Keeyask Generation Project

Terrestrial Effects Monitoring Plan

Muskrat Habitat Effects Monitoring Report

TEMP-2024-14

KEEYASK

Manitoba Environment and Climate Change Client File 5550.00
Manitoba Environment Act Licence No. 3107

2023 -2024

KEEYASK GENERATION PROJECT

TERRESTRIAL EFFECTS MONITORING PLAN

REPORT #TEMP-2024-14

MUSKRAT HABITAT EFFECTS

YEAR 2 OPERATION

2023

Prepared for

Manitoba Hydro

By

Wildlife Resource Consulting Services MB Inc.

June 2024

This report should be cited as follows:

Wildlife Resource Consulting Services MB Inc. 2024. Keeyask Generation Project Terrestrial Effects Monitoring Plan Report #TEMP-2024-14: Muskrat Habitat Effects – Year 2 Operation, 2023. A report prepared for Manitoba Hydro by Wildlife Resource Consulting Services MB Inc., June 2024.

SUMMARY

Background

Construction of the Keeyask Generation Project (the Project) at Gull Rapids began in July 2014. The reservoir was impounded in early September 2020, 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. 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.

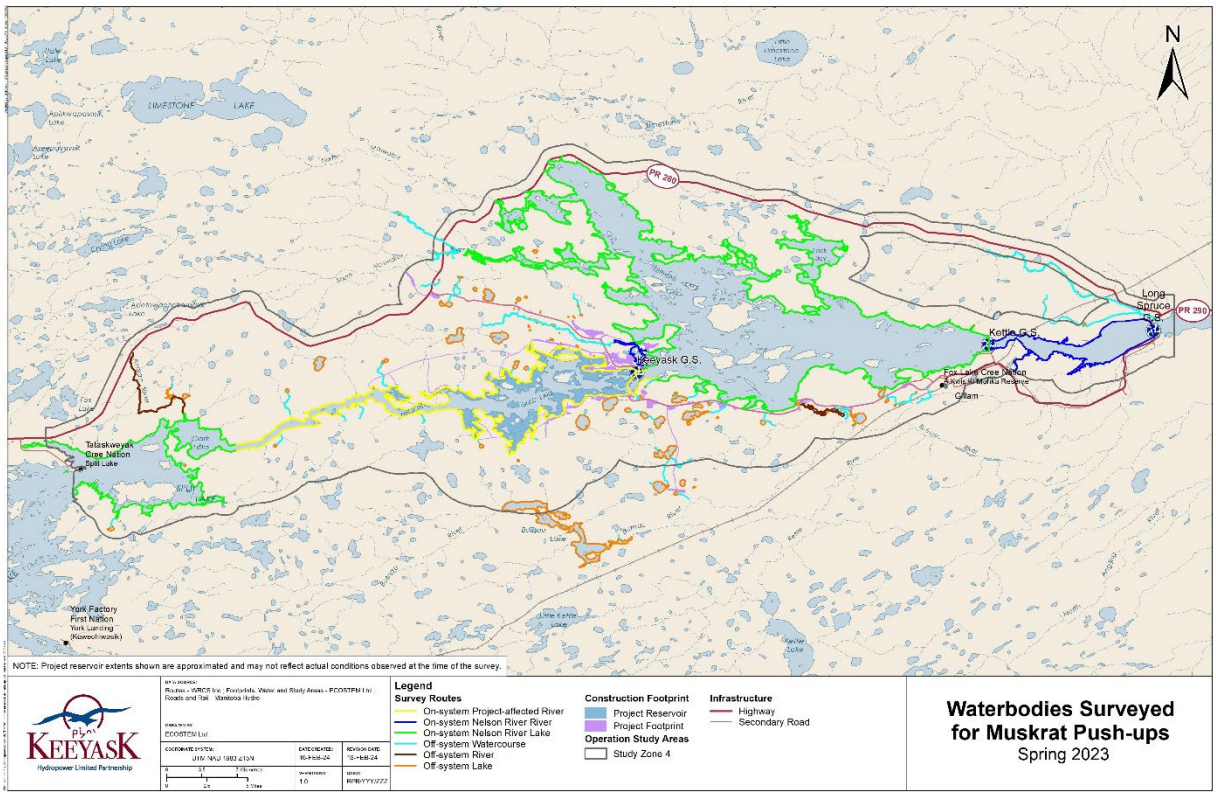
This report describes the results of muskrat habitat effects monitoring conducted during the spring of 2023, the second year of Project operation.

