Lake St. Clair Call – Introduction to Nutrient and Algae Projects

10 a.m. - noon (eastern), Wednesday, October 19, 2016

Facilitated by Don Scavia, Graham Sustainability Institute, University of Michigan

Objectives

- Allow different organizations to outline their current and planned monitoring and modeling activities on Lake St. Clair.
- Foster communication among science project teams and management organizations, and identify opportunities to support each other's work.

Contact List for Participants on Conference Call (organized by organization)

Name	Organization	Email
Mark Rowe	Cooperative Institute for Limnology and Ecosystems Research (CILER)	mark.rowe@noaa.gov
Alice Dove	Environment and Climate Change Canada (ECCC)	alice.dove@canada.ca
Arthur Zastepa	Environment and Climate Change Canada (ECCC)	arthur.zastepa@canada.ca
Cynthia Watson	Environment and Climate Change Canada (ECCC)	linet.watson@canada.ca
Tom Edge	Environment and Climate Change Canada (ECCC)	thomas.edge@canada.ca
Katie Stammler	Essex Region Conservation Authority (ERCA)	KStammler@erca.org
Michelle Selzer	Michigan Dept of Environmental Quality (MDEQ)	SELZERM@michigan.gov
Ngan Diep	Ministry of Ontario for Environment and Climate Change (MOECC)	Ngan.Diep@ontario.ca
Craig Stow	National Oceanic and Atmospheric Administration (NOAA) – Great Lakes Environmental Research Lab	craig.stow@noaa.gov
Ed Rutherford	National Oceanic and Atmospheric Administration (NOAA) – Great Lakes Environmental Research Lab	ed.rutherford@noaa.gov
Hongyan Zhang	National Oceanic and Atmospheric Administration (NOAA) – Great Lakes Environmental Research Lab	hongyan.zhang@noaa.gov
Michelle Tomlinson	National Oceanic and Atmospheric Administration (NOAA) – National Centers for Coastal Ocean Science	michelle.tomlinson@noaa.gov
Timothy Wynne	National Oceanic and Atmospheric Administration (NOAA) – National Centers for Coastal Ocean Science	timothy.wynne@noaa.gov
Russ Kreis	U.S. Environmental Protection Agency (EPA)	Kreis.Russell@epa.gov
Mary Anne Evans	U.S. Geological Survey (USGS), Great Lakes Science Center	maevans@usgs.gov
Don Scavia	University of Michigan (U-M)	scavia@umich.edu
Jennifer Read	University of Michigan (U-M)	jenread@umich.edu
Lynn Vaccaro	University of Michigan (U-M)	Lvaccaro@umich.edu
Rebecca Muenich	University of Michigan (U-M)	rlogsdon@umich.edu
Serghei Bocaniov	University of Michigan (U-M)	bocaniov@umich.edu

Notes about Projects Discussed (also see slides, below)

Ecological modeling –Serghei Bocaniov, Dave Schwab (U-M)

- Lake St. Clair 3D modeling is part of a new watershed modeling project that covers the U.S. and Canadian area that feeds into the St Clair and Detroit River System.
- Project webpage – Watershed Assessment of Nutrient Loads to the Detroit River
- The Lake St. Clair modeling is outlined in the meeting slides (below).
- Team is looking for additional water quality data.

Nutrient monitoring – Ngan Diep (MOECC)

- MOECC and partners (including ECCC) have several goals for this monitoring, including assessing temporal and spatial water quality patterns in Lake St. Clair, tracking tributaries plumes, contributing to HAB forecasting tools and assessing how the lake might respond to nutrient load reductions.
- Alice also described how they are comparing lab results across Canadian agencies.
- Work is in progress and will expand in subsequent years.
- Their sampling incudes some in situ instruments that continue to log data this fall.
- They have more cyanobacteria samples than can be processed and are happy to share.

