Lake Michigan CSMI 2020 Workshop

Summary and Recommendations to the Lake Michigan Partnership for Research and Monitoring for the 2020 Intensive Year

Prepared by Carolyn Foley, Illinois-Indiana Sea Grant, Purdue University, 195 Marsteller Street, West Lafayette, IN 47907, USA.

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Background

On October 16 and 17, 2018, nearly 60 scientists and managers met at a workshop in Milwaukee, WI to discuss research needs for Lake Michigan. The workshop, sponsored by the International Joint Commission through its Science Advisory Board Research Coordination Committee and organized by Illinois-Indiana Sea Grant, was part of the Cooperative Science Monitoring Initiative (CSMI). CSMI is a binational program organized through the U.S. Environmental Protection Agency Great Lakes National Program Office (GLNPO) and Environment and Climate Change Canada. Each year since 2002, scientists have focused on one of the Great Lakes for a coordinated research effort. While work happens on all five lakes every year, only one lake per year is targeted for intensive sampling. The last time Lake Michigan was the focus of intensive field sampling was 2015. The Milwaukee workshop, formally called the "Lake Michigan CSMI 2020 Kickoff Workshop", was to help plan activities for the next intensive field year in 2020.

To jumpstart the 2020 planning, Lake Michigan scientists and managers met to discuss the main findings from 2015 and potential research priorities for 2020. Members of the Lakewide Action and Management Plan Partnership Working Group for Lake Michigan (LAMP partners) will then set the official lake priorities (likely in early 2019) after considering these expert opinions from scientists working around the lake and prior research results, as well as their own management needs.

Ultimately, the goals of the CSMI 2020 kickoff workshop were to:

1) Review main findings from previous Lake Michigan research, including results from the 2015 CSMI intensive sampling effort.
2) Allow scientists familiar with issues on Lake Michigan an opportunity to suggest pressing needs or gaps in understanding of the lake as they and the LAMP partners prepare for the 2020 intensive field year.
3) Foster communication between Lake Michigan scientists and managers about management needs and pressing concerns.

Information contained in this report is intended as guidance only. While primarily written to help the Lake Michigan LAMP partners as they set research priorities for the 2020 intensive field year, Illinois-Indiana Sea Grant expects that other researchers and entities studying Lake Michigan might be interested in this summary. Raw transcripts of the workshop discussions are available on request. In addition, findings from 2015 are summarized in a white paper available at http://www.iiseagrant.org/publications/cooperative-science-and-monitoring-initiative-csmi-lake-michigan-2015-report/. Questions about this report can be directed to Illinois-Indiana Sea Grant staff members Carolyn Foley (cfoley@purdue.edu) or Paris Collingsworth (collingsworth.paris@epa.gov).

Summary of Workshop

The planning committee for the 2020 Kickoff Workshop (Appendix 1) was critical to the success of the workshop, helping inform the agenda and the invitee list, coordinating onsite accommodations, and assisting with breakout facilitation. And it was the workshop participants (Appendix 2) and their robust discussions over the course of the two days that produced the fruit of the workshop.

Day 1 – Reviewing Current Knowledge

The workshop began with four overview talks on 1) nutrient loads and movement in Lake Michigan, 2) Lake Michigan long-term monitoring programs, 3) the Lake Michigan sport fishery, and 4) technological advances in field sampling. The topics were informed by discussion during a special CSMI session at the 2017 State of Lake Michigan conference and selected by the planning committee. Each broad talk had multiple contributors who were also recommended by members of the planning committee.

Summaries of each overview talk are provided below, but readers are encouraged to reach out to presenters for additional information.