Why is the study being done?

Predicted Project effects on muskrat during operation were mainly habitat loss and alteration. Reservoir impoundment has resulted in a permanent loss of local muskrat habitat because creeks, tributaries, small ponds, and lakes were flooded. The objective of muskrat monitoring is to estimate how much of their habitat is lost or altered due to the Project by observing their use of the reservoir and nearby areas during Project operation.

What was done?

Helicopter surveys for muskrat push-ups were performed on May 2 and 3, 2023 in the Keeyask region (Study Zone 4; see map below). Two observers and a helicopter pilot searched the Nelson River between the Kettle and Long Spruce generating stations as well as smaller waterways and waterbodies in the region. Observations of muskrat push-ups were recorded. Aerial surveys for muskrat push-ups were previously conducted in the Keeyask region in spring 2001, 2003, and 2006 for the Project's environmental impact assessment, and in spring 2018, 2019, and 2021 during Project construction.



What was found?

One hundred eighty-four muskrat push-ups were observed at 36 locations during the aerial survey in spring 2023. The number of push-ups per location ranged from one to 15. Eighty-six percent of the push-ups were on off-system lakes, where their density was considerably greater than on other types of waterbodies. Density of muskrat push-ups in 2023 was greatly increased compared to 2021, and approached the densities observed in pre-construction monitoring.

Muskrat Push-up Observed in 2023 Survey

What does it mean?

The increased density of muskrat push-ups in off-system lakes in 2023 suggests that the observed increase was likely due to muskrat population cycles and not related to operation of the Project.

What will be done next?

Muskrat habitat effects monitoring will continue in spring 2026 to monitor the muskrat population during Project operation.

STUDY TEAM

We would like to thank Sherrie Mason and Rachel Boone of Manitoba Hydro for editorial comments. We would also like to thank James Ehnes of ECOSTEM Ltd. for GIS support and mapping. Biologists and other personnel who designed, participated in, and drafted the survey results included:

- Robert Berger, WRCS – Design and reporting
- Thomas Wood, WRCS – Data analysis and reporting
- Mark Baschuk, WRCS – Survey personnel
- Naomi Hutchinson, 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, the reservoir was impounded in early September 2020, and the GS 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 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 operation 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 included habitat loss or alteration and increased mortality. 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 their habitat in the Keeyask region.

