Initial Fish and Fish Habitat Investigations in Support of the Assessment of Development Options for the Matabitchuan GS, Matabitchuan River

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Ontario Power Generation Inc.
700 University Avenue
Toronto, Ontario, M5G 1X6

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C. PORTT and ASSOCIATES
56 Waterloo Avenue
Guelph, Ontario, N1H 3H5
cportt@sentex.net

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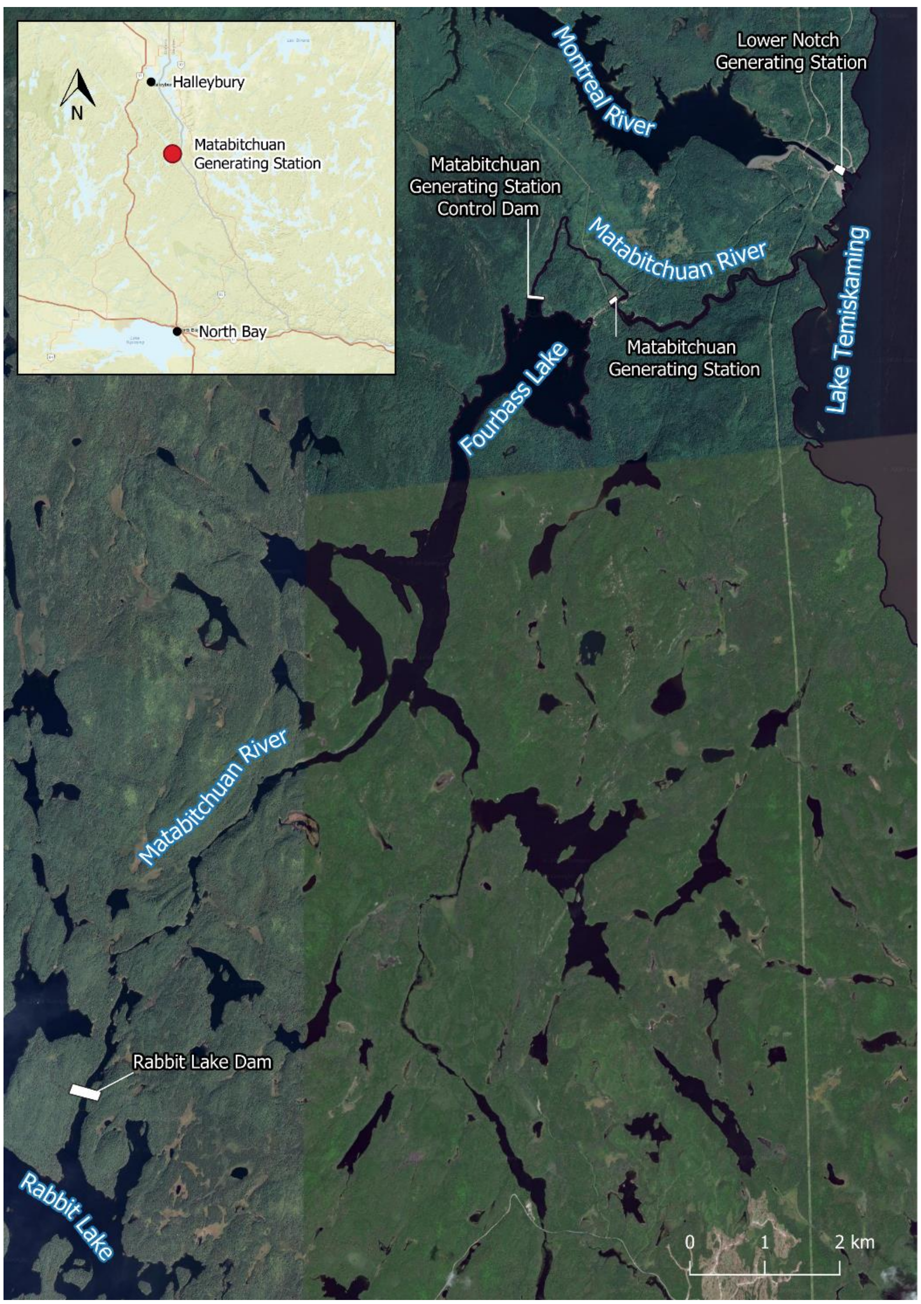
1 Introduction

C. Portt and Associates was retained by Ontario Power Generation Inc. (OPG) to conduct an initial aquatic habitat and fish community investigation at the Matabitchuan Generating Station (GS) on the Matabitchuan River, approximately 37 km south of Haileybury, Ontario and 90 km north of North Bay, Ontario (Figure 1-1). This initial investigation is in support of the assessment of options for development opportunities at this site, which considers overhaul, refurbishment, and redevelopment. This document presents the results of the background information review and the field investigations undertaken in 2020.

