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Submission on the Consultation for engagement on a potential Aquaculture Act (the "Act")
Section: Finfish production in the Great Lakes

The Georgian Bay Association (GBA) is an umbrella organization for 19 community associations along the east and north shores of Georgian Bay, representing around 3,000 families. We have been advocating on behalf of our land-owning members for over 100 years and estimate that we reach around 18,000 residents of the Georgian Bay. Our mandate is to work with our water-based communities and other stakeholders to ensure the careful stewardship of the greater Georgian Bay environment.

GBA is grateful for the invitation to submit our comments on the proposed federal Aquaculture Act. Our comments are primarily confined to the open net cage aquaculture industry in Georgian Bay and the North Channel of Lake Huron (the "Industry").

Our concerns fall under four areas, as follows:

Part A: The Act must recognize that the risks associated with freshwater cage aquaculture differ from the risks associated with marine cage aquaculture. Therefore, the Act should ensure that freshwater cage aquaculture is subject to different regulations than those that apply to marine cage aquaculture.

Part B. The Act should distinguish between waterbodies subject to Canadian only policies and regulations and those subject to international agreements. Policy and regulation of open net cage aquaculture within international waters, such as the Great Lakes, should be governed by the Boundary Waters Treaty (through the International Joint Commission, IJC), and the Great Lakes Water Quality Agreement (GLWQA). The Industry also needs to comply with the revised Canada-Ontario Agreement; Canada's revised Fisheries Act (specifically Sections 35 and 36) and the UN's Technical Guidelines for Aquaculture Certification, specifically Sections 37 to 50, *Environmental Integrity* (UN Guidelines).

Part C. The Act should examine phosphorous load limits as defined in the GLWQA and the work of the IJC and distinguish between the risks/impacts of nearshore and offshore locations for cage aquaculture in the Great Lakes.

Part D. The Act and regulations should ensure that license applications and renewals for aquaculture operations comply with UN Guidelines, the Boundary Waters Treaty, the GLWQA and the revised Fisheries Act (Bill C-68), with particular emphasis on ensuring that the Industry operators are certified as being compliant after demonstrating that their operations are sustainable. The Provinces should also adopt these standards.

In this submission there are specific attachments referenced that are organized and available on the GBA website at this link: https://georgianbay.ca/fisheries/cage-aquaculture-issue/cage-aquaculture-submissions/ as follows:

- Attachments A, B …J relate to the main body of the text of this submission; and
- The GBA Submission to Senate Committee Bill C68 Mar 31 2019 and its attachments, 1, 2, …26.

A list of all these attachments can be found in Appendix 12 below.

Part A: Freshwater cage aquaculture requires different regulations

A freshwater system is completely different from a saltwater marine coastal environment. The limiting nutrient in freshwater lakes is phosphorus, whereas the limiting nutrient in a marine salt-water environment is nitrogen. In addition, the marine environment consists of tides that facilitate tidal mixing and associated strong currents which disperse pollutants such as fish waste, excess feed, antibiotics and pesticides used in the farming of fish over a much wider area, whereas the relatively static lacustrine environments of freshwater systems result in a much higher sensitivity to aquaculture and its environmental impacts. These impacts are summarized below and include but are not limited to:

- assimilation of nutrients resulting in hypoxia;
- disruption of fish habitat through depletion of dissolved oxygen below the levels tolerated by fish and the benthic organisms that they feed on;
- nutrients added by aquaculture can stimulate the growth of nuisance and potentially toxic algae in freshwater, including blue-green algae (cyanobacteria) and other hazardous algal blooms; and
- large spills of fish escaping the net pens due to breakage from violent storm and ice action.

We are pleased to see that Canada's modernized Fisheries Act received Royal Assent and became law on June 21, 2019. Our position is that freshwater cage aquaculture causes:

- cumulative deleterious and harmful alteration and disruption of fish habitat;
- far-field ecosystem disruptions from the use of antibiotics, pesticides and chemicals in the production process; and
- harm to wild fish stocks because the tens of thousands of inevitable fish escapements of the domestically reared fish, specifically bred to be voracious eaters and fast growers, compete for both food and habitat when released into the wild.

Further information that supports GBAs contentions on the impacts of the Industry listed above and the resultant harm caused to ecosystems are set out in this submission. As per the conclusions of Attachment A: *Uni of Guelph Review-of-Aquaculture_2017* (see Appendix 12) there has been little published information provided by DFO, or other scientific studies, to prove that freshwater cage aquaculture does not have the above impacts.

Even in the marine aquaculture sector, a recent 10-year study conducted at the finfish aquaculture facility in Port Mouton Bay, Nova Scotia (see Appendix 2) suggests that there is no evidence to support government narratives about the sustainability of finfish aquaculture in Canada. The report suggests that current regulations are not sufficient to cover the wide range of potential impacts on other species and the aquatic ecosystem. Simply claiming that assimilation of the fish waste matter by the receiving waters means that the Industry's practices are sustainable is incorrect, as this has not been proven (see: *Attachment A: Uni of Guelph Review-of-Aquaculture_2017* referenced in Appendix 12). The solution to pollution is not dilution.

Should the government insist on continuing to permit the Industry to operate within Georgian Bay/Lake Huron and the Great Lakes, it should only be conducted in offshore regions that, as a result of invasive zebra and quagga mussels, have become depleted of nutrients and can assimilate a controlled portion of the fish waste, so long as that is closely monitored.

Canada is a signatory to United Nations conventions on sustainable development and has entrenched sustainability goals in legislation and policies relating to natural resource sectors including aquaculture. Monitoring and measuring progress towards sustainable development requires the development of sustainability indicators (SI) that, when measured, indicate movement towards or away from a stated policy objective, as well as providing the public with a measure of government accountability. This has not been the case for cage aquaculture in fresh waters.

The DFO's National Aquaculture Strategic Action Plan Initiative 2011-15 ("NASAPI"), see Attachment J *NASAPI action plan 2011-2015* (Appendix 12), had the following objectives:

1. Maintaining healthy and productive aquatic ecosystems as a condition for aquaculture development;
2. Operational and regulatory transparency;
3. Consumer and stakeholder confidence; and
4. A prosperous aquaculture sector that generates meaningful employment, attracts investment, and advances sector stability.

GBA submits that these objectives have not been met with regard to the Industry. See both Appendix 2 and the following extract from our September 4, 2019 Response to the Draft Canada-Ontario Agreement on Great Lakes Water Quality and Ecosystem Health, 2020 ("COA") provides background information that demonstrates the extent to which these objectives have not been met:

GBA COA Submission Extracts

GLWQA and COA clearly define the need to reduce nutrient loading, particularly in nearshore waters where algae blooms are on the increase, and yet Ontario allows open net cage aquaculture operations which directly add nutrients into the nearshore waters of Georgian Bay and the North Channel of Lake Huron.

Ontario is the ONLY Province or State within the Great Lakes that permits this free use of public waters for intensive monoculture fish farming that disperses the fish feces, and excess feed (sometimes containing antibiotics and pesticides) into the receiving waters disrupting the natural balance of the aquatic ecosystem. These nutrients and chemicals are assimilated into the surrounding water body and the cumulative effects, such as increased algae blooms (some toxic as shown in the photos below), are yet to be determined.

Picture taken by a resident in August 2019.
Ontario has yet to revoke the license for this fish farm despite these regular algae outbreaks and the clear evidence from Ontario's Ministry of Environment that the fish farm is responsible.

This picture is from a research report conducted by Kelly Amber Hille in 2008 at Lake Wolsey, an embayment of the North Channel of Lake Huron.
Over the years there have been regular outbreaks of blue green algae at this fish farm - 1999, 2006, 2010, 2011, 2013, and every year from 2015 to 2019. The trend is clear – the deterioration of these waters is accelerating.

Canada has the ultimate jurisdiction over these waters and should not be allowing this practise to continue, but should instead, with Ontario, require this industry to move into fully sustainable enclosed facilities. Both Ontario and Canada have specific responsibilities under GLWQA and COA to reduce nutrient loading where possible. Neither are living up to these responsibilities if they continue to allow non-sustainable open net cage aquaculture operations **without** any requirement to move these operations into fully sustainable enclosed facilities.

In fact, both Ontario and Canada are encouraging the open net industry to expand both in Lake Huron and into Lake Superior. Since alternative, fully sustainable enclosed methods of growing fish (see below) are readily available to this industry, this nutrient loading poses an unnecessary risk to water quality, because it could be avoided.

In this respect we have learned, in public presentations (see Attachment B: *Ontario Aquaculture Research Priorities Roundtable 2019* - Appendix 12), that the open net cage aquaculture industry in Georgian Bay and the North Channel has already grown from 4,000 metric tonnes per annum (mtpa) of annual production to ~6,000 mtpa, and aims to grow the industry in Lake Huron and Lake Superior to between 30,000 and 50,000 mtpa over the next ten years."

We therefore ask both Canada and Ontario to determine what the growth of this industry may mean in the context of compliance with the terms of GLWQA and COA, given the high risk to water quality and native fish populations and habitat.

Furthermore:

- Ontario proposes to renew all the current open net cage licenses in 2020 for a period of 20 years from the current 5-year renewals. **No public consultation has been permitted regarding this proposal.** See: https://ero.ontario.ca/notice/013-5097
- License renewals for open net cage operations are subject to only a Category A Class Environmental Assessment (EA) which is the lowest category. Category A means that: there is no public concern (GBA has repeatedly confirmed the concerns of the ~18,000 Georgian Bay residents about this industry for over 20 years); and the environmental impacts are negligible (blue green algae outbreaks, and escapees impacting native fish populations and habitat, are just two of the many documented negative environmental impacts from fish farms that Ontario is well aware of). This should be changed to a Category C before the 2020 renewals are completed, to allow for a full environmental assessment appropriate to the public concerns and known impacts, and allow for a public consultation process that is appropriate to the risks associated with open net cage aquaculture operations in freshwater lakes.

  GBA was called in to participate in meetings and the drafting of the *Provincial Policy Objective for Managing the Effects of Cage Aquaculture Operations on the Quality of Water and Sediment in Ontario Waters.* The Ontario Ministry of Environment, Conservation and Parks (MECP) finalized this document on August 29, 2019. It was first put on the Registry in 2016, see: https://ero.ontario.ca/notice/012-7186.

  GBA is reviewing the document that MECP depicts as ensuring that the open net cage aquaculture operations will now be sustainable. Given the previous closure of two of these operations and the need to now close a third, and the US determination that this industry poses an unacceptably high risk to Great Lakes water quality (see below), we question the use of the term "sustainable" in this context.
- Conversely, land based fully sustainable enclosed methods of growing fish, such as the newer Recirculating Aquaculture Systems (RAS) and Aquaponic technologies, and the older pond and flow-through methods, are required to obtain Environmental Compliance Approval from MECP.

Recommendation: Canada and Ontario should work together to phase out open net cage aquaculture operations in Georgian Bay and the North Channel and support their move into sustainable enclosed systems.

In this context it is important to note the following:

- Two open net cage aquaculture operations off the north-east coast of Manitoulin island in Georgian Bay were closed by Ontario in past years due to severe water quality degradation including blue green algae (See Appendix 1 for details of blue green algae effects), and/or hypoxic conditions of the receiving waters, and a third should be closed without delay:
  - **Closed:** La Cloche Channel where the undesirable anoxic (low oxygen) condition of the water was attributed to this operation and was documented by Hamblin and Gale (2002), Clerk et al. (2004) and within the Environment Commissioner of Ontario's reports to the Ontario legislature;
  - **Decommissioned:** Grassy Narrows, where Milne (2008) documented that it took approximately nine years, after operations ceased in 1999, for most of the accumulated fish deposits and excess feed to dissipate and that some detectable deposits of fish manure on the lakebed near the cage location still remained. Close to one third of the phosphorus occurring in the surrounding waters was attributed to this fish farm; and
  - **Lake Wolsey**, an embayment of the North Channel on Manitoulin Island, has had annual blue green algae blooms every year since 2010 (except 2014) and should be closed without delay. Two Ontario Ministry of the Environment reports confirm that these outbreaks are attributable to the open net cage aquaculture operation in this bay. These 2016 MOE reports are: THE STATE OF LAKE WOLSEY WATER QUALITY DYNAMICS and THE STATE OF LAKE WOLSEY PART II: SOURCE LOADING ASSESSMENT, both by Ngan Diep and Duncan Boyd, Environmental Monitoring and Reporting Branch, Water Monitoring and Reporting Section, Ontario Ministry of Environment and Climate Change (MOECC). The main findings of these reports were that the aquaculture operation is contributing around 45% of the phosphorous input into this bay, and wide-spread hypolimnetic anoxia was being caused as the result of this input exceeding the capacity of the bay to absorb these nutrients.

