International Joint Commission
Canada and United States

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November 15, 2019

Chris Korleski
Director, Great Lakes National Program Office
& U.S. GLEC Co-Chair
U.S. Environmental Protection Agency
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Mike Goffin
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Environment and Climate Change Canada
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Canada

Re.: Great Lakes Science Advisory Board Advice on Parties' 2020-2022 Science Priorities

Dear Messrs. Korleski and Goffin,

Annex 10 of the *Great Lakes Water Quality Agreement* requires that the Parties establish science priorities on a three-year basis, considering advice developed by the Commission in consultation with the IJC's Great Lakes Science Advisory Board (SAB). The Commission recently reviewed and endorsed the attached SAB advice on the Parties upcoming Priorities for Science.

The Commission believes that the restoration and health of the Great Lakes would benefit from a longer term integrated binational approach to science. The Commission recently approved a Science Advisory Board project whose goal is to develop a comprehensive science plan for a decadal scale, binational program of Great Lakes research. The project will summarize major existing investments in Great Lakes research and monitoring and hold two major workshops to develop science questions, assess gaps, describe required research infrastructure, human resources, and funding needs. The project work group will include representatives from the Parties and is being coordinated with the Congressionally-mandated science plan being developed by the U.S. Geological Survey. The Commission would welcome the opportunity to collaborate with the Parties to assess how we might be able to align these efforts. We anticipate that this work would help strengthen and inform the governments' subsequent Priorities for Science.

We trust the attached SAB advice will be helpful to the Parties. Consistent with its current policy, the Commission will make these comments available to the public.

Sincerely,

Pierre Béland
Chair, Canadian Section

Jane Corwin
Chair, U.S. Section

cc. Sylvain Fabi, Global Affairs Canada
Laura Lochman, U.S. Department of State

Attachment

INTERNATIONAL JOINT COMMISSION
SCIENCE ADVISORY BOARD

ADVICE ON PARTIES' DRAFT PRIORITIES FOR SCIENCE (2020-2022)

November 6, 2019

Introduction

Annex 10 (Science) of the Great Lakes Water Quality Agreement assigns the International Joint Commission (IJC) and its Science Advisory Board (SAB) a role in providing input to the Parties on priority science issues on a three year basis. The relevant excerpt from Annex 10 of the Agreement is pasted below, with italics added for emphasis:

> C. Science Review, Priority-Setting and Coordination
>
> The Parties, in cooperation and consultation with State and Provincial Governments, Tribal Governments, First Nations, Métis, Municipal Governments, watershed management agencies, other local public agencies, and the Public, shall:
>
> 1. undertake a review of available scientific information to inform management actions and policy development. Priority issues to be addressed through this review of available scientific information shall be established on a three-year basis by the Parties in consultation with the Great Lakes Executive Committee, *considering advice developed by the Commission in consultation with the Great Lakes Science Advisory Board*;
>
> 2. *identify science priorities, taking into account recommendations of the Commission*;

The Parties' initial Draft Priorities for Science and Action (2020-2022) was posted to binational.net on August 1, 2019. Although the deadline for comments was August 30, 2019 the Great Lakes Executive Committee (GLEC) Co-Chairs signalled they would welcome SAB input after that date. The Agreement states that the Parties shall establish their priorities not later than six months after the Great Lakes Public Forum, which was held June 17-19, 2019.

This document summarizes the SAB's advice to the Parties on the attached Draft Priorities for Science[1]. In addition to this document, IJC and its advisory boards have produced recent reports that include recommendations related to research, monitoring and surveillance[2]. This advice benefitted from input

[1] The Agreement does not invite input on the Priorities for Action, and therefore comments are limited to Priorities for Science.

[2] Relevant reports that can be accessed at www.ijc.org include:
Fertilizer Application Patterns and Trends and Their Implications for Water Quality in the Western Basin of Lake Erie – original report (2018) and supplemental report (2019).
Use of Modelling Approaches to Affect Nutrient Management Through Adaptive Management (2019)
Great Lakes Surface and Groundwater Model Integration Review (2018)
Human Health Effects of Cyanobacterial Toxins in the Great Lakes Region: A Science and Monitoring Assessment (2017)

provided by the IJC's Water Quality Board. General comments that apply to all Agreement Annexes are presented first, followed by advice on each of the Agreement's 10 Annexes. Editorial comments are presented last. The SAB's recommendations are **bolded** where they appear in this advice.

