predicted effects and planned mitigation for the Project. Technical supporting information for the terrestrial environment, including a description of the environmental setting, effects and mitigation, and a summary of proposed monitoring and follow-up programs is provided in the *Keeyask Generation Project Environmental Impact Statement Terrestrial Supporting Volume* (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 and in 2011. Waterfowl surveys during construction occurred in 2015, 2017, and 2019. 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. In 2020, waterfowl habitat within the Project's reservoir footprint experienced large changes due to the water-up phase and impoundment of the reservoir. Water-up included the transfer of water into work areas contained by temporary and permanent structures up to the prevailing upstream water levels and occurred from February 26 to April 16, 2020. Reservoir impoundment, which is the flooding of the full reservoir area, occurred from August 31 to September 5, 2020.

This report presents findings of the aerial waterfowl survey conducted on September 15, 2020 and general observations of waterfowl and other avian species made during the reservoir impoundment surveys in late August and early September 2020.

## 2.0 METHODS

### 2.1 AERIAL SURVEYS

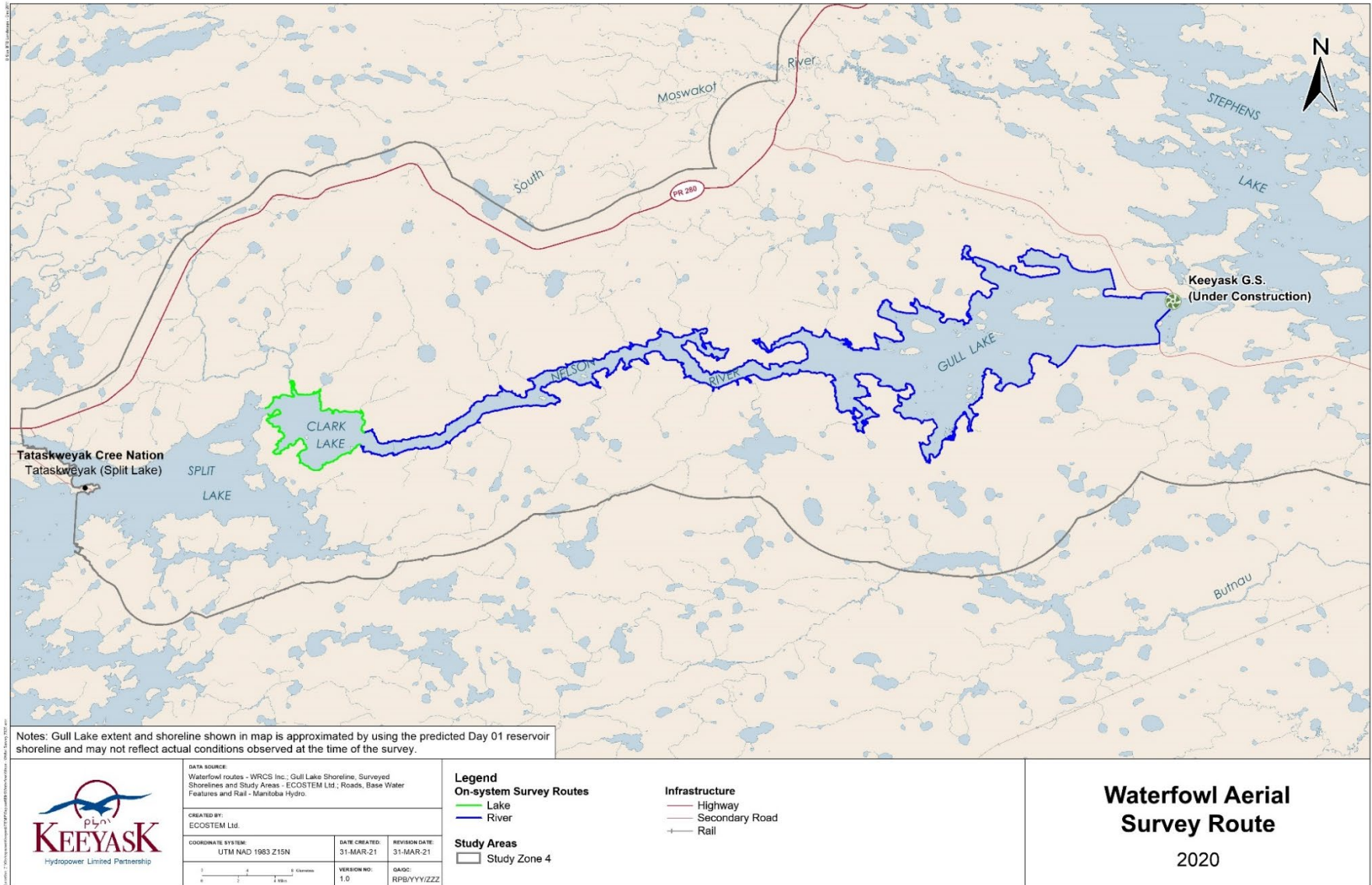
An aerial survey for waterfowl was conducted once on September 15, 2020 within and around the Project reservoir, which consisted of 225 km of shoreline (Map 1). Previous construction monitoring surveys in 2015, 2017, and 2019 covered the entire regional bird study area, but the 2020 survey was focused on the areas within and around the newly formed reservoir.

