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By email: Cassandra.Carter@Ontario.ca

Dear Ms. Carter:

Re: EBR Registry Number: 012-9499
Naturally Resilient: MNRF's Natural Resource Climate Adaptation Strategy

Ontario Rivers Alliance (ORA) is a Not-for-Profit grassroots organization acting as a voice for several stewardships, organizations, and private and First Nation citizens who have come together to protect, conserve and restore healthy river ecosystems.

Safeguarding the resiliency of our natural heritage landscape is of the utmost importance in this changing climate where warming seasonal temperatures, heavy rains, severe drought and high winds seem to have become the norm. ORA is pleased to comment on MNRF's draft Naturally Resilient: Natural Resource Climate Adaptation Strategy (Strategy).

A Natural Heritage Landscape:

It is unfortunate that such an important policy document is centered around protection of "natural resources" and their usefulness to humans, and ultimately our economy, rather than a much broader focus on safeguarding Ontario's natural heritage landscape to provide a thriving and resilient environment in the face of climate change. This can only be accomplished through the alignment of other key policies and legislation to ensure a reduction in the environmental footprint of past, present and future developments on our air, land and water.

Resiliency of Freshwater Ecosystems:

It is encouraging that MNRF in its risk assessment recognizes that the areas of greatest risk from climate change will be on biodiversity, wetlands, peatlands, maintaining ecological integrity, managing water resources sustainably, and in the operation and maintenance of Crown-owned dams.

Climate change has already taken its toll on our freshwater ecosystems with increasing water temperatures and water alkalinity, which have led to increased incidents of blue-green algae, and severe challenges to freshwater fish populations, especially cold-water species.

Ontario fisheries are a valuable but ecologically sensitive resource that contributes substantially to the Ontario economy, with recreational and commercial fishing valued at more than $2.5 billion, and employing 41,000 person years annually. It is also a driving force for Ontario's tourism industry and a key economic component in many communities, particularly in Northern Ontario with 1600 licensed tourist operators generating hundreds of millions of dollars in revenue annually[1].

It is therefore imperative that Ministries direct policy and decision making, as well as enforcement of existing laws, with the goal of building resiliency into Ontario's streams, rivers, lakes and wetlands, and protecting them from existing and new developments.

Ontario's freshwater has been heavily impacted by development, including the release of untreated and undertreated wastewater into our streams, rivers and lakes, as well as existing hydroelectric dams that are given lucrative incentives under the Green Energy Act to increase power generation during peak demand hours without first having undergone environmental assessments to assess and/or mitigate their impacts on riverine ecosystems.

It is crucial that the province not just consider future development of natural resources, but also the sustainability and cumulative effects of all past and present developments within a watershed.

Natural resource management planning, policy, programs and practices must ensure that the precautionary principle is used in a meaningful way during monitoring, enforcement, and future development decisions.

Hydroelectric Reservoirs and Greenhouse Gas Emissions:

The Strategy strives to complement Ontario's other action plans to mitigate climate change through actions that reduce, sequester or prevent emissions of greenhouse gasses (GHG) into the atmosphere. However, there must be a broader scope that encompasses the consideration of numerous other pressures and triggers within complex ecosystems.

As the Strategy mentions, wetlands and peatlands are particularly important in reducing greenhouse gas concentrations because they have the potential to sequester and store significant amounts of carbon, and yet existing hydroelectric reservoirs are flooding wetlands, and new proposed facilities would clear cut forests and flood wetlands to reap the lucrative incentives under the Green Energy Act. These types of developments turn a GHG sink into a GHG emitter.

Resource management must also consider the valuable ecosystem services that healthy forests provide to our streams, rivers, lakes and wetlands. Healthy forests act as buffers to filter stormwater runoff, prevent erosion, and provide natural cover to help reduce thermal warming of our freshwater.

Hydroelectric power generation is often described as "clean" and "green", and hence a preferred alternative to "dirty" energy produced by other means such as coal-fired power plants that produce GHGs. When people refer to hydro as clean, it's usually in the context of GHG emissions. However, governments and utilities often use the term "clean" categorically and without caveat or qualification. This is misleading - just because dams are not spewing out smoke does not mean they are clean or

[1] *EBR Registry 012-0291. 2014. Draft-Provincial Fish Strategy – Ontario Government.*

green. Indeed, hydroelectric power generation has resulted in significant and ongoing impacts to fish and wildlife populations and habitat, to ecological processes, and to aboriginal communities.[2]

Dams and associated waterpower facilities harm the environment[3] and, when headponds or reservoirs are flooded, can produce significant amounts of carbon dioxide and methane for decades, and possibly centuries.[4,5] As Environment Canada states in their "Threats to Water Availability in Canada" document,

> *In contrast to the widespread assumption (e.g., in Intergovernmental Panel on Climate Change scenarios) that GHGs emitted from reservoirs are negligible, measurements made in boreal and tropical regions indicate they can be substantial*[6,7].[8]