1) *Nutrient Loads and Movement in Lake Michigan*
   Russell Cuhel of the University of Wisconsin – Milwaukee (UWM) discussed the important role quagga mussels play in nutrient cycling. Studies along the mid-lake reef off of Fox Point, WI, led by he and Carmen Aguilar suggest that quagga mussel dynamics are drastically altering the presence of nutrients, particularly along the reef's plateau. In addition, upwelling events in summer bring large volumes of mussel excrement to the surface, potentially serving as a key nutrient source to the broader food web. Cuhel's results also suggest that studies conducted during the overwinter period are key to understanding lakewide dynamics. Mark Rowe from the University of Michigan Cooperative Institute for Great Lake Research summarized how he and his colleagues at NOAA-GLERL (especially Hank Vanderploeg) have been similarly examining the integral impact quagga mussels have on Lake Michigan nutrient dynamics. Their biophysical models have the ability to predict nutrient dynamics throughout the Great Lakes, and could support the CSMI effort by tracking the contribution of specific tributaries to nutrients and productivity, providing real-time forecast guidance in support of field experiments (for example, if individuals are looking to sample during a large runoff event), or estimating lakewide implications of spatial and temporal hot spots of productivity and trophic interactions. Peter Esselman of the USGS presented findings focused specifically on phosphorus. He and his colleagues devised and tested an approach to estimate 5-day total phosphorus mass loading to all pour points of US Great Lakes. Generally the model performed well with its ability to predict the total phosphorus concentrations and discharge rates, though it slightly under-predicted the total phosphorus mass discharged to the lakes.

2) *Long-term Monitoring Programs*
   Todd Nettesheim first summarized long-term monitoring efforts supported by the US EPA Great Lakes National Program Office. GLNPO monitors all five Great Lakes for nutrients, water quality, lower food web structure, and contaminants. Since the early 2000s, Lake Michigan has

seen reductions in the spring phytoplankton bloom and summer *Diporeia* and cladoceran populations, increases in water clarity, and changes in nutrient concentrations. Chlorophyll and zooplankton have been relatively stable since 2005, and calanoid copepods, those of the genus *Limnocalanus* in particular, seem to be making up a larger proportion of the zooplankton biomass. Contaminants are monitored in air, sediment, water, and fish tissue. Generally, contaminant loads have been decreasing over time, which is good news for fish consumption advisories and overall lake health. Long-term monitoring efforts led by NOAA-GLERL staff were summarized by Steve Pothoven. Benthic ecology surveys both lakewide and in the southern basin have included, more recently, efforts to assess dreissenid mussel growth and condition. Major findings from these efforts is that quagga mussel biomass in the lake is increasing and mussel condition is highest in nearshore areas. Findings from a nearshore-offshore transect off Muskegon, MI, show that changes to the zooplankton community vary with distance from shore. *Mysis diluviana*, the opossum shrimp, appears to be reproducing differently than in the past, and is not responding positively to recent declines in fish populations. Overall, NOAA monitoring efforts suggest that the spring phytoplankton bloom, which supports production in Lake Michigan, has also all but disappeared. This finding is consistent with the long-term GLNPO monitoring. Bo Bunnell of the USGS Great Lakes Science Center discussed the long-term prey fish monitoring program. The main species being followed are alewife, bloater, round gobies, and deepwater and slimy sculpins, all critical to the Lake Michigan recreational fishery. There is considerable spatial and temporal variability in the biomass and distribution of each species or even each age class within a species. Lakewide prey fish biomass is much lower today than it has been historically, and is well below the Fish Community Objectives that have been set for Lake Michigan. Trawl data from the USGS monitoring program are fed into a model that was recently developed by the Michigan State University Quantitative Fisheries Center. This model estimates the ratio of piscivores to prey fish, which in turn is used by fishery managers to determine stocking needs. The target predator to prey ratio for Lake Michigan is 1:20 for the total biomass of salmon to the total biomass of alewife in the lake.

