Keeyask Generation Project

Zebra Mussel Monitoring Plan

Zebra Mussel Monitoring Report

ZMMP-2022-01

KEEYASK

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2021 -2022

KEEYASK GENERATION PROJECT

ZEBRA MUSSEL MONITORING PLAN

REPORT #ZMMP-2022-01

ANNUAL REPORT

APRIL 2021 TO MARCH 2022

Prepared by

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&

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SUMMARY

Zebra mussels are an aquatic, invasive species that grow on hard materials in the water, such as rocks and pipes, and can become so prolific they cause major problems for utilities. They were first introduced to North America in the 1980s from Europe and/or Asia, where they were carried in the bilge water of oceangoing ships that was released into North American waterways. They are a major problem because they do not have predators in North America and therefore, grow freely on submerged surfaces (Figure 1). The first zebra mussel was found in Lake Winnipeg in 2013 and they have made their way to the Nelson River since that time.

Figure 1: Once present, zebra mussels grow on hard surfaces that are in the water, as shown on this boat propeller. Each mussel is approximately the size of a fingernail.

The *Zebra Mussel Monitoring Plan* (ZMMP) was developed and is being implemented in accordance with the Keeyask *Environment Act* Licence to monitor and manage the impacts of zebra mussels on the Keeyask Project. A key component of the ZMMP is to ensure that Keeyask employees and visitors are aware of zebra mussels and the provincial regulations for cleaning

watercraft, water-related equipment, trailers, and motor vehicles to prevent them from spreading. Zebra mussel education and awareness was promoted in 2021 at Keeyask in the site orientation session, by displaying aquatic invasive species posters in lunchrooms across the Project site, and by distributing electronic information bulletins to all parties on site.

A hot water decontamination unit is used at site to prevent the spread of zebra mussels to or from Keeyask. All incoming and outgoing watercraft and water-related equipment (anchors, nets, paddles, etc.) were inspected for the presence of zebra mussels and decontaminated, if they were leaving the Nelson River Control Zone.

In 2021, 44 inspections were conducted, and 3 hot water decontaminations were performed. At the main entrance to Keeyask off PR 280, a sign remains posted reminding site users to report watercraft and water-related equipment for inspection and decontamination. Additionally, the main gate security documented all watercraft and water-related equipment, using a red tagging system and email notification for all arriving equipment.

Zebra mussel “veligers” (microscopic mussel larvae) were first found in Gull Lake in 2019 and monitoring is ongoing. During 2021, three samples were collected from the Keeyask reservoir and a total of 89 veligers were found. This count has increased from 2020, when a total of 28 veligers were found.

2020 marked the first year when adult zebra mussels were found on monitoring substrate and various, submerged equipment/surfaces located in and around the project site. In 2021, substrate monitoring in Clark Lake, the Keeyask reservoir and Stephen Lake showed that 98% of the zebra mussels (1,027) grew on substrates in Stephens Lake. There were no mussels found on the substrates from Clark Lake and 19 were found growing on one of three substrates in the reservoir.

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1.0 INTRODUCTION

The Keeyask Generation Project (the Project) is a 695-megawatt (MW) hydroelectric generating station at Gull (Keeyask) Rapids on the lower Nelson River in northern Manitoba. The Project is approximately 725 kilometres (km) northeast of Winnipeg, 35 km upstream of the existing Kettle Generating Station, where Gull Lake flows into Stephens Lake, 60 km east of the community of Split Lake, 180 km east-northeast of Thompson and 30 km west of Gillam. Construction of the Project began in July 2014.

Although none of the aquatic invertebrate species identified during the environmental assessment of the Project were listed as invasive in accordance with the Invasive Species Council of Manitoba's listing at the time (KHLP 2012), the Project's *Environment Act* Licence #3107 (Clause 18) indicated the Keeyask Hydropower Limited Partnership (KHLP) must develop a Zebra Mussel Monitoring Plan to "*monitor and adaptively manage impacts to the Development (Project) associated with zebra mussels and participate with the Government of Manitoba on treatment programs within the Keeyask reservoir.*"

The *Zebra Mussel Monitoring Plan* (ZMMP) was submitted by the KHLP in December 2015 (KHLP 2015) and was subsequently approved by Manitoba Sustainable Development. This report summarizes the results and activities conducted from April 2021 to March 2022 in accordance with the ZMMP.

