



## ***Full Abstract Agenda***

### **TUESDAY MARCH 3, 2026**

**9:00 AM - R Coding Tips Workshop** - optional, pre-registration required  
Gus Pendleton, Lake Superior National Estuarine Research Reserve; Cornell University

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**1:00 PM - Steady Steps Toward Restoration** (Yellowjacket Union Great Room)

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**1:00 PM - Welcome**

**1:25 PM - Grit & Gratitude Reflections - Saving the Superior Municipal Forest**

**1:35 PM - Reintroducing Ishkode (fire) to Wisconsin Point Through Collaborative Stewardship**

Vern Northrup\*, Fond du Lac Band of Lake Superior Chippewa  
Camron Vollbrecht, Superior Fire Department  
Jeremiah Rule, Fond du Lac Band of Lake Superior Chippewa Forestry and Fire Program

Wisconsin Point, half of the sandbar that separates the St. Louis River from Lake Superior, contains rich cultural and ecological history. For centuries, Ojibwe people living on the Point cultivated relationships with fire, known as Ishkode in Ojibwe, for myriad reasons, including blueberry regeneration, red pine pitch essential for building birchbark canoes, promoting the growth of medicinal plants, and taking care of the land. In the early 1900s, when fire suppression policies took effect and Ojibwe people were removed from the Point, these intentional fires that shaped the landscape ceased.

Results from a Wisconsin Sea Grant funded project led by Dr. Evan Larson (UW-Platteville) and Nisogaabokwe Melonee Montano (member of the Red Cliff Band of Lake Superior Chippewa, graduate student at UM-Twin Cities), which combined the analysis of fire scars in tree rings and Ojibwe history and knowledge, highlighted what Ojibwe people have always known, that continuous intentional fires were set on the landscape as an act of reciprocity and necessity.

Consequentially, together in coordination with forestry and fire professionals from the sovereign Fond du Lac Band of Lake Superior Chippewa (Ojibwe), City of Superior and Superior Fire Department, The Nature Conservancy, and the Lake Superior National Estuarine Research Reserve, a 22-acre cultural prescribed fire was conducted in the red pine forest of Wisconsin Point in early November 2025. The main goals of this fire were promoting red pine regeneration, blueberry growth, and other culturally significant plants. Additionally, fire was implemented as a way to open the forest canopy, clear brush, and control non-local species. This fire is the first in an ongoing series of planned burns that will help to restore, revitalize, and heal relationships with the lands of Wisconsin Point and with each other in our communities.

*Keywords: fire, indigenous knowledge, collaboration, restoration, stewardship*

### **1:55 PM - Year One Response to Allouez Bay Wetland Restorations and Next Steps**

Tom Prestby\*, Audubon Great Lakes  
Molly Wick, Wisconsin Dept. of Natural Resources  
Cherie Hagen, Wisconsin Dept. of Natural Resources

Audubon Great Lakes (AGL) and Wisconsin Department of Natural Resources (WDNR) are leading a project with approximately a dozen other partners to restore degraded habitat for marsh birds, fish, and other wildlife in Allouez Bay by managing invasive cattail and diversifying the structure of the large coastal wetland to increase hemi-marsh conditions.

Hemi-marsh construction in 2024 included the creation of a network of interconnected channels, pools, mounds of varying height and shape, and mimic muskrat dens. Invasive cattail was mowed and cut by hand in 2024 to complement the hemi-marsh construction. Response of the wetland was evaluated in 2025 by vegetation and avian monitoring and a partner paddle tour.

Observed responses included promising natural growth of native wetland vegetation including wild rice on the borders of the channels and pools and growth of natives from custom seed mixes in several areas, but also recolonization of invasive cattails in some areas where they were cut.

We will present details of the vegetation and avian response during the first year after restorations including sharing drone imagery and describe original lessons learned. We will also detail follow-up cutting of invasive cattails with hand tools that occurred in 2025. As we continue to implement adaptive restoration at the site, we will also discuss possible next steps in continued Phase One restorations in Allouez Bay, and give a brief overview of plans for Phase Two, which are currently in development.

*Keywords: marshbirds, restoration, hemi-marsh, adaptive*

### **2:15 PM - Restoring the Sturgeon Population in St. Louis River River**

Shawna Weaver\*, Great Lakes Aquarium  
Miranda Rinne\*, Great Lakes Aquarium  
Jay Walker, Great Lakes Aquarium

Lake sturgeon populations plummeted in the headwaters region with the arrivals of colonization and industrialization. Disregard for and misunderstanding of sturgeon broke thousands of years of

human-sturgeon relationship and fractured our fragile ecosystem. For the last few decades, sturgeon restocking has helped sturgeon populations begin to stabilize. Restoration projects from estuary cleanup to fishing regulations have further helped sturgeon come back both above and below the dam. Lessons learned through these efforts have informed a new phase in sturgeon population restoration.

In partnership with the DNR and the Fond du Lac Tribe, Great Lakes Aquarium has broken ground for a sturgeon rearing trailer and new exhibit. The rearing facility will utilize water directly from the St. Louis River Bay, so fingerlings are released annually into waters they already know.

The project, and the exhibit, will be directly informed by the descendants of Native Americans who had navigated life on the St. Louis River with sturgeons ever-present. Their story of our region's historical human-sturgeon relationship will frame our goals for sturgeon, and our multicultural life on the estuary, into the future.

*Keywords: sturgeon, fish hatchery, sturgeon rearing*

## **2:35 PM - St. Louis River Area of Concern (AOC) 101**

Matt Steiger\*, Wisconsin Department of Natural Resources

The St. Louis River has been designated as an Area Of Concern (AOC) since 1987. Have you ever wondered what this really means? What were the environmental problems that led to this program and the St. Louis River being included on this list?

This AOC 101 presentation will introduce the AOC program, terminology and process that is planned for delisting. Agencies tasked with AOC responsibilities and many partners have been making progress to address these problems for many years. This AOC refresher will define the scope of the program, highlight some of the major work that has happened over the years, and put the St. Louis River in context with other Great Lakes AOCs.

*Keywords: Area of Concern, restoration, program scope*

## **2:50 PM - 3:10 PM - BREAK**

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### **3:10 PM - Steady Steps Toward Restoration (Yellowjacket Union Great Room)**

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## **3:10 PM - St. Louis River Area of Concern Annual Progress Update**

Tyler Kasper\*, Minnesota Department of Natural Resources  
LaRae Lehto, Minnesota Pollution Control Agency  
Matt Steiger, Wisconsin Department of Natural Resources  
Grace Leppink-Walz, Fond du Lac Band of Lake Superior Chippewa

Implementation of the St. Louis River Area of Concern Remedial Action Plan continues to make progress toward delisting. Over 80% of the defined management actions are complete and four of nine Beneficial Use Impairments have been removed.

This presentation will highlight what work has been done since the last Summit, along with planned 2026 work and milestones. The strategy for completing remaining work, removing Beneficial Use Impairments, and delisting the St. Louis River Area of Concern will be shared.

*Keywords: area of concern, delisting, remedial action plan*

### **3:30 PM - Celebrating Completion of MN Remediation Sites**

LaRae Lehto\*, Minnesota Pollution Control Agency  
Steve Schoff, Minnesota Pollution Control Agency  
Brad Leick, Minnesota Pollution Control Agency

The St Louis River Area of Concern remedial management actions in Minnesota are complete. Over 640,000 cubic yards of contaminated sediments from legacy industrial sources were remediated across eight sites.

Remedial caps were installed at Minnesota Slip, Slip 3, Slip C, and the Azcon/Duluth Seaway Port Authority Slip. At the Ponds behind Erie Pier and Munger Landing sites, 155,000 cubic yards of contaminated sediments were dredged, removed, and disposed of at offsite landfills. Activated carbon amendments were placed at the Scanlon Reservoir and Thomson Reservoirs to bind contaminants and protect aquatic organisms.

The Minnesota Pollution Control Agency (MPCA) remediation team will present a summary of the remedial actions at each of the sites along with the next steps for long-term monitoring and maintenance.

*Keywords: remediation, construction, dredging, capping*

### **3:45 PM - LAMP Implementation in the St. Louis River Estuary: Linking Local Actions to Lakewide Priorities and GLRI Funding into the Future**

Tyler Kasper\*, Minnesota Department of Natural Resources  
Cherie Hagen\*, Wisconsin Department of Natural Resources  
Jesse Martus\*, Minnesota Pollution Control Agency

The Lake Superior 2020-2024 Lakewide Action and Management Plan (LAMP) helps guide St. Louis River Area of Concern (SLRAOC) and non-AOC projects and efforts in the estuary. The LAMP closely aligns with Great Lakes Restoration Initiative (GLRI) Action Plan IV Focus Areas (1- Toxic Substances and AOC; 2-Invasive Species; 3-Green Infrastructure; 4-Habitat and Species; 5-Foundations for Future Restoration Actions) and can be a tool to link local priority projects to funding available in the five focus areas.

