



Keeyask Generation Project  
Terrestrial Effects Monitoring Plan

Muskrat Habitat Effects and Mortality Monitoring Report  
TEMP-2020-09



# **KEEYASK GENERATION PROJECT**

## **TERRESTRIAL EFFECTS MONITORING PLAN**

REPORT #TEMP-2020-09

### **MUSKRAT HABITAT EFFECTS 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. Monitoring results will help the KHLP, government regulators, members of local First Nation communities, and the general public understand how construction and operation of the generating station will affect the environment, and whether more needs to be done to reduce harmful effects.

This report describes the results of the second and final year of construction monitoring conducted for muskrat. The monitoring occurred during the spring of 2018 and 2019, the fourth and fifth years of Project construction. Monitoring occurred along the shorelines of waterbodies in the Keeyask region.

## Why is the study being done?

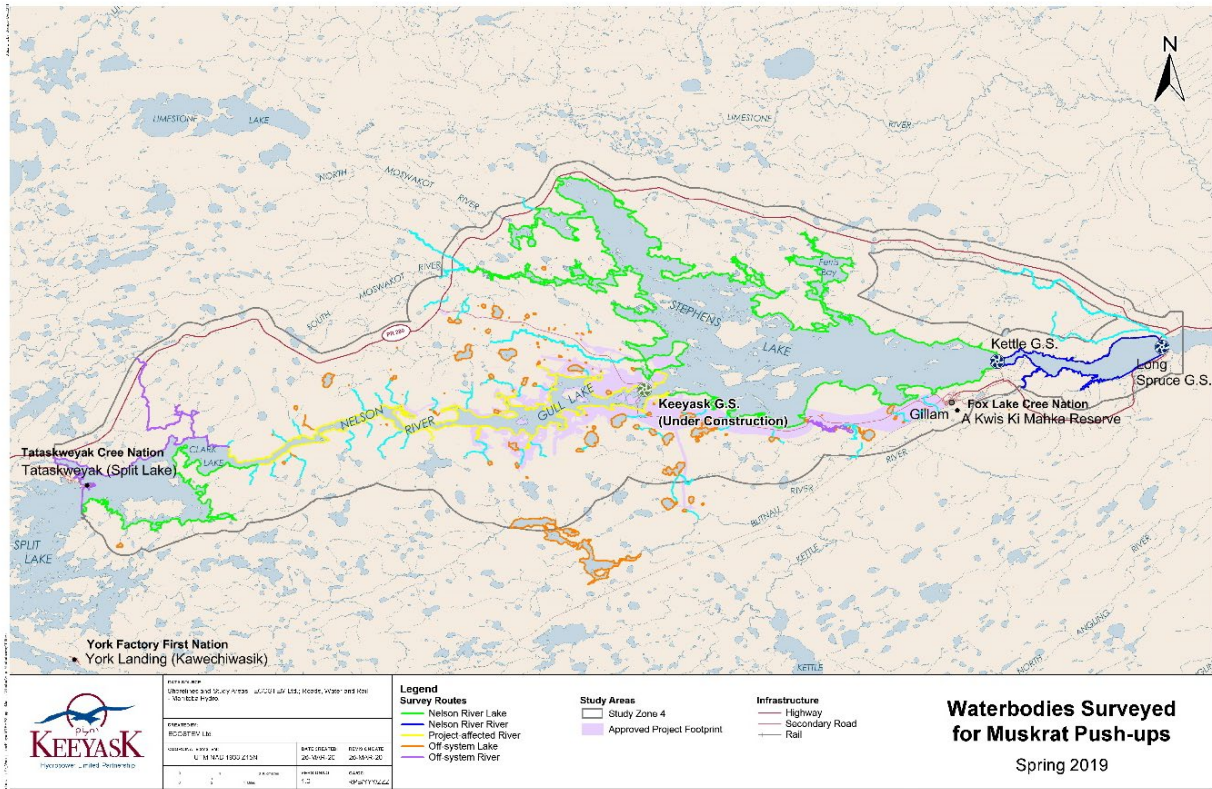
Construction-related effects on muskrat include habitat loss or alteration and mortality due to reservoir impoundment. Along with beaver, which occupy similar habitat, the muskrat is an important furbearer in the Keeyask region. Due to the cultural, economic, and ecological significance of beaver and muskrat, a monitoring program was developed to quantify the loss and alteration of habitat in the Keeyask region and to record the removal of individuals humanely trapped prior to reservoir impoundment.