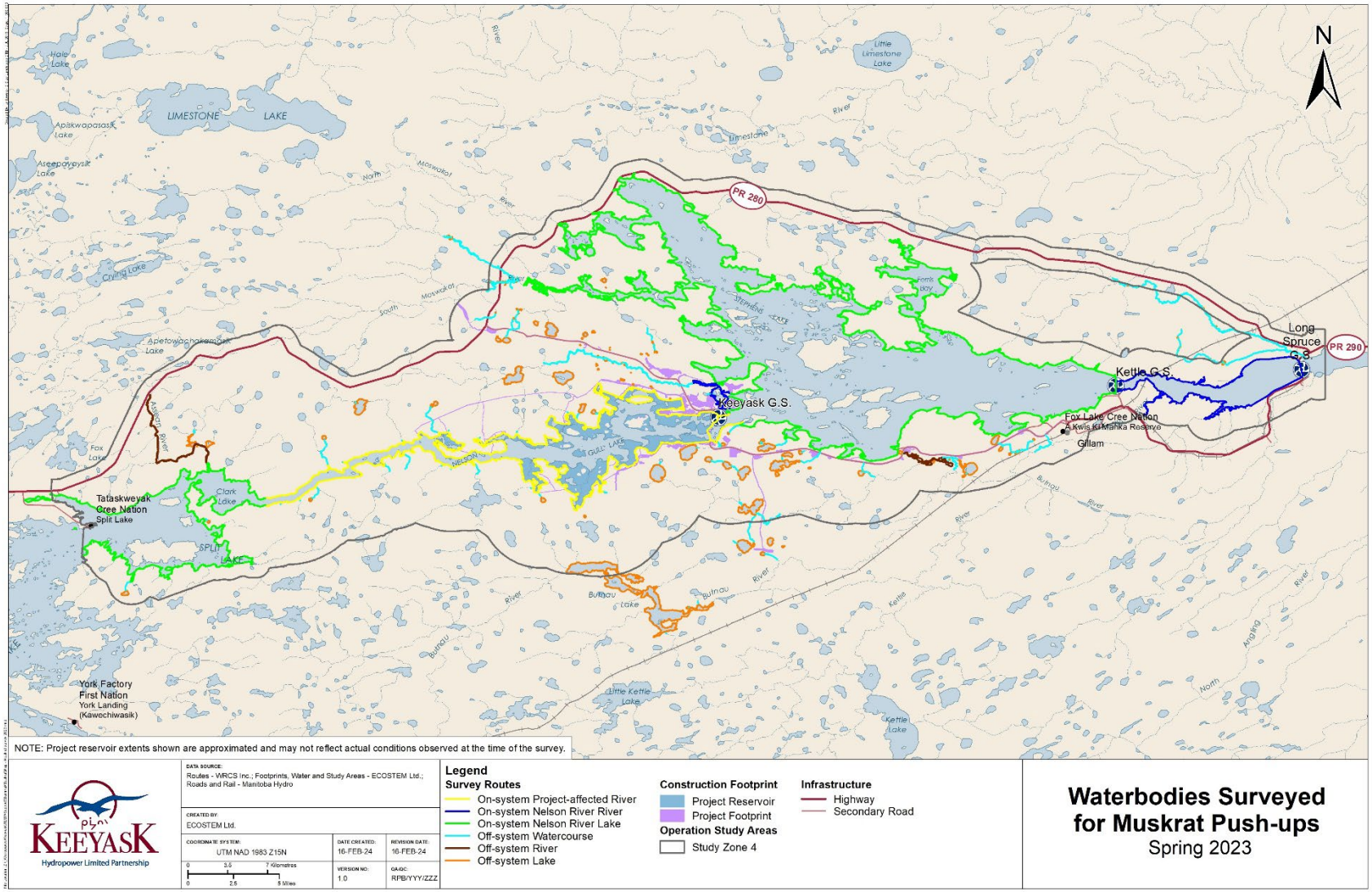
2.0 METHODS

An aerial survey for muskrat push-ups was conducted on May 2 and 3, 2023 in Study Zone 4 (Map 1). Aerial surveys for muskrat push-ups were also conducted in 2018, 2019, and 2021 during Project construction. Pre-selected survey routes were flown in a Bell 206 Jet Ranger helicopter. Two observers and a pilot searched the Nelson River between the Kettle and Long Spruce generating stations as well as smaller waterways and waterbodies in the region. 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 (Photo 1) and marked their locations with a handheld Global Positioning System (GPS) unit. The locations of hunters observed incidentally during the survey were also recorded and marked.

Waterbodies were first grouped by hydraulic zone and classified as either on-system, including Project-affected (directly affected by the Project and influenced by existing hydroelectric developments) and 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 1,584 km was surveyed in 2023. The density of push-ups on each type of waterbody was calculated as the number of push-ups observed per kilometre of shoreline surveyed.

Table 1: Shoreline Lengths of Waterbodies Surveyed, Spring 2023

Hydraulic Zone	Waterbody Type	Total Survey Length (km)
Project-affected	River	246
Nelson River	Lake	793
	River	98
Off-system	Lake	200
	River	45
	Watercourse	157



Map 1: Waterbodies Surveyed for Muskrat Push-ups, Spring 2023

Photo 1: Muskrat Push-up, 2023

3.0 RESULTS

One hundred eighty-four muskrat push-ups were observed at 36 locations during the aerial survey in spring 2023 (Map 2). The number of push-ups per location ranged from one to 15 (Appendix 1, Table 1-1). Eighty-six percent of the push-ups were on off-system lakes, where their density was considerably greater than on other types of waterbodies. The other 14% of push-ups were observed on the Nelson River lake waterbody type. No push-ups were found on Project-affected river, Nelson River river, or off-system river and watercourse waterbody types (Table 2).

