

Great Lakes Horizon Scanning Pilot Workshop

(October 7-8, 2025)



OVERVIEW

The U-M Water Center convened this workshop to launch the Great Lakes Horizon Scan process. The goal was to identify “weak signals” of environmental strain before they become the blinking red lights of crises.

Over time, the Great Lakes community has been caught off guard by emergent threats—from invasive species to persistent toxic chemicals, excess nutrients, and the Flint Water Crisis. Too often, management, governance, and stewardship organizations have had to respond reactively. The horizon scanning process is a proactive approach designed to surface potential socio-economic and ecological issues well in advance and determine, together, how to avoid or mitigate them. At a time when federal institutions and funding are facing significant declines, this process supports a forward-looking, collaborative, and resilient future for the Great Lakes and the institutions that steward them.

The University of Michigan Water Center is committed to facilitating a trusted Great Lakes horizon scan, with this workshop as a key first step. We also recognize that horizon-scanning is not new; Indigenous communities have been planning for the seventh generation for millennia and have long built resilience into their systems and relationships. Yet in periods of disturbance and uncertainty, it is especially important to draw on the “wisdom of the crowds” to scan the horizon and plan for a more sustainable future.

Horizon Scanning Pilot Meeting Objectives

The workshop was convened by the University of Michigan Water Center at the Graduate Hotel in Ann Arbor, MI, USA, on October 7–8, 2025, with the following objectives:

- Develop a shared understanding of what horizon scanning is and its potential benefits to individual practice and the Great Lakes region.
- Identify Great Lakes–specific opportunities for conducting horizon scanning.
- Identify potential general and Great Lakes–specific obstacles to horizon scanning.
- Identify key elements necessary for a trusted Great Lakes horizon scanning process.
- Identify up to six emergent issues and pilot components of the horizon scanning process.

The Great Lakes Horizon Scanning workshop brought together a carefully selected group of scientists, policymakers, and community leaders to identify emerging issues, opportunities, and barriers shaping the future of the region (see Appendix A for the attendee list and Appendix B for the agenda).

Horizon Scanning Process

Horizon scanning is a systematic, forward-looking process used to identify and assess emerging environmental, technological, and socio-economic issues that could shape the future of a particular system, organization, or region. Its goal is to detect early signals of change, often weak or nascent, and analyze their potential implications before they fully materialize. In doing so, horizon scanning enables policymakers, scientists, and decision-makers to anticipate risks, capitalize on opportunities, and prepare strategic responses to possible future scenarios (Bengston, 2013; Hines et al., 2019).

A successful horizon scanning process is built on trust, transparency, and inclusivity. Sound science from credible experts is essential, but developing a common language and shared purpose among diverse stakeholders can be equally important. To be effective, the process must clearly articulate how input will be gathered, evaluated, and incorporated, with multiple opportunities for engagement.

The process typically begins by defining the scope and objectives of the scan—one of the major accomplishments on the first day of this workshop. Establishing a clear problem statement at the outset provides focus and accountability, while iterative feedback ensures adaptability as new insights emerge. Defining scope includes clarifying the area of focus, determining key issues of concern, and establishing desired outcomes, such as identifying emerging threats, opportunities, or research priorities.

Once the scope is set, the information-gathering phase begins, drawing on a wide array of sources, including academic and grey literature, regulatory documents, media, expert interviews, and even social media and online data platforms (Schindler & Baena, 2023). This information is analyzed through a combination of qualitative and quantitative techniques, such as trend analysis, the Delphi method, scenario planning, and environmental scanning, which are often supported by automation-based tools like text mining to manage large datasets (Veenhoff et al., 2025).

The next critical stage involves sense-making, or the interpretation of raw information to identify patterns, clusters, and signals of change that might indicate potential disruptions or transitions (Abdelhakim et al., 2024). The sense-making portion of the horizon scan took place on the second day of the workshop. In this

phase, experts and stakeholders assess signals, cluster related risks, and evaluate their potential impacts, both positive and negative, on the defined system (Muench et al., 2024). Analysts also examine underlying driving forces, such as political, economic, or ecological trends, and use them to construct plausible future scenarios through methods like backcasting and cross-impact analysis. This stage allows for a nuanced exploration of how multiple factors may interact to produce cascading or compounded effects.

Following analysis, horizon scanning emphasizes prioritization and strategic planning. This step identifies the most critical emerging issues and assesses their urgency, severity, and potential consequences. These insights inform the development of adaptive strategies, management plans, and policy recommendations rooted in a forward-looking understanding of risk and opportunity (Bengston, 2013).