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, following 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, 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.

### 2.2 RESERVOIR IMPOUNDMENT SURVEY

Prior to and during reservoir impoundment, general wildlife surveys were conducted in and around the reservoir area to confirm predicted effects on terrestrial wildlife, including waterfowl (Map 1). Surveys were conducted from a helicopter, by boat, and by vehicle from August 25 to September 4, 2020. Observations of wildlife, waterfowl, bald eagles, and shorebirds were recorded and georeferenced with a handheld GPS.



**Map 1: Overview of Waterfowl Aerial Survey Route in 2020 and Approximate Area Examined during the Reservoir Impoundment Surveys in 2020**



## 2.3 DATA ANALYSIS

## 2.4 WATERFOWL DENSITIES

To assess the potential effects of Project construction on waterfowl, waterfowl densities (birds/km) in and around the reservoir area, from Clark Lake to Gull Rapids were compared between the fall pre-construction surveys (2001-2003 and 2011), the fall construction surveys in 2015, 2017, 2019, and 2020. 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 of the most common waterfowl species observed). The length of the shoreline was calculated to be 210 km for the pre-construction surveys and the 2015, 2017, and 2019 construction surveys within the same spatial extent as the 2020 survey area, and 225 km for the 2020 construction survey, following reservoir filling and a new shoreline being created.