To assist with linking local priorities to GLRI Focus Area funding, some Great Lakes states, such as MN and WI, have LAMP Coordinators to perform this work. Since GLRI inception in 2010, Focus Area 1-AOC funding has been available to AOCs in the Great Lakes and utilized to assist completion of actions in the SLRAOC Remedial Action Plan. However, this funding will no longer be available for work in the estuary once the SLRAOC is delisted and other funds will be needed to complete future work.

In this presentation, LAMP coordinators from MN and WI will describe how coordination and implementation of LAMP actions in the St. Louis River estuary links to local priorities, provide examples of non-AOC GLRI funded projects/accomplishments and how they support/supplement current and previous AOC projects, and discuss the importance of utilizing the LAMP to connect local priorities to the other, non-AOC, GLRI Focus Area funding once the St. Louis River is no longer an AOC.

*Keywords: area of concern, delisting, lakewide action and management plan, great lakes restoration initiative, funding*

**4:25 PM - Transition to evening Poster Session**

**4:30 - 6:00 PM - Poster Session (Yellowjacket Union Atrium)**

*\*Poster abstracts listed at the end of this document.*

**WEDNESDAY MARCH 4, 2026**

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**9:00 AM - The River Runs Through Us All (Yellowjacket Union Great Room)**

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**9:00 AM - Welcome - Remarks from Douglas County Board of Supervisors Chair Mark Liebaert**

**9:15 AM - Connect & Collaborate Preview**

**9:40 AM - Grit & Gratitude Reflections - The Early Days of the EPA**

**9:50 AM - Starting Out in Conservation: The Maajii Akii Gikenjigewin Crew**

Emily Lockling\*, Conservation Corps of Minnesota and Iowa

Hillary Olsen\*, Conservation Corps of Minnesota and Iowa

Indigenous stewardship is the sustainable management of land and resources based on the knowledge, practices, and values passed down through generations of Indigenous peoples. Oftentimes, Indigenous stewardship is not as valued or recognized as western practices.

The Maajii Akii Gikenjigewin crew was started in 2023 and continued through the 2025 field season, providing natural resource opportunities to young adults from the Fond du Lac reservation area. The crew prioritizes personal and professional growth while developing conservation skills, receiving hands-on training, and engaging with the Fond du Lac community.

This presentation will highlight what work has been done in and around the St. Louis River Area of Concern (AOC), and will lay the foundation for the next field season.

*Keywords: conservation, young adult, indigenous*

## **10:10 AM - There is No Poop Fairy: 15 years of Regional Stormwater Knowledge, Attitudes, and Practices**

Lisa DeGuire\*, Regional Stormwater Protection Team; City of Superior  
Ryan Granlund\*, Regional Stormwater Protection Team; City of Duluth

The Regional Stormwater Protection Team (RSPT) is an interstate collaborative that seeks to enhance our water resources through stormwater pollution prevention and education within the Western Lake Superior watershed.

Every five years since 2010, RSPT has hired Zenith Research Group to do a large-scale public survey of regional stormwater knowledge, attitudes, and behaviors. In 2025, online survey responses were collected from 741 people in the greater Twin Ports region.

This presentation will share some of the findings from the 2025 public survey, highlight general shifts in knowledge and perceptions around stormwater over the past 15 years, and outline key takeaways for future public outreach.

*Keywords: stormwater, survey, public outreach, collaborative*

## **10:25 AM - A Vanishing Estuary**

Deanna Erickson\*, Lake Superior National Estuarine Research Reserve

A recent analysis of historic maps and water levels conducted across National Estuarine Research Reserves revealed that 53% of the emergent and hemi-marsh wetlands that edge the St. Louis River estuary have been lost over the last 160 years. Comparisons of historic aerial imagery and contemporary satellite images reveal that some islands are continuously shrinking, berms that once protected back bays have gone missing, and features like Kilchlis Meadow have eroded and nearly disappeared.

While some explanations for these losses are straightforward, such as the dredging of wetland areas to establish shipping channels, others are complex and not well studied or understood. These may include the influence of intense flooding, hydroelectric dams, the role of seiche and flow velocity, dredged channels, and the continuous but slow-moving effects of isostatic rebound.

This short talk uses visual evidence of erosion and loss of features in the estuary to pose questions that can drive research and restoration, and underscores the necessity of protecting the critical wetlands of the St. Louis River estuary.

*Keywords: erosion, sedimentation, wetland loss, islands, habitat*

## **10:30 PM - 10:50 AM - BREAK**

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**10:50 AM - The River Runs Through Us All (Yellowjacket Union Great Room)**

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**10:50 AM - Community Engagement for Conservation: A Toolkit**

Molly Wick\*, Wisconsin Department of Natural Resources  
Sarah Beaster, Minnesota Land Trust  
Gini Breidenbach, Minnesota Land Trust

Community engagement is increasingly recognized as essential to ensure conservation actions result in the greatest possible positive impact on local communities. As such, community engagement is one of 12 priorities for the Lake Superior Headwaters Sustainability Partnership, with a goal for St. Louis River estuary communities to “generate, inform, co-develop, contribute to, and evaluate the actions of the Headwaters Partnership, with reciprocal responsiveness, resources, and support from the Partnership.”

To support agencies and organizations in work towards this goal, we are developing a voluntary Headwaters Partnership Community Engagement Toolkit. The toolkit contains job aids to help plan and implement community engagement for conservation projects in the St. Louis River estuary. This includes worksheets to identify attributes of potentially impacted communities, to define appropriate community engagement goals, and to identify appropriate engagement actions with respect to those community attributes and goals. The toolkit includes an engagement activity menu with possible engagement actions (along with resources and case study examples for each), and an adaptable template engagement plan.

We have also compiled a resource library for those interested in building specific skills and knowledge in community engagement to support conservation. The toolkit is designed to be highly adaptable for engagement goals ranging from informing community about projects to empowering community to engage in conservation decision-making. These components of the toolkit will be available in 2026. Additional components are planned and include a job aid to support grant language and budget development for community engagement.

*Keywords: community engagement*

**11:05 AM - Building Collaborative Capacity: Designing for the Multiple Dimensions of Trust**

Gini Breidenbach\*, Western Michigan University & Minnesota Land Trust

Trust is one of the most powerful forces shaping collaborative work, and it grows through intentional, well-designed practices. Research in natural resource management settings shows that trust is multidimensional, involving rational trust (confidence in competence and reliability), procedural trust (confidence in the fairness and transparency of collaboration), and affinitive trust (confidence grounded in personal relationships and shared values). When collaboration is designed to support all three dimensions, participation deepens, communication improves, and groups are better able to make and implement decisions together.

Rational, procedural, and affinitive trust each develop through distinct pathways. Confidence in one another's competence and follow-through strengthens rational trust. Transparent, inclusive, and predictable processes foster procedural trust. Repeated interaction, respectful communication, and opportunities to

understand one another build affinitive trust. Because each dimension reinforces the others, effective collaboration requires deliberate design choices that create the conditions for all three to grow.

Specific design strategies can help. Clear roles, stable coordination structures, and predictable routines build rational trust. Transparent rules for how information is used and how decisions are made cultivate procedural trust. Structured dialogue and opportunities for informal connection support affinitive trust. Joint learning and collaborative interpretation of evidence strengthen trust across dimensions.

This presentation will introduce a practical conceptual model for interorganizational trust and share design recommendations that practitioners can use to strengthen rational, procedural, and affinitive trust in collaborative natural resource projects.

*Keywords: trust, collaboration, community engagement*

### **11:20 AM - Ecological Justice Hotspots in Chigami-Ziibiing**

Nicolette Slagle\*, Aalto University

Ecological justice is an emerging concept to re-set our relationship with the more-than-human world. Ecological justice rejects the false dichotomy between humans and nature and presents a framework for sustainability that decentralizes the economy.

Ecological justice is a concept with roots in environmental justice but focuses on justice for nature. It is commonly understood to consist of four aspects of distribution, participation, capabilities and recognition. In this presentation you will learn about a different conceptualization of ecological justice consisting of rights, agency, recognition and reconciliation. This re-framing of ecological justice foregrounds the rights of nature and asks us to critically examine our relationship with the more-than-human world.

Applying this concept to the Chigami-Ziibiing highlights how engaging in remediation and restoration processes can physically and metaphysically repair our relationship with nature.

