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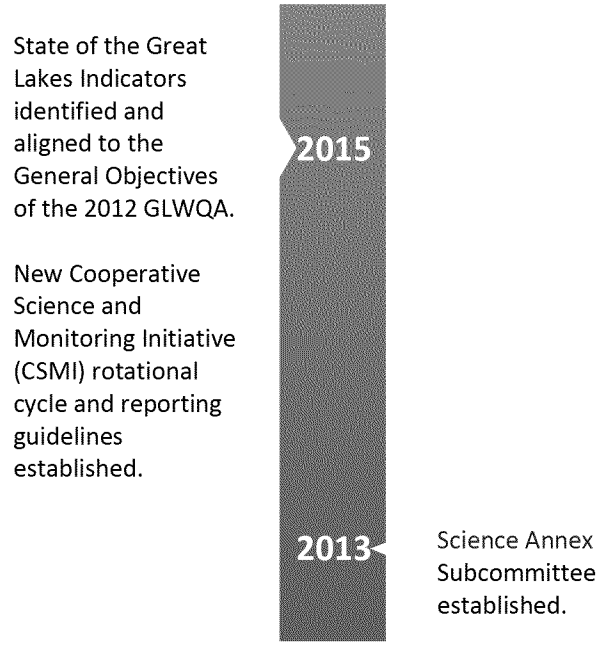
PROGRESS REPORT OF THE PARTIES
SCIENCE ANNEX CHAPTER

OVERVIEW

The 2012 GLWQA recognizes that implementing management decisions, policies and programs need to be based on the best available science, research and knowledge. Throughout the 2012 GLWQA, various annexes contain specific science-based commitments relevant to those other annexes; and the Science Annex of the 2012 GLWQA commits Canada and the United States to enhancing the coordination, integration, synthesis, and assessment of science activities across all annexes of the Agreement.

Key activities of the Science Annex in the first three years of the implementation of the 2012 GLWQA included establishing a suite of indicators to assess the ecosystem conditions of the Great Lakes; and strengthening the Cooperative Science and Monitoring Initiative to ensure binational coordination of Great Lakes priority science and research activities.

PROGRESS TOWARD MEETING GLWQA COMMITMENTS



This annex is implemented by the Science Annex Subcommittee, co-led by Environment Canada and the United States Environmental Protection Agency. Organizations on the subcommittee include: [insert logos]

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BINATIONAL ACTIONS TAKEN FOR KEY COMMITMENTS

The Parties shall establish and maintain comprehensive, science-based ecosystem indicators to assess the state of the Great Lakes, to anticipate emerging threats and to measure progress in relation to achievement of the General and Specific Objectives of this Agreement. The indicators shall be periodically reviewed and updated as necessary.

The Parties shall also issue, every three years, a State of the Great Lakes Report to the Commission and the Public, describing basin-wide environmental trends and lake-specific conditions using ecosystem indicators established by the Parties.

- In January 2015 Canada and the United States confirmed the suite of indicators for use in assessing the ecosystem conditions of the Great Lakes. This suite was established using the Great Lakes indicator work (previously known as SOLEC) that began in 1994.
- The indicator suite includes nine indicators, one for each of the General Objectives of the 2012 GLWQA. The nine indicators are supported by 43 sub-indicators [reference Figure].
- Over 100 Great Lakes experts have been engaged in reporting against these indicators, representing federal, provincial, state and local governments, as well as academia and non-governmental organizations.
- Draft indicator information will be presented at the Great Lakes Public Forum in October 2016 for public comment. Following the Forum, the State of the Great Lakes reports, describing basin-wide and lake-specific environmental trends and conditions using the ecosystem indicators, will be released in spring 2017 [reference Figure].

