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By Email: Kate.Cantin@OPG.com

Re: Lake Sturgeon Rescue from the Lower Mattagami Generating Complex
Ontario Power Generation

Dear Kate:

The Ontario Rivers Alliance (ORA) and associates are pleased to offer the following recommendations to Ontario Power Generation (OPG) for the protection and mitigation of the environmental impacts of the Little Long Generating Station (LLGS) on the current population of Lake Sturgeon in the Lower Mattagami River and its major tributaries.

Introduction

The effects of dams and hydroelectric facilities on fish populations and fisheries have been well documented over the past century and include the loss or serious decline of many iconic fish species, which are resources of importance to Ontario's economy, biodiversity, and natural and cultural heritage. Effects include barriers to fish migration, often preventing access to critical habitat (e.g. spawning and rearing areas), changes in water temperature and water quality, and result in conditions unsuitable for many native fish species. Indeed, the effects can be so severe that waterpower facilities are often described as important reasons for the decline and/or significant threats to the recovery of imperiled fish species.[1,2,3,4,5,6,7,8]

In the case of Lake Sturgeon, non-fragmented habitats are critical as adults historically migrate considerable distances to reproduce.[9] Downstream passage through waterpower facilities and dams can cause injury or direct mortality to all life history stages of Lake Sturgeon from exposure to extreme changes in water pressure, cavitation, shear, turbulence or mechanical injuries, entrainment and impingement[10,11] As a result, it has been concluded that,

> *the historical loss of habitat through impoundment and fragmentation and the failure to mitigate these losses is likely the greatest ongoing impediment slowing the recovery of sub-populations of Lake Sturgeon inhabiting highly developed systems such as the Ottawa River*[12], and the Mattagami River.

Lake Sturgeon, (*Acipenser fulvescens*) is listed as a Species at Risk in the province of Ontario, and the Hudson Bay-James Bay populations are classified as a species of special concern. Over-

exploitation and habitat alteration at hydroelectric facilities has resulted in dramatic declines in Sturgeon populations throughout much of their historical range.

"The recovery goal for Lake Sturgeon in Ontario is to maintain existing Lake Sturgeon populations throughout their current range and where feasible, to restore, rehabilitate or re-establish, self-sustaining Lake Sturgeon populations which are viable in the long term within their current habitat and/or within habitats they have historically occupied, in a manner consistent with maintaining ecosystem integrity and function."[13]

To this day, OPG has failed to adequately mitigate the devastating impacts to Lake Sturgeon populations within the waters of the Lower Mattagami River Hydroelectric Complex (LMRHC) which has totally altered and limited habitat to the detriment of its aquatic inhabitants.

To that end, the following concept recommendations were developed to support repairing the errors made in the past and provide a promising future that could resolve this long-standing issue.

Recommendations

We offer the following recommendations in light of the environmental impacts on Lake Sturgeon at the LLGS, at the top of the LMRHC:

1. To help prevent any future entrainment of Lake Sturgeon down both the Little Long Sluiceway (LLS) and the Adam Creek Sluiceway (ACS), we recommend the installation of an electronic fish migration barrier at an effective distance upstream of the LLGS.
2. To reduce or buffer drawdown impact on the aquatic environment we recommend installing an inflatable weir upstream of the headpond and downstream of the confluence of the three major rivers that provide inflow to the LLGS headpond.
3. Recommendations 1 and 2 are to be constructed in close proximity. The range of location upstream of the headpond is to be determined in order to make it land accessible, waterway span acceptable and feasible for OPG. The electronic migration barrier is a priority.
4. All residing aquatic species in the man-made LLGS headpond must be captured and relocated upstream of the electronic migration barrier.

In support of these recommendations, we submit the following information for your consideration.

Backgrounder

Since 1963, when operations at the LLGS began, Lake Sturgeon entrainment has occurred during spring season to varying degrees, depending on the annual freshet intensity. The ACS was designed to release excess water flows by opening the bottom draw gates to release water. The sluiceway gates are left open until the freshet is completed, which is usually not until well into the month of June. Sometimes the gates are opened in the fall, depending on seasonal levels of precipitation.

The LLGS headpond has become a sustained habitat for adult Lake Sturgeon during a major part of their annual displacements. The only residency exception is during the spawning season of May or June when they migrate upstream into the major tributaries. When lethargically returning post spawn

to the man-made habitat in the headpond, Lake Sturgeon are drawn by the sluiceway current and flushed under the open gates.

Over the last 56 years a serious aquatic environmental situation has been present, where Lake Sturgeon are left stranded in pools with no possibility of escape back into their preferred habitat in the headpond above the dam or in the Mattagami River mainstream, over 35 km below the sluiceway gates. It was only in the early 1990s that the Ministry of Natural Resources (MNR) moved to force Ontario Hydro to relocate the stranded Sturgeon back into the headpond above the LLGS dam. The Department of Fisheries and Oceans (DFO) have verbally identified the waters below the ACS as unsustainable habitat for fisheries.