Figure 1-1. Location of the Matabitchuan GS on the Matabitchuan River.



2 Background

2.1 Existing Infrastructure

The four unit generating station was constructed in 1910 with an installed capacity of 10,140 kilowatts, a hydraulic head of 95 m, and a maximum flow of 14 m^3/s (OMNR and OPG, 2007, OPG 2020). It is located within the lower portion of the Matabitchuan River watershed, which flows into Lake Temiskaming. There are three water control dams upstream from the Matabitchuan GS. Net Creek Dam and North Milne Dam, owned by the Ontario Ministry of Natural Resources (OMNR), are located in the upper watershed. Rabbit Lake Dam, owned by OPG, is used to control flow from Rabbit Lake into the Matabitchuan River and Fourbass Lake (Figure 1-1) (OMNR and OPG, 2007). The Matabitchuan GS is the only hydroelectric facility in the watershed.

Figure 2-1 identifies project infrastructure and illustrates the general habitat and flow conditions in the vicinity of the GS. The Matabitchuan GS control dam (sluicegates) and intake structure are located on Fourbass Lake, approximately 800 m apart. The control dam and intake structure divert water to the powerhouse through penstocks, bypassing approximately 3km of the Matabitchuan River that is now the spillway. The forebay has a surface area of approximately 5,500 m^2, while the tailrace has a surface area of approximately 1,800 m^2.

Figure 2-1. Matabitchuan River in the vicinity of the Matabitchuan GS.

2.2 Fish Community

Table 2-1 lists the fish species known to occur in Fourbass Lake and the Upper Matabitchuan River (i.e., between the Rabbit Lake Dam and the Matabitchuan GS spillway, Figure 1-1), and in the Lower Matabitchuan River (i.e., from the Matabitchuan GS control dam downstream to Lake Temiskaming). The Matabitchuan GS control dam is a barrier to upstream fish migration from the lower Matabitchuan River into Fourbass Lake, however downstream passage of fish is possible under higher flow conditions.

Table 2-1. Fish species reported to occcur in the Upper Matabitchuan River and Fourbass Lake and in the Lower Matabitchuan River (OMNR and OPG, 2007).

Group	Common name (*Scientific name*)	Fourbass Lake and Upper Matabitchuan River	Lower Matabitchuan River
Suckers	White Sucker (*Catostomus commersonii*)	X	X
	Longnose Sucker (*Catostomus catostomus*)†	-	X
	Redhorse Sucker (*Moxostoma sp.*)	-	X
Trouts and Salmons	Lake Trout (*Salvelinus namaycush*)	X	-
	Cisco (*Coregonus artedi*)	X	-
Pikes	Northern Pike (*Esox lucius*)	X	X
Perches and Darters	Walleye (*Sander vitreus*)	X	X
	Yellow Perch (*Perca flavescens*)	X	-
Sunfishes	Smallmouth Bass (*Micropterus dolomieu*)	-	X
Minnows	Bluntnose Minnow (*Pimephales notatus*)	X	-

† Reported from 2012 sampling conducted by OMNR and OPG (see Appendix A)

Lake Trout and Cisco, both coldwater species, occur in Fourbass Lake, in addition to Walleye, Northern Pike, and other coolwater species that are present both upstream and downstream from the GS. Although Smallmouth Bass are not reported to occur in Fourbass Lake in the water management plan, they are present further upstream in the watershed (OMNR and OPG, 2007) and, therefore, are probably present in Fourbass Lake, as the name implies. Redhorse Sucker and Longnose Sucker have also only been reported to occur in the Lower Matabitchuan River. The water management plan identifies important Walleye and Redhorse Sucker spawning habitat within the GS spillway, immediately upstream of the powerhouse (OMNR and OPG 2007).