## What was done?

Helicopter surveys for muskrat push-ups were first done in 2018 and were repeated from April 29 to May 1, 2019 in Study Zone 4 (see map below). Two observers and a helicopter pilot searched the shorelines of the Nelson River from the eastern portion of Split Lake to the Long Spruce Generating Station and the shorelines of nearby waterways and waterbodies. Observations of muskrat push-ups were recorded.

Musk rats trapped by the Project-based trapping program in winter 2019/2020 were recorded.



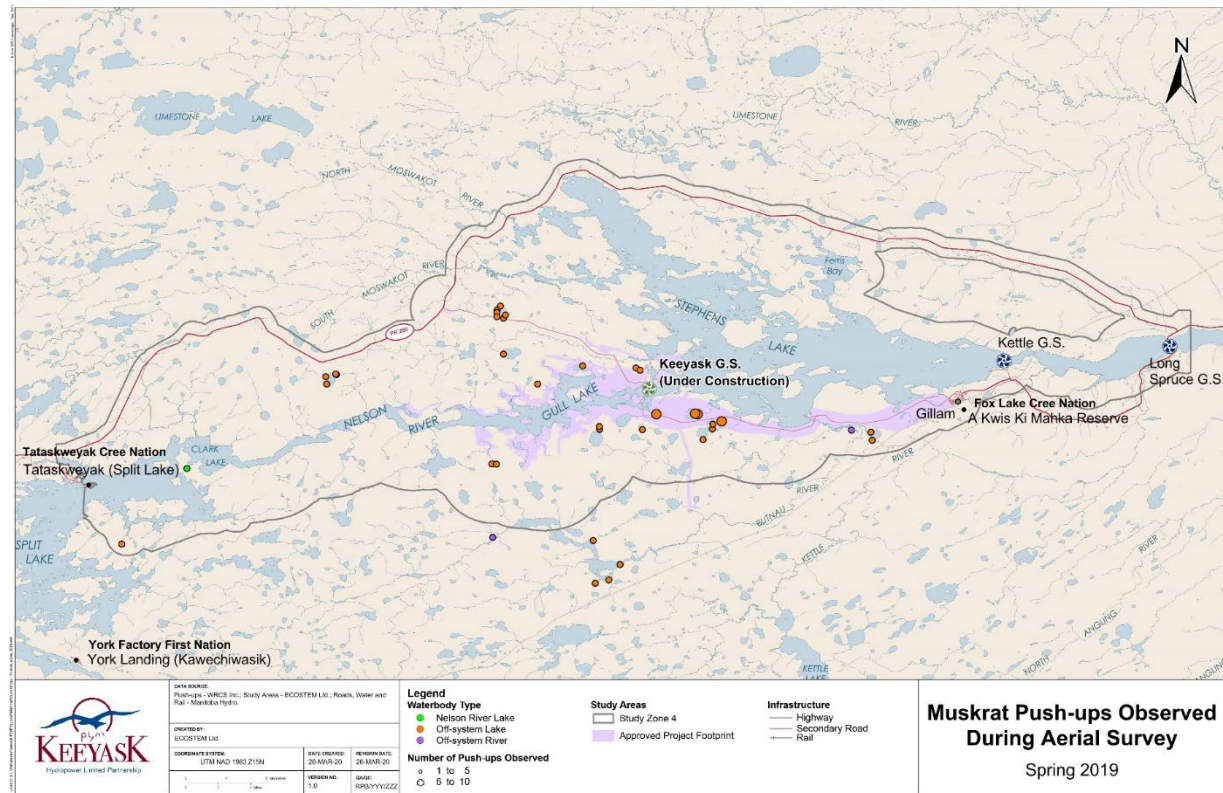


## What was found?

One hundred and nine muskrat push-ups were observed at 37 locations during the 2019 aerial survey. The number of push-ups per location ranged from 1 to 10. One push-up was found in the future reservoir area and 13 were found within 1 km of the north or south access roads.