During last year's summit, I hosted a networking session on ecological justice in the estuary. Participants were introduced to the concept and worked together in small groups to locate areas within the estuary that represented one (or more) of the aspects of justice. I also hosted two additional community workshops, following the same format. I have coded these responses and created maps of ecological justice hotspots within the estuary. During this presentation I will share these results, along with some potential ecological justice indicators. Finally, this presentation will open the question of how this framework could inform future work in the estuary.

*Keywords: ecological justice, reconciliation, rights, agency, recognition*

### **11:40 AM - Weaving the Stories and the People of the St. Louis River Together for Hope and Change**

Kris Eilers\*, St. Louis River Alliance

In the St. Louis River Estuary Area of Concern (SLRAOC), river-adjacent residents have been historically cut off from the river due to industry and legacy pollution. As a result, they have suffered disproportionate health consequences, barriers to resources that support well-being, and greater economic disparities.

Over the last five years the Alliance has been focusing on building relationships with residents of those neighborhoods in new ways, and connecting them to the resources they need to overcome barriers that have kept them from experiencing the river. Concurrently, a coalition of partners has begun to weave together people and their stories, events, and life-changing experiences with the river at the center. Early indications suggest positive change is emerging as collective listening and engagement progress.

This presentation will examine the outcomes achieved through several years of evolving authentic community engagement strategies and discuss how these efforts are influencing paradigm change, with the St. Louis River serving as a source of inspiration.

*Keywords: authentic connections, listening, collaboration*

### **11:55 AM - Enhancing Paddle Safety and Community Connection in the Twin Ports**

Kelsey Prihoda\*, University of Minnesota Sea Grant College Program

Natalie Chin, University of Wisconsin Sea Grant Institute

Madison Rodman, University of Minnesota Sea Grant College Program

The Minnesota Sea Grant extension program, Paddle Safe Twin Ports, launched in 2020 to address a recognized need for coordinated paddle sport safety efforts in western Lake Superior and the St. Louis River. The program's goal is to reduce water-related incidents while fostering safe, mixed recreational use of the Duluth-Superior working harbor. Outdoor recreation is a vital part of the region's economy. In St. Louis County alone, outdoor recreation contributed nearly 4% to the gross domestic product in 2024 and supported 3,700 jobs. Beyond economic value, spending time in nature offers significant benefits, including reducing stress, improving wellbeing, and promoting responsible stewardship of land and water. Paddle Safe Twin Ports is a celebration of the St. Louis River's restoration success because it represents the transition from disconnection with the river a generation ago to renewed relationship with the river today. It is a recognition that communities are reconnecting with the water by getting out on the water. This increased access necessitates providing clear information, education, and outreach. In recent years, Minnesota Sea Grant has expanded Paddle Safe Twin Ports to ensure prospective paddlers have the information they need to stay safe before launching. This presentation will detail these program updates, including new methods for surveying paddle craft launch sites, added features to the program website ([paddlesafetwinports.org](http://paddlesafetwinports.org)), and increased community engagement efforts. We will chart a course for future directions as we look ahead at the next five years of this program.

*Keywords: Paddle, Safety, Recreation, Community, Connection*

### **12:00 - 1:15 PM - LUNCH in the YU Great Room, with optional concurrent events**

#### **Career Session for Students: Learning from Each Other (YU Room 204)**

Students are invited to attend this free workshop at the St. Louis River Summit. At this event, you will:

- Share your experiences and learn from others'
- Hear from professionals in land and water careers
- **Discuss and work on** job search elements like **skills** beyond school, **networking** and building relationships, **resume** preparation, and **graduate school** considerations.

### **Legislative Listening Session hosted by Friends of the Lake Superior Reserve (YU Room 203)**

The Legislative Listening session is a chance for Summit attendees to interact with regional staff of our elected officials in Washington, D.C. and--new this year--we've also invited our state elected officials in Madison and St. Paul. We've invited all state and federal officials that represent the area around the St. Louis River estuary. After introductions by each staff person, we will informally go around the room and allow each attendee to describe to the legislative staff how federal funding has benefited the region, and how sustaining, or even growing funding, will help us do more. We've encouraged our guests to ask you questions as well. They will then take what they learned to their respective elected officials.

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### **1:15pm - Impacted Ecosystems (Yellowjacket Union Great Room)**

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#### **1:15 PM - Grit & Gratitude Reflections - A Little Help From My Friends**

#### **1:25 PM - Hydrologic and Pollutant Load Effects of Peatland Restoration in the St. Louis River Basin**

Christian Lenhart\*, University of Minnesota  
Emily Deering, University of Minnesota  
Randy Kolka, US Forest Service  
Jackson Brady, University of Minnesota  
Shubham Aggarwal, University of Minnesota  
Val Brady, NRRI  
Sarah Janssen, USGS

The University of Minnesota, NRRI, US Forest Services and other government partners have been investigating the impacts of peatland restoration on the hydrology and mercury load of three study sites in the headwaters of the St. Louis River basin. While peatland restoration has been successful at raising the water level back to pre-ditch elevations and slowing the breakdown of peat, there are some problems such as high methyl mercury levels in outflowing water, which accumulates in fish and is toxic to people.

The study, funded by LCCMR, includes field data collection, modeling and mesocosm studies. The study has a control site, two restored (rewetted) sites, and a ditched site at the Sax-Zim and Arlberg bogs. At each site we are measuring stream outflow, sampling for total mercury and methyl mercury (MeHg) as well as measuring weather variables and greenhouse gas fluxes with weather towers.

Data from 2024-25 showed that methyl mercury concentration and loads were greatest at the restored site #1. Preliminary data at restored site #2 had high concentrations but lower total loads because of the smaller drainage area and better filling of the ditch which reduced outflow. Hydrologically, peatland restoration retains water, which favors increased ET in the long term. In the short term (<10 years) there may be reduced ET over the impounded ditches. Water retention is more effective in headwater or smaller watersheds and with greater surface roughness through fill, logs and vegetation infill over time.

The study continues through the 2026 field season and parts of it beyond that. Our findings will help to inform future restoration design and management of peatlands to address the methyl mercury issues and other ecological issues.

*Keywords: peatland, restoration, hydrology, mercury, load*

## **1:45 PM - Salinity-based Effects on the Photochemistry of Dissolved Organic Matter within St Louis River**

Keagan Bailey\*, University of Minnesota-Duluth, Large Lakes Observatory  
Elizabeth Minor, University of Minnesota-Duluth, Large Lakes Observatory  
Justin Elliott, University of Texas A&M University-Corpus Christi  
Hussain Abdulla, Texas A&M University-Corpus Christi

Dissolved Organic Matter (DOM) is a ubiquitous component of aquatic carbon pools that affects light penetration in the water column and can interact with pollutants, including road salt that enters rivers and lakes, leading to different DOM photochemical reactions compared to those in systems with lower ionic strength.

In this study, we sampled water across a watercolor gradient from the St. Louis River to nearshore to offshore Lake Superior to examine how photodegradation reactions vary with DOM source and salinity. Samples were amended with an artificial seawater mixture to achieve salinities of 0, 5, 17, and 35 and then irradiated in a solar simulator.

Preliminary results show that photobleaching, a decrease in the absorbance of UV and visible light as determined by spectrophotometry, increases with greater salt content. Salt effects also increased the changes seen in optical proxies for DOM composition; the E2/E3 and slope ratios between 275-295 nm and 350-400 nm increased with both irradiation time and salinity, indicating shifts toward lower molecular weight ranges for DOM molecules. Excitation and Emission Matrices (EEMs) further indicate that higher salinity increases DOM humification, and there is a greater decrease in fluorescence intensity in the saline samples. Results also indicate that the salt addition may promote DOM flocculation. Ongoing experiments aim to distinguish salt-flocculation effects from DOM photochemistry across a salinity gradient.

Overall, our results indicate that when brown water is exposed to light, a greater shift in optical properties is observed when exposed to salt.

*Keywords: Salinity, Dissolved Organic Matter, Photochemistry, Salt-flocculation*

## **2:00 PM - Summary of the Dangers of Sulfate Pollution to the St. Louis River and Estuary**

Thomas Anderson\*, Tamarack Water Alliance

Sulfate based water pollution continues to be a controversial topic as the Minnesota Pollution Control Agency (MPCA) works to enforce sulfate standards on the Minnesota range. "Closer to home" proposed high sulfide mining near the St. Louis River watershed threatens to impact the St. Louis River and Estuary.

This presentation will outline the three main impacts of sulfate pollution, their potential effects on the environment and impacts to human health. Specifically, sulfate pollution can result in acidification due to the creation of sulfuric acid in the environment over time, increased production of highly toxic methylmercury that can bio accumulate in fish and the destruction of wild rice beds.