2.0 ZEBRA MUSSEL MONITORING 2021

The ZMMP methodology is designed to assess zebra mussel presence using four approaches, as follows:

1. Education and awareness;
2. Water quality sampling;
3. Colonization/adult sampling;
4. Visual inspections of in-water infrastructure.

The work undertaken to implement each of these approaches is summarized below.

2.1 EDUCATION AND AWARENESS

Site Environmental Inspectors received refresher training regarding requirements related to aquatic invasive species legislation, as well as provincially approved inspection and decontamination techniques for zebra mussels and other common aquatic invasive species (AIS). The site orientation session given to all Keeyask employees, contractors, and visitors includes a section on AIS and outlines the regulatory requirements for decontaminating watercraft and water-related equipment. Aquatic invasive species information posters are also displayed in Main Camp as well as Manitoba Hydro and contractor lunchrooms around the construction site; this helps familiarize people regarding what to look for, and how they can follow up if they find something. An information bulletin on zebra mussels and other aquatic invasive species was distributed to all contractors on site beginning in May 2018 and continues to be distributed annually in the spring. A sign posted at the main gate in 2018 remains in place to notify site users that Keeyask is in the Nelson River Control Zone and to remind personnel to report for inspection/decontamination of watercraft and water-related equipment when entering and leaving Keeyask (Figure 2).

A decontamination unit was constructed at Keeyask in September 2016 to prevent the transfer of zebra mussels from boats and equipment used elsewhere to Gull and Stephens lakes, as well as to prevent the spread of zebra mussels or veligers from the Keeyask site. The unit consists of a hot water (≥60 °C) sprayer and a drain pad designed to allow wash water to rapidly infiltrate the ground and prevent it from flowing off the pad. The unit meets the Provincial requirements for AIS decontamination.

Watercraft and equipment users were informed that whenever watercraft/equipment are removed from the Nelson River (including Gull Lake and Stephens Lake), general provisions (*i.e.*, clean, drain, dry) should be performed. In addition, when leaving Keeyask, any watercraft or equipment leaving the Nelson River Control Zone needs to be decontaminated prior to departure unless they can 1) provide proof of an exemption permit issued from Manitoba Wildlife and Fisheries Branch or 2) the party has access to decontamination facilities and agrees to provide records to Manitoba

Hydro after decontamination in accordance with the provincial *Aquatic Invasive Species Regulation*.

Figure 2: A sign is located at the main gate to remind site users to report for inspection of watercraft and water-related equipment.

2.1.1 RESULTS

From April 2021 to March 2022, all watercraft and water-related equipment was inspected for AIS upon arrival and departure from Keeyask. In total, forty-four inspections were conducted, and three, hot water decontaminations (Figure 3) were performed on incoming and outgoing watercraft and water-related equipment.

Figure 3: One of three pieces of equipment that underwent hot water decontamination at Keeyask in 2021; an accidently submerged telehandler was inspected and was covered with adult zebra mussels. It was decontaminated on June 12, 2021.

2.2 NEXT STEPS

AIS inspections and decontamination will continue in 2022. Signs will be posted at the upstream and downstream boat launches to notify site users that Keeyask is in the Nelson River Control Zone, and to remind personnel to report for inspection/decontamination of watercraft and water-related equipment when entering and leaving Keeyask. The signs will also list the Keeyask standard AIS requirements when launching or removing watercraft/equipment from the Nelson River.

2.3 VELIGER SAMPLING

Zebra mussel veligers (larval mussels) were sampled at three locations upstream of the Keeyask GS on September 19, 2021 (Figure 4). Samples were collected with a plankton net consisting of a 27 cm diameter ring with bridle; a 1 meter long, 63-micron mesh net; and a removable weighted cod end for sample retrieval. Samples were collected using the vertical tow (used in areas of water 6 meters or more in depth) method. The net was released, allowed to sink to ~1 m above the bottom. It was allowed to sit for 30 seconds and pulled up at a rate of approximately 0.5 m/s. This was repeated between two and four times to retrieve a single sample over 1,000 L.

All sampling information was recorded onto field data sheets that included sample date and time, sample ID, water temperature (˚C), location (UTM), Secchi depth (m), water depth (m), water velocity (m/sec), start time, and tow distance (m). Site specific data are presented in Table 1.