    Please also see the GBA press release on this matter earlier this year and recent posting of algae pictures at Lake Wolsey from early August, here: https://georgianbay.ca/gba-is-calling-for-the-closure-of-fish-farm-on-lake-wolsey/ and here: https://georgianbay.ca/news/fish-farm-algae-and-potential-threat-to-pets
- The State of Michigan recently conducted a detailed review after fish farmers applied for open net licenses in Lake Michigan. They concluded that this industry posed too great a risk to water quality. As a result, no US Great Lakes state allows open net fish farms. See Attachment C: *Michigan Ministries Report to not permit cage aquaculture March 2016* (see Appendix 12) and Appendix 6 for more details.

Here are the relevant conclusions reached by Michigan that can be found at the end of this report:

> *"The Michigan QOL agencies do not recommend pursuing of commercial net-pen aquaculture in the Great Lakes at this time for the following reasons:*
>
> - *Given the ecological and environmental risks and uncertainties, as pointed out by the Science Panel and with further information provided through public input, commercial net-pen aquaculture would pose significant risks to fishery management and other types of recreation and tourism. Furthermore, both collaborating management interests and tribal nation interests would likely not agree to Michigan moving forward and pose a significant challenge in any attempts to do so.*
>
> ……
>
> *While not recommending the pursuit of commercial net-pen aquaculture in the public waters of the Great Lakes, the state can and will continue to work within existing authorities to assist the industry in development of well-designed flow through, closed and recirculating aquaculture facilities."*

Finally, it should be noted that this industry does not have remediation provisions for the private operators to address the environmental degradation caused by the fish farm in the event that an operation is closed down. As noted above two sites have already been closed and it is likely that a third will follow shortly. The cost to Ontario to remediate these sites is likely to outweigh the financial support Ontario and Canada could provide to move the current operations into sustainable facilities. GBA would suggest that not remediating closed sites is inconsistent with the provisions of both GLWQA and COA. So why continue to allow this avoidable non-point source nutrient loading, which poses such an unnecessary risk to water quality and ecosystem health and a potential financial loss to government?

Why do Canada and Ontario insist on allowing this industry when the US states have determined that the risks to water quality are too high to permit it, following thorough scientific research on those risks?

How is this divergence consistent with the GLWQA under which both countries are supposed to work together to improve water quality and reduce the risks to water quality?

Given the above, why do Canada and Ontario insist on encouraging this industry to expand, provide them with free access to public waters and a free license to dump nutrients, pharmaceuticals and escapees into public waters, without any remediation performance bond to address the long-term impacts?

It is not only GBA who have been expressing concern on the impacts of this industry. Please see the attached synthesis of former Environmental Commissioner for Ontario Gord Miller's annual reports to the Ontario Legislature: Attachment D: *Excerpts from ECO (2000-2006) revolving issues* (see Appendix 12), which explains many of the issues that are still relevant today.

Recommendation: Given the determination by the US Great Lakes states that open net cage aquaculture operations pose too high a risk to water quality, and given the terms and intent of the Great Lakes Water Quality Agreement, Canada should cease their support for this industry, and Canada and Ontario should reflect this decision in GLWQA and COA.

Recommendation: Canada should reverse the exemption afforded the open net cage aquaculture operations in Georgian Bay and the North Channel from the section of the Federal Aquaculture Regulations Act 2015 Act, an Annex of the Fisheries Act, which forbids the harmful alteration, disruption or destruction of fish habitat (HADDS).

In addition, the net cages are frequently damaged by storms, ice movements and vandalism allowing the rainbow trout to escape by the tens of thousands into the ecosystem, impacting both habitat and the natural sources of food for other wild species of fish. The farmed rainbow trout are selectively bred to be voracious eaters that grow fast to maturity for harvesting. Furthermore, reports given to us by anglers say they have been spotted in creeks and stream areas during the spawning season. They are reported to be triploid (unable to reproduce) but it is suspected they are there to eat the fry of other fish, because they are a carnivorous salmonid breed. Whilst no definitive studies have been done, the anecdotal evidence is that these escapees do substantial harm to the native fish populations and reduce the effectiveness of government programs to increase native fish populations.

Recommendation: Canada and Ontario should fully assess the negative environmental impacts on water quality, aquatic biota, and fish habitat from open net cage aquaculture operations in Georgian Bay and the North Channel, including the impact of rainbow trout that escape from the nets, before they continue to support this industry and its expansion plans.

[end of extract of COA submission]

Based on the above, the failures to meet NASAPI objectives can be summarized as follows:

1. Maintaining healthy and productive aquatic ecosystems as a condition for aquaculture development

The most striking examples that aquatic ecosystems have been adversely affected in Georgian Bay and the North Channel is the closure of two operations as noted above, and the need to close Lake Wolsey forthwith. Given the length of time it took to address the two closed sites and the failure to date to close Lake Wolsey, it is clear that neither Ontario nor Canada actually know what impact the Industry is having on aquatic ecosystems from not only nutrient loading, but also escapees and pharmaceuticals in feed and chemicals from net cleaning entering the water, given the lack of any comprehensive studies of these issues.

Therefore, neither Canada nor Ontario can confirm that the Industry has maintained the aquatic ecosystems in which they operate in a healthy and sustainable state. This should be done before any future growth of the Industry is permitted.

In this respect, GBA notes that a useful tool for both Canada and Ontario to improve their knowledge of the impact that the Industry nutrient loading is having would be the International Joint Commission endorsed SPARROW (SPAcially Referenced Regression On Watershed attributes), see: https://ijc.org/en/what/iwi/sparrow This is a watershed modelling application that can give insight into human practices that are compounding the total amounts of nitrogen (TN) and phosphorus (TP) that enter the receiving lakes. Some relevant excerpts from SPARROW are set out in Appendix 8.

2. Operational and regulatory transparency

The recent moves by Ontario to block public consultation on relaxing key regulations for the Industry, as above, combined with the difficulties we have had over the last year in getting answers to questions from the Ontario government, are not good indications of operational and regulatory transparency. There needs to be a clear confirmation from government as to the gaps in their knowledge of the ecosystem impacts as per 1. above, how they intend to address this and how they will hold the Industry accountable to comply with international standards, such as Attachment E: *UN Guidelines, Aquaculture Certification 2019* (see Appendix 12).

3. Consumer and stakeholder confidence

GBA has received reports that fish grown at Lake Wolsey needed to be destroyed rather than processed for consumers, due to liver damage presumably caused by the cyanobacteria outbreaks at Lake Wolsey (see above). And, despite all the numerous letters GBA submitted to governments detailing our many concerns, each time the Industry submits license and land use renewal applications, both Canada and Ontario continue to claim that the Industry has a social license for its use of Great Lakes waters. We strongly disagree. Accordingly, there is a clear lack of stakeholder confidence. Further, consumer confidence in the end product (rainbow trout sales to retail stores and restaurants), is vulnerable should buyers become aware that the Industry's operations are not sustainable.

4. A prosperous aquaculture sector that generates meaningful employment, attracts investment, and advances sector stability

In Ontario almost all efforts to grow the aquaculture sector have been focused on the Industry, with very low advancement in the growth of the land based, sustainable, enclosed methods of growing fish, such as the newer Recirculating Aquaculture Systems (RAS) and Aquaponic technologies, and the traditional pond and flow-through methods. To establish a stable, prosperous industry, it needs to be put on a sound, sustainable footing. GBA submits that the sustainability issues associated with the Industry make it inherently unstable, and consideration should therefore be given to moving the Industry into sustainable closed containment facilities. Industry development efforts should be focused on sustainable technologies that are proving to be financially viable, and that offer attractive investment and long-term employment opportunities that are not inherently unstable.

Part B. The Act should distinguish between waterbodies: those subject to Canadian only policies and regulations; and those subject to international agreements. Policy and regulation of open net cage aquaculture within international waters, such as the Great Lakes, should be governed by the Boundary Waters Treaty (operations of the International Joint Commission, IJC), and the Great Lakes Water Quality Agreement (GLWQA). The Industry also needs to comply with: the revised Canada-Ontario Agreement; Canada's revised Fisheries Act (specifically Sections 35 and 36); and the UN's Technical Guidelines for Aquaculture Certification, specifically Sections 37 to 50, *Environmental Integrity.*

The above **GBA COA Submission Extracts** and the Attachment C: *Michigan Ministries Report to not permit cage aquaculture March 2016* (see Appendix 12) provide information on the reasons why the Industry is not permitted on the US side of the Great Lakes, and why GBA believes that the Industry does not comply with the GLWQA and the Fisheries Act.

The table below details why GBA submits that the Industry fails to comply with the **UN Guidelines**. Our comments relate to the Environmental Integrity section of the Guidelines and the referenced clauses.

Clause	UN Guideline	Non-Compliance
37	Aquaculture should be planned and practiced in an environmentally responsible manner, in accordance with appropriate local, national and international laws and regulations.	For the reasons set out above and elsewhere in this submission GBA submits that the Industry is not practiced in an environmentally responsible manner, and does not comply with either the GLWQA, the Boundary Waters Treaty, or the Fisheries Act.
38	Aquaculture certification schemes should encourage restoration of habitats and sites damaged by previous uses in aquaculture.	There is no requirement for the Industry to post any form of remediation bond in order to finance restoration of habitats and ecosystems damaged by Industry operations that have caused significant harm and have been closed. No effort was made to clean up the sites at La Cloche Channel and Grassy Narrows (see above). Furthermore, the closure of the aquaculture operation at Lac Heney in Quebec in 2007 and subsequent rehabilitation demonstrates clearly why this failure to hold the Industry accountable for restoration is highly irresponsible, and puts the government and taxpayers at risk for restoration costs that can be very substantial. See Attachment F: *NALMS Lake Heney Presentation* and *Attachment F1: Memo on Lac Heney Rehabilitation 2007* (see Appendix 12). It should also be noted that Lac Heney is the reason why the Quebec government does not permit open net cage operations in their freshwater lakes. [see also Appendix 11 for more information on Lac Heney.]

39	Aquaculture can impact on the environment and aquaculture certification schemes should ensure these impacts are identified and adverse impacts are managed or mitigated to an acceptable level in accordance with local and national laws. Whenever possible, native species should be used for culture and measures should be taken to minimize unintentional release or escape of cultured species into natural environments.	Please see Attachment G: *GBA letter to MOE re Class EA RSFD Nov 13, 2018* (see Appendix 12) which sets out GBA's concerns on the Environmental Assessment (EA) requirements for the Industry and why GBA considers them to be inadequate. Since that letter was written there has been another major escape at the Depot Harbor fish farm in Georgian Bay – apparently over 70,000 or more rainbow trout, some of which were seen in nearby spawning rivers and streams. Please also see the relevant section in **GBA COA Submission Extracts** above for more details of GBA concerns regarding escapees competing for food and habitat with native species.
40	Management practices that address environmental impacts of aquaculture differ substantially for different types of scale of aquaculture and for different aquaculture farming systems. Certification schemes should not be overly prescriptive, but set measurable benchmarks that encourage improvement and innovation in environmental performance of aquaculture.	This supports the GBA position that different regulations are required for freshwater aquaculture operations, in particular for the Industry – open net cage operations in the Great Lakes, which are also subject to the GLWQA. See Part A above. GBA is in the process of reviewing Attachment H: *MECP Environment Policy Objectives for Cage Aquaculture - August 2019* (see Appendix 12) to determine if the referenced benchmarks are appropriate, and if there are any shortcomings or omissions. GBA suggests that the IJC's SPARROW (see Appendix 8) may be useful for establishing measurable benchmarks and lake-wide impacts from the Industry.
41	Certification schemes may consider application of the "precautionary approach" in accordance with the relevant provisions of the Code of Conduct for Responsible Fisheries.*	As per Part A above, GBA maintains that there is insufficient scientific research to demonstrate that the Industry does no damage to the aquatic environment. The only conclusive evidence is that significant harm has been done at the two closed sites, and now at Lake Wolsey. Therefore, both Canada and Ontario should take measures to "conserve target species, associated or dependent species and non-target species and their environment". The optimum method of exercising this precautionary approach in relation to the Industry would be to move the Industry into sustainable enclosed facilities.