Aerial surveys for muskrat push-ups were conducted in the Keeyask region in spring 2001, 2003, and 2006 for the Project's environmental impact assessment and in spring 2018 during Project construction. The total density of muskrat push-ups was the same in 2018 and 2019 and was lower than in all earlier survey years, having decreased 55% from 2006.

One muskrat was removed from the future reservoir area by the registered trapper in January 2020.



### What does it mean?

There appears to be little suitable habitat for muskrat in the Project footprint (the area expected to be directly affected by the Project), given how few push-ups were observed during the aerial surveys in spring 2018 and 2019. While there was little habitat for muskrat in the Project footprint prior to construction, clearing in the future reservoir area has likely further reduced the amount available. The density of muskrat push-ups observed in the Keeyask region was lower during construction monitoring in 2018 and 2019 than in pre-Project monitoring in 2001, 2003, and 2006, which could indicate that the regional population is smaller. However, the decrease is unlikely due only to the Project, as the amount of suitable habitat in the Project footprint was limited before construction began, as described in the EIS.

### What will be done next?

Construction monitoring for muskrat has now concluded. A multi-year monitoring synthesis report will provide an integrated evaluation of Project construction effects on muskrat numbers and location and the availability of suitable habitat using results from this monitoring study. Monitoring will continue during Project operation.

# STUDY TEAM

We would like to thank Sherrie Mason and Rachel Boone of Manitoba Hydro for logistical assistance in the field. We would also like to thank James Ehnes of ECOSTEM Ltd. for GIS support and mapping. Tataskweyak Cree Nation (TCN) trapper Jonathan Saunders and his assistants Mark Saunders (TCN) and Anthony Jacobs (TCN) are acknowledged for their removal of muskrats from the future Keeyask reservoir area prior to impoundment. Biologists and other personnel who designed, participated in, and drafted the survey results included:

Robert Berger – Design and reporting

Andrea Ambrose – Reporting

Mark Baschuk – Survey personnel

Kevin McRae – 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* (TE SV). 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, muskrat (*Ondatra zibethicus*), during the construction phase.

The muskrat is a semi-aquatic mammal that requires a source of permanent water for habitat (Boutin and Birkenholz 1998; Erb and Perry 2003). In winter, muskrats construct push-ups by making a hole in the ice and pushing aquatic vegetation up through it, forming a pile of debris that is used as a feeding area and resting site (Erb and Perry 2003). Push-ups, which are temporary structures that collapse into the water when the ice melts, can be counted for an indication of the abundance of muskrat and their use of habitat in an area (Boutin and Birkenholz 1998).

Along with beaver (*Castor canadensis*), which occupy similar habitat, the muskrat is an important furbearer in the Keeyask region. Predicted Project effects on these species include habitat loss or alteration and mortality due to reservoir impoundment. Individuals were humanely trapped by a registered trapper prior to reservoir impoundment, to prevent the potential for prolonged death from exposure and displacement. Due to the cultural, economic, and ecological significance of beaver and muskrat, a monitoring program, as outlined in Section 6.4 of the TEMP, was developed to quantify the loss or alteration of habitat in the Keeyask region and to record the removal of individuals humanely trapped prior to reservoir impoundment.