Lake Sturgeon have historically been known to spawn at Lower Notch, where the Montreal River enters Lake Temiskaming approximately 1.5 km north of the mouth of the Matabitchuan River (Figure 1-1). OMNR and OPG set gill nets for Lake Sturgeon in the Matabitchuan GS tailrace and sluiceway and further downstream in the river in May of 2012 and 2014 to determine if spawning occurred there. Notes reporting that work are provided in Appendix A. No Lake Sturgeon were captured, however, Northern Pike, Walleye, Smallmouth Bass, White Sucker, and Longnose Sucker were observed in the vicinity of the tailrace during the 2012 sampling.

None of the fish species within these sections of the Matabitchuan River are considered at-risk in Ontario (https://www.ontario.ca/page/species-risk-ontario#section-3, checked November 24, 2020) or federally (https://www.dfo-mpo.gc.ca/species-especes/sara-lep/identify-eng.html?province=Ontario, checked November 24, 2020).

2.3 Operational Procedures Related to Fish Protection

A minimum water level elevation of 274.60 m is maintained in Fourbass Lake from April 15 to June 15 to facilitate Walleye spawning in a tributary (OMNR and OPG 2007). From April 15 to July 1 a spill log is installed in the sluicegates to provide sufficient flow (approximately 0.7 m^3/s) for Walleye and Redhorse Sucker spawning in the lower spillway (OMNR and OPG 2007).

MNRF has indicated that there is a self-sustaining Lake Trout population in Fourbass Lake and therefore winter draw-down could be a concern (Kimberley Tremblay, MNRF Management Biologist, North Bay; email to George Coker, Sep. 21, 2020; refer to Appendix A).

2.4 Instream Work Timing Window

Timing windows restricting instream works are based on the fish species that are present and are intended to protect fish from impacts of works or undertakings in and around water during spawning migrations and other critical life stages (https://www.ontario.ca/document/water-work-timing-window-guidelines, OMNR 2013). Downstream from the Matabitchuan GS control dam, the presence of spawning Walleye restricts in-water work from April 1 to June 20 and the presence of Smallmouth Bass extends this restriction to July 15 (Table 2-2). Therefore, based on the guidelines, instream work downstream from the control dam would only be permitted from July 16 to March 31. It is possible that Lake Whitefish (*Coregonus clupeaformis*), which are present in Lake Temisikaming, spawn in the lower Matabitchuan River. Based on the background information reviewed, this has not been investigated. If Lake Whitefish do spawn there, instream work would be restricted from September 15 to July 16.

Upstream of the project, in Fourbass Lake, the presence of Lake Trout further restricts in-water work from September 1 to May 31 (Table 2-2), which could impact work on the control dam or intake structure. The purpose of the in-water work timing restrictions is to prevent those works from interfering with spawning activity and incubating eggs or embryos either directly or due to sediment generated by the works. It is unlikely that Lake Trout spawn in the immediate vicinity of the control dam or GS intake. If they do not, it would not be necessary to adhere to the Lake Trout timing restrictions.

Table 2-2. Timing window when instream work is restricted, based on fish species known to be present (OMNR 2013). Note that Lake Trout are only present upstream from the GS.

Spawning Season	Species	Restricted Work Date Range
Spring	Walleye	April 1 to June 20
	Smallmouth Bass	May 15 to July 15
Fall	Lake Trout	Sept. 1 to May 31

3 Field Investigations

3.1 Methods

3.1.1 Electrofishing

Electrofishing was conducted by G. Coker and J. Ellenor on July 21-22, 2020, at three locations within the spillway and two locations downstream of the powerhouse (Figure 3-1). A Model HT 2000B Mrk 5 backpack electrofisher was used, set to 350 volts and 60 hertz. All fish collected were identified to species, counted, and released near the point of capture. As a measure of fishing effort, the number of electroseconds (duration that current was generated), start and stop locations, and electrofishing path (i.e., distance electrofished, determined using a Garmin GPSmap76CSx GPS unit) were recorded.

3.1.2 Habitat Investigation and Mapping

Habitat investigations were conducted on July 21-22, 2020. A Humminbird 898ci HD SI sonar unit was used to record georeferenced sonar data, downstream of the powerhouse where the water depth was sufficient to operate a boat. Sonar data were used to construct a bathymetric map, using ReefMaster software (ver. 2.0).

