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Nipigon River System Water Management Plan

Implementation Report Submission

April 1, 2015 to Dec 31, 2021

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Acronyms

AOFRC	Anishinabek/Ontario Fisheries Resource Center
CUE	Catch per Unit Effort
CMP	Compliance Monitoring Plan
cms	Cubic meters per second
DFO	Department of Fisheries and Oceans
DICP	Data and Information Collection Program
EA	Environmental Assessment
EMP	Effectiveness Monitoring Program
FAU	Fisheries Assessment Unit
FCIN	Fish Community Index Netting
FWIN	Fall Walleye Index Netting
GS	Generating Station
IR	Implementation Report
MECP	Ministry of Environment Conservation and Parks (previously known as Ministry of the Environment – MOE)
MNRF	Ministry of Natural Resources and Forestry
NWO	North West Operations
NRSWMP	Nipigon River System Water Management Plan
OBBN	Ontario Benthic Biomonitoring Network
OMNR	Ontario Ministry of Natural Resources (previously known as)
OPG	Ontario Power Generation
OWES	Ontario Wetland Evaluation System
RCA	Reference Condition Approach
SAC	Standing Advisory Committee
TGC	True Grit Consulting
WMP	Water Management Plan
WSC	Water Survey of Canada
YOY	Young of the Year

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1. Background

The original Nipigon River System Water Management Plan (NRSWMP) was prepared according to the Ontario Ministry of Natural Resources' 2002 *Water Management Planning Guidelines for Hydropower*, and approved for an initial period of July 1, 2005 to March 31, 2015.

Amendments occurred in 2007/2008, all of which considered minor in nature, and all basically entailed more detailed descriptions of normal operations. Timing of planned flow changes and the removal of changing data on the Monday change so as not to invoke a non-compliance was the first amendment. The second described further what a peaking cycle on the river looked like day to day, with an example provided. The third were adjustments in the decision making from week to week to provide for increased flexibility in choosing flow changes for the following week. Lastly, the fourth amendment was a definition of "Out of Normal" with associated triggers defined.

The process of renewing the NRSWMP began in 2010 resulting in an extension of the NRSWMP for a three-year period of April 1, 2015 to March 31, 2018. The NRSWMP was extended with minor amendments rather than renewed as it was known there was an upcoming change being the Ontario Ministry of Natural Resources and Forestry's (MNRF) 2016 *Maintaining Water Management Plans* Technical Bulletin.

In August 2017, the NRSWMP was amended to align with the newly issued Ontario Ministry of Natural Resources and Forestry's (MNRF) 2016 *Maintaining Water Management Plans Technical Bulletin*. This administrative amendment resulted in several administrative changes, the largest of which was to include a requirement to prepare an Implementation Report (IR) submission to MNRF every five years.

IRs are required to provide status updates, transparency of dam operations, and inform adaptive management considerations, including the following minimum content:

- a summary of all amendment requests received,
- the status of the applicable Standing Advisory Committee (SAC),
- the results of the applicable Effectiveness Monitoring Program (EMP),
- the status and results of the applicable Data and Information Collection Program (DICP).

This document represents the first IR for the NRSWMP and covers the period from July 1, 2005 to December 31, 2021. Subsequent implementation reports will cover five-year periods. This document is structured to show the reporting of results from the MNRF, followed by reporting from OPG. There are some subjects that cross over and will have reporting shown by both the MNRF and OPG. There is a conclusions and recommendations section at the end of the document that provides a summary for future consideration for the next round of implementation reports.

2. Summary of Amendment Requests

2.1. Description

This section of the report provides a summary of all amendment requests pertinent to OPG facilities on the Nipigon River, or the NRSWMP document, including the rationale for completed amendments and how proposed amendments that did not proceed were addressed, if applicable.

2.2. Amendment Requests Received by OPG

None.

2.3. Amendment Requests Proposed by OPG

Four minor amendments were proposed by OPG and approved by MNRF in 2007 and 2008.

An extension was required to the WMP expiry date, a clarification of Winter Operations Limits and incorporation of the previous four amendments was proposed by OPG and approved by MNRF in 2015.

Amendment 1 - Timing of flow changes. Approved June 20, 2007

Intent of the change is to allow the Operator of the facility to make the required flow adjustments while remaining in compliance with the plan. Amendment adds the following to Section 10.1.1.2.

1) *When the plan calls for a flow change, whether increasing or decreasing, Monday's average flow will not be used in the calculation of the end of the week average flow for compliance purposes.*
2) *In addition, the compliance limits for the entire first day (being Monday) will utilize the outside compliance bands of both the previous weeks flow and the current weeks flow.*

Amendment 2 - Clearly define the term 'peaking cycle' as used within the WMP. Approved Dec 19, 2008.

Section 10.1.1.2 amended to add clear definition of a peaking cycle. Addition of the following text.

*One Peaking Cycle Per Day is defined as any day, beginning at 00:00, where an average hourly river flow, as measured between the top of the hours (example 03:00 to 04:00), has experienced only one **planned** rising trend in hourly average flow through the course of the entire day from 00:00 to 24:00. Upon an hourly average flow being at least 15cms greater than the previous hour, a rising trend for the day has been initiated. A peak for the day is not established until after a rising trend has been initiated, and, a **planned** hourly average flow being at least 15cms less than the previous hourly average has occurred. After the peak has been established, no further planned flow during the course of the day (i.e. no further rising trends in hourly average flow). Upon reaching 24:00 hours a new day has begun and a new peaking cycle may be initiated.* (note: examples provided not shown here)

Amendment 3 - Adjusting Plan for Increased Flexibility. Approved Dec 19, 2008

Section 10.1.1.1 Use of Weekly Flow Tables amended to add the following.

There are times during wet and dry periods where the watershed conditions will be changing more rapidly than typical. During these times the method of setting weekly flows as described above may not respond quickly enough to the changing watershed conditions. There are also times when a flow change may not be in the best interests of the resource, such as when the tables call for a (short term) flow change during a spawning or incubation period. As such, the following variations may be used to set the weekly flows:

1. *On the Monday when the flow change for the week is scheduled to occur (which was set according to the inflow and water level conditions present on the Wednesday of the previous week), if the watershed conditions warrant, OPG can choose to use the most recent data (Lake Nipigon elevation and the 7 day average inflow) available on the Monday and adjust the flow for that week in accordance with the existing Weekly Flow Tables within Schedule A of the WMP.*
2. *If the elevation on the day on which flow is established for the given week is within +/- 2cm of an alternate flow in the Weekly Flow Tables within Schedule A of the WMP, OPG can choose to select the flow value that is deemed most appropriate given the watershed conditions and resource management considerations.*

If OPG chooses to use either of the above two options, OPG will notify the MNR (either by telephone or email) on the day that the flow is established for the week.

It is expected that most situations warranting consideration of these variations will have been the topic of a proactive discussion between OPG, MNR, and NWAC regarding the anticipated conditions and/or resource management implications.

Amendment 4 - Definition of 'out of normal' watershed conditions, process to choose operations that vary from those outlined within the WMP and a list of watershed indicators that may trigger an 'out of normal' condition. Approved December 11, 2008.

Amendment adds section 10.1.6 Operations During "Out of Normal" Watershed Conditions to the WMP. The section contains a definition of 'Out of Normal', a list of conditions that would be used to decide if the watershed was 'Out of Normal', and a procedure that would be used for operations that vary from the WMP during 'out of normal' conditions.

Incorporating 1 to 4, clarifying Winter Operations flow limits, and Extension of original WMP end date from 2015 to 2018 - March 12, 2015

The WMP was re-issued with a new extended expiry date and chapter 10 was cleaned up to add the above four amendments and to clarify Winter Operations.

The version approved in March 2015 of the WMP was an extension of the expiry date of the original WMP to March 31, 2018. The changes made to the WMP were the inclusion of the four (4) previously approved amendments made in 2007 and 2008. These amendments were incorporated into Chapter 10: Operational Plan. In section 10.1.1.5, Winter Operations, a paragraph was revised to clarify the original intent of the winter flow limit being 30cms less than the highest Fall

Operations flow to protect spawning areas, and an example was provided. At the time, the process of renewing WMPs in Ontario was being revised and the intent of the extension was to allow the process to be clarified before renewal of the WMP. No other portions of the original WMP or the operations of the Nipigon River system were altered.

2.4. Amendments Ordered by MNRF

'Maintaining Water Management Plans' Technical Bulletin (MNRF, 2016).

2.5. Amendments Completed by MNRF

MNRF completed an administrative amendment to the NRSWMP July 25, 2017.

2.5.1. Administrative Amendment of July 2017

MNRF approved and issued an amendment to the NRSWMP to align the plan with the approved 2016 *Maintaining Water Management Plans* Technical Bulletin.

The full text of the Technical Bulletin and additional information on the new requirements for the long-term maintenance of Water Management Plans (WMPs) are available on the MNRF website at:

https://www.ontario.ca/page/maintaining-water-management-plans?nocache=1.

This administrative amendment resulted in changes to the following sections of the NRSWMP:

Expiry Date	March 31, 2018 has been removed
Compliance Monitoring	Chapter 12 was revised
Compliance Reporting	Section 12.2 was revised
Plan Amendments	Section 13.1 was revised

3. Standing Advisory Committee (SAC)

3.1. Description

The NRSWMP SAC, was originally created from interested members of the Public Advisory Committee that was formed during the creation of the Water Management Plan. The SAC, which goes by the name Nipigon Watershed Advisory Committee, or **NWAC**, was created in 2004 and has been active since the implementation of the Water Management Plan.

3.2. NWAC Status Update

The NWAC is still active. There are usually annual meetings, typically in May each year, where a variety of information is provided from both OPG and the MNRF to the NWAC. The last meeting was held September 29th, 2021 and was done online. OPG is the administrator of the NWAC and keeps records of the meeting minutes. Contact Tom Aaltomaa, OPG Operations Manager, for further information regarding the NWAC. He can be contacted at Tom.Aaltomaa@Opg.com

The following table shows the current members of the NWAC.

Table 1: NWAC Committee Members (current as of last meeting Sep 29 2021)

Member	**Representing**
Wilfred King	Kiashki Zaaging Anishinaabek (Gull Bay 1st Nation)
Edward King Dale Hardy (Alt)	Biinjitiwaabik Zaaging Anishinaabek (Rocky Bay 1st Nation)
Jordan Hatton	Biingwi Neyaashi Anishinaabek (Sand Point 1st Nation)
Yvette Metansinine Theresa Nelson (Alt)	Animbiigoo Zaagi'igan Anishinaabek (Lake Nipigon Ojibway 1st Nation)
Tom Borg (Vice Chair)	Red Rock First Nation
Darcy Aubin Paul Matinet (Alt)	Whitesand First Nation
	Municipality of Greenstone
Levina Collins Richard Harvey (Alt)	Township of Nipigon
Mike Zeleny	Polly Lake Cottage Association
Darren Goodman	Lake Nipigon Tourism
Alan Cheeseman	Ogoki-Mojikit Tourism
Frank Goodman	Commercial Fishing
Guy Rioux Lewis Martin (Alt)	Red Rock Fish & Game Club
John Furtado (Chair)	Sport Fishing/Hunting
Tom Aaltomaa Denise Hardy Regan Lord Tana-Leigh Harty Dave Pacholczak Jason Bailey	Ontario Power Generation
Patti Westerman	Resource Management Supervisor (MNRF)
Matthew Heerschap	Biologist (MNRF)
Andrea Osala-Schaaf	Recording Secretary

It should be noted that Toby Braithwaite of the MNRF worked on and performed many of the effectiveness monitoring activities between 2017 and 2021. Rob Swainson, retired MNRF, dedicated many years of his career to the Nipigon system previous to Toby. Rosemary Hartley took part and contributed to the Effectiveness Monitoring program as well. We are grateful for the efforts and contributions of these individuals.

The NWAC has an approved a terms of reference.