The presentation will provide references to further data and research in this area to encourage additional research.

*Keywords: sulfate pollution, methylmercury, AMD, wild rice, health*

## **2:20 PM - Environmental Justice and a Blueprint for More Equitable Lighting**

Todd Burlet\*, Starry Skies North  
Steve Wilbers, University of Minnesota

The St. Louis River Area of Concern (AOC) was established in 1987 to address a century of uncontrolled contamination of the watershed. Since then, State, Tribal, and National partners have achieved tremendous success in controlling and mitigating the damage caused by pollution. But even today one form of pollution in the AOC continues to grow unchecked.

That pollutant? Uncontrolled light pollution. Decades of research have shown that artificial light reduces biodiversity, damages the estuary's precious ecosystem, and harms human and ecosystem health. These impacts are all-pervasive, going beyond the harm done by air, land, and water pollution.

Delegates to the First National People of Color Environmental Leadership Summit in 1991 adopted 17 principles of Environmental Justice. These principles included the right to be free from ecological destruction, the right of all workers to a safe and healthy work environment, and the need to honor the cultural integrity of all our communities.

Residents living near the estuary are disproportionately impacted by light pollution, a legacy of the red-lining of past decades, but also employment practices still present today. As a result, racial minorities are being exposed to twice the level of light pollution as the white population.

This presentation will review the discriminatory lighting policies of both the past and the present, and it will offer a blueprint for more equitable lighting for both residents and the environment.

*Keywords: Justice, Environment, Culture, Ecosystem, Health*

## **2:40 PM - Effects of DEM Properties on Watershed Delineation Accuracy in the St. Louis River Area of Concern**

Taylor Moore\*, University of Wisconsin-Superior  
Raymond Lee, University of Wisconsin-Superior

Watershed delineation is a computational operation performed on a digital elevation model (DEM) in a Geographic Information System (GIS). This operation is vital because it identifies the land that drains to a given body of water; the attributes of this land are then analyzed for their potential to impact/impair the water quality at the outlet. However, the source and resolution of the DEM, the user's objective, subjective, and/or subconscious choices of operation parameters, and a given software's preset algorithms altogether determine the ultimate shape and size of the watershed, and thus impact subsequent analyses. In this project, we carried out a sensitivity analysis that explored how much these variables and user choices impact the shape and size of the St. Louis River Area of Concern (AOC; whose boundary is determined in part by the delineation of the St. Louis River and Nemadji River watersheds), and, in turn, impact water quality in the AOC. Although watershed delineation is a common operation, our sensitivity analysis of the choices made to carry it out can be helpful in understanding the AOC, mitigating impairments to it, and reducing concern about it.

*Keywords: Watershed, Delineation, GIS, DEM, Contaminants*

3:00 - 3:10 PM - Transition to **Connect & Collaborate Sessions**

3:10 - 3:30 PM - **BREAK**

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3:30 PM - **Connect & Collaborate Sessions** – held concurrently from 3:30-5:00 PM

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3:30-5:00 PM **Connect & Collaborate Sessions (Concurrent)**

- **Ecological Justice and Chigami-Ziibiing- Next steps?** (Room SWEN 2005)

Nicolette Slagle, Aalto University

*Ecological justice offers a model for relational, justice-oriented remediation and restoration practices. It also invites reflection on the entanglements of biocultural landscapes—how ecologies and cultures shape one another over time. Applying this concept to the Chigami-Ziibiing highlights how engaging in remediation and restoration processes can physically and metaphysically repair our relationship with nature. Ecological justice is a potent tool for community-based socio-ecological systems research, and remediation and restoration planning and practices.*

*As part of last year's summit, I hosted a networking session on ecological justice in the estuary. Participants were briefly introduced to ecological justice and my research. Working together in small groups, participants marked on maps areas that represented the four aspects of ecological justice (rights, agency, recognition, and reconciliation). I also hosted two additional community-workshops, following the same format. Additional data gathered from the workshops included notes from the small groups, my observations, and short participant surveys. Finding practical applications for my research for the Chigami-Ziibiing community is the next step of this research.*

*Since last year's summit, I have worked to code the responses and create maps of ecological justice hotspots within Chigami-Ziibiing. This presentation will present the results of those workshops and open the question of how this framework could inform future work in the estuary.*

*Participants will be asked to reflect on:*

- *Their understanding of ecological justice*
- *How the concept may apply to their work*
- *What they would like more information on*
- *What they see as the practical application of this research (if any)*
- *Blind spots, false assumptions or other errors in the research*

- **Gibiskising minis: Past, Present, Future. Ecological and Cultural Landscape Restoration Strategies for Wisconsin Point** (Room YU 203)

Samuel Geer, Urban Ecosystems

Bryan Pynn, Urban Ecosystems

Deanna Erickson, Lake Superior National Estuarine Research Reserve

*Since it was regained by the Fond du Lac Band in 2017, the land at the tip of Gibiskising Minis (Land Bridge / Wisconsin Point) has remained unchanged. The design team from Urban Ecosystems, The Fond du Lac*

*Band, The 106 Group, and the Lake Superior Estuarine Research Reserve will present the results of the first year of work. This included extensive community engagement and consultation with scientists, agency staff, and ecological restoration specialists.*

*The process also involved archaeological and cultural resource surveys as well as plant community mapping. This input was developed into a conceptual site plan for the tip of Wisconsin Point, portrayed in the report *Gisbiskising Minis - Past, Present, Future*.*

*After the presentation, the design team will facilitate a technical discussion about a series of topics relevant to the restoration effort (dune restoration, controlled burns, programming, interpretation, invasive species control, etc) to elicit feedback from community members, subject matter experts, and members of the wider conservation community.*

- **Examining the uses and limitations of AI through the lens of the St. Louis River Estuary (Room YU 204)**

Natalie Chin, Wisconsin Sea Grant

Sarah Peterson, Wisconsin Sea Grant

Stephanie Warden, University of Wisconsin - Superior

Joshua Stangle, University of Wisconsin - Superior

Dan Widiker, School District of Superior

*The recent, rapid proliferation of AI has created an urgent need for researchers and practitioners to engage in conversation about its uses and limitations. This session will bring together Summit attendees who are interested in discussing AI usage within the context of the St. Louis River Estuary as well as how we might navigate its associated challenges.*

*Session facilitators will begin the session with a brief introduction to AI, including case study examples of how it is being used in environmental research and education. Participants will be invited to share how they are using AI or considering its use in their own work. Roundtable discussions will also touch on ethical considerations around environmental and community impacts of AI.*

*The overall goal of this session is to facilitate connections between participants who are interested in collaborating on the topic of AI moving forward.*

- **Partnering for Science: Best Practices and New Opportunities for Participatory Science (SWEN 2016)**

Hilarie Sorensen, Minnesota Sea Grant

Madison Rodman, Minnesota Sea Grant

Kelsey Prihoda, Minnesota Sea Grant

Tiff Sprague, Natural Resources Research Institute

*This interactive "Connect and Collaborate" session brings together Summit participants to share opportunities and co-create a roadmap for successful participatory science efforts in and around the St. Louis River Estuary.*

*We invite Summit participants into a collaborative space to demystify the process of volunteer engagement and incorporating volunteer collected data into research and monitoring initiatives. For this 90-minute session, we will kick off the discussion with a mini-panel of lightning talks to highlight past and ongoing*

*participatory science initiatives in the area before moving into an interactive discussion about what makes a successful participatory science project.*

*Highlighted projects will include recent efforts on identifying drowning hotspots, monitoring harmful algal blooms and chloride, and monitoring phenology in northeast Minnesota. Through hands-on activities, participants will co-create a set of best practices and discuss the nuances of volunteer incentives, training, and meaningful engagement. We will also highlight upcoming opportunities for volunteer engagement in science, providing opportunities for prospective volunteers to engage with researchers. Whether you are a researcher looking for a team or someone looking to get involved in your community through volunteering, you will leave this session with new partners and a clearer path forward.*

*Session facilitators will compile the session's findings into a shared resource list and best practices summary to drive future successes and ensure these conversations turn into action.*

- **Headwaters Partnership Visions for the Future: Sharing the Partnership's Work (YU 202)**

Sarah Voje, Emmons and Olivier Resources

Gini Breidenbach, MN Land Trust

Sarah Beaster, MN Land Trust

Kirsten Rhude, Lake Superior Reserve

Mark Prankus, Interfluve

*Restoration isn't fixing what is broken but imagining what's possible. This session invites participants to engage with the visions for the Lower St. Louis River, Upper St. Louis Bay, and Allouez Bay being developed by the Lake Superior Headwaters Sustainability Partnership. Participants will explore the results of the partnership's two-year, collaborative visioning process for its twelve priority concerns (see below) that were evaluated to envision the future of the estuary and surrounding watersheds.*