## 3.0 RESULTS

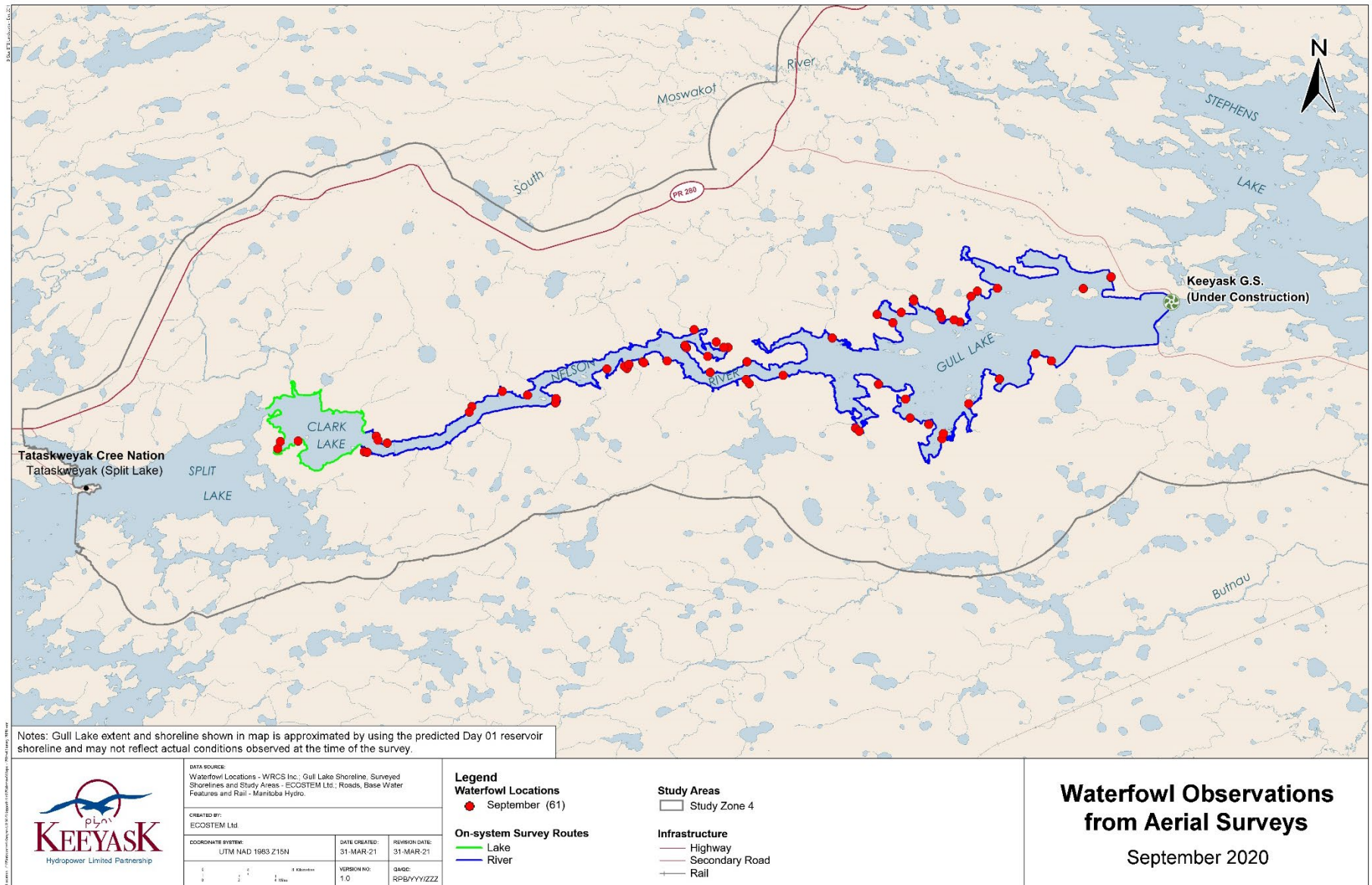
### 3.1 WATERFOWL DENSITIES

In the September 2020 aerial construction survey, 303 waterfowl, consisting of at least four different species, were observed (Table 1). The Canada goose and mallard were the most common species observed, comprising 48% and 35% of all observations, respectively (Table 1).

Most observations were made in Gull Lake, where there are numerous sheltered bays and inlets, and the water flow is slower, compared to the portion of the Nelson River surveyed (Map 2). Waterfowl observations often occurred where peatland areas had recently become submerged, creating shallow water areas interspersed with vegetation (Photo 1) that many species of waterfowl prefer (Photo 2).

**Table 1: Total Number of Waterfowl Observed During Aerial Surveys in September 2020**

Species	No. Waterfowl
Bufflehead ( <i>Bucephala albeola</i> )	16
Canada Goose ( <i>Branta canadensis</i> )	145
Common Merganser ( <i>Mergus merganser</i> )	4
Mallard ( <i>Anas platyrhynchos</i> )	105
Unknown Dabbler	25
Unknown Diver	3
Unknown Duck	5
<b>Total</b>	<b>303</b>



Map 2: Waterfowl Observations from Aerial Surveys in September 2020





**Photo 1: Examples of Submerged Peatland in the Recently Inundated Reservoir Providing Waterfowl with Shallow Water Interspersed with Vegetation, September 2020**



The number of waterfowl observed in and around the reservoir in fall 2020 was within the ranges observed during previous construction and pre-construction surveys (Table 2). Waterfowl numbers in the Project area during the fall can vary drastically due to birds migrating through the area at this time. 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 and may be overestimated and not directly comparable.



**Photo 2: Flock of Bufflehead Observed during the Aerial Survey, September 2020**

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

Year	Period	No. Waterfowl	Waterfowl Density (birds/km)
2001*	Pre-construction	698	3.3
2002*	Pre-construction	1,761	8.4
2003*	Pre-construction	1,650	7.9
2011	Pre-construction	145	0.7
2015	Construction (Pre-reservoir)	479	2.3
2017	Construction (Pre-reservoir)	247	1.2
2019	Construction (Pre-reservoir)	662	3.2
2020	Construction (Reservoir present)	303	1.3

\*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 RESERVOIR IMPOUNDMENT SURVEY

Thirteen waterfowl species were observed during pre-impoundment surveys conducted over five days from August 25 to 31, 2020 (Table 3). Of these, Canada goose (Photo 3) was the most common, with a total of 124 observed. Mallards ( $n = 98$ ) were also common. Two swans (potentially tundra swan or trumpeter swan) were observed on August 25. Thirty-two other bird species were also noted (Appendix B). Bank swallow (*Riparia riparia*;  $n = 90$ ), a species at risk, and bald eagle (*Haliaeetus leucocephalus*;  $n = 76$ ) were the most common.