4. Effectiveness Monitoring Program

4.1. Description

This section of the report provides a summary of the EMP components applicable to OPG facilities as outlined in the Chapter 11 of the NRSWMP, including details on:

- Definition and goals of effectiveness monitoring,
- Monitoring the effectiveness of operational changes,
- Monitoring the effectiveness of the Ecological Objectives,
- Determination of whether revisions to the facility operations, or to the EMP, are required, e.g. proposed changes/amendments going forward.

4.2. Effectiveness Monitoring Program Components

The purpose of an EMP is to confirm that operational changes resulting from the implementation of a WMP generate the expected ecological, social and economic improvements.

The EMP is detailed in Chapter 11 and Appendix F of the Nipigon River System WMP.

4.3. Effectiveness Monitoring Program Results

Effectiveness monitoring is used to determine if prescribed water management activities outlined in this Water Management Plan (WMP) are achieving identified social and ecological objectives for the Nipigon River System. Effectiveness monitoring is a cooperative effort between OPG and MNRF. Nipigon District MNRF is responsible for developing, implementing, and reporting on studies linked to goals and objectives outlined in Chapter 11 and Appendix F of the Nipigon River System Water Management Plan, 2015. As such, this section summarizes the work completed by the Nipigon District MNRF and its partners. In some cases, MNRF commitments have not been met or have been accomplished through other initiatives which began after the development of this plan. Since the inception of this plan MNRF priorities, workload and strategic direction have shifted. Work undertaken by MNRF must always be considered relative to the current established priorities, resourcing, and workload. In situations where objectives are out of date or cannot reasonably be accomplished, MNRF should consider plan amendments.

For clarity, objectives identified in Appendix F of the WMP are organized into categories which represent priority areas of interest. Within each area of interest, the objectives outlined in the WMP are assessed for completeness and a summary of MNRF undertakings is provided.

4.3.1 Wildlife and Aquatic Ecosystems

Table 2: MNRF commitments related to Wildlife and Aquatic Ecosystems.

Code	Objective	Proposed Frequency	Commitment	Result	Status
OR-1	Use the northern version of the Ontario Wetland Evaluation System to score wetlands in the Ogoki Reservoir	Every other year	Compare and report on OWES results between years.	No OWES surveys in Ogoki during plan period	**Incomplete**
LN-1	Use the northern version of the Ontario Wetland Evaluation System to score wetlands in Lake Nipigon	Every five years	Compare and report on OWES results between years.	Baseline surveys complete in 2005.	**Incomplete**
OR-5	Ogoki Reservoir: Identify Moose and Caribou calving islands and peninsulas and the associated lake elevation required to maintain the habitat	Every five years	Report on the status of the islands as determined by lake elevation and monitor habitat use to identify success	Moose and Caribou habitat identified in Ogoki Reservoir and Lake Nipigon	**Incomplete – Ongoing**

4.3.1.1 Wetland Evaluation: Objective code(s): **OR-1, LN-1**

Summary

In 2005 MNRF completed wetland evaluations on the Nipigon, Poshkokagan and Kabitotikwia Rivers within the Nipigon River Watershed. Evaluations were completed using the Ontario Wetland Evaluation System (OWES) for Northern Ecosystems, 1993 (MNRF, 2014). The OWES scores wetlands based on the biological, social, hydrological and special features present at each site. Scores are used to determine if the wetland meets the criteria to be considered a "Provincially Significant Wetland". Each of the three wetlands evaluated were determined to be provincially significant. Ecosystem services provided by these wetlands include social values such as fishing and areas to enjoy, appreciate and learn about nature. Biological values included the identification of mammal, avian and insect habitat as well as the presence of regionally rare plant species. Hydrological services included shoreline protection and groundwater discharge/ recharge functions. The degree and source of human influence varied between the sites however hydrological disturbance from water level regulation was identified as a disturbance for each wetland site.

The results of these surveys provide quality baseline data on the status of three important wetlands found within the area of influence for this WMP. However, the OWES assessment framework is not designed to monitor environmental change over time. Therefore, no further assessments were

completed on Nipigon River System and no report comparing a time series of wetland evaluation results was completed. OWES surveys did identify water level regulation as a common source of human disturbance at each of the surveyed sites. Therefore, MNRF and OPG should consider researching and implementing a scientifically recognized wetland evaluation methodology which is designed to monitor wetland status over time and at various water levels.

4.3.1.2 Caribou and Moose Calving Areas: Objective code(s): **OR-5**

Summary:

Concerns related to Moose and Caribou calving habitat on islands and peninsulas as they relate to water level management were identified in the WMP. To date, no formal investigation into how Moose and Caribou calving islands are impacted by fluctuations in water level elevation on the Ogoki Reservoir has been completed as part of this effectiveness monitoring program. However, other MNRF initiatives do provide valuable insight into Moose and Caribou status in the Lake Nipigon range. In 2010 the MNRF Integrated Range Assessment for Woodland Caribou (MNRF, 2014) conducted aerial inventories of Caribou across the Nipigon Range, including in the Ogoki Reservoir. The Ogoki Reservoir was found to contain high quality Caribou habitat, including calving islands. The integrated range assessment predicted a high probability of Caribou occupancy within the habitat surrounding the Ogoki Reservoir. As well, earlier work conducted as part of the Lake Nipigon Signature Site initiative identified track and pellet evidence as well as radio telemetry data which suggest that several islands in southern Lake Nipigon provide calving and summering habitat for Woodland Caribou and Moose. It is now recognized that Lake Nipigon has a significant influence on Woodland Caribou in the southern portion of the Lake Nipigon Range, particularly shoreline and island habitat which enable predator avoidance during the calving season (MNRF, 2014). Based on this information MNRF implemented motion activated camera trap surveys on Lake Nipigon islands and peninsulas. Since 2005 camera trap surveys on Lake Nipigon islands have documented both Caribou and Moose habitat use on several islands in southern Lake Nipigon.

It is recognized that the Ogoki Reservoir represents high quality habitat for Caribou and its geographic position provides an important linkage between Lake Nipigon and habitat in the Far North. While logistical challenges have hindered a focused attempt at studying the impact of water management practices on Caribou and Moose calving sites in Ogoki, the objective remains valid. The relative proximity of known Caribou and Moose calving locations in southern Lake Nipigon provides a more practical opportunity to investigate the impact of water management practices on these sites. Therefore, OPG and MNRF should consider modifying objective OR-5 to include the assessment of water management impacts on Lake Nipigon calving sites. Continued identification of Moose and Caribou calving habitat and subsequent investigation into the impacts of water level fluctuations during Moose and Caribou calving periods on both the Ogoki Reservoir and Lake Nipigon is recommended.

4.3.2 Tourism, Recreation and Aquatic Ecosystems

Table 3: MNRF commitments related to Tourism, Recreation and Aquatic Ecosystems.

Code	Objective	Proposed Frequency	Commitment	Result	Status
OR-2	Ogoki Reservoir Outfitter Survey- Design a standard evaluation form for outfitters to provide diary of opinions on water levels	Annual	Contact outfitters to develop importance of doing evaluations, compiling results in a format useful for informing management decisions	Outfitters contacted to develop water level satisfaction questionnaire. Outfitters participate in water level satisfaction survey. Responses summarized in annual reports.	**Complete**
OR-3	Mercury in Fish Sampling- Develop partnership with MOE (MECP) on their fish contaminate study, emphasis on methylmercury, in sport fish in the Ogoki reservoir	One year then work out sustainable schedule considering results	Report on fish mercury levels in Walleye, Northern Pike and Suckers	Attempted coordination between Thunder Bay district MNRF, Ogoki Outfitters and Nipigon District MNRF failed to produce samples. Walleye samples collected from Namewaminikan River, Little Jackfish River and Ombabika River.	**Incomplete**
LN-2	Charter Boat Input- Encourage charter boat operators to keep diary on water levels in Lake Nipigon	Annual	Contact Charter boat captains to compile information about water levels	Development of the water level satisfaction questionnaire and volunteer surveys provide forum to collect charter boat captain concerns with water levels on Lake Nipigon. Responses	**Complete - Ongoing**

Code	Objective	Proposed Frequency	Commitment	Result	Status
				summarized in annual reports. Continued engagement through Public Advisory Committee.	
LN-3	Mercury in Fish Sampling- Develop partnership with MOE (MECP) on their fish contaminate study, emphasis on methylmercury, in sport fish in Lake Nipigon	One year then work out sustainable schedule considering results	Report on mercury levels in Lake Trout, Walleye, Sauger, Yellow Perch, Whitefish, Cisco, longnose sucker, and rainbow smelt	Samples collected from Lake Nipigon for all targeted species.	**Complete**
LN-5	Lake Nipigon Fish Assessment – Develop partnership with Lake Nipigon Assessment Unit to provide specific information on fish species sensitive to water level drawdown and complete trend through time data from existing surveys such as FCIN	Annual with sector rotation	Report on general health of fish populations to highlight data related to water management. Expand existing program to look at spawning Brook Trout and Lake Trout	Data summaries and status of stock indicators reported by Lake Nipigon Intensive Inland Lakes Monitoring Unit. Development of timeseries data from FCIN, FWIN and Brook Trout mark recapture studies. Targeted investigation into impact of water level manipulation on Walleye, Lake Trout and Lake Whitefish age class strength in Lake Nipigon.	**Complete/ Ongoing**
LN-6	Lake Nipigon Cottagers- Provide a contact for cottagers to raise concerns, comments related to water level management	Annual	Produce a summary of comments from cottagers	Cottagers able to participate in water level satisfaction questionnaire and volunteer access point surveys. Responses summarized in annual report	**Complete**

Code	Objective	Proposed Frequency	Commitment	Result	Status
NR-4	Angler Creel-Volunteer Angler Creel on the Nipigon River (Including Jessie Lake)	Annual-Open water season	Conduct volunteer angler creel during open water season on Nipigon River	Volunteer Creel Surveys including the Angler Diary program and the access point creel box program surveyed anglers during the plan period. Results contributed to MNRF status reports and regulation changes.	**Complete-Ongoing**
NR-5	Angler Creel-Roving or Access Creel on the Nipigon River (including Jessie Lake)	2 years in a row then every 5 years	Conduct a roving or access creel survey during the open water season on Nipigon River	2 Roving creel surveys were completed on the Nipigon River and Jessie Lake during the open water season. As well, a winter creel survey was completed on Jessie Lake	**Complete-Ongoing**

4.3.2.1 Water Level Satisfaction Survey: Objective code(s): **OR-2, LN-2, LN-6**

Summary:

The Nipigon River System Water Management Plan identified a need for a forum for outfitters and other users in the Nipigon River system to provide feedback and voice concerns related to water levels. In 2006 and 2007 several outfitters were contacted by MNRF to review concerns and possible solutions related to water levels on the Nipigon River system. From this, a standardized questionnaire was developed to survey outfitters as well as other watershed users effected by water levels. In 2008 and 2009 the "Water Level Satisfaction Questionnaire" was used to complete 717 interviews in the Nipigon River (430), at South Bay (183) and at High Hill Harbor (104). Respondents were asked "Do you have any concerns with water levels this year?" and if the respondent replied "Yes" they were asked to indicate whether they would prefer higher or lower water levels. Overall, 6% of respondents identified concerns with water levels. Responses, when ask to indicate a preferred water level change (higher or lower), varied by year with 96% indicating higher water levels would be preferred in 2008 versus only 50% in 2009. Access creel surveys at South Bay on Lake Nipigon in 2015 and 2016 also surveyed user satisfaction with water levels. Of 187 interviews 23% of individuals had concerns about water levels.

Like the earlier surveys, concerns related to water levels varied annually and corresponded with dry or wet conditions in the system.

Survey results suggest that climate (dry or wet years) has a greater influence on water level satisfaction than water management practices. However, due to the close relationship between water levels and climatic conditions, water level satisfaction is inherently variable from year to year. To parse out concerns related to prescribed water level changes outlined in the plan, independent of other sources of covariation, the survey would need to be completed on an annual basis and for many years. The surveys do however provide the public with an opportunity to voice concerns related to new and emerging trends such as those related to climate change. In addition, local advisory committees such as the Nipigon Watershed Advisory Committee provide an additional forum for watershed users to voice concerns. Continued engagement with the public across multiple avenues to assess water level satisfaction is recommended.