3) *The Lake Michigan Sport Fishery*

For this presentation, Vic Santucci of the Illinois DNR, Tomas Höök of Purdue University, Titus Seilheimer of Wisconsin Sea Grant, and Dan O'Keefe of Michigan Sea Grant compiled information from their own studies plus studies conducted by other organizations. The Lake Michigan sport fishery generates approximately $1.0 billion and 20,000 jobs lakewide. Salmon, trout, and yellow perch are the species that contribute the most to numbers and biomass harvested by anglers. Waves of invasive species have drastically reshaped the Lake Michigan fish community. The Lakewide Fish Community Objectives, which are set by the Great Lakes Fishery Commission, are currently not being met for salmonines, yellow perch, and benthivores (lake whitefish), but are being met for walleye, mainly due to a strong Green Bay fishery. Natural reproduction is occurring for the introduced Chinook salmon as well as native lake trout. Yellow perch abundance is at a historic low largely due to inconsistent recruitment and slow juvenile growth. Lake whitefish populations in the main lake are declining and experiencing poor recruitment and growth. In contrast, Green Bay lake whitefish populations are still seeing positive recruitment and support a strong winter sport fishery. Evaluation of trophic markers in fish and invertebrate tissue, fish stomach contents, and patterns in location of angler harvest of lake trout

and rainbow trout suggest that nearshore and benthic production plays a key role in support of the Lake Michigan food web. Alewife are the dominant prey for salmonines. Overall, there seems to be a high degree of spatial variability in Lake Michigan food web structure and function. Warming water temperatures may mean that there is more suitable thermal habitat for most fishes, however, they may spend less time in nearshore waters and they may need to eat more to maintain the same level of growth. Fishery managers may need to consider which species could be suitable sport fishes in the future, where two key characteristics for these could be flexible foraging and ability to tolerate warm, nearshore temperatures.

4) *Technological Advances in Field Sampling*

A key finding from the 2015 intensive sampling effort on Lake Michigan was that technological improvements to sampling methods are key to increased understanding of the changing Lake Michigan system. Four scientists discussed different technologies that have helped refine and improve data collection. Common themes were to consider 1) how to sample overwinter or in rocky or otherwise difficult to sample habitats, 2) when and where certain technologies are not able to be deployed, and 3) how all the different technologies (e.g., satellites, acoustic data, point-sampling, real-time monitoring) can be used in concert to answer relevant, complex questions. "In concert" could mean collecting complementary data to answer a single set of questions, or using the same technologies to collect different data. Steve Ruberg of NOAA-GLERL summarized various technologies that are either already being tested in the Great Lakes or may be a priority for testing in the future, including using airborne hyperspectral cameras to aid in the detection of Cyanobacteria, adding sensors (e.g., dissolved oxygen) to pre-existing monitoring stations, and increasing use of Autonomous Systems (e.g., gliders, drones). Many pre-existing monitoring stations are part of NOAA-GLERL's real-time coastal observation network and the Great Lakes Observing System. These include meteorological stations on lighthouses or piers, evaporation stations, and buoys deployed in the lake proper. Annie Scofield of Purdue University (formerly of Cornell University), spoke about how towed instrumentation available on the R/V Lake Guardian can help quantify zooplankton communities. Specifically, the laser optical plankton counter (LOPC) available on the Triaxus, when paired with high taxonomic resolution data such as net tow data, can be a powerful way to examine zooplankton distributions. The Triaxus has been used in past efforts to assess how Lake Michigan zooplankton predator and prey dynamics change spatially, but one potential disadvantage with this system is that LOPC data may be of limited use when other particulates are present (e.g., in nearshore zones). Ethan Theuerkauf of the Illinois State Geological Survey discussed the use of unoccupied aerial systems (e.g., drones) to collect data inland and along shorelines. Use of unoccupied aerial systems is very flexible, relatively inexpensive and can be quickly mobilized for a variety of applications, e.g., after episodic events. Use of unoccupied vessels removes personal safety concerns and provides a previously unavailable means of sampling these types of events. Tom Hollenhorst of the US EPA Office of Research and Development (ORD) summarized how this group is integrating satellites, robots, and models to better understand nearshore water quality. ORD has deployed gliders in the Great Lakes for up to 45 days in a single mission, and has been examining how gliders may be able to study highly dynamic nearshore zones. Some data sharing methods cannot accommodate the size of current datasets, but ORD is exploring the utility of available data visualization methods (e.g., using Cesium as a way to visualize glider data which are collected every 0.5-1 seconds). ORD

also integrates information to support adaptive sampling, for example changing glider tracts based on recent satellite imagery in order to sample in the vicinity of a recent episodic event. There are many platforms available that could facilitate development of a CSMI Data Interoperability Framework (after the Interoperable Watersheds Network). Some Great Lakes scientists are already working on this, and some tools that may be able to help include Qlik Sense and Quickbooks.