Just recently we received a Lake Sturgeon relocation report 19-045 from the Freedom of Information Coordinator for OPG. It shows that from 2012 to present, there have been no Lake Sturgeon reported stranded below the LLS; however, 260 Lake Sturgeon were relocated between 2004 and 2012. Why was there no relocation reported between 2012 to present?

The report also shows that from 2004 to present, a total of 2,510 Lake Sturgeon have been relocated to the LLGS headpond from both the LLS and the ACS. Previous OPG 1990 records taken from the Mattagami River Water Management Plan posted back in May of 2005 show Sturgeon relocations that surpass 5,000 to present day. The entrainment numbers if projected from the start of operations at LLGS from 1963 to 1990, when relocations started, are unknown to us at this time; however, based on the aforementioned, the numbers are likely to be staggering.

The nature of a hydroelectric generating facility is based on water flow through the turbines to produce power to the grid upon demand. During the drier season when the inflows upstream are low, the drawdown of water in the headpond can be dramatic, and the upstream reaches of the zone of influence created by the complex can go dry. These reaches extend into the confluence of the Groundhog, Kapuskasing and Mattagami Rivers. The flora and fauna of these modified ecosystems is drastically affected when drawdown conditions are extreme. Public access to water and camps on the shores of these rivers become almost inaccessible to locals during the low-flow season. These drawdown effects were studied and reported in 2006 by MNR personnel of the Kapuskasing District under guidance from MNR, Northeast Region.

Many attempts by the facility operators and managers to control drawdown and to mitigate Lake Sturgeon entrainment conditions have only been partially successful. These environmental issues remain fully unresolved to this day.

Concept Features

Electronic Migration Barrier:

With a view to the broader picture of the situation at the OPG's LMRHC, we recognized a need to offer reasonable options in the development of effective mitigation measures to support not only the survival, but an increase in Lake Sturgeon populations.

Smith-Root Inc. is an American company that has been installing electronic fish migration barriers for over 30 years. Progress in technology has proven successful for this company operating out of the State of Washington. Although they do not have a Lake Sturgeon barrier in place, they can see no reason why it wouldn't be successful and reported that,

> *In this type of application, we would recommend a graduated electronic barrier that has been set up to develop a large fright zone in a segment of the waterway where the fish can*

> *respond to the electronic field and swim away without being captured in the outfall velocities. (Smith-Root INC, February 2020)*

They also recommend a feasibility study to gain an acceptable level of confidence that fish will be deterred and not have any physiological effects.

The research paper that OPG recently submitted to us following the public information sessions held in Smooth Rock Falls and Kapuskasing, seems to be the supporting document that OPG is relying upon in their decision not to pursue more research with a low-frequency electric deterrent barrier.

> *Our results show that individuals can acclimatize to low-voltage electric fields in a relatively short time period and that larger individuals tend to be less affected by low-frequency/low-voltage electric fields than smaller fish. This would suggest that low voltage fields will not prove as effective deterrents to lake sturgeon. (Conclusion, Lake Sturgeon entrainment Research Paper published February of 2018.)*

However, upon review of the study it is clear there was a major flaw in that the testing was performed on year 1 and year 2 juvenile Lake Sturgeon in a testing environment where there was no safe zone in the tank for the fish to escape to.

> *For experimental trials, individual fish were selected from their circular holding tanks and placed in a 1-m long experimental arena which was created by sectioning off an area in the middle of the 5 m rearing troughs using plastic snow fence to prevent fish from escaping the arena. (Trial, Lake Sturgeon entrainment Research Paper published February of 2018.)*

Therefore, they were continually exposed to the low-frequency/low-voltage electrical field. When the research paper was submitted to the Smith-Root INC's project engineer, it was noted that:

> *In the study, the fish tested were placed into tanks with electrodes at each end with the result that the entire tank was electrified. There were not zones which were safe and not electrified for the fish to retreat to. Under this circumstance the behavior of the fish was not being evaluated but only the physiological reaction to electricity. Under this environment the fish have no alternative but to acclimate to the electrical fields as long as they are non-lethal. (Smith-Root INC, March 2020)*

Inflatable Weir:

Arcon-AquaPro out of London, UK, in partnership with Floecksmuhle, supplies the highest specification Rubber Dam systems available in the industry today. They have been designing; developing, manufacturing and installing custom built air-filled and water-filled Rubber Dams worldwide since 1984. These installations combined with the simplicity of design and intelligent control systems, flow control and fail-safe systems make Arcon AquaPro the most efficient and dependable weir possible. Our contact with the company informed us that even a 400 to 500 meter river span is possible.

