CIGLR Summit Final Report: Great Lakes Social-Ecological Indicators

Date: August 2-4, 2026

Summit lead: Mike Shriberg (U-M Water Center/SEAS)

Steering committee members: John Bratton (LimnoTech); Patrick J. Doran (The Nature Conservancy, Midwest Division); Sophee Langerman (National Wildlife Federation, Healing Our Waters Coalition); Meghan Klasic (University of Minnesota); Josie McCarthy (U-M Water Center/SEAS); Sarah Miller (U-M Water Center); Jess Rudnick (University of Illinois Extension); Julie Simmons (National Oceanic and Atmospheric Administration); Tennessee Swearingen (U-M Water Center/SEAS); Katie Williams (University of Minnesota-Duluth)

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Executive Summary

The Great Lakes Social-Ecological Indicators Project, supported by the Cooperative Institute for Great Lakes Research (CIGLR), had numerous objectives:

1. Identify priority human dimensions indicator categories and specific candidate indicators that are adaptable to local contexts, while informative at the regional scale.
2. Advance ideas for a framework and decision-support tool that provides the necessary support to Great Lakes stakeholders and local resource managers to self-select relevant indicators according to their own community-specific or management context needs. The development of these tools aims to promote adoption of human dimension indicators across the Great Lakes basin.
3. Build collective understandings of the processes, drivers, impacts, and management challenges related to management objectives that inform tool and resource creation and aid implementation of selected human dimension indicators across the basin.
4. Build collaboration between managers and stakeholders to drive adoption of the use of indicators developed through this project and foster a community that collaboratively works to incorporate indicators into Great Lakes governance and management decision-making.

Project initiatives leading up to and culminating in the August 2026 Summit made great strides in advancing all objectives and identifying important paths forward to continue to advance this work and its implementation. Here we provide quick highlights of the key advances made around each objective. For additional details, please see corresponding sections in the full report.

Objective 1: Priority indicator categories and potential specific indicators were identified by compiling human dimension indicators monitored around the Great Lakes and across other relevant social-ecological systems (SESs), and organizing these indicators around human dimensions relevant to the Great Lakes management objectives. Summit participants then had the opportunity to brainstorm additional potential indicators of interest.

Objective 2: Feedback on valuable frameworks and decision-support tools was gathered throughout the pre-summit processes, including two workshops (online and at the International Association for Great Lakes Research conference), a survey and multiple rounds of review by the Steering Committee. During the summit, participants identified initial priority indicators for four Great Lakes Restoration Initiative (GLRI) management objectives (M.Os). Further analysis and synthesis of these indicators is anticipated, potentially informing a white paper or publication and the development of adaptable decision-support tools to support stakeholders and resource managers across the Great Lakes basin in applying indicators to their specific contexts and needs.

Objective 3: Challenges and barriers to indicator adoption and implementation were identified throughout the pre-summit process. During the summit, participants identified initial priority indicators across four Great Lakes Restoration Initiative management objectives (M.Os) and collaboratively developed shared definitions. Participants mapped how these priority indicators could be used by specific audiences and stakeholder groups to inform actionable decision-making and be assessed and measured. They also identified opportunities to integrate priority indicators into existing efforts and align them with stakeholder group priorities. Discussions focused on potential next steps to address implementation barriers and strengthen interorganizational coordination to support the integration, adoption, and practical application of priority indicators.

Objective 4: The project engaged 75 people across 2 pre-summit convenings and the in-person August 2026 Summit. The Summit convened 25 individuals, representing 21 organizations across 7 sectors. See Appendix G for the summit attendee list.

Next Steps: Participants identified several priorities for advancing Great Lakes human dimensions indicators beyond this initial CIGLR project funding at the near-term, medium-term, and long-term stages. **Near- to medium-term work** will likely include:

- Refining the highest-priority indicator categories and candidate indicators identified during the August Workshop by clarifying their intended audiences, terminology used, measurement approaches, and the scales (spatial or social) at which they are appropriate to implement.

- Drafting a white paper or other publication (via a committee including Summit participants) releasing the refined, prioritized indicators from the August workshop.
- Gathering feedback through existing institutions and convenings, engaging agencies, Tribes, non-governmental organizations, and community groups to build acceptance and awareness of these efforts.
- Piloting prioritized indicators and developing case studies and practical tools for local resource managers

A full list of generated next steps ideas from the workshop can be found in *Next Steps & Future Plans*.

Background

The 2026 CIGLR Great Lakes Social-Ecological Indicators Summit was organized in response to growing calls to understand and integrate human dimensions and well-being into Great Lakes ecosystem-based management programs to improve the efficacy, equity, community support, and long-term sustainability of restoration investments. Ecosystem-based management approaches often identify and monitor "indicators" that measure progress toward stated management goals and can be used to assess how management and policy approaches affect progress toward these outcomes. Many frameworks exist for selecting indicators that are conceptually valid, scientifically grounded, sensitive to change, measurable, and understandable; yet these efforts have largely focused on biophysical indicators rather than social or human well-being indicators.

The Laurentian Great Lakes are no exception to the focus on biophysical indicators, with decades of work by U.S. and Canadian government agencies, researchers, and stakeholders to monitor various biological, chemical, and physical indicators that are used to describe basin-wide trends and assess progress toward the restoration objectives outlined under the Great Lakes Water Quality Agreement (GLWQA), Great Lakes Restoration Initiative (GLRI), and other initiatives, laws, or programs. As with so many other social-ecological systems (SESs), monitoring efforts include very few social or human well-being indicators.

In recent years, a community of social science scholars, practitioners, and advocates focused on understanding the social dynamics of the Great Lakes and demonstrating the importance of accounting for human dimensions in the design of environmental programs has burgeoned. The summit marks the fourth convening in recent years to advance shared understandings and build a collaborative community able to integrate human dimensions into Great Lakes management. **While prior gatherings have identified concepts for action and important priorities for the U.S. EPA, IJC, and other agencies, the gatherings have not synthesized and tailored the frameworks, measurement tools, or data sources that will be necessary to track human dimension indicators in the Great Lakes.** This CIGLR Summit uniquely contributed to this growing lineage of work by actively addressing this gap and aiming to produce usable tools.

Pre-Summit Work

In preparation for the CIGLR Summit workshop that was held in August 2026, the project team sent out a survey in April 2026 to contacts within the team's institutional networks to get a better sense of current social, ecological, and human dimensions indicators being used within the Great Lakes basin, and to understand challenges to their effective use and implementation. We received 30 survey responses. Survey findings included what those in the region are using indicators for (e.g., adaptive management; decision-making; to better understand community and human benefits; to inform research and project formulation and planning; and decision support), as well as the main considerations for indicator usage.

Participants ranked considerations for indicator usage on a Likert scale of 1-5 (with 1 being strongly disagree and 5 being strongly agree). The following considerations were ranked as "agree" and/or "strongly agree" by participants at high frequency. We used this to ground portions of the workshop agenda, including the selection of "good indicators" (Figure 1).

Criteria Prioritized by Survey Respondents

Criterion	Respondents selecting criterion (%)
Methodological rigor / scientific credibility	92%
Geographic relevance	92%
Integrated decision-making is a priority	84%
Practical / reliable data	80%
Accessibility to non-experts	80%
Alignment with community / constituent values	76%
Low barriers to implementation and/or use	76%
Ability to track changes to data over time	72%

Figure 1. Criteria Prioritized by Survey Respondents

Notable findings from the survey also included extensive lists of example indicators currently being used in the basin as well as key challenges and barriers to indicator use, adoption, and implementation (e.g., limited funding and capacity; lack of human dimensions and/or social science expertise; insufficient funder, agency, or practitioner buy-in; changes in "acceptable language"; limited or poor-quality data, including geospatial and long-term datasets; equity, culture, and power dynamics; a need for culturally relevant indicators developed with affected communities; and political or institutional resistance to data sharing, mapping, or publication).

The project team also coordinated a series of virtual and in-person workshops to build knowledge of the project and spark initial conversations around the project objectives. These included:

(1) **a virtual workshop on May 18th, 2026** that convened 28 social scientists and others working on indicators across the US, within the Great Lakes region and within other systems, as well as other leaders tackling social and environmental issues in Michigan to better understand challenges and barriers to implementing social, ecological, and human dimensions indicators to inform summit planning and workshop output development. Knowledge of indicators varied across participants in the May 18 workshop, but notable challenges and barriers were identified, including but not limited to lack of capacity (e.g., funding and institutional knowledge); uncertainty in how to implement; lacking "the language of human dimensions indicators"; inaccessible language to non-experts; and not having indicators that are relevant and/or reflective of localized community needs. Participants of this workshop noted ways to address these barriers and recommendations for project outputs (e.g., need for adaptability based on each project and/or municipal context; durability to withstand changes in the current political climate; storytelling and communication as a means to address power dynamics and uplift disenfranchised communities; and ensuring reciprocal relationships with those involved in indicator development).

(2) **An in-person workshop at IAGLR 2026 on May 27th** convened 25 academics, social scientists, and others working on indicators within the IAGLR network**.** The goals and objectives were the same as those of the May 18 workshop. Noted challenges and barriers to indicator use and adoption included the tension between a reported need for scalability, including standardization of indicators, and maintaining the usefulness of indicators for local community relevance. Participants recommended that a successful framework needs to reflect cultural values and community priorities, as well as place-specific experiences, while also being broadly applicable. Individual indicators were also noted as merely a snapshot of a larger and more complex system. Attendees at IAGLR stressed the importance of meaningful community engagement, which requires time, resources, and trust. Community engagement was also noted as a way to provide insight into local cultural values, place attachment, resource use patterns, and local perceptions of risk and benefit.

Participants at IAGLR also noted that indicators should be actionable so they can inform management decisions while also being scientifically valid. One participant noted that the use or utilization of indicators should not be the goal, but the long-term impacts of better and more effective management. Priority recommendations included organizing indicators by topic area, management objective, human dimensions categories, or use cases. Indicators should include definitions, purposes, data requirements, collection

methods, resource needs, and strengths and limitations. Participants highlighted that community and practitioner feedback should be incorporated iteratively to validate indicators and identify gaps, and that decision support tools should be flexible and help managers and users identify the most appropriate indicators for their specific context, circumstances, and capacity.

August 3-4 Summit Summary

The 1.5-day Summit was organized into six core working sessions. A full agenda of the summit can be found in Appendix A, and the process pathway for the workshop can be found in Figure 2.

1. Understanding human dimensions relevant to current Great Lakes Management Objectives & identifying indicators to track those human dimensions (Day 1 - Breakout Session 1)
2. Identifying synergies across Management Objectives to highlight high-priority indicators that cross multiple Management Objectives (Day 1 - World Cafe)
3. Prioritizing potential indicator categories and candidate indicators (Day 1 - Indicator Prioritization Voting)
4. Developing example draft frameworks for indicators that emerged as top priorities (Day 1- Breakout Session 2)
5. Brainstorming opportunities to integrate and implement human dimension indicators (Day 2- Breakout Session 3)
6. Discussing strategies to advance human dimension indicators beyond this Summit (Day 2- Breakout Session 4)



Figure 2. Workshop Process

Understanding human dimensions relevant to current Great Lakes Management Objectives & identifying indicators to track those human dimensions

Day 1 began with a grounding in the project history and summit goals. In addition to building a shared understanding of priority human dimension topics relevant to priority Great Lakes Management objectives, a key goal of the workshop was to identify and prioritize indicators that are most relevant, useful, and aligned with management needs. The steering committee identified four management objectives (M.Os), largely derived from the GLRI, to narrow our scope and give us scaffolding for indicator development. These M.Os included:

1. Fisheries that provide safe food sources
2. Recreation that is safe and accessible
3. Reduced nutrient and related runoff that prevents harmful/nuisance algal blooms
4. Habitat and species protection that increases resiliency and supports safe consumption

For each of these M.Os, we developed tables that included the GLRI focus areas where the M.Os are implied, specific GLRI objectives that speak to the M.Os, the GLRI "commitments" (or intended outcomes), and what measures exist to track progress towards the objective or outcome. The table for each M.O. can be found in Appendix B.

Our decision to prioritize these M.Os was also informed by a review of existing efforts around the Great Lakes that have or are working to identify, propose, or implement human dimension indicators or metrics. In total, 21 efforts were reviewed. These were identified through a comprehensive literature review, existing team knowledge, or direct suggestions from summer workshop participants. Most proposed indicator frameworks are basin-wide, with a few implemented in specific locales or regions. From these efforts, we pulled out key categories of human dimension indicators. For each category, we developed sub-categories where appropriate and sorted indicators into these categories and sub-categories. We provided some general examples of indicators as well as listed all of the specific indicators that have been proposed, developed, or implemented in these efforts. These are shown in *Table 1: Great Lakes Human Dimension Efforts Indicators* in the Appendix.