Microcystin sampling – Cynthia Watson, Arthur Zastepa, Tom Edge (ECCC)

- ECCC works closely with NOAA (Tim Davis) on microcystin monitoring in Lake St. Clair.
- This includes some genomic analyses that could be expanded through partnerships.
- Ultimately, hope to use sampling to develop forecasting and predictive capabilities for HABs in the lake.
- Map of monitoring points is in meeting slide set.
- Data can be accessed here: GLERL - St. Clair Microcystin

Beach monitoring – Katie Stammler (ERCA)

- ERCA has been using optical probes to measure algal blooms and assess toxicity along shores of Lake St. Clair. (See meeting slides below for map of 2016 sampling locations.)
- Includes some algal identification using ELISA

Ecological studies – Mary Anne Evans (USGS)

- USGS and partners sample mayflies, dreisseind mussels, total benthos, macrophytes and water quality periodically (not every year).
- Other USGS teams are tracking fish movement for lake sturgeon and sea lamprey in Lake St. Clair. There is potential that anchors for their monitoring equipment can hold other sensors.
- Other studies are looking at zooplankton, phragmites and tributary water quality studies (e.g., Clinton R.).
- Meeting slides (below) include more details and project contacts.

Grass carp modeling– Ed Rutherford and Hongyan Zhang (NOAA)

- Hongyan, Ed and Doran Mason will be modeling potential effects of grass carp introduction on the plant community, food web and fisheries of Lake St. Clair. This work is funded by the Asian carp regional coordinating committee.
- Nutrient loads are a driver of the food web model - Ecopath with Ecosim that we will use.

Hydrodynamics and algal bloom forecasting – Mark Rowe (CILER)

- CILER has helped develop a few HAB tracking and forecasting tools for Lake Erie and this work could be expanded to Lake St. Clair. For example: GLERL – HABS and Hypoxia
- They use particle tracking models that are linked to hydrodynamics and satellite derived information.

- Their models help account for vertical mixing, which influences scum formation and potential impact on drinking water intake pipes.

HAB forecasting ideas – Tim Wynne, Shelly Tomlinson (NOAA)

- Tim and Shelly work with Rick Stumpf in a national NOAA lab. They use satellite information to assess algal blooms in different regions of the U.S.
- This work could be expanded to Lake St. Clair. Rick is planning to visit Lake St. Clair and get a feel for this environment.
- They are optimistic their algorithm would work in this setting. Sediment and shallowness of lake shouldn't be a factor because satellites only look at top part of water column.
- Would need field data on timing and locations of bloom and non-bloom areas to get started. Folks on the call offered to provide this field data (Katie, Tom).

Other Projects Of Interest Oil Spill Modeling

- Dave Schwab is working with Michigan Tech Research Institute to model impacts of oil spills on drinking water. Preliminary work shows little mixing across shipping channels.
- OMAFRA is doing a LIDAR survey of whole Lake Erie watershed, including Detroit R. and Lake St. Clair to improve digital elevation models.
- Katie and Ngan mentioned the GLASI Priority Subwatershed Project is studying impacts of agricultural BMPS on P losses. Project includes modeling and has many partners - Ontario Soil and Crop Improvement Association, Univ of Guelph.

U.S. Environmental Protection Agency Priorities & Activities - Russ Kreis

- The Great Lakes Water Quality Agreement Annex 4 is interested in the Huron Erie Corridor and is currently revising some of their task teams.
- Concerned about uncertainty for inputs from Lake Huron and other tributaries feeding into Lake. St. Clair.
- The next Coordinated Science and Monitoring Initiative (CSMI) in 2019 will cover part of Huron-Erie Corridor. 2014 sampling focused on Lake Erie.
- Reports from 2014 CSMI sampling and planning for 2019 will be discussed at the Lake Erie Millenium Network Meeting, February 21-23 in Windsor.
- Pilot sampling work with National Coastal Condition Assessment will expand in 2020. This includes water, benthos, ponar grabs, video and fish surveys.