4.3.2.2 Mercury Contamination in Fish: Objective code(s): **OR-3, LN-3**

Summary:

Flooding of previously dry land from reservoir construction has been identified as a key driver for the mobilization of inorganic mercury through microbial methylation. The methylation process converts the inorganic mercury into a bioavailable form, Methylmercury. Methylmercury bioaccumulates in organic tissues such as fish flesh and can be passed up the food chain resulting in magnification of methylmercury levels in organisms with higher trophic position. The neurotoxic properties of methylmercury result in health risks associated with human consumption. To satisfy the objectives in this WMP, MNRF collected samples from fish as part of both dedicated contaminate sampling programs and as part of other fisheries assessment surveys. In 2012, samples of Walleye (*Sander vitreus*) tissue from the Little Jackfish and Ombabika Rivers were sent to the MECP Organic Contaminates Laboratory for analysis and inclusion in the provincial database. As well, fish contaminant samples were taken between 2006 and 2015 from Fall Walleye Index Netting and Fish Community Index Netting surveys conducted by the Lake Nipigon Fisheries Assessment Unit near Rabbit Island, East Bay, Undercliff Island, Ombabika Flats, Gull Bay, Willows Island, Dawson Island, Caribou Island, Virgin Island, Macintyre Bay and Wabinosh Bay on Lake Nipigon. Fish species sampled from Lake Nipigon include Burbot (*Lota lota*), Cisco (*Coregonus artedi*), Lake Trout (*Salvelinus namaycush*), Lake Whitefish (*Coregonus clupeaformis*), Longnose Sucker (*Catostomus Catostomus*), Northern Pike (*Esox lucius*), Rainbow Smelt (*Osmerus mordax*), Sauger (*Sander canadensis*), Walleye, Yellow Perch (*Perca flavescens*), and White Sucker (*Catostomus commersonii).* These samples were also sent to the MECP Organic Contaminates Laboratory. Data collected has contributed to the MECP consumption advisories contained in the "Guide to eating Ontario Fish" publication available online at https://www.ontario.ca/page/eating-ontario-fish .

Assessment of how water management practices have impacted fish mercury contamination in Lake Nipigon or the Ogoki reservoir has not been completed as part of the effectiveness monitoring program. Given the considerable public interest, the MNRF and OPG should consider including a commitment to monitor fish mercury as well as other contaminates of concern in the Nipigon River, below the

Alexander Dam, in addition to the Ogoki Reservoir and Lake Nipigon. This could be accomplished through partnership with local First Nation communities and MECP.

4.3.2.3 Lake Nipigon Fish Assessment: Objective code(s): **LN-5**

Summary:

The water management plan identified a need to monitor the status of fish species which are sensitive to water level drawdown. This included the continued maintenance of long-term data sets such as those associated with Fish Community Index Netting (FCIN) and Fall Walleye Index Netting (FWIN). Consistent trend-through-time data from the FCIN survey provides abundance estimates for 27 fish taxa over the first 11 years of the WMP (2005-2016). FWIN surveys were also completed regularly during the plan period and provide targeted abundance estimates for Walleye as well as catch data for non-target species in Ombabika Bay and Wabinosh Bay. Stock status indicators provide information through time on Lake Trout and Lake Whitefish, species thought to be sensitive to water level drawdown. Brook Trout (*Salvelinus fontinalis*) tagging projects designed to estimate the size of the spawning population at locations in South Bay and West Bay on Lake Nipigon were completed regularly throughout the plan period (2001-2015 & 2021) (MNRF, 2018).

The concomitant maintenance of fish stocks suitable to support commercial and recreational fisheries for Lake Whitefish, Lake Trout, Brook Trout and Northern Pike with the implementation of this WMP indicate that water management practices do support Lake Nipigon fish stocks. However, no causal link between fish stock status and water management practices has been made. Status of fish stocks in Lake Nipigon are influenced by a variety of factors other than water management (resource use, species invasion, and climate change) and therefore may not be an appropriate indicator of plan performance. More targeted approaches to fisheries assessments which identify causal links to water management practices should be pursued.

4.3.2.4 Lake Trout, Walleye and Lake Whitefish Year Class Assessment**:** Objective code(s): **LN-5**

Summary:

In 2011, Marshall Consulting in partnership with MNRF investigated the impact of water level fluctuations on year class strength of Lake Trout, Walleye and Lake Whitefish from Lake Nipigon (Marshall, 2011; Marshall, 2011). The purpose of this work was to determine if lake level fluctuations, such as those related to water level management, negatively impact reproductive success. Lake Trout samples from the Lake Nipigon Fisheries Assessment Unit (FAU) commercial catch monitoring program were used to assess year class strength over a 17-year period. Water levels during periods of time which correspond with sensitive life history stages (spawning, egg incubation, hatch) were analyzed to determine if year class strength was related to water level fluctuations. No relationship

between water level drawdown during sensitive periods and year class strength were detected. Walleye and Lake Whitefish catch data from standardized gill net surveys were similarly used to calculate year class strength over 29-year and 33-year periods respectively. Water levels in Lake Nipigon during sensitive life history stages were analyzed to determine if a relationship between lake level variability and reproductive success existed. No relationship between water levels on Lake Nipigon and year-class strength for either Walleye or Lake Whitefish were found. Additionally, relationships between climate and year class strength were noted for all three species.

These studies indicate that variability in water levels does not have a strong direct effect on year-class strength for Lake Whitefish, Lake Trout or Walleye. Variation in climate, such as period of ice cover, growing degree days or air temperatures during spawning periods all may be influencing year-class strength. These results also indicate that populations of Lake Whitefish, Lake Trout and Walleye may not be as sensitive to water level fluctuations as previously thought. However, it is possible that water level manipulation may impact year-class strength indirectly through an interacting species (Mesopredator suppression) or by influencing both inter- and intra-specific competition. Further investigation is required to determine if water level management is having an impact on the reproductive success of Lake Whitefish, Walleye and Lake Trout in Lake Nipigon.

4.3.2.5 Angler Creel**:** Objective code(s): **NR-5, NR-4**

Summary

In 2005, MNRF developed an "Individual Angler Diary" to be administered with the "Water Level Satisfaction Survey". The angler diary was used to complete volunteer creel surveys annually between 2006 and 2011 on the Nipigon River during the open water season. The survey asked cooperating anglers to track and submit information about their catch, fishing locations and preferred angling methods during the open water season. The results of this survey contributed to the 2010 Brook Trout regulation review summary report, 2005-2010 and the 2011 report "Update on Brook Trout rehabilitation in the Ontario waters of Lake Superior, Lake Nipigon and the Nipigon River" (Upper Great Lakes Management Unit- Lake Superior, 2011; MNRF, 2010).

In 2009 and 2010 open water creel surveys were completed on the Nipigon River and Jessie Lake. Roving survey crews randomly surveyed fishermen on the Nipigon River, including Jessie Lake. The results were compared to similar creel surveys completed in 1993, 1994 and 2003. Total angling effort remained stable from 1993 to 2010. However, the distribution of effort between species changed as angling effort for Chinook Salmon (*Oncorhynchus tshawytscha*) in 2009 and 2010 increased significantly, representing approximately half of the total angling effort in each of those years. A 96% catch and release rate among all angled Brook Trout and a 94% release rate among those angled Brook Trout of legal size to keep represent both a shift in angler habits and the added protection afforded by regulation changes. Brook Trout catch rates reached the targeted level of 1 Brook Trout / 5 Angler Hours (CUE - 0.20) in both 2003 and 2010. Lake Trout catch rates in the Nipigon River system also increased from levels seen in the 1990's. Conversely, Rainbow Trout (*Oncorhynchus mykiss*) catch

rates declined from levels seen in 2003. Also noteworthy is the emergence of a Northern Pike fishery in the Nipigon River system.

Lake Trout harvest on Jessie Lake during the open water season approached morphometric index estimates for recommended total allowable harvest. In addition, a winter fishery for Lake Trout and Lake Whitefish on Jessie Lake also exists. Subsequently a winter creel in 2010 and 2011 was conducted to quantify angler effort and harvest during the "ice-on" season. A roving crew conducted a creel survey between Feb 15 and March 15 in both 2010 and 2011. Lake Trout catch rates through the ice were much lower than the catch rates observed in the open water surveys. However, a much greater proportion of the Lake Trout caught through the ice were killed. Mean catch and kill rates in the winter were 83% versus 29% in the open water season. Total harvest for the combined 2009 open water season and 2010 winter fishery exceeded the total allowable harvest estimates for Jessie Lake. Results of this survey therefore indicate that Lake Trout harvest in Jessie Lake may be unsustainable. However, the morphometric index estimate for total allowable harvest was developed for lake environments and may not account for the greater productivity present in riverine environments like Jessie Lake. Baseline population estimates produced through a standardized assessment survey should be completed to accurately monitor the status of Lake Trout in Jessie Lake.

Creel survey results confirm that this water management plan effectively provides both open and hard water fishing opportunities to the public. Water level management practices have sufficiently protected a valuable sport fishery for Brook Trout while supporting the growth of a new pacific salmon fishery. Given the significant changes in both angler habits and species-specific catch rates observed in the 1993-1994, 2003 and 2009-2010 open water creel surveys it is apparent that continued monitoring of fishing pressure is needed. Volunteer creel boxes posted at access points around Lake Nipigon and the Nipigon River in 2021 provided the most recent angler survey opportunity on the Nipigon River System. It is recommended that the volunteer creel box program is continued to increase the overall number of survey responses. In addition, the commitment to complete a roving creel every 5 years has not been met in recent years. Therefore, OPG and MNRF should consider a roving creel on the Nipigon River as soon as possible.

4.3.3 Erosion

Table 4: MNRF commitments related to Erosion

Code	Objective	Proposed Frequency	Commitment	Result	Status
OR-4	Monitor shoreline erosion on Little Jackfish River, Ogoki Reservoir, and Mojikit Lake	Annual	Use aerial photography to monitor bank stability. Document when vegetation grows over previously eroded banks.	Erosion study completed as part of the Environmental Assessment for the Little Jackfish Hydropower project	**Incomplete**
LN-4	Monitor shoreline erosion on Lake Nipigon	Annual	Use aerial photography to monitor bank stability. Document when vegetation grows over previously eroded banks.	Planning discussion between MNRF and OPG did not result in a workable solution. No action taken	**Incomplete**
NR-6	Monitor the impact of erosion on First Nations land adjacent to the Nipigon River.	Annual, Open water season	Develop monitoring program which involves Red Rock First Nation	Annual documentation of landslide events on the Nipigon River between Alexander dam and Lake Helen.	**Complete – Ongoing**
NR-7	Monitor and evaluate effectiveness of flow events.	Year round	Monitor important flow events and regime characteristics necessary to maintain the health of the river channel and its floodplain structure. Report of the effectiveness of the system to provide important flow events.	Erosion Monitoring at Gapen's Pool conducted by OPG consultant in 2016 and continued by MNRF in 2018, 2019 and 2020. Annual monitoring and documentation of landslide events on the Nipigon River from 2005-present.	**Complete – Ongoing**

4.3.3.1 Gapen's Pool Erosion Monitoring: Objective code(s): **NR-7**

Summary:

Gapen's Pool is a significant Brook Trout spawning area located on the lower Nipigon River. The area of concern is an adjacent headland on the eastern bank which is composed of erodible material (sand, gravel, cobble) and is situated in a narrowing of the river. There is concern that shoreline erosion in this site will lead to a large slump event which would negatively impact the spawning site. In 2016, True Grit Consulting (TGC) in association with Baird & Associates were contracted by OPG to investigate the cause of the headland erosion. TGC installed a series of 71 erosion monitoring pins along 7 transects, each transect consists of 12 equidistant pins positioned from the top of the headland to the bottom. Pins are constructed of two-meter lengths of 20mm rebar which are driven into the substrate, leaving 10cm exposed. The exposed rebar can then be measured regularly to analyze the pattern of erosion at the site. Following the initial investigation by Baird & Associates (Baird & Associates, 2017) MNRF continued to monitor the site. Erosion monitoring pins were measured 1-2 times annually by MNRF in 2018, 2019 and 2020. While results vary between transects, trends in the average degree difference of exposed rebar across all transects between 2018 and 2020 indicate a net loss of sediment around monitoring pins positioned near the top of the slope and a net increase in sediment around pins located near the bottom (MNRF, 2019). These results indicate that erosion is in fact occurring at Gapen's Pool and that the headland is eroding from the top down. In 2021, MNRF began mapping Brook Trout habitat use during the fall spawn to develop a geospatial catalogue of spawning sites at Gapen's Pool. This includes sites both adjacent to and downstream of the area of concern.