Substrate and aquatic macrophytes were characterized from the Matabitchuan GS sluicegates to approximately 400 m downstream of the powerhouse, as well as immediately upstream of the intake structure (Figure 3-1). Visual observations of substrate were made while walking the spillway channel and while standing on the intake dam. Downstream of the powerhouse, observations of substrate were made either from the surface, where the water was shallow and visibility allowed, or using an Aqua-Vu 740c underwater colour video system where the water was deeper. All substrate observations were georeferenced with a Garmin GPSmap76CSx GPS unit, and data were delineated and mapped using GIS software (QGIS version 3.12). Substrate was characterized using a modified Wentworth (1922) scale (Table 3-1).

Figure 3-1. Locations electrofished and extent of the habitat characterized on July 21-22, 2020.

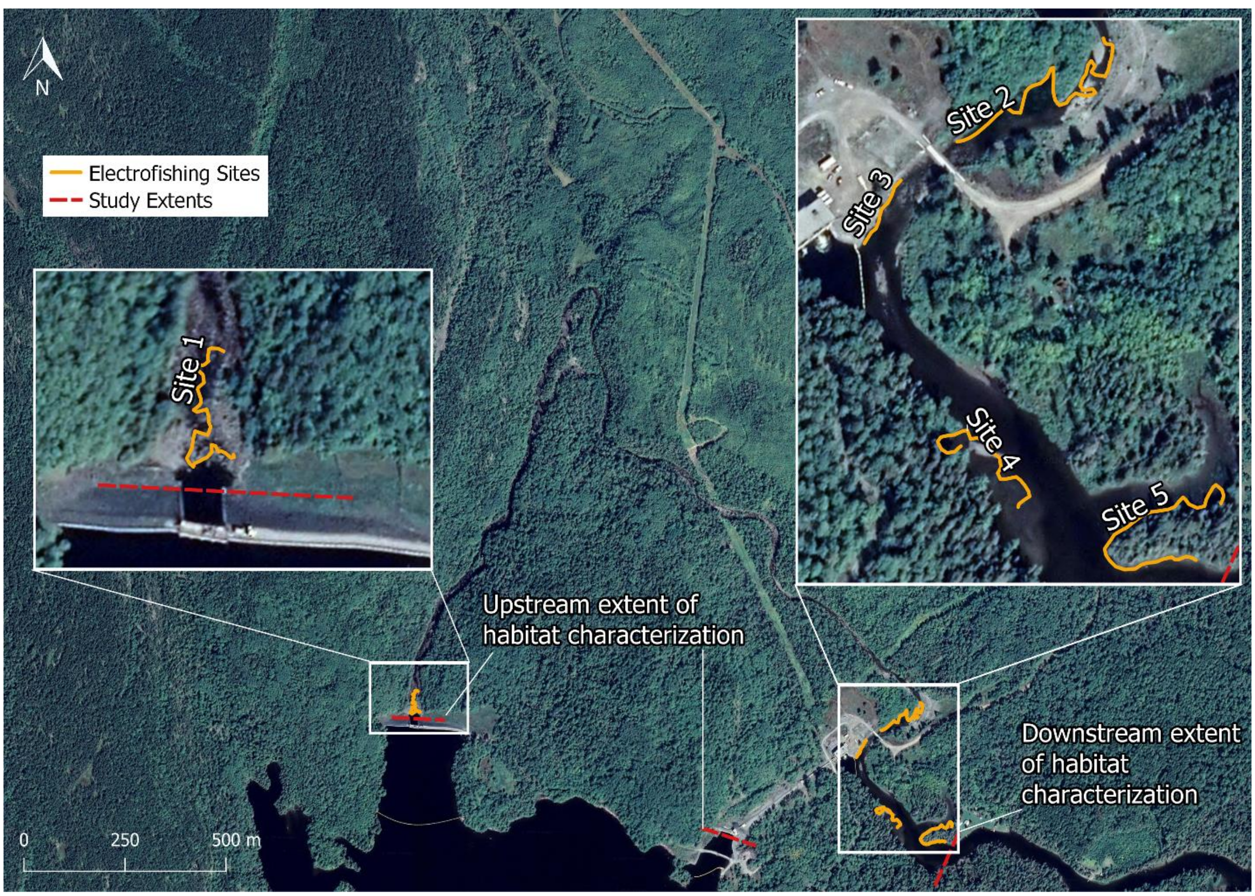


Table 3-1. Substrate size classes used in habitat mapping, modified from Wentworth (1922).