* *"States and sub-regional and regional fisheries management organizations should apply a precautionary approach widely to conservation, management and exploitation of living aquatic resources in order to protect them and preserve the aquatic environment, taking account of the best scientific evidence available. The absence of adequate scientific information should not be used as a reason for postponing or failing to take measures to conserve target species, associated or dependent species and non-target species and their environment."*

42	In undertaking risk analysis, risks should be addressed through a suitable scientific method of assessing the likelihood of events and the magnitude of impacts, and take into account relevant uncertainties. Appropriate reference points should be determined and remedial actions taken if reference points are approached or exceeded.	GBA sees no evidence that this approach is being taken by Canada or Ontario in relation to the Industry. We recommend that this methodology is included as a requirement for regulating the entire aquaculture industry in Canada in the Aquaculture Act. The IJC's SPARROW model method could provide a more accurate documentation of the impacts associated with the Industry's nitrogen and phosphorus loadings.
43	Certification schemes should endeavor to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment. *Based on Principle 16 of the Rio Declaration on Environment and Development, June 1992.*	See comments on 38 above. This is not being done and GBA recommends that specific provisions in this respect be incorporated in the Aquaculture Act for the entire aquaculture industry in Canada. However, with regard to the Industry, there needs to be separate and distinct requirements for posting a restoration bond as part of licensing requirements that ensures that the polluter bears the cost of pollution.
Minimum substantive criteria for addressing environmental integrity in aquaculture certification schemes:		
44	Environmental impact assessments should be conducted, according to national legislation, prior to approval of establishment of aquaculture operations.	See Attachment G: *GBA letter to MOE re Class EA RSFD Nov 13, 2018* (Appendix 12) for GBA input on the shortcomings of the Environmental Assessment process for the Industry.
46	Evaluation and mitigation of the adverse impacts on surrounding natural ecosystems, including fauna, flora and habitats should be carried out.	As advised above GBA is reviewing the recently released Attachment H: *MECP Environment Policy Objectives for Cage Aquaculture - August 2019* (see Appendix 12) to ensure that the evaluation and mitigation measures are sufficient.

47	Measures should be adopted to promote efficient water management and use, as well as proper management of effluents to reduce impacts on surrounding land, and water resources should be adopted.	The Industry does not manage effluents from the operations but allows effluents to be released directly into the surrounding water body. This results in an accumulation of nutrients under the cages and nutrient loading in nearby waters. Therefore, no effort is made to reduce impacts on the surrounding water resources.
50	With reference to paragraph 9.3.1 of the Code of Conduct for Responsible Fisheries, where genetic material of an aquatic organism has been altered in a way that does not occur naturally, science-based risk assessment should be used to address possible risks on a case-by case basis. Induction of polyploidy is not included.	Rainbow trout grown by the Industry are selectively bred to be voracious eaters for more rapid growth. When these trout escape from the cages, they compete with the native fish species, for habitat and prey. The risk of escapes has increased significantly with climate change impacts as above. GBA is unaware of any follow-up by government on these major escapes, to carry out science-based risk assessment to address possible risks on a case-by case basis.
51	Infrastructure construction and waste disposal should be conducted responsibly.	As above the Industry has no waste disposal arrangements in place and the net cages are highly vulnerable to being damaged by storm actions and ice movements.
52	Feeds, feed additives, chemicals, veterinary drugs, including antimicrobials, manure and fertilizer, should be used responsibly to minimize their adverse impacts on the environment and to promote economic viability.	The Industry has taken steps to minimize feed additives, including veterinary drugs and antimicrobials. However, GBA is reviewing the recently released Attachment H: *MECP Environment Policy Objectives for Cage Aquaculture - August 2019* (see Appendix 12) to ensure that it contains sufficient provisions for reporting on feed additives, chemicals used to clean the nets, and how the nets are cleaned, in order to ensure that these practices have no adverse impacts on the environment.

Further, the Industry appears not to comply with certain provisions of the new Fisheries Act. Please see: https://georgianbay.ca/fisheries/cage-aquaculture-issue/cage-aquaculture-submissions/ for the *GBA Submission to Senate Committee Bill C68 Mar 31 2019* and related attachments for details (see Appendix 12).

GBA has also observed the unequal treatment on EA requirements for land based fully sustainable enclosed methods of growing fish, which are required to obtain Environmental Compliance Approvals, and the EA requirements for the Industry, see Attachment G: *GBA letter to MOE re Class EA RSFD Nov 13 2018* (see Appendix 12). The Aquaculture Act should ensure that the EA requirements of the provinces for freshwater open net pen operations are as stringent as those for land based fully sustainable enclosed methods, particularly with regard to complying with effluent regulations under respective Environmental Protection Acts. The waters of the Great Lakes ought not to be used for their "assimilation capacity" for nutrients from the Industry.

Part C. The Act should examine phosphorous load limits as defined in the GLWQA and the work of the IJC and distinguish between the risks/impacts of nearshore and offshore locations for cage aquaculture in the Great Lakes.

Please see the *GBA Submission to Senate Committee Bill C68 Mar 31 2019* and its attachments (see Appendix 12), which include information on the risks associated with excess nutrient loading in the nearshore waters of Georgian Bay and the North Channel of Lake Huron for Industry operations. As above these risks are amply demonstrated by the experience at the two closed sites and at the Lake Wolsey operation. Industry operations require road access and are therefore located in nearshore waters. An offshore location (i.e. water access only) would likely be highly vulnerable to cage damage from wave/ice action and therefore escapes, and would face significant operational management issues, and logistical challenges. However nutrient loading will likely have less impact in any offshore location. Therefore, the risks and impacts are different for nearshore vs offshore locations and this must be addressed in the Act.

In addition, it is necessary to distinguish between those freshwater bodies having high sedimentation rates combined with high flushing rates from water bodies that have low sedimentation rates and long flushing times. Lake Diefenbaker (North et al. 2015)* is suited to aquaculture since any phosphorus not buried by its high sedimentation rate is flushed out of the lake with flushing rates in the order of months. Lakes not suited to aquaculture are similar to such water bodies as Lake Huron since it has low sedimentation rate (Kemp et al., 1974)** and long flushing times in the order of decades.

* L North, J. Johansson, D. M Vandergucht, L.E Doig, K. Liber, KE Lindenschmidt, H. Baulch, J. J Hudson, 2015. Evidence for internal phosphorus loading in a large prairie reservoir (Lake Diefenbaker, Saskatchewan). J. Great Lakes Research Vol. 41, pp91-99

** A. L. W. Kemp, T.W.Anderson, A. Mudrochova 1974. Sedimentation rates and sediment history of Lakes Ontario, Erie and Huron.
J. Sedimentary Research. 44(1)

Recommendation: Sedimentation and flushing rates should be taken into account in determining which freshwater systems should allow open net pen aquaculture operations, and where it should not be permitted. The same determinations should be made when considering whether or not to permit expansion of this industry in any freshwater system.

Part D. The Act and regulations should ensure that license applications and renewals for aquaculture operations comply with UN Guidelines, the Boundary Waters Treaty, the GLWQA and the revised Fisheries Act (Bill C-68), with particular emphasis on ensuring that the Industry operators are certified as being compliant after demonstrating that their operations are sustainable. The Provinces should also adopt these standards.

Please see the above section: **GBA COA Submission Extracts**, which arrives at the above conclusion and provides recommendations in this respect.

The Industry should not be granted any exemptions to full compliance with the UN Guidelines, the GLWQA and the revised Fisheries Act (Bill C-68). Accordingly, the MECP Environment Policy Objectives for Cage Aquaculture - August 2019 regulations for the Industry may need to be revised to reflect compliance and to remove any implied or actual exemptions. GBA is in the process of reviewing these regulations and would like to follow up on this matter with DFO once we have completed our review.

In order to ensure compliance, GBA recommends that Industry operators be required to be certified as compliant with the standards noted above. This would normally require an intensive third-party audit, leading to certification.

Ongoing monitoring of compliance is critical. Responsibility for most monitoring and testing processes should be delegated to the Industry based on standards and guidance provided by Government. Monitoring and testing programs must be subject to regulatory oversight. In Ontario this would be done by MNRF and MECP, but the associated regulations must be based on legislation, regulations and standards set by Canada. See Appendix 7 for a summary of the Ontario regulatory environment and Appendix 9 for details of the application process.

GBA has significant concerns with approval and promotion of the planned growth of the Industry from the current 6,000 mtpa (metric tonnes per annum) up to 50,000 mtpa (see Attachment B: *Ontario Aquaculture Research Priorities Roundtable 2019 -* Appendix 12). Before such plans are approved by Government, sufficient research should be completed to establish all the environmental impacts of the current operations, particularly following the clear evidence of catastrophic impacts at the two closed sites and, currently, at Lake Wolsey.

In addition, very little regard has been given to First Nation rights over these waters, which the Anishinaabe refer to as *Sacred Waters.* Therefore, consultation with First Nations should be carried out with respect to both the contents of this submission and other relevant matters.

Summary

GBA's recommendations to DFO regarding the proposed Aquaculture Act are summarized in this list:

General Recommendations:

G-1: The following methodology should be included as a requirement for regulating the entire aquaculture industry in Canada in the Aquaculture Act: *In undertaking risk analysis, risks should be addressed through a suitable scientific method of assessing the likelihood of events and the magnitude of impacts, and take into account relevant uncertainties. Appropriate reference points should be determined and remedial actions taken if reference points are approached or exceeded.*

G-2: Certification schemes should endeavor to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment.

G-3: The following minimum substantive criteria for addressing environmental integrity should be incorporated in aquaculture certification requirements:

- Environmental impact assessments should be conducted, according to national legislation, prior to approval of establishment of aquaculture operations;
- Evaluation and mitigation of the adverse impacts on surrounding natural ecosystems, including fauna, flora and habitats should be carried out; and
- Measures should be adopted to promote efficient water management and use, as well as proper management of effluents to reduce impacts on surrounding land, and water resources should be adopted.

G-4: With reference to paragraph 9.3.1 of the Code of Conduct for Responsible Fisheries, where genetic material of an aquatic organism has been altered in a way that does not occur naturally, science-based risk assessment should be used to address possible risks on a case-by case basis.

G-5: Consultation with First Nations should be carried out with respect to both the contents of this submission and other relevant matters.

Recommendation of Part A. The Act must recognize that the risks associated with freshwater cage aquaculture differ from the risks associated with marine cage aquaculture. Therefore the Act should ensure that freshwater cage aquaculture is subject to different regulations than those that apply to marine cage aquaculture.

A-1: Canada should reverse the exemption afforded the open net cage aquaculture operations in Georgian Bay and the North Channel from the section of the Federal Aquaculture Regulations Act 2015 Act, an Annex of the Fisheries Act, which forbids the harmful alteration, disruption or destruction of fish habitat (HADDS).

A-2: Growth efforts for the freshwater aquaculture industry in Canada should be focused on sustainable closed containment technologies that have proven to be financially stable, and which offer attractive investment and long-term employment opportunities.

A-3: With regards to fish escapes in the Industry, government should carry out science-based risk assessment to address possible risks on a case-by case basis.

Recommendation of Part B. The Act should distinguish between waterbodies: those subject to Canadian only policies and regulations; and those subject to international agreements. Policy and regulation of open net cage aquaculture within international waters, such as the Great Lakes, should be governed by the Boundary Waters Treaty (operations of the International Joint Commission, IJC), and the Great Lakes Water Quality Agreement (GLWQA). The Industry also needs to comply with: the revised Canada-Ontario Agreement; Canada's revised Fisheries Act (specifically Sections 35 and 36); and the UN's Technical Guidelines for Aquaculture Certification, specifically Sections 37 to 50, *Environmental Integrity.*

B-1: Both Canada and Ontario should determine what the growth of the Industry may mean in the context and terms of GLWQA and COA, given the high risk to water quality and native fish populations and habitat.

B-2: Canada and Ontario should fully assess the negative environmental impacts on water quality, aquatic biota, and fish habitat from open net cage aquaculture operations in Georgian Bay and the North Channel, including the impact of rainbow trout that escape from the nets, before they continue to support this industry and its expansion plans. See Appendix 10 for the Canadian Science Advisory Secretariat recommendations on prerequisites for expansion.

B-3: There needs to be a clear confirmation from government as to the gaps in their knowledge of the ecosystem impacts, how they intend to address this and how they will hold the Industry accountable to comply with international standards, such as the attached UN Guidelines, Aquaculture Certification 2019.

B-4: The Industry should be required to post some form of restoration bond as part of licensing requirements that ensures that: the polluter bears the cost of pollution; and the bond will finance the restoration of habitats and ecosystems damaged by Industry sites that have caused significant harm and have been closed.

B-5: To ensure compliance with the Fisheries Act, action should be taken to ensure appropriate management and regulation of Industry, and the reinstatement of full transparency on their operation and supervision. In particular the replacement of subsections 35(3) and (4) of the Act by paragraph (2)(b) concerning amendment, suspension or cancellation [of fish farm licenses] will be of assistance for the proper regulation of the Industry.