Michigan Dept. of Environmental Quality Priorities & Activities- Michelle Selzer

- Michigan's strategy for reaching the 40% P reduction target for Lake Erie is to focus on point sources and other NPDS permitted entities.
- New investments planned for Green Infrastructure throughout metro Detroit area, this includes work with Detroit Water and Sewer District and the Southeast Michigan Council of Governments.
- St. Clair Detroit River System Initiative includes objectives and indicators for regulated and non-regulated sources of P.
- Wayne State is monitoring metro park and other beaches near Clinton River (includes qPCR).
- Wayne State (Jaime Olsen) is updating their real time drinking water network, which aims to improve communication and response to spills and other threats.
- ErieStat is a new effort to track progress toward Lake Erie nutrient targets.
- Muck along beaches continues to be a concern along U.S. shore of Lake St. Clair, but complaints and state investigations have been lower than usual this year.
- Michigan doesn't typically sample within Lake St. Clair but they do sample watersheds every 5 years.

Call Objectives

- Allow different organizations to outline their **current and planned monitoring and modeling** activities on Lake St. Clair.
- **Foster communication** among science project teams and management organizations, and identify opportunities for **collaboration**.

Communication on the Call

- Mute your line during presentations.
- Open time for questions and discussion after each presentation.
- Use chat box if you prefer.

Agenda – Part I

I. Project Introductions
- Ecological modeling – Serghei Bocaniov, Dave Schwab (U-M)
- Nutrient monitoring – Ngan Diep (MOECC)
- Microcystin sampling – Tim Davis (NOAA), Cynthia Watson and Arthur Zastepa (ECCC)
- Beach monitoring – Katie Stammler (ERCA)
- Limnology and fisheries monitoring – Rich Drouin (OMNRF)
- Benthos and algae sampling– Mary Anne Evans (USGS)
- Others?

Agenda – Part II

II. Other needs/opportunities
- Management priorities and activities –
  - Santina Wortman, Russ Kreis (EPA)
  - Raj Bejankiwar (IJC)
  - Michelle Selzer (MDEQ)
- HAB forecasting – Tim Wynne, Shelly Tomlinson (NOAA)
- Other research opportunities – Mark Rowe (CILER)
- Others?

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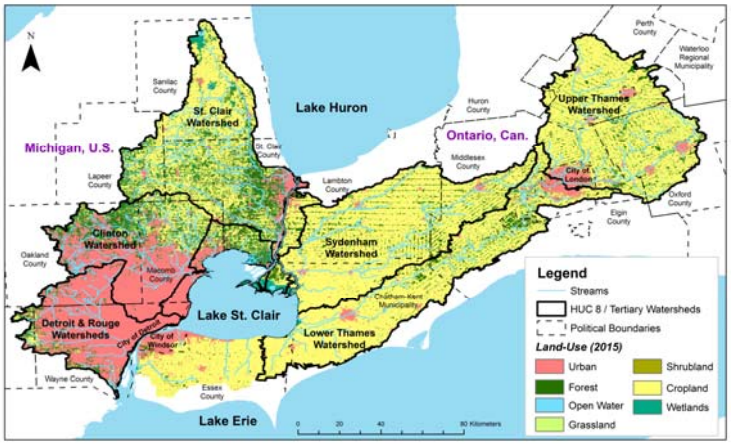
Assessing the Sources and Management Options for Detroit River Nutrient Loads to Lake Erie

- Project period: 2016 – 2018
- Funded by the Erb Family Foundation

Project Objectives:

- Engage policy and management community
- Develop watershed models to assess nutrient loads from different sources.
- Explore options for reducing P loads from the most important sources

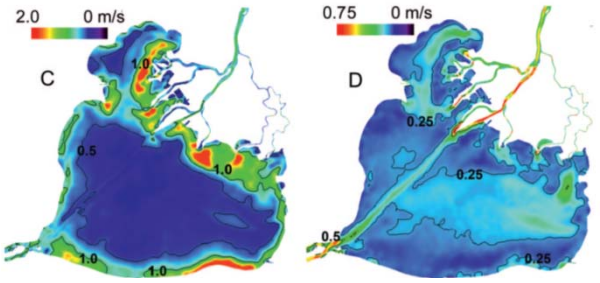
Project Study Area



Estimating nutrient attenuation in Lake St. Clair: Insights from three-dimensional modeling

Serghei Bocaniov, David Schwab and Donald Scavia

October 19, 2016



Example of physical model of Lake St. Clair (Anderson et al., 2010)

There are good physical models of Lake St. Clair, but we need a good water quality model. Especially to understand the fate and transport of nutrients through the lake.