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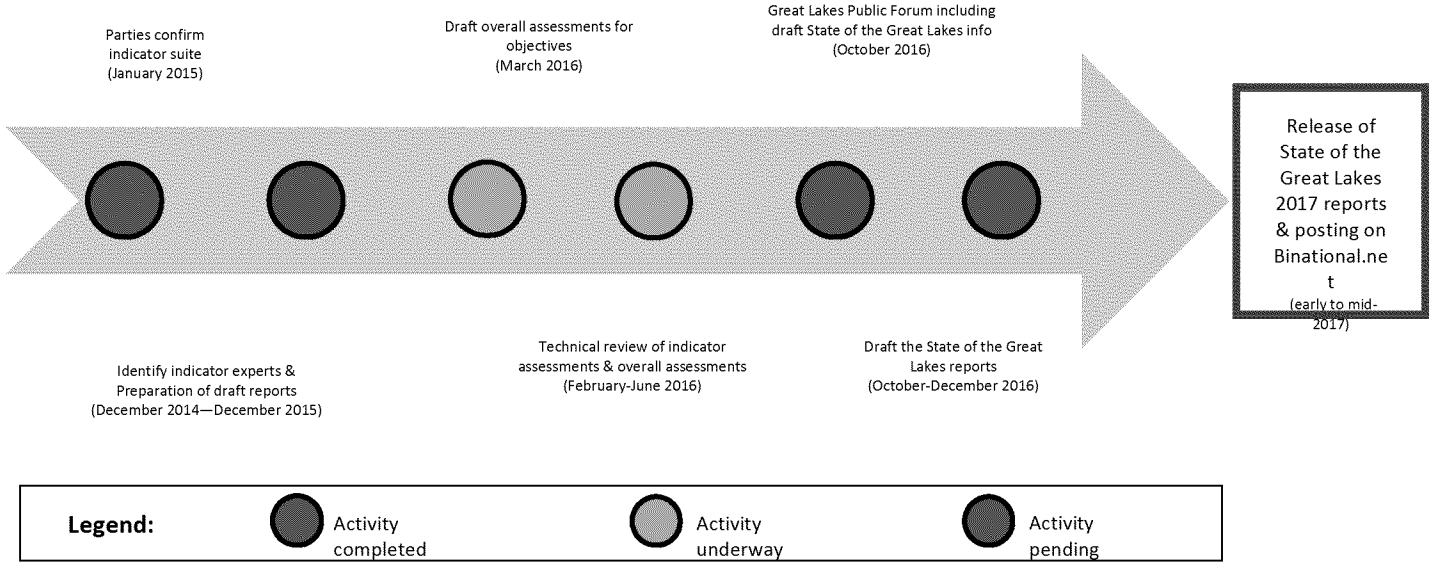
Indicators & Sub-Indicators for Assessing the State of the Great Lakes

1. Drinking Water
2. Beaches
3. Fish Consumption
4. Toxic Chemicals
   - Toxic Chemical Concentrations (open water)
   - Toxic Chemicals In Great Lakes Whole Fish
   - Toxic Chemicals In Great Lakes Herring Gull Eggs
   - Toxic Chemicals in Sediment
   - Atmospheric Deposition of Toxic Chemicals
   - Water Quality in Tributaries
5. Habitat & Species
   - Coastal Wetland Invertebrates
   - Coastal Wetland Fish
   - Coastal Wetland Plants
   - Coastal Wetland Amphibians
   - Coastal Wetland Birds
   - Coastal Wetlands: Extent and Composition
   - Aquatic Habitat Connectivity
   - Fish Eating and Colonial Nesting Waterbirds
   - Phytoplankton (open water)
   - Zooplankton (open water)
   - Benthos (open water)
   - Diporeia (open water)
   - Preyfish (open water)
   - Lake Trout
   - Walleye
   - Lake Sturgeon
6. Nutrients & Algae
   - Nutrients in Lakes (open water)
   - Harmful Algal Blooms
   - Cladophora
7. Invasive Species
   - Aquatic Invasive Species
   - Sea Lamprey
   - Dreissenid Mussels
   - Terrestrial Invasive Species
8. Groundwater
9. Watershed & Climate Impacts
   - Water Levels
   - Surface Water Temperature
   - Ice Cover
   - Precipitation Events
   - Baseflow due to Groundwater
   - Watershed Stressors
   - Forest Cover
   - Land Cover
   - Tributary Flashiness
   - Hardened Shorelines
   - Human Populations

2017 State of the Great Lakes Report timeline



In addition to ongoing science and monitoring activities that are routinely carried out by the Parties and other government and non-government entities, the Parties shall implement a cooperative science and monitoring initiative for each of the Great Lakes on a five-year rotational basis. The Parties shall focus monitoring activities on the science priorities identified through the Lakewide Management Process. The Parties will coordinate these activities across government and non-government organizations.