The final stage involves communication, monitoring, and iteration; sharing results with relevant stakeholders, establishing systems to track trends over time, and regularly updating the scan as new information emerges (National Academy of Sciences, 2020). Throughout, effective horizon scanning depends on diverse stakeholder engagement, flexibility, and continuous feedback to ensure the process remains relevant and responsive to changing contexts.

Overall, by identifying weak signals and early indicators of change, horizon scanning helps decision-makers anticipate risks and seize opportunities before they fully emerge. Discussions in the workshop reflected both optimism about the power of collaboration and proactivity, as well as concern about the fragility of current social, political, and ecological systems. Through shared dialogue, participants explored how horizon scanning could guide proactive action, foster trust, and strengthen resilience across the Great Lakes basin.

WORKSHOP OUTCOMES

Potential for Horizon Scanning Application in the Great Lakes

Workshop participants concluded that the Great Lakes region offers a strong foundation for horizon scanning, supported by engaged research networks, active local organizations, and deeply invested residents. Leveraging existing trust and expertise is key to sustaining engagement and expanding participation. Integrating horizon scanning into established bodies, such as the Great Lakes Advisory Board or Task Force, could help ensure that foresight becomes an ongoing, institutionalized practice.

Authentic community engagement is both a value and a necessity. Reaching beyond traditional scientific and policy circles to include underfunded agencies, grassroots organizations, Indigenous communities, and local institutions will enrich the process with lived experience and ensure emerging issues are viewed through social, cultural, and public health lenses.

Artificial intelligence tools offer the ability to scan volumes of information, identify patterns, and flag weak signals of change. Private-sector forecasting and innovative approaches such as “reverse scans,” which begin with known challenges and work backward, also represent promising models for strengthening future horizon scanning efforts.

Enabling Conditions, Opportunities, and Obstacles to Implementing Horizon Scanning

While enthusiasm for horizon scanning in the Great Lakes is high, participants identified several obstacles that must be addressed:

- **Persistent silos:** Disconnection between water quality and natural resources (e.g., fisheries) limits interdisciplinary collaboration.
- **Political and funding instability:** Federal support is fragile, and political shifts can affect information integrity and funding reliability.
- **Relevance and engagement:** Long-term foresight may be deprioritized if not linked to personal relevance and tangible benefits (e.g., public health, economic resilience).
- **Capacity constraints:** Tribal nations and smaller agencies often lack stable funding needed for long-term thinking.
- **Emerging pressures:** Rising freshwater demand from new industries, loss of winter conditions, and unequal water access signal urgent concerns.

Participants agreed that overcoming these obstacles will require challenge-based long-term funding, integrated governance structures, and clear linkages to real-world benefits to sustain engagement and trust.

Key Elements of a Trusted Process

To undertake a full horizon scan, workshop participants identified six key elements:

- **Transparency:** Clearly communicate how public and stakeholder input informs decisions.
- **Accountability:** Begin with a well-defined problem statement that guides the scan.
- **Inclusivity:** Cultivate diverse participation from research, policy, community, and underserved groups.
- **Iterative learning:** Integrate ongoing feedback to adapt the process.
- **Communication:** Use creative strategies (arts, technology) to strengthen engagement and understanding.
- **Equity and trust:** Embed these principles throughout the process so outcomes resonate across social, cultural, and health dimensions.

Pilot Horizon Scans

Before the workshop, participants completed a pre-survey identifying 1-3 issues that met the following criteria:

- The issue is not yet adequately addressed in the Great Lakes region and remains unknown or “fuzzy.”
- If it materialized, it would generate short- or long-term disruption (economic, social, or environmental).
- There is no clear governance or management home for the issue, nor effective policies to address it; it is not a current policy priority.
- We lack a clear understanding of potential impacts and/or ways to address them.
- There is a research gap.
- There is a programmatic gap.
- The region lacks a cross-sector partnership network to address it.

The issues most frequently identified were:

- Rising freshwater demand (e.g., from data centers) and changing freshwater supply
- Microplastics and emerging contaminants
- Loss of resilience within Great Lakes governance systems
- Climate migration and its impact on water resources
- Pressure to export Great Lakes water
- Impacts of new invasive species (terrestrial and aquatic)
- Providing affordable water for all
- Resilience of Great Lakes shorelines and coastal regions
- Measuring progress in the Great Lakes beyond ecological indicators
- Loss of winter in the Great Lakes region
- Health of and funding for water infrastructure
- Dam removal and future fisheries management
- Access to the Great Lakes

EMERGING ISSUES

We presented these topics to the group at the end of the first day and used a sticky-dot voting exercise to identify priority emerging issues for the pilot horizon scan. Five topics stood out and were explored in depth by five groups of 4–6 individuals throughout the second day of the workshop.

