Lake Michigan Cooperative Science and Monitoring Initiative (CSMI) Priorities for the 2025 Field Year

The 2025 CSMI priorities are comprised of five theme areas, described in detail below. These priorities were established collectively by the Lake Michigan Partnership to inform ecosystem and water quality management programs. The Lake Michigan Partnership has identified two additional priority theme areas, nearshore sampling and winter/shoulder season sampling, that cut across multiple priorities.

Priorities to Address Bottlenecks Limiting Fish Recruitment and Lower Trophic Level Health

1. Identify biological 'hot spots' (e.g., Green Bay, major tributaries/nearshore areas, reefs, and upwelling events) and quantify their contribution to overall Lake Michigan fish production and recruitment. Seek opportunities to leverage existing and past work in these areas.
2. Investigate recruitment bottlenecks for key fish species such as lake whitefish, cisco and alewife by examining differences in growth, diet, mortality and spawning in areas with contrasting productivity (e.g., southern Lake Michigan vs. Green Bay and Sturgeon Bay) and environmental conditions (e.g., variations in UV radiation, ice cover, habitat types, contaminants). Seek opportunities to leverage and integrate existing fish sampling efforts, examine bottlenecks at finer temporal scales, and extend offshore sampling further into the nearshore environment.
3. Conduct nearshore to offshore monitoring of nutrients and key food web components (e.g., phytoplankton, zooplankton, *Diporeia* and dreissenid mussels).
4. Develop estimates or methodology for improved round goby abundance assessments in Lake Michigan.
5. Identify areas of high invasive species densities to further the understanding of current and future impacts of terrestrial and aquatic invasive species upon the health of the Lake Michigan ecosystem.
6. Assess current and future predicted climate change impacts on Lake Michigan nursery habitats and fish recruitment, including impacts from changing ice cover, lake and tributary warming, water level fluctuations, and changes in sediment transport.
7. Investigate understudied but potentially important components of the food web, including nearshore (including shallow shoreline areas) and under-ice community structure, dreissenid veliger abundance and energy density during critical periods (e.g., first feeding post-yolk sac larvae) for key fish species, the contribution of the micro-food web to larval fish recruitment, as well as *Limnocalanus* copepods, *Mysis*, and the microbial loop (bacteria and microzooplankton).
8. Provide more spatially robust assessment of the lower food web in areas of the lake that will likely experience the earliest impacts of climate change, such as Green Bay.
9. Use high-tech sensing and traditional ecological knowledge (TEK) to identify current spawning and nursery habitats of bass, wild lake trout, yellow perch, and lake whitefish in nearshore Lake Michigan, mapping the associated bathymetry and substrates.

Priorities to Address Chemicals

10. Monitor concentrations and distributions of emerging contaminants of concern and their metabolites in waters, sediments, and biota of the Lake Michigan basin. Contaminants of interest include PFAS, atrazine and other triazines, neonicotinoids, and glyphosate.
11. Monitor and assess the levels of salinity in Lake Michigan tributaries and nearshore areas.
12. Assess the trophic transfer of contaminants, with a focus on PFAS, through the Lake Michigan food web, including transfer through the microbial portion of the food web.

Priorities to Address Watershed/Tributaries Connections to Lake Michigan Water Quality

13. Measure and assess tributary sediment transport and nutrient dynamics on in-lake conditions (chemical and physical integrity) and determine impacts on lower trophic level productivity, both nearshore and offshore, as well as during winter and shoulder seasons.
14. Assess land use and land conservation changes within Lake Michigan watersheds and the impacts they have had on water quality.
15. Evaluate to what extent nutrient management actions in Fox River and Green Bay are likely to have the desired effect (mitigating algal blooms, protecting water quality, sustaining aquatic habitat) under current and projected conditions.
16. Determine the extent to which climate change impacts to tributaries, including temperature change, storm events, and changes in water quality values, will affect transport of nutrients and sediment to the lake.
17. Assess the timing of nutrient loading to the lake, with a focus on Green Bay, and how that could impact development of nuisance and harmful algal blooms.
18. Investigate nutrient and algae community dynamics under the ice and during the spring season, especially in Green Bay, and how those conditions affect summertime *Cladophora* and cyanobacteria conditions.
19. Better understand the groundwater impact, both quantity and quality, on Lake Michigan waters. This includes furthering our understanding of nutrient and contaminant transport and loadings from groundwater.

Priorities to Characterize “Very” Nearshore Habitat

20. Improve understanding of winter season physical processes (e.g., shelf ice, ice dams, open water ice cover) and the impacts on nearshore habitat.
21. Quantify changes in shoreline (e.g., hardening or coastal wetland restoration) and assess impacts on nearshore habitat.
22. Identify the impacts of in-lake sediment and nutrient transport on biological, physical, and chemical integrity in the nearshore region with a focus on transport from the very nearshore region, including the beach/swash zone, to deeper nearshore regions and along the shore within a depth region.

Priorities to Implement Social Science (e.g., perceptions by users (boaters, anglers, beachgoers, shoreline homeowners))

23. Assess the extent to which Lake Michigan property owners, particularly those along the shoreline, understand the impact their individual activities (e.g., shoreline hardening, septic tanks, vegetation/landscaping, etc.) can have on the Lake Michigan shoreline and water quality.
24. Examine fish consumption on a lake wide scale by recreational and subsistence fishers (which species, where, by whom) to identify the populations/communities most vulnerable to contaminants.

Cross-cutting CSMI Priority Themes: *Nearshore sampling* and *Winter/shoulder season sampling*