Partnering for Monitoring and Research Across the Great Lakes: The Cooperative Science and Monitoring Initiative.

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Background

- Cooperative Monitoring Initiative (CMI) started in 2002 to coordinate monitoring
  - Simple premise: focus resources on a few key issues on one lake each year
- Expanded mandate of CMI to include research coordination resulted in CSMI in 2006
- In 2009, connecting channels (including St. Lawrence) were added to CSMI process
  - Connecting channel addressed with downstream lake
  - Only issues that affect downstream lake will be included
- CSMI follows a 5 year rotational cycle
- CSMI does NOT set priorities
Our Partners

- Federal Agencies
- Provincial Agencies
- First Nations
- Regions
- Cities/Towns
- Academics

- IJC-CGLRM
- GLRRIN
- Sea Grant
- Industry
- NGO’s

- Federal Agencies
- State Agencies
- Tribes
- Cities/Towns
- Academics
CSMI Process:

Cooperative Science and Monitoring Initiative Process

Each LaMP, with BTS, GLFC and SOLEC and support from CGLRM, CGLRM organizes Lake Based Forum to discuss Science of the lake

LaMP Management Committee identifies key Science and Monitoring Needs ** for lake

CSMI - SC will identify where multiple agencies are conducting ONGOING science that will benefit from coordination

ONGOING Science

CSMI-SC vets list to determine how science priorities can be addressed: ONGOING work or NEW work required

NEW SCIENCE

CSMI - SC vets list to determine what NEW science can be initiated to address priority information needs, based on available resources and expertise

CSMI SC will facilitate coordination of priority ONGOING science

Feedback: binational CSMI workplan presented to LaMP Management Committee, CGLRM and CGLRM

Year of Field Activity

Laboratory Analysis Phase

Data Analysis and Report writing Phase

Communicating Out!

1. BEC
2. Primary literature publications;
3. Conference presentations/posessions, joint synthesis reports, etc.
4. Outreach - CGLRM/9LRR/IN
What is going on in ONE year?

- **Lake Erie** – Workshop to scope out issues
- **Lake Ontario** – Planning year for field year
- **Lake Huron** – Field Year
- **Lake Superior** – Data being worked up from field year
- **Lake Michigan** – Reporting out
CSMI Steering Committee Membership

- Co-Chaired by EC and EPA–GLNPO
- Members:
  - DFO
  - MOE
  - MNR
  - EC
  - USGS
  - NOAA
  - USFW
  - EPA–GLNPO
  - EPA–ORD
  - States (as needed)
Cooperative Science and Monitoring Initiative: Where are we?

OBJECTIVE: Improve binational coordination of monitoring to achieve:

☑ Greater awareness
  □ Sharing of technologies; enhanced networking; continued feedback to LaMP working groups

☑ Optimization of programs
  □ Consensus among experts on project design; evaluation of new technologies; joint work planning and scheduling

☑ Improved reporting
  □ Intercomparison studies (nutrients, trace organics in water and fish); data exchange; joint workshops and reporting

☑ Efficiencies
  □ Extensive piggy-backing on cruises, surveys; sharing of sample extracts
Canada will participate in another lake cycle.
Base annual monitoring supports intensive work

- U.S. EPA – Spring and Summer surveys of all lakes –
  - Nutrients, water chemistry, zooplankton, phytoplankton, benthos
  - Fish contaminants, air contaminants
- Environment Canada – Surveys of 2 lakes per year for nutrients, water chemistry and contaminants in water
- USGS – Annual fish surveys – trawls and acoustics in each lake
Information needs are different for each lake
Lake Superior

- Basic lower food web information
- Contaminant measurements
2011 Coordinated Science and Monitoring Initiative (CSMI) lakewide survey for Lake Superior


- Red: 0 - 30 m
- Yellow: 30 - 100 m
- Purple: 100 - 200 m
- Green: > 200 m
- Light blue: Nearshore 5 to 30 m
- Medium blue: 30 to 100 m
- Dark blue: 100 to 200 m
- Very dark blue: > 200 m
- White: Inshore

Kilometers

[Map of Lake Superior with color-coded depth areas]
2011 Effort

1. Benthic fish sampled with bottom trawls at 54 of 56 planned locations during the last week of June and all of July.
   
   20 min trawls, 0.8 – 0.9 km, on-contour

2. Pelagic fish sampled with hydroacoustics and mid-water trawls at 52 of 56 planned locations during August and September.