During the impoundment surveys conducted from September 1 to 4, 2020, 15 waterfowl species were observed, the most common of which was Canada goose ( $n = 473$ ; Table 3), followed by mallard and greater/lesser scaup. Twenty-four other bird species were counted (Appendix B), most frequently common tern (*Sterna hirundo*;  $n = 29$ ). Fewer bald eagles ( $n = 17$ ) and bank swallows ( $n = 0$ ) were observed than during pre-impoundment surveys. During impoundment, many of the waterfowl and shorebirds were observed feeding in the newly submerged peatland areas of the reservoir, which provided foraging habitat. The habitat in these areas is anticipated to change over time as the peatlands continue to disintegrate.

Trumpeter swan, a species at risk, was recorded on October 6, 2020 during a separate survey after the reservoir was impounded. Two adults and five cygnets were observed swimming on a small lake (Photo 4) located about 1.5 km SSW of Birthday Rapids.

The survey confirmed the predicted effects of reservoir impoundment on waterfowl, including habitat loss and alteration, as listed in the EIS.

**Table 3: Waterfowl Species Recorded during Pre-impoundment (August 25-31, 2020) and Reservoir Impoundment (September 1-4, 2020) Surveys**

Species	Pre-impoundment Surveys					Impoundment Surveys						Total
	Aug. 25	Aug. 26	Aug. 27	Aug. 30	Aug. 31	Sub-total	Sep. 1	Sep. 2	Sep. 3	Sep. 4	Sub-total	
Canada Goose	5	28	6	28	57	124	23	122	328	x <sup>1</sup>	473	597
Swan Spp.	2	0	0	0	0	2	0	1	2	0	3	5
Mallard	2	14	1	32	49	98	20	92	68	x	180	278
American Black Duck	0	0	0	0	0	0	0	1	0	0	1	1
Northern Shoveler	0	1	0	0	0	1	0	2	0	0	2	3
Gadwall	0	2	0	0	0	2	0	2	3	x	5	7
American Widgeon	0	0	0	1	0	1	0	6	1	x	7	8
Northern Pintail	0	0	0	0	0	0	0	12	0	0	12	12
Green-winged Teal	0	0	0	2	3	5	4	2	2	0	8	13
Blue-winged Teal	0	0	0	0	0	0	0	7	1	0	8	8
Ring-necked Duck	0	0	0	0	0	0	0	0	1	0	1	1
White-winged Scoter	1	0	0	1	0	2	0	0	0	0	0	2
Greater Scaup	0	0	0	4	1	5	0	0	0	0	0	5
Greater/Lesser Scaup	0	0	0	0	0	0	0	15	30	x	45	45
Common Goldeneye	1	3	0	0	0	4	10	2	1	x	13	17
Common Merganser	5	2	0	6	2	15	1	2	2	x	5	20
Hooded Merganser	0	0	0	6	0	6	1	2	2	x	5	11
Red-breasted Merganser	2	2	0	0	0	4	0	0	0	0	0	4
Sub-Total/Total	18	52	7	80	112	269	59	268	441	0	606	1,037
Effort (Minutes) Travelling	160	147	157	140	249	853	240	217	278	40	775	1,628

1. X = species was detected.





**Photo 3: Canada Geese Observed in Submerged Peatland Habitat in the Recently Inundated Reservoir, Early September 2020**



**Photo 4: Pair of Trumpeter Swans with Five Cygnets Observed on a Small Lake South of Birthday Rapids, October 6, 2020**

## 4.0 DISCUSSION

Reservoir filling in early September 2020 altered waterfowl habitat in the reservoir area and appeared to influence waterfowl use. The increased amount of shoreline created by reservoir filling and the inundation of peatland areas appeared to have provided increased foraging opportunities for waterfowl and a short-term benefit during the 2020 fall migration period. Numerous flocks of waterfowl, shorebirds, and sandhill cranes were observed feeding in the newly submerged peatland areas, which consisted of shallow water interspersed with vegetation that many waterfowl species prefer. However, the inundated peatland areas are expected to disintegrate over time and will likely become less attractive to waterfowl.