Recommendation of Part C. The Act should examine phosphorous load limits as defined in the GLWQA and the work of the IJC and distinguish between the risks/impacts of nearshore and offshore locations for cage aquaculture in the Great Lakes.

C-1: The Industry should be required to manage effluents from their operations to avoid effluents being released directly into the surrounding water body.

C-2: Sedimentation and flushing rates should be taken into account in determining which freshwater systems should allow open net pen aquaculture operations, and where it should not be permitted. The same determinations should be made when considering whether or not to permit expansion of this industry in any freshwater system.

Recommendation of Part D. The Act and regulations should ensure that license applications and renewals for aquaculture operations comply with UN Guidelines, the Boundary Waters Treaty, the GLWQA and the revised Fisheries Act (Bill C-68), with particular emphasis on ensuring that the Industry operators are certified as being compliant after demonstrating that their operations are sustainable. The Provinces should also adopt these standards.

D-1: DFO and ECCC should provide the legislation, regulations and standards to monitor compliance as above.

D-2: Given the determination by the US Great Lakes states that open net cage aquaculture operations pose too high a risk to water quality, and given the terms and intent of the Great Lakes Water Quality Agreement, if the Industry fails to meet the above recommended compliance requirements, then Canada and Ontario should consider working together to phase out open net cage aquaculture operations in Georgian Bay and the North Channel and support their move into sustainable enclosed systems.

D-3: Both Canada and Ontario should take measures to "conserve target species, associated or dependent species and non-target species and their environment". The optimum method of exercising this precautionary approach in relation to the Industry would be to move the Industry into sustainable enclosed facilities.

We hope that this submission and recommendations are useful as you develop the proposed Aquaculture Act. In this respect we would be grateful for an opportunity to meet to discuss this matter.

Yours sincerely,

Rupert Kindersley
Executive Director

Copied to:

Bernadette Jordan	Minister of Fisheries, Oceans and the Canadian Coast Guard
Jonathan Wilkinson	Minister of Environment and Climate Change Canada
Chrystia Freeland	Deputy Prime Minister and Minister of Intergovernmental Affairs
John Yakabuski	Ontario Minister of Natural Resources & Forestry
Jeff Yurek	Ontario Minister of Environment Conservation & Parks
Scott Aitchison	MP, Parry Sound - Muskoka
Norm Miller	MPP, Parry Sound - Muskoka
Dean Medeiros	Aquaculture Management Directorate, Fisheries & Oceans
Steve Naylor	Aquaculture Specialist, Fisheries & Oceans
Michael Goffin	Regional Director General, Environment and Climate Change Canada
Greg Mayne	Lake Huron Program Officer, Environment and Climate Change Canada
Ken Lacroix	Upper Great Lakes Management Unit, Natural Resources & Forestry
Brian Burdick	Lead for Fisheries Section, Natural Resources & Forestry
Liam O'Brien	Director of Policy, Natural Resources & Forestry
Carolyn O'Neill	Great Lakes Office, Environment Conservation & Parks
Jennie Weller	Special Project Officer, Environment Conservation & Parks

Appendix 1 – Blue Green Algae

The National Oceanic and Atmospheric Administration reports that every Great Lakes state in the United States is affected by algal bloom problems - https://www.noaa.gov/what-is-harmful-algal-bloom – with Lake Erie being the prime example. NOAA reports that these blooms are a national concern because they affect not only the health of people and aquatic ecosystems, but also the "health" of our economy — especially communities dependent on the income of jobs generated through fishing and tourism. With climate change and increasing nutrient pollution potentially causing HABs to occur more often and in locations not previously affected, it is important for us to learn as much as we can …. so that we can reduce their harmful effects.

Within Ontario's Biodiversity Council's report *Blue-Green Algae Blooms in the Great Lakes*, we read that:

"In the past decade, massive toxic blue-green algae, or harmful algal blooms, have reappeared in lakes Erie, Ontario and Huron (Paerl and Paul 2012). The causes of these recent algal blooms are more complex than in previous decades and the effects are more detrimental. Increased inputs of phosphorous from agriculture as well as neighboring urban areas are thought to be one factor (Richards et al. 2008). Pesticides and other chemicals may also increase the risk of an algal bloom by reducing populations of natural grazers which would otherwise control algal growth. The presence of invasive Quagga Mussels and Zebra Mussels compound the problem due to their capacity to selectively remove edible algae, leaving behind the toxic blue-green algae, *Microcystis*. Blooms of *Microcystis* are of particular concern for two reasons: they are a poor food source for zooplankton that are, in turn, important food for fish larvae; and they can contain a toxin that, when ingested by animals, including humans, may cause liver damage (FPTGC 2014).

Climate change may also increase the frequency of algal blooms in the Great Lakes (Hallegraeff 2014). Increases in water temperatures favour the growth of some algae such as the toxic blue-green algae and the growth of these algae, in turn, further increase water temperatures by absorbing sunlight … The Great Lakes Water Quality Agreement continues to be the main driving force towards reducing the amount of nutrients loaded into the lakes by setting targets. Ontario's proposed Great Lakes Protection Act also includes provisions for the Minister of the Environment to set targets for a range of environmental issues, such as the reduction of nutrient loading. Nutrient loading from agriculture has been regulated through the Nutrient Management Act since 2002 to prevent excess nutrients runoff into the Great Lakes - http://sobr.ca/blue-green-algae-blooms-in-the-great-lakes/

In Ontario, after the Walkerton Tragedy occurred in May 2000, the Ontario Legislature enacted three key laws intended to implement the multi-barrier approach to drinking water safety: the *Safe Drinking Water Act, 2002, Nutrient Management Act, 2002, and Clean Water Act, 2006* (CWA). Last year, the Canadian Environmental Law Association pointed out that:

Under the **CWA**, multi-stakeholder Source Protection Committees (SPC's) were established to develop comprehensive Source Protection Plans to safeguard drinking water sources from degradation or depletion. At the present time, there are 22 provincially approved Source Protection Plans, and these Plans are now being implemented by various public authorities.

However, the mandatory policies in these Source Protection Plans are essentially limited to protecting water used by municipal residential drinking water systems, which serve about 80% of Ontario's population, [but] source water used by other non-municipal systems across Ontario, receive no direct protection from the new legal tools under the CWA.

Property owners, including many First Nation Communities (some of which have invested in the economic and social (jobs prospects) of fish farming) draw their potable water directly from the waters in the vicinity of fish farms. Others, like the M'Chigeeng First Nation of West Bay, Manitoulin Island, adamantly refuse to support the MNRF's permitting of cage aquaculture due to both the water quality issues and the loss of traditional way of life concerns. Here is an article from the Manitoulin Expositor Article on this matter:

M'Chigeeng opposes fish farm expansion into West Bay waters

by Michael Erskine

M'CHIGEENG—M'Chigeeng Chief Glen Hare asserts that the first he heard that plans for Cold Water Fisheries were going ahead with a cage culture operation in the upper portion of West Bay was in an advertisement in the Manitoulin Expositor requesting public input on the proposal.

"I was talking to someone from Coldwater, I can't remember his name, earlier this year who told me the project was dead, dead in the water," he said. "Now I find that it is going ahead. We are dead set against this."

.continued from page 1

It is an assertion that oldwater Fisheries Manger Al Wright finds difficult to credit.

"I can't imagine anyone ere telling them that. Give ie a name," he said. There is no reason anyone ere would say that. The ompany has been following the procedure designed meet public and environental concerns; it is a etailed and comprehenive process, that's why it kes four years to complete."

Mr. Wright said he felt ie proper course of action r anyone with an interest the proposal would be to rite out their concerns nd submit them to the INR for consideration. hat way, he said, the ssessment could be dealt rough the proper chanels.

"I don't think the proper ay to do things is to battle out in the paper," he said. There is a process to follow, and we are following ."

In a letter to Ontario Premier Dalton McGuinty, Chief Hare served notice that although the band will continue to follow the process as laid out, they believe that their permission to install the cages is a prerequisite to any approval, and Chief Hare is adamant that permission will not be forthcoming.

"We want to notify you that using an environmental assessment as great, plodding steps to ultimate approval should not be countenanced," he said. "We oppose this venture because we know it will harm the waters, our band members' livelihood, the environment and the fish and life of these Great Lakes," writes Chief Hare.

The project will be using three million pounds of feed each year, writes Mr. Hare, and such waste must go somewhere."

Chief Hare cited the wisdom and teachings of the Seven Grandfathers, that each generation must plan for the next seven generations.

"Short term gain in growing fish will harm the next six generations," he said. "That is not acceptable to our people."

Proponents of the project point out that a considerable amount of data has now been amassed on the impact of aquaculture operations on the environment and argue that it is the science that should govern decisions, not unfounded scare tactics.

Chief Hare said he did not care what anyone claimed as 'scientific' evidence.

"We are not going to take the chance," he said, standing on the site of the community's new marina and pointing to a white buoy a few hundred feet off-shore. "That's the water intake for our new water plant," he said. "You can't tell me that there won't be any impact on the community. If we wanted something like this, we would have done it ourselves."

Other issues of concern in the letter from Chief Hare include Aboriginal experiences in British Columbia, which he asserts discovered that salmon fish farms have cut into their subsistence fishing and have altered the natural salmon upon mating.

Chief Hare also cites support from the Township of Billings in his letter to the premier, but Billings Reeve Austin Hunt said the township has not formalized its response to the issue.

"We had a presentation from the company about a year ago," he said. "We haven't heard anything about it since, as far as I am aware. Frankly, I thought it had fallen by the wayside."

See also the submission to government from then Chief Glen Hare shared with the GBA: Appendix 3, which was provided anonymously.

Yet another First Nation Community who was in contact with the Georgian Bay Association, has shared with us the devastating effects of the inevitable large fish spills (escapements) that have occurred regularly in the waters. This particular incident occurred even when the embayment was winter ice. (See: Appendix 4 from the Whitefish River First Nation, again, located on Manitoulin Island. And see also a reference to a study from the Journal of Aquaculture Science regarding fish escapes and effect in Lake Huron watershed, Appendix 5).

Appendix 2

Media Release: ***Is sustainable aquaculture in Canada lost in translation?***
Monday, June 24, 2019 (Halifax, NS)

According to researchers from Dalhousie University, there is virtually no evidence to support decades-long narratives about the sustainability of finfish aquaculture in Canada. The study, which was recently published in the journal Marine Policy, examined the progress Canada has made towards translating sustainable aquaculture policy goals into measurable outcomes. It describes 11 potential environmental, social and economic sustainability indicators identified by the Department of Fisheries and Oceans (DFO) in 2012 to advance the sustainable development of aquaculture in Canada.

"DFO reports on industry's compliance with environmental regulations as an indicator of the sustainability of aquaculture," says Inka Milewski, a research associate in the Department of Biology at Dalhousie, and the lead author for the study. "This approach assumes that current regulations are sufficient to cover the wide range of potential impacts fish farms can have on other species and the ecosystem, and that simply reporting the results of benthic monitoring, drug and pesticide use or dead fish are measures of environmental impacts or sustainability."

In 2015, the new federal Aquaculture Activity Regulations came into effect, which makes it mandatory for Marine finish operators in Canada to report drug and pesticide use. In 2017, marine finfish farms reported using 14.4 mt of antibiotics and 439 mt of hydrogen peroxide pesticides. According to Milewski, these numbers tell regulators and the public nothing about the potential sub-lethal, cumulative, and far-field impacts of serial exposure to antibiotics and pesticides on non-target species.

The study also used the result of more than 10 years of research focused on a single fish farm in Port Mouton Bay, Nova Scotia, to examine how Canada's national policy goals for sustainable aquaculture played out at the community level. Ruth Smith, the study's co-author and community research partner, notes that the Port Mouton case study demonstrates how Canada's new aquaculture regulations fail to capture the lobster catch decreases, eelgrass loss, copper contamination and nutrient loading reported in studies done in Port Mouton Bay. The case study also found that DFO's social sustainability goal of generating meaningful employment in rural, remote and coastal communities has not occurred. Data from the Nova Scotia Department of Fisheries and Aquaculture shows that finfish production in Nova Scotia has increased 1000% between 1995 and 2017 but employs the same number of full-time people and there has been an 86% drop in part-time employment.

"Sustainability indicators should provide the public with concrete measures of government accountability on policy narratives and goals," says Milewski. "In the absence of meaningful measures of sustainability, Canada's declared aquaculture policy goals risk being reduced to mere political catchphrases."

Funding for the study was provided by the OceanCanada Partnership, a 6-year research initiative (2014-2020) funded by the Social Sciences and Humanities Research Council of Canada (SSHRC) that brings partners from across Canada together to study the challenges and opportunities facing Canada's oceans and coastal communities.