After retrieval, the entire net was rinsed from the outside to ensure all of the sample material was washed into the cod end. Contents were thoroughly rinsed into a labelled sample jar. Samples were preserved using 70% denatured ethanol (alcohol to sample ratio = 2:1). All samples were stored for transport in a cooler and sent to ALS Laboratories (Winnipeg, MB) for analysis.

2.3.1 RESULTS

Zebra mussel veligers were found in all three samples collected in September 2021. A total of 28 veligers were collected at GUL-01, 28 at GUL-02, and 33 at GUL-03. Zebra mussel veligers were previously recorded in the area in both 2019 and 2020.

2.3.2 NEXT STEPS

Annual sampling for zebra mussel veligers will continue. Sampling will be conducted in August/September 2022.

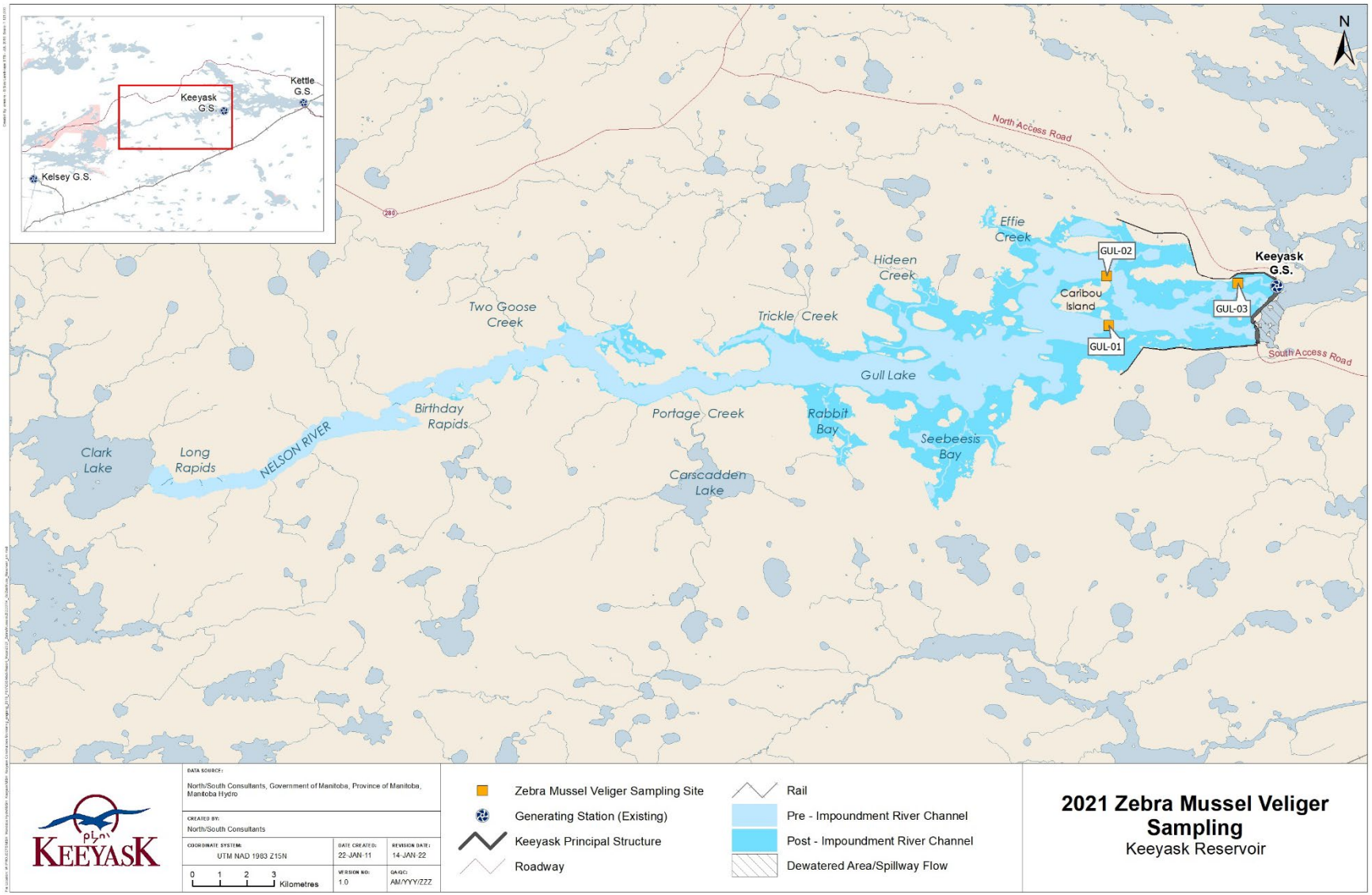

Figure 4: Sampling sites for zebra mussel veliger monitoring in the Keeyask Study Area, September 21, 2021.