Table 2: Muskrat Push-ups Observed During the Aerial Survey, Spring 2023

Hydraulic Zone	Waterbody Type	Number	Density (push-ups/km)
Project-affected	River	0	0.00
Nelson River	Lake	26	0.03
	River	0	0.00
Off-system	Lake	158	0.79
	River	0	0.00
	Watercourse	0	0.00

Aerial surveys for muskrat push-ups were previously conducted in the Keeyask region in spring 2001, 2003, and 2006 for the Project's environmental assessment and in spring 2018, 2019, and 2021 during the Project's construction. Push-up density on lakes (0.19 push-ups per km) in 2023 was higher than those observed during pre-construction and Project construction survey years, but push-up density of watercourses was much lower than in pre-construction years (Table 3). In 2023, the total push-up density in the Keeyask region was lower than pre-construction years but higher than construction years (Figure 1).

Table 3: Density of Muskrat Push-ups in the Keeyask Region before Construction (2001, 2003, 2006), During Construction (2018, 2019, and 2021), and During Operation (2023)

	Density (push-ups/km)						
Waterbody Type	2001	2003	2006	2018	2019	2021	2023
Lake	0.15	0.17	0.12	0.14	0.15	0.02	0.19
River	0.06	0.11	0.04	0.02	0.01	0.02	0.00
Watercourse	0.22	0.38	0.34	0.01	0.00	0.00	0.00