General

In 2016, the Commission provided input on the Parties (then) draft priorities for science (2017-2019), accessible at https://www.ijc.org/en/sab/advice-parties-2017-2019-science-priorities. The SAB finds that several of the recommendations included in the Commission's previous advice are relevant for the 2020-2022 science priorities.

The SAB finds that there is significant unevenness in the level of detail associated with each Annex's science priorities. Contrasting examples include Annex 1 (little detail) and Annex 7 (greater detail). While it is recognized that less detailed priorities allow for flexibility, generally SAB members felt that greater detail is more appropriate for guiding agency science programs over the three-year duration the priorities are in effect.

Annex 1 – Areas of Concern

The SAB commends the Parties on including a priority for science for Annex 1 for 2020-2022. The 2017-19 priorities for Annex 1 did not include any science priorities which the SAB viewed as a deficiency given that most remedial actions are justified by underlying science assessments for each of the impaired beneficial uses.

The Annex 1 science priority included in the 2020-2022 draft is very general and would benefit from greater specificity. Greater specificity would provide local Remedial Action Plan teams with improved direction, and fulfil the accountability principle of the Agreement. At a minimum **the SAB recommends** that two science priorities be included to address progress towards beneficial use impairment removals (BUIs) that include a consideration of Indigenous Knowledge, and ensures no backsliding for delisted Areas of Concern (AOCs):

- Undertake research and monitoring, including a consideration of Indigenous Knowledge, in AOCs to guide remediation and measure progress towards removal of BUIs;
- Undertake research to determine the appropriate on-going monitoring requirements for ensuring delisted AOCs continue to meet or exceed the criteria for delisting.

The SAB has heard from Remedial Action Plan practitioners that for some AOCs, some BUIs remain at a 'needs assessment' status and others that have been confirmed as impaired need additional study. The Parties should clarify the process to determine the needs for more science investigations in AOCs, and to prioritize those activities.

For other AOCs, the SAB has heard that effective remedial approaches for contaminated mine tailings have not yet been found or tested, although work is underway. An increased emphasis on scientific evaluation of new and emerging technologies for addressing sediments and contamination is needed.

The Parties have invested heavily in remedial actions in AOCs, and the increased rate of BUI removals in the last several years is encouraging. Because many of the remedial projects being undertaken in AOCs are impacted by changing climate – notably habitat restoration and fish and wildlife populations, and eutrophication and nonpoint source pollution remediation – **the SAB recommends** there be an explicit

emphasis on climate change in the design, implementation and monitoring of those management actions. Areas of inquiry that could be included in the Annex 1 science priorities include:

- Investigate whether and how climate change already has, or might lead to, increased costs, challenges, and longer timeframes needed to address certain BUIs and delist AOCs and/or influence the need to revisit priorities for addressing BUIs within and among AOCs;
- Investigate how climate change may reverse improvements to beneficial uses;
- Identify potential changes in actions or advancements in technology or management practices that might be able to mitigate these increased challenges and costs for addressing BUIs, and ensure their consistency among the states, province and implementing agencies; and,
- Identify and prioritize opportunities for which advancements in science and technology might be able to mitigate these increased challenges and costs.

The SAB reiterates its 2016 input that the Agreement includes language related to listing new AOCs. **The SAB recommends** that the Parties define the criteria for listing new AOCs[3] and ensure that ongoing monitoring programs at potential (i.e., degraded) sites are adequate to warn that a potential AOC may be developing.

Annex 2 – Lakewide Action and Management Plans

The 2020-2022 science priorities prescribe the continued implementation of the Nearshore Framework Assessments, including conducting the next National Coastal Condition Assessment (NCCA) in U.S. coastal waters of all the Great Lakes, and completing the Nearshore Assessment and LiDAR topobathymetry for the Canadian side of the Great Lakes.