Material	**Size (mm)**	**Description**
Bedrock	-	Rock not granulated.
Hard Clay	-	Consolidated parent material. Functions similarly to bedrock with regards to habitat, but is softer and slippery.
Silt/Soft Clay	<0.062	Mud. Feels soft and smooth between fingers.
Sand	0.062-2	Feels gritty between fingers.
Gravel	2-64	
Cobble	64-256	
Boulder	>256	

3.2 Results and Discussion

3.2.1 Electrofishing

The electrofishing catches are provided in Table 3-2. Of the eleven species captured, nine had not been previously reported from this section of the Matabitchuan River. These are Rock Bass, Brown Bullhead, Iowa Darter, Johnny Darter, Logperch, Mottled Sculpin, Longnose Dace, and Mimic Shiner. All of these fishes are common in Ontario. Young-of-the-year Rock Bass, Smallmouth Bass, White Sucker, and Mottled Sculpin were captured, indicating that spawning occurs nearby. Longnose Dace, which is adapted to fast current (Scott and Crossman, 1973), was the most abundant species in catches at Sites 1 and 2, in the spillway. The flatwater section of the Matabitchuan River downstream of the powerhouse provides habitat for species, including Mimic Shiner and Bluntnose Minnow, that are adapted to slower water velocities (Becker 1983).

Table 3-2. Results of electrofishing in the Matabitchuan River within the spillway and immediately downstream of the Matabitchuan GS.

	Spillway			Downstream	
	Site 1	Site 2	Site 3	Site 4	Site 5
Effort					
Electrofishing Seconds	628	949	497	556	807
Distance Electrofished (m)	207	382	88	208	284
Total Catch by Species (*latin name*)					
Smallmouth Bass (*Micropterus dolomieu*)	7	5	4	2	0
Rock Bass (*Ambloplites rupestris*)	1	0	0	1	0
White Sucker (*Catostomus commersonii*)	0	8	0	1	0
Brown Bullhead (*Ameiurus nebulosus*)	0	2	0	0	0
Iowa Darter (*Etheostoma exile*)	0	7	3	0	3
Johnny Darter (*Etheostoma nigrum*)	0	8	7	5	5
Logperch (*Percina caprodes*)	5	4	2	1	0
Mottled Sculpin (Cott*us bardii*)	0	11	4	0	0
Bluntnose Minnow (*Pimephales notatus*)	0	0	0	0	5
Longnose Dace (*Rhinichthys cataractae*)	20	51	0	0	0
Mimic Shiner (*Notropis volucellus*)	0	0	0	13	0

3.2.2 Habitat Investigation and Mapping

The results of the habitat mapping are presented in Figure 3-2 for the spillway channel, and Figure 3-3 for downstream of the powerhouse. At the time of habitat data collection (July 21-22, 2020) flow through the spillway was limited to dam leakage (Figure 3-4), while through the powerhouse was 4.0 m^3/s . The 3 km spillway consists predominately of boulder/cobble substrate (Figure 3-5, Figure 3-9, and Figure 3-10). The upper spillway has a relatively steep gradient, and three potential barriers to upstream fish passage are present in a bedrock section that extends from approximately 0.75 km to 1 km downstream of the sluicegates (Figure 3-6, Figure 3-7, and Figure 3-8). In the lower spillway, the gradient decreases and substrate transitions to cobble/gravel (Figure 3-11 and Figure 3-12). This section of the spillway likely provides suitable spawning for Walleye and Redhorse Sucker, as noted in the Water Management Plan (OMNR and OPG 2007). Flow volume during the spawning period influences depth and current velocity which also influence spawning locations.

Downstream of the powerhouse cobble/boulder habitat transitions into finer, cobble/gravel/sand habitat as the stream gradient decreases further, forming a low velocity run (Figure 3-13). A patch of rooted aquatic plants is present within the stream, and a shallow backwater with organic substrate is also present.