The first breakout of Monday's session grouped attendees by the pre-selected M.Os and asked participants to generate human dimension indicators that complement their assigned objective. After considering which human dimensions were most relevant to achieving the objective and which indicators could be used to track those dimensions, participants generated indicators on sticky notes and sorted them into relevant categories or groups.

Identifying Priority Indicators

Attendees participated in a 'World Cafe'-style rotation among the three additional M.Os and brainstormed additional human dimension indicators. Participants then returned to their morning M.Os, debriefed on what they saw at other tables, and refined their own list of indicators. Each group then reported on themes identified across indicators, indicators that appeared across objectives, and the largest gaps or questions remaining in relation to their M.Os. The full list of generated indicators per M.O. is available in Appendix C.

Prioritizing potential indicator categories and candidate indicators

From other SESs and the vast body of literature on indicators, we know there are many criteria for "good" indicators. To build a shared understanding, we provided participants with a list of criteria generated from the survey sent out through U-M Water Center channels and the project team's institutional networks (Figure 1).

Using these as criteria, participants were given ten stickers to place next to indicators they found particularly important or that they believed should be prioritized. Participants were able to each place 10 votes across M.Os and indicators however they saw fit. The planning team then identified the indicators that had the highest votes in their M.Os, and combined/synthesized some indicators that appeared overlapping. Voting results are in Appendix D. Top indicator categories were:

- Trust in the message and trust in the messenger (relevant to M.O. 1)
    - Testimonials of local communities
- Awareness of Great Lakes health and safety indicators (relevant to M.O. 1)
    - HAB-related beach closures
- Social connectivity & social capital
- Public accessibility (relevant to M.O. 2- shoreline accessibility; relevant to M.O. 4 - recreational opportunity accessibility)
- Engagement in collective action behaviors (relevant to M.O. 3)
- Culturally valued species (relevant to M.O. 4)

Developing Indicator Frameworks

The second breakout of Day 1 asked each M.O. group to review their top-priority indicators and begin to work together to develop a draft Indicator Framework for some of the top-rated indicators to have attendees think more deeply about what social indicators would best support assessment needs across the Great Lakes within our four M.Os. Attendees were also asked to complete these to outline key components, definitions, considerations, and logistics for each respective indicator's application and effective use. Draft indicator frameworks were developed for the following indicators and can be seen in Appendix E.

- Trust in the message (M.O. 1)
- Trust in the messenger (M.O. 1)
- Social connectivity & social capital (M.O. 2)
- Impacts of HAB-related beach closures (M.O. 3)
- Promote collective action (e.g., county and/or watershed-level change in Agricultural practices) (M.O. 3)
- Testimonials of local communities (M.O. 4)
- Recreational opportunities (M.O. 4)

Opportunities for Integrating and Implementing Human Dimensions Indicators

Day 2 started with breakout session 3, where participants were organized around institutions that may advance indicator implementation. These institutions included:

- Federal Government (e.g., GLRI, Bureau of Indian Affairs, etc.)

- Academia (e.g., SeaGrants)
- International Treaty Organizations (e.g., IJC, Great Lakes Fishery Commission, Great Lakes Commission, Indigenous treaties)
- NGOs (e.g., TNC, land trusts, watershed and river groups, etc.)

Each group was asked to choose an entity to target first and develop actionable recommendations for how that organization could implement human dimension indicators. A summary of each conversation is included.

Group 1: Federal Government

Group one identified three main federal groups/programs to target to include human dimension indicators (e.g., Congress, GLRI, and the US Fish and Wildlife Service (FWS) Coastal Program). For Congress, the group recommended language for GLRI funding that would require human dimension indicators for project funding. They highlighted that if multiple groups supported this and there was proof of other successful indicator measurements related to a project's success, it could be feasible. For GLRI, the group highlighted that they might need to reframe it as return-on-investment and practical outcomes due to potential political pushback. They also highlighted that you could connect human dimension indicators to current GLRI objectives and highlight them as a way to strengthen currency goals. For FWS Coastal programs, it was noted that there was a lot of human dimension-focused work ongoing, including educating the public, and that it would be easy to link current work with human dimension indicators.

The group saw a more tangible indicator implementation plan with the FWS Coastal programs, with numerous existing data and metrics that could be classified as human dimension indicators (e.g., education, outreach, and self-assessment of biologists). The group also identified 5 ecosystem services related to human dimensions that could be layered onto decision support tools (e.g., sense of place, tourism, commercial fisheries, and recreation). This group identified tangible ways of integrating human dimension indicators into current work, which would allow for a more gradual introduction to indicators and measuring them within the FWS.

Group 2: Academia

Group 2 identified Sea Grant and the International Joint Commission (IJC) as promising partners for integrating human dimensions indicators into Great Lakes monitoring and reporting. Given Sea Grant's presence in every Great Lakes state and the IJC's existing regional survey efforts, participants saw opportunities to incorporate human dimensions metrics into established data collection and reporting processes, facilitating regional implementation and tracking.

One proposed approach was for CIGLR, Great Lakes Sea Grant Network, academic water centers, Canadian partners, and the IJC to collaboratively develop and disseminate

a human dimensions indicator framework and shared set of indicators that organizations could adopt and track across the Great Lakes region. GLRI funding could potentially support this effort, building on related opportunities identified by Group 1.

Participants noted that stronger coordination between CIGLR and Sea Grant would be needed, but existing connections within the workgroup to the IJC could provide an entry point for engaging with its ongoing social dimensions project. Ultimately, the group emphasized the importance of a dedicated human dimensions indicator coordination function to bridge these organizations, align efforts, support implementation, and build broader stakeholder buy-in.

Group 3: International Treaty Organizations

Group 3 focused on the relationships, structures, and processes needed to ensure human dimensions indicators are meaningful, culturally appropriate, and useful for decision-making. Participants emphasized that developing effective indicators requires more than collecting additional data; it requires intentional relationship-building, inclusive processes, and clear pathways to connect knowledge production to action.

Participants noted that Tribal Nations must be involved from the outset – including shaping the questions, indicators, methodologies, and intended applications of the work. This group recognized Indigenous communities' leadership and expertise in indicator development and also highlighted the importance of intentional language and presentation of materials that reflect the history, sovereignty, and treaty rights of tribal communities in the Great Lakes region. Building meaningful relationships requires time, resources, organizational buy-in, and patient persistence, and participants stressed the importance of building relationships and creating opportunities for partners to shape the work before developing proposals.

Participants emphasized that the intended audience and use of indicators should be established before indicators are developed. They expressed skepticism that additional data or indicators alone would drive change, noting that storytelling, relationships, and narrative are essential for communicating findings and influencing decision-makers. This requires creating clear pathways between knowledge production and decision-making and integrating human dimensions with ecological, social, cultural, and political considerations rather than treating them as standalone additions.

Rather than creating a new, standalone product, participants recommended embedding human dimensions indicator efforts within existing institutions, convenings, priorities, and decision-making processes. The IJC, Great Lakes Commission, nongovernmental organizations, and academic institutions in both Canada and the United States were identified as potential partners. Building on these established networks and processes

could strengthen collaboration, support implementation, and increase the likelihood that indicators inform regional priorities and decisions.

Group 4: NGOs

Drawing on the group's expertise, participants looked at The Nature Conservancy and Milwaukee River Keepers as possible examples for exploring how non-governmental organizations (NGOs) might incorporate human dimension indicators into existing programs and efforts. Participants acknowledged that many environmental NGOs are struggling to deliver on their current work, and focused the discussion on metrics that NGOs could measure at a broader scale.

Participants noted the role of NGOs as the bridge between scientific research and local communities. This group noted that NGOs are well positioned to collect indicators on community perspectives, experiences, and feelings, including perceptions of ongoing projects, possible use and frequency of restored areas, health and wellbeing impacts, and desires. Participants also noted that because NGOs are embedded within their communities, there is the possibility that longer-term data collection is feasible.

Strategies to Advance Human Dimensions Indicators

The workshop concluded with a brief session to brainstorm next steps as a collective. We created "buckets" of pathways, including short-term, medium-term, and long-term actions to collectively advance next steps (Appendix F).

Key Takeaways

While the indicators generated and prioritized are specific to each M.O., it appears that the indicators reflect the **need for both quantitative indicators as well as qualitative indicators**. For example, almost all of the M.O.s cite the need for some type of quantitative indicator. For the Fisheries M.O., the participants identified the number of fisherpeople who are aware of and understand fish consumption guidelines as an indicator. Similarly, for the Recreation M.O., the participants recognized the % of shore that is publicly accessible. Finally, the habitat M.O. noted indicators to measure species and recreational opportunities. These indicators are directly related to the biophysical environment and, as a result, may be most easily incorporated into existing management plans.

Notably, almost every group identified indicators that **focus specifically on human dimensions that are important but may not have been traditionally measured**. For example, the Fisheries M.O. identified trust in the message and messenger as important; if the entity putting forth advisory language isn't trusted by the community, it's less likely to be followed. The Recreation M.O. identified social capital and participation in decision-making as indicators. The Reduce Nutrients and Runoff M.O. identified collective action and community-level change in agriculture as an indicator. Finally, the Habitat M.O. identified local community testimonials,

Indigenous knowledge, and inclusion as indicators. These indicators could fall into a broad theme of relationships. Trust and relationships between agencies and communities, as well as within communities, are important for action and should be monitored for change and progress.

Interestingly, the groups **identified a wide range of "who" would need, use, or measure the indicators**. The list of potential data users or collectors included park boards, public health agencies, governmental agencies at different scales, regional organizations, environmental NGOs, funders, local businesses, local or neighborhood organizations, community advisory councils, advocacy groups, agriculture organizations, and others. This broad array of actors with an interest in these indicators creates opportunities for collaboration and co-creation of relevant measures, data collection protocols, and data implementation plans.

One of the **challenges, or gaps, identified through this analysis is that of scale**. Many biological, physical, and chemical data sets may be available at local, as well as regional scales. The data for human dimensions indicators such as trust or social capital are most often available or can be collected at smaller scales. Sometimes data on trust or social capital might be collected at even the project scale. This condition reflects a mismatch in biophysical data sets and social indicator data sets. This is a gap that will need to be addressed as this project continues.

A last finding that the project team would like to note is that **Indigenous communities often already do integrate different kinds of knowledge into their management and stewardship**. We are grateful for the opportunity to learn from this wisdom. A challenge for non-Indigenous communities is to learn from our Indigenous neighbors with respect and without appropriating traditional knowledge unethically.

Outcomes & Impacts

This workshop and broader effort has generated several near-term outcomes, with longer-term impacts anticipated to support the development and effective use of human dimensions indicators in the Great Lakes region and beyond.

- **Synthesized knowledge and practice** – This project compiled a literature review drawing from nearly 300 peer-reviewed articles and grey literature sources (e.g., government reports, NGO reports/dashboards) that summarized existing efforts from systems around the world and in the Great Lakes region that are developing and implementing human dimensions indicators. These articles helped the project team better understand existing efforts to advance human dimension indicators, and lessons learned that we could apply to this project, including the importance of institutionalized support and robust integration of human dimensions indicators into ecosystem-based management systems. (See Appendix: TABLE 1)
- **Strengthened connections** – This workshop brought together 23 social scientists and indicators experts in Ann Arbor, Michigan, creating opportunities to establish new connections among those in attendance and build upon existing relationships. Interest in continued collaborations is currently being explored among attendees and members of the project team. While collaborations have not been formalized yet, further exploration of

summit findings for case study and white paper/publication development and dissemination of summit findings at relevant workshops/symposia are being explored.

- **Expanded interest in indicator development** – The workshop generated interest among attendees in the continued development and advancement of human dimensions indicators at a time when many are facing challenges (e.g., reduced funding, lack of capacity, uncertainty of implementation, and the unique challenges of developing and implementing indicators, including usability, scale, and accessibility to a nontechnical audience, etc.). Summit discussions and findings highlight the challenges to implementation and effective adoption of human dimensions indicators, ensuring future products are usable and accessible for management and decision-making needs.
- **Increased professional development opportunities** – This project provided ample professional development opportunities for two graduate-level students and one project manager who was new to human dimensions indicators work. This provided these team members with the opportunity to engage with and review the existing literature, participate in project and workshop development and planning, and participate in cross-sector discussions on the topic.
- **Identified priority indicator candidates** – Generated 5 priority indicator candidates for four M.O.s in the Great Lakes Restoration Initiative, through workshop breakout sessions. These are anticipated to be refined in the future.
- **Initiated identification of processes and pathways to implementation** – This project, through the workshops and summit, held many discussions with cross-sector participants to identify needed processes, resources, and products for effective priority indicator development and implementation. This included understanding institutional and other barriers that limit their adoption, effective use, and long-term implementation in the Great Lakes Region. This lays the groundwork for future product development.