In the afternoon, workshop attendees participated in two breakout sessions. For the first, they self-selected into one of four groups, each associated a different overview talk. Each group was charged with adding to what had been covered in their respective overview talk by discussing 1) ongoing efforts in their given topic, 2) main findings from completed or ongoing work in their given topic, and 3) pressing questions associated with their given topic.

After a report out to the larger group, participants were asked to identify additional topics of importance to Lake Michigan that had not been covered in an overview talk. Participants identified five broad topics for discussion: 1) legacy and emerging contaminants, 2) the microbial food web and an understanding of lake metabolism, primary production, and Cyanobacteria, 3) the importance of habitat to production, including consideration of Green Bay and shoreline habitats like wetlands and tributaries, 4) the importance of understanding hydrodynamics in Lake Michigan, and 5) human dimensions of the diverse communities and stakeholders that interact with Lake Michigan.

Participants again self-selected into breakout discussion groups related to these 5 topic areas, and were charged with discussing 1) ongoing efforts in their given topic, 2) main findings from completed or ongoing work in their given topic, and 3) pressing questions associated with their given topic. Two broad topics that have potential to affect all other topics were a) how conditions might change in the future (e.g., in response to climate change or changing demographics in lake stakeholder groups) and b) how variable conditions across Lake Michigan work together to affect the whole lake system. Participants were encouraged to consider these in their respective group discussions. Day 1 ended with a large group discussion of the current knowledge of Lake Michigan processes.

Recurring topics from Day 1 included acknowledgement that there is tremendous value in this coordinated effort (CSMI), as it allows scientists to effectively answer broader questions and test new technologies. In addition, participants acknowledged sampling overwinter or after episodic events, developing size- or species-fractionated production isotopic baselines, understanding of very nearshore processes, and generating and acquiring data to supply to integrated, fine-resolution models are all key to developing a full understanding of Lake Michigan processes. At the same time, these are challenging to accomplish and may require rethinking how information is being collected or shared, including making potential changes to infrastructure (e.g., to be able to quickly identify key episodic events and respond to them). Other recurring topics from Day 1 included a need to understand or develop:

- The role of very small organisms in the Lake Michigan food web, e.g. microbial food web, veligers
- More information about *Cladophor*a dynamics in the lake, including sloughing, transportation, and the fate of sloughed material

- The role of emerging contaminants and the role of groundwater in contamination pathways
- Updated nutrient loading information
- How to consider questions at meaningful temporal or spatial scales
- Ecosystem valuation or some other understanding of how the people who engage with Lake Michigan fit with work accomplished during CSMI
- Data standardization in terms of collection and QA/QC methods

Day 2 – Looking Forward

The second day of the 2020 CSMI Kickoff Workshop started with a review of Day 1 and a reminder of the goals of the workshop. After this, participants were invited to give 3 minute Lightning Talks where they could identify the one pressing data need or research gap that they thought the Lake Michigan LAMP partners should consider as they set research priorities for the 2020 intensive field year. A full list of presenters plus title or topic area are included in Table 1.

After the lightning talks, participants were asked to collectively suggest broad issues that they felt could and should be addressed in the CSMI 2020 sampling effort. Six broad issues were identified:

1. Lake Michigan nutrient loads and spatial variation in nutrients
    - Nutrient loading targets are being revised, could the CSMI 2020 effort support this?
    - Potential for coordination with state-level efforts.
    - Importance of rivermouths.