Waterfowl numbers observed in fall 2020 were within the ranges observed during previous construction and pre-construction surveys in the same area, suggesting Project construction activities did not disturb waterfowl. However, only a single survey during the fall migration period was conducted in 2020, limiting the evaluation of broader waterfowl use patterns. During fall migration, waterfowl are often observed in large flocks in the region (WRCS 2016; WRCS 2018; WRCS 2020), which can result in irruptive numbers. Future surveys conducted during the spring, summer, and fall of 2021 will help to identify habitat use patterns of the now inundated reservoir and allow a more rigorous comparison to pre-construction observations.

Trumpeter swans, a species at risk that has recently expanded its range into northern Manitoba (Koes 2018), were observed raising young on a small lake south of Birthday Rapids. This sighting confirms the northern-most breeding record to date for trumpeter swan in Manitoba.

## 5.0 SUMMARY AND CONCLUSIONS

Waterfowl densities observed in fall 2020 in and around the newly formed reservoir were similar to those observed during the pre-construction and previous construction surveys. This suggests that waterfowl use in the general reservoir area has been fairly consistent since the start of construction and disturbance related to Project construction activities, including reservoir filling, does not appear to be limiting waterfowl use. Data collected from all the construction monitoring 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. Future waterfowl surveys are planned for the spring, summer, and fall of 2021.

## 6.0 LITERATURE CITED

- KHLP (Keeyask Hydropower Limited Partnership). 2012. Keeyask Generation Station Project Environmental Impact Statement – Response to EIS Guidelines. Prepared by Keeyask Hydropower Partnership Limited, Winnipeg, Manitoba. June 2012. 1208 pp.
- Koes, R. F. 2018. Trumpeter Swan in Artuso, C., A. R. Couturier, K. D. De Smet, R. F. Koes, D. Lepage, J. McCracken, R. D. Mooi, and P. Taylor (eds.). The Atlas of the Breeding Birds of Manitoba, 2010-2014. Bird Studies Canada. Winnipeg, Manitoba <http://www.birdatlas.mb.ca/accounts/speciesaccount.jsp?sp=TRUS&lang=en> [21 Apr 2021]
- Koneff, M.D., Royle, J.A., Otto, M.C., Wortham, J.S., and Bidwell, J.K. 2008. A double-observer method to estimate detection rate during aerial waterfowl surveys. The Journal of Wildlife Management 72 (7): 1641-1649.
- Manitoba Breeding Bird Atlas. 2015. <http://www.birdatlas.mb.ca/> [Accessed November 27, 2015].
- Stantec (Stantec Consulting Ltd.). 2013. Keeyask Project - Avian 2011 Field Studies Report. Report # TERR-11-01. Prepared for Manitoba Hydro. May 2013. 160 pp.
- TetrES (TetrES Consultants Inc.). 2004. Gull (Keeyask) Project – Avian Field Studies Report 2001. Tataskweyak Cree Nation – Manitoba Hydro Joint Environmental Studies Report # 01-09. July 2004. 222 pp.
- TetrES. 2005a. Gull (Keeyask) Project – Avian Field Studies Report 2002. Report # 02-11. Prepared for Manitoba Hydro. February 2005. 179 pp.
- TetrES. 2005b. Keeyask Project – Avian Field Studies Report 2003. Report # 03-04. Prepared for Manitoba Hydro. June 2005. 170 pp.
- WRCS (Wildlife Resource Consulting Services MB Inc). 2016. Waterfowl Habitat Effects Monitoring Report. Keeyask Generation Project. Terrestrial Effects Monitoring Plan, Report #TEMP-2016-02. June 2016. Prepared for Manitoba Hydro.
- WRCS. 2018. Keeyask Generation Project, Terrestrial Effects Monitoring Plan Report #TEMP 2018-11, Waterfowl Habitat Effects Monitoring. A report prepared for Manitoba Hydro by Wildlife Resource Consulting Services MB, Inc., June 2018.
- WRCS. 2020. Keeyask Generation Project, Terrestrial Effects Monitoring Plan Report #TEMP 2020-13, Waterfowl Habitat Effects Monitoring 2019. A report prepared for Manitoba Hydro by Wildlife Resource Consulting Services MB, Inc., June 2020.