*Participants will explore graphics and maps highlighting considerations, information gaps, best practices and priority actions for each priority concern. Guided discussions will provide an opportunity to reflect on how this vision can inform future projects and planning efforts in order to connect with others working towards a resilient Estuary.*

*Priority Concerns:*

1. *Birds*
2. *Brook Trout Streams*
3. *Coastal Wetlands,*
4. *Community Engagement*
5. *Dredge Material Management*
6. *Environmental Justice*
7. *Hydrologic Integrity*
8. *Invasive Species*
9. *Lake sturgeon*
10. *Terrestrial Habitat Connectivity*
11. *Water Quality*
12. *Wild rice*

- **Backstage Secrets for Better Outreach (SWEN 1007)**  
Ryan Feldbrugge, Lake Superior National Estuarine Research Reserve  
Luciana Ranelli, Lake Superior National Estuarine Research Reserve

*Connect and collaborate with the Lake Superior Reserve's education team to learn some tips, tricks, and practices for sharing your work in an engaging way.*

*Many people have outreach, facilitation, or education as part of their job even when it's not their primary focus. Instead of muddling through or gritting your teeth over this part of your job, join the Reserve education team "backstage" to experience some of the planning and teaching tools we use that you can too. Do you know what a learning cycle is? Or practices for teaching in a culturally responsive way? If not, come learn! If yes, come share in the conversation!*

*In this hands-on session, we'll share and practice techniques that we use with a variety of audiences to share the work of the Reserve and about the St. Louis River Estuary and Lake Superior. Come prepared to share some of your teaching successes and persistent puzzles.*

- **Taking Stock of Success and Building social indicators for community impact in the St. Louis River Estuary (YU 201)**  
Meghan R. Klasic, United States Environmental Protection Agency, Great Lakes Coastal Science Branch, Ecosystem Services Section  
Tom Hollenhorst, United States Environmental Protection Agency, Great Lakes Coastal Science Branch, Ecosystem Services Section  
Molly J. Wick, Wisconsin Department of Natural Resources

*Scientists, artists, engineers, decision-makers, business owners, advocates, and residents have dedicated countless hours to remediating, restoring, and revitalizing the St. Louis River Estuary (SLRE) through the Great Lakes Areas of Concern (AOC) program. Biological, chemical, and physical data collection shows marked improvement in water quality, sediment quality, wildlife habitat, and increased enjoyment of the river.*

*As work continues outside of the AOC program, decision-makers and environmental managers seek to understand how environmental investments in ecological remediation impact communities and community access to improved park, lake, and other public spaces. Developing and tracking measurable quantitative and qualitative social indicators is one method for capturing community impact of environmental work. However, not all indicators are created equal. What is relevant to one community or region of the estuary may not align with another community's perspective. Even within a single environmental project area (e.g., Allouez Bay), there may be indicators that are more and less appropriate for measuring community impact.*

*To grapple with these questions and to begin identifying a set of social indicators that can be adapted to different projects, regions, scales, and scopes in the SLRE, we are hosting an active networking session at the Summit. We invite you to join us to 1) reflect on a shared vision of what success looks like for a thriving estuary landscape and community, 2) help develop a set of potential social indicators for measuring community impact across projects and geographies, and*

3) begin building a SLRE social indicator workgroup.

The output of this session will inform ongoing work in the SLRE and provide fodder for a larger Great Lakes effort to develop a tool and roadmap of social indicators.

## THURSDAY MARCH 5, 2026

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**9:00 AM - River Renewal** (Yellowjacket Union Great Room)

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### 9:00 AM - Grit & Gratitude Reflections - The Terns of Interstate Island

### 9:10 AM - Islands without Ash: Restoration on Forested Wetlands in the St. Louis River Estuary

Kirsten Rhude\*, Lake Superior National Estuarine Research Reserve  
Kathryn Hofmeister, Michigan Technological University

Black ash (*Fraxinus nigra*) are abundant along the St. Louis River Estuary and the Lake Superior coast. These ash dominated wetlands are changing rapidly due to the invasion of emerald ash borer, or EAB (*Agrilus planipennis*) which reached the St. Louis River Estuary in 2013.

Since 2023, The Lake Superior National Estuarine Research Reserve has been working with the Wisconsin Department of Natural Resources and Wisconsin Conservation Corps to plant over 30,000 tree seedlings in an effort to maintain some of these sites as forested wetlands into the future. Replacement tree species were selected based on site conditions, projected future climate scenarios, and cultural uses and traditions these species support.

Monitoring plots that include each replacement species were also planted to observe mortality and growth rate of these plantings over time. After 2 growing seasons basswood (*Tilia americana*), swamp white oak (*Quercus bicolor*), and northern hackberry (*Celtis occidentalis*) had the highest survival rate, while cottonwood (*Populus deltoides*), black spruce (*Picea mariana*), and sugar maple (*Acer saccharum*) had the lowest survival rates. These findings, as well as other research across the region should help identify promising species to incorporate into other restoration efforts in coastal ash dominated wetlands.

*Keywords: Emerald Ash Borer, restoration, trees,*

### 9:30 AM - Lower St. Louis River Centrarchid and Yellow Perch Population Dynamics

Sam Peterson\*, Wisconsin Department of Natural Resources  
Paul Piszczek, Wisconsin Department of Natural Resources

Quantitative data collection of Centrarchids (panfish) and yellow perch (*Perca flavescens*) in the St. Louis River are currently variable and inconsistent across agencies (state and federal), gear types, and timeframes.

The Wisconsin Department of Natural Resources (DNR) piloted a standardized summer panfish survey from 6/16/2025 to 6/19/2025 to analyze growth, mortality, relative abundance and size structure. Panfish population dynamics included ages spanning one to 19 years, mortality estimates ranging from 19.7 to 38.9

percent; relative abundance was estimated between 3.5 to 31.6 fish per net night; and size structures reached 3.5 to 13.7 inches.

Current data suggests a sustainably balanced, naturally reproducing panfish stock in the St. Louis River. This survey addresses specific goals and objectives under the DNR Lake Superior Fisheries Management Plan (2020-2029), which was collaboratively developed to guide management direction of sport and commercial fisheries. DNR's effort to fulfill the objectives of the Management Plan while updating stakeholders on results ensures transparency and allows fish managers greater capability to make well-informed decisions to provide sustainable fisheries for future generations.

*Keywords: Panfish, St. Louis River, Fish Management*

### **9:45 AM - A Compelling Story of Successes in AIS Prevention**

Doug Jensen\*, Minnesota Department of Natural Resources

Over the last century, the St. Louis River Estuary (SLRE) has become infested with many aquatic invasive species (AIS) causing damage to the environment, recreation, and economy of our area. Preventing the spread from the Estuary to inland lakes and watersheds (and vis-vis) has been a key priority for AIS management. While many AIS have invaded the Estuary for over 30 years, many including Eurasian ruffe, round goby, tubenose goby, three spine stickleback, white perch, quagga mussel, New Zealand mudsnail, faucet snail, pea clams, bloody red shrimp, lumholtzi waterflea, water cress, viral hemorrhagic septicemia and others have not spread inland.

Efforts began in the early 1990s to address the challenges of AIS in the SLRE and statewide. Using transdisciplinary approaches, the keys to AIS prevention have been public outreach (using strategic, consistent and simple messaging), watercraft inspection (and more recently decontamination), enforcement and risk assessment.

But do we have evidence of success? Yes! Several surveys of Minnesota boaters and anglers show significant reported behavior change from 90% in 1994 to 97% in 2007 – a 27% increase – since then, results show >95%. Awareness has grown to be extremely high, more boaters and anglers than ever are taking actions and using cleaning tools at water accesses. Since 2015, watercraft inspection data indicate that most boaters and anglers (95%+) are following AIS prevention laws with many counties reporting 98-99%. Analyses by the Minnesota Aquatic Invasive Species Research Center and by the Cass County AIS Program indicate the rate of AIS spread has slowed in Minnesota over the last decade. Through grit and gratitude, partnerships among the Minnesota DNR, counties, MAISRC, federal agencies, tribes, lake associations, advocacy groups and the public have contributed to this success.

Learn about this compelling story and how successes in prevention can transcend boundaries.