Table 1: Site specific data collected at zebra mussel veliger sampling sites upstream of the Keeyask GS construction site during September 2021.

Sample ID	Sample Date	Water Temperature (°C)	15V (NAD 83)		Water Depth (m)	Secchi Depth (m)	Sample Method	Number of Tows
			Easting	Northing				
GUL-01	19-Sep-21	11	357712	6245772	10.5	0.5	Vertical	3
GUL-02	19-Sep-21	11	357639	6247590	11.6	0.5	Vertical	2
GUL-03	19-Sep-21	11	362468	6247332	7.3	0.5	Vertical	4

2.4 COLONIZATION/ADULT SAMPLING

Substrate samplers were used to sample adult zebra mussels in Clark Lake, the Keeyask reservoir, and Stephens Lake (Figure 5 & Figure 6). Substrate samplers consisted of a series of four, square plates that are 6, 8, 10 and 12 inches in size, pyramiding from smaller plates at the top down to larger plates at the bottom (Figure 7). The plates were made of ⅛-inch PVC board with ¾-inch PVC pipe for spacers (1-inch sections) between the plates, held together with rope.

2.4.1 RESULTS

Two of the substrate samplers set in the Keeyask reservoir (ZM-04 and ZM-06) and one in Stephens Lake (ZM-10) were lost during the open-water period (Figure 6). A total of 1,046 adult zebra mussels were present on the remaining seven samplers (Table 2). No zebra mussels were collected on the two samplers set in Clark Lake. Nineteen zebra mussels were present on one of the two samplers in the Keeyask reservoir set closer to the GS. The remaining 1,027 were collected on the three samplers in Stephens Lake. The largest number of zebra mussels were collected on the sampler set farthest downstream in Stephens Lake (ZM-09; n = 800; Figure 6; Figure 8). At all sites, zebra mussels ranged in size from 1.5 to 7.0 mm.

2.4.2 NEXT STEPS

Adult zebra mussel samplers will be set in spring 2022. Additional anchors will be added in an attempt to mitigate sampler loss. The adult samplers set in Clark Lake will be moved to slightly deeper sites in the same area.