   ~3 km acoustic transects, 20 – 30 minute mid-water trawls at 2 or 3 depths

3. Mysis, zooplankton, benthos, and nutrients sampled at 50 to 54 of 56 planned locations.
Lakewide mean biomass

- Cisco
- Siscowet lake trout
- Kiyi
- Rainbow smelt
- Bloater
- Lean lake trout
- Shortjaw cisco
- Lake whitefish
- Deepwater sculpin
- Other

Biomass (kg ha\(^{-1}\))

Native fish, 93%

Invasive fish
Lake Michigan

- Nutrient input information – impact on nearshore cladophora
- Food web information for fisheries bioenergetics models
- Benthic survey – focused on loss of Diporeia and dreissenid mussel (quagga mussel) increase
Projects

- USGS and NOAA – nearshore to offshore transects for lower food web and fish
- EPA – tow of Triaxus (towed sensors) at 20 m depth contour
- Development of nutrient/Cladophora/quagga mussel interaction model
- Measurement of nutrient input from tributaries
Zebra Mussel

1994/95

2000

2005

2010

Density (No. m²)
Lake Ontario

- Lower food web survey
- Nearshore to offshore nutrient movement
- Lake trout survey
- Benthic survey
Figure 3. Biomass of Diporeia in Lake Ontario
Figure 4. Biomass of *Dreissena* in Lake Ontario
Lake Huron

- 2012 field year
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<th>Types of Samples</th>
<th>Questions Addressed</th>
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<tr>
<td>Food Web Spatial Structure Projects</td>
<td>USGS, NOAA, Dept. Fish. Oceans Canada, EPA</td>
<td>Nutrients, phytoplankton, zooplankton, benthic invertebrates, larval fish, prey fish, stable isotopes, primary productivity, continuous (towed instruments)</td>
<td>Spatial and temporal distribution of nutrients, pelagic and benthic food webs, productivity and processes for: understanding of changing spatial distribution of production and biomass - for model updates and fisheries</td>
<td>Monthly - weekly sampling along transects off Alpena, MI, Port Sanilac, MI and Goderich, Ontario</td>
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<tr>
<td>Nearshore Project</td>
<td>Michigan DNR</td>
<td>Fish - bottom trawls, beach seining, gill netting (large and small mesh), trap netting</td>
<td>Distribution, growth and survival of fish</td>
<td>Transects between 3 m and 18 m depth</td>
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<tr>
<td>Tributary Monitoring</td>
<td>USGS</td>
<td>Contaminants - PCBs, Hg, chemicals of emerging concern, sediment loads, nutrients, bacteria, protozoa and viruses, turbidity, conductivity</td>
<td>Loads of various chemicals, USGS methodology studies</td>
<td>Automated sampling - continuous, year round</td>
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<td>River Mouth Project</td>
<td>USGS, EPA, MDNR, NOAA Marine Sanctuary</td>
<td>Water velocity and direction, tracer chemicals, water levels, water quality, sediments, wetland plants, benthos, larval fish</td>
<td>Quantify nutrient dynamics in river (reservoirs), water movement, hydrodynamic model data</td>
<td>Thunder Bay River - lower river, river mouth and nearshore. Frequency?</td>
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<tr>
<td>Benthos assessment</td>
<td>NOAA, EPA, EC, OMNR</td>
<td>Benthic grab samples for invertebrates</td>
<td>Five-year assessment of benthic community at 80 stations throughout Lake Huron</td>
<td>Late July</td>
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<td>Nearshore Assessment</td>
<td>EPA</td>
<td>Triaxus towed sensor survey- plankton, chlorophyll, chemistry</td>
<td>Assessment of nearshore of Lake Huron - at 20 meter depth contour</td>
<td>Summer</td>
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Lake Erie

- Hazardous algal blooms
- Eutrophication
- Low D.O. in central basin
Lake Erie Algal Bloom
Nutrient management

- **Finding**: Sampling in the Maumee River and the Sandusky River began in April and high concentrations of Microcystis were already present in the rivers and in sediments within the river and lake.

- **Implication**: Sediment movement, from the river to the Lake during storms and dredging activities, may be one source of “seed” for algal blooms in the Lake.
Nutrient management

- **Finding:** During storm runoff events in the Maumee River, dissolved nutrients from the watershed (predominantly cropland), such as dissolved reactive phosphorus and nitrate, are present at high concentrations and are carried with the storm runoff water.

- **Implication:** Management efforts to reduce phosphorus loading to Lake Erie should focus primarily on reducing dissolved phosphorus loading.
Keep 'Em Great!