*Keywords: AIS, prevention, success, assessment*

### **10:05-10:25 AM - BREAK**

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**10:25 AM - Measuring the Micro** (Yellowjacket Union Great Room)

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**10:25 AM - What do we know about cyanobacterial blooms in the St. Louis River estuary and western Lake Superior?**

Sam Blackburn\*, University of Wisconsin - Madison Center for Limnology  
Kaitlin L. Reinl, Rensselaer Polytechnic Institute  
Ellen Coffman, Wisconsin Department of Natural Resources  
Brenda Lafrancois, National Park Service  
Matt Hudson, Burke Center for Ecosystem Research  
Hilary Dugan, University of Wisconsin - Madison Center for Limnology

Cyanobacterial blooms have emerged as a persistent management challenge in the St. Louis River Estuary and Western Lake Superior. Blooms have been documented annually in the Twin Ports area since 2021, following notable blooms near the Apostle Islands in 2012 and 2018. Microcystin and other cyanotoxins have been detected at a number of these blooms including at popular public beaches like Barker's Island and Wisconsin Point.

To better understand factors related to bloom formation, the Lake Superior Estuarine Research Reserve, Wisconsin Department of Natural Resources, Burke Center for Ecosystem Research (formerly at Northland College), the National Park Service, and other organizations have conducted regular water quality monitoring in the lake and estuary since 2015. Data collected include discrete water quality samples (e.g., nutrients, chlorophyll-a, total suspended solids) and continuous data collected via sensors (e.g., temperature, dissolved oxygen, conductivity). Over the past year, we synthesized and analyzed data from these organizations and reviewed the existing published literature to better understand the drivers of blooms in the region.

We identified three key factors influencing cyanobacterial bloom formation: warm water temperatures, nutrient concentrations, and hydrodynamics (water movement). The influence of these factors on blooms differs notably between the estuary and lake, highlighting the importance of focused management strategies. Our research has led to increased collaboration on water quality monitoring between regional organizations and identified new directions for bloom research in the Twin Ports.

*Keywords: Cyanobacterial Blooms, Nutrients, Monitoring*

**10:45 AM - Bridging Citizen Science and Research Standards in Microplastic Monitoring: Comparative QA/QC Analysis and Fluorescence-Based Detection**

Abimbola Ige\*, University of Minnesota Duluth  
Melissa Maurer-Jones, University of Minnesota Duluth  
Lee Penn, University of Minnesota Twin Cities  
Matt Simcik, University of Minnesota Twin Cities  
Margaret Elmer-Dixon, University of Minnesota Duluth  
Mary Kosuth, University of Minnesota Twin Cities

Widespread microplastic pollution in natural systems has garnered attention because of implications for ecosystem health. This work investigates citizen science integration into microplastic monitoring in Minnesota waters.

The objectives are to optimize dye-based microplastic detection methods and assess the reliability of data collected by citizen scientists compared to research experts. The preliminary phase tested fluorescent dyes on plastics to characterize the response of varying surface hydrophobicities fluorescent response. Using varied conditions, 0.05 mg/mL of dyes in ethanol gave optimal staining, sequential staining (i.e., staining with two different stains) was pursued as a potential avenue to differentiate polymers from each other and natural particles.

Results yielded greater signal intensities compared to single staining and varying the stains showed differing spectral features depending on the dye combination and polymer material used, which is promising that different plastics will respond differently to the sequential stains. Sampling in 2025 by Minnesota high school students included six lakes in Spring, with four of these lakes resampled in fall with the introduction of two additional water bodies. The surface water samples employed two methods for comparison with citizen science protocol, which entailed sampling 20L surface water by high school student participants. First, we deployed the sampling kits and analysis protocols as detailed for the citizen scientists to ensure consistency of comparison across observer groups. Secondly, we collected high volume samples (~200 L) through a Tyler sieve stack with flow totalizer and analyzed using typical laboratory chemical processing protocols for polymer quantification and identification. Spring sampling revealed microplastic concentrations varied widely across lakes and observer types, while polymer identification confirmed diverse polymer compositions. Final microplastic counts and QA/QC results will showcase a scalable model integrating citizen science with research methods for microplastics detection.

*Keywords: Citizen science, microplastics, Minnesota lakes, fluorescence staining,  $\mu$ FTIR analysis*

### **11:05 AM - Turbidity in the St. Louis River Estuary**

Joe Wallace\*, University of Wisconsin-Superior, Natural Sciences Department  
Raymond Lee, University of Wisconsin-Superior, Natural Sciences Department

In recent decades, the St. Louis River Estuary (SLRE) was cleaned up and delisted for multiple beneficial use impairments, including excessive sediment loading. Continual monitoring of water quality has remained a priority but is expensive. Currently, turbidity is monitored at a relatively low cost by using automatic probes at four permanent stations maintained by the National Estuarine Research Reserve (NERR), but these data may not characterize all turbidity dynamics at all locations across the SLRE.

We tested whether this was the case by monitoring water clarity with a Secchi disk at 17 sites regularly over an entire summer (Jun 6 to Oct 28). Additional sites were monitored opportunistically by following large ships and surveying dredging sites, so a total of 97 sites were observed with 765 Secchi disk measurements. The Secchi disk (m) data were compared with the turbidity (NTU) data specifically at the NERR stations, and analyses were contextualized with meteorological and seiche data.

Our Secchi disk data correlated well with the NERR turbidity data, but only at high turbidity, which occurred only at the Pokegama River station. Here, pulses of high turbidity occurred episodically, coincidentally with storm events. At the other NERR stations (in more open waters), turbidity was consistently near zero. Here, time series of Secchi disk data had gradual parabolic shapes (minimum measurements of ~0.4 m occurred

between mid-Jul to mid-Aug) that typically indicate an algal growing season. As such, shipping movements had negligible impacts on turbidity dynamics.

Our results demonstrate how Secchi disk monitoring provides important additional information to the ongoing monitoring efforts with automatic probes. Future research on sediment loading in particular and water clarity in general should investigate spatiotemporal patterns of sediment transport during rain events at the mouths of rivers (e.g., Pokegama River) vs. algal growth in the calmer open waters.

*Keywords: Turbidity, Sediment, Water Clarity, Secchi Disk Depth, Algae*

### **11:25 AM - Cyanobacteria Have Spatially Distinct Seasonality in the St. Louis River Estuary**

Gus Pendleton\*, Lake Superior National Estuarine Research Reserve; Cornell University  
Addi Knoll, Lake Superior National Estuarine Research Reserve  
Hannah Nicklay, Lake Superior National Estuarine Research Reserve  
Kait Reinl, Lake Superior National Estuarine Research Reserve  
Marian Schmidt, Cornell University

The St. Louis River Estuary (SLRE) is a vital ecosystem whose ecological resilience and productivity depend on its aquatic microbial communities, including cyanobacteria. Under certain conditions, however, cyanobacteria in the SLRE can cause harmful algal blooms and produce toxins.

Understanding the composition as well as genetic diversity of these cyanobacterial assemblages may help us predict the timing, location, and toxicity of blooms. To characterize cyanobacterial communities, I collected microbial samples from the water column at nine sites (from North Bay out to Lake Superior) and four timepoints (June - September) in 2025. Using fluorescence-based flow cytometry, I quantified microbial cell abundance and cyanobacterial subpopulations. Microbial abundance increased seasonally across the estuary and peaked in late August.

Cyanobacteria displayed distinct spatial and seasonal patterns: upper estuary stations such as North Bay, Oliver Bridge, and Pokegama Bay had peak phototroph abundances in early and late samples, while lower estuary stations, including Barker's Island, Blatnik Bridge, and Billings Point, has a mid-summer peak. Current work includes coupling these data with microscopy-based phytoplankton identification, and using long-read metagenomics to assess cyanobacterial genetic diversity within the SLRE.

*Keywords: Cyanobacteria, microbial ecology, flow cytometry, phenology*

### **11:30 AM - Invasive Plants in My Neighborhood-a linocut study of invasive plants in my neighborhood**

Monica Ihrke\*, M. Ihrke Prints

Artist Monica Ihrke presents a compelling new body of work, "Invasive Plants in My Neighborhood," a series of linocut prints that brings the often-overlooked presence of non-native flora into sharp focus. Based in Duluth, Minnesota, Ihrke utilizes the distinct textures and bold lines of relief-printed linoleum to explore the intersection of the natural and the industrial, often highlighting spaces deemed both beloved and vulnerable.

This latest project, supported in part by an Individual Artist Project Grant from the Arrowhead Regional Arts Council and a Creative Individuals Grant from the Minnesota State Arts Board, delves into the pervasive issue of invasive plant species within the local ecosystem, beginning with those found closest to home – in Ihrke's own neighborhood. Through her evocative prints, Ihrke aims to cultivate public awareness and recognition of these species, ultimately encouraging viewers to actively engage in their removal and replacement with native plants.

"Invasive species, defined as non-native organisms causing economic, social, or environmental harm, pose a significant threat to our local biodiversity," explains Ihrke. "This series is designed to bridge the gap between identification and action. By visually highlighting these plants, I hope to empower individuals to take tangible steps towards ecological restoration."