The Agreement also requires that an integrated nearshore framework be implemented collaboratively through the lakewide management process for each Great Lake. However, implementation of nearshore management is proceeding through separate domestic processes: the NCCA in the U.S., and the Nearshore Assessment in Canada. Although the SAB acknowledges that they both serve a good purpose and provide useful information, neither has demonstrated how they work together to fulfill the Agreement requirement that they be implemented collaboratively. This is problematic, and calls attention to two specific issues:

- The NCCA, while useful in providing important information, was developed to use in marine coastal waters, and its methodologies do not necessarily match up with the ecology of the Great Lakes or the goals of the Nearshore Framework described in the Agreement. While the latest published NCCA report does say that it is working on its methodologies to better fit with the ecology of the Great Lakes, it raises the question of why undertaking the NCCA is a priority if, by using it, the assessment is not explicitly aligned with Agreement priorities.
- There is no information about how the NCCA relates to the work being done through the Nearshore Assessment, how they compare, if there are gaps in their respective analyses, or how they fulfill the requirement of an integrated, collaborate nearshore assessment in the Agreement.

Therefore, **the SAB recommends** that there be an explicit analysis of how the U.S. National Coastal Condition Assessment and Canadian Nearshore Assessment work together, identify any gaps, and demonstrate how using the two separate methodologies meet the intention of the integrated nearshore

[3] The IJC's List/Delist Criteria for Great Lakes AOCs provides useful guidance (available at http://www.ijc.org/rel/focus/listdelist/lidemain.html).

framework described in the Agreement. Further, the nearshore framework governance model needs to be tested and continually refined to adequately address threats to the lake at different and appropriate scales.

Annex 3 – Chemicals of Mutual Concern

The Parties have identified three priorities for science regarding chemicals of mutual concern (CMC). The SAB is fully supportive of those priorities and commends the Parties for including them. The SAB also believes that additional work should be considered as priorities, including providing more details on specific tasks to be carried out. Specifically, **the SAB recommends** that:

- Given limited resources for research, monitoring and surveillance, the Parties should review information needs identified in the binational strategies developed to date, develop prioritization criteria, and prioritize the information needs for these CMCs. This should include consideration of both outstanding science issues present for each of the CMCs, as well as information needs that may be particularly helpful in advancing management actions (including assessing effectiveness of such actions) to address individual CMCs. This process should also include consideration of needs identified in all the binational strategies for the first round of CMCs once finalized. Furthermore, the Parties should be investigating opportunities to advance research, monitoring and surveillance approaches that can address multiple CMCs at the same time, which may partly entail innovative sampling and analytical approaches (as indicated below).
- Concerning activities in support of an early warning system for potential future CMCs, the Parties should explore two avenues – the first related to actual surveillance and monitoring, and the second related to other approaches, including modeling (with a consideration of population growth, demographics and chemical use) and consideration of chemical properties. On the latter approach, there has been significant work historically identifying potential chemicals of concern (especially persistent, bioaccumulative, and toxic) based on physical-chemical properties (e.g. Howard, P.H. and Muir, D.C.G. 2010, *Environ. Sci. Technol*., 44:2277-2285), and the Parties should promote additional research building on that and more recent work to help identify and prioritize potential CMCs and the most appropriate media for monitoring in the Great Lakes.
- A related point is the potential need to expand the scope of current CMCs, where a particular category has been identified. For example, for the perfluorinated chemicals, the individual CMCs within this category are perfluorooctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS), and the long-chain perfluoroalkyl carboxylic acids group. There are thousands of perfluoroalkyl substances (PFASs) and considerable need to identify and address other PFASs, especially because compounds such as PFOA and PFOS have been phased out in the U.S. and Canada. Several recommendations related to additional science work addressing PFASs in the region were recently identified in an overview report (Murray, M.W., and Salim, O. 2019. The Science and Policy of PFASs in the Great Lakes Region: A Roadmap for Local, State and Federal Action, National Wildlife Federation, Great Lakes Regional Center, Ann Arbor, MI.)
- Concerning the third objective regarding analytical methods, we believe the Parties should consider a broader approach for understanding the presence and trends of CMCs in the Great Lakes basin. This should include consideration of sampling as well as analytical techniques for measuring toxic chemicals in the Lakes, which should be consistent among responsible authorities. The Parties could be promoting (including through funding programs) innovative and consistent approaches to both sampling and analysis, including via new approaches to passive sampling and application of newer, more sensitive analytical techniques that provide information across a wider range of chemicals and media in the Great Lakes.

Annex 4 – Nutrients

The SAB commends the Parties on including Annex 4 science priorities that are appropriate and offer greater detail than many of the other Annexes. This likely reflects the considerable investments by all levels of government and other stakeholders in understanding and mitigating the nutrient threat to the lakes.