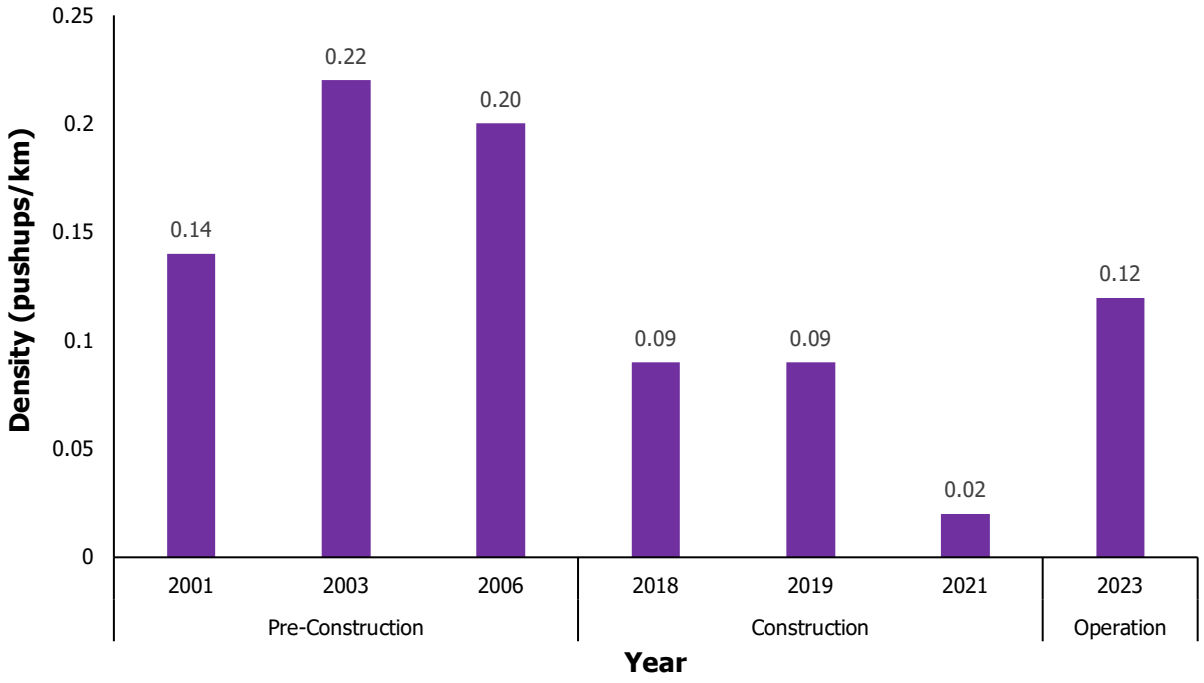
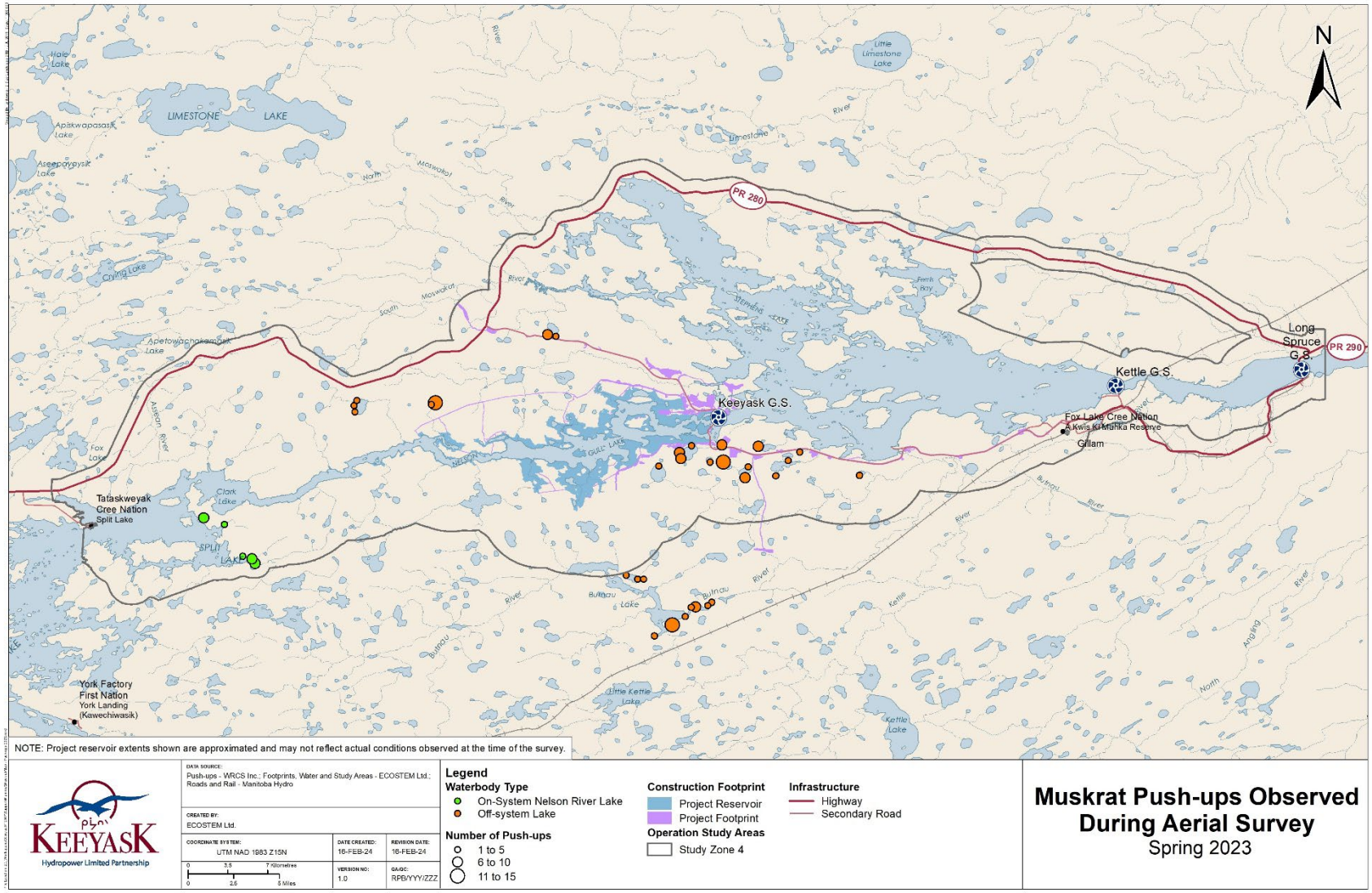


Figure 1: Density of Muskrat Push-ups Before Construction, During Construction, and During Project Operation

Incidental Observations

Hunters were observed at eight locations during the survey (Appendix 2, Table 2-1). At one location, two different hunting parties were observed. Two muskrats were also observed on the ice.