Links:
Publication: Marine Policy
https://www.sciencedirect.com/science/article/pii/S0308597X19301332
https://doi.org/10.1016/j.marpol.2019.103571
Other published scientific studies on aquaculture impActs on Port Mouton Bay: http://friendsofportmoutonbay.ca/documents.html
Author ContAct: Inka Milewski, Research Associate, Department of Biology, Dalhousie University
Tel: (506) 622-0314, Email: milewski@nbnet.nb.ca or milewski@dal.ca

Appendix 3

Cold Water Fisheries: Proposed Aquaculture Site on Honora Point

Prepared For: M'Chigeeng First Nation
June 03, 2005

Cold Water Fisheries Inc., has submitted an application for an aquaculture license and a request for a Land Use Permit or Lease to the Ministry of Natural Resources for the establishment of a cage culture operation for rearing rainbow trout in West Bay. This application is being made under the Interim Cage Culture Site Application Process (2003).

The Chief and Council of M'Chigeeng First Nation have submitted numerous methods of correspondence to various federal and provincial ministries and agencies stating their opposition to this initiative being undertaken by Cold Water Fisheries Inc. To date, the correspondence that has been received by M"Chigeeng First Nation concerning this initiative has consistently referred them back to the Environmental Bill of Rights (EBR) Registry and has urged them to pursue the processes that will be used for participation and comment through the EBR Process.

Yet again, M'Chigeeng First Nation has been referred back to a process that has been developed without input from First Nations as to the mechanisms used for response and comment. Time and time again it has been determined by First Nations, Provincial Territorial Organizations and other First Nation Interest Groups that this process does not take into account the needs of our individual communities nor does it acknowledge the processes that are required within our governments to enable them to respond to initiatives that are posted on the EBR for response. Many First Nations communities still govern under the auspices of *Direct Democracy* and therefore include their membership in decisions that would affect them as a whole. This type of process requires more time than the 30 days that are allowed for response within the EBR process.

In the last letter that was received from the Hon. David Ramsey concerning the initiative by Cold Water Fisheries, he states that, "there are currently seven other Active cage culture operations in and around Manitoulin Island, some of which are Actually owned and operated by other First Nation communities."[1] This statement from the Minister seems to question the motives of M'Chigeeng First Nation in their opposition to the Cold Water Fisheries Inc. initiative within their traditional territory. Whether or not there are other First Nation communities that support the use of aquaculture within their traditional territories is of no relevance to the issue at hand; which is the opposition of M'Chigeeng to this particular initiative. In this same letter the Minister states that, "I also urge you (Chief Glen Hare) to work with Cold Water Fisheries to ensure that your concerns can be addressed".[2] This statement from the Minister is in complete contradiction with the recent decisions of the Supreme Court of Canada[3] concerning the duty of government to consult, and in some cases accommodate, the interests of First Nations communities when Activities that take place within their traditional territories may infringe upon their Aboriginal or Treaty rights. Therefore, the responsibility rests with the provincial government to consult with M'Chigeeng First Nation and ensure that their concerns are heard and addressed; private industry does not share this same obligation.

[1] Letter dated January 12, 2005, file # MNR1205MC-2004-4092, *Hon. David Ramsey, Minister of Natural Resources*
[2] *ibid*
[3] *Taku River Tlingit First Nation v. British Columbia*, S.C.R. [2004] 3
Haida Nation v. British Columbia (Minister of Forests), S.C.R. [2004] 3

Apart from the most fundamental of principles for government to consult with M'Chigeeng First Nation, there are other pertinent scientific, social and sovereignty related points with which M'Chigeeng is opposing the development of the aquaculture site within their traditional territories.

The quality of the drinking water that M'Chigeeng First Nation receives from the waters of the West Bay will undoubtedly be affected by the operations of a cage culture site within the bay. There is insufficient evidence surrounding the amount of waste, fecal matter and phosphorous that the proposed operation will add to the water system within West Bay. This lack of evidence should be a clear basis for a decision not to allow this operation to take place since there is a community that accesses its potable water from this same bay. With the incidents that occurred at Walkerton and the ever changing and stringent provincial water quality and processing policies, the safe drinking water of M'Chigeeng First Nation should be of the utmost priority for both the provincial and federal governments; not the interests of private industry.

The proposed aquaculture facility is expected to produce 1,185,000 kg of rainbow trout per year with a feed yield of 1,500,000 kg per year.[4] The paper titled 'Murky Waters' that was funded by the Environmental Defense Fund makes the following comments concerning aquaculture sites utilizing open cage culture and the waste produced by them;

> *Aquaculture wastes consist primarily of uneaten fish feed and fecal and other excretory wastes. They are a source of nutrient pollution - carbon-based organic matter and nitrogen and phosphorous compounds. High nutrient levels can stimulate blooms of phytoplankton, or algae populations. When algae die in large numbers, their subsequent degradation can drastically reduce oxygen levels in water, stressing or killing fish and other organisms*.[5]

Although it would seem that such a small operation could not seriously affect the quality of water or increase the growth of algae on a large scale, I need only refer back to the comments made by the Hon. David Ramsey concerning the number of Active aquaculture production sites that are currently operating on and around Manitoulin Island.[6] In a study that was commissioned by the David Suzuki Foundation there is a comparison made between the waste discharge of the aquaculture industry in British Columbia and the waste discharge of human population, "Discharges from the many salmon farms along the coast of British Columbia are a significant pollution source, estimated to be equivalent to raw human sewage from a city of 500,000 people."[7] It is not difficult to come to a simple hypothesis of what the net result of increased aquaculture operations will have on the water quality of the West Bay.

The Ontario Ministry of Natural Resources (MNR) has been developing new policy regarding a biodiversity strategy to deal with Ontario's various plants, wildlife and natural ecosystems. The strategy is meant to deal with and provide the context for current initiatives in the areas of protected areas, sustainable natural resources management, stewardship, and conservation of Ontario's fish and wildlife.

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[4] Ontario Ministry of Natural Resources, *EBR Registry Number: XB04E2009*, 2004/11/08
[5] R. Goldburg and T. Triplett, *Murky Waters: Environmental Effects of Aquaculture in the US*, The Environmental Defense Fund, 1997
[6] Letter dated January 12, 2005, file # MNR1205MC-2004-4092, *Hon. David Ramsey, Minister of Natural Resources*
[7] Ellis, D.W., and Associates, *Net loss: the salmon net cage industry in British Columbia,* Vancouver, BC: David Suzuki Foundation, 1996

This new strategy is in response to the United Nations Convention on Biological Diversity (1992)[8], and to the Canadian Biodiversity Strategy (1995).[9] This policy initiative is meant to protect and preserve Ontario's biodiversity through better management of our natural resources and protection of the delicate balance between the many inter-related ecosystems of the plant and animal life within the province. The amounts of both nitrogen and phosphorous that are introduced into the water bodies where aquaculture operations take place have been proven to negatively affect the ecosystems of the local body of water in many studies that have taken place in both the US and Canada. It would seem to be an oxymoron for the proposed aquaculture site for the Honora Point to be approved when its operations are in contradiction to a new policy initiative by the provincial government.

There are numerous studies from around the world that describe the levels of degradation within water quality as a result of aquaculture operations. These studies contain thorough arguments to support the environmental claims being made by M'Chigeeng First Nation; however, I will leave the rest of that debate for the scientists.

The proposed aquaculture site interferes with the traditional way of life of the people of M'Chigeeng First Nation as it is to be located directly in the path of the traditional travel route from the West Bay mainland to Clapperton Island where M'Chigeeng First Nation's traditional summer camping and fishing grounds are located. The safety of not only the community members of M'Chigeeng First Nation, but of all who use this right of way will be seriously jeopardized by the placement of the cage nets in the traveled portion of the bay.

M'Chigeeng First Nation maintains that in order for any development within their traditional territory to take place they must be consulted; specifically in cases where there is the possibility that their Aboriginal or Treaty rights may be infringed upon. Since the area where the Cage culture site is being proposed is within the traditional fishing areas of M'Chigeeng First Nation, and that these fishing rights within the Robinson-Huron Treaty (1850)[10] area were enshrined in the R v. Agawa decision of 1988[11], there is the potential for this operation to violate and possibly diminish the fishing prActices of M'Chigeeng First Nation band members.

The Chief and Council of M'Chigeeng First Nation do not wish to stifle the evolution of the economy of the area; they simply choose to put the health, safety and Aboriginal rights of their people before any opportunity or venture that is driven by profit. With the province of Ontario already being touted as one of the worst polluters in North America, it is the hope of M'Chigeeng First Nation that the provincial government ministries, the Environmental Commissioner and private industry will heed the warnings that have been brought to light by this initiative and respect the stand that the community is willing to take in support of their beliefs.

It is time for the provincial government to acknowledge their Nation to Nation relationship with M'Chigeeng First Nation that has been enshrined in the Constitution Act 1982, and to respect the internal sovereignty of this governing body. Until the right of this community to determine what is acceptable within their territory is acknowledged, and the value of their Traditional Ecological Knowledge is affirmed, the Chief and Council of M'Chigeeng First Nation will be unable to respect the decisions made by the province or its agencies and regulatory bodies concerning the management and conservation of natural resources in the Province of Ontario.

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[8] *United Nations Convention on Biological Diversity*, Rio De Janeiro, June 1992
[9] Report of the Biodiversity Working Group, *Canadian Biodiversity Strategy*, November 1994
[10] Robinson-Huron Treaty Sept. 9, 1850, *"Surrender by the Ojibiwa Indians inhabiting the North Shore of Lake Huron,* "National Archives of Canada, RG 10, volume 1844, IT 148
[11] R. v. Agawa (1988), 65 O.R. (2d) 505

Appendix 4

April 19, 2006

John Pepperell
President
The Georgian Bay Association
19 Edgecombe Avenue
TORONTO, Ontario.
M5N 2X1

Dear Mr. Pepperell,

Re: Impacts Created by Cage Rainbow Trout Escapees on the Territory of
The Whitefish River First Nation – Fisher Harbour Aquaculture Site

I am contacting you to provide a brief report on the impacts to our community land base that took place over the past winter months due to the Coldwater Fisheries Limited fish escapement in November 2005 near Fisher Harbour. Approximately 200,000 cage farmed rainbow trout escaped into the McGregor Bay aquatic environment at that time.

The east face and southern end of the community lands of the Whitefish River First Nation front McGregor Bay. Several areas of our land base were directly impacted from the rainbow trout escapees. The first point of impact was an area known as Horseshoe Bay which fronts a band member privately owned cottage lot subdivision.

Our office started receiving complaints in mid-January of 2006 that fishermen who were attending the Horseshoe Bay to fish were observed to **be crossing on Reserve lands, blocking the private drives of the cottage lot tenants, blocking the driveway of the band member who lives at this location, and trespassing through these areas** to reach the Horseshoe Bay to fish for the escaped rainbow trout.

The Old Village Road, a **public road, was becoming congested** around Horseshoe Bay due to roadside parking. This Activity raised **concerns on timely snow removal and emergency vehicle access to this location**.

In addition, concerns were being raised regarding **the pollution of Reserve lands and the Horseshoe Bay ice.** The pollution was accumulating from human waste and litter left behind by the fishermen. Fishermen were being observed by cottagers to be urinating and defecting on the ice, in the ice holes and on adjacent private and reserve lands. This caused considerable concern because of impacts to potable water. The **cottagers draw their water from the Horseshoe Bay.**

The First Nation arranged for signs to be placed at this location to discourage the attendance of the public at this site in an effort to reduce the impacts outlined above. The public were notified their vehicles would be towed if left on the road. The private land owner opened an area of her land for parking, to keep her own driveway open, and began charging parking fees. In addition, she brought in a "Johnny on the Spot" for toilet and collected litter on a daily basis. The private land owner's efforts alleviated only a small part of the parking and waste problem. Most of the vehicles stopped parking on the road after we had a few cars towed away. People then started coming into the Horseshoe Bay by snow machine.

At one point the entire Horseshoe Bay ice was covered with fish huts and fishermen. It looked like a small village had sprung up. It was a terrible **visual impact** for the cottagers who were used to looking at a quiet and peaceful Bay scene – with only the occasional deer crossing in front.

During this period, we also noticed **fishermen removing more than their catch limit**. On one occasion I observed a **wild species lake trout being fished from the same ice hole where a rainbow trout escapee** was removed. Both fish looked very similar. I wondered about the impacts occurring to wild species lake trout and whether or not fishermen were putting the wild species fish back into the water when they were caught.

MNR then began monitoring the site – a month after the fishing frenzy was well under way. Do you know which government agency could tell us about the **impact of the escapees on the wild species lake trout?** Are any of these agencies investigating that impact to your knowledge?

