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Cooperative Science and Monitoring Initiative (CSMI) for the Great Lakes — Lake Ontario 2008

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ABSTRACT

The Cooperative Science and Monitoring Initiative (CSMI) was created as the result of a need to coordinate science in support of management of the Great Lakes. The process includes enhanced monitoring and research field activities which are conducted in one lake per year, tied to the needs of the Lakewide Management Plan (LaMP) committees. Lake-specific activities in the other four years are: sample analysis, data interpretation, reporting, LaMP data needs compilation, CSMI monitoring and research workplan development and vetting through the LaMP, and planning and logistics for the next field year. Through planning efforts in 2006, Lake Ontario LaMP committees determined that data were needed on: status of the lower food web as a detection for ecological change; extent of decoupling of nearshore to offshore movement of materials, specifically nutrients and pollutants; lake-wide lake trout assessment as an indication of progress towards restoration; and development of whole system ecological models that would assist fishery managers when dealing with multiple stressors such as invasives. CSMI helped in the coordination of a number of these monitoring and research efforts, the results of which are reported in this issue.

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Introduction

The Cooperative Science and Monitoring Initiative (CSMI) is a multilateral process designed to promote and accommodate discussion and cooperation among agency scientists and academic researchers on both sides of the Great Lakes. Over a repeated 5-year rotation through the Great Lakes, CSMI attempts to enhance the management-related science activities for each lake. Investigations in Lake Ontario during the 2008 field year provided an opportunity to both apply and refine the CSMI concept. The cycle of planning and preparation for the 2008 field year provided a firsthand illustration of the need for the rotational cycle to incorporate a significant effort to consult and clarify primary information needs and survey objectives well in advance of the field year itself. Similarly, the subsequent time spent on data analysis and interpretation has also confirmed the need for the cycle to accommodate a sufficient period to consolidate information. The scope and number of papers included in this special issue (Makarewicz and Howell, 2012) testify to the magnitude of the postfield season effort, and it is fair to say that the amount of information collected in the 2008 field year will yield additional results for several years to come, including offshore food web assessments not reported here. We believe that in some small way, the work was encouraged by the CSMI effort.

This research and special issue is a result of a series of workshops sponsored by the Lake Ontario Lake Management Plan (LaMP) and the International Joint Commission's (IJC) Council of Great Lakes Research Managers held in Kingston, Ontario, in October of 2006 and a series of several follow-up meetings held at Burlington, Grand Island, etc. As part of the Lake Ontario Intensive Year 2008, this coastal zone research was coordinated with the CSMI for the Great Lakes. Major portions of the American monitoring and research were funded by the New York State Department of Environmental Conservation, and Canadian efforts were sponsored by Environment Canada and the Ontario Ministry of the Environment.

The Great Lakes Water Quality Agreement (GLWQA) is the principal driving force behind monitoring and surveillance of ecosystem integrity in the Great Lakes by provincial, state, and federal agencies. The Agreement includes extensive recommendations for monitoring pollutant sources, loadings, presence, impacts and trends in various media, as well as ensuring compliance with specific environmental objectives. Monitoring is also necessary to support modeling and predictive techniques and to assess the success of remedial or restorative measures. Lakewide Management Plans (LaMPs) are binational, cooperative efforts described in the GLWQA to restore and protect the health of each of the Great Lakes by reducing chemical pollutants entering the lake and by addressing the biological and physical factors impacting the lake. LaMPs require additional monitoring to assess

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impairment of 14 different beneficial uses — for example, fish tumors; degradation of benthos; beach closings; and restrictions on fish and wildlife consumption. In addition, the GLWQA recognizes the importance of "the interacting components of air, land, water, and living organisms, including humans" in the Great Lakes basin ecosystem, and calls for research to "determine the impact of water quality and the introduction of non-native species on fish and wildlife…".

Responsibility for monitoring in the Great Lakes, under the GLWQA, is shared among Canadian and U.S. federal agencies, as well as the eight Great Lakes states and the province of Ontario. The U.S. General Accounting Office identified 24 government agencies that provide Great Lakes monitoring and/or research information; in addition, U.S. Municipalities and Canadian Conservation Authorities implement monitoring activities. This does not include academia and volunteer organizations such as Bird Studies Canada.

Although multi-agency consultation and collaboration have increased over the past decade, with so many players the potential for both real and perceived duplication of effort remains. Multiple groups investigating the causes and possible solutions of a lake's problems often benefit from working in a coordinated fashion. To be aware of who is doing what, is a challenge. In fact, this challenge has not gone unnoticed by the Canadian Commissioner of the Environment and Sustainable Development, the IJC, or the U.S. Government Accounting Office, who all recognized that the responsibility for monitoring in the Great Lakes is dispersed among numerous organizations and demanded better coordination, leadership, accountability and focus. In response to this need, the Binational Executive Committee, comprised of senior executives of agencies responsible for delivering on the GLWQA requirements, asked for recommendations on how to improve binational coordination of Great Lakes monitoring.