The results of the current monitoring program indicate that the erosion occurring at Gapens Pool is occurring from the top down, from areas above what could be directly impacted by river flows. The results of this survey therefore indicate that water level management is not directly responsible for the erosion and potential slumping at Gapen's pool. However, the cumulative effects of water level management, highway maintenance, natural erosion and human disturbance may have an unforeseen interactive effect. Given the considerable amount of public concern and the potential for harm or disturbance to fish habitat, erosion monitoring at Gapen's pool should continue. However, to mitigate disturbance by human foot traffic, on the ground monitoring of erosion pins should be conducted minimally while options for less invasive monitoring methods are identified. Lastly, continued documentation of the site's status following high flow events should be completed.

4.3.3.2 Ogoki Reservoir and Lake Nipigon Erosion: Objective code(s): **OR-4, LN-4**

Summary:

The WMP identified a need to identify and monitor sites on Lake Nipigon and the Ogoki Reservoir which may be experiencing erosion related to water management activities. An annually updated catalogue of georeferenced aerial photographs was to be developed to monitor the sites. Due to the logistical and fiscal challenges of working in this remote location Nipigon District, MNRF and OPG explored options to include aerial photography of selected sites during regular OPG flights to and from Summit and Waboose dam sites. Despite planning discussions this work was never actioned. It is

recommended that these objectives be reevaluated with consultation from the public advisory committee to evaluate interest in the issue and help identify specific areas of concern.

4.3.3.3 Little Jackfish River Erosion: Objective code(s): **OR-4**

Summary:

The water management plan identified a need to investigate the ecological impact of erosion on the Little Jackfish River and determine how current water management practices are impacting erosion. This work was completed by Hatch Consulting on behalf of OPG in 2009 and 2010 as part of the Environmental Assessment for the proposed Little Jackfish River hydro development project. In August 2009, Hatch consultants conducted a site visit to the Little Jackfish River to investigate the cause of a recent landslide event (Ontario Power Generation , 2012). The results of the investigation determined that the slide was the result of a deep-seated slip in the varved clay substrate and not the result of a surficial process such as the undercutting of a bank by river erosion. Assessment of historical and future erosive impacts on the Little Jackfish River were summarized in the 2012 Hatch report titled "Little Jackfish Hydroelectric Development Future Erosion - Mile 0 to Mile 9" (Ontario Power Generation , 2013). The report concludes that bank erosion along the Little Jackfish River existed before construction of the 1943 Ogoki diversion. However, the diversion resulted in significantly greater flows in the Little Jackfish River and subsequently led to wide scale erosion of the riverbed and banks. Since then, erosion rates have diminished significantly to levels that are typical of other Canadian shield rivers. Erosive mechanisms identified during this review included erosion below the river water level due to river flow as well as natural riverbank instabilities such as those identified in the 2009 slide event highlighted above. It is difficult to determine if flow requirements on the Little Jackfish following the implementation of this WMP have influenced riverbank erosion. However, the declines in erosion rates observed over the plan period suggest that this WMP has not exacerbated erosion on the Little Jackfish River.

4.3.3.4 Nipigon River Landslide Documentation: Objective code(s): **NR-6, NR-7**

Summary:

The Nipigon River between Lake Helen and the Alexander Dam has been monitored annually for landslide events since 2005. Landslides are photographed and GPS coordinates are taken following the discovery of each event. In 2015, high water levels were thought to be responsible for 14 landslide events along this stretch of river. Anecdotal evidence suggests that landslide events are more common during high flows, however this data has never been analyzed. It is recommended that OPG and MNRF continue to monitor and document landslide event. As well, MNRF should consider preparing a summary report comparing landslide occurrence to flow conditions. Currently, it is unclear how WMP prescribed flows are affecting the number of landslides on the Nipigon River between Alexander Dam and Lake Helen.

4.3.4 Aquatic Ecosystems

Table 5: MNRF commitments related to Aquatic Ecosystems

Code	Objective	Proposed Frequency	Commitment	Result	Status
NR-1	Aquatic Environment Long Trend Data Monitoring	Every 5 years	Establish key sampling stations to sample benthos, zooplankton, aquatic insects, and water parameters. Develop a standardized sample protocol recognized by the scientific community. Produce a report on long term trends.	Application of a modified version of the OBBN aquatic biomonitoring program in 2007, 2008, 2009, 2016, and 2021 on the Nipigon River and Lake Nipigon.	**Ongoing – Incomplete No monitoring has been completed on zooplankton, larger macro-inverta-brates or water parameters**
NR-2	Fish Stranding	During low flow events	Produce a report after event. Provide and implement action needed to reduce fish stranding. Monitor the effectiveness of improvements to reduce the incidence of stranded fish.	Fish Stranding was assessed during low flow events on the Nipigon River. High risk areas were identified, and mitigation strategies were implemented. Mitigation strategies were monitored in subsequent years and successes / continued problem areas reported on in annual reports to OPG	**Complete-Ongoing**

Code	Objective	Proposed Frequency	Commitment	Result	Status
NR-3	Spawning Locations	During Spawning Period	Produce a report after each season to evaluate effectiveness of proposed peaking during fall period and to evaluate spawning success	Spawning locations for Walleye, Northern Pike and Lake Sturgeon were identified using telemetry and visual observation surveys. Spawning success of Lake Sturgeon, Northern Pike, Brook Trout and Walleye was evaluated using trap netting assessments, underwater video surveys, driftnet surveys, visual observations, redd counts and fry counts. Various MNRF publications including annual submissions to OPG report on this work. Rehabilitation initiatives in the Nipigon River and Polly Lake successfully restored historical Walleye spawning locations.	**Complete – Ongoing**

Code	Objective	Proposed Frequency	Commitment	Result	Status
NR-8	Alexander back pool	Two years within the plan term	Monitor, evaluate and produce a report that evaluates the effectiveness of the system in reducing elevation fluctuations in the Alexander back pool.	Incidence of fish stranding were monitored in the Alexander Back Pool during low flow events. No incidence of fish stranding was reported. No report investigating mitigation strategies for water level fluctuations was completed.	**Incomplete**

4.3.4.1 Aquatic Environment Long Trend Data Monitoring: Objective code(s): **NR-1**

Summary:

The Nipigon River System Water Management Plan identified a need for a scientifically recognized aquatic invertebrate monitoring program to generate baseline data in Lake Nipigon and the Nipigon River. In 2007, 2008, 2009 and 2016 a benthic macroinvertebrate monitoring program using a modified Ontario Benthos Biomonitoring Network (OBBN) methodology was used to inventory and report on benthic macroinvertebrate communities (Deacon, 2017). Ten stations, representing both lentic and lotic environments in the Nipigon River and Lake Nipigon, were assessed using a standard 27 taxa Reference Condition Approach (RCA). This approach applies knowledge of the relative tolerance or intolerance of each taxa to stressors such as eutrophication, chemicals spills and physical disturbance to develop biotic indices. These indices are used to make inferences regarding water quality and the combination of biotic indices can be used to infer a sites overall suitability for supporting a fish community.

The macroinvertebrate communities in the Nipigon River system remained comparable through each of the survey years. Some site-specific changes were detected between survey years however the changes were credited to fluctuations in water levels because of natural water level fluctuations. It was also noted that macroinvertebrate communities present in the river probably do not represent the same communities present prior to human disturbance. However, the current macroinvertebrate communities in each site were indicative of high quality, unimpaired and well oxygenated water. Overall, the macroinvertebrate communities present in the Nipigon River system are indicative of moderately/high-quality benthic macroinvertebrate habitat. The survey data is a suitable baseline for continued benthic invertebrate community biomonitoring. Further monitoring was completed in 2021 and should continue to develop a time series to monitor changes in water and habitat quality over time.

4.3.4.2 Fish Stranding: Objective code(s): **NR-2, NR-8**

Summary:

Incidence of fish stranding are monitored by MNRF staff during periods of low flow on the Nipigon River. Summaries of each occurrence are contained within annual effectiveness monitoring reports submitted to OPG. Monitoring activities have led directly to corrective measures such as creating riverbed channels to promote connectivity between pools and the main river. In 2006, during a drawdown event a pool below the Alexander Dam containing stranded fish was identified. In 2007, a channel was constructed from the stranding pool to the main stem of the river. In 2011, further channelization of another stranding pool located under the Alexander Dam spill wall was completed following a fish stranding event identified by MNRF crews in September 2010. This stranding pool was later assessed by MNRF crews at various water levels in 2012, no further fish stranding was detected.

In 2016, a planned reduction in flows to complete lampricide treatments on the Nipigon River was monitored by MNRF crews. While lampricide treatments are not within the scope of this WMP they do provide valuable information regarding low flow conditions and potential mitigation strategies. During this inspection fish were observed stranded in exposed rock rubble. In 2019 another scheduled low flow event for lampricide treatment was monitored by MNRF and DFO crews to detect incidence of fish stranding. Fish stranding was detected in previously unidentified pools below the Alexander Dam. Fish stranding was also assessed in the "Alexander Back Pool" area in 2019 during low flows associated with lampricide treatments. No incidence of fish stranding was reported in the back pool in 2019.Low flow levels related to dry conditions and scheduled dam repairs were monitored by MNRF crews in August and September 2020. MNRF crews completing the August inspection and identified stranded fish in the same pool as observed during the 2019 low flow event for lampricide treatment. In addition, fish stranding was assessed in the Alexander back pool in August and September 2020. No stranded fish were identified in the back pool area and it was noted that the area remained flooded during the low flow event.

Monitoring fish stranding events has been used to inform the management of planned low flow events. MNRF also monitored the impact of fish stranding as a result of natural climatic variability and found that current WMP prescribed flows may result in fish stranding occurrences when conditions in the watershed are exceptionally dry or wet. In wet conditions, water levels in the Alexander head pond, and further upstream, necessitate the spill of excess water over the spill wall. This can provide fish with access to habitat below the spill wall. However, when water levels return to normal and water no longer passes over the spill wall the habitat immediately under the wall can experience dewatering. Channels created in 2011 to address this issue provide passage and allow fish to exit this area during dewatering. However, it has been noted that fish eggs which were deposited in this area can be exposed. In addition, in exceptionally dry years WMP prescribed flows can result in the dewatering and exposure of spawning habitat in Lake Nipigon or the Nipigon River. These conditions have led to "out of normal" designations on the Nipigon River as MNRF and OPG closely manage water levels to mitigate the impact of non-normal conditions on fish and fish habitat. Therefore, MNRF and OPG should consider completing a review of watershed conditions during "out of normal" designations to inform

future WMP amendments. As well, continued monitoring of low flow conditions on the Nipigon River is recommended to identify further fish stranding mitigation strategies.