Map 2: Muskrat Push-ups Observed During Aerial Survey, Spring 2023

4.0 DISCUSSION

Density of muskrat push-ups in the Keeyask area greatly increased from 2021 to 2023, as predicted in the previous Muskrat Habitat Effects and Mortality report (WRCS 2023). Muskrat populations are somewhat cyclical (Banfield 1987; Erb et al. 2000), with cycles ranging from approximately 8 to 10 years in central and northern Canada (Erb et al. 2000; Haydon et al. 2001; Sadowski and Bowman 2021). Observing higher densities in 2003-2006, lower densities in 2018 to 2021, and higher densities in 2023 is consistent with 2023 being part of a high phase in a 10-year population cycle. Reservoir impoundment resulted in a loss of muskrat habitat, as predicted in the EIS, and subsequently most muskrat push-ups observed in 2023 were in off-system lakes. These two factors considered together suggests that the increase in muskrat density is unlikely related to the Project.

Like previous years, little muskrat activity was observed on the large, open waterbodies of Clark Lake, Stephens Lake, and the Keeyask reservoir. Muskrat generally inhabit smaller, shallower waterbodies and watercourses with limited wave action (Errington 1963 in Erb and Perry 2023). Like 2018 and 2019, push-ups observed on Split Lake were in a bay where wave action is likely less compared to the main lake. No push-ups were observed on Split Lake in 2021. Little muskrat activity was observed in off-system watercourses, similar to Projection construction years. During pre-construction monitoring, muskrat activity in off-system watercourses was high. The pre-construction surveys covered a larger geographical area than the Project construction and Project operation surveys, which might lead to differences in observed muskrat density if the larger survey area included watercourses with relatively higher muskrat activity.

5.0 SUMMARY AND CONCLUSIONS

The density of muskrat push-ups in the Keeyask region has increased greatly since 2021. The increase in push-up density could indicate that the regional population has increased. Reservoir impoundment in 2020 led to a loss of muskrat habitat and the increase in muskrat push-up density was largely observed in off-system waterbodies, which suggests that the increase is unrelated to the Project. The increase in muskrat push-up density is more likely due to population cycles observed in muskrat. Muskrat habitat effects monitoring will continue in 2026 to further examine muskrat populations during Project operation.

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APPENDIX 1:
MUSKRAT PUSH-UPS OBSERVED IN SPRING 2023

Table 1-1: Muskrat Push-ups Observed, Spring 2023

System	Waterbody Type	Location	Number of Push-ups
On-system	Lake	15 V 323028 6234324	6
		15 V 322742 6234716	7
		15 V 321939 6234943	2
		15 V 320319 6237744	5
		15 V 318471 6238341	6
Off-system	Lake	15 V 363359 6230885	1
		15 V 363015 6230580	3
		15 V 361904 6230490	6
		15 V 361521 6230427	2
		15 V 357334 6232930	4
		15 V 356804 6232920	3
		15 V 355778 6233284	4
		15 V 358280 6227912	2
		15 V 359848 6228894	12
		15 V 360990 6229615	4
		15 V 370095 6243382	3
		15 V 368987 6242038	5
		15 V 348845 6254510	7
		15 V 349600 6254357	3
		15 V 338943 6248485	15
		15 V 338582 6248338	5
		15 V 332026 6248701	5
		15 V 331769 6248241	3
		15 V 331840 6247671	3
		15 V 358669 6242891	3
		15 V 360498 6244089	6
		15 V 360610 6243574	6
		15 V 361549 6244707	5
		15 V 363206 6243250	4
		15 V 364380 6243254	15
		15 V 366293 6241892	6
		15 V 366565 6242828	2
		15 V 364237 6244795	8
		15 V 367460 6244651	6
		15 V 371136 6244144	4
		15 V 376399 6242096	3

APPENDIX 2:
INCIDENTAL OBSERVATIONS IN SPRING 2023

Table 2-1: Incidental Observations During 2023 Muskrat Survey

Date	Observation	Location	Comments
02-May-23	Hunter	15 V 355140 6267428	
	Muskrat	15 V 377677 6254730	
		15 V 357056 6263063	
03-May-23	Hunter	15 V 344201 6253913	
		15 V 338166 6245527	Two hunting parties
		15 V 319121 6242460	
		14 V 684373 6248369	
		14 V 676129 6239280	
		15 V 382332 6243029	
		15 V 385447 6242980	