The SAB finds that the science priorities focus almost exclusively on the nearshore and on Lake Erie. While these foci are understandable, **the SAB recommends** broadening the science priorities to include:

- Other areas within the basin that are experiencing excessive nutrient loading and harmful algal bloom (HAB) conditions including but not limited to Green Bay in Lake Michigan which has a long history of excessive algal blooms, and seasonal hypoxia. The recently established target for Green Bay phosphorus load reductions is 30% from current baseline by 2030, and a 60% reduction by 2040 which would achieve identified water quality goals. Other locations include Saginaw Bay, and parts of the southwestern shore of Lake Superior and northern and southern shores of Lake Ontario.
- An examination of the implications of new loading targets on both nearshore and offshore lake compartments. Lakewide ecosystem models need to be developed and applied to ensure that unforeseen offshore consequences are avoided that may arise from a narrow focus on addressing *Cladophora* in coastal locations. In the case of Lake Ontario particular consideration must be given to anticipated future changes in Lake Erie phosphorus concentrations (by the load reductions specified through international agreement) because the Niagara river is the major source of phosphorus to Lake Ontario.

The **SAB also recommends** that the science priorities address the role of dreissenids in altering phosphorus dynamics.

As noted above although the SAB commends the degree of specificity included in the Annex 4 priorities, we believe even greater specificity would better focus research, monitoring and surveillance activities. Therefore **the SAB recommends** the following changes to existing priorities (underlined) and new priorities:

- Update and apply watershed loading and aquatic ecosystem models to improve our ability to predict watershed and aquatic ecosystem response to nutrient load reduction efforts and use these models to support the adaptive management process.
- Conduct research and monitoring to improve our understanding of:
    - Inter-lake transport and sources of phosphorus in the Huron-Erie Corridor and Niagara River, including attention to the contribution of the Thames River to phosphorus and phytoplankton load to Lake Erie through the Detroit River system;
    - Factors driving toxicity in harmful algal blooms, including the role of nitrogen.
    - Build our knowledge base of the relationship between cyanobacteria growth and biomass and toxin concentrations, so models can better relate cyanobacteria control to toxicity reduction.
    - How future climate conditions may affect nutrient conditions in the Lake Erie basin, including the climate change impacts on hydrology and temperature in both the watershed and lake;
    - Techniques for controlling soluble reactive phosphorus, especially pertaining to export through tile drainage and intensive feedlot manure management systems.

- Beginning with Lake Ontario, commence review of GLWQA interim phosphorus concentration and phosphorus loading targets to assess their adequacy for the purpose of meeting Lake Ecosystem Objectives for the other Great Lakes, especially with respect to balancing the competing effects of phosphorus load reduction on *Cladophora* control and offshore productivity.

New priorities:

- Monitor the nutrient concentrations and loads in the Maumee River watershed, including the tributary system up into the watershed, to make an assessment of the effectiveness of BMPs being applied and to further post-audit the watershed models being applied.
- Develop and operationalize new remote sensing products to provide near real-time satellite imagery of algal blooms and provide future-casts of bloom extent/coverage.
- Conduct research to predict the occurrence and composition of harmful algal blooms (which has lagged well behind our ability to predict and control total algal biomass).
- Conduct research on the effectiveness of urban and rural best management practices (BMPs) and how such findings translate from local sub-watershed scale to delivery of nutrients to the lakes.
- Determine the influence of lag times in the catchment (i.e., the lag from adoption of BMPs in agricultural catchments to improved water quality in receiving rivers, river mouths, and lake). This can guide adaptive management actions and contribute to a better understanding of legacy phosphorus.
- Work with states and provinces to use existing science to set implementation goals for the footprint of management practices (e.g., percent of cropland with cover crops, riparian buffers, nutrient management, etc.) needed to achieve established nutrient reduction goals.

Annex 5 – Discharges from Vessels

The focus of the 2020-2022 science priorities are on ballast water, which is understandable given the importance of ballast water as a vector for aquatic invasive species to the lakes. However, we are of the view that Annex 5 should address other discharges and, accordingly, **the SAB recommends** the science priorities be expanded to address detecting, characterizing and reporting all discharges from vessels, including hydrocarbons and other chemicals, wastewater and sewage, plastics and other waste.