4.3.4.3 Walleye Spawning Observations: Objective code(s): **NR-3**

Summary:

Nighttime Walleye spawning surveys were completed on the Nipigon River annually from 2008-2016. Visual observations of Walleye spawning behavior, fish counts, and water temperature data were collected at spawning sites regularly throughout the spawning period (Mid-April to Mid-June). This information was used to predict the expected egg incubation and hatching periods based on a theoretical time/temperature relationship. Predicted hatch dates were calculated and reported annually in the effectiveness monitoring summary reports. The predicted hatching period for Walleye on the Nipigon River fell between May 31st and June 22nd. Visual observations of Walleye staging behavior at known spawning sites in each year indicates that the WMP supports Walleye staging. As well, egg collections and the live capture and identification of ripe/gravid Walleye during the survey suggests that the WMP supports Walleye spawning behavior at the surveyed sites.

MNRF survey crews observed fewer Walleye at spawning locations when water levels were higher. However, no link to water levels and spawning population size can be drawn from these anecdotal observations as it is unclear whether it was due to observer bias (the higher water levels impeded the ability to detect walleye) or whether there is a causal relationship. Further investigation is required to investigate these anecdotal reports.

4.3.4.4 Northern Pike Spawning Observations**:** Objective code(s): **NR-3**

Summary:

Potential Northern Pike spawning locations were identified using a combination of habitat identification and traditional knowledge provided by members of Red Rock First Nation. Visual spawning observation surveys were completed during the typical spawning window (April-May) from 2008-2016 using daytime shoreline cruises. Spawning Northern Pike were observed in both historical and previously unidentified spawning locations in Lake Helen, Polly Lake and the Nipigon River. Annual surveys detected Northern Pike in 2008, 2009, 2014 and 2015 at a historical spawning location in the Nipigon River. To confirm whether spawning activity was occurring at this location seine nets were deployed in 2014 and more than 60 young of the year (YOY) Northern Pike were captured. However, low water levels in 2010, 2013 and 2016 resulted in a significant reduction in the wetted area at this site, subsequently no spawning at this location was observed in those years. Drift net surveys in 2010 did however capture YOY Northern Pike at this site, suggesting that spawning had occurred at an alternate upstream location. Similarly, Northern Pike were observed spawning along flooded sections

of shoreline in Polly Lake during high water years. However, under drier conditions no spawning was observed during shoreline cruises and a reduction in the wetted area was noted.

These results indicate that fluctuations in water levels during the spawning window do affect the availability of some spawning sites. However, results from driftnet surveys as well as an improving Northern Pike population observed in both creel (see section 4.3.2.5) and trap netting surveys (MNRF, 2019) indicate that Northern Pike are successfully spawning in the Nipigon River. Whether or not spawning efficacy is impacted by fluctuating water levels remains unclear.

4.3.4.5 Walleye Telemetry: Objective code(s): **NR-3**

Summary:

A multi-year Walleye telemetry study was initiated in 2006 in the lower Nipigon River (MNRF, 2019). A total of 120 Walleye were captured and fitted with radio transmitters between 2009 and 2012. Walleye were tracked on a regular basis throughout the open water season and more intensively during the spring spawning window. Walleye were tracked both actively (using a boat, helicopter or on shore) and passively (using strategically located base stations). The objectives of this work were threefold; to determine if flows prescribed by the water management plan support spawning activity, to identify and catalogue spawning locations, and to identify discrete spawning populations of Walleye based on their habitat use.

Staging, spawning and post-spawning behaviour were observed using the telemetry movement data, and a small number of spawning locations were identified in the lower Nipigon River based on these movements. In addition, these movement patterns corroborate with previous spawning observations completed during regular nighttime visual inspections (see 4.3.4.3 Walleye Observations above). Lastly, the results support the hypothesis that the Walleye population in the lower Nipigon River is composed of two discrete stocks. Walleye caught in the fall in the Nipigon River exhibited one of two behavioural traits. The first proposed "stock", the Lake Helen stock, moves seasonally between the river and either Lake Helen or Polly Lake. Conversely, the Nipigon Bay stock makes seasonal migrations between the Nipigon River, Nipigon Bay and the Jackfish River (MNRF, 2019).

Spring flows prescribed by the WMP during the spawning and incubation period appear to adequately support Walleye spawning activities at the assessed sites. Successful spawning activity appears to corroborate with fisheries assessment data from the Nipigon District (MNRF, 2019) that shows signs of Walleye recovery. The lifespan of the batteries for all tagged Walleye has now ended and this effectiveness monitoring commitment is considered complete. Further radio telemetry and/or genetic analysis is required to investigate the existence of discrete Walleye stocks in the Nipigon River.

4.3.4.6 Lake Sturgeon Telemetry**:** Objective code(s): **NR-3**

Summary:

From 2006-2021 a cooperative Lake Sturgeon (*Acipenser fulvescens*) telemetry project was completed by Nipigon District MNRF, Red Rock First Nation, Lake Helen First Nation and Anishinabek / Ontario Fisheries Resource Center (AOFRC) in the lower Nipigon River. The objective of this study was to locate spawning and nursery habitat and determine if flows prescribed by the WMP effectively protect these areas.

Gillnetting and trap netting surveys in Lake Helen, Polly Lake and the Nipigon River below the Alexander Falls GS were completed in 2007-2015 with the intent to capture Lake Sturgeon. Lake Sturgeon catches in these surveys were very low, in 102 gill net sets in 2008 and 2010 AOFRC crews captured 4 Lake Sturgeon which is a catch per unit effort less than 0.04 (Anishinabek/Ontario Fisheries Resource Centre, 2011). No Lake Sturgeon were captured from 2006-2009 by MNRF or AOFRC and only 11 Lake Sturgeon were captured and tagged with radio transmitters between 2010 and 2015. Tagged Sturgeon were intermittently tracked by boat, helicopter and from shore between March and November in 2010 - 2020 using handheld receivers. In addition to actively tracking tagged fish, shore-based tracking stations were strategically placed on the lower Nipigon River to act as a gate which detected tagged fish as they passed by. Detailed tracking histories for each tagged fish have been summarized in annual reports to OPG from MNRF. In addition, AOFRC summarized the results of their gill netting and tagging efforts in the 2010 report "Lake Helen and Polly Lake, Lake Sturgeon Assessment project 2010. Red Rock First Nation" (Anishinabek/Ontario Fisheries Resource Centre, 2011) and the subsequent 2012 report update.

Results of the Lake Sturgeon telemetry program indicate that habitat in the Nipigon River supports resident populations of Lake Sturgeon which spend most of the year in Lake Helen and Polly Lake. MNRF crews conducting aerial surveys over Nipigon Bay, Lake Superior located 2 of the 11 tagged Sturgeon more than 10 km from the mouth of the river in 2011-2013. Both fish travelled out into Nipigon Bay, remained there for a period of time, then returned to the river. Therefore, habitat in the Nipigon River may also help support broader Lake Sturgeon populations from Lake Superior. Four of the 11 tagged Lake Sturgeon were tracked to the area directly below the Alexander Falls GS where they remained for extended periods of time during the spawning period (June -Early July). Wet conditions in the spring of 2012 resulted in the flow of water over the spill wall (spill) from May 29th to July 15th. As conditions dried up in the early summer water levels in the Alexander head pond and further upstream returned to normal levels, no longer necessitating spill over the spill wall. The subsequent dewatering directly below the spill wall resulted in the exposure of fish habitat previously made available during the spill event. Desiccated Sturgeon eggs were collected from this area, confirming that Lake Sturgeon will spawn below the spill wall during high flow events. Similar high-water conditions existed in 2015. Lake Sturgeon were again tracked to sites directly below the spill wall. Spill was maintained to Aug 3rd in 2015. Following the reduction in spill and subsequent dewatering below the spill wall the potential spawning area was exposed and inspected by MNRF crews. No fry or eggs were observed during the inspection.

The results of the Lake Sturgeon telemetry project suggest that flows prescribed by the WMP enable:

- Lake Sturgeon in the Nipigon River to use habitat in Lake Helen, Polly Lake and the Nipigon River up to the Alexander Falls GS throughout the year;
- connectivity between Lake Sturgeon from Lake Superior and Lake Sturgeon in the Nipigon River; and
- Lake Sturgeon to congregate during the spawning period below the Alexander Falls GS.

However, there is potential during high flow years, when spill is coming over the wall, to provide spawning habitat during the spawning period which may experience water level drawdown during the egg incubation period. Lake Sturgeon spawning behavior as evidenced by this telemetry project or other related initiatives should be taken into consideration when managing springtime and early summer flows. In addition, Lake Sturgeon behavior as noted in this section should be taken into consideration during future amendments to WMP flow tables. In May 2014, OPG implemented the "Alexander Falls Generating Station Lake Sturgeon Mitigation Plan" which was prepared specifically for the Alexander Falls Generating Station on the Nipigon River. It describes operational strategies to avoid and or mitigate negative impacts to Lake Sturgeon and Lake Sturgeon habitat. This plan was prepared in accordance with O.Reg 242/08 General and is required to be reviewed on a five year cycle. Continued monitoring of Lake Sturgeon habitat use during the spawning period and further identification of other critical habitat in the lower Nipigon River is recommended.

4.3.4.7 Assessment of Lake Sturgeon Spawning Site Use: Objective code(s): **NR-3**

Summary:

The Lake Sturgeon telemetry project identified several areas below the Alexander Falls GS which Sturgeon regularly inhabited during the spawning period. These potential spawning sites were assessed using egg mats and underwater cameras to determine if spawning behavior or egg deposition was occurring. GoPro cameras mounted to a weighted harness were lowered from a boat and passed over potential spawning and staging habitat. Video surveys were completed during the spawning period annually between 2012 and 2016. Several Lake Sturgeon were captured on film during these surveys. In 2015, seven adult Lake Sturgeon were documented below the Alexander Falls GS, 6 at once on June 17th, 2015. Active spawning behavior was not captured on video however the video survey provided clear evidence of staging behavior.

Egg mats were deployed in 2012, 2013 and 2016 below the Alexander Falls GS to capture Sturgeon eggs. No eggs were captured. Sturgeon egg hatch dates and the subsequent larval drift period were estimated by combining water temperature data and estimated spawning date (based on telemetry

results) and applying a theoretical quantity of Thermal Units (150-350 TU). In 2012, tagged Sturgeon were recorded below the Alexander Falls GS between June 25th and July 12th. Water temperatures over this period ranged from 12.5 C – 17.5 C. Based on this information Sturgeon eggs were estimated to have hatched between July 10th and Aug 10th, 2012. This information was used to inform the timing for subsequent drift netting efforts.

The results of the above ground truthing exercises support the results from the Lake Sturgeon Telemetry project. Video surveillance has confirmed that Lake Sturgeon do congregate below the Alexander Falls GS during the spawning period. The flows prescribed by the WMP therefore do support Lake Sturgeon staging behavior. However, more work is required to identify spawning locations and assess how they may be impacted by fluctuating water levels.

4.3.4.8 Summertime Drift Net Survey: Objective code(s): **NR-1, NR-3**

Summary:

Summertime (June – September) driftnet surveys were completed annually between 2009 and 2013 in the Nipigon River. Suitable drift netting locations are limited on the Nipigon River however shallow water sites downstream of Walleye, Northern Pike and Lake Sturgeon spawning sites between the Alexander Falls GS and Lake Superior were identified. The purpose of the summertime drift net surveys was to capture young of the year (YOY) Walleye, Northern Pike and Lake Sturgeon to confirm successful upstream spawning activity and better understand their early life history. Drift nets were fished for a total effort of 342 net days (24hrs/day/net) and successfully captured YOY Northern Pike as well as Walleye eggs. No Lake Sturgeon eggs or YOY were captured. Other notable species captured included YOY Brook Trout, Common White Sucker, Yellow Perch, Sclupin (*Cottus sp*.) Rainbow Smelt, 3 and 9 Spine Stickleback (*Gasterosteidae sp.*), Rainbow Trout, and pacific salmon species. Significant hatch events were recorded for Sculpin as well as several invertebrate species and paired with water temperature and flow data.

The summertime drift net survey successfully confirmed upstream spawning events for Northern Pike and Walleye. As well, records of hatch events help to characterize the Nipigon River benthic macroinvertebrate community and inform the collection of long-term monitoring data. The results of this survey provide ground truthing support for telemetry and visual spawning observation surveys and spawning site rehabilitation initiatives.