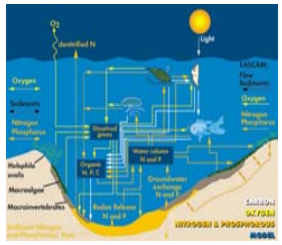
Applied Numerical Model: ELCOM-CAEDYM

❑ Estuary & Lake COmputer Model (**ELCOM**):

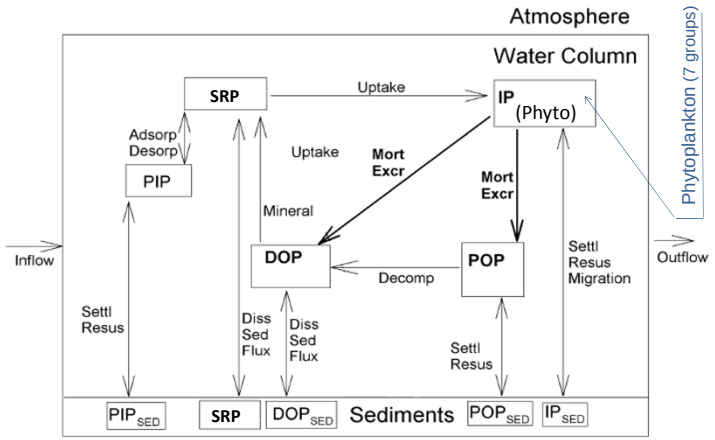
- 3D hydrodynamic model
- baroclinic & barotropic responses
- tidal forcing, wind stresses
- surface thermal forcing, inflows & outflows

❑ Computational Aquatic Ecosystem DYnamics Model (**CAEDYM**):

- ecological & water quality model
- primary production
- C, P, N, Si, O_2 & metal cycling
- sediment dynamics
- Phytoplankton and Zooplankton
- Mussels
- Fish, Fish Eggs and Larvae