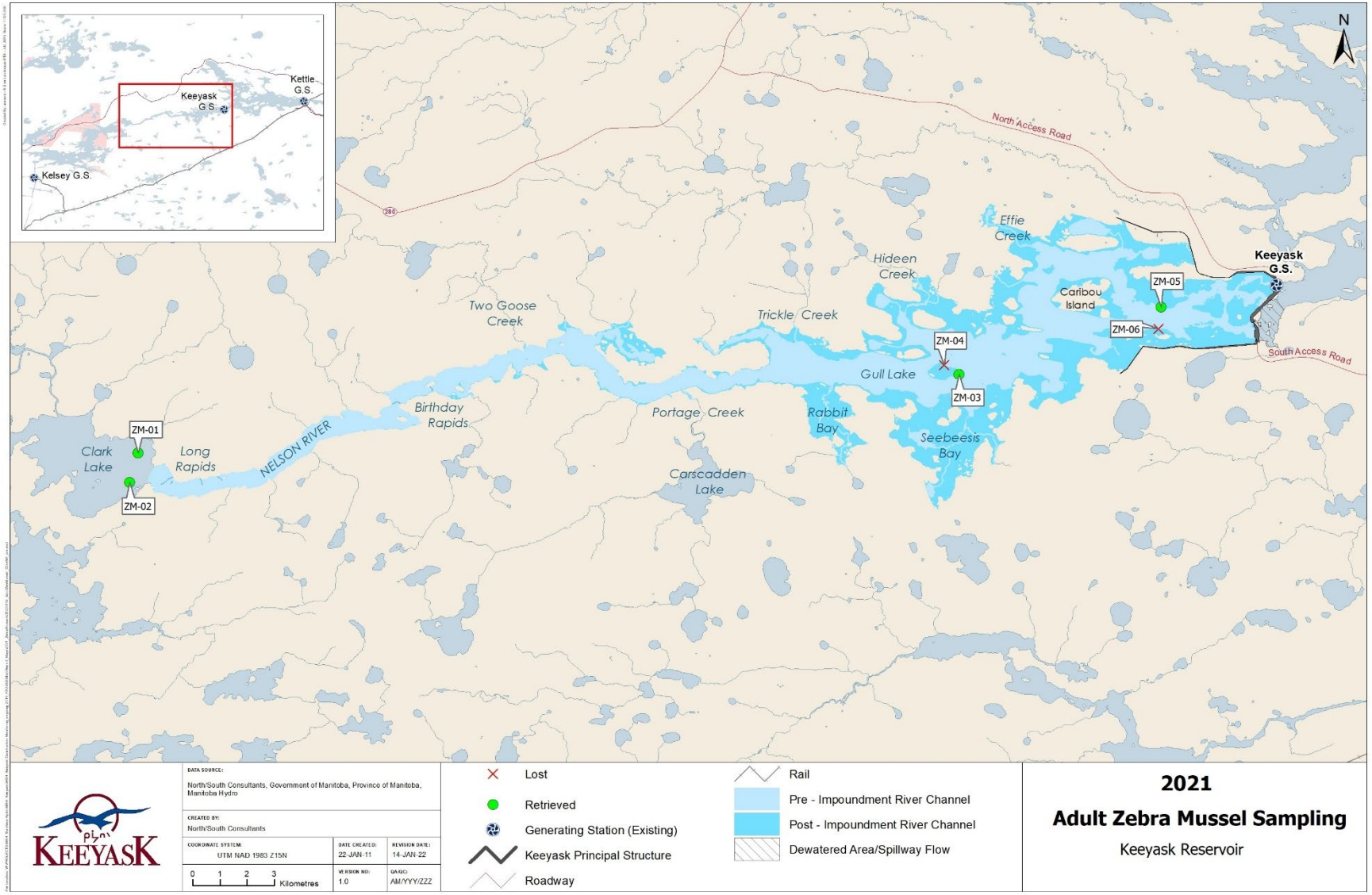

Figure 5: Sampling sites for adult zebra mussel monitoring in Clark Lake and the Keeyask reservoir, 2021.