The SAB notes that reporting of discharges has been problematic for assessing vulnerabilities due to differences in the required level of reporting detail in each country. Within Canada, information on accidental discharges is collected in the Transportation Safety Board database. However, the database lacks consistencies in terms of product types and classification. Accordingly, **the SAB recommends** that both Canada and the U.S. enter discharge information of all specified types using a single coordinated tool.

Annex 6 – Aquatic Invasive Species

As noted in the draft 2019 State of the Great Lakes highlights presented at the Great Lakes Public Forum, aquatic invasive species (AIS) present a dire threat to the lakes. The SAB lauds the governments' focus in the 2020-2022 priorities for science on AIS prevention, which is essential. The SAB finds that its 2016 recommendations related to the determination of effects of habitat and climate change on the risks of AIS establishment are still valid.

The priorities for science address all AIS as a single group, and no species or other organism groups are highlighted for special attention. **The SAB recommends** that dreissenids be given special attention and mention for control and eradication. They are present in all lakes, and their impacts are extensive in at least four of the lakes - considering their role in redirecting phosphorus into the nearshore and loss of value of shoreline property, and in reduced productivity to valuable offshore fisheries. Limited intervention in dreissenid hotspots may have cost effective benefits even when lakewide eradication is not possible, such as where it can be shown that dreissenids are the primary driver of nuisance *Cladophora* blooms on high value coastlines. Consider the lesson of sea lamprey: after enormous effort to find an effective control strategy in the 1960s we now have an effective control program - science did not give up then and it should not now. No similar effort has been mounted for dreissenids, and more research is needed on dreissenid control and eradication approaches.

The use of models to understand invasion risk, spread, etc. is considerable and growing. **The SAB recommends** that models be referenced in the science priorities, specifically to assess the potential benefits and costs of different AIS management scenarios (across multiple pathways) across the Great Lakes, which use bioeconomic modeling to assess changes in ecosystem services.

Outreach and engagement approaches could also benefit from empirical analysis, and **the SAB recommends** that the Parties quantify and compare the potential effectiveness and costs of traditional (e.g., meetings, factsheets) vs. alternative (e.g., social media) education and outreach efforts to increase understanding and change the behavior of key stakeholders that influence the movement of AIS across the landscape (e.g., anglers and boat owners, pet trade retailers, bait shops, etc.).

<u>Annex 7 – Habitat and Species</u>

The SAB commends the governments for the specificity included in their priorities for science for Annex 7. We note that the Habitat Baseline Survey focuses mainly on habitat quantity, while restoration activities across the basin are concentrating on both restoring quantity and quality. **The SAB recommends** that habitat quantity and quality receive consideration for all relevant Annex 7-related activities.

Regarding the first priority for science which addresses inventories and mapping, **the SAB recommends** that consistent approaches be used in both the U.S. and Canada so that seamless and harmonized data products are available basin-wide.

For the final priority for science addressing changes to habitat suitability, **the SAB recommends** that indicator metrics be benchmarked to stressor levels and to current climate conditions to enable monitoring data to be used to assess both status and trends through time. Metrics need to account for potential changes in parameters (e.g., habitat suitability) with changing climate.

<u>Annex 8 – Groundwater</u>

The SAB agrees with the Annex 8 priorities for science, and is of the view that the first and second priorities could be further strengthened. For the first priority in particular, the IJC Science Advisory Board report included in footnote 2 includes some relevant recommendations.

The first science priority, which addresses developing better tools to assess groundwater-surface water interactions, is missing a basin-wide perspective. Thus, **the SAB recommends** that the first priority be revised to state:

- Develop better tools to assess groundwater - surface water interactions, including a basin-wide hydrological conceptual model that includes the role of groundwater and regional-scale numerical models based on local scale assessments that can be used to assess regional-scale flow of groundwater to surface waters in the Great Lakes basin.

The SAB is of the view that the second science priority should not be limited to contaminants in the groundwater that might affect lake water, but rather should include contaminants (especially algal toxins) in the lake that might enter the nearshore groundwater and affect shallow sources of drinking water. Thus, **the SAB recommends** that the second priority be revised to state:

- Undertake a focused assessment of the geographic distribution of known and potential sources of groundwater contaminants relevant to Great Lakes water quality, with a focus on nearshore contaminant sources and impacts, as well as consideration of potential influx of lake-water borne contaminants on shallow aquifers used as a source of drinking water.