2. Winter sampling and other challenging sampling

3. Maintaining continuity with the 2015 CSMI effort on Lake Michigan
    - Monitoring?
    - Tracking contaminants.
    - Understanding of physical processes.

4. Habitat considerations
    - Rivermouths.
    - Reef complexes.
    - Hot spots.

5. Food web dynamics
    - Effects of mussels on the Lake Michigan system.
    - Fish recruitment bottlenecks.
    - Contaminants.
    - Productivity.
    - Microbial loop.

6. Miscellaneous catchall
    - Coordination of researchers, especially with respect to sharing data for integrated models.
    - Social science.
    - Ecosystem services.

The breakout session associated with these six broad issues was designed to allow participants to weigh in across any topic they wished. Participants were asked to float between broad issue groups. For any issue they chose to discuss, they were asked to consider: data needs and pressing questions for that issue, what Lake Michigan management needs could be addressed by the work being discussed, and why work being discussed should happen in 2020. All workshop participants participated in discussion for at least 2 different broad issues, while many travelled to 5 or 6 different broad issue groups.

In the final breakout session of the workshop, participants were asked to pick any pressing question or topic that they had heard discussed throughout the workshop and design a study to address this question or topic. Specifically, while designing the study participants were asked to consider the management need that their study would address, identify what entities would conduct the work and be engaged with the work, identify resource needs including funding and equipment, and link the proposed study to monitoring needs. These monitoring needs could be new or ongoing.

For all breakout sessions but particularly for those on Day 2 of the workshop, LAMP partners were spread evenly across discussion groups, listening to what workshop participants had to say as well as engaging in discussion.

Table 1. List of the participating 3-minute lightning talks.

Presenter	Affiliation	Title/Topic of Lightning Talk
Ashley Elgin	NOAA-GLERL	Dreissenid mussel impacts: VELIGERS to adults
Catherine Riseng	Michigan Sea Grant University of Michigan	Great Lakes Aquatic Habitat Framework www.glahf.org
Bo Bunnell	USGS Great Lakes Science Center	Are changes in lower trophic levels limiting prey-fish biomass and production in Lake Michigan?
Carmen Aguilar	University of Wisconsin-Milwaukee	The importance of changing water clarity patterns to larval fish and the overall Lake Michigan food web
Mike Ripley	Chippewa Ottawa Resource Authority	Why Are Atikameg (Whitefish) Declining?
DJ Shook	Grand Traverse Band of Ottawa and Chippewa Indians	Need to understand early life history of Whitefish and its role in overall declines
John Janssen	University of Wisconsin-Milwaukee	Understanding of *Hemimysis* in the food web - maybe important prey, difficult to sample
Tom Johengen	CIGLR University of Michigan	Better understanding of lake-scale primary production Grounding new methodologies to the gold standard ^{14}C P vs I Historical trend analysis and a baseline for the future
Hank Vanderploeg	NOAA-GLERL	Fine-Scale Organization of the Pelagic Food Web During Early Stratification Is Important to Understanding Food Web Dynamics & Larval Fish Recruitment
Vincent Denef	University of Michigan	Are dreissenid mussels re-engineering lake microbial systems?
James Pauer	EPA Office of Research and Development	The Need for Data Integration and Transparency
James Larson	USGS La Crosse	Rivermouths and nutrient dynamics
Steve Ruberg	NOAA-GLERL	HAB Toxin Detection with MBARI 2nd Generation Environmental Sample Processor
Russell Cuhel	University of Wisconsin-Milwaukee	A Little Ammonia Goes a Long Way to Alter Food Web Nitrogen Dynamics in Lake Michigan
Lisa Fogarty	USGS	SiGL Mapper (metadata mapper https://sigl.wim.usgs.gov/sigl/)

Research Priority Recommendations

Over two days of vibrant discussions, certain ideas consistently rose to the top as key recommendations when considering Lake Michigan research priorities. It is important to note that not all the following suggestions may be suitable for a CSMI focus (i.e., they do not meet an obvious management need, or sampling in a single year may not be feasible). However, they all are included as they have the potential to inform further discussions about Lake Michigan research.