Flooding landscapes to create reservoirs causes flooded vegetation and soils to decompose, and for sediment to accumulate behind the dam, resulting in net emissions of the GHGs, carbon dioxide (CO_2), and methane into the atmosphere for decades and possibly centuries following flooding.[9,10] New reservoir flooding also accelerates the bioaccumulation of methylmercury, and these effects can persist for 20 to 30 years or more.[11,12]

Methane is a potent greenhouse gas with a heat trapping capacity 34 times greater than that of carbon dioxide on a 100 year time scale.[13] Methane is generated in reservoirs from bacteria living in oxygen-starved environments. *"These microbes eat organic carbon from plants for energy, just like*

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[2] PEW Environment Group. 2011. A Forest of Blue: Canada's Boreal. Online: http://www.pewtrusts.org/~/media/legacy/uploadedfiles/peg/publications/report/PEGBorealWaterReport11March2011pdf.pdf

[3] Ibid.

[4] Maeck, A., DelSontro, T., McGinnis, D.F, Fischer, H., Flury, S., Schmidt, M., Fietzek, P. and Lorke, A., 2013. Sediment Trapping by Dams Creates Methane Emission Hot Spots, Environmental Science and Technology, 8130-8137, Online: http://www.dx.doi.org/10.1021/es4003907

[5] Venkiteswaran, J.J., Schiff, S.L., St. Louis,V.L., Matthews, C.J.D., Boudreau, N.M., Joyce, E.M., Beaty, K.G., and Bodaly, R.A.(2013), Processes affecting greenhouse gas production in experimental boreal reservoirs, Global Biogeochem. Cycles, 27, doi:10.1002/gbc.20046

[6] St. Louis, V.L., Kelly, C.A., Duchemin, E., Rudd, J.W.M., Rosenberg, D.M. 2000. Reservoir Surfaces as sources of greenhouse gases to the atmosphere: a global estimate. BioScience 50(9) : 766-775.

[7] World Commission on Dams. 2000. Introduction to Global Change, Working Paper of the World Commission on Dams, Secretariat of the World Commission on Dams, Cape Town, South Africa.

[8] Environment Canada. 2004. Threats to Water Availability in Canada. National Water Research Institute, Burlington, Ontario. NWRI Scientific Assessment Report Series No. 3 and ACSD Science Assessment Series No. 1. 128 p.

[9] Venkiteswaran, J.J., Schiff, S.L., St. Louis,V.L., Matthews, C.J.D., Boudreau, N.M., Joyce, E.M., Beaty, K.G., and Bodaly, R.A.(2013), Processes affecting greenhouse gas production in experimental boreal reservoirs, Global Biogeochem. Cycles, 27, doi:10.1002/gbc.20046

[10] Maeck, A., DelSontro, T., McGinnis, D.F, Fischer, H., Flury, S., Schmidt, M., Fietzek, P. and Lorke, A., 2013. Sediment Trapping by Dams Creates Methane Emission Hot Spots, Environmental Science and Technology, 8130-8137, Online: http://www.dx.doi.org/10.1021/es4003907

[11] Rosenberg, D.M., et al. 1997. Large-scale impacts of hydroelectric development. Environmental Reviews. 5: 27-54.

[12] World Commission on Dams. 2000. In Dams and development: A new framework for decision-making; Earthscan Publications: London.

[13] Myhre, G., Shindell, D, Breon, F.-M., Collins, W., Fuglestvedt, J., Huang, J., Koch, D., Lamarque, J.F., Lee, D., Mendoza, B., Nakajima, T., Robock, A., Stephens, G., Takemura, T., Zhang, H., Anthropogenic and natural radiative forcing. In Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change; Stocker, T. F., Qin, D., Plattner, G.-K., Tignor, M., Allen, S. K., Boschung, J., Nauels, A., Bex, V., Midgely, P. M., Eds.; Cambridge University Press: Cambridge, U.K. and New York, U.S.A., 2013.

people and other animals, but instead of breathing out carbon dioxide, they breathe out methane." [14] River networks with high nutrient and sediment loading from agricultural or wastewater effluent provides microbial communities with a large source of carbon that can deplete sediment oxygen and fuel methane production. Algal blooms from excessive nutrient loading can further enrich reservoir sediments.[15]

It is way past time for governments to acknowledge the serious and ongoing negative impacts associated with hydroelectric power generation, including the significant amounts of GHGs emitted from their reservoirs. Steps must be taken to improve the sustainable development and use of water and waterpower in Ontario.