The fishermen then slowly began moving to the Swift Current location at the foot of Dreamer's Rock to continue their fishing Activities. The same problems arose there with respect to the impacts I have outlined at Horseshoe Bay.

The First Nation's concerns mounted on the **impact of the human wastes and litter on the ice surrounding Dreamers Rock.** Once the ice melts, the wastes enter the water. Dreamers Rock and the waters that surround it is a well-known sacred site of the Anishnabek Nation. These obscenities have **desecrated our Nation's spiritual site and have left a lasting effect on the minds and hearts of our community members.** This can be compared to the desecration of religious or historic sites elsewhere. Do members of the public tolerate human wastes left on the steps of their cathedrals? It seems our community is expected to tolerate it in and around the waters at their site.

In addition to the above, a private landowner at Swift Current was subjected to trespassing on her property. Confrontations with fishermen occurred and the police had to be called. I made the MNR aware of this problem.

On several occasions I contacted the MNR by telephone to ask them what could be done to stop these impacts and what they could do to help us. MNR personnel stated their Ministry had not provided toilets for fishermen for fifteen years! I was informed that MNR can do nothing but monitor and regulate catch limits. I asked if MOE or DFO had controls in place to regulate the type of impacts which were occurring. The person I spoke with stated he was not aware of any such controls being in place, sympathized with our plight, and stated he would contact the MNR District Manager to relay our concerns.

The wastes that were left on the ice are now in the water – that's a fact. Who can measure that impact? There are accumulative impacts occurring to the quality and condition of the waters**.**

Is the solution to pollution, dilution? This seems to be the adage held to here in our instance, by fishermen, and a government agency entrusted with a stewardship role over natural resources.

Our offices do not have the financial resources or human capacity to deal with the impacts and problems created by the recent fish escapements. **We need attention to the problems which have unfolded and to which no agency will help take responsibility to address.**

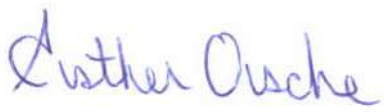
I am requesting that you please bring forward the concerns of the Whitefish River First Nation which are outlined in this letter, together with the concerns of the Georgian Bay Association in response to the "Proposal for Managing Rainbow Trout Recreational Fisheries in Ontario".

It is urgent that government take a comprehensive approach. Take everything into account. All of Creation is inter-related and reliant upon the balance and well-being of the other.

Thank you for your review of our concerns and any assistance you can facilitate.

Yours Truly,

WHITEFISH RIVER FIRST NATION



Lands Manager

Appendix 5

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AQUACULTURE ENVIRONMENT INTERACTIONS
Aquacult Environ Interact

Published online June 26

Oncorhynchus mykiss escaped from commercial freshwater aquaculture pens in Lake Huron, Canada

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ABSTRACT: The fate of farmed fish after escape from aquaculture operations, and their potential ecosystem impacts, remains a primary concern for the sustainable development of this industry. We simulated small- (<50 fish) and large-scale (500 fish) escape events of rainbow trout *Oncorhynchus mykiss* from 2 commercial operations in the North Channel of Lake Huron, the site of greatest freshwater production in Canada. Individual fish were either implanted with telemetry transmitters (n = 120) or marked with external tags (n = 1000) to monitor their movements and estimate survival and growth upon recapture. Rainbow trout dispersed quickly from the farms, and overall showed variable levels of site fidelity (2 to 40% after 3 mo), with most fish returning to the farm sites on multiple occasions after departure. Released fish were often detected in near-shore areas or at neighbouring commercial operations, but escapees were capable of long distance movements (>350 km), where they were located in rivers, open waters and in an adjacent Great Lake. Rainbow trout maintained high specific growth rates (average 0.33% d^{-1}) in the wild, both at and away from the farms. Known survival of escaped fish after a 3 mo period following release was ~50%, with some fish recaptured up to ~2.5 yr after release. Angling and avian predation accounted for the majority of mortalities. The ability of farmed fish to survive, successfully forage near and far from aquaculture operations and their preponderance to occupy near-shore habitats provide a strong basis for understanding the potential risks that escaped fish may pose to the fish community of Lake Huron.

KEY WORDS: Open-pen aquaculture · Escapee · Rainbow trout · Site fidelity · Dispersal · Survival · Growth

Appendix 6

Synthesis Report Regarding Net-pen Aquaculture in the Great Lakes

State of Michigan, March 9, 2016

Departments of: Agriculture and Rural Development (MDARD) Environmental Quality (MDEQ) Natural Resources (MDNR)

Catalyst for the Conversation Regarding Commercial Net-pen Aquaculture in the Great Lakes

The Michigan Departments of Agriculture and Rural Development, Environmental Quality, and Natural Resources (Quality of Life (QOL) Departments) were approached in late 2014 with two proposals for establishing commercial aquaculture netpen operations in northern Lakes Huron and Michigan. While Ontario has established netpen operations in the North Channel and Georgian Bay in Lake Huron, there are no commercial net-pen aquaculture operations in Michigan's open waters of the Great Lakes. The issue was viewed as a serious and potentially contentious matter and constituted a new use for Michigan's bottomlands and Great Lakes waters.

Background on Process

To give this precedent-setting issue the level of attention and deliberate evaluation that was required, the directors requested that the QOL departments' Aquaculture Workgroup develop an ecosystem approach to evaluating the issue. An ecosystem management approach requires considerations of the scientifically based environmental and ecological aspects as well as the social and economic attributes of a proposed management Action. In this process, social considerations included the legal authorities and public input. Under that paradigm, the Aquaculture Workgroup:

Elicited an independent volunteer Science Panel of experts to evaluate the environmental and ecological considerations. (Environmental and ecological factors)

Contracted with three entities to develop an understanding of the economic aspects commercial net-pen development -- product demand, processing, distribution, etc. (Economic factors)

Established an internal workgroup to develop a paper on the existing legal authorities regarding the establishment of netpens, such as permitting (water quality, bottomlands, fish health, and stocking) and recognition of the Great Lakes Consent Decree and tribal nation rights. (Social factors)

Conducted, after the above information was complete, a public forum to present the information and take public input regarding the social aspects (conflicts, fishing, etc.) and community benefits. (Social factors)

Land-based aquaculture facilities, such as flow through, closed, or recirculating, were beyond the scope of both the process used to address the issue of commercial net-pen aquaculture and this synthesis paper.

Synopsis of the Report Findings

Six reports were produced from this process and provided input for this synthesis. Science-based review:
Great Lakes Net-Pen Commercial Aquaculture: A Short Summary of the Science, see:
https://www.michigan.gov/documents/mdard/AquaRprt_504335_7.pdf

Regulations-based review:
A Regulatory Analysis of Proposed Commercial Net-Pen Aquaculture in the Great Lakes -
https://www.michigan.gov/documents/mdard/NetPenRegRev_504302_7.pdf

Economics-based reviews:
Overview of Natural Resource Values Potentially at Risk from Consequences of Net-Pen Aquaculture
https://www.michigan.gov/documents/mdard/MSU-Dr-Lupi_504300_7.pdf

Expected Economic ImpAct of Cage Trout Aquaculture on Michigan's Great Lakes
https://www.michigan.gov/documents/mdard/MSU-Miller_504301_7.pdf

Aquaculture Industry Report from IBIS World Industry Report 11251- Fish & Seafood Aquaculture in the US
https://www.michigan.gov/documents/mdard/Aquaculture-MI-SBDC_504298_7.pdf

Stakeholder Input
Commercial Net-pen Aquaculture in the Great Lakes Public Input and Comment

Ecological and Environmental Issues

The Science Panel provided several recommendations and cautions if Michigan were to move forward with commercial net-pen aquaculture. At the outset the report states that if Michigan were to allow commercial netpens, it should be with great caution and use an agency managed, scientifically structured Active adaptive management design to address and evaluate potential concerns as they arise. This view was affirmed by many who provided public input. The adaptive management process as envisioned by the Panel includes the following:

"The principles of adaptive management for natural resources include experimentation at the relevant management scale, intensive monitoring, and stakeholder involvement (Walters 1986). Thus, the ability to determine the existing ecosystem conditions, monitoring in locations both with and without a perturbation (in this case net-pen aquaculture), understanding the magnitude of change resulting from the perturbation, evaluating the effects of the perturbation (which would necessarily include a rigorous statistical analysis of the data), and then determining appropriate next steps in consultation with stakeholders, thus completing the adaptive management cycle. This cycle should be led and coordinated by a single group for greatest effectiveness; the QOL group may be best positioned to be this body."

Other provisions included:

Development of a tool to determine the best locations for commercial netpens as this would be critical to ensuring their safe operation in the Great Lakes. The siting tool should address the

technical, legal and social issues of locating netpens. The tool could be similar to the tool developed for siting wind turbines in Michigan waters of the Great Lakes.

Development of a nutrient tracking modeling tool that would guide placement and understanding of the fate of nutrients contributed by net-pen operation given the inability to collect wastes.

Use of only fish species that are present in the Great Lakes to avoid a new invasive species.

Use of sterile/triploid fish to prevent fish escapes from altering the genetics of wild fish in the Great Lakes.

Use of certified disease-free fish.

Careful monitoring of netpens by industry to manage for disease, proper use of feed, water quality, ice damage to netpens and over-all integrity of pen systems in the Great Lakes.

Significant added expertise and capacity from state agencies to properly monitor and manage commercial net-pen aquaculture in the Great Lakes.

During the stakeholder input process, several participants noted a lack of information pertaining to the ecological consequences of netpens in Ontario and in other locations around the world. This information was limited in the reports and inclusion of that additional information would further speak to the importance of implementing the Actions noted above to protect the public's interest in the Great Lakes resource if the state were to allow commercial net-pen aquaculture, even in a limited fashion.

Legal Authorities in Michigan

Based on current Michigan law, commercial netpens cannot legally operate in the Michigan portion of the Great Lakes. The Aquaculture Development Act of 1996 (PA 199) states that aquaculture facilities may only be registered by MDARD if they are operating in privately controlled waters. The Great Lakes are not privately controlled waters. Therefore, current state law does not allow the State of Michigan to register a commercial net-pen aquaculture facility in the Great Lakes.

In other permitting Actions:

In order to site a new-pen, a permit would be required under Part 325 of the Natural Resources and Environmental Protection Act (NREPA) (Great Lakes Submerged Lands) would require a permit for placement of netpens in the Great Lakes, mooring buoys, bottom anchors and other materials.

Part 325 requires a permit for placement of net-pens mooring buoys, bottom anchors and other materials in the Great Lakes. In addition, Part 325 requires an agreement for the use and occupation of Great Lakes public trust waters and bottomlands by commercial net-pen aquaculture facilities. A permit and conveyance application can be submitted for review by the DEQ at any time. Part 325 requires a 20-day public notice for both the permit application and the bottomlands conveyance

application. In addition, a public hearing would be held to gather additional comments. The DEQ has 90 days from the date of a complete application to make a decision or 150 days if a public hearing is held.
Part 325 allows a person to appeal a decision by the DEQ through a contested case hearing. The decision from the contested case hearing can then be appealed through the courts.
The U.S. Army Corps of Engineers requires the same permit and would conduct its own review. Both agencies would have to give approval for any net-pen aquaculture to be sited in the Great Lakes.

In order to operate and discharge, a National Pollutant Discharge Elimination System (NPDES) would be required from the DEQ under the federal Clean Water Act and Part 31 (Water Resources Protection) of NREPA.

An application for an NPDES permit could be submitted at any time and the DEQ has a statutory timeline of 180 days to make a permitting decision. An NPDES permitting Action requires an evaluation of both water quality and treatment technology considerations with the most stringent limitations or requirements applied to the operation. In addition, Antidegradation applies to any NPDES permit Action that will result in a new or increased loading of pollutants to surface waters of the state.

The NPDES permit process requires a 30-day public notice. The DEQ expects significant interest in any net-pen aquaculture application received and would hold a public hearing to take comments. Upon consideration of published comments, a decision to issue or deny the permit would be made. Any permitting decision can be appealed through a contested case hearing. The Director of the DEQ is the decision maker on the contested case; however, a challenge of the decision would move the proceedings to the Circuit Court followed by the Court of Appeals and ultimately the Michigan Supreme Court. We expect this would take 5-10 years given recent appeals of NPDES permits.

A fish stocking permit would be required from the DNR under Part 487 (Sport Fishing) of NREPA. A fish stocking permit in treaty-ceded areas of the Great Lakes would require agreement of the tribal nations to that Activity.

The Great Lakes Fisheries Commission pointed to the agreement amongst states, tribes, and federal agencies called, "*A Joint Strategic Plan for Management of Great Lakes Fisheries*," to which Michigan is a signatory. The document calls for consensus among management (state and tribal) jurisdictions about proposed management Actions in the Great Lakes that may affect other jurisdictions. This governance structure was pointed to in several instances as one that should not be taken lightly in terms of other states, province, and tribal nation input.