Next Steps & Future Plans

Participants identified several priorities for advancing Great Lakes human dimensions indicators beyond this initial CIGLR project funding. These include near-term (low resource requirements), medium-term (requiring some additional resources/capacity), and long-term (requiring significant investment, capacity, and widespread buy-in) goals, each of which is summarized below.

Near-term work should refine the highest-priority indicator categories and candidate indicators by clarifying their intended audiences, terminology used, measurement approaches, and the scales (spatial or social) at which they are appropriate to implement. Participants proposed gathering feedback through existing institutions and convenings, engaging agencies, Tribes, non-governmental organizations, and community groups to build acceptance and awareness of these efforts. Specifically, participants identified the importance of strengthening Tribal partnerships to shape this work. Participants agreed that these priority indicators should be released and published as a white paper or publication to build awareness and have an easily

shareable (and citable) product from this work. Additional near-term priorities included identifying communities for outreach around what human dimension indicators are and their importance, assessing available baseline data, and securing support to reconvene and coordinate a social science network/community of practice to continue this work.

Over the medium term, participants proposed piloting indicators with willing partners and developing accessible case studies and practical tools for local resource managers. These efforts would demonstrate how indicators can inform management decisions, including in settings with limited resources. Participants also suggested exploring opportunities to integrate data collection and reporting into existing Great Lakes monitoring, assessment, and restoration programs (e.g., IJC Biennial State of the Great Lakes Reports; GLRI plans and grant reporting). Continued collaboration across social science disciplines, Indigenous studies, the humanities, and community-based partners will be critical to ensure broader perspectives inform indicator development.

The long-term vision is to establish sustained use of human dimensions indicators across the Great Lakes. Proposed steps included identifying and addressing implementation barriers, building support for indicators in future U.S. EPA Great Lakes Restoration Initiative Action Plans and grantee requirements, and securing lasting funding and coordination capacity for a network of partners who will coordinate, implement, analyze, and synthesize the human dimension indicators; this likely requires funding for dedicated personnel to lead this network and coordinate data collection and synthesis efforts (e.g., an idea for a director and a post-doctoral researcher role to be jointly funded by IJC-CIGLR-Sea Grant programs). Participants suggested exploring opportunities to establish a Great Lakes Social Science Center (e.g., NSF funding for a “Center of Research Excellence”) and other collaborative funding approaches for cross-institutional staffing. Eventually, basin-wide human dimension indicator data collection efforts may consider building a basin-wide survey to support ongoing, consistent measurement of certain indicators, which would supplement locally-tailored and collected indicators. Finally, resources that aid local project and resource managers to incorporate human dimensions in the pre-planning, implementation, and ongoing monitoring and management will be essential to ensuring long-term, comprehensive integration of human dimension indicators into Great Lakes management.

CIGLR Great Lakes Social-Ecological Indicators Summit
Appendix A: Participant Agenda

Dates/Times: August 3-4; 9:00 AM-5:00 PM and 9:00 AM-12:00PM EST
Location: The Dana Building (Room 2315), University of Michigan School for Environment and Sustainability (SEAS); 440 Church Street, Ann Arbor, MI 48109

Draft Summit Goals + Objectives

- Build a shared systems understanding of priority human dimensions topics relevant to priority Great Lakes Management Objectives.
- Identify and prioritize human dimensions indicators that are most relevant, useful, and aligned with management needs, priorities, and existing frameworks.
- Assess implementation needs and feasibility through defining data requirements, methods, expertise, and capacity needed to operationalize indicators and address critical gaps.
- Develop a pathway for institutional adoption and use by creating recommendations, governance structures, and action plans that support the integration of indicators into Great Lakes management and decision-making.

August 2nd

Out-of-town participants arrive in Ann Arbor, check in at the Graduate by Hilton Ann Arbor (if applicable), and join us for an informal welcome dinner if you're in town.

- 6:00 – Optional Pre-Dinner @ Jolly Pumpkin [311 S Main St, Ann Arbor, MI]

August 3rd

- 8:30 AM – Gather, Breakfast, and Networking
- 9:00 AM – Summit Kick-Off
- 10:15 AM – Breakout Session 1: *Identifying Human Dimensions Indicators for Great Lakes Management Objectives*
- 12:15 PM – Lunch provided; Optional time to explore campus
- 1:00-2:00 PM – “World Cafe”: *Cross-Pollination and Synergies Across Management Objectives and Topical Focus Areas*
- 2:30 PM – Report Outs and Indicator Prioritization
- 3:00 PM – Breakout Session 2: *Developing Indicator Frameworks for Priority Indicators*
- 4:30 PM – Wrap up Day 1: Takeaways, Logistics; Preview Day 2
- 6:00 PM – Dinner at Vinology [110 S Main St, Ann Arbor, MI 48104]

August 4th

- 8:30 AM – Breakfast and Networking
- 9:00 AM – Day 2 Welcome + Agenda
- 9:15 AM – Breakout Session 3: *Opportunities for Integrating and Implementing Human Dimensions Indicators*
- 10:45 AM – Full Group Discussion on *Strategies to Advance Human Dimensions Indicators*
- 11:30 AM – Next Steps, Summit Wrap-up and Adjourn

Appendix B: Management Objective Tables

Management Objective: Fisheries that provide safe food sources

GLRI Focus Area	GLRI Objective	GLRI Commitment	Bio-Physical Measures	Social Measures
Toxic Substances and AOCs	1.2. Engage communities to share information on the risks and benefits of consuming Great Lakes fish, wildlife and harvested plant resources with the people who consume them.	1.2.a. Provide information, including Indigenous Knowledge based information, regarding the consumption of Great Lakes fish, wildlife and harvested plant resources to Great Lakes communities.	GLRI 1.2.1. Risks and benefits of consuming Great Lakes fish, wildlife and harvested plant resources are shared to inform consumption choices. SOGL: contaminants (PCBs and mercury) in the fillets of five fish species (Chinook Salmon, Coho Salmon, Lake Trout, Walleye and Lake Whitefish) commonly eaten in the Great Lakes	
Habitat and Species	4.1. Protect, enhance and increase resilience of habitats necessary for sustaining native aquatic and terrestrial species	4.1.a. Protect, enhance and provide connectivity for habitats to support important native species, maintain Tribal cultural uses and/or provide benefits to	GLRI 4.1.1. Acres of coastal wetland, nearshore and other habitats protected or enhanced.	

	important to the Great Lakes ecosystem.	people. 4.1.b. Implement projects that increase resilience in watersheds and along coastlines, considering flood reduction and recreational benefits to communities.	GLRI 4.1.2. Miles of connectivity established for aquatic species. SOGL: fish population counts (wild and stocked) for Lake Trout, Sturgeon, and Walleye	
Toxic Substances and AOCs	1.1. Remediate, restore and delist Areas of Concern.	1.1.a. Implement management actions necessary to remove Beneficial Use Impairments and delist Areas of Concern. 1.1.b. With input from community partners on the benefits they would like to see included in GLRI projects, investigate opportunities for enhancing planned projects. 1.1.c. In Areas of Concern that have management actions yet to be completed, ensure that agencies and local Public Advisory Committees have	GLRI 1.1.1. Areas of Concern where all management actions necessary for delisting have been implemented. GLRI 1.1.2. Beneficial Use Impairments removed in Areas of Concern. GLRI 1.1.3. Areas of Concern delisted.	GLRI 1.1.4. Meaningfully involve communities within Areas of Concern in all phases of Management Actions.

		meaningful involvement with communities to ensure fair treatment.		

Appendix B: Management Objective Tables

Management Objective: Recreation that is safe and accessible

GLRI Focus Area	GLRI Objective	GLRI Commitment	Bio-Physical Measures
Toxic Substances and AOCs	1.1. Remediate, restore and delist Areas of Concern.	1.1.a. Implement management actions necessary to remove Beneficial Use Impairments and delist Areas of Concern. 1.1.b. With input from community partners on the benefits they would like to see included in GLRI projects, investigate opportunities for enhancing planned projects. 1.1.c. In Areas of Concern that have management actions yet to be completed, ensure that agencies and local Public Advisory Committees have meaningful involvement with communities to ensure fair treatment.	GLRI 1.1.1. Areas of Concern where all management actions necessary for delisting have been implemented. GLRI 1.1.2. Beneficial Use Impairments removed in Areas of Concern. GLRI 1.1.3. Areas of Concern delisted. SOGL: Beach Advisories (beaches were open and safe for swimming based on E.Coli levels)

Appendix B: Management Objective Tables

Habitat and Species	4.1. Protect, enhance and increase resilience of habitats necessary for sustaining native aquatic and terrestrial species important to the Great Lakes ecosystem.	4.1.a. Protect, enhance and provide connectivity for habitats to support important native species, maintain Tribal cultural uses and/or provide benefits to people. 4.1.b. Implement projects that increase resilience in watersheds and along coastlines, considering flood reduction and recreational benefits to communities.	GLRI 4.1.1. Acres of coastal wetland, nearshore and other habitats protected or enhanced. GLRI 4.1.2. Miles of connectivity established for aquatic species.

Appendix B: Management Objective Tables

Management Objective: Reduce nutrient and related runoff to prevent harmful/nuisance algal blooms

GLRI Focus Area	GLRI Objective	GLRI Commitment	Bio-Physical Measures	Social Measures
Nonpoint Source Pollution	3.1. Reduce nutrient loads from agricultural water- sheds to prevent harmful and nuisance algal blooms.	3.1.a. Implement systems of conservation practices on farms and in watersheds to reduce and prevent nutrient runoff. 3.1.b. Increase adoption of enhanced nutrient management practices through peer-to-peer learning and one-on-one assistance. 3.1.c. Support development, expansion and capacity of demonstration farms to reach new producers.	GLRI 3.1.1. Estimated pounds of phosphorus reductions from conservation practice implementation. GLRI 3.1.2. Acres receiving technical or financial assistance on nutrient management in priority water- sheds. GLRI 3.1.3. Number of active demonstration farms created or sustained with GLRI funding. SOGL: Nutrients in Lakes (offshore phosphorus levels) SOGL: Algal Bloom Extent SOGL: *Cladophora*	
Nonpoint Source Pollution	3.2. Reduce or prevent stormwater runoff to improve and sustain water quality.	3.2.a. Increase implementation of green infrastructure practices in communities impacted by polluted runoff. 3.2.b. Implement projects in urban and rural communities designed to reduce or prevent runoff, flooding	GLRI 3.2.1. Estimated gallons (in millions) of stormwater runoff reduced. GLRI 3.2.2. Miles of Great Lakes streams and shoreline restored or protected.	

		and erosion.	GLRI 3.2.3. Acres of riparian buffers, wetlands and floodplains restored or reconnected.	
Nonpoint Source Pollution	3.3. Improve effectiveness of nonpoint source control efforts to prevent harmful and nuisance algal blooms.	3.3.a. Monitor and assess nutrient conditions in western Lake Erie, Green Bay, Saginaw Bay and priority tributaries to the Great Lakes. 3.3.b. Demonstrate new, improved or collaborative approaches to achieve water quality goals.	GLRI 3.3.1. Nutrient monitoring and assessment activities conducted. GLRI 3.3.2. Nutrient and stormwater runoff reduction demonstration projects implemented.	

Appendix B: Management Objective Tables

Toxic Substances and AOCs	1.1. Remediate, restore and delist Areas of Concern.	1.1.a. Implement management actions necessary to remove Beneficial Use Impairments and delist Areas of Concern. 1.1.b. With input from community partners on the benefits they would like to see included in GLRI projects, investigate opportunities for enhancing planned projects. 1.1.c. In Areas of Concern that have management actions yet to be completed, ensure that agencies and local Public Advisory Committees have meaningful involvement with communities to ensure fair treatment.	GLRI 1.1.1. Areas of Concern where all management actions necessary for delisting have been implemented. GLRI 1.1.2. Beneficial Use Impairments removed in Areas of Concern. GLRI 1.1.3. Areas of Concern delisted.	GLRI 1.1.4. Meaningfully involve communities within Areas of Concern in all phases of Management Actions.