The urgency of this message is underscored by the vital role native plants play in supporting healthy ecosystems. These indigenous species foster biodiversity, providing essential food and shelter for insects and pollinators. Furthermore, once established, native plants often require less maintenance, having evolved in harmony with the local climate.

*Keywords: invasive plants, local art, printmaking, non-native plants*

**11:35 - CELEBRATION!**

**12:15 PM - Adjourn** – transition to **pre-registered optional Field Trips**

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**1:30 PM - Optional Field Trips** – held concurrently. Pre-registration is required.

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**1:30 PM Optional Field Trips (Concurrent)**

- **Winter Birds on a Working Riverfront: Avian Life along the St. Louis River Estuary**

Step inside an active industrial riverfront to observe how birds use the St. Louis River Estuary in winter. This guided field trip provides behind-the-gates access to Resource Renew's 26-acre waterfront property, an area normally closed to the public, where shoreline infrastructure and avian habitat exist side by side.

Walking along the river's edge, participants will observe winter bird activity while learning how water quality protection and resource recovery shape this working landscape. Resource Renew staff will explain how facility operations interact with the estuary, grounding the experience in the realities of managing infrastructure along a living river. Avian ecologist Dr. Annie Bracey (NRRI) and Margie Menzies of Hawk Ridge will lead bird identification and interpretation throughout the walk, helping participants understand how species respond to habitat features and seasonal conditions. Dr. Bracey will also connect field observations to avian research that has incorporated data collected at the Resource Renew site. The tour will highlight the "Everyone Can Bird" initiative, describing regional efforts to expand access to birding and foster inclusive outdoor experiences.

- **Data on Deck: Tour of the University of Minnesota's research vessel, RV Blue Heron**

Tour the RV Blue Heron dockside at Montreal Pier in Superior WI. Learn about the vessel, the crew members that operate the vessel, and the scientists who use the vessel. We will discuss the wide range of projects that the Blue Heron and crew have assisted over the years, including Great Lakes ice coverage, fisheries assessments, methane release, and microplastics.

- **Celebrating Clean Water and Community Art**

Join us for an outdoor tour of the City of Superior Wastewater Treatment Plant and unveiling the new Wastewater Process Mural by local artist, Adam Swanson. During the tour, participants will learn about the grit removal and other treatment and disinfection processes. Folks will learn about the Wastewater Administration's dedication and determination to ensure the city meets water quality standards to protect the St. Louis River and Lake Superior.

- **Old Dock - New Era: Public Access and Possibility at 44th Avenue E in Superior (Bunge Dock)**

Join the St. Louis River Alliance and City of Superior staff on a guided walking tour of the 44th Ave E dock, the site of a future public water access area on Allouez Bay. This on-site tour will explore the location's history, current conditions, and opportunities for future public use. SLRA staff will be on hand to gather input from participants as part of their broader community engagement and strategic outreach efforts to help shape the vision for this space. Final uses for the site are still to be determined and will be informed directly by public feedback.

**POSTER PRESENTATIONS**

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**1. Transient Storage of Coarse Fluvial Sediment in Western Lake Superior Tributaries**

Haven Free, University of Minnesota Duluth  
Michael Park, UMD graduate student  
Dr. Karen Gran, UMD Professor

Due to post-glacial isostatic rebound, the level of Lake Superior near the city of Duluth is rising at an average rate of 0.3 cm/year. Lake level rise has created small-scale estuaries at the mouths of rivers draining into the western portion of Lake Superior. We hypothesize that coarse fluvial sediments are deposited at the head of these estuaries and temporarily trapped until later remobilization during high-flow events, resulting in episodic delivery of coarse fluvial sediment to Lake Superior. As the lake level continues to rise, these estuaries continue to expand and allow for longer-term storage of coarse sediments, reducing the delivery of fluvial sediments to Lake Superior. Eroding river bluffs are the primary source of sediment to the study area rivers. We conducted extensive GIS- and field-based surveys of eroding bluffs to estimate grain size distribution of sediment delivered to the fluvial system. Two machine-learning models developed by the USGS are being used to quantify the annual volumetric fluvial sediment loads of the study area rivers in terms of bedload and suspended sediment concentration. The model outputs will be coupled with the bluff grain size surveys to estimate the volume of sediment transported by the study area rivers differentiated by grain size. Ponar samplings and pebble counts were conducted upstream, within, and downstream of the estuaries in several study area rivers to determine the grain size fraction that is temporarily sequestered within the backwater zones. We will combine this with the GIS and modeling outputs to estimate the volume of coarse sediment that is trapped in these estuaries. The findings from this study will be incorporated into a fluvial sediment budget of the western portion of Lake Superior.

*Keywords: Sediment, Lake Superior, Erosion, Backwash, Modeling*

**2. A Fluvial Sediment Budget for the Western Arm of Lake Superior**

Michael Park, University of Minnesota Duluth  
Karen Gran, University of Minnesota Duluth  
John Swenson, University of Minnesota Duluth  
Gustavo Merten, University of Minnesota Duluth  
Haven Free University of Minnesota Duluth

Minnesota Point is a baymouth bar at the St. Louis River estuary maintained by coarse sediments delivered via longshore drift from the north and south shores of Lake Superior. Minnesota Point is presently developed with hundreds of properties and two entry points to the Duluth-Superior Harbor. Prior studies have found that Minnesota Point is starved of sediment due to harbor infrastructure that impedes longshore sediment transport and is being systematically drowned by lake level rise driven by post-glacial isostatic rebound. Coastal bluff erosion in this region is an important source of sediment to this system. However, due to a lack of systematic regional analysis, sediment delivered to Lake Superior by rivers is poorly understood. We hypothesize that rivers draining to Lake Superior contribute a nontrivial quantity of coarse sediment to this system and should be considered in the management of Minnesota Point. To improve understanding of

sediment dynamics in this region, we are developing a fluvial sediment budget of the western arm of Lake Superior by compiling existing and novel datasets. We have conducted field surveys of over 50 riverbank slumps and identified several glacial deposits as primary fluvial sediment sources, with samples collected to characterize grain size distributions. Two machine learning models developed by the United States Geological Survey can yield volumetric sediment loads of study area watersheds in Minnesota in terms of suspended sediment concentration and bedload. We are using GIS-based analyses and existing stream gaging data to extend the Minnesota-based machine learning models to south shore streams in Wisconsin. Additionally, we are coupling results from grain-size analyses of source sediments with modelling outputs and existing datasets to determine the volume of clay, silt, sand and gravel regularly delivered to the western arm of Lake Superior by rivers.

*Keywords: Fluvial processes, Machine learning*

### **3. Hydroclimate and Moisture Source as Controls on the Isotopic Signature of Precipitation Near Lake Superior**

Eva Muscatello, University of Minnesota Duluth  
Daniels William, University of Minnesota Duluth  
Swenson John, University of Minnesota Duluth

Climate change may influence the types of storms that deliver precipitation to the western Lake Superior Region (WLSR). This has the potential to alter precipitation patterns, with implications for the regional water balance. Here, we aim to establish an isotope-based approach to evaluating changes in Duluth's hydro-climatology and storm characteristics. We collected precipitation samples for isotopic analysis, analyzed precipitation data, and determined the storm type and moisture source of storms between May 2023 and July 2025. The goal of the study is to characterize storm patterns in the WLSR in terms of frequency, precipitation amounts, and isotopic signatures. Of the 78 total storms sampled, 23 were Alberta clippers, 27 were Colorado lows, 10 were Gulf storms, 1 was a Hudson Bay Low, and 17 have not been identified as one of those storm types. Each storm type originates from a different moisture source, which is apparent in the  $\delta^{18}\text{O}$  and  $\delta^2\text{H}$  signatures. The average  $\delta^{18}\text{O}$  signal is more enriched for Colorado lows and Gulf storms and strongly  $^{18}\text{O}$ -depleted for Pacific and Arctic storms origins. Based on a 2 end-member mixing model, the Gulf of Mexico delivered 65.2% of the total precipitation. This study creates a record of precipitation isotopes in the Great Lakes region and contributes to understanding the sources of water vapor to the region.