History of the cooperative monitoring effort

The cooperative monitoring effort began as a way for the U.S. and Canadian federal governments to better coordinate their routine, ongoing monitoring programs. In discussions between Environment Canada and the U.S. Environmental Protection Agency, it became apparent that efficiencies and additional work could be accomplished through cooperation. The addition of other federal, provincial, and state agencies became the next priority. In particular, by including agencies responsible for water quality monitoring as well as those dealing with Great Lakes fisheries (e.g., Great Lakes Fisheries Commission), the cooperative effort could begin to address larger scale issues and bring together research/monitoring groups that had not traditionally worked collaboratively.

In fall of 2001, the Binational Executive Committee (BEC) formed a planning group to explore the need, value, and objectives for coordination of monitoring and research (science). This group developed a cooperative monitoring framework which incorporated science priorities identified in Environment Canada's Canadian Federal Water Framework, *Annex 17 of the GLWQA*, the *Great Lakes Regional Collaboration Strategy*, *US Ocean Research Priorities Plan*, and the *Canadian COA Framework*.

The scope of the framework was limited to aquatic ecosystems and stressors such as atmospheric inputs of contaminants and land use that affect aquatic ecosystems. The determination was made that the planning group would not establish science priorities but only prioritize areas for collaboration. At this point, science priorities were not directly determined by LaMP needs. A set of criteria established to guide science collaboration included visibility and relevance of the science to the well-being of Great Lakes' residents, more advantageous if carried out collaboratively, and addressed GLWQA priorities.

Later that year BEC endorsed two initiatives to improve binational coordination of Great Lakes monitoring: the establishment and maintenance of the Great Lakes Monitoring Inventory, as a first step in communicating who is doing what in the basin; and the Cooperative Monitoring Initiative, which was intended to provide focus and leadership to address key information needs identified as priorities by each of the Lakewide Management Plans, as well as to coordinate efforts and optimize use of resources. BEC also approved a rotational cycle (Fig. 1) for cooperative monitoring that focuses efforts on one lake each year.

Cooperative Monitoring was an approach that attempted to address a few key information needs, as identified by the LaMPs, through new monitoring and research on the lake. This was accomplished by actively seeking the expertise and participation of agency staff and academia in designing a program to address that need; coordinating these new activities to the extent possible with ongoing programs; providing seed money and, in some cases, grants to conduct the work; arranging for technology transfer and sharing of equipment and expertise; and, as necessary, arranging for data-sharing agreements.

In 2003, a group of government and academic scientists focused their efforts and resources on Lake Ontario to determine the status of the lower food web. This effort was continued to Lake Erie (2004) where the focus was to better understand the nutrient issue in the lake as well as to determine the density and spatial extent of invading mussels. The process was expanded to the other lakes.

In 2006, BEC decided that a more formalized process was required. This process needed to include a more structured approach of how science priorities were determined; whose priorities were included; and how results were to be reported to BEC, LaMP committees, and the public.

In 2008, the formalized approach was presented to BEC. It now included monitoring coordination, research coordination and coordination of other groups' issues (such as the Binational Toxics Strategy (BTS), Great Lakes Fisheries Commission (GLFC), State of the Lake Ecosystem Conference (SOLEC), etc.…) as they are brought forth through the LaMP. In 2009, a revised process was approved and became known as the Cooperative Science and Monitoring Initiative (CSMI). In September 2009, a CSMI steering committee (CSMI-SC) was established with membership from federal, provincial and state environmental monitoring, science, and natural resource agencies who have a mandate under the Great Lakes Water Quality Agreement.

During the October 2009 BEC meeting, CSMI was asked to expand its mandate to include connecting channels into the CSMI process. After careful consideration, the CSMI-SC decided that incremental implementation of the connecting channels would be the best approach. In the case of CSMI, this means inclusion of the upstream connecting channel in the activities planned for a lake.

Cooperative Science and Monitoring Initiative (CSMI) process

The accompanying flow chart (Fig. 1) explains the sequence of events.

Year 1

This is the LaMP reporting year. Each LaMP committee, with BTS, GLFC, and SOLEC input and support from the Council of Great Lakes Research Managers (CGLRM) and Great Lakes Regional Research Information Network (GLRRIN), holds a Lake-Based Forum to discuss science on the lake and will be based on information generated by the previous years' cooperative science and monitoring field year. It is the first of two planning years for the next cooperative science and monitoring exercise. During the planning years, the LaMP update document will be published.

Following this, the LaMP Management Committee identifies and prioritizes key science and monitoring needs for the lake. This list is passed to the CSMI-SC.

Year 2

During this year, the CSMI-SC determines if the science and monitoring priorities can be addressed with ongoing work or whether new science and monitoring are required. The CSMI-SC facilitates the development of a workplan which will bring together ongoing