Management Objective: Habitat and species protection to increase resiliency and support safe consumption

Appendix B: Management Objective Tables

GLRI Focus Area	GLRI Objective	GLRI Commitment	Bio-Physical Measures	Social Measures
Toxic Substances and AOCs	1.2. Engage communities to share information on the risks and benefits of consuming Great Lakes fish, wildlife and harvested plant resources with the people who consume them.	1.2.a. Provide information, including Indigenous Knowledge based information, regarding the consumption of Great Lakes fish, wildlife and harvested plant resources to Great Lakes communities.	GLRI 1.2.1. Risks and benefits of consuming Great Lakes fish, wildlife and harvested plant resources are shared to inform consumption choices.	Applies to both Toxic Substances and AOCs focus areas/objectives: Stewardship; Public health; Workforce; Engagement in project and decisions; Post resource use; Awareness; Connection and celebration
Invasive Species	2.2. Reduce economic, ecological and human health impacts by limiting range expansion, including lake-to-lake transfers, of non-native species.	2.2.a. Conduct standardized, basin-wide early detection and surveillance activities. 2.2.b. States, Tribes, local governments and non-governmental organizations conduct targeted early detection, surveillance and rapid response actions.	GLRI 2.2.1 Percentage of aquatic, high-priority locations for potential new non-native species occurrence under surveillance.	GLRI 2.2.2. Number of rapid responses, exercises and post response follow-up activities conducted annually
				Applies to both Invasive Species focus areas/objectives: Funding for technical assistance; Engaging in implementation; Regulation for enforcement; Make the case for sustainability; Economic benefit

Appendix B: Management Objective Tables

		2.2.c. Regional and local organizations sustain containment after initial response projects and complement federal, state and Tribal surveillance.		
Invasive Species	2.3. Provide ecosystem and human benefits through prioritized and collaborative invasive species control efforts.	2.3.a. Implement invasive species control efforts that sustain ongoing and past GLRI restoration efforts, providing benefits to native species, habitat and Great Lakes communities. 2.3.b. Pilot and test new control tools including, where applicable, tools derived from Indigenous Knowledge, for high-impact invasive species.	GLRI 2.3.1. Acres controlled for invasive species to benefit habitats, native species and communities.	

Appendix B: Management Objective Tables

Habitat and Species	4.1. Protect, enhance and increase resilience of habitats necessary for sustaining native aquatic and terrestrial species important to the Great Lakes ecosystem.	4.1.a. Protect, enhance and provide connectivity for habitats to support important native species, maintain Tribal cultural uses and/or provide benefits to people. 4.1.b. Implement projects that increase resilience in watersheds and along coastlines, considering flood reduction and recreational benefits to communities.	GLRI 4.1.1. Acres of coastal wetland, nearshore and other habitats protected or enhanced. GLRI 4.1.2. Miles of connectivity established for aquatic species. SOGL: Coastal Wetlands and Aquatic Habitat Connectivity (sub-indicators: wetland invertebrates, fish, amphibians, birds, plants; wetland extent; habitat connectivity) SOGL: aquatic food web	Cultural and Spiritual Practices; Tourism and Recreation; Public Input; Public Health; Governance (Planning and Policy); Economy

Appendix B: Management Objective Tables

Toxic Substances and AOCs	1.1. Remediate, restore and delist Areas of Concern.	1.1.a. Implement management actions necessary to remove Beneficial Use Impairments and delist Areas of Concern. 1.1.b. With input from community partners on the benefits they would like to see included in GLRI projects, investigate opportunities for enhancing planned projects. 1.1.c. In Areas of Concern that have management actions yet to be completed, ensure that agencies and local Public Advisory Committees have meaningful involvement with communities to ensure fair treatment.	GLRI 1.1.1. Areas of Concern where all management actions necessary for delisting have been implemented. GLRI 1.1.2. Beneficial Use Impairments removed in Areas of Concern. GLRI 1.1.3. Areas of Concern delisted.	GLRI 1.1.4. Meaningfully involve communities within Areas of Concern in all phases of Management Actions.

TABLE 1: Great Lakes Human Dimension Efforts Indicators

*This table provides examples of human dimension indicator categories(i.e. topics/ domains), sub-categories, examples of indicators from general literature, and any Great Lakes-specific examples of indicators that are being measured or proposed. This is **NOT** a comprehensive or exhaustive list, merely examples. Use for inspiration.*

Category	Sub-category	General Example Indicators	Great Lakes Specific Examples
Well-being	Physical Health	• Physical abilities • Sleep • Nutrition • Medical conditions • Access to medical care/ resources	• Number of people engaging in different activities [11] • Social vulnerability/human health [8] • Public recreation opportunity [8] • Public recreation access [8] • Illness risk at Great Lakes beaches [4] • Number of beach closures [7] • % binge drinking ages 18+ [12] • % adults with hypertension [12] • Life expectancy at birth in years [12] • Census tract walkability score [12] • Total days per year that healthcare facilities close due to flooding or flood [6] • Monthly and yearly occurrences of waterborne gastrointestinal illness within a defined geographic region [6] • Percentage of healthcare facilities that have completed their own vulnerability and adaptation assessments or are covered by existing assessments [6] • Number of deaths attributable to drowning per year per 100,000 people [6] • Mortality from exposure to extreme heat in persons over 65 [6]
	Spiritual and cultural health	• Sense of purpose or meaning • Values • Religion • Tradition	• % of anglers satisfied with harvest (rate and amount) [10] • % of anglers satisfied with available fish (species, size) [10] • % of anglers satisfied with overall experience [10] • Number of anglers [10] • Number of license sales [10] • Fishing hours and days per year [10] • Number of people on charter boats [10] • % of anglers that know about Great Lakes ecosystem ability to sustain desired fish species and number of desired fish [10]

			• % of anglers and public that know about health of the fish resource [10] • % of anglers that know about fishing regulation [10] • Number of local fishery museums [10] • Number of social events around fisheries [10] • Existence of newspaper section dedicated to recreational fishing [10] • Peer pressure to comply with fishing regulations [10] • Cultural Practices [1] • Change in sentiment based on analysis of social media posts, following extreme weather events [8] • Social Vulnerability/Human Health [8] • Sense of place [8] • % population in the census tract with view of water within 50m of home [12]
	Emotional health	• Ability to cope with stress • Positive sense of self • Life satisfaction • Happiness	• Change in sentiment based on analysis of social media posts, following extreme weather events [8] • Social Vulnerability/Human Health [8] • Total days per year that healthcare facilities close due to flooding or flood [6] • Sense of place [8] • Change in sentiment based on social media analysis following extreme weather events [6] • Visual assessment/aesthetics [9] • % of population in census tract >500m from park entrance [12] • % green space in census tract [12] • % area of green amenities in census tract [12] • Per capita tree cover [12] • Water access amenity density in the census tract [12] • % population in the census tract with view of water within 50m of home [12]
	Intellectual health	• Educational attainment • Intellectually stimulating activities • Pursuit of knowledge and skills	• GLC establishes regular convenings for the Great Lakes community to share expertise and coordinate on activities related to climate resilience [3] • Community climate-water knowledge/beliefs [1] • Awareness of consequences of pollutants to water quality [5] • Awareness of environmental issues/concerns [11] • % educational attainment [12] • Willingness to take action to improve water quality [5]

	Safety and security	• Physical safety • Crime	• Number of deaths attributable to drowning per year per 100,000 people [6] • Mortality from exposure to extreme heat in persons over 65 [6]
	Financial health	• Living standards • Financial security • Job security	• Evaluate and publicize economic impact of resilient investments [3] • Voluntary investments in practices to reduce the emissions footprint of the maritime transportation industry [2] • Percentage of children that grew up in a tract with a high income [12] • Median home value [12] • Median household income [12] • % educational attainment [12] • Total annual damage from weather events within the Great Lakes basin [6] • Local investment in fishery dependent businesses [10] • Economic income for local businesses [10] • Number of marketing initiatives to promote fishing [10] • % of state's economy that comes from the fishery [10] • Revenue from fishing license sales [10] • Number of license sales [10] • Fishing hours and days per year [10] • Number of people on charter boats [10] • Number of fishery dependent business closures [10] • Unemployment rate in fisher dependent businesses [10] • % Unemployment [12]
	Social cohesion	• sense of belonging • supportive networks, • meaningful connections with others	• Social cohesion [8] • Community social supports and networks [1] • Community climate-water activism/engagement [1] • Awareness of consequences of pollutants to water quality [5] • Awareness of appropriate practices to improve water quality [5] • Number of local fishery museums [10] • Number of social events around fisheries [10] • Existence of newspaper section dedicated to recreational fishing [10] • % divorces in people older than 15y [12] • Old age dependency ratio [12] • Establish regular convenings for the Great Lakes community to share expertise and coordinate on activities related to climate resilience [3] • Establish and/or expands peer-to-peer networks [3] • Community climate-water knowledge/beliefs [1] • Extent of Indigenous knowledges and perspectives considered in

			non-Indigenous community climate resilience/capacity building [1] ● Political and jurisdictional cohesion [1]
	Leisure	● Time for leisure ● Connection to nature	● % population in the census tract with view of water within 50m of home [12] ● Community climate-water knowledge/beliefs [1] ● Beach Closures [7] ● Public recreation opportunity [8] ● Public recreation access [8] ● Visitor use [9] ● Visitor type [9]
Sense of Place	Place attachment		● Sense of place [8] ● % population in the census tract with view of water within 50m of home [12] ● Change in sentiment based on social media analysis following extreme weather events [6] ● Visual assessment/aesthetics [9] ● Change in experience of a place [9] ● Number of local fishery museums [10] ● Number of social events around fisheries [10] ● Existence of newspaper section dedicated to recreational fishing [10] ● Willingness to take action to improve water quality [5] ● % of target audience implementing practices in critical areas [5]
	Place dependence		● Sense of place [8] ● Change in experience of a place [9] ● % population in the census tract with view of water within 50m of home [12]
	Place meaning/ identity		● Sense of place [8] ● Change in sentiment based on social media analysis following extreme weather events [6] ● Awareness of consequences of pollutants to water quality [5] ● Awareness of environmental issues/concerns [11] ● Visual assessment/aesthetics [9] ● Change in experience of a place [9] ● Number of local fishery museums [10] ● Number of social events around fisheries [10] ● Existence of newspaper section dedicated to recreational fishing [10] ● % population in the census tract with view of water within 50m of home [12]

	Cultural and historical connections		• Sense of place [8] • Extent of Indigenous knowledges and perspectives considered in non-Indigenous community climate resilience/capacity building [1] • Cultural Practices [8] • Change in experience of a place [9] • Number of local fishery museums [10] • Number of social events around fisheries [10] • Existence of newspaper section dedicated to recreational fishing [10] • Awareness of consequences of pollutants to water quality [5] • Awareness of environmental issues/concerns [11]
Environmental Justice	Distributional justice (distribution of environmental goods and bads)		• Sense of place [8] • Change in sentiment based on social media analysis following extreme weather events [6] • Visual assessment/aesthetics [9]
	Procedural justice (consultation and fair process)		• Transparency and accountability in climate-water decision-making [1] • Sense of place [8]
	Recognitional justice (communities are represented and heard)		• Sense of place [8] • Community climate-water activism/engagement • Engage Indigenous peoples in climate and water policy [1] • Engage Indigenous peoples in management practices and decisions [1] • Indigenous peoples actively participating in management and decision [1] • Indigenous peoples actively participating in climate and water policy [1] • Community-focused climate-water support programs and incentives [1]
	Capabilities (benefits)		• Local capacity building through training and guidance materials on planning and implementing adaptation and resilience [1] • Change in experience of a place [9] • Number of license sales [10]