Location:

Probably the best possible location for the installation of a 360-meter-wide electronic fish migration barrier and inflatable weir is situated between river banks upstream of the LLGS dam and headpond at the following coordinates:

- 49 degrees 56'25"N, 82 degrees 09'26.5"W
- 49 degrees 56'26.86"N, 82 degrees 09'08.20"W

Conclusion

We submit that to move forward with our recommendations, OPG could still meet the present peaking demand operations while gaining the ability to have a more environmentally sustainable and buffered upstream ecosystem. This concept would also provide a more seasonally publicly accessible watershed above the inflatable weir.

The possibility of an emergency drawdown immediately within the Little Long headpond would allow for increased power generation rates during major blackout events. Most importantly, once fishery netting and relocations above the weir are completed post-construction, Lake Sturgeon will, **as proven in the Upper Mattagami re-introduction**, adopt sustainable habitat to survive. It will also end the possibility of entrainment at the spillways of either the Adam Creek or any of the four generating facilities in the LMRHC.

We feel our recommendations provide the potential for OPG to present the most environmentally sustainable hydroelectric generation complex in all of Ontario. The investments into developing this one-of-a-kind structure would provide less costly and more effective mitigation measures to protect and improve Lake Sturgeon populations than the present efforts at annual recovery and extent of population surveys.

We look forward to your response.

Respectfully,

Laurent Robichaud
Ontario Rivers Alliance Member

Linda Heron
Chair, Ontario Rivers Alliance
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1 Haxton, T.J., and Findlay, C.S. 2008. Variation in lake sturgeon (Acipenser fulvescens) abundance and growth among river reaches in a large regulated river. Canadian Journal of Fisheries and Aquatic Sciences. 65: 645-657.
2 Golder Associates Ltd. 2011. Recovery Strategy for Lake Sturgeon (Acipenser fulvescens) – Northwestern Ontario, Great Lakes-Upper St. Lawrence River and Southern Hudson Bay-James Bay populations in Ontario. Ontario Recovery Strategy, Series. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario. vii + 77 pp.
3 MacGregor, R., Casselman, J., Greig, L., Dettmers, J., Allen, W.A., McDermott, L., and Haxton, T. 2013. Recovery Strategy for the American Eel (Anguilla rostrata) in Ontario. Ontario Recovery Strategy Series. Prepared for Ontario Ministry of Natural Resources, Peterborough, Ontario. x + 119 pp. P-45.

[4] *Pratt, T.C and Mathers, A. 2011. 2010 Update on the status of American Eel (Anguilla rostrata) in Ontario. Canadian Science Advisory Secretariat, Research Document 2011/050, Central and Arctic Region, Fisheries and Oceans Canada. 18 pp.*
[5] *Hildebrand, L. R. and Parsley, M. 2013. Upper Columbia White Sturgeon Recovery Plan – 2012 Revision. Prepared for the Upper Columbia White Sturgeon Recovery Initiative. 129 pp. + 1 app. Online: www.uppercolumbiasturgeon.org.*
[6] *Middle Columbia River Steelhead Recovery Plan 2009.*
[7] *Kondolf, G.M., E.W. Larsen, and J.G. Williams. 2000. Measuring and modeling the hydraulic environment for assessing instream flows. North American Journal of Fisheries Management 20: 1016-1028.*
[8] *Haxton, T.J. and Findlay, C.S. 2009. Variation in large-bodied fish community structure and abundance in relation to water management regime in a large regulated river. Journal of Fish Biology. 74: 2216-2238.*
[9] *Golder Associates Ltd. 2011. Recovery Strategy for Lake Sturgeon (Acipenser fulvescens) – Northwestern Ontario, Great Lakes-Upper St. Lawrence River and Southern Hudson Bay-James Bay populations in Ontario. Ontario Recovery Strategy, Series. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario. vii + 77 pp.*
[10] *Cada, G.F. 1998. Better science supports fish-friendly turbine designs. Hydro Review. November 1998: 52-61.*
[11] *Golder Associates Ltd. 2011. Recovery Strategy for Lake Sturgeon (Acipenser fulvescens) – Northwestern Ontario, Great Lakes-Upper St. Lawrence River and Southern Hudson Bay-James Bay populations in Ontario. Ontario Recovery Strategy, Series. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario. vii + 77 pp.*
[12] *Haxton, T.J., and Findlay, C.S. 2008. Variation in lake sturgeon (Acipenser fulvescens) abundance and growth among river reaches in a large regulated river. Canadian Journal of Fisheries and Aquatic Sciences. 65: 645-657.*
[13] *Golder Associates Ltd. 2011. Recovery Strategy for Lake Sturgeon (Acipenser fulvescens) – Northwestern Ontario, Great Lakes-Upper St. Lawrence River and Southern Hudson Bay-James Bay populations in Ontario. Ontario Recovery Strategy, Series. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario. vii + 77 pp.*