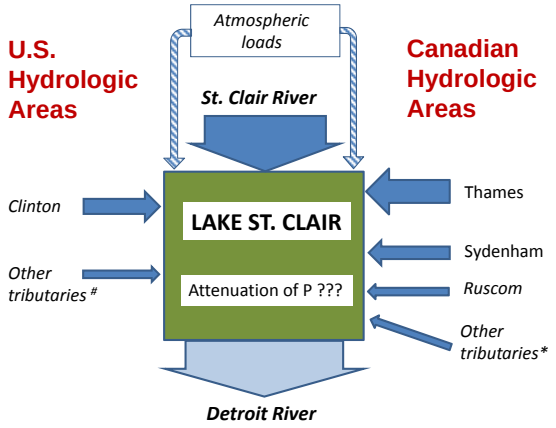


Schematic (simplified) of P dynamics in CAEDYM*



**CAEDYM provides quantitative estimates of key physical and bio-chemical processes*

Approach for a nutrient budget for Lake St. Clair



Frog, Black, Swan, Salt

* Belle, Puce, Pike, Trembley, Little

WQ data availability – limited for Lake St. Clair

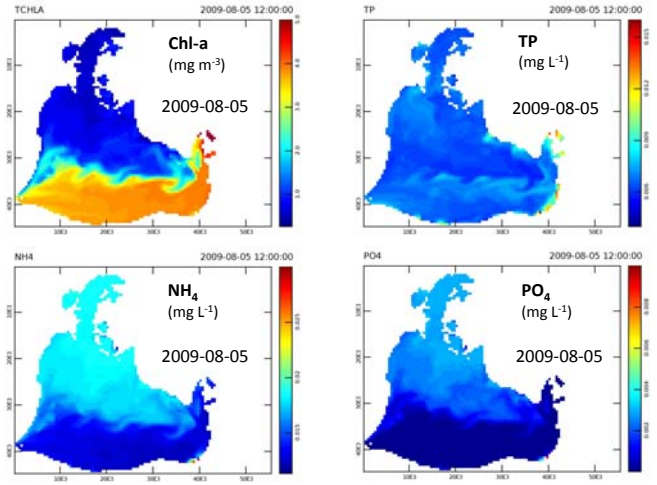
stations 740016 & 820414: all years

stations 209 & 210: data for **2001, 2004, 2007, 2010 and 2014**

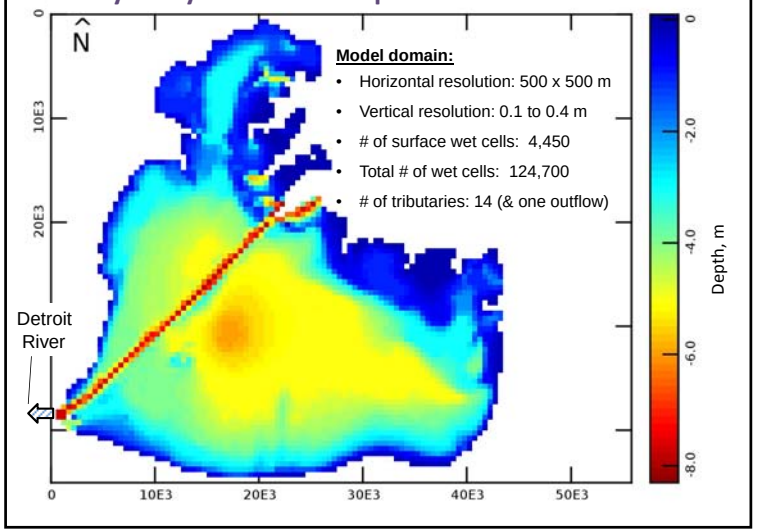
I am looking for additional WQ data for Lake St. Clair

Current MOECC project (2016 – 2018):

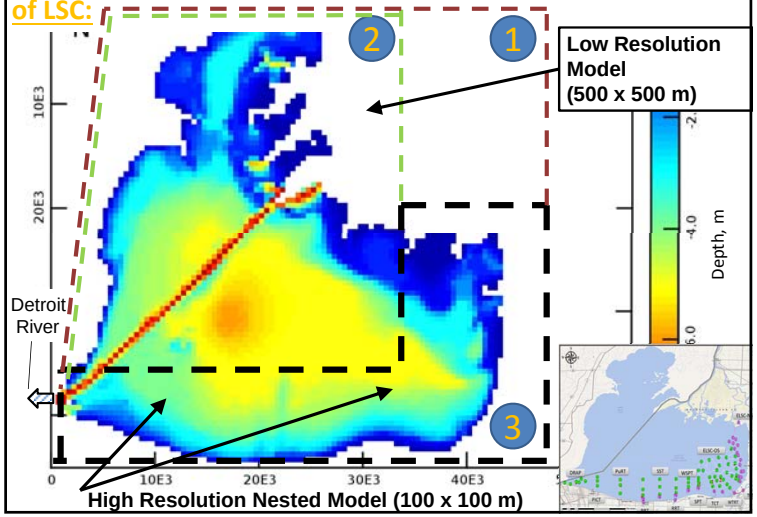
Example of simulation results: surface layer at 1 m depth



Bathymetry & Model set up



Collaboration opportunity with MOECC: Nested 3-D model of LSC:



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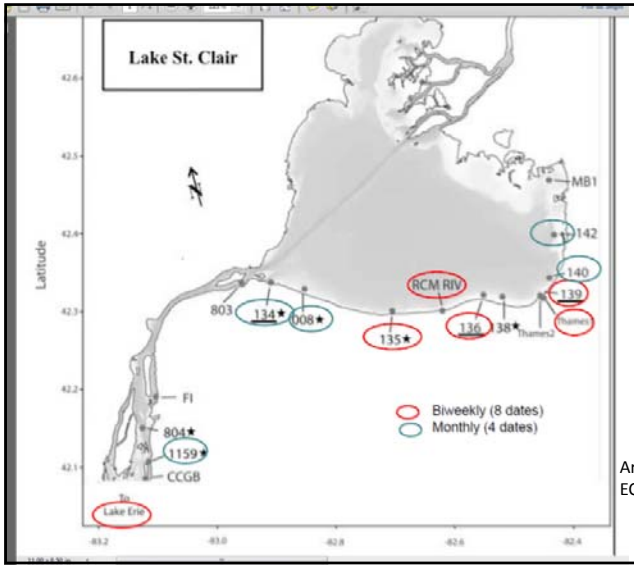