			• % of anglers that know about Great Lakes ecosystem ability to sustain desired fish species and number of desired fish [10] • Number of local fishery museums [10] • Number of social events around fisheries [10] • Existence of newspaper section dedicated to recreational fishing [10]
Recreation and accessibility of nature	Geographic accessibility		• Sense of place [8] • Public recreation access [8]
	Economic		• Evaluate and publicize economic impact of resilient investments [3] • Local investment in fishery dependent businesses [10] • Economic income for local businesses [10] • Number of marketing initiatives to promote fishing [10] • % of state's economy that comes from the fisher [10] • Revenue from fishing license sales [10] • Public recreation opportunity [8] • Funding available to support NPS practices in critical areas [5] • Resources allocated: institutional funding for climate-water initiatives [1] • Resources allocated: human resource capacity building [1] • Impact of water quality and harmful algal blooms on blue economy [3] • Number of license sales [10] • Fishing hours and days per year [10] • Number of people on charter boats [10] • Number of fishery dependent business closures [10]
	Socio-cultural		• Access to recreation [8] • Evaluate and publicize economic impact of resilient investments [3] • Cultural practices [8] • Change in sentiment based on social media analysis following extreme weather events [6] • Visitor use [9] • Visitor type [9] • Visual assessment/aesthetics [9] • Change in experience of a place [9] • Changes in community priority environmental challenges [11]
	Psycho-soci		• Changes in community priority environmental challenges [11]

	al		• Public recreation opportunity [8] • Public recreation access [8] • Sense of place [8] • Change in sentiment based on social media analysis following extreme weather events [6] • Change in experience of a place [9]
Governance			• Political will and leadership [1] • Political and jurisdictional cohesion [1] • Intercity and interagency collaboration [1] • Transparency and accountability in climate-water decision-making [1] • Integration of multiple, diverse actors/communities in climate and water decision-making [1] • Engagement of multiple, diverse actors/communities in climate and water decision-making [1] • Community political activism [1] • Civic organization [1] • Community participation and engagement [1] • Local capacity building through training and guidance materials on planning and implementing adaptation and resilience [1] • Engage Indigenous peoples in climate and water policy [1] • Engage Indigenous peoples in management practices and decisions [1] • Indigenous peoples actively participating in management and decision [1] • Indigenous peoples actively participating in climate and water policy [1] • Resources allocated: human resource capacity building [1]
Climate vulnerability and resilience	Physical or environmental		• Community disaster training/preparedness [1] • Climate water disaster response and recovery, emergency manager plans, capacity [1] • Coastal Resilience and Flood Reduction • Total annual damage from weather events within the Great Lakes basin [6] • Percentage of cities/counties that have completed climate change vulnerability and adaptation assessments [6] • Visual assessment/aesthetics [9] • Awareness of consequences of pollutants to water quality [5] • Awareness of environmental issues/concerns [11]
	Knowledge and		• Assess availability and accessibility of climate resilience knowledge, resources, and tools

	understanding		• Awareness of consequences of pollutants to water quality [5] • Awareness of environmental issues/concerns [11] • Percentage of cities/counties that have completed climate change vulnerability and adaptation assessments [6] • Evaluate and publicize economic impact of resilient investments [3] • Community climate-water knowledge and beliefs [1] • Regular meetings to share expertise and coordinate activities related to climate [3] • Change in sentiment based on social media analysis following extreme weather events [6] • Change in experience of a place [9] • % of anglers that know about Great Lakes ecosystem ability to sustain desired fish species and number of desired fish [10] • % of anglers and public that know about health of the fish resource [10] • % of anglers that know about fishing regulation [10]
	Activism		• Community climate-water activism/engagement [1] • Willingness to take action to improve water quality [5] • % of target audience implementing practices in critical areas [5] • Change in sentiment based on social media analysis following extreme weather events [6] • Community political activism [1] • Civic organization [1]
Indigenous knowledge & sovereignty			• Engage Indigenous peoples in climate and water policy [1] • Engage Indigenous peoples in management practices and decisions [1] • Indigenous peoples actively participating in management and decision [1] • Indigenous peoples actively participating in climate and water policy [1] • Manoomin stand health [8] • Extent of Indigenous knowledge and resource capacity building [1] • Conservation sovereignty [8] • Extent of Indigenous perspectives that acknowledge and consider climate science [1]

REFERENCES:

Citations	In-text reference
(Bassone-Quashie and Johns, 2025 "The State of Climate Resilience and Water Governance in the City of Toronto")	1
Great Lakes Commission "Blue Accounting"	2
Great Lakes Commission "Resilience Action Plan"	3
IJC Great Lakes Human Health Indicators	4
IN Dept Env Management, Social Indicators for Nonpoint Source Pollution Management	5
LimnoTech for IJC "Monitoring the Human Health Consequences of Climate Change in the Great Lakes"	6
NOAA "Great Lakes Beach Monitoring Program"	7
USFWS Midwest Conservation Blueprint, Proposed Great Lakes Waters Indicators	8
Klasic et al. “Leveraging mixed methods in social-ecological systems: A plan for measuring community impacts of environmental clean-up”	9
Heck et al. “Indicators to evaluate the social dimensions of the recreational fishery in the Great Lakes”	10
Breffle et al. “Socioeconomic evaluation of the impact of natural resource stressors on human-use services in the Great Lakes environment: A Lake Michigan case study”	11
Angradi et al. “Human well-being and natural capital indicators for Great Lakes waterfront revitalization”	12
Angradi et al. “Goals, beneficiaries, and indicators of waterfront revitalization in Great Lakes Areas of Concern and coastal communities”	13
Norris et al. “Defining community revitalization in Great Lakes Areas of Concern and investigating how revitalization can be catalyzed through remediation and restoration”	14

Appendix C: Indicators Developed During Workshop

Group	MO	Sub-Category (If Applicable)	Indicator
Group 1: Fisheries that provide safe food sources	1.2. Engage communities to share information on the risks and benefits of consuming Great Lakes fish, wildlife and harvested plant resources with the people who consume them.	Fisher Characteristics	What people are fishing/consuming Where people are fishing (geographic location) Reason for consumption Different Communities that are consuming fish -harvesting/fisher (families and school) -children Number of people fishing How are you preparing the fish Qualitative capture of communities who are consuming fish (indigenous, other cultural/spiritual reason) How are you preparing the fish % of fisher people dependent on GL fish for their diet

Appendix C: Indicators Developed During Workshop

		Motivations	Understand community motivations to barriers to harvesting different species - can inform messaging (social marketing) Sense of Place -smelt -seven fishes -cultural needs
		Awareness	Number of fisher people who are aware of shin consumption advisories/guidance Measure of fish consumption risk understanding Perceived risk of fish consumption Incorporate awareness/perception of benefits into decision making Awareness of WQ impairments
		Messanging	Messaging and how it changes once some contaminated is removed but not all of it is

Appendix C: Indicators Developed During Workshop

			Info available in non-technical language that is translated into languages prevalent near fishing areas Preferred format of information Where people received their info Metrics for how information is distributed (format and location) Behavioral intentions past, message
		Trust	Trust in providers of information -who do you trust Trust in message and messenger Identifying opinion leaders and credible, trusted sources within community to engage in sharing message Vulnerable communities and how to dm of vulnerable communities

Appendix C: Indicators Developed During Workshop

		Misc.	How are risks distributed. Who is most vulnerable? Important ties in indigenous culture and communities Food severity and sovereignty Do people/business know where to access local fishery products? Going into the field to find fishers -move beyond fishing licenses Culturally significant species -arrow up and arrow down of species for Why are you sharing information? What is the goal? Measurable/Outputs -# contacts -# communities -#fact sheets distributed/video views/meeting/ect

Appendix C: Indicators Developed During Workshop

	1.1. Remediate, restore and delist Areas of Concern	Access	Has access Ad? Positive or negative
		Trust, Fairness, Transparency (Procedural Justice)	# of meetings with PAC/CAGS? And frequency of meetings Trust with PACS/CAGs and AOC leads Gentrification Phase if AOC planning that community can add onto What was the approach/framing for meaningful community involvement? Do community members perceive the PAG-AOC relationship as fair? Does community understand and access AOC documents? # attendees at public meetings

Appendix C: Indicators Developed During Workshop

			Are people satisfied with the changes that are made? Trust in process? Most vulnerable communities reached Need more human health metrics -perception f health vs actual health -subjective vs objectives metrics Decreased health issues associated with exposure to contaminants
		Awareness	Public awareness of management action development Public awareness of projects Communication of key milestones (via projects/actions)
		Influenced Changes -Recognitional justice	All communities in an area involved in project development Work force should be build from local communities

Appendix C: Indicators Developed During Workshop

			Did community experience the desired output % of project objectives resulted from PAC/CAG input Do AOC reports reference PAC/CAG input (is it documented) Characteristics of community partners (demographics) Track impact of PAC/CAGs discussion on management plans (meeting recordings/minutes)
	4.1. Protect, enhance and increase resilience of habitats necessary for sustaining native aquatic and terrestrial species important to the Great Lakes ecosystem.	Fisher Characteristics	Age of fisher Gender of fisher Characteristics of fisher groups specialization /equipment used Purpose of fishing

Appendix C: Indicators Developed During Workshop

		Fishing Activity	# of people harvesting Catch per unit effort Presence of fishing activity What are people harvesting
		Charter Measures	Charter activity and economic activity Purpose of chartering (eating, tourism) Brooder economic impact to the community Species cateching Species targeting # of people per charter # of charters per season

Appendix C: Indicators Developed During Workshop

			Who has access to charter fishing?
			Measure of power dynamics-mapping out interests/priorities Whitefish recovery? -enought fish to support sustainable harvest -cultural significance Where do fishers access fishing spots? -Natural/manmade infrastructure How are the benefits of fishing shared? Presence of indigenous methods for resilience for fishing pop (fishing methods) Local community lead based monitoring programs

Appendix C: Indicators Developed During Workshop

			Physical man made barriers to fish migration Tradeoffs between societal benefits of hard infrastructure (dams, hydro, shoreline protection) vs fish habitat Do agency priorities align with community interests? Which ones? What are the tradeoffs? Cultural connection to what is native vs non-native but culturally important # of types of native fish Percentage of habitat (has it improved) Measure of comfort in waterway once delisted or cleaned up Effectiveness of meeting the management objectives (restoration vs protection)

Appendix C: Indicators Developed During Workshop

			How has access of activity changed? (are people how restricted bc of conservation or construction ect) Gentrification changes with cleanup Lingering effects of guidance removal over time

Group	**MO**	**Sub-Category (If Applicable)**	**Indicator**
Group 2: Recreation that is safe and accessible *(Note: Sub-categories not linked to particular MOs)* *(Added note on sticky pad: Access and activities vary so much by place, these should be place-specific)*	1.1. Remediate, restore and delist Areas of Concern.	Safety	Physical safety
			Knowing how to swim
			Beach "ambassadors" (Tell people about safety concerns - Milwaukee doesn't have lifeguards anymore)
			Beach closings (% open vs. use during open) (how to measure knowledge of site risk and access?)
			Water quality (bacteria) (clarity)
			What about other foods like mussels? Can we eat it?

Appendix C: Indicators Developed During Workshop

			Pyschological/emotional safety
			Other people around (perceptions of safety)
			Perception of contamination
			Perception of “clean beach”
			Safety - perceptions of safety, maintenance care of place vs. “actual” safety (currents, water quality, etc.)
			Public awareness of wave/weather/current warnings and advisories - physical safety
			Safe for different activities (e.g., ok to boat but not swim; catch and release vs. eat fish)
			Complication of nuance during AOC process (can access in one way but not another - can indicator address this? measure this progress)
			Fish consumption advisories
			Communication of risks/hazards

Appendix C: Indicators Developed During Workshop

		Access	ADA accessibility
			Elderly

Appendix C: Indicators Developed During Workshop

			Youth engagement
			Metrics - use demographics
			Ceremonial uses
			Blue gentrification
			Awareness of area for recreational uses
			Do people know how and where to access the river safely and in the way they want (multiple domains for this)?
			Awareness of restoration projects, orgs doing work, ongoing activities
			'Where can access' dune recreation drove moving access, motivating access via boardwalks, etc. to access beach in other ways/other areas
			Balance tradeoffs between access and ecosystem degradation (i.e., social trails, refuse/litter)
			Community involvement in AOC process

Appendix C: Indicators Developed During Workshop

		Access (Barriers)	Cost of recreation activities (different types of activities)
			Public transit access
			Free parking
			Bike trails / Connecting paths
			Distance (time to travel) (perceived financial hardship to access)
			Physical barriers to entry
			Public vs private access
			% of shore that is publicly accessible
			Different interpretations of Public Trust Doctrine (whether beachwalking is legal)
			Who has access? Are there economic barriers?
	4.1. Protect, enhance and increase resilience of habitats necessary for sustaining native aquatic and terrestrial species important to the Great Lakes ecosystem.	Use *(Added note on stick pad: How to measure use - clicker surveys of beach visitors; number of cars/boats from Google or other satellite imagery)*	Use of waterways (swimming, wading, fishing, boating)
			Beach “parties” (community events)
			Rivers “swimmable” (what does this mean)
			Subsistence vs recreational

Appendix C: Indicators Developed During Workshop

			fishing
			Hunting
			Birdwatching
			Gathering spaces multi-use (e.g. flood walls double as amphitheater seating)
			Community-driven art installations
			Sitting - walking; picnics - grilling; birdwatching; reading
			Community-planned events/activities centering ecosystems/waters (calendar of activities?)
			Economic - water-based tourism
			“Too much” use - too crowded
			Over-use - degradation (how much is too much)
			Fishing - tribal, commercial, recreational
			Health (physical and mental)
			Beach closings/open (95% time beach open)
			“Blue flag” beach certification

Appendix C: Indicators Developed During Workshop

			(WQ criteria, cleanliness measure)
			Opening when and where people want to go
			Impact on behavior (not open when want to go; lingering effect of closures on perceptions; knowledge and trust in information and advisories/alerts)
			Trust in advisory information
			Perceptions “lag” / lingering effect after beach closing
			Fatigue of information (advisories)
			Metrics (are people receiving info? Are they incorporating it into their decision-making?
			Aesthetics - beach looks cleaner/prettier
			Interpretive signage to explain public restoration/cleanup projects
			Visitor centers (place-making; education; interpretation)
			Infrastructure (physical, social, knowledge - capacity for maintenance)