4.3.4.9 Jessie Lake, Lake Trout spawning habitat: Objective code(s): **NR-3**

Summary:

In October 2008, Nipigon District MNRF completed an investigation into Lake Trout spawning in Jessie Lake. A combination of visual identification and radio telemetry were used to identify 3

previously unidentified Lake Trout spawning sites and 1 previously unidentified Brook Trout spawning site. Trap netting and short duration gillnet sets were used to confirm the presence of spawning fish at the sites. Water levels at the spawning locations were measured and determined to be adequate to support normal spawning behavior. Future monitoring of fall-time water levels at these sites is recommended to ensure WMP prescribed water levels adequately protect this habitat.

4.3.4.10 Spawning Site Rehabilitation: Objective code(s): **NR-3**

Summary:

Historical Walleye spawning sites on the Nipigon River were impacted by increased water levels and siltation following the diversion of the Ogoki River in 1943. Rehabilitation initiatives on the Nipigon River and Polly Lake began in 2011 and 2013 respectively. Funding from OPG and the Canada-Ontario Agreement was used to rehabilitate a historical spawning site downstream of the Alexander Falls GS. In August 2011 flows from Nipigon River tributary were channeled and suitable substrate was positioned in the newly developed channel. Flowing water from the creek would keep the newly deposited substrate clear of silt from the main stem of the river. Walleye telemetry, driftnet and visual observation surveys completed between 2011 and 2020 confirmed the presence of spawning Walleye at this site annually. Today this site is considered one of the most important Walleye spawning locations on the Nipigon River. Visual observations of Walleye during the spawning period on a shoal structure in Polly Lake indicated that this site supported spawning activity. From 2013 – 2015 rock substrate was deposited along this shoal to provide suitable spawning habitat. Visual observation of the shoal during spawning season was completed annually in from 2014-2016. Walleye were observed congregating on the shoal however egg mat surveys failed to collect Walleye eggs.

Rehabilitation of Walleye spawning sites in the Nipigon River successfully created valuable spawning sites which support annual spawning runs. Rehabilitated spawning sites were designed to provide suitable spawning habitat under normal flow conditions. Increasingly, “non-normal” flow conditions are becoming more and more common. Further investigation of Walleye spawning success under low and high flow conditions is recommended.

4.3.4.11 Brook Trout Fry Counts: Objective code(s): **NR-3**

Summary:

Brook Trout reproductive success was assessed at spawning sites on the Nipigon River and Lake Nipigon. Emergent Brook Trout fry were enumerated during weekly visual inspections at Gapen’s Pool, Parmacheen Pool on the Nipigon River and at South Bay, on Lake Nipigon. Inspections were completed annually at Gapen’s Pool between 2000 and 2021 during the typical hatching window (April 1st to Jun 1st). Fry counts at the other two locations were completed more sporadically and began after water management practices prescribed in the WMP were initiated. To assess how the WMP has

influenced Brook Trout reproduction, fry counts from Gapen's Pool were compared from pre- and post-WMP time periods. The results of this analysis were summarized and reported in the 2019 MNRF report "Gapen's Pool Brook Trout Monitoring, 2000-2018" (MNRF, 2019). Results indicated that the average number of Brook Trout fry observed following the implementation of the water management plan (2006-2018) was greater than the average number observed before water management practices were implemented (2000-2006). The observed increase in fry numbers following the implementation of the WMP indicates that water management practices are supporting Brook Trout reproduction at Gapen's Pool. However, the highly variable nature of this data results in a weak positive relationship over time ($R^2 = 0.13$). It is therefore recommended that the sampling methodology is standardized to account for variability between observers and conditions. Continued surveillance of Brook Trout reproductive success at all three sites is also recommended to monitor the effect various fall, winter, and spring flow levels to ensure the plan provides adequate protection.

4.3.4.12 Brook Trout Redd Counts: Objective code(s): **NR-3**

Summary:

Brook Trout spawning activity was monitored on the Nipigon River by conducting weekly visual surveys overtop of known spawning locations. Spawning Brook Trout and their redds (spawning beds) were enumerated and recorded throughout the typical spawning period (Oct 1st – Dec 1st). Sampling at Gapen's Pool was conducted from 2000-2021. The MNRF report titled "Gapen's Pool Brook Trout Monitoring, 2000-2018" compared the number of Brook Trout redds observed annually between the "pre-plan period" (2000-2006) and the "plan period" (2006-2018) to determine if WMP activities were supporting Brook Trout spawning behavior (MNRF, 2019). The report found that the number of Brook Trout redds increased during the plan period. The mechanism for this increase remains unclear however the author speculates that the increase could be the result of a greater wetted area available under WMP prescribed flows. However, the nature of the data is highly variable. Discrepancies between observers as well as environmental conditions such as light conditions and water clarity may affect the results.

In 2021, monitoring efforts were modified to standardize the collection between observers as well as create a geospatial catalogue of redd locations. Redd locations and the number of fish in relation to each redd were recorded between Oct 18th and Dec 06th 2021. Over time this data should be able to provide an estimate of the spawning area size specific to various flow conditions. Given the increase in redd numbers during the spawning period as well the number of fry observed in the spring and increased Brook Trout catches observed in creel surveys the WMP appears to support successful Brook Trout spawning. Continued monitoring and cataloguing of Brook Trout redds is recommended.

4.3.4.13 Nipigon River Trap Netting: Objective code(s): **NR-3**

Summary:

Trap netting surveys were conducted in the lower Nipigon River in 2006-2009, 2013, 2017 – 2019. The objective of these surveys was to assess the status of Walleye and Northern Pike populations in the lower Nipigon River and determine if flow conditions prescribed by the WMP support successful reproduction. Surveys were completed in May and June and followed the Nearshore Community Index Netting protocol or the End of Spring Trap Netting protocol. The survey methodologies are similar, and both provide a standardized framework to produce relative abundance estimates as well as other biological attribute data, including age class structure and sex ratios. Walleye and Northern Pike catches reported in "Lower Nipigon River Trapnetting Synthesis, 2006-2018" revealed an increase in catch per unit effort (CUE) in recent years (MNRF, 2019). Walleye and Northern Pike age composition also improved in recent years with the addition of older fish in the population. The results indicate that both Walleye and Northern Pike populations in the lower Nipigon River are successfully reproducing. As well, Walleye and Northern Pike growth and condition in the lower Nipigon River are above provincial benchmark values.

The results of the trap netting program indicate that the water management plan has provided sufficient conditions to support the reproductive success of Walleye and Northern Pike populations in the lower Nipigon River. However, signs of success are only recently being detected. Therefore, it is recommended that trap netting efforts continue to assess Walleye and Northern Pike population and age composition over time.

5. Data and Information Collection Program

5.1. Description

This section of the report provides a summary of the applicable DICP components outlined in Chapter 9 of the NRSWMP, including details on:

- background and intent of program component,
- timing and duration of data or information collection conducted,
- findings and conclusions, e.g. assessment of information,
- determination of whether revisions to the facility operations or to the DICP are required, e.g. proposed changes/amendments going forward.

5.2. Data and Information Collection Program Components

Section 9.3 of Chapter 9 of the NRSWMP lists a number of information gaps identified by the initial Steering Committee during the stakeholders' consultation process as points of interest or questions for future consideration. Filling these gaps was recommended to follow a cooperative

approach between MNRF and plan proponents, as well as First Nations and other interest groups as applicable.

5.3. Data and Information Collection Program Results

Table 6: Assessment of Physical and Biological Data Gaps contained in Table 30 of the Nipigon River System Water Management Plan, 2015.

Description of Data Gaps at time of Plan Development	Location	Was the Data Gap Addressed?	How was Data Gap Addressed?	Does the Data Gap Still Exist?	Description of Current Data Gap
Locations and depths of spawning beds need to be determined.	Lake Nipigon	Yes	Brook Trout spawning sites on South Bay and West Bay were observed for spawning activity during spawning season regularly during the plan period. Mark and recapture studies at these sites were completed by the Lake Nipigon Fisheries Assessment Unit regularly between 2001 – 2015 and in 2021. See Section 4.3.2.3 of this report.	Yes	Specific spawning site depths have not been recorded for any species. Very few biological reference points exist on Lake Nipigon. Further investigation into Lake Trout, Lake Whitefish, Brook Trout, and Northern Pike spawning locations and depths is required.
There is no fisheries information (or guidelines) available for the stretch of water from the Cameron Falls to the Alexander GS.	Nipigon River	No	Data gap was not addressed.	Yes	This area is no longer as accessible to the public as it was during the development of this plan. Data gap should be reviewed for appropriateness.

Description of Data Gaps at time of Plan Development	Location	Was the Data Gap Addressed?	How was Data Gap Addressed?	Does the Data Gap Still Exist?	Description of Current Data Gap
There is no data regarding the incidence of fish being drawn into intakes at generating stations.	Whole System	No	Data gap was not addressed.	Yes	There is no data regarding the incidence of fish being drawn into intakes at generating stations.
There is no recent water quality, zooplankton, or benthos information for Lake Nipigon tributaries and the Nipigon River.	Whole System	Yes	Benthic macroinvertebrate (excluding Mollusk and Crustacean species) studies were completed in 2007, 2008, 2009, 2016 and 2021 on Lake Nipigon and the Nipigon River. See section 4.3.4.1 of this report.	Yes	Inferences regarding water quality have been drawn from benthic macroinvertebrate community studies. MNRF has not completed chemical analysis of water quality during the plan period. Status of zooplankton communities are unknown. Impacts of water level regulation on zooplankton communities and water quality are unknown.
There is no data on required water levels for migrating birds.	Whole System	No	Data gap was not addressed.	Yes	There is no data on required water levels for migrating birds.

Description of Data Gaps at time of Plan Development	Location	Was the Data Gap Addressed?	How was Data Gap Addressed?	Does the Data Gap Still Exist?	Description of Current Data Gap
More data is required to describe the effects of ramping rates on fish habitat as well as mitigation techniques.	Nipigon River	No	Effects of ramping rates were not addressed. However, efforts to identify fish habitat and characterize fish habitat use in the Nipigon River were completed and contribute to a greater understanding of this knowledge gap.	Yes	More data is required to describe the effects of ramping rates on fish habitat and behaviour as well as mitigation techniques to reduce the impact of water level ramping on fish habitat (erosion, loss of wetted area, stranding etc..) and fish behaviour (eg. staging and spawning activity). Biological reference points which identify minimum or maximum threshold water levels at important sites (spawning / staging sites and areas with restricted fish passage) have not been adequately explored since the development of this plan and remain a data gap.
Need to identify areas of fish entrapment when water levels are low so as to resolve the issue.	Nipigon River	Yes	Incidence of fish stranding was investigated during periods of low flows throughout the plan period. Areas which have the potential to entrap fish during low flows were identified. Mitigation of fish stranding was accomplished through adaptive management of water flows and physical alteration of stranding pools. See section 4.3.4.2 of this report.	Yes	Incidence of fish stranding during low flow periods occurring during winter operation are unknown. Long term effectiveness of mitigation measures remains unknown.

Description of Data Gaps at time of Plan Development	Location	Was the Data Gap Addressed?	How was Data Gap Addressed?	Does the Data Gap Still Exist?	Description of Current Data Gap
Aquatic vegetation communities	Whole System	Yes	Some site-specific assessment of aquatic vegetation communities was performed as part of the OWES wetland evaluations completed on wetlands adjacent to Lake Nipigon and the Nipigon River. See section 4.3.1.1 of this report.	Yes	Status of aquatic vegetation communities as well as the potential impacts of water level regulation on these plant communities throughout the system remain largely unknown.
Need data on mollusks and crustaceans.	Whole System	No	Data gap was not addressed.	Yes	Status of Mollusk and Crustacean communities unknown. Impact of water level regulation on Mollusk and Crustacean communities is unknown.
Terrestrial vegetation communities (rare, threatened, endangered)	Whole System	Yes	Some site-specific assessment of terrestrial vegetation communities was performed as part of the OWES wetland evaluations completed on wetlands adjacent to Lake Nipigon and the Nipigon River. Regionally rare and SAR designated terrestrial and aquatic plant species were identified during these surveys. See section 4.3.1.1 of this report.	Yes	Status of terrestrial plant communities adjacent to the Nipigon River System remains largely unknown. Impacts of water level regulation on terrestrial plant communities is unknown.