Economic Assessments

The U.S. imports about 75 percent of the seafood it consumes. Worldwide, aquaculture provides 50 percent of the fish consumed. In addition, fish is recognized by the U.S. as a key dietary component for those pursing heathier eating habits. These are opportunities for growth in domestic fish production.

However, Michigan faces growth constraints including feed costs (no local producer of feed), insufficient in-State processing capacity, financing and experienced labor. These limitations exist, as noted by others, for both commercial net-pen aquaculture as well as land-based aquaculture enterprises.

The hypothetical best-case modeled results suggest that locating two, one million pound commercial netpen aquaculture trout facilities in Michigan could lead to up to 17 direct jobs, an additional 27 jobs from indirect Activities (e.g. fish processing) generating annual personal income of $2.5 million. This volume of production would likely contribute $10.3 million in total output provided fish processing is done in Michigan. Critics of this modeled outcome suggest the amounts used to generate these results may be an overestimate given the variability of commercial prices for trout in the market.

The over-all economic impact of recreational fishing in the Great Lakes for Michigan is estimated at about $1 billion per year. Other noted uses include boating and swimming. As a matter of perception, the public input process noted that the tourism industry could be negatively affected because of the viewscape or belief that the water was degraded or not clean for recreational purposes. While some of the economic value for these other sectors would be at risk because of commercial net-pen aquaculture, we were not able to determine what those Actual effects would be. Therefore, we use the economic information to provide general guidance rather than a definitive economic cost-benefit outcome.

Several constituents noted that the economic reports were not as robust as they would have desired and the assessments themselves noted limitations on available data. The agencies worked with the best resources that could be acquired in the short time frame for assessment and recognize that a more robust cost-benefit analysis may have yielded a clearer outcome. However, the analysts providing information for those reports noted the difficulty in obtaining accurate data given the limited sources for the information and a more costly approach may not yield any further certainty.

Tribal Nation Input

Nine of the 12 federally recognized tribes participated in a consultation meeting that we held with them in November 2015. Their concerns and comments are recorded in detail in the public input document. The input the state received from the tribes, both verbally and written, expressed serious concern regarding commercial net-pen aquaculture in the Great Lakes because the Activity may negatively affect the fishery and water quality. They also pointed out that they should be included in any process for pursuit of this Activity.

Stakeholder Input

Nearly 1,700 written comments were received by the departments. More than 1,600 were in opposition while 11 letters provided support. Of those in opposition, 90% were an electronically submitted form letter through the Food and Water Watch organization. An additional 117 individual comments were received articulating ardent opposition to commercial aquaculture net-pens from individuals from Michigan, Illinois, and Indiana, tribal nation governments, nongovernmental environmental groups (Michigan United Conservation Clubs, National Wildlife Federation, Michigan Trout Unlimited, etc.), and one Great Lakes State Department of Natural Resources (Indiana).

One letter was neutral, but strongly supported adhering to the collaborative governance process for fisheries management in the Great Lakes (Great Lakes Fishery Commission).

Those in opposition point to risks to water quality, the fishery (genetics, disease, escapes), and tourism and many of the issues identified by the Science Panel. Some that were opposed to commercial net-pen aquaculture were supportive of recirculating aquaculture and in some cases also supported flow through aquaculture.

Those in support state the provision of jobs, economic benefits to local economies, and provision of a desired product.

Other Considerations

Through the public input process, it was very clear that the state would be challenged to thoroughly evaluate the role of the Public Trust Doctrine in any implementation of commercial net-pen aquaculture in the public waters of the Great Lakes. The QOL Aquaculture Workgroup did not pursue a thorough legal analysis on this issue, but it would be advisable to further understand this aspect of objection.

Program Costs of Implementation

There are no traditional sources of funding to provide for the programming and oversight that commercial net-pen aquaculture would require. New funding would be required to provide for the public's expectation of oversight and protection of the Great Lakes. The following estimates are provided as an example program based on experience in addressing Great Lakes bottomland development (windpower), monitoring (DNR Fisheries Division Great Lakes Assessment Program), and staffing for program assistance, management, and coordination amongst the QOL agencies and with industry.

Initial Investment (2 Years to completion):

Development of a Commercial Net-pen Aquaculture Siting Tool to include facilitation of an external multi-interest stakeholder group	$350,000
Development of a Commercial Net-pen Aquaculture nutrient input and tracking model	$500,000
Development of an Adaptive Management Design and Science Panel	$50,000
Start up costs total:	**$900,000**

Ongoing Annual Costs to also include Annual Adaptive Management Science Panel Meeting

Monitoring program to assess water quality, fish health, genetics, invasive species, nutrients, benthos/zooplankton for control locations and far-field net-pen locations with a statistically robust design (could be contracted or assumed internally)	$1,160,000
MDARD Aquaculture Program (Registration, Inspection, Industry support)	$1,000,000
DEQ Permitting and Assistance	$150,000
Science Panel Meetings and Support (staff time, travel, meeting support)	$25,000
Ongoing annual costs:	**$2,335,000**

Thus startup costs for this program would be approximately $3.33 million with ongoing costs of approximately $2.4 million annually to create a Great Lakes commercial net-pen aquaculture program that would serve the aquaculture industry while providing the people of Michigan with a scientifically based program to regulate and monitor (in addition to any permit- required facility monitoring at netpen locations) for the protection of the Great Lakes. It is possible that the monitoring requirements to fulfill the adaptive management approach could also be included with the self-monitoring requirements for the operator of the facility as specified in an issued NPDES permit.

Conclusions

The Michigan QOL agencies do not recommend pursuing of commercial net-pen aquaculture in the Great Lakes at this time for the following reasons:

Given the ecological and environmental risks and uncertainties, as pointed out by the Science Panel and with further information provided through public input, commercial net-pen aquaculture would pose significant risks to fishery management and other types of recreation and tourism. Furthermore, both collaborating management interests and tribal nation interests would likely not agree to Michigan moving forward and pose a significant challenge in any attempts to do so.

The $3.3 million to implement a commercial net-pen aquaculture program by the State to protect the public's interest in the Great Lakes and provide the stated expected service to the industry are not provided through any conventional funding models available to the QOL agencies. There would need to be a new funding stream identified for this industry effort to support initial costs as well as the $2.33 million needed annually to monitor and maintain the program and protection of the state's resources. This level of public investment for an estimated return of $10 million (under the modeled scenarios for two facilities) does not appear to be a prudent use of the state's resources at this time.

Regulatory authority does not currently exist to issue registrations for commercial aquaculture in the Great Lakes.

It is important to note that MDEQ must make a Part 325 and NPDES permitting decision regardless of the ability to license an aquaculture facility. Any policy decision regarding aquaculture in the Great Lakes must be carefully constructed to prevent a preempting of DEQ's permitting processes which could result in unnecessary litigation; and to prevent stimulating permit applications. Decisions made in this process have a very high likelihood of legal challenge.

While not recommending the pursuit of commercial net-pen aquaculture in the public waters of the Great Lakes, the state can and will continue to work within existing authorities to assist the industry in development of well- designed flow through, closed and recirculating aquaculture facilities.

Appendix 7

The Ontario Snapshot of 2018:

MNRF's Authority to Regulate Aquaculture

***Public Lands Act*:**

- All aquaculture licence are issued with associate land tenure (i.e. LUP/lease)
- All new applications for disposition of Crown resources must follow the process set out in the "Class Environmental Assessment for MNR Resource Stewardship and Facility Development Projects".
- Environmental impact of Activities (i.e. loss of habitat, impact to fishery)

Fish and Wildlife Conservation Act

- the Minister may refuse to issue a licence for any reason consistent with the purpose of this Act, including the conservation or management of wildlife or fish

Aquaculture licenses:

- issued under the authority of the *FWCA*
- include conditions intended to mitigate potential environmental impacts
- reporting of escaped fish
- identification of required escape prevention measures
- report any fish infected with any of the listed disease organisms

Agency Role Details

MNRF

- Lead provincial ministry for aquaculture in Ontario
- Authority to issue tenure and licence
- MNR and then MOE agreed upon an operational protocol (MNR-MOE Protocol on Cage Aquaculture, 2000) that outlines the roles and responsibilities for each ministry with respect to protecting water quality in the context of regulating cage aquaculture. All cage sites have mandatory sediment and water quality monitoring and reporting conditions attached to their licences.

MECP is the legislated authority for environmental protection under the OWRA and the EPA and also has regulations to govern the use and discharge of water by land-based operations.

Appendix 8

Excerpts from the International Joint Commission endorsed SPARROW (SPAcially Referenced Regression On Watershed attributes)

https://ijc.org/en/what/iwi/sparrow

SPARROW (SPAtially Referenced Regression On Watershed attributes) is a watershed model that relates patterns in water quality to human activities and natural processes. Using existing monitoring data, SPARROW analyses the water quality of streams, rivers, and lakes in relation to the location and relative intensity of contaminant sources, landscape characteristics, and environmental factors.

This can give insight on the causes and effects of challenging and complex environmental issues related to water quality. One such issue found across the transboundary basins is excessive nutrient loading. Human land use practices and activities, like agriculture and wastewater discharge, are compounding the total amounts of nitrogen (TN) and phosphorus (TP) that enter the boundary waters. These are both examples of constituents that SPARROW models can track as they are transported and deposited into receiving lakes or reservoirs.

Issues of water quality have broad effects and are very pertinent to the IJC. The Boundary Waters Treaty, which established the IJC in 1909, provides principles for Canada and the United States to follow in using the waters they share. Far ahead of its time, the treaty states that waters shall not be polluted on either side of the boundary to the detriment of health or property on the other side.

Furthermore, since the early 1970s, through the Great Lakes Water Quality Agreement, Canada and the United States have made it a goal to restore and maintain the physical, chemical, and biological integrity of the Great Lakes. To help achieve these goals and address issues of water quality across the transboundary, nutrient reduction strategies are needed that require knowledge of where water quality problems exist, as well as where and from what sources the contributing nutrients originate throughout the watershed. Through applications like SPARROW, modelling helps provide answers to these questions.

Normally, water quality health is determined through water quality monitoring, defined as the sampling and analysis of water and conditions of the waterbody (i.e. a stream, lake, river, or estuary). It evaluates the physical, chemical, and biological characteristics of a water body related to human health, ecological conditions, and designated water uses in the waterbody (US Environmental Protection Agency). Models on the other hand are tools for interpreting such observations. For example, using geographic data models can simulate patterns using both statistical relationships and physical processes represented in the model to develop a more complete picture of water quality issues in a watershed. These findings can be mapped in GIS software. The integration of monitoring and modelling is crucial for our current and future understanding and management of large-scale water quality.

SPARROW modelling results can help:

- Determine how to reduce loads of contaminants and design protection strategies;
- Design strategies to meet regulatory requirements;
- Predict changes in water quality that might result from management actions; and
- Identify gaps and priorities in monitoring.

The output of SPARROW models is a spatial representation of total nutrient load and yield, broken down by watershed. In addition, the model can produce a breakdown of the different sources of these nutrients ranging from human activities and land use practices, to environmental sources including agricultural activity, atmospheric deposition, and more.

Appendix 9

Excerpts from Ontario's *Application Guidelines for Cage Aquaculture Facilities in Ontario*
https://www.ontario.ca/page/application-guidelines-cage-aquaculture-facilities

* **Note** : This guideline was approved (2016) and in use for regulating the cage farm operations 3 years before the Ontario Ministry of Environment (MECP) had finalized the accompanying Water Quality and Sediment Guidelines (2019). GBA found that very disturbing and after much questioning there was little communications to offset our concerns.

Glossary of terms

Class environmental assessment (class EA):
An environmental assessment for a class of undertakings that is approved under Part II.1 of the *Environmental Assessment Act, 1990*.

Crown land:
For the purposes of aquaculture licences, this only includes lands administered under the *Public Lands Act* by the Ministry of Natural Resources and Forestry, and does not include any area regulated under the *Provincial Parks and Conservation Reserves Act, 2006*.

Operational boundary:
A geographic area defined in the aquaculture licence representing the perimeter of the cage aquaculture operation site within which the environmental effects of the operation on sediment quality are expected to be contained.

Primary site:
The geographic location where the majority of aquaculture operations occurs (e.g. spatial, temporal).

Secondary site:
A geographically discrete site from the primary site where fish from the primary site may be moved to on an annual or seasonal basis.

Type 1 site:
Enclosed (lake like) basins/embayments with limited flushing.
Type 2 site:
Partially exposed sites having good epilimnion/metalimnion flushing but limited or no hypolimnion exchange.
Type 3 site:
Exposed locations where the hypolimnion is well flushed.