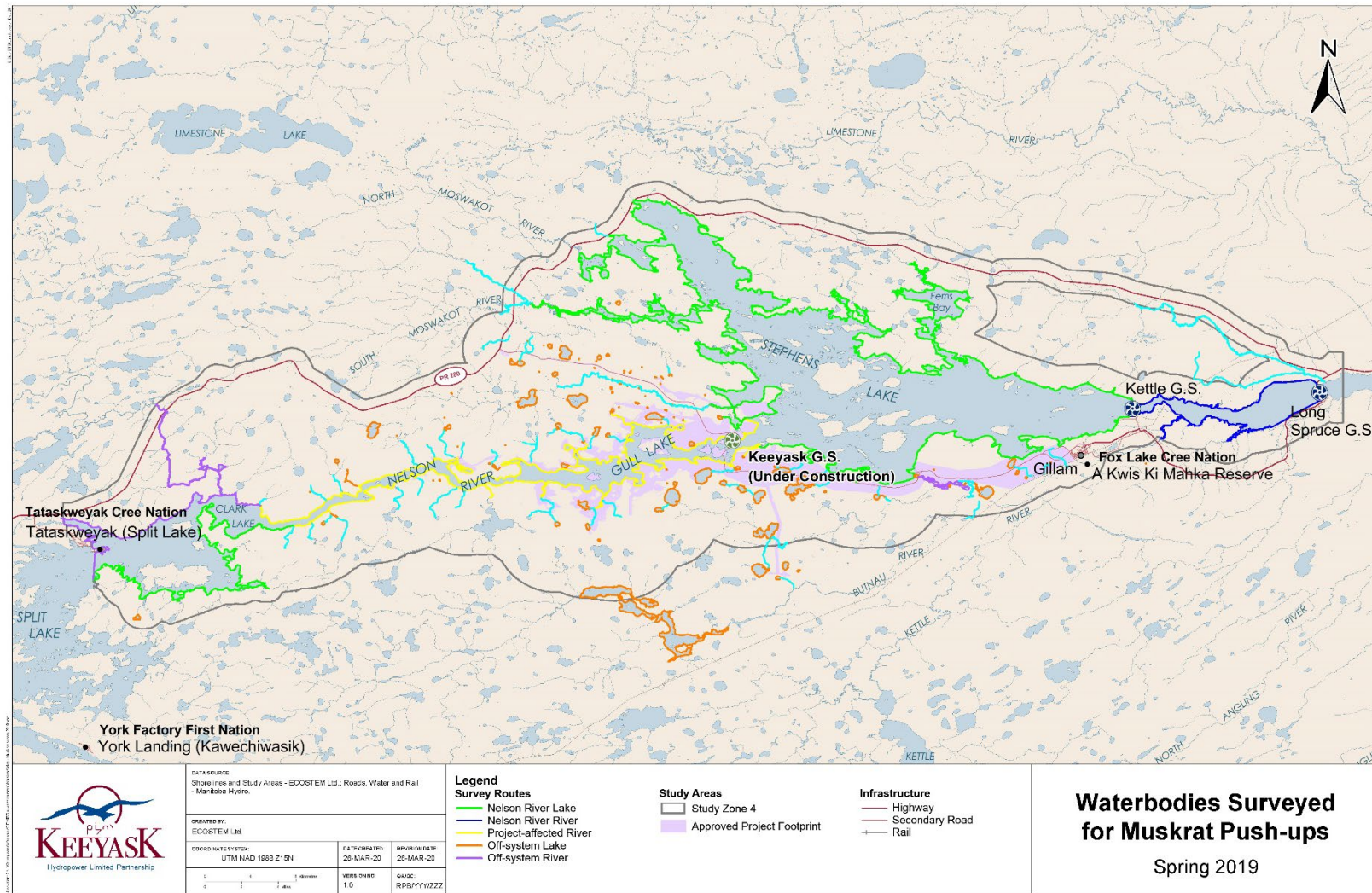
## 2.0 METHODS

An aerial survey for muskrat push-ups was conducted from April 29 to May 1, 2019 in Study Zone 4 (Map 1), replicating the survey conducted in 2018. Pre-selected survey routes were flown in a Bell 206 Jet Ranger helicopter. Two observers and a pilot searched the shorelines of the Nelson River from the eastern portion of Split Lake to the Long Spruce GS and the shorelines of nearby waterways and waterbodies. The survey was conducted at a speed of approximately 100 kilometres per hour and at roughly 50 metres above ground level. Observers positioned on either side of the helicopter recorded observations of muskrat push-ups and marked their locations with a handheld Global Positioning System (GPS) unit.