1. Rising Freshwater Demand: Driven by industrial growth, data centers, and population shifts, rising freshwater demand poses significant ecological, economic, and social risks.

Impacts	Driving Forces	Future Scenario
<ul style="list-style-type: none"> • Positive: Cleaner water through new technologies and increased recycling to replenish aquifers; economic opportunities, utility and construction jobs; challenges that foster collaboration and improved governance. • Negative: Loss of habitat, wetlands, and groundwater; degraded water quality; resource competition; public health risks; rising costs and affordability issues for utilities and treatment. 	<ul style="list-style-type: none"> • Ecological: Climate change and drought. • Economic: Industrial expansion (particularly data centers) competes with agricultural water needs. • Social: Perception of an unlimited water supply in the Great Lakes; population migration increasing demand. • Political: Pro-business/tech-oriented policies and fragmented local decision-making encourage short-term choices. 	<p>A shared-resource mindset grounded in both short- and long-term goals. A transparent, adaptive water budget process that responds to ecological change and population shifts, supported by innovative technologies and global best practices.</p> <ul style="list-style-type: none"> • Next Step: Education and research to guide long-term strategy.

2. Microplastic Contamination: Emerging pollutants challenge existing regulatory regimes and require new governance approaches rooted in precaution and prevention.

Impacts	Driving Forces	Future Scenario
<ul style="list-style-type: none"> • Positive: New scientific understanding; expanded monitoring; job creation; improved coordination among municipalities; opportunities to strengthen governance; increased public advocacy. • Negative: Disrupted trophic interactions; altered biogeochemical cycles; higher risks from invasive species, costly cleanup; agricultural impacts; losses in recreation and tourism revenue; poor public health outcomes; negative public perception and media coverage. 	<ul style="list-style-type: none"> • Ecological: Ecosystems are passive recipients of accumulating microplastics. • Economic: Externalized production costs; remediation is not economically viable under current systems. • Social: Consumption and overconsumption preferences for convenience products; low public awareness. • Political: Difficult to regulate; significant corporate influence limiting regulatory action. 	<ul style="list-style-type: none"> • Next Step: Expand research and monitoring; increase staffing resources for microplastic cleanup.

3. Governance Challenges: Fragmented agreements, overlapping jurisdictions, and political tensions undermine collective response capacity.

Impacts	Driving Forces	Future Scenario
<ul style="list-style-type: none"> • Positive: Shared waters enable collaboration; strengthened monitoring, target setting, and stakeholder involvement; new opportunities to rebuild resilient systems. • Negative: Current agreements do not adequately address climate change; emerging issues fall outside existing structures; inequitable cost-sharing; disconnect between governance and societal value; too many decision-makers and too little cooperation. 	<ul style="list-style-type: none"> • Ecological: Disruption of scientific collaboration due to funding cuts; climate change and groundwater threats. • Economic: Massive water demands from AI data centers; increased recreation in the Great Lakes. • Social: Growing public appreciation of the Great Lakes; new issues that do not neatly fit current agreements; humanitarian water needs beyond the Compact. • Political: Tension between the U.S., Canadian, Tribal, and First Nations governments; uncooperative leaders; limited accountability. 	<ul style="list-style-type: none"> • Next Step: Develop accountable, effective governance systems that support a resilient Great Lakes region and healthy communities.

4. Water Affordability: Deep and persistent social inequities stem from historical underinvestment, structural racism, and the imperative to treat water as a fundamental human right.

Impacts	Driving Forces	Future Scenario
<ul style="list-style-type: none"> • Positive: Sewer separation reduces CSO; economic development; reduced health care costs; improved public health; greater trust in government. • Negative: Reduced resilience due to short-term decisions; CSO and flooding; costly emergency repairs; lost economic opportunities; weakened connection to local environments; eroded trust in institutions. 	<ul style="list-style-type: none"> • Ecological: Industrial contamination; increased demand; abundant surface water; new scientific knowledge. • Economics: Chronic underinvestment; rising labor and material costs; population decline; growing household and municipal debt. • Social: Structural and institutionalized racism; segregation; white flight; low trust in institutions. • Political: Short-term thinking; inconsistent policy; limited accountability to communities of color; low voter participation. 	<ul style="list-style-type: none"> • Next Step: Invest in water infrastructure to improve affordability and access at both household and community levels.