Appendix C: Indicators Developed During Workshop

		Participation (in process and activities) **Includes both Inclusion (who uses it) and Connection (how do you feel when using it)*	Where are (which neighborhoods) people are using recreation sites coming from/deomgraphics of users
			Habitat restoration should track recreation use as sign of success
			Rec x HABs: recreation access; beach closures; community knowledge)
			Rec + fisheries: Water-based tourism (recreation; fishery industries)
			Rec + fisheries: advisory group participation - minutes result in suggestions
			"Anglershed" and similar metrics (where anglers come from)
			Who does not use it? Why not?
			Perception of who the project is "intended for"
			What's your purpose for using it?
			Participation in decision-making (who? rates?)
			Number of recreation groups involved
			34 federally recognized tribes in

Appendix C: Indicators Developed During Workshop

			Great Lakes region
			Number of advisory meetings (does advisory input result in project goals/outputs? Who's participating?)
			Companies/brands partner community orgs for Great Lakes recreation identity?)
			Diversity of beach ('people who look like you')
			Community input
			Green gentrification
			Number of design elements (local)
			Number of renters
			Property value
			Property value increases
			Newer vs. long-term owners
			Economics
			Percent owners vs. renters
			Rent protection policies
			Affordable housing

Appendix C: Indicators Developed During Workshop

			Policing (makes some people feel unsafe to use beaches/waters)
			Connection to water
			Cultural connections
			Connection to lakes are vital to Tribal traditions and ceremony (defines who we are)
			Spiritual connections
			Sense of place
			Place dependence for desired uses (the one place for X vs one of many places for X)
			Social capital
			Reciprocity
			Knowing your neighbors
			Social connectivity (recreating with others)(knowing each other)
			Does connection increase when BUIs are improved?
			Heritage - Is heritage a dimension of sense of place?
			Knowledge of Indigenous history
			Manoomin (TEK;

Appendix C: Indicators Developed During Workshop

			intergenerational transfer; subsistence; stewardship)
			Many indigenous folks don't identify with "recreation" - how to frame cultural connections in this priority
			Protections for/restoration of/interpretation around cultural keystone species (e.g., manoonin, sturgeon, etc.)
			Activities around, gatherings, interpretive materials around cultural keystone species)
			Connectivity projects that benefit recreation (e.g., river trails, tubing, etc.)
			Physical connections between recreation access sites and habitat/ecological connectivity
Group 3: Reduce nutrient and related runoff to prevent harmful/nuisance algal blooms	3.1. Reduce nutrient loads from agricultural tural watersheds to prevent harmful and nuisance algal blooms.		Relative financial status of farms using conservation measures
			Safe recreation downstream
			Social networks' ability to share initiatives
			Number of returning peer-to-peer participants
			Demonstration farms/evidence

Appendix C: Indicators Developed During Workshop

		shared with educators, extension, local community planners
		Testimonial peer-to-peer/farmer-to-farmer ("farm bill incentives gave me better yields")
		Right to know (public tracking of where nutrients are coming from - reveal high runoff farms/fields)
		Reduced "ick" factor and improved aesthetics and willingness to use waterways
		Degree of awareness farmers have of incentives and best practices
		Policies incentivizing/unintentionally disincentivizing farmer actions
		Reduce financial/capacity barriers for changing management/operation
		Number of trades or amount of money being invested in agriculture BMPs to improve downstream waters for recreation and quality of life
		Support to farmers for conservation practice and implementation (knowledge

Appendix C: Indicators Developed During Workshop

		sharing and monetary incentives)
		Number of new farmers engaged
		"Front-end" measures - BMP efficacy for farmers (e.g., via surveys) speakers to continuity/persistence/future expansion of practices
		Promote collective action, community-level change in agriculture practices (vs. individual landowner approaches)
	3.2. Reduce or prevent stormwater runoff to improve and sustain water quality.	Access to shoreline - safe recreation
		Number of days downstream beach access/recreation lost due to HABs
		Recreational areas available for community activities
		Percent of time beaches and waterways are safe for swimming
		Aesthetics improved and quality of life, use tourism; Increased recreational use (paddling, fishing, etc.)
		Number of community-led restoration projects (and motivation)

Appendix C: Indicators Developed During Workshop

		Public awareness of stormwater destinations/recieving waters
		Community-led initiatives on wetlands/floodplains
		Attitudes? Discourses? Environmental vs. economic pressures
		Areas on farms restored for wetlands and restoration
		Social networks for sharing initiatives and knowledge
		Emphasize co-benefits of green infrastructure to deliver relevant benefits
		“Front-end” property owner - GI efficacy (willingness)
		Reduction in communities using road salt
		Number of community composters and leaf programs
		Number of riparian landowners that maintain natural shorelines
		Reduced flooding and basement backups
		Reduction of costs associated with stormwater flooding events

Appendix C: Indicators Developed During Workshop

	3.3. Improve effectiveness of nonpoint source control efforts to prevent harmful and nuisance algal blooms.	Safe and accessible recreation/use
		Perception index (did delisting process improve attitudes and perceptions of environmental initiatives)
		Existence/public use of NPS control measures/conservation measures resource library (with supporting research)
		Amount/availability of technical assistance (and turnover rate)
		Community-based water monitoring, and community-led
		On-farm nutrient monitoring
	1.1. Remediate, restore, and delist Areas of Concern.	Degree of citizen decision making / do they have opportunities/feel included
		Community vision and funding for AOC uses/community amenities
		Public awareness of remediation and restoration initiatives
		Property values
		Protection for homeowners from

Appendix C: Indicators Developed During Workshop

		gentrification (number of residents that remain after restoration)
		Renters and affordable housing
		Positive reactions to these initiatives in communities
		What community-led tracking initiatives for incentives and disincentives for change
		Disadvantaged population (number or index) benefitted by AOC delisting and restoration (use of demographic index/disadvantaged community data sets)
		Number of community listening sessions/number of community participants actually engaged
		Community advisory board membership
		Number of comments/ideas included/addressed from community listening sessions
	Crosscutting	Clean drinking water for everyone (cost piece)
		“Back-end” measure - shoreline recreation satisfaction (e.g., index)(beach going, etc.)

Appendix C: Indicators Developed During Workshop

		"Back-end" measure - recreational/commercial fishing satisfaction
		Research capacity to understand and respond to emerging HABs (e.g., Superior)
		Progress towards nutrient policy reform (CWA doesn't have teeth to address nutrients)
		Is there organization towards post-delisting AOCs? (e.g., ways to continue addressing issues larger than AOCs)
		Problem of nutrient BU. from NPS in AOCs
		Awareness of consequences
		Community-led initiatives
		Property value
		Community-led initiatives
		Shoreline management/defense/status and perspectives
		Reduced health issues caused by HABs exposure (human/pets)

Appendix C: Indicators Developed During Workshop

Group 4: Habitat and species protection to increase resilience and support safe consumption	1.1. Remediate, restore and delist Areas of Concern. 1.2. Engage communities to share information on the risks and benefits of consuming Great Lakes fish, wildlife and harvested plant resources with the people who consume them.	Stewardship	Civic Organization and Activism
			Sense of Place (Place Attachment; Willingness to Take Action to Improve Water Quality)
		Workforce	Incorporate Community in Projects / Measure Local Workforce to Project from the Start
			Post-Restoration and Long-Term Maintenance (Who? - Local Community NGO, Tribes) (Base it on dimension and priority)
			Economic activity/employment in blue economy
		Post-Resource Use	Existence of Funding to Support Delisted AOCs
			Measure Number of Uses at New Accesses or Cleaned Up Sites
			Establish Opportunities for Post/Beyond AOC Delisting
			Resources to fund community-identified amenities and projects
			Number of residents in community before and after clean-up - measure gentrification

Appendix C: Indicators Developed During Workshop

		Connection and Celebration	Increase Testimonials of Local Communities ("This is the first time I have fished this lake in years. Used to w/ my dad.")
			Public Understanding (Community outreach with info on environmental health measures) (Celebrations of progress; communications on successes and limitations)
			Invest in environmental literacy
		Awareness	Public Knowledge/Awareness of Contaminants
			Awareness of Consequences of Pollutants to Water Quality
		Engagement in Projects and Decisions	Participation in Public Input Opportunities
			Measure Inclusion of Communities in Projects (Buy-in from all) (Proposal stage - proactive then share what it means)
		Public Health	Social Vulnerability Human Health Index
	2.2. Reduce economic, ecological and human health impacts by limiting range expansion,	Make the Case for Investment	Value of Native Plants / Wildlife / Fish

Appendix C: Indicators Developed During Workshop

	including lake-to-lake transfers, of non-native species. 2.3. Provide ecosystem and human benefits through prioritized and collaborative invasive species control efforts.		Measure Specific Species Connectedness to Medicine, Utilitarian, and Ceremony - Species Connected to Humans
			Existence of Early Detection methods (at various scales and throughout the basin)
			Recreational benefit to removal
		Regulation and Enforcement	# Public Compliance w/ Control Measures / Regulations
			Awareness of Consequences of Invasive Species and Individual Actions That Can Prevent Spread
			Shift to Natives - # Nurseries w/ Non-Native Species
			(# Public Compliance w/ Control Measures / Regulations) Including decreased sale/trafe of invasive species/increased enforcement action taken
		Economic Benefit	Increase in Property Values After Removal
			Decrease in Treatment Costs
			Number of jobs that work with eco-restoration; Money for workforce programs
			How have people benefitted

Appendix C: Indicators Developed During Workshop

			economically from controlling invasives?
			Industries that benefit from harvest/removal of invasives (e.g., industries making use of dyes, biomass, food products, etc. from invasives)
			Investing in proactive (early in invasion curve) approaches for preventative benefit/savings
		Engagement in Implementation	Incorporate Indigenous Knowledge in Control Efforts (Proactive listening sessions) (Measure it tell testimonials - European Green Crab, Black Ash, Eurasian Milfoil)
			Number of Partners Involved in Control Efforts
			Established (and Trusted) Communication Channels for Detection / Surveillance (Connect two-way -> communities and decision makers)
			Public Understanding (Information/teaching on why its an issue) (Opportunities for active engagement in planting, pulls, restoration, etc.)
			Promoting Clean Shorelines With

Appendix C: Indicators Developed During Workshop

			Native Vegetation (Geese stay off) (Increase use of nature-based solutions) (Testimonials of)
			Communication of response action - transparency and input from community (i.e., use of chemicals)
			Where do people get their information on invasives? Do they know where to report? Are they comfortable reporting?
			Use of behavior-centered design principles/approaches (more likely to be effective in engaging people in solutions)
			What can seniors tell us about how invasive species have changed the environment?
			How are different communities participating in these initiatives?
			Are youth being invited to participate in these initiatives?
			Increased community awareness and participation; number of friends groups to help maintain
		Funding for Technical Assistance	Public Funding
			Existence of Funding to Sustain Restoration Projects

Appendix C: Indicators Developed During Workshop

			Post-"Completion"
			Availability of Technical Assistance Capacity
			What incentives are there for local people to participate in invasive species monitoring?
			(Incentives) for managers to use monitoring data?
			Funding/assistance to maintain areas treated for invasives (to avoid/minimize relapse)
			Fund community outreach and creation of friends groups? Government will not be able to maintain
	4.1. Protect, enhance and increase resilience of habitats necessary for sustaining native aquatic and terrestrial species important to the Great Lakes ecosystem.	Cultural and Spiritual Practices	Cultural and Spiritual practices (Harvesting and Processing of Manoomin)
			Increase/Decrease Language Speakers (Connected to Earth + Relation)
			Native Migration Routes Opened and Navigable Miles Used by Tribes for Harvesting (Access)
			Increase/Decrease of Cultural Fish Species Tied to Great Lakes Clans and Communities (Neighboring Tribes)

Appendix C: Indicators Developed During Workshop

			Wildrice and Harvesters for People, not Just Waterfowl
			Measure Increase/Decrease of Wildrice Beds and Harvesters
			Measure of Cultural, Medicinal, Utilitarian Plant Species Protected Within a Wetland Related to Neighboring Tribe (Protection of Relations = Culture and Reconciliation)
			Sense of Place
			Number of biocultural restoration projects (or projects that support cultural reconnections)
		Both ↑↓	Access (Linkage to Protected Areas With Public Use)
			Hunting and Fishing Licenses by Count
			# Harvesters of Wetland Plants (Terrestrial)
			Whitefish recovery - progress toward sustainable harvest
			Pollination as ecosystem service - prairie restoration
		Tourism and Recreation	Number of Boat Landing Launches

Appendix C: Indicators Developed During Workshop

			Recreation Opportunities (Fishing, Hunting, Birdwatching, Boating, Kayaking, Hiking, Nature Photography)
			Tourism/Birding
			Number of Users - Observation Counts or Surveys of Water-Based Recreation
			Types of users; purpose of use
			New green space - community rating scope; FEMA? insurance?
		Planning and Policy (Governance)	Increased Community Planning
			Reduction of Hardened Shoreline (Measure in Shoreline Miles)
			Incorporation of Plans Into Policy/Practice
			Existence and/or Updates to Plans (Mast Plans, Climate Plans, etc.)
			Increase habitat for listed species (e.g., using patch bumblebee, bats); improve flood and stormwater management
			Number of watershed management plans
			Community-led projects and support for those projects

Appendix C: Indicators Developed During Workshop

			Number of tools supporting incorporation of cultural practices and values in restoration (e.g., ganawenindiwag planting guide)
		Economic	Tourism Money Linked to Great Lakes Communities
			Commercial Fisheries (Yellow Perch, Walleye, Rainbow Smelt, etc.)
			How are commercial initiatives being shared? Is there public knowledge?
			Is there equal access to profits from these industries? (marginalized communities)
			Focus on workforce - creating short-term and long-term jobs in restoration activities
		Public Health	Tribal Water Quality Indices - Tribal Standards (ex. Wildrice Harvest Ceremonial Use)
			Number of Beach Closure Days
			Water Quality Indices
			Access to Green Space/Parks
			Public trust around swimming and fishing

Appendix C: Indicators Developed During Workshop

		Public Input	Public Understanding (Opinion Surveys, Feedbacl/Comments from Public Audiences)
			Public Participation (Opportunities for Active Restoration, Opportunities for Leadership Development)
			Participation in Community Clean-Up or Citizen Science Projects
			Increase/Decrease Native Youth Either in Cultural Practices or Education
			Citizen science: ecosystem monitoring

Appendix D: Top Voted Indicators for each Management Objective

Note: This is direct transcription of indicators of those that received the most dot votes; we did not aggregate or synthesize this list.