Overall, there was a recommendation for CSMI to consider how to balance exploration of new topics with development of consistent, long-term monitoring programs, as there is value in both of these approaches. There were recommendations to evaluate ongoing work associated with any research priority because certain data may already be available, consider involving community science efforts as a way to supplement and expand CSMI sampling, and identify a central location for Lake Michigan scientists to share data and discuss plans for sampling and analysis. The use of new technology was encouraged, but there was a recommendation to critically evaluate what works and what doesn't before adopting officially (e.g., submersible AUVs vs. gliders). Finally, Lake Michigan's food web has changed so drastically that sampling over winter and in early spring seems critical.

The specific potential research priorities were to:

- Focus on members of the Lake Michigan food web who are potentially important players but have previously been understudied, at least in CSMI-focused efforts. These include but are not limited to dreissenid veligers, *Limnocalanus* copepods, larval stages of all fishes, and all life stages of whitefish and round gobies.
- Focus on sampling Lake Michigan "hot spots" of productivity (nutrients, biota, etc.).
- Continue to examine the importance of tributaries and nearshore areas to the broader lake. Acknowledge their considerable spatial and temporal variability in sampling plans.
- Consider how Green Bay and other major tributaries may be supporting Lake Michigan productivity.
- Develop a lakewide nutrient cycling model.
- Explore the balance between nutrients inputs from tributaries and nutrients required to support production within the increasingly oligotrophic lake.
- Focus on transfer of contaminants to the Lake Michigan food web.
- Create an in-depth substrate map or otherwise capture substrate variation, especially important given the considerable heterogeneity in Lake Michigan and the potential for hot spot analyses.
- Generate information on the values and needs of the wide variety of stakeholder groups present around Lake Michigan. There is potential for conflict between these groups in terms of how they view any CSMI research priorities. Understanding how these values differ will help scientists and managers most effectively conduct Lake Michigan research.

Appendix 1. Planning Committee Members

Derek Ager, Physical Scientist, US EPA GLNPO

Paris Collingsworth, Great Lakes Ecosystem Specialist, Illinois-Indiana Sea Grant, Purdue University

Carolyn Foley, Research Coordinator, Illinois-Indiana Sea Grant, Purdue University

Jennifer Hauxwell, Assistant Director for Research and Student Engagement, Wisconsin Sea Grant

Elizabeth Hinchey-Malloy, Lake Michigan and Lake Erie Leader, US EPA GLNPO

J. Val Klump, Dean, Professor, University of Wisconsin-Milwaukee School of Freshwater Sciences

Diana Olinger, Policy Specialist and Safety and Environmental Compliance Officer, NOAA

James Pauer, Environmental Engineer, US EPA ORD

Ed Rutherford, Research Fishery Biologist, NOAA-GLERL

Owen Stefaniak, Graduate Student, University of Wisconsin-Milwaukee School of Freshwater Sciences

Kristin TePas, Community Outreach Specialist, Illinois-Indiana Sea Grant, University of Illinois at Urbana-Champaign

Ethan Theuerkauf, Coastal Geologist, Illinois State Geological Survey, University of Illinois

Annie Turek, Sustainability and Partnerships Specialist, Illinois Department of Natural Resources Coastal Management Program

Lizhu Wang, Biological Scientist, International Joint Commission

Appendix 2. Workshop Attendees

(Few cancelled at the last minute, and others joined during the workshop).