Annex 9 – Climate Change Impacts

Climate change is expected to interact with many of the stressors already affecting the lakes, as well as the lakes' resource values. We believe there should be clearer linkages with other Annexes in the priorities for science, and therefore **the SAB recommends** the following additional priorities:

- Continue to refine hydrologic models for the Great Lakes to understand and forecast water level change (especially under changing climate), including short term wave action, seiches and storm surges.
- Continue to support investigations quantifying stressor interactions (especially with respect to climate change).
- Continue to refine models predicting nutrient loads to the lakes under changing climate regimes, with an emphasis on both eutrophic and mesotrophic lakes (or basins).
- Further our understanding of the factors that promote the initiation of harmful algal blooms.
- Work with Annex 7 (Habitat and Species) to assess vulnerabilities, adaptability, and responses of high priority species and suitability of their habitats in the Great Lakes basin to landscape level changes, including those induced by climate change, to identify projected changes in species distributions, population levels, and viability to inform binational conservation actions and decision-making.

To more fully understand climate change impacts in the basin **the SAB recommends** that the Parties complete an assessment of the monitoring and observing systems within the lakes and their adequacy for determining key climate signals, e.g. subsurface thermal structure. While we have reasonably good data on surface temperatures in the lakes, primarily via satellites, our collection of temperature profiles is quite limited and spatially sparse, i.e. we would benefit from an adequate and diagnostic network of thermistor strings that would detail thermal structure, changes in upwelling, propagation of thermal bars, etc. Winter data are also very limited, but may represent a time of year in which we see some of the largest, most significant changes. There are other climate change signals both direct and indirect that an observing system could track.

The SAB is presently embarking on the development of a decadal science plan in which we expect climate change will feature prominently.

The science priorities included in the existing draft could also be made more explicit. Therefore **the SAB recommends** the following (underlined) revisions:

- Refine and implement State of the Great Lakes indicators for assessing and reporting on climate change impacts on water quality, the timing and duration of ice cover, changes in the timing of the annual spring bloom, response of energy and water fluxes to variations in ice cover, the influence of hypoxic and increased thermal zones on the response of zooplankton and fish communities.
- Improve coordination and knowledge exchange to address climate science gaps in the Great Lakes by convening discussions on climate projections, integrated modeling and downscaling approaches for the Great Lakes to predict ecosystem responses to climate change and other anthropogenic impacts.
- Increase understanding of Indigenous communities' vulnerability and adaptation to climate change.
- Increase understanding of municipalities' vulnerability and adaptation to climate change.

Annex 10 – Science

The SAB reiterates advice from its input on the 2017-2019 Priorities for Science, namely that the Parties review the last two complete cycles of CSMI activities (10years) and assess the success of the program and the extent to which the initiative has provided new data and information otherwise lacking or absence from 'off year' monitoring, and that the Parties complete a quantitative economic analysis of the human activities that impact environmental quality.

For the 2020-2022 Priorities for Science, **the SAB recommends** that the first priority include science to support indicators identified through the nearshore priority, and that the CSMI process be used to build a more quantitative understanding through research and modeling of how each lake ecosystem functions in response to external forcing (e.g., nutrient loads, climate change, invasive species).

In addition, the SAB believes multiple science-focused efforts in the lakes can benefit by laying out the current conceptual understanding of key drivers, stressors, and responses in the lakes, and a recent summary report offers suggestions on potential increased use of conceptual frameworks in planning for restoration and protection work in the Great Lakes[4].

The SAB recommends that the Parties work with stakeholders with data expertise, such as the Council of the Great Lakes Region and the Great Lakes Observing System through the new Smart Great Lakes initiative, to develop a real-time monitoring strategy and network in the Great Lakes, as well as a strategy for connecting, storing, and analyzing various data streams using smart computing solutions in order to deepen insights and knowledge about environmental changes, risks, and futures.

[4] See Murray, M.W., Steinman, A.D., Allan, J.D., Bratton, J.F., Johnson, L.B., Ciborowski, J.J.H., Stow, C.A. 2019. Conceptual frameworks and Great Lakes restoration and protection: A white paper. National Wildlife Federation, Great Lakes Regional Center, Ann Arbor, MI.

The SAB also recommends that scientific literacy be fostered in Great Lakes stakeholders and community groups through "meet the scientist" evenings, open house events at government facilities, encouraging and enabling citizen science, and similar mechanisms.

Editorial

Scientific names should be italicized throughout the document e.g., *Cladophora*.