Description of Data Gaps at time of Plan Development	Location	Was the Data Gap Addressed?	How was Data Gap Addressed?	Does the Data Gap Still Exist?	Description of Current Data Gap
Geology, soil structure and slope	Whole System	Yes	Site specific erosion studies completed on the Little Jackfish River and Nipigon River assessed local geology and bank composition including soil structure and slope. Erosion projects and studies have been completed at Whitesands and Gull Bay FN sites on Lake Nipigon. Reports include information on bank composition, soil structure and slope. See section 4.3.3 of this report.	Yes	System wide scale geology, soil structure and slope are poorly understood. Areas subject to erosion on Ogoki Reservoir and other areas on Lake Nipigon are unknown. There are reports available from the previous Northern Development Ministry that have come to light since the ministries have been integrated together. These reports will require review to add to the knowledge for this data gap.
Waterfowl nesting	Whole System	Yes	Flooded Loon nest containing eggs identified in 2013. Loon nesting platform study completed in 2014 and documented in 2014 and 2015 Annual Report of Effectiveness Monitoring submitted to OPG by MNRF. Results were inconclusive.	Yes	Impacts of water level fluctuation on waterfowl nesting is largely unknown.

Description of Data Gaps at time of Plan Development	Location	Was the Data Gap Addressed?	How was Data Gap Addressed?	Does the Data Gap Still Exist?	Description of Current Data Gap
Reptiles, amphibians, mammals - habitat and communities	Whole System	Yes	Motion activated camera trap surveys documented large mammal use on Lake Nipigon islands, shoreline, and peninsulas with the objective of identifying Moose and Caribou habitat on Lake Nipigon. Other MNRF initiatives used radio telemetry, aerial surveys and track and pellet surveys to identify Caribou habitat near the Ogoki Reservoir and on Lake Nipigon Islands. See section 4.3.1.2 of this report.	Yes	System scale understanding/catalogue of mammal, reptile and amphibian habitat use and community structure largely unknown. Location of Caribou and Moose calving sites on Ogoki Reservoir are unknown. Impact of water level fluctuation on Moose and Caribou habitat is unknown.
Fish spawning, nursery, staging areas	Whole System	Yes	**Lake Sturgeon:** Spawning and staging habitat in the lower Nipigon River was identified using a combination of radio telemetry, underwater video surveillance, and inspection of potential spawning sites during low flow conditions. See sections 4.3.4.6 and 4.3.4.7 of this report.	Yes	The impacts of water level regulation on specific spawning, nursery or staging locations in Lake Nipigon and Ogoki remain unknown. A comprehensive database of spawning locations on Lake Nipigon, its tributaries and the Ogoki reservoir remains a data gap. Nursery and staging habitat on Lake Nipigon and Ogoki is poorly understood and remains a data gap. Impacts of water level regulation on fish spawning staging and nursery areas in the Nipigon River remains unknown.

Description of Data Gaps at time of Plan Development	Location	Was the Data Gap Addressed?	How was Data Gap Addressed?	Does the Data Gap Still Exist?	Description of Current Data Gap
Fish spawning, nursery, staging areas	Whole System	Yes	**Walleye:** Spawning and staging areas were assessed using a combination of radio telemetry, nighttime visual inspections, and summertime driftnet surveys. See sections 4.3.4.3, 4.3.4.5, 4.3.4.8 and 4.3.4.10 of this report.	Yes	Walleye spawning locations in Lake Nipigon and many of its tributaries have been assessed historically and during the plan period as part of fisheries objectives for Lake Nipigon which are unrelated to this Water Management Plan. The impacts of water level regulation on specific spawning, nursery or staging locations in Lake Nipigon and Ogoki remain unknown. A comprehensive database of spawning locations on Lake Nipigon, its tributaries and the Ogoki reservoir remains a data gap. Nursery and staging habitat on Lake Nipigon and Ogoki is poorly understood and remains a data gap. Impacts of water level regulation on fish spawning staging and nursery areas in the Nipigon River remains unknown.

Description of Data Gaps at time of Plan Development	Location	Was the Data Gap Addressed?	How was Data Gap Addressed?	Does the Data Gap Still Exist?	Description of Current Data Gap
Fish spawning, nursery, staging areas	Whole System	Yes	**Northern Pike:** Spawning and nursery habitat were assessed in the lower Nipigon River using a combination of shoreline cruises and summertime driftnet surveys. See sections 4.3.4.4 and 4.3.4.8 of this report.	Yes	Northern Pike spawning locations in Lake Nipigon and the Nipigon River have been identified. However, a comprehensive database of spawning locations throughout the system remains a data gap. The impacts of water level regulation on specific spawning, nursery, or staging locations in Lake Nipigon and Ogoki remain unknown. Nursery and staging habitat on Lake Nipigon and Ogoki is poorly understood and remains a data gap. Impacts of water level regulation on fish spawning staging and nursery areas in the Nipigon River are poorly understood and remain a data gap.

Description of Data Gaps at time of Plan Development	Location	Was the Data Gap Addressed?	How was Data Gap Addressed?	Does the Data Gap Still Exist?	Description of Current Data Gap
Fish spawning, nursery, staging areas	Whole System	Yes	**Brook Trout:** Brook Trout spawning, and nursery locations were surveyed in the Lower Nipigon River and in Lake Nipigon using visual observation surveys completed in the spring and fall. Telemetry and short duration gill net sets on Jessie Lake identified Brook Trout spawning sites. Nipigon River tributary surveys identified potential Brook Trout nursery habitat (MNRF Unpublished). See sections 4.3.4.9, 4.3.4.11 and 4.3.4.12.	Yes	Brook Trout spawning locations in Lake Nipigon and many of its tributaries have been assessed historically and during the plan period as part of both WMP driven effectiveness monitoring initiatives and other fisheries objectives for Lake Nipigon which are unrelated to this Water Management Plan. The impacts of water level regulation on specific spawning, nursery or staging locations in Lake Nipigon are not fully understood and remain as a data gap. A comprehensive database of spawning locations on Lake Nipigon and its tributaries remains a data gap.

Description of Data Gaps at time of Plan Development	Location	Was the Data Gap Addressed?	How was Data Gap Addressed?	Does the Data Gap Still Exist?	Description of Current Data Gap
Fish spawning, nursery, staging areas	Whole System	Yes	**Lake Whitefish:** High level assessment of Lake Whitefish reproductive success as inferred by year-class strength was completed for Lake Nipigon. See section 4.3.2.4 of this report.	Yes	Lake Whitefish spawning locations in Lake Nipigon and many of its tributaries have been assessed historically and during the plan period as part of fisheries objectives unrelated to this water management plan. A comprehensive database of spawning, nursery and staging locations throughout the system is a data gap. Impacts of water level regulation on spawning, nursery and staging locations throughout the system remains a data gap.

Description of Data Gaps at time of Plan Development	Location	Was the Data Gap Addressed?	How was Data Gap Addressed?	Does the Data Gap Still Exist?	Description of Current Data Gap
Fish spawning, nursery, staging areas	Whole System	Yes	**Lake Trout:** Telemetry and short duration gill netting on Jessie Lake identified Lake Trout spawning shoals. See section 4.3.4.9 of this report.	Yes	Lake Trout spawning locations in Lake Nipigon and many of its tributaries have been assessed historically and during the plan period as part of fisheries objectives for Lake Nipigon which are unrelated to this Water Management Plan. The impacts of water level regulation on specific spawning, nursery or staging locations in Lake Nipigon are unknown. A comprehensive database of spawning locations on Lake Nipigon remains a data gap. Nursery and staging habitat on Lake Nipigon is poorly understood and remains a data gap. Impacts of water level regulation on fish spawning staging and nursery areas in Jessie Lake is poorly understood and remains a data gap.

Description of Data Gaps at time of Plan Development	Location	Was the Data Gap Addressed?	How was Data Gap Addressed?	Does the Data Gap Still Exist?	Description of Current Data Gap
Fish spawning, nursery, staging areas	Whole System	No	**Various Species:** Data gaps associated with spawning, nursery and staging habitat for other ecologically, culturally and economically valuable fish species in the Nipigon River System including but not limited to Pacific Salmon, Rainbow Trout, Yellow Perch, Rainbow Smelt, Cisco species, Burbot and Sucker species were not addressed as part of this effectiveness monitoring program.	Yes	Spawning locations in Lake Nipigon and the Nipigon River have been assessed historically and during the plan period as part of fisheries objectives for Lake Nipigon and Lake Superior which are unrelated to this Water Management Plan. The impacts of water level regulation on specific spawning, nursery, or staging locations in Lake Nipigon, Ogoki and the Nipigon River are poorly understood.
Flood plain mapping	Whole System	No		Yes	Flood plain mapping remains incomplete.

Description of Data Gaps at time of Plan Development	Location	Was the Data Gap Addressed?	How was Data Gap Addressed?	Does the Data Gap Still Exist?	Description of Current Data Gap
General bathymetry	Whole System	Yes	Collection of bathymetry data was completed at specific sites on the Nipigon River (Gapens Pool, Lake Helen, Alexander Dam). Bathymetric data collection on Lake Nipigon is incomplete.	Yes	System scale bathymetry data remains a data gap.
Fish community assessment	Ogoki / Mojikit, Ogoki River, Little Jackfish River	Yes	Data gap was not addressed as part of this Water Management Plan. Initiatives outside of this plan have contributed to a better understanding of this knowledge gap. Fish community assessment was completed on Zigzag Lake and in the Little Jackfish River as part of the Little Jackfish River Hydroelectric Development proposal Environmental Assessment. A 2002 Fall Walleye Index netting program was completed on Mojikit Lake and the Ogoki River by Thunder Bay District MNRF.	Yes	Fish community assessment on Ogoki Reservoir, Ogoki River and Mojikit Lake have not been completed recently and therefore remain a data gap.

Description of Data Gaps at time of Plan Development	Location	Was the Data Gap Addressed?	How was Data Gap Addressed?	Does the Data Gap Still Exist?	Description of Current Data Gap
Impact of low water flows is unknown.	Nipigon River	Yes	Fish stranding was assessed during low flow events throughout the plan period. Low flow events in the Alexander back pool were investigated for fish stranding. See section 4.3.4.2 of this report.	Yes	Threshold low water level values identified in the water management plan have not been reviewed. Lower threshold water levels in Jessie Lake and at recently identified spawning locations on the Nipigon River are unknown. Lower threshold water levels for Lake Sturgeon spawning activity at Alexander dam are poorly understood and remain a data gap. There are instances of the Nipigon River operating at the lower flow of 170cms but they have not been reviewed specifically for impacts to salmon.
Mercury levels in sport fish.	Whole System	Yes	Mercury contamination in fish was assessed through other initiatives outside of this Water Management Plan as part of both dedicated contaminate sampling programs and as part of other fisheries assessment surveys in Lake Nipigon, the Little Jackfish River, Zigzag Lake, Mojikit Lake, and Lake Helen. Mercury levels in fish were not assessed as part of this Effectiveness Monitoring initiative. See section 4.3.2.2 of this report.	Yes	Mercury contaminate analysis is led by the Ministry of Environment, Conservation and Parks in partnership with various local organizations (including MNRF). Given the presence of commercial, subsistence and recreational fisheries on the Nipigon River System and the considerable public interest in Mercury in fish, assessment of the food quality of fish in the Nipigon River System remains a data gap.

OPERATIONAL DATA GAPS

Table7: Assessment of Operational Data Gaps.