Waste Assimilation:
Consumption of aquaculture waste materials by benthic invertebrates and their conversion into invertebrate tissue indicated by benthic invertebrate densities.

4.1.7 Class Environmental Assessment for MNRF Resource Stewardship and Facility Development Projects (Class EA-RSFD)

The MNRF is subject to the requirements of the *Environmental Assessment Act, 1990* (EAA). The MNRF's Class EA-RSFD provides EAA coverage for resource stewardship and facility development projects, including their planning, design, construction, operation, maintenance, rehabilitation, and retirement or decommissioning. The disposition of certain or all rights to Crown resources (e.g., Crown land administered under the *Public Lands Act*) is one of the MNRF projects to which the Class EA-RSFD applies.

The Class EA-RSFD has requirements that MNRF must follow before proceeding with a proposed project. The Class EA-RSFD screening process enables a proposed project to be assigned to one of four categories (Category A, B, C or D) based on the potential net environmental effects, Aboriginal considerations and level of public concern.

A few examples of projects that could fall under various Class EA-RSFD categories include:

Category A:

- A transfer of Crown land occupational authority documents (e.g. Type C applications).

Category B:

- Type A applications proposing a new facility and Crown land occupational authority; or
- Type B applications requesting an expansion of Crown land occupational authority to allow for infrastructure upgrades or improvements, or production increase.

Category C:

- Applications requesting occupational authority to allow for production that would require a feed allocation greater than 2500 tonnes (metric) per year.

Each Class EA-RSFD category has specific requirements for project evaluation (e.g. project plans, environmental studies) and consultation (e.g. public notice inviting the public for comment on the proposed project, Notice of Completion), tailored to the potential risk associated with that category of project. For example, Category B projects include one notice at the beginning of the process and a second notice to parties who expressed their interest. Whereas the Category C process includes two mandatory points of notification and the preparation of an Environmental Study Report. In addition, evaluation of the environmental effects and/or issues raised throughout this process may identify the need for additional information and/or mitigation measures. Where significant concerns remain, the project may be elevated to a higher Class EA-RSFD category.

MNRF may delegate certain procedural aspects of the applicable Class EA-RSFD requirements to the applicant. This may include notifying, disclosing information, discussing issues, providing opportunities to make submissions, providing written responses to comments and modifying proposals to address comments and time

4.1.8 *Environmental Bill of Rights, 1993*

The EBR sets out minimum levels of public notice that must be met before the Government of Ontario makes decisions on certain kinds of environmentally significant proposals. A proposal to issue a licence that authorizes a person to engage in cage aquaculture is prescribed as a Class I proposal under the EBR and requires giving notice on the Environmental Registry, except where the proposal relates to the issuance of a licence for a cage aquaculture facility that requires a decision under the MNRF Class EA-RSFD (e.g. where the facility would require occupational authority under the *PLA*). In cases when the exception applies, MNRF will post Information Notices on the Environmental Registry at the onset of the preliminary review (step 5a) to allow for public comment to be provided and considered by the MNRF.

4.2.1 *Fisheries Act*, and Aquaculture Activities Regulations

For aquaculture operations, the deposit of prescribed deleterious substances (e.g. drugs, pesticides and biochemical oxygen demanding matter) and serious harm are authorized through the Aquaculture Activities Regulations (AAR), subject to conditions specified within (including but not limited to annual reporting requirements). Best efforts to avoid serious harm during aquaculture facility siting by re-locating or modifying a planned operation is a responsibility of aquaculture operators; otherwise, if serious harm cannot be avoided, compliance with Section 15 of the AAR authorizes the operation subject to conditions which include taking reasonable measures to mitigate the risk of serious harm.

The AAR was developed to clarify conditions under which aquaculture operators may install, operate, maintain or remove an aquaculture facility, or undertake measures to treat their fish for disease and parasites, as well as deposit organic matter, under Sections 35 and 36 of the *Fisheries Act*. The AAR allows aquaculture operators to do so within specific restrictions to avoid, minimize and mitigate any potential detriments to fish and fish habitat. Operators are responsible for meeting the requirements of all applicable legislation and regulations and are advised to refer to the most current version of the regulations directly.

4.3 Agreements and Commissions

Ontario is a signatory to agreements and commissions with respect to both water quality and fisheries including the Canada-Ontario Agreement on Great Lakes Water Quality and Ecosystem Health (COA) and The Great Lakes Fishery Commission (GLFC). Ontario is also a leader in the development of strategic initiatives with respect to both water quality and fisheries including domestic action plans and the Great Lakes Strategy. Although these initiatives do not specifically provide criteria with respect to the review of an aquaculture application, strategic and/or operational policy may be developed in response to such initiatives. The Application Guidelines will be updated in the event that a future policy response outlines additional factors, and/or criteria, that are required to be taken into consideration when reviewing an application.

5. Application review process

5.1 Review process

MNRF will act as the 'One Window' for the applicant to facilitate a coordinated review of the application by provincial and federal agencies that are responsible for regulating and issuing approvals, permits and authorizations required for cage aquaculture activities in Ontario.
MNRF decisions with respect to the review of an application are informed by:

- Information provided by the applicant;
- Consultation with First Nation and Métis communities;
- Information received from other government agencies, and the public;
- Legislation, regulations, and strategic and operational policies; and
- Expertise of government staff involved in the review of the application.

MNRF will coordinate, to the extent possible, the information exchange between the applicant and responsible agencies (e.g. timing and communication of decisions). Each agency will make its independent decision regarding approvals, permits and authorizations under the applicable legislation within their agency mandate.

5.2 Application review timelines

The timelines required to process an application will vary depending on the scope and nature of the application, the need for data collection and analysis, and the level of Aboriginal consultation and public engagement that is required. General application review timelines are anticipated as follows:

- Type A or Type B applications that require more comprehensive data collection, consultation and notification could take up to two years;
- Type C applications may be processed within 6 to 9 months.

Appendix 10

Canadian Science Advisory Secretariat (CSAS)
Research Document 2017/059
Central and Arctic Region
October 2017 Freshwater Cage Aquaculture:

Excerpts: ***Ecosystems Impacts from Dissolved and Particulate Waste Phosphorus***
Megan K. Otu1 , Dominique P. Bureau2 , Cheryl L. Podemski1

https://waves-vagues.dfo-mpo.gc.ca/Library/40643761.pdf

Should the industry expand, sites still must meet the licence agreements with high flushing rate (Type 3 sites) and adequate water depths (> 16 m) that will continue to ensure a sustainable industry. Future expansion requires careful placement and consultation to meet these regulations.

Furthermore, confounding variables like the introduction of invasive species or climate change may challenge our current understanding of the threats of P from freshwater cage operations.

Sound modelling of biotic and abiotic factors that can be calibrated with current monitoring values will better aid future predictions of lake wide responses to P loads.

Appendix 11

Lac Heney, Quebec, disaster from cage aquaculture

Cottagers turn to chemical solution for trout farm mess

Quebec settlement funds $3.2-million barge project

Ottawa Citizen
3 Dec 2007
BY DAVE ROGERS

Cottagers on Lac Heney near Gracefield have purchased a $3.2-million bargeload of corrosive chemicals they hope will reverse years of trout farm pollution that is killing the lake.

The money comes from a $5-million mediated settlement in 2004 that requires the Quebec government to pay for pollution produced by a trout farm it subsidized on the picturesque 12-square-kilometre lake in the 1990s. The 350 cottagers involved in a class-action lawsuit against the government and the trout farm, Serge Lafrenière Inc., will receive nothing.

A crew on the barge, towed by three tugboats, will have until Saturday, mixing lake water with iron chloride and injecting the red liquid into the lake. The 1,800 tonnes of chemicals will cause the phosphates produced by seven years of fish farming to sink to the lake bottom, increasing oxygen levels in the water.

Pierre Calvé, the president of the Association for the Protection of Lac Heney, said it's probably the largest such cleanup ever attempted.

The Quebec government paid Serge Lafrenière $2 million to close his trout farm in 1999 after allowing him to produce up to 250 tonnes of fish a year for six years. Mr. Lafrenière then set up half a dozen trout farms and hatcheries in Nova Scotia that went into receivership in 2000, owing almost $21 million to about 100 creditors.

Mr. Calvé said the fish feed and resulting feces released phosphates equivalent to that produced by a city of 100,000 people into Lac Heney. The lake became increasingly turbid as phosphate levels rose and algae and weeds — which are fertilized by the phosphates — increased.

Phosphate levels continued to rise after the fish farm closed because the lake's water is not renewed as quickly as it is in most other lakes.

"Scientists found that the real problem was that the lake lacked iron," Mr. Calvé said. "The iron is what keeps the phosphates in the sediment rather than have it accumulate in the water.

"The fish farm left hundreds of tonnes of phosphates in the lake. Any lake deteriorates over time, but the fish farm accelerated this process a hundredfold."

The low iron levels mean that phosphates in the sediment at the lake's bottom is released.

Scientists who tested iron chloride in one bay on the lake two years ago found that the chemical reduced phosphate levels in the water within a few days, Mr. Calvé said.

Appendix 12

The specific attachments referenced in this submission can be viewed on the GBA website at this link: https://georgianbay.ca/fisheries/cage-aquaculture-issue/cage-aquaculture-submissions/ are as follows, as listed at this link:

- A Uni of Guelph Review-of-Aquaculture_2017
- B Ontario Aquaculture Research Priorities Roundtable 2019
- C Michigan Ministries Report to not permit cage aquaculture March 2016
- D Excerpts from ECO (2000-2006) Revolving Issues
- E UN Guidelines, Aquaculture Certification 2019
- F NALMS Lake Heney Presentation (wecompress.com)
- F1 Memo on Lac Heney Rehabilitation 2007
- G GBA letter to MOE re Class EA RSFD Nov 13 2018
- H MECP Environment Policy Objectives for Cage Aquaculture – August 2019
- J NASAPI action plan 2011-2015

The GBA Submission to the Senate Committee on Bill C68 Mar 31 2019 and its attachments can also be viewed at:
https://georgianbay.ca/fisheries/cage-aquaculture-issue/cage-aquaculture-submissions/
and the attachments to that submission, as listed at this link, are as follows:

- 1 GBA Aquaculture updated position and rationale October 18 2018
- 2 GBA Briefing Notes to Standing Committee on Fisheries and Oceans Nov 2011
- 3 GBA COMMENTS ON DFO'S NATIONAL AQ STRATEGIC ACTION PLAN SEPT 2009
- 4 GBA Letter to Senate Committee on aquaculture Oct 2014
- 4A Followup Letter to Senate Committee re Industry Testimony Feb 17 2015 final
- 4B Internal GBA memo on Industry testimony to Senate Committee Jan 2015
- 5 Transcript of GBA's Witness statement to DFO Senate Committee Oct 2014
- 5A GBA Notes re NASAPI plan Oct 2014
- 6 GBA Response to NOAA Fact Sheet November 2012
- 7 GBA Phosphorous Fact Sheet 2013 Paul Hamblin
- 8 GBA Letter to GlenMurray re GLPA Feb 23 2015
- 9 GBA Petition to Federal Environment Commissioner Feb 2007
- 10 GBA Letter to DFO Dec 17 2013
- 11 Ontario Nature & GBA Brief to Ontario MNR Oct 2006

- 12 GBA memo Summary Fish Habitat Paper, Lotimer Apr 2007
- 13 Letter to Ontario MECP re Class EA RSFD Nov 13 2018
- 14 Advanced RAS2020 Model,2019
- 15 Report on Manitoba Aqua-Farm 2018
- 15 Report on Manitoba Aqua-Farm 2018 GBA Notes
- 16 Feb 2017 news article on sustainable salmon operation
- 16 Feb 2017 news article on sustainable salmon operation 2
- 17 GBA Report on Lake Wolsey Jan 8 2018
- 18 MOECC Lake Wolsey Study Part 1
- 19 MOECC Lake Wolsey 2016 Study Part 2
- 20 Resolution on Aquaculture, GLFC jun 2015
- 21 Lake Huron LAMP 2017-2021_1-55 (1)
- 21 Lake Huron LAMP 2017-2021_56-end
- 22 Michigan nixes net-pen aquaculture – Aquaculture North America
- 22A Report,Michigan's Science Advisory on Net-cage aquaculture, Oct,2015
- 23 Ontario MOECC report on cage aquaculture effects on sediment and water quality Jun 2013
- 24 Ontario MECP Draft Objectives for Sediment and Water Quality, 2016 posting
- 25 GBA EBR Response to MNRF June 10 2016
- 26 GBA EBR Response to MOECC June 10 2016