Arthur Zastepa, ECCC

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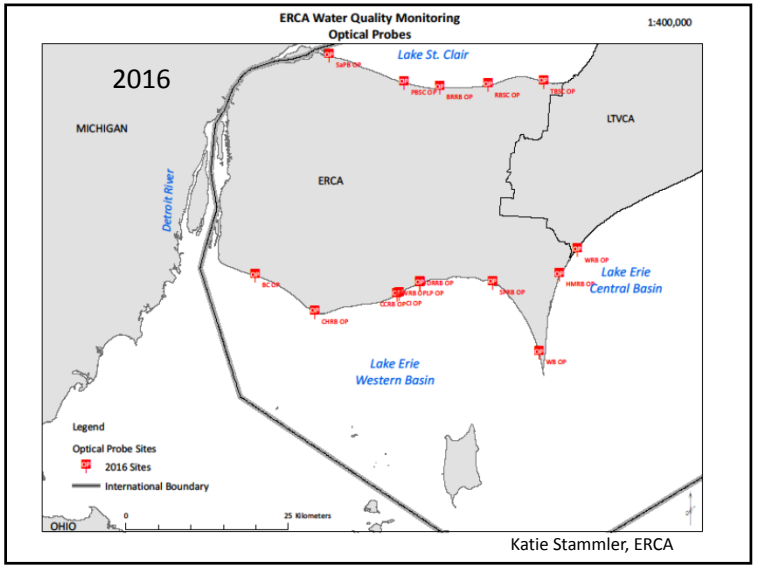

Katie Stammler, ERCA

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USGS projects on Lake St. Clair

Mary Anne Evans (maevans@usgs.gov)

Ecosystem and phytoplankton ecology

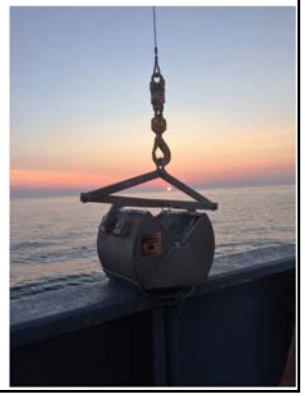
USGS – Great Lakes Science Center

USGS science for a changing world

Benthos monitoring

- Mayflies as indicators of water quality
  (annual sampling)
- Changes in dreisseinds
- Total benthos, macrophyte, and water quality surveys
  (Ron Griffiths, most recent in 2015)

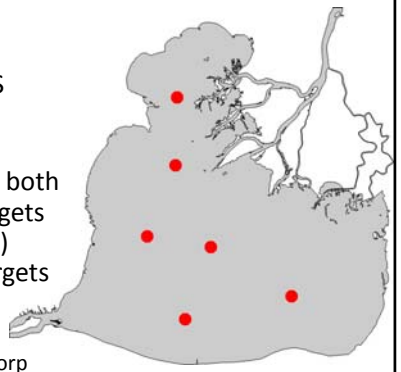
Contact: Don Schloesser (dschloesser@usgs.gov)



USGS science for a changing world

Fish movements

- Part of GLATOS
- Tracking fish migration and habitat use for both restoration targets (Lake sturgeon) and control targets (Sea lamprey)



● = acoustic telemetry receiver

Receivers can hold other payloads

Contact: Darry Hondorp (dhondorp@usgs.gov)
Chris Holbrook (cholbrook@usgs.gov)

USGS science for a changing world GLATOS Great Lakes Acoustic Telemetry Observation System

Other people with data

- Ed Roseman (eroseman@usgs.gov)
  - Zooplankton data for 2-4 sites in LSC, also D and SC River sites
- Kurt Kowalski (kkowalski@usgs.gov)
  - Shoreline phragmites studies
- MI-WSC, Lisa Fogarty (lrfogart@usgs.gov)
  - Clinton River Watershed loading project
  - Nutrients, sediment, evolving list of contaminants

USGS
science for a changing world

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