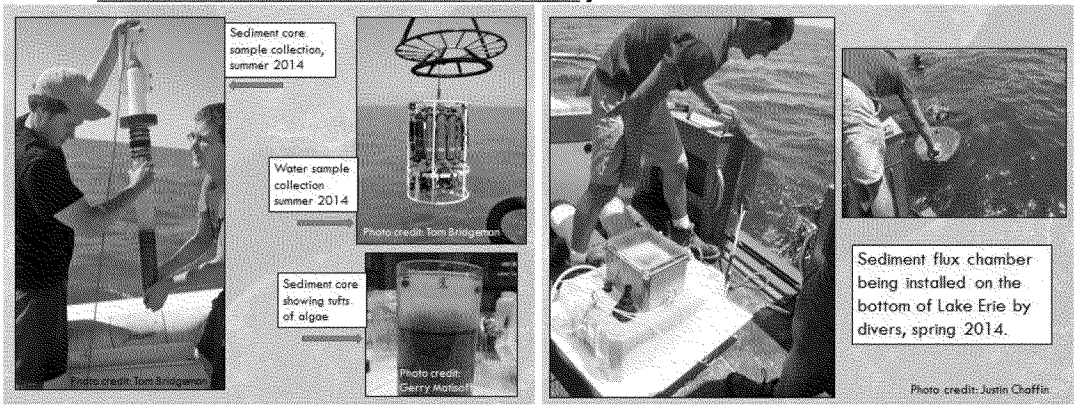
[Need Paul's text]

- The Cooperative Science and Monitoring Initiative (CSMI) was originally created under the 1987 GLWQA as the result of a need to binationally coordinate science efforts in support of management decisions for the Great Lakes. Through the CSMI binational priority science and research activities in the Great Lakes basin are coordinated with an emphasis on enhanced monitoring and research field activities of one of the Great Lakes per year, on a five year rotating cycle [reference figure]. For the 2012 GLWQA, Canada and the United States renewed the CSMI by updating/establishing(?) the CSMI multi-tier guidelines [reference figure]. The Annex leads identify research, monitoring and other science priorities to assess threats to water quality and support management actions. To address these priorities, the Annex 10 CSMI Task Team works with governmental and academic scientists to develop, coordinate, and allocate resources for specific research activities for each lake on a five year rotating basis. The CSMI-focussed science and monitoring field work has been undertaken in 2013 in Lake Ontario, 2014 in Lake Erie, 2015 in Lake Michigan. Field monitoring is currently underway in Lake Superior (2016) and will be undertaken in Lake Huron in 2017.

[Possible images to use. This image looks lot better than the EC one but would need rights to use.
Source: https://rvlakeguardian.wordpress.com/2014/07/29/whats-living-along-the-bottom-of-lake-erie/]

Source: https://www.ec.gc.ca/grandslacs-greatlakes/default.asp?lang=En&n=F9A91157-1&printfullpage=true

[Can something like this be put together for CSMI that is recent?
Source: http://lakeerie.ohio.gov/GLRI/CSMI.aspx]



Facilitate information management and sharing to improve knowledge, accessibility and exchange of relevant Great Lakes information.

- The Science Annex Subcommittee are also examining data and information management and sharing efforts that will best support implementation of the commitments throughout the 2012 GLWQA. An initial examination was undertaken to understand the needs of all annex subcommittees as to their needs for data and information management and sharing. Based

on this information and discussions at the Great Lakes Executive Committee meetings, the Science Annex Subcommittee will be examining existing Great Lakes-related distributed data and information access systems and platforms and their application to a specific pilot project on a priority area such as the Lake Erie phosphorus and/or nearshore issue.

Identify science priorities, taking into account recommendations of the Commission.

Undertake a review of available scientific information to inform management actions and policy development.

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- The Science Annex Subcommittee coordinated and assisted in the development of the 2014-2016 binational priorities for science amongst the other annexes. As called for in Article 5 of the 2012 GLWQA, these priorities, along with the priorities for action, were posted onto binational.net (www.binational.net/2014/03/20/psa-pasa-2014) in March 2014.

- In support of the development of nutrient objectives for *Cladophora* issue in the Great Lakes, the Science Annex Subcommittee organized a binational workshop to determine the state of knowledge of *Cladophora* from the perspectives of the entire Great Lakes basin, from that of individual lakes, and with respect to areas within each lake where *Cladophora* is perceived to be a significant local problem. The findings of the workshop will help guide a strategy for proposing nutrient reduction targets that will control *Cladophora*.

DOMESTIC ACTIONS TAKEN

CANADA [Placeholder GLNI science story]

Identify science priorities, taking into account recommendations of the Commission.

- In March 2013, a Canadian workshop was organized to support identifying possible science priorities that Canada could put forward for first three years under the 2012 GLWQA, pursuant to the development of the binational priorities for science called for in Article 5 of the 2012 GLWQA.
- GL Science Day (Mar 2014 and Oct 2015) ...
- Include some Provincial activities? I.e. science work under GL Protection Act or GL Strategy

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[Link a key commitment from annex if relevant / delete this box]

- [Insert any relevant US domestic actions you want to highlight related to achieving this annex – can be very brief or deleted if not needed or may want to consider adding a nice domestic GW story as a "boxed" item.]