Management Objective: Fisheries that provide safe food sources	
Indicator	*Vote(s)*
Trust in the fisheries message and messenger	8
Number of fisherpeople who are aware of **and** understand fish consumption advisory/guidelines	8
Do agency priorities align with community interest (which ones and what are the tradeoffs)	6
Are people satisfied with changes made (trust in process)	4

Management Objective: Recreation that is safe and accessible	
Indicator	*Vote(s)*
Social Capital - Reciprocity, knowing your neighbors, social connectivity	8
% of shore that is publicly accessible	7
Participation in decision-making	5
Public Awareness and Support for GLRI	5
Safety/Perception of Safety	5

Management Objective: Reduce nutrient and related runoff to prevent harmful/nuisance algal blooms	
Indicator	*Vote(s)*
Integrated stormwater wastewater management	10
Promote collective action, community-level change in ag practices (vs. individual/landowner approaches)	8
Impact of beach closures from HABs	5
Clean drinking water for all	4

Appendix D: Top Voted Indicators for each Management Objective

Note: This is direct transcription of indicators of those that received the most dot votes; we did not aggregate or synthesize this list.

Reduced health issues caused by habs exposure for humans and pets	4

Management Objective: Habitat and species protection to increase resiliency and support safe consumption	
Indicator	*Vote(s)*
Measure of cultural, medicinal, utilitarian plant species protected within a wetland related to neighboring tribes (protection of relations = vulture and reconciliation	7
Recreation opportunities (fishing, hunting, birdwatching, boating, kayaking, hiking, nature photography)	6
More testimonials of local communities ("This is the first time I have fished the lake in years. Used to with my dad.")	6
Measure inclusion of communities in projects. Buy-in from all. Proposal stage - proactive, then share what it means to all	6
Incorporate indigenous knowledge in control efforts (proactive listening sessions) and measure it; tell testimonials (European green crab, black ash, Eurasian milfoil)	5

Appendix E: Indicator Frameworks

Group 1: Fisheries	**M.O. #:** 1.1
Indicator 1 name: Trust in the message	**Definition:** Recipient of the information uses message to inform their decision; finds it credible enough to consider in their decision-making
Why is the indicator relevant to the management objective? ● If they don't think messenger is credible they will use it ● Moving beyond just sharing information but the consideration of the message to an individual	
How is the indicator actionable? (i.e. how would it inform different management or policy approaches) ● Helps enact behavioral change ● Could help entity put together BUI removal package ● As a diagnostic- if data tell us people trust our message but we aren't seeing behavior change, it helps you diagnore what's working and what isn't and where there is a barrier	
Who wants or would make use of the indicator? ● Fish consumption advisory people (BUI - state health agencies or environmental agencies) ● City; DNR; Park Service	
What program might this serve? (i.e. who would use this data and how)? ● Parks and Rec Boards ● Public health agencies	
Is the indicator feasible to assess? How so? (e.g., cost, person power, etc.)	
Who might measure this indicator (Agency, managers, communities, NGO, etc)? ● Rational trust - does the message fit with my recent experiences ● Does the information make sense to the recipient of the message; is there a rationale provided or is it just a new guidance coming out	
What scale should the indicator be measured at?	
How might/could the indicator be tailored to different contexts/locations (e.g., type of ecosystem, geography, scale or scope, community type - Tribal vs non-Tribal, etc) ● The message format/design ● Rational trust	

Appendix E: Indicator Frameworks

● Are people considering this message when making a decision ○ Why did you eat 10 fish per week? ○ Why did you not go to the beach on xyz? ○ Did you receive this message? ○ Did you consider this message when deciding whether to consume fish this week? ○ Something observational could help (when
How difficult is the indicator for non-scientists to understand?
How frequently should it be measured? For how long?
What might trend data look like and how would we measure success?
Has anyone collected data on this indicator before? Who?
What else is missing?

Appendix E: Indicator Frameworks

Group 1: Fisheries	**M.O. #:**
Indicator 2 name: Trust in the messenger	**Definition:** Recipient of the information uses what the messenger says to inform their decision
Why is the indicator relevant to the management objective? ● If they don't think messenger is credible they won't use it ● Important bridge between recipients and messengers - more likely to head the message	
How is the indicator actionable? (i.e. how would it inform different management or policy approaches) ● Results in more buy-in and supports whether there is public support of the entity, their decisions, and their actions ● Influences the way by which you develop messages ● Helps to identify whether a messenger will be the best carriers for a said message (are they trusted within a community or not; local champions)	
Who wants or would make use of the indicator? ● Fish consumption advisory people (BUI - state health agencies or environmental agencies) ● City; DNR; Park Service	
What program might this serve? (i.e. who would use this data and how)?	
Is the indicator feasible to assess? How so? (e.g., cost, person power, etc.) ● Yes - challenge is it will be messenger-dependent (needs to be specific enough) ○ Ex: Creel survey- (could target IN DNR for example) ● If there are local contacts embedded in a community and they represent an agency – different than faceless agency ● Where do you get your fish consumption advisory? Do you trust the fish consumption advisory? ● Where do you seek out information and who do you trust? ○ Issue that remains is more vulnerable communities who don't have fishing licenses wouldn't be captured if we did a survey to wide swath of people	
Who might measure this indicator (Agency, managers, communities, NGO, etc)? ● Agencies, communities, NGO	
What scale should the indicator be measured at? ● Local in phase I - we need to start local and then could talk more broadly about basin-scope	

Appendix E: Indicator Frameworks

How might/could the indicator be tailored to different contexts/locations (e.g., type of ecosystem, geography, scale or scope, community type - Tribal vs non-Tribal, etc) ● Specific to the entity and locality ● Tailor to subsistence, type of fishing approach, ● Could be a standard framing/protocol to get the specific context – at the message level
How difficult is the indicator for non-scientists to understand?
How frequently should it be measured? For how long?
What might trend data look like and how would we measure success? ● Have there been major changes/turn-over in personnel? Has there been a major regulation change or recommendation change from the messenger source? Is Trust holding through the change [or other disturbances] ● Base rate: annually because fishing is seasonally ● Do you just wait for disturbances and measure fishing related to that - if you're trying to see degradation trend (does trust change in a person/entity year to year) ● Benefit of regular data over time to then map onto disturbances so you can see if it's changing because of (set time interval and a response note– major event) ● Every time a new advisory comes out - send a new survey (won't be too often –
Has anyone collected data on this indicator before? Who?
What else is missing? ● Source of messaging ● Distribution of messaging ● Design a framework

Appendix E: Indicator Frameworks

Group 2: Recreation	**M.O. #:**
Indicator 1 name: Social Connectivity/Capital - Reciprocity, knowing your neighbors, social connectivity	**Definition:**

Why is the indicator relevant to the management objective?

- Social capital contributes to reaching recreation-focused management objectives. (e.g., increased community involvement may help design recreation projects that are more tailored and effective)
- Social capital could increase as an outcome of a successful restoration & clean up projects that result in more recreation.
- Social capital contributes to capacity for resiliency
- Social capital contributes to well-being
- Social connectivity brings people together
- Habitat restoration is thought of as beneficial for connectivity for non-human species…. Social capital could be a way to measure if/ how restoration also benefits connectivity of humans
- Does greater social connectivity lead to more human-non-human connectivity?

How is the indicator actionable? (i.e. how would it inform different management or policy approaches)

- Assess what social cohesion benefits are resulting from the restoration/ clean up actions (e.g., are people spending more time *together* outside, in green spaces, along water fronts; do people know their neighbors more; do people trust each other more)
- If GLRI objectives were to be rewritten, how would you incorporate social cohesion/connectivity

Who wants or would make use of the indicator?

- Environmental/River Restoration NGOs
- Government Leaders
- Funders
- Local Businesses
- Local neighborhood associations/groups

What program might this serve? (i.e. who would use this data and how)?

- Cities, counties, national governments might use data as justification / communication of benefits of the restoration & clean up investments

Is the indicator feasible to assess? How so? (e.g., cost, person power, etc.)

- Probably an index type variable (social capital is conceptual/ latent concept)
    - Community groups who are active in an area & how they are connected to one another (i.e. social network analysis)

- # of community events
- # of volunteers / volunteer effort
- Social Network Analysis?
- Civic engagement / participation
- Gathering spaces & use thereof
- # active community groups & membership
- Multi-generational events/integration
- Possible subjective indicators on social connection, ownership of community projects
- People spending time outside with each other
- Products of social cohesion? (community art, collaborative projects, etc?)
- Reciprocity
    - Between individuals - mutual aid networks (are they active, how often are they activated, who participates/ who do they serve)
    - Between members of the public and decision makers – making good on community input and delivering/ being responsive to public input
    - Between humans and non-humans
- Things that contribute to or facilitate social capital:
    - Access to green space

Who might measure this indicator (Agency, managers, communities, NGO, etc)?

- Within AOCs, it's the CAC (e.g., St. Louis Alliance)
- Convener like CAC or academia or reserves or other - Sea Grants
- Local Neighborhood Associations or other local groups? Economic development groups
- Larger NGOs could potentially compile or compare data across places
- Tourism associations/ Chambers of commerce

What scale should the indicator be measured at?

- Local - can't really do it beyond that
- Some coarser grained indicators may be measured at GL scale

How might/could the indicator be tailored to different contexts/locations (e.g., type of ecosystem, geography, scale or scope, community type - Tribal vs non-Tribal, etc)

How difficult is the indicator for non-scientists to understand?