## **APPENDIX A: PHOTOS**



**Photo 1: Flock of Canada Geese on Inundated Peatland, September 2020**



**Photo 2: Canada Geese on Inundated Peatland, September 2020**



**Photo 3: Sandhill Cranes on Inundated Peatland, September 2020**



**Photo 4: Mallard (top) and American Black Duck (bottom) Observed in the Reservoir, September 2020**





**Photo 5: Lesser Yellowlegs on Inundated Peatland, September 2020**



**Photo 6: Bald Eagle on Nesting Platform, September 2020**

## **APPENDIX B: BIRD SPECIES OBSERVED DURING PRE-IMPOUNDMENT AND IMPOUNDMENT SURVEYS**



**Bird Species Recorded during Pre-impoundment (August 25-31, 2020) and Reservoir Impoundment (September 1-4, 2020) Surveys**

Species	Pre-impoundment Surveys					Impoundment Surveys						Total
	Aug. 25	Aug. 26	Aug. 27	Aug. 30	Aug. 31	Sub-total	Sep. 1	Sep. 2	Sep. 3	Sep. 4	Sub-total	
Sandhill Crane	2	5	5	3	2	17	2	13	0	x	15	32
Spotted Sandpiper	1	2	2	0	0	5	0	2	0	0	2	7
Semi-palmated Plover	0	0	0	0	4	4	0	0	0	0	0	4
Killdeer	0	8	0	2	0	10	0	0	3	0	3	13
Greater Yellowlegs	0	4	1	6	2	13	1	4	6	x	11	24
Lesser Yellowlegs	0	0	0	0	0	0	0	12	0	0	12	12
Ring-billed Gull	10	22	11	1	5	49	12	0	0	x	12	61
Herring Gull	0	1	0	0	0	1	0	0	0	0	0	1
Bonaparte's Gull	0	0	0	0	1	1	0	1	0	0	1	2
Common Tern	10	16	9	4	23	62	21	7	1	x	29	91
American White Pelican	0	14	0	0	0	14	0	0	0	0	0	14
Bald Eagle	20	13	2	1	40	76	9	3	5	x	17	93
Northern Harrier	0	0	1	0	0	1	1	0	1	0	2	3
Red-tailed Hawk	0	0	0	0	1	1	0	0	1	x	1	2
Merlin	0	1	0	0	0	1	1	0	0	0	1	2
American Kestrel	0	0	0	0	0	0	0	0	1	0	1	1
Northern Shrike	0	0	0	0	0	0	0	0	1	0	1	1
Black-backed Woodpecker	1	0	0	0	0	1	0	0	0	0	0	1
Common Raven	4	5	0	8	2	19	0	1	1	x	2	21
American Crow	0	30	0	0	0	30	0	0	0	0	0	30
Alder Flycatcher	0	0	1	0	0	1	0	0	0	0	0	1
Bank Swallow	1	70	14	5	0	90	0	0	0	0	0	90
American Robin	2	1	1	0	0	4	0	0	1	0	1	5
Chipping Sparrow	1	0	0	0	0	1	0	0	0	0	0	1

Species	Pre-Impoundment Surveys					Impoundment Surveys						Total
	Aug. 25	Aug. 26	Aug. 27	Aug. 30	Aug. 31	Sub-total	Sep. 1	Sep. 2	Sep. 3	Sep. 4	Sub-total	
Fox Sparrow	0	1	0	0	0	1	0	0	0	0	0	1
White-throated Sparrow	0	1	1	0	0	2	0	1	0	x	1	3
White-crowned Sparrow	0	0	0	0	0	0	0	0	6	x	6	6
Song Sparrow	1	0	1	0	0	2	0	0	0	0	0	2
Mourning Warbler	0	1	0	0	0	1	0	0	0	0	0	1
Blackpoll Warbler	0	1	0	0	0	1	0	0	0	0	0	1
Yellow Warbler	0	0	1	0	0	1	0	0	0	0	0	1
Palm Warbler	0	0	2	0	0	2	0	0	0	0	0	2
Yellow-rumped Warbler	0	0	1	0	0	1	0	0	1	0	1	2
Rusty Blackbird	1	1	0	0	0	2	0	0	0	0	0	2
Canada Jay	0	0	0	0	2	2	0	0	2	x	2	4
Bohemian Waxwing	0	0	0	0	5	5	0	0	0	x	0	5
Pine Grosbeak	0	0	0	0	0	0	0	0	0	1	1	1
White-winged Crossbill	0	0	0	0	0	0	0	10	0	0	1	10
Red Crossbill	0	0	0	0	0	0	0	5	0	0	5	5
Sub-Total/Total	54	197	53	30	87	421	47	59	30	1	128	1,594
Effort (Minutes) Travelling	160	147	157	140	249	853	240	217	278	40	775	1,628

1. X = species was detected.