Name	Affiliation	Name	Affiliation
Adit Chaudhary	University of Illinois at Chicago	John Janssen	University of Wisconsin Milwaukee
Allison Neubauer	IL-IN Sea Grant, University of Illinois	Katelyn Bockwoldt	US EPA GLNPO
Annie Scofield	Purdue University	Kristin TePas	IL-IN Sea Grant, University of Illinois
Annie Turek	IL DNR Coastal Management Program	Li Wang	International Joint Commission
Ashley Elgin	NOAA-GLERL	Lisa Fogarty Reynolds	USGS-Michigan Water Science Center
Beth Hinchey-Malloy	US EPA-GLNPO		
Bo Bunnell	USGS-GLSC	Liz Tristano	Wisconsin DNR
Carmen Aguilar	University of Wisconsin Milwaukee	Madeline Magee	Wisconsin DNR
		Mark Rowe	University of Michigan, CIGLR
Caroline Moellering	Little Traverse Bay Band		
Carolyn Foley	IL-IN Sea Grant, Purdue University	Matt Preisser	Michigan DEQ, Office of the Great Lakes
Catherine Riseng	University of Michigan, Michigan Sea Grant	Michael Spinar	IN DEM
		Michelle Caldwell	IN DEM
Charlie Roswell	Illinois Natural History Survey	Mike Ripley	Chippewa Ottawa Resource Authority
Cheryl Masterson	Wisconsin DNR	Owen Stefaniak	University of Wisconsin Milwaukee
Danielle Nelson	IL DNR Coastal Management Program	Paris Collingsworth	Purdue University, IL-IN Sea Grant
Debera Backhus	IN DNR Coastal Management Program	Rachel Poretsky	University of Illinois at Chicago
Diana Olinger	NOAA		
DJ Shook	Grand Traverse Bay Band	Rebecca Kreiling	USGS-La Crosse
Ethan Theuerkauf	Illinois State Geological Survey	Russell Cuhel	University of Wisconsin Milwaukee
Forest Service Rep	US Forest Service	Scot Peterson	Illinois Natural History Survey
Hector Bravo	University of Wisconsin Milwaukee	Sergiusz Czesny	Illinois Natural History Survey
Irene Miles	IL-IN Sea Grant, University of Illinois	Steve Pothoven	NOAA-GLERL
James Larson	USGS-La Crosse	Steve Ruberg	NOAA-GLERL
James Pauer	US EPA-ORD	Steven Brown	IL State Geological Survey
Jason Lorenz	Gun Lake Tribe Environmental Department	Titus Seilheimer	Wisconsin Sea Grant
		Todd Nettesheim	US EPA-GLNPO
Jen Hauxwell	Wisconsin Sea Grant	Tom Johengen	University of Michigan, CIGLR
Joel Hoffman	US EPA-ORD		
		Tomas Hook	Purdue University, Illinois-Indiana Sea Grant
		Vic Santucci	IL DNR

Appendix 3. Workshop Agenda

CSMI 2020 Field Year on Lake Michigan Kickoff Workshop
October 16-17 2018

University of Wisconsin-Milwaukee, School of Freshwater Sciences, Great Lakes Research Facility, 600 E Greenfield Ave, Milwaukee, WI 53204, Room 3080

W = will be broadcast via webinar, all times Central

Agenda Day 1, Reviewing current knowledge - October 16, 2018

10:00 am	Coffee/tea
10:15 am W	Welcome and overview of workshop – Beth Hinchey-Malloy, Paris Collingsworth
10:20 am W	Brief overview of CSMI 2015 efforts and SOLM (follow up to reading material provided to participants beforehand) – Paris Collingsworth
10:30 am W	Introductory talks (30 minutes each)

- Nutrient loading to and movement in Lake Michigan
- Lake Michigan long-term monitoring programs
- The Lake Michigan sport fishery
- Technological advances in field sampling

12:30 pm	Lunch provided
1:15 pm	**Breakout session 1: What could have been added to the overview talks?**
2:15 pm	Break – 15 minutes
2:30 pm	**Breakout session 2: What else could have been its own overview talk?**
3:30 pm	Large group report out and facilitated discussion related to Breakout sessions 1 and 2
4:30 pm	Adjourn

4:30 pm – 5:30 pm	Optional tour of R/V Lake Guardian
6:00 pm	Optional dinner with group at O'Lydia's (not provided).