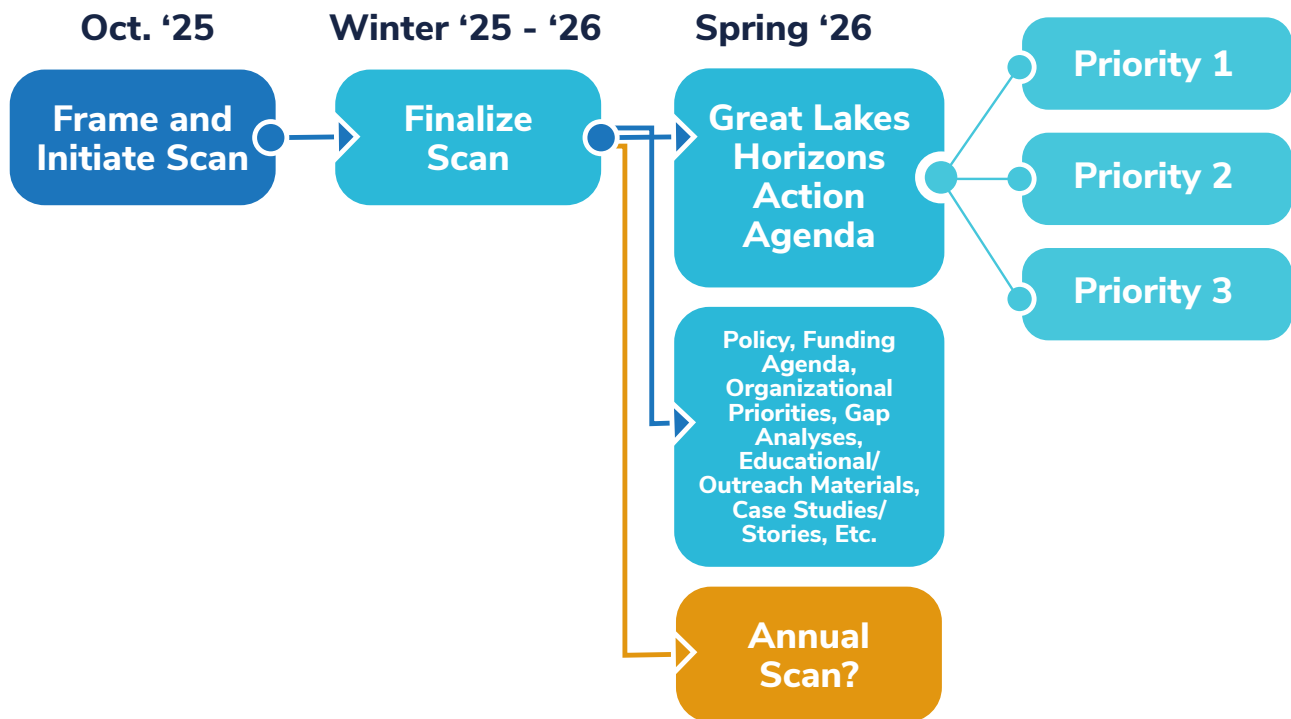
5. Declining Winter: Climate change threatens ecosystems, local economies, cultural identities, and Indigenous rights as winters become shorter, warmer, and less predictable.

Impacts	Driving Forces	Future Scenario
<ul style="list-style-type: none"> • Positive: Milder winters; lower heating costs; extended tourism seasons; increased data to inform policy. • Negative: Shifting climate zones; species loss; forced migration; increased invasive species and pests; agricultural impacts; cultural loss; shipping and Coast Guard challenges from inconsistent ice conditions. 	<ul style="list-style-type: none"> • Ecological: Climate change; altered atmospheric composition. • Economic: Industrial emissions; manufacturing and shipping; carbon-intensive activity. • Social: Lack of consensus on climate change causes; distrust in science; reluctance to join international agreements; culture of convenience. • Political: Energy policy gaps; weak accountability; limited incentives for green-tech transition. 	<ul style="list-style-type: none"> • Next Step: Expand education, strengthen policy implementation, and plan proactively for long-term impacts.

These priorities reflect intertwined ecological, economic, and social dimensions that require integrated governance, equitable investment, and foresight-driven decision-making.

NEXT STEPS

The horizon scanning process developed through this workshop lays essential groundwork for a full regional scan. There is strong enthusiasm for a comprehensive Great Lakes Horizon Scan in 2026, integrating ongoing research, stakeholder feedback, and community participation. Next steps include refining emerging threats, deepening engagement, and developing a roadmap to sustain horizon scanning as a living tool for the region's long-term resilience.



APPENDICES

- Appendix A: 2025 Great Lakes Horizon Scanning Attendee List
- Appendix B: Great Lakes Horizon Scanning Workshop Agenda
- Appendix C: Opportunities and obstacles notes
- Appendix D: Impacts, drivers, and future scenarios
- Appendix E: Uses and products poster photos
- Appendix F: Horizon scan issues poster photos
- Appendix G: Key elements of a trusted process poster photos
- Appendix H: Bibliography