Waterbodies were first grouped by hydraulic zone and classified as Project-affected (to be directly affected by the Project and also influenced by existing hydroelectric developments), Nelson River (influenced by existing hydroelectric developments), or off-system (unaffected by existing hydroelectric development). They were then categorized as lake, river, or watercourse (Table 1). Lakes were defined as non-linear waterbodies with minimal water flow; rivers as large, linear waterbodies with flow; and watercourses as narrow, linear waterbodies with flow (creeks and streams). A total of 1,222 km was surveyed, most of which was on Gull and Stephens lakes (both characterized as a "Nelson River lake"). The density of push-ups on each type of waterbody was calculated as the number of push-ups observed per kilometre surveyed.

**Table 1: Shoreline Lengths of Waterbodies Surveyed, Spring 2019**

Hydraulic Zone	Waterbody Type	Total Survey Length (km)
Project-affected	River	176
Nelson River	Lake	491
	River	62
Off-system	Lake	211
	River	97
	Watercourse	185



**Map 1: Waterbodies Surveyed for Muskrat Push-ups, Spring 2019**

### 3.0 RESULTS

One hundred and nine muskrat push-ups were observed at 37 locations during the aerial survey in spring 2019 (Map 2). The number of push-ups per location ranged from 1 to 10 (Appendix 1). Most (96%) of the push-ups were observed on off-system lakes, where their density was considerably greater than on other types of waterbodies. One push-up was found in the future reservoir area, in an existing off-system lake north of Gull Lake. None were found on the Nelson River river reaches, Project-affected or on Off-system watercourses (Table 2). Two push-ups were found on Nelson River lakes at one location on Split Lake. Two push-ups were observed on off-system rivers, one of which was on the Butnau River. Thirteen (12%) muskrat push-ups were observed less than 1 km from the north or south access roads (identified as secondary roads in Map 2).

**Table 2: Muskrat Push-ups Observed during the Aerial Survey, Spring 2019**

Hydraulic Zone	Waterbody Type	Number	Density (push-ups/km)
Project-affected	River	0	0
Nelson River	Lake	2	<0.01
	River	0	0
Off-system	Lake	105	0.50
	River	2	0.02
	Watercourse	0	0