Description of Data Gaps at time of Plan Development	Location	Was the Data Gap Addressed?	How was Data Gap Addressed?	Does the Data Gap Still Exist?	Description of Current Data Gap
More information is required as to the natural flow regime and the associated impact of sending water north over Waboose Dam.	Ogoki Reservoir	No	Data gap was not addressed	Yes	More information is required as to the natural flow regime and the associated impact of sending water north over Waboose Dam.

SOCIO-ECONOMIC DATA GAPS

Table8: Assessment of Socioeconomic Data Gaps.

Description of Data Gaps at time of Plan Development	Location	Was the Data Gap Addressed?	How was Data Gap Addressed?	Does the Data Gap Still Exist?	Description of Current Data Gap
Low water levels are impacting access to a camp on Ogoki Lake. More information is required to determine the exact cause and associated solution.	Ogoki Lake	Yes	Water level satisfaction surveys were completed from 2006-2009 which surveyed outfitters and other Nipigon River System users. See Section 4.3.2.1 of this report.	Uncertain	It is unclear if the data gap still exists.

Description of Data Gaps at time of Plan Development	Location	Was the Data Gap Addressed?	How was Data Gap Addressed?	Does the Data Gap Still Exist?	Description of Current Data Gap
More information is required as to levels, flows and associated erosion rates that are affecting First Nations lands at Parmacheene and McIntyre Bay. Further research is required to determine actions necessary to minimize erosion.	Nipigon River and Lake Nipigon	Yes	Incidence of landslides on the Nipigon River below Alexander Dam were documented throughout the plan period (2005-2021) and reported in annual reports to OPG from MNRF. Some Erosion Studies were completed on the Nipigon River and Little Jackfish River. See section 4.3.3 of this report.	Yes	No erosion studies have been completed at Parmacheene on the Nipigon River or at McIntyre Bay, Lake Nipigon. Water level management has not been investigated for a causal link to landslide occurrence in the Nipigon River. More information is required to determine if a causal relationship between water level management and erosion exists.
Input from First Nations is required to better identify what flows and levels are necessary for the protection of cultural sites.	Whole System	No	Cultural sites were reviewed during the Little Jack Fish EA. Other sites will be reviewed if work is proposed in other areas of Lake Nipigon.	Yes	Continue to work with FN to identify areas requiring possible protection from flow or level changes.
Need to identify what elevations are required to avoid impacting the Whitesands Healing Lodge.	Whole System	Yes	Data gap was addressed. Shoreline rehabilitation on Whitesands FN was performed between 2009 and 2016 and erosion will no longer impact the location of the Healing Lodge.	No / Complete	Consider removing this data gap from the Water Management Plan as it has been completed.
Shoreline inventory of infrastructure.	Whole System	No	Data gap was not addressed	Yes	Gap remains.

Description of Data Gaps at time of Plan Development	Location	Was the Data Gap Addressed?	How was Data Gap Addressed?	Does the Data Gap Still Exist?	Description of Current Data Gap
Cultural and Archaeological site reconnaissance.	Whole System	No	Data gap was not addressed	Yes	Gap remains.

6. Conclusions and Recommendations

In conclusion, OPG has and will continue to operate the Nipigon River System as per the Water Management Plan. At times due to drought or high water beyond OPGs control, deviations from the WMP have occurred and OPG has responded to these events in conjunction with the MNRF to effectively balance the interests of all stakeholders. At this time there are no known negative or unintended impacts as a result of current operations as defined in the WMP.

OPG believes that it has met and will continue to meet the eight *specific* plan objectives (no particular order);

- Maintain or improve recreation, tourism, and commercial opportunities and experiences
- Maintain or improve the value of water power generation
- Protect, restore or enhance aquatic ecosystems
- Minimize shoreline erosion
- Protect Native values
- Protect historical and cultural values
- Protect, restore or enhance wildlife habitat
- Maintain or improve water quality

The NWAC is active and is kept informed yearly, and more often during years with outstanding issues. This report will be provided to the NWAC and their input will be considered for ideas and studies for the next implementation report due in five years.

The table below (table 9) summarizes what has been done, what is expected to continue and some possible new ideas for effectiveness monitoring (EMP) in the next implementation report period.

Table 9: Effectiveness Monitoring Summary for Future Consideration

Objective	Details	Product	Frequency	Results	Future
EMP Aquatic Habitat Littoral Area – *Aquatic Ecosystems*	Perform Northern Version of OWES Ogoki Region Nipigon Region	Report for comparison to previous years	Ogoki - Every other year Nipigon – Every five years	Reports provide baseline data but not suited for year by year comparisons. See 4.3.1.1.	Change study methodology to consider researching and implementing a scientifically recognized wetland evaluation methodology which is designed to monitor wetland status over time and at various water levels
EMP Caribou and moose calving areas – *Wildlife Habitat*	Identify calving islands and peninsulas and elevation needed to maintain area. Ogoki Region	Report on the status of the islands as determined by elevation. Use could be monitored to identify success.	Every five years.	No determination between water elevation and islands made. Other studies conducted. See 4.3.1.2	Increase the objective scope to include the islands on southern half of Lake Nipigon for easier access to research area.
EMP Outfitter Survey *–Aquatic Ecosystems, Tourism, and Erosion*	Design a standard evaluation form for outfitters to provide diary of opinions on the water levels	Contact with outfitters to develop importance of doing evaluation, compiling results of information gathered into a format useful for future management decisions.	Annually Ogoki	Standard questionnaire developed and used. Information compiled. See 4.3.2.1	Continue with this program. Add Nipigon Region as the survey was used over the region and not just at the Ogoki.
EMP Mercury in Fish Sampling - *Aquatic Ecosystems, Tourism*	Develop partnership with MOE on their fish contaminant study of methyl-mercury in sport fish on Ogoki	Report on the mercury in walleye, northern pike and suckers.	One year, then work out suitable schedule based on results. Ogoki Lake Nipigon	Samples taken by various programs over years and sent to MECP Data contributed to MECP consumption advisories in the “Guide to eating Ontario Fish” See 4.3.2.2	Continue and expand area to include Nipigon River below Alexander Dam with possible partnership with First Nation communities and MECP.

Objective	Details	Product	Frequency	Results	Future
EMP Little Jackfish River/Ogoki/ Mojikit Lake Nipigon and Nipigon River monitoring erosion - *Tourism, and Erosion*	Monitoring of erosion	Provide comparison bank stability over time. Identify any areas where vegetation is growing on previously eroding banks.	Annual aerial photography of erosion prone areas with reference to location.	No results for Ogoki / Mojikit. Little Jackfish River was studied by Hatch during an EA in 2012 by OPG. True Grit/ Baird & Assoc. studied Gapen's Pool in 2016. See 4.3.3.1 - 4.3.3.4	Review with NWAC as other technologies to provide similar results. Satellite imagery may be an option to explore as it is dated and can be synchronized with past water levels.
EMP Charter Boat Input - *Aquatic Ecosystems, Tourism*	Encourage charter boat operators to keep a diary on water levels on Lake Nipigon	Contact with charterboat operators to compile information from diaries.	Annual	Forum created to collect charter boat captain concerns with water levels on Lake Nipigon. Responses summarized in annual reports. See 4.3.2.1	Continue.
EMP Lake Nipigon Fish Assessment - *Aquatic Ecosystems, Tourism*	Develop partnership with MNRF Lake Nipigon Assessment Unit to provide specific information on fish species sensitive to water level drawdown. Complete trend through time data from existing surveys such as Fish Community Index Netting program.	Provide report of fish data on general health of fish populations to highlight data related to water management. Work at expanding existing program to look at spawning brook trout and lake trout	Annual with sector rotation.	Data collected. Maintenance of fish stocks suitable to support commercial and recreational fisheries with the implementation of the WMP indicate that water management practices do support fish stocks. See 4.3.2.3	No causal link between fish stock status and water management practices have been made as a variety of other influential factors may impact the data. To identify causal links to water management practices this initiative should continue but with different or more targeted approach for fisheries assessments.
EMP Lake Nipigon Cottagers - *Recreational*	Provide a contact for cottagers to raise concerns or comments.	Produce a summary of comments from cottagers.	Annual	Complete. See 4.3.2.1.	Continue with collection of surveys and comments from cottagers, users and public via the water level satisfaction questionnaires and report in annual reports.

Objective	Details	Product	Frequency	Results	Future
EMP Aquatic Environment Long Trend Data Monitoring - *Aquatic Ecosystems*	Establish key sampling station to sample benthos, zooplankton, aquatic insects and water parameters. Reference OLL Lake Nipigon Signature Series Site Document for details. Nipigon River (including Jessie Lake)	Produce a report on long term trends. Develop standardized sampling protocol recognized within the scientific community	Every five years.	Application of a modified version of OBBN aquatic biomonitoring program. Indications of moderately/high-quality benthic macroinvertebrate habitat and high quality, unimpaired and well oxygenated water at the test sites. Suitable baseline created. Continue monitoring. Lake Nipigon and Nipigon River Performed in 2007, 2008, 2009, 2016 and 2021. See 4.3.4.1.	Ongoing repetition every five years for long term monitoring.
EMP Stranding Fish - *Aquatic Ecosystems*	Monitor the effectiveness of improvements to reduce the incidence of stranded fish. Nipigon River (including Jessie Lake)	Produce a report after each visit to evaluate sites. Provide and implement action needed to reduce stranding of fish.	Each visit.	Various flow conditions (high and low) were monitored for evidence of stranding. Corrective measures invoked and monitored (channels, operational changes to attempt no spill during spawning) See 4.3.4.2.	Continue reports. Study ‘out of normal’ conditions and fish stranding for very high and very low water years.

Objective	Details	Product	Frequency	Results	Future
EMP Spawning Location - *Aquatic Ecosystems*	Monitor spawning sites Nipigon River (including Jessie Lake)	Produce a report each season to evaluate effectiveness of proposed peaking during the Fall period and to evaluate spawning success.	During spawning periods.	Completed. See 4.3.4.3. See 4.3.4.4. See 4.3.4.7. See 4.3.4.9. through 4.3.4.12	Continue, some species may require some consideration as to how they are studied.
EMP Angler Creel - *Aquatic Ecosystems, Tourism*	Volunteer Angler Creel, Access Creel and Roving Creel Nipigon River (including Jessie Lake)	Attempt to obtain creel data during open water season.	Annually, or two years, then every five. Depending on Creel.	Confirmation that the WMP effectively provides open and hard water fishing opportunities. WMP affords sufficient protection of brook trout sport fishery. Supports Salmon fishery. See 4.3.2.5.	Roving Creel to be performed shortly, volunteer creel boxes to continue. Continued creels provide important information to monitor continued fishing pressure.
EMP Impact of Erosion on First Nations land – *Native values, and Erosion*	Monitor erosion on the Nipigon River. Nipigon River (including Jessie Lake)	Develop monitoring program involving Red Rock First Nations.	Open water season	Complete. Landslides documented. Photos and GPS locations. See 4.3.3.4.	Continue to monitor and document landslides. Investigate potential causal link between high flows and increased incidences of landslides as per anecdotal evidence. Summarize obtained data to evaluate WMP flows versus landslide occurrences.

Objective	Details	Product	Frequency	Results	Future
EMP Monitor important flow events and regime characteristics necessary to maintain the health of the river channel and its floodplain structure – *Aquatic Ecosystems, and Erosion*	Monitor and evaluate effectiveness of flow events.	Produce a report evaluating the effectiveness of the system to provide important flow events	Year round	Erosion monitoring at Gapen's Pool, annual documentation of landslide events.	Complete, define ongoing requirements.
EMP Alexander back pool area - *Aquatic Ecosystems*	Monitor and evaluate effectiveness of flows on the elevation fluctuations on Alexander back pool	Produce a report that evaluates the effectiveness of the system in reducing Alexander back pool elevation fluctuations	Two years within the planning term	Incomplete. Fish stranding studied, see 4.3.4.2.	Further clarification required.

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