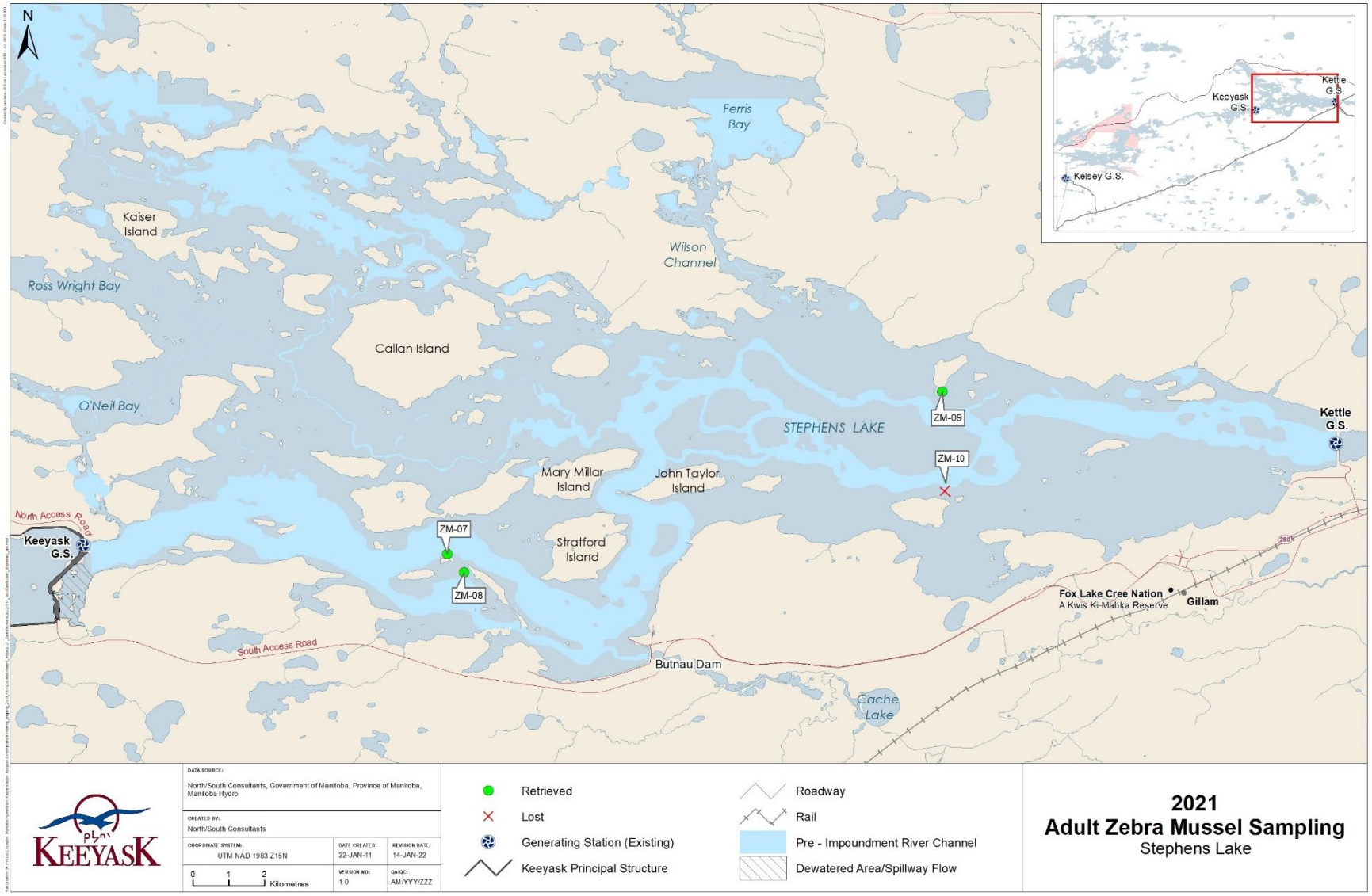

Figure 6: Sampling sites for adult zebra mussel monitoring in Stephens Lake, 2021.