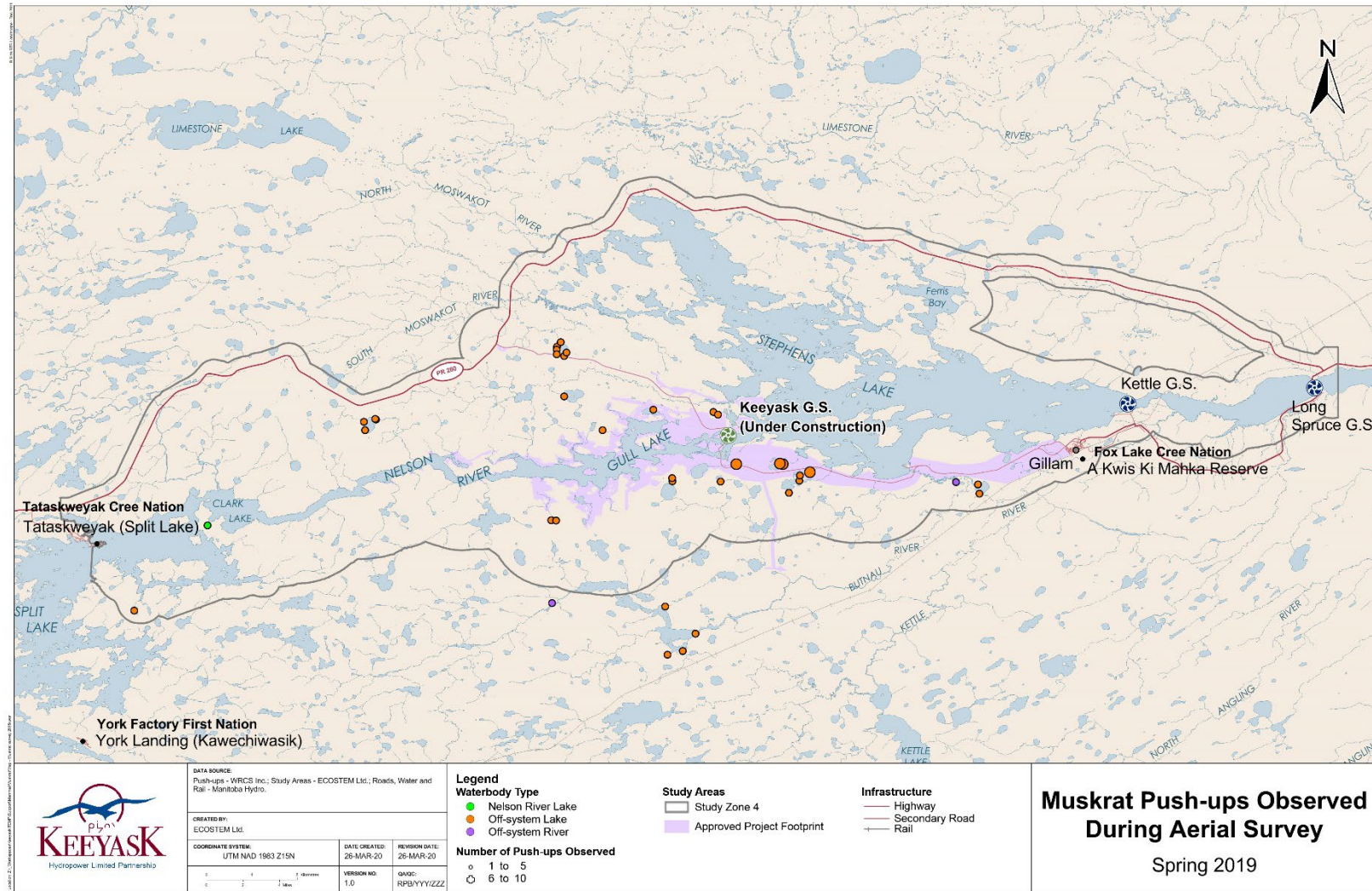
Aerial surveys for muskrat were previously conducted in the Keeyask region in spring 2001, 2003, and 2006 for the Project's environmental assessment. Total muskrat push-up density ranged from 0.14/km in 2001 to 0.22/km in 2003 and was greatest on watercourses in each of the three survey years (Table 3). In all waterbody types, push-up density increased from 2001 to 2003 and then decreased in 2006. During construction monitoring in 2018, the total density of muskrat push-ups was lower than in all previous survey years, having decreased 55% from 2006 to 2018. Total push-up density was the same in 2018 and 2019. Push-up density during construction monitoring was within the range observed in the earlier years on lakes but was lower on rivers and considerably lower on watercourses.

One muskrat was trapped along a watercourse north of Gull Lake during the Project-based trapping program in January 2020 (Wildlife Resource Consulting Services MB Inc. [WRCS] 2020). One muskrat was trapped along a watercourse north of Gull Lake during the Project-based trapping program in February 2018 and five muskrats were removed in February 2019 (WRCS 2019).