Figure 3-2. Substrate within the spillway and immediately downstream of the Matabitchuan GS on July 21-22, 2020. For each substrate class, the size classes are listed in order of decreasing proportion. Location and direction of representative stream habitat photos are also identified using arrows.

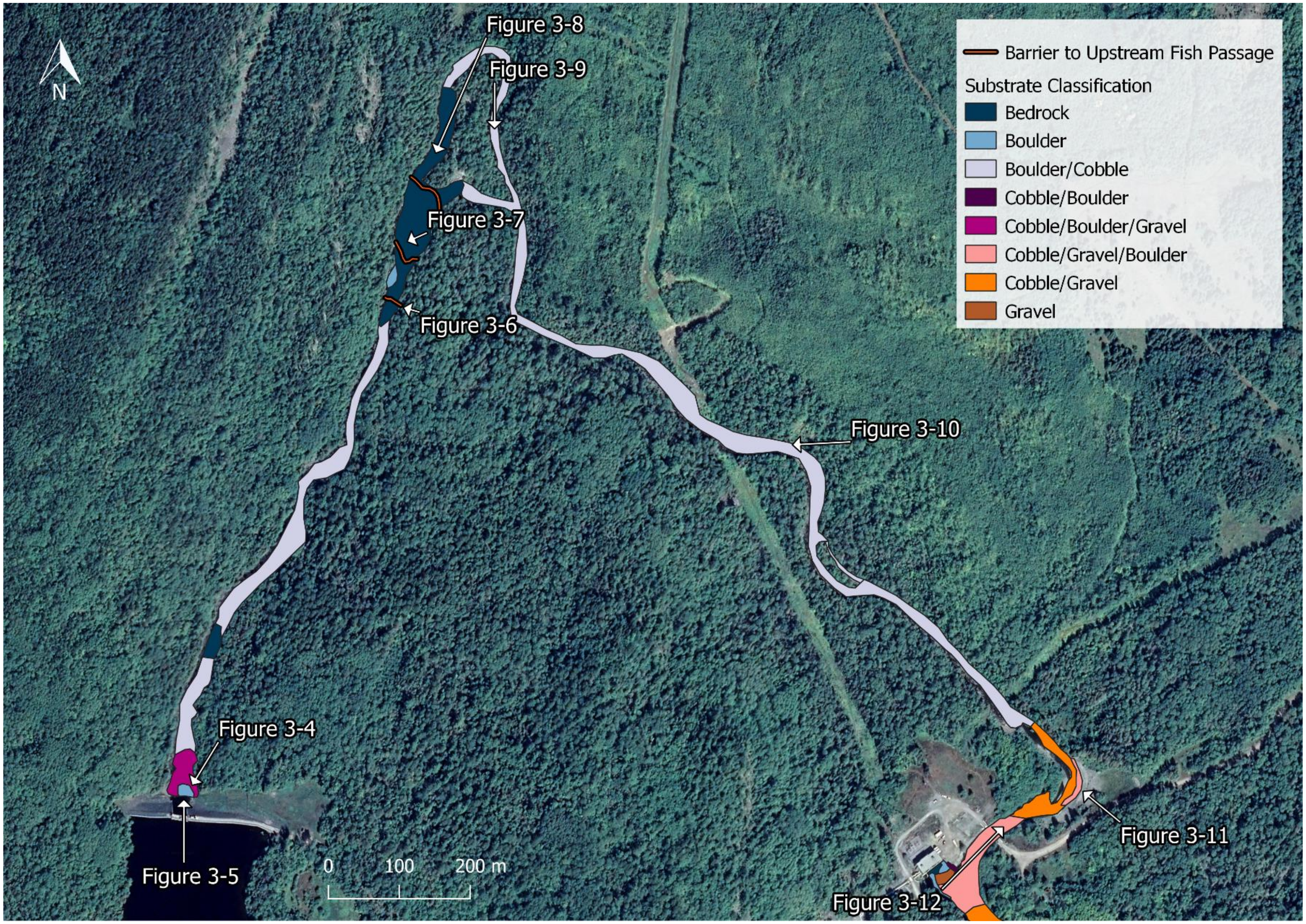


Figure 3-3. Substrate and bathymetry upstream of the intake, within the lower spillway, and immediately downstream of the Matabitchuan GS on July 21-22, 2020. For each substrate class, the size classes are listed in order of decreasing proportion. Location and direction of representative stream habitat photos are also identified using arrows.