Agenda Day 2, Looking forward - October 17, 2018

8:15 am	Coffee/tea/light breakfast
8:30 am W	Recap of Day 1 – Paris Collingsworth/Carolyn Foley
8:40 am W	Review of Lake Partnership role in determining CSMI priorities, reminder of Goals of Workshop – Beth Hinchey-Malloy
8:45 am W	Lightning Talks Round 1 + Designated question and answer time for Round 1
9:15 am	Break
9:20 am W	Lightning Talks Round 2 + Designated question and answer time for Round 2
9:50 am	Break
10:00 am	**Breakout session 3: Broad issue discussion**
12:30 pm	Lunch provided, plus informal overview of the 2015 CSMI Storymap Outreach Tool – Kristin TePas, Allison Neubauer
1:15 pm	**Breakout session 4: Design-A-Study**
2:15 pm	Report out/large group discussion
3:00 pm	Adjourn

Appendix 4. Background Reading Provided to Attendees before the Workshop

Cooperative Science and Monitoring Initiative

Background

The Cooperative Science and Monitoring Initiative (CSMI) is a joint United States and Canadian effort to provide environmental and fishery managers with the science and monitoring information necessary to make management decisions on each Great Lake. The intensive CSMI field year follows a five-year rotating cycle in which the lakes are visited one per year. The emphasis on a single Lake per year allows for coordination of science and monitoring activities focused on information needs not addressed through routine agency programs, and cooperation on specific science assessments.

The Process (*using Lake Michigan as the example*)

Year 1: Priority Setting (2018)

The GLWQA Annex 2 Lake Partnerships are responsible for the identification of research, monitoring, and other science priorities needed to assess threats to Great Lakes water quality and fisheries and support management actions for their respective lake.

Year 2: Planning (2019)

A GLWQA Annex 10 CSMI Task Team considers the Lake Partnership science priorities and develops intensive year plan. The CSMI Task Team will:

- Clarify priorities with Lake Partnerships as appropriate
- Determine whether existing base programs address priorities
- Leverage ongoing efforts and collaborate to accomplish work
- Identify new projects to address priorities
- Coordinate efforts across lakes, where appropriate

Year 3: Field Year (2020)

The field year is the intensive year when samples are collected as part of coordinated monitoring and cooperative assessments throughout the lake, upstream connecting channels, and watersheds as appropriate. During the entire field year, the Great Lakes Sea Grant Network will work with the Lake Partnerships to provide outreach and communication.

Year 4: Analysis (2021)

Samples collected during the CSMI field year will continue to be analyzed, and data processing and interpretation begun. A special session may be organized at IAGLR to present preliminary results of the intensive field year.

Year 5: CSMI Reporting (2022)

Data processing and interpretation are completed. A white paper summarizing the results of CSMI projects and how they address the Lake Partnership science priorities should be completed this year.

CSMI Task Team Membership

The CSMI Task Team includes representatives from the following agencies:

- U.S. Environmental Protection Agency (U.S. EPA)
- U.S. Geological Survey (USGS)
- National Oceanic and Atmospheric Administration (NOAA)
- U.S. Fish and Wildlife Service (USFWS)
- Other agencies and partners. as appropriate
- The CSMI Task Team intends to rotate in relevant provincial, state and tribal members for each Lake under discussion.

CSMI Steps	2016	2017	2018	2019	2020	2021
Year 1 - Priority Setting	Lake Ontario	Lake Erie	Lake Michigan	Lake Superior	Lake Huron	Lake Ontario
Year 2 - Planning	Lake Huron	Lake Ontario	Lake Erie	Lake Michigan	Lake Superior	Lake Huron
Year 3 - Field Year	Lake Superior	Lake Huron	Lake Ontario	Lake Erie	Lake Michigan	Lake Superior
Year 4 - Analysis	Lake Michigan	Lake Superior	Lake Huron	Lake Ontario	Lake Erie	Lake Michigan
Year 5 - Reporting	Lake Erie	Lake Michigan	Lake Superior	Lake Huron	Lake Ontario	Lake Erie