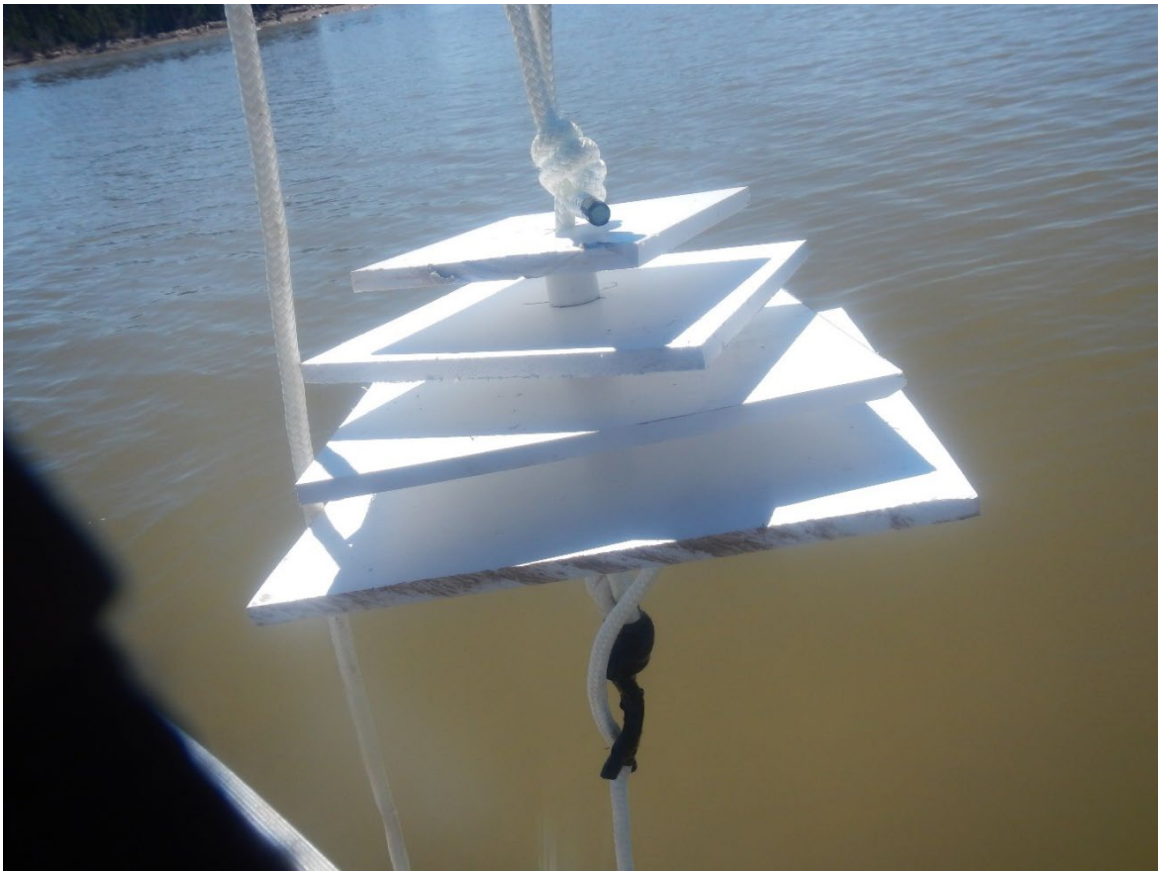

Figure 7: Adult zebra mussel sampler set in the Keeyask area, 2021.

Figure 8: Adult zebra mussels attached to plate of a sampler at the end of the 2021 sampling period.

Table 2: Site specific data and results for adult zebra mussel substrate samplers set in Clark Lake, the Keeyask reservoir, and Stephens Lake between June and October, 2021.

Site	Location	Set Depth (m)	Set Date	Retrieval Date	Sampling Days	Total Number	Size Range (mm)	Average Size of 30 Mussels (mm)
ZM-01	Clark Lake	3.0	1-Jun-21	5-Oct-21	126	0	-	-
ZM-02	Clark Lake	3.0	1-Jun-21	5-Oct-21	126	0	-	-
ZM-03	Keeyask reservoir	5.7	15-Jun-21	11-Oct-21	118	19	1.5-4.0	2.7
ZM-04	Keeyask reservoir	5.6	15-Jun-21	Lost	-	-	-	-
ZM-05	Keeyask reservoir	4.9	15-Jun-21	11-Oct-21	118	0	-	-
ZM-06	Keeyask reservoir	5.3	15-Jun-21	Lost	-	-	-	-
ZM-07	Stephens Lake	7.5	14-Jun-21	2-Oct	110	88	1.5-7.0	4.2
ZM-08	Stephens Lake	5.9	14-Jun-21	2-Oct	110	139	2.2-6.0	4.0
ZM-09	Stephens Lake	6.4	15-Jun-21	1-Oct	108	800	3.0-6.0	4.8
ZM-10	Stephens Lake	5.0	15-Jun-21	Lost	-	-	-	-

3.0 CONCLUSIONS

The Keeyask ZMMP was implemented in 2021 in accordance with the Keeyask *Environment Act* Licence and included education and awareness activities to mitigate the introduction of zebra mussels at the Keeyask site, as well as to conduct veliger sampling, colonization sampling, and visual inspections of in-water infrastructure as the means to locate zebra mussels at the Keeyask site.

In 2021, 89 zebra mussel veligers were collected during instream monitoring. The substrate monitoring program was carried out in concert with the province's method, and was expanded beyond the Keeyask reservoir, upstream (Clark Lake) and downstream (Stephens Lake), to track them over a broader area to potentially find trends. Adult mussels were found on artificial monitoring substrates in the reservoir (19), but of the 1046 mussels found, 98% were growing on substrate from Stephens Lake. 2021 marks the second year of adult zebra mussels being found at Keeyask.

Monitoring for veligers and mussels as described in this report will continue in 2022.

4.0 LITERATURE CITED

Keeyask Hydropower Limited Partnership. 2012. Keeyask Generation Project Environmental Impact Statement: Response to EIS Guidelines, Winnipeg, Manitoba. June 2012. 1,200 pp.

Keeyask Hydropower Limited Partnership (KHLP), 2015. Keeyask Generation Project: Zebra Mussel Monitoring Plan. Winnipeg, Manitoba. June 2015.