Figure 3-4. Looking upstream from the spillway at the control dam of the Matabitchuan GS on July 22, 2020 (see Figure 3-2 for approximate location).

Figure 3-5. Looking downstream from the control dam at the boulder/cobble substrate in the upper spillway of the Matabitchuan GS on July 22, 2020 (see Figure 3-2 for approximate location).

Figure 3-6. Looking cross-river at a small bedrock falls in spillway of the Matabitchuan GS on July 22, 2020 (see Figure 3-2 for approximate location).

Figure 3-7. Looking upstream at a bedrock falls in spillway of the Matabitchuan GS on July 22, 2020 (see Figure 3-2 for approximate location).

Figure 3-8. Looking upstream at a bedrock falls in spillway of the Matabitchuan GS on July 22, 2020 (see Figure 3-2 for approximate location).

Figure 3-9. Looking downstream at the boulder/cobble substrate in spillway of the Matabitchuan GS on July 22, 2020 (see Figure 3-2 for approximate location).

Figure 3-10. Looking upstream at the boulder/cobble substrate in spillway of the Matabitchuan GS on July 22, 2020 (see Figure 3-2 for approximate location).

Figure 3-11. Looking upstream at the cobble/gravel dominant substrate present in the lower spillway of the of the Matabitchuan GS on July 22, 2020 (see Figure 3-2 for approximate location).

Figure 3-12. Looking upstream at the cobble/gravel/boulder substrate in the lower spillway of the Matabitchuan GS on July 22, 2020 (see Figure 3-2 for approximate location).

Figure 3-13. Looking upstream at the flatwater section of the river where cobble/gravel/sand substrates are dominant, downstream of the powerhouse (in the background) on July 21, 2020 (see Figure 3-3 for approximate location).

4 Conclusions

- The control dam is a barrier to upstream fish passage and there are three vertical drops in a bedrock section of the sluiceway that are also barriers to upstream fish passage under most, and possibly all, flow conditions.

- Seven species of fish are known to occur in Fourbass Lake and the Upper Matabitchuan River, upstream of the GS control dam including fall spawning Lake Trout and Cisco. Smallmouth Bass are not reported to occur in Four Bass Lake in the water management plan, but are probably present.

- Fourteen species of fish are known to occur in the Matabitchuan River between the GS control dam and Lake Temiskaming, including nine species captured by electrofishing in this study which had not been previously reported from this reach.

- Important Walleye and Redhorse Sucker spawning habitat within the spillway, immediately upstream of the powerhouse, was identified in the water management plan. From April 15 to July 1 a spill log is installed in the sluicegates to provide sufficient flow (approximately 0.7 m^3/s) for Walleye and Redhorse Sucker spawning in the lower spillway (OMNR and OPG 2007).

- A minimum water level elevation of 274.60 m is maintained in Fourbass Lake from April 15 to June 15 to facilitate Walleye spawning in a tributary (OMNR and OPG 2007).

- MNRF has indicated that there is a self-sustaining Lake Trout population in Fourbass Lake and therefore winter draw-down could be a concern.

- Lake Sturgeon were not captured in the Matabitchuan River during targeted sampling within the lower spillway, and downstream of the powerhouse conducted by OMNR and OPG in May 2012 and May 2014.

- Young-of-the-year Rock Bass, Smallmouth Bass, White Sucker, and Mottled Sculpin were captured in the vicinity of the GS during this study, indicating that spawning occurred nearby.

- Aquatic Species at Risk are not known to occur in the vicinity of the Matabitchuan GS.

- Based on MNRF guidelines and the fish species present, instream work would be permitted from July 16 to March 31 in the spillway and downstream of the powerhouse. The presence of Lake Trout in Fourbass Lake could limit in-water work to July 16 to August 31 upstream from the intake and sluicegate structures, however the additional restriction during the winter would probably not be necessary if Lake Trout spawning does not occur in the immediate vicinity of the control dam or intakes.

5 References

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Appendix A: Correspondence and notes regarding netting in May 2012 and May 2014 targeting Lake Sturgeon