Appendix E: Indicator Frameworks

● **“**Social capital” might be difficult terminology for resource managers, AOC managers to understand… what we’re talking about is connectivity, neighborlyness, reciprocity among community members
How frequently should it be measured? For how long? ● Whether a project or project impact is visible or not may majorly influence whether and when social response would change
What might trend data look like and how would we measure success? ● Is change good? What does an increase or decrease mean? ● Overall Index might not change, but individual contributing factors might shift over time
Has anyone collected data on this indicator before? Who? ● Not as a systematic level that we’re aware of
What else is missing? ● Often hard to fund because its value is less transparent ● Story Telling is an important way to capture social connectivity

Appendix E: Indicator Frameworks

<table>
<tr><td><u>Group 3: HABS</u></td><td><u>M.O. #:</u> 3.1 + 3.2</td></tr>
<tr><td><u>Indicator 1 name:</u> impact of beach closures from HABs
Post-it cards language:
● % of time beaches/waterways are safe for swimming (5 votes)
● # of days of downstream beach access/recreation lost due to HABs</td><td><u>Definition:</u> economic impact and the why (related to HABs) of beach closures</td></tr>
<tr><td colspan="2">Why is the indicator relevant to the management objective?
● Toxins from HABs prevent access to/ use of marinas/piers/beaches</td></tr>
<tr><td colspan="2">How is the indicator actionable? (i.e. how would it inform different management or policy approaches)
● Park authorities/land/water managers testing water quality
● Use indicator information/data to inform and support program/funding continuation (ex. H2Ohio)
○ Increase funding for mitigation
○ Decrease programming from coming in</td></tr>
<tr><td colspan="2">Who wants or would make use of the indicator?
● Mayors, civic organizations, chambers of commerce to make an argument for better stormwater management and/or reduce phosphorus load from farms
● Advocates/Farm orgs/other interests can use the indicator to make the case for programs/funding to address HAB’s
● Pure Michigan and related tourism industry</td></tr>
<tr><td colspan="2">What program might this serve? (i.e. who would use this data and how)?
● Advocates/Farm orgs/other interests can use the indicator to make the case for programs/funding to address HAB’s
● H2Ohio
● Farm Bill conservation programs (NRCS, farm bill, FWS partners)
● Water quality monitoring programs (ex., Heidelberg)
● State and federal domestic action plans
● Water Quality Agreement (Annex 4)
● Great Lakes Sediment and Nutrient Reduction Program (GLC)</td></tr>
<tr><td colspan="2">Is the indicator feasible to assess? How so? (e.g., cost, person power, etc.)
● Yes, and it costs money; testing results have to be turned around quickly
○ Counties currently test, add 1 additional criteria (item to be considered)</td></tr>
</table>

○ Tourism tax revenue changes ○ Normalize for weather, etc.
Who might measure this indicator (Agency, managers, communities, NGO, etc)? ● Cities (E.g., Chicago?) ● Opportunities for citizen science ● Park agencies
What scale should the indicator be measured at? ● Raw measurement at beach-specific scale ● Data can be aggregated to regional (or even lake-wide) scale - i.e., cumulative # of beach closure (or 'no swimming') days
How might/could the indicator be tailored to different contexts/locations (e.g., type of ecosystem, geography, scale or scope, community type - Tribal vs non-Tribal, etc) ● Erie, Saginaw, and Green Bay are similar; Lake Superior and Bay of Quinte are different
How difficult is the indicator for non-scientists to understand? ● Straightforward for a non-technical audience
How frequently should it be measured? For how long? ● Ideally, aggregate number of individual days a beach is closed (or swimming not permitted)
What might trend data look like and how would we measure success? ● Number of days a particular beach is closed each season - trend up or down (very weather dependent)
Has anyone collected data on this indicator before? Who? ● Yes:Brent Sohngen (OSU professor) looking at how much beach closures cost and Saginaw Bay - Frank Lupi (NOAA Multi-Stressor project - conducted circa 2010) ● Important to learn from past studies, including economic impact of beach closures ● Swim Guide (aggregated)
What else is missing? ● Beaches close for things other than HABS–need to distinguish ● Metrics – Economic activity, drinking water, costs, sense of place, public perception, etc.

Appendix E: Indicator Frameworks

Group 3: HABS	**M.O. #:** 3.1
Indicator 2 name: Promote collective action, county/watershed level change in ag practices (vs. individual/landowner approaches)	**Definition:** Assess the state of peer-to-peer farmer networks in facilitating adoption of conservation actions.
Why is the indicator relevant to the management objective? ● Enhance peer-to-peer learning networks by funding more demonstration farms ● Funding staff/programming ● Build capacity of farmers/communities ● Scale that impacts water quality	
How is the indicator actionable? (i.e. how would it inform different management or policy approaches) ● Could inform funding decisions	
Who wants or would make use of the indicator? ● TNC or other coordinators of peer-to-peer networks ● Statewide associations of conservation districts	
What program might this serve? (i.e. who would use this data and how)?	
Is the indicator feasible to assess? How so? (e.g., cost, person power, etc.)	
Who might measure this indicator (Agency, managers, communities, NGO, etc)?	
What scale should the indicator be measured at? ● County, or other regional scale?	
How might/could the indicator be tailored to different contexts/locations (e.g., type of ecosystem, geography, scale or scope, community type - Tribal vs non-Tribal, etc)	
How difficult is the indicator for non-scientists to understand?	
How frequently should it be measured? For how long?	
What might trend data look like and how would we measure success?	

Appendix E: Indicator Frameworks

Has anyone collected data on this indicator before? Who?
What else is missing?

Appendix E: Indicator Frameworks

Group 4: Habitat and Species Protection	**M.O. #:** 1.1/1.2
Indicator 1 name: Testimonials of Local Communities	**Definition:** The existence of testimonials from local communities helps with two things: (1) it is an indicator of the investments achieving the outcomes, and (2) they can be used to further advocate for additional activities or funding. These are testimonials not from the project personnel, but people impacted by the project. **Could be applied to many objectives, it is generally universal.
Why is the indicator relevant to the management objective? ● Testimonials about public confidence, trust, and understanding ● Buy-in ● Helpful for understanding/contextualizing data-heavy topics ● Often will identify a usefulness or positive benefit; make the connection between public funds being spent and some positive outcome	
How is the indicator actionable? (i.e. how would it inform different management or policy approaches) ● Use it to try and get more funding ● To justify a position (policy option); advocacy for policy or decision-making	
Who wants or would make use of the indicator? ● Politicians to advocate an agenda ● Agencies (USFWS might take a story about some kind of species and elevate it to help with their budget)	
What program might this serve? (i.e. who would use this data and how)? ● Fish passage ● GLRI ● GLFWRA	
Is the indicator feasible to assess? How so? (e.g., cost, person power, etc.) ● Yes, talk to the project implementer, and they could identify people for you to speak to; therefore doesn't cost a lot ● GLRI would ask if the project is replicable, could serve as an example ● Low cost, but would the "source" want it to be on the record	
Who might measure this indicator (Agency, managers, communities, NGO, etc)?	

Appendix E: Indicator Frameworks

What scale should the indicator be measured at?

- Could be both place-based and scalable
- Individual stories are going to vary, but they're all good stories (i.e. GLRI testimonials about specific projects, but they support the broader call for funding)

How might/could the indicator be tailored to different contexts/locations (e.g., type of ecosystem, geography, scale or scope, community type - Tribal vs non-Tribal, etc)

- Depends on the person that's speaking to it
- Who is making the testimonial - thinking local, the person who is incentivized by the project

How difficult is the indicator for non-scientists to understand?

- Naturally from the lay person, not technical

How frequently should it be measured? For how long?

- Pre and post-framework (before and after activity takes place)
- Post testimonial could frame the pre (e.g., before this restoration, this area was x, y, z)

What might trend data look like and how would we measure success?

- Ripple effect

Has anyone collected data on this indicator before? Who?

- GLRI (25th anniversary) - did the Tribal perspective, rural perspective, more

What else is missing?

- People have asked Tribal members for testimonials but don't follow cultural cues; mindful of who you are talking to and asking for testimonials
- Would be uncomfortable if your only data source is testimonials; testimonial or pull quote is powerful, but maybe shouldn't be used as its own assessment

Appendix E: Indicator Frameworks

Group 4: Habitat and Species Protection	**M.O. #:** 1.1/1.2
Indicator 2 name: Recreational Opportunities 4.1. Protect, enhance and increase resilience of habitats necessary for sustaining native aquatic and terrestrial species important to the Great Lakes ecosystem.	**Definition:** Recreation opportunities (fishing, hunting, birdwatching, boating, kayaking, hiking, nature photography) Measuring participation rates and satisfaction with water-based recreation
Why is the indicator relevant to the management objective? ● Funding for restoration often comes from hunting/fishing licenses ● Recreationists might support the system/groups doing restoration work if they develop a love/appreciation for the habitat	
How is the indicator actionable? (i.e. how would it inform different management or policy approaches) ● Yes - fishing and hunting help move things along (e.g., salmon introduction)	
Who wants or would make use of the indicator? ● State agency policymakers	
What program might this serve? (i.e. who would use this data and how)? ● Water trail/corridor initiatives	
Is the indicator feasible to assess? How so? (e.g., cost, person power, etc.) ● Satisfaction may be hard to assess ● Hard to capture duplicates (e.g., you can't know if it's someone's first time on the boat, or their fifth)	
Who might measure this indicator (Agency, managers, communities, NGO, etc)?	
What scale should the indicator be measured at? ● Many times aggregated at a state level and can't be disaggregated to a meaningful unit of management.	
How might/could the indicator be tailored to different contexts/locations (e.g., type of ecosystem, geography, scale or scope, community type - Tribal vs non-Tribal, etc) ● Easily tailored	
How difficult is the indicator for non-scientists to understand?	

Appendix E: Indicator Frameworks

● Generally not too difficult to understand (use numbers are pretty straightforward)
How frequently should it be measured? For how long?
What might trend data look like and how would we measure success? ● Participation is a proxy for desirability
Has anyone collected data on this indicator before? Who?
What else is missing? ● Approval processes may be complex (e.g., state DNR may take too long) ● Related to public access; (has many components; access is defined by the usage) ● Still may need to deal with negative public perception.

Appendix F: Identified Next Steps

Near-Term Goals

- Develop hold statement before report comes out
- Workshopping indicators with Samantha GLC
- Define audience for these indicators
- Write up results for participants of workshop
- Define language of indicators
- Narrow and specify indicators to smallest definable level
- Synthesize indicators with tribes, organizations, other GL coastal symposium (Oct 26-28)
- HD folks to dive in (KR + BH + LB)
- Develop a list of GL (communities) that need their temperatures taken and methods (eg., fishers, farmers, tribes, water drinkers, retirees)
- Opportunity to build relations with GL tribes
    - Opportunity to build power and shift paradigms
- Persistence in building relations
- Define terminology
    - Social
    - Human dimensions
- Determine how/when/where to reconvene this group and how to fund
- Review conference agenda for human dimensions sessions and speakers or leaders

Medium Term Goals

- GLMBOs resistance to indicators and limiting factors
- CSMI lake cruises and data collection
    - How to integrate HD
    - Meghan K Collab on this
- Identify scale(s) indicators should be collected at
- Develop case studies showing effective use of HD indicators
- Show accessible, affordable cases
- Develop case studies for effective use to demystify process
- Develop tools for project managers to implement HD at project scale
- Pilot draft indicators with ACO CAS Milwaukee River
- GLGLR post doc to do HD survey
- Take indicators back to resources with community and out networks
    - Lake superior Research reserve
- Expansive thinking and build relations across ways of thinking and disciplines (eg., Indigenous studies, humanities)
- Funding for indigenous studies doing expansive thinking humanities-based research/work
    - At NGOs and other organizations
- Seek seed funding for GL social science/human dimensions center of excellence and identify a director

Appendix F: Identified Next Steps

- IAGLR 2027
    - K Williams/M Klasic on planning communities
    - Get people involved in Duluth

Long Term Goals

- Understand resistance to HD indicators and how to build buy-in
- Draft text and build support for HD indicators in GLRI action plan V
- Identify funding apps for proposal development with indicator criteria
- Bring social indicators info to Grant Funding Scoring
- Develop tools to help project managers incorporate HD indicators into projects
- Think 7 generations ahead
- Persist
- ESTABLISH LONG TERM HD INDICATORS FOR GL !!!

CIGLR Great Lakes Social-Ecological Indicators Summit
Attendee List

First Name	Last Name	Organization/Affiliation	Email address
Tori	Agnew-Camiener	Michigan Sea Grant	agnewcam@umich.edu
Liz	Berg	USFS	elizabeth_berg@fws.gov
John	Bratton	LimnoTech	jbratton@limno.com
Stuart	Carleton	Illinois-Indiana Sea Grant	carltons@purdue.edu
Kaeley	Cole	Bay Area Restoration Council	kaeley@bayarearestoration.ca
Kira	Davis	Native American Fish and Wildlife Society	kira.davis@nafws.org
Patrick	Doran	The Nature Conservancy	pdoran@tnc.org
Molly	Flanagan	Fred and Barbara Erb Family Foundation	mflanagan@erbff.org
Bob	Holsman	DJ Case + Associates	bob@djcase.com
Matt	Jurjonis	Auburn University - College of Forestry, Wildlife & Environment	mdj0048@auburn.edu
Nathan	Kroeze	Great Lakes Commission	Nkroeze@glc.org
Chris	McLaughlin	International Joint Commission Water Quality Board	chris@backloop.ca, chris@bayarearestoration.ca
Josie	McCarthy	U-M Water Center	mjosephi@umich.edu
Samantha	Miller	Great Lakes Commission	smiller@glc.org
Sarah	Miller	U-M Water Center	milsar@umich.edu
Cheryl	Nenn	Milwaukee Riverkeeper	cheryl_nenn@milwaukeeriverkeeper.org
Kiandra	Rajala	U.S. Fish and Wildlife Service	kiandra_rajala@fws.gov
Todd	Redder	LimnoTech	tredder@limno.com
Jessica	Rudnick	University of Illinois Extension	jrudnick@illinois.edu
Amanda	Shankland	Toronto Metropolitan Research University	ashankla@torontomu.ca
Mike	Shriberg	UM-SEAS / U-M Water Center	mshriber@umich.edu
Tennessee	Swearingen	U-M Water Center	tswearin@umich.edu
Noah	Webster	UM Institute for Social Research	njwebs@umich.edu
Molly	Wick	Lake Superior National Estuarine Research Reserve	mollwick@gmail.com