**Table 3: Density of Muskrat Push-ups in the Keeyask Region, Spring 2001, 2003, 2006, 2018, and 2019**

<b>Waterbody Type</b>	<b><u>Density of Push-ups (number/km)</u></b>				
	<b>2001</b>	<b>2003</b>	<b>2006</b>	<b>2018</b>	<b>2019</b>
Lake	0.15	0.17	0.12	0.14	0.15
River	0.06	0.11	0.04	0.02	0.01
Watercourse	0.22	0.38	0.34	0.01	0
Total	0.14	0.22	0.20	0.09	0.09



**Map 2: Muskrat Push-ups Observed during Aerial Survey, Spring 2019**

## 4.0 DISCUSSION

Clearing in the future reservoir area during the winters of 2015/16, 2016/17 and 2017/18 has resulted in the loss of some muskrat habitat. Of the 109 muskrat push-ups observed in 2019, one was in the future reservoir area. Thirteen push-ups were located less than 1 km from the north or south access roads; these animals are unlikely to be affected by the Project.

Little muskrat activity was anticipated or observed on large, open waterbodies such as Clark, Gull, and Stephens lakes (characterized as "Nelson River lakes"). Muskrats typically inhabit smaller, shallower waterbodies and watercourses where there is limited wave action (Errington 1963 in Erb and Perry 2003). The push-ups identified on Split Lake were in a bay, where there is likely less wave action than in the main waterbody.

Muskrat density in the Keeyask region was lower during construction monitoring in 2018 and 2019 than in 2001, 2003, and 2006. The difference in push-up density could be due to changes in the muskrat population between the early 2000s and 2018/2019. Muskrat populations are somewhat cyclical (Banfield 1987; Erb et al. 2000), and the lower density of push-ups during construction monitoring could be an indication of a population at or nearing the low phase of its cycle. As the amount of suitable habitat for beaver and muskrat in the Project footprint was limited prior to the start of construction, the decrease is likely not primarily attributable to Project-related habitat loss.



## 5.0 SUMMARY AND CONCLUSIONS

There appears to be little suitable habitat for muskrat in the Project footprint, given how few push-ups were observed during the aerial surveys in spring 2018 and 2019. While there was little habitat for muskrat in the Project footprint prior to construction, clearing in the future reservoir area has likely further reduced the amount available. Muskrats were trapped out of the future reservoir area prior to impoundment, to prevent the potential for prolonged exposure and displacement death.

The density of muskrat push-ups was lower in the Keeyask region during construction monitoring than in 2001, 2003, and 2006, which could indicate that the regional population is now smaller. However, the decrease is unlikely due only to the Project, as the amount of suitable habitat in the Project footprint was limited before construction began, as described in the EIS. Monitoring that began in 2018 and continued in 2019 to establish a baseline before the reservoir was impounded has concluded.

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# **APPENDIX 1: MUSKRAT PUSH-UPS OBSERVED IN STUDY ZONE 4, SPRING 2019**

System	Waterbody Type	Location	Number of Push-ups
Nelson River	Lake	15 V 318002 6239403	2
Off-system	Lake	15 V 348750 6255125	2
		15 V 348743 6254886	4
		15 V 348728 6254456	5
		15 V 349396 6254311	5
		15 V 349598 6254622	1
		15 V 349095 6255536	1
		15 V 362512 6249384	2
		15 V 362942 6249152	2
		15 V 357243 6249586	1
		15 V 352768 6247798	5
		15 V 349409 6250758	1
		15 V 332839 6248732	3
		15 V 332759 6248771	2
		15 V 331773 6248521	2
		15 V 331873 6247798	4
		14 V 683829 6231730	1
		15 V 360952 6229892	1
		15 V 358286 6232286	5
		15 V 358478 6228040	5
		15 V 359837 6228367	1
		15 V 348264 6239856	2
		15 V 348683 6239849	3
		15 V 358925 6243285	3
		15 V 358896 6243569	2
		15 V 364536 6244811	10
		15 V 363170 6243273	2
		15 V 369171 6242286	3
		15 V 370093 6243345	1
		15 V 385946 6242205	1
		15 V 385803 6243020	1
		15 V 371001 6244110	8
		15 V 370132 6243798	1
		15 V 368617 6244820	7
		15 V 368356 6244865	8
	River	15 V 348318 6232569	1
		15 V 383889 6243220	1