Ontario recognizes that sustainable development is vital in many of its strategic documents, and has recognized it as development that meets the needs of the present without compromising the ability of future generations to meet their own needs.[16] Ecology and the environment have been significantly compromised by many waterpower facilities in the past, often caused by narrow one-off approaches to approvals that have ignored the potentially significant cumulative effects on the environment, ecology and biodiversity of a region. Unless carefully identified and mitigated, significant cumulative effects from waterpower will occur at the watershed, regional and/or provincial scale.[17]

We must take into account both the built infrastructure and the green infrastructure as a unit working together to improve sustainability and climate resilience. Considerations such as climate change, downstream flow regimes, siting and design, biodiversity, water quality, and financial viability, must be integrated into the cost-effectiveness, risk and sustainability of a project. The watershed or sub-basin in question must be considered as a whole in which other human activities and the natural environment are inseparable and should accordingly operate harmoniously for the long-term.[18]

As the province continues to implement its green energy mandate and considers new sites for waterpower, it is important that all involved recognize that water is a finite resource. All water in a watershed shares the same fate and flows to the same destination; therefore, any upstream development will impact on all downstream waters. The lessons learned over the past century in Ontario and elsewhere, tells us that what we do in our waterways can ultimately affect species and ecosystems hundreds of kilometers downstream.

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[14] Beaulieu, J.J., Smolenski, R. L., Nietch, C.T., Townsend-Small, A., and Elovitz, M.S., 2014. High Methane Emissions from a Midlatitude Reservoir Draining an Agricultural Watershed. United States Environmental Protection Agency, Office of Research and Development, National Risk Management Research Laboratory, Cincinnati, Ohio 45268, United States.

[15] West, W.E., Coloso, J.J., Jones, S.E. Effects of algal and terrestrial carbon on methane production rates and methanogen community structure in a temperate lake sediment. Freshw. Biol. 2012, 57 (5), 949−955.

[16] Maeck, A., DelSontro, T., McGinnis, D.F, Fischer, H., Flury, S., Schmidt, M., Fietzek, P. and Lorke, A., 2013. Sediment Trapping by Dams Creates Methane Emission Hot Spots, Environmental Science and Technology, 8130-8137, Online: http://www.dx.doi.org/10.1021/es4003907

[17] MacGregor, R., Haxton, T., Greig, L., Casselman, J.M., Dettmers, J.M., Allen, W.A., Oliver, D.G., and McDermott, L. 2015. The demise of American Eel in the upper St. Lawrence River, Lake Ontario, Ottawa River and associated watersheds: implications of regional cumulative effects in Ontario. Pages 149–188 in N. Fisher, P. LeBlanc, C. A. Rose, and B. Sadler, editors. Managing the impacts of human activities on fish habitat: the governance, practices, and science. American Fisheries Society, Symposium 78, Bethesda, Maryland.

[18] The Handbook for Management and Restoration of Aquatic Ecosystems in River and Lake Basins, 2015. ISBN: 978-91-87823-15-2 – P-36

A very high environmental and socio-economic price has been paid in the past in terms of losses to other valued natural resources due to the installation of dams and waterpower facilities. The socio-economic costs of these losses are generally ignored[19,20], and rarely reported to the public.

Any future growth of waterpower must reflect the need for an evolution of perspectives that respect existing ecosystems, cultures and human rights.[21]

Conclusion:

The World Economic Forum in its "Global Risks 2015" report lists "water crises" as its number one global risk in terms of impact – beating out the rapid spread of infectious disease, weapons of mass destruction, and failure of climate-change adaptation.[22]

It is essential that we secure an environmentally and socially sustainable freshwater future for our children and grandchildren, so let's ensure that any actions taken today to address climate change or power shortages or green energy are methodically researched and carefully considered to understand what the trade-offs will be.

The focus of the Strategy's five goals should not just be on "Natural Resources", but rather on the resilience of the province's natural heritage landscape, using a watershed approach, in consideration of the cumulative effects of all past, present and future development on our air, land and water. Additionally, the scope of the Strategy must be broadened to encompass a review of all policies, guidelines and legislation that do not support the resiliency, conservation and protection of our streams, rivers, lakes and wetlands in this warming climate.

In closing, ORA would like to extend our support for the submissions of the WCS Canada, as well as the Ontario Headwaters Institute.

ORA is grateful for this opportunity to comment.

Respectfully,

Linda Heron
Chair, Ontario Rivers Alliance

Cc: Diane Saxe, Environmental Commissioner of Ontario
Justina C. Ray, Ph.D. President & Senior Scientist, WCS Canada
Andrew McCammon, Executive Director, Ontario Headwaters Institute

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[19] *Wang, G., Fang, Q., Zhang, L., Chen, W., Chen, Z., Hong, H. 2010. Valuing the effects of hydropower development on watershed ecosystem services: Case studies in the Jiulong River Watershed, Fujian Province, China, Estuarine Coastal and Shelf Science. 86.3:363-368.*

[20] *Institute for Fisheries Resources.1996. Cost of Doing Nothing: The economic burden of salmon declines in the Columbia River basin. Report No. 1 of 3.*

[21] *Bauer, Martin W. and Jensen, Pablo (2011). The mobilization of scientists for public engagement. Public Understanding of Science, 20 (1). pp. 3-11. ISSN 0963-6625*

[22] *Global Risks 2015 – 10th Edition. Online: http://www3.weforum.org/docs/WEF_Global_Risks_2015_Report15.pdf*