*Keywords: Climate, Water Isotopes, Meteorology, Precipitation*

### **4. Campus Tree Planting and Applied Ecological Decision-Making: A Course-Based Undergraduate Research Experience**

Michelle Frack, University of Wisconsin-Superior  
Holly Johnson, University of Wisconsin-Superior

Undergraduate students in Ecology and Management of Forest Ecosystems at the University of Wisconsin-Superior participated in a Course-based Undergraduate Research Experience (CURE) centered on a semester-long, campus-based tree planting project. Rather than treating tree planting as a predetermined activity, the course positioned students as ecological decision-makers responsible for

developing evidence-based recommendations. Students investigated forest structure, species composition, and campus land-use priorities to evaluate tradeoffs in species selection and planting locations, applying ecological theory through observation, data collection, analysis, and reflection. To connect student inquiry with professional practice, the project was enriched through collaborations with campus staff and forestry and land-management professionals from the Cloquet Forestry Center, the Douglas County Forestry Department, and the Lake Superior National Estuarine Research Reserve. These partnerships provided students with insight into how applied ecological decisions are made in real systems, including how site conditions, ecological goals, and long-term monitoring considerations shape management choices. The project emphasized that applied ecology involves uncertainty, iteration, and balancing ecological and human priorities. This poster highlights the design and implementation of the campus tree planting CURE, with particular attention to how place-based projects can support applied ecological decision-making while creating tangible stewardship outcomes. We describe how campus landscapes can serve as accessible sites for undergraduate research, generate infrastructure for future monitoring, and support sustained student engagement across courses. This work demonstrates the value of integrating applied ecology, community partnerships, and undergraduate research to strengthen scientific reasoning, communication, and environmental stewardship.

*Keywords: Applied ecology, habitat enhancement, undergraduate research, community partnerships, tree planting*

## **5. Steel Waters Run Deep: Uncovering the Ripple Effects of Restoration on Community and Ecology**

Jules Witts, U.S. Environmental Protection Agency

Meghan Klasic

Kasey Benesh

Thomas Hollenhorst

Julie Maurer

Kathleen Williams

Great Lakes coastal wetlands, often located in urban areas, provide a multitude of ecosystem services that contribute to human well-being. Many of these wetland systems are undergoing restoration efforts to enhance ecological functions and provide additional benefits. A critical knowledge gap in research on Great Lakes wetland systems remains in understanding the human well-being benefits of ecological restoration. Our study aims to understand how ecological restoration influences community perceptions, a proxy for human well-being, at the former U.S. Steel Duluth Works site, a Superfund site located along the St. Louis River. This site, contaminated with polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), heavy metals, PCBs, and dioxins/furans from over 100 years of operation, underwent a 4-year, \$186 million cleanup and restoration effort completed in July 2024. The project involved significant sediment removal and habitat restoration, addressing ecological and health risks and enabling the opening of a new two-mile-long waterfront trail. Preliminary results suggest expanded recreational opportunities, such as bird watching and educational activities, enhancing user experiences and potentially leading to increased human well-being benefits. To evaluate these outcomes, we are collecting data through direct observation, aesthetics surveys, intercept surveys, and bird observation surveys. These diverse monitoring efforts will provide insights into how cleanup efforts influence the social-ecological wetland system, offering a more comprehensive understanding of restoration impacts. The views expressed in this presentation are those of the authors and do not necessarily represent the views or the policies of the U.S. Environmental Protection Agency.

*Keywords: Restoration, Site Use, well-being, water quality, U.S. Steel*

## **6. How do contaminants in the St. Louis River estuary affect the health of restored manoomin and those who eat it?**

Becca Honeyball, University of Wisconsin-Madison, Lake Superior National Estuarine Research Reserve  
Ashla Ojibway, Fond du Lac Band of Lake Superior Chippewa, Lake Superior National Estuarine Research Reserve

Deanna Erickson, Lake Superior National Estuarine Research Reserve

Jessica Hua, University of Wisconsin-Madison

Gigi Diekelman, University of Wisconsin-Madison, Lake Superior National Estuarine Research Reserve

Manoomin spiritually and physically sustains Anishinaabe peoples, and thus, the preservation of Manoomin is also the preservation of Indigenous lifeways and identity. In Chi-gami ziibi, the St. Louis River Estuary, climate change, non-local beings, dredging, water level fluctuation, and a long history of pollution from industrial activities caused significant losses to manoomin stands. Restoration efforts over the last decade in the estuary have aimed to protect, steward, and restore the manoomin that was once plentiful to support tribal health and food sovereignty. As manoomin returns to the estuary, tribal communities have voiced interest in understanding more about this restored rice and whether it can uptake pollutants, such as heavy metals and PFAS, from the estuary and impact the health of manoomin and those who eat it. With input and knowledge from Tribal partners and community members, a research study was developed and conducted by the UW-Madison Hua Lab and LSNERR to help address these concerns.

## **7. Creating spaces and connecting interests: providing an approach for collaboration in the St. Louis River AOC**

Katie Williams, USEPA Great Lakes Coastal Lab

Jules Witts, USEPA GLCL

Meghan Klastic, USEPA GLCL

Sebastian Paczuski, ORAU

The success of the Great Lakes Areas of Concern (AOC) program depends on a combination of resources: grit, creativity, cooperation, and effective communication. One of the innovations of the Great Lakes AOC program was the inclusion of the local governments and the direction to engage with the public. Yet, researchers and practitioners still search for ways to improve communication and collaboration. The poster will demonstrate the application of two promising approaches for fostering collaboration: increasing the practice of boundary work and the intentional creation of spaces for meaningful participation. Boundary work is the people, ideas, and objects that facilitate cooperation across boundaries of expertise and experience. This poster will demonstrate two different approaches to removing the Degradation of Aesthetics in two AOCs to learn how it is possible to use common concepts or objects and create spaces where volunteers and communities can contribute to environmental management processes. This poster will conclude with recommendations for the St. Louis River AOC. The views expressed in this presentation are those of the authors and do not necessarily represent the views or the policies of the U.S. Environmental Protection Agency.

*Keywords: decision support, stakeholders, participation, leadership*

## 8. Wisconsin Point Visitor Use Assessment

Ellen Kwiatkowski, LegacyWorks Group  
Daniela Mansbach, UW Superior Center for Research and Evaluation Services  
Alisa VonHagel, UW Superior Center for Research and Evaluation Services  
Alex Norton, OPS Strategies

Wisconsin Point is a significant natural area within the Lake Superior Basin that provides important habitat for a variety of species, important vegetation communities and, together with the Allouez Bay wetland complex, is designated as an Important Bird Area (IBA) by the Wisconsin Bird Conservation Partnership. A Wisconsin Point Resiliency Study is gathering data to inform strategies to improve the resilience of Wisconsin Point in the face of growing climate change stressors. As a component of that study, a Visitor Use Assessment was conducted during 2024-2025 to provide data on visitor volumes, experience and connection to Wisconsin Point. Data on how visitors view coastal resiliency and threats to Wisconsin Point that impact cultural resources, habitat value, and infrastructure was also gathered. This poster highlights some of the findings of that assessment.

*Keywords: Climate resilience, Wisconsin Point, Community Engagement*

## 9. Wisconsin Point Coastal Habitat Restoration & Resiliency Project – Data Collection & Investigation

Shanna Saarela-Schultz, AMI Consulting Engineers  
Erv Kraft, AMI Consulting Engineers  
Molly Wick, Wisconsin Department of Natural Resources  
Matt Steiger, Wisconsin Department of Natural Resources

Wisconsin Point is a culturally and ecologically significant freshwater sandbar located between Allouez Bay of the St. Louis River Estuary and Lake Superior. The site hosts critical dune habitats, supports endangered species such as the Piping Plover, and remains an area of profound importance to the Anishinaabe community. Recent assessments have identified accelerating shoreline erosion that threatens both natural communities and cultural resources, prompting the initiation of a multi-agency effort to develop conceptual coastal resilience solutions for approximately four miles of Lake Superior shoreline southeast of Superior, Wisconsin. The purpose of this study is to characterize site-specific physical, biological, and hydraulic conditions that influence erosion at Wisconsin Point and use these data to inform future restoration and protection strategies. During the summer of 2025, a comprehensive field data collection program was implemented to capture a holistic understanding of the coastal processes driving shoreline change. Data collected included topographic surveys of the beach and dune system, bathymetric mapping of the nearshore lakebed, characterization of vegetation and habitat communities, sediment characterization, and drone-based photogrammetry to document shoreline condition. Additionally, two offshore moorings with oceanographic observation equipment were deployed to collect continuous hydrodynamic measurements. The surface buoy recorded wave height, period, direction, and meteorological conditions, while a lake-bottom acoustic Doppler current profiler measured water-column currents and provided corroborating wave data. Model results are anticipated to provide insight into the erosive risk posed to the shoreline. Areas of high erosion will be identified by the results, and the extents of erosive impacts will be determined by these models. Collected data will be incorporated into hydrodynamic and aeolian sediment transport modeling to support the development of conceptual designs focused on increasing coastal resiliency through nature-based solutions and informed shoreline management. This work provides

foundational information needed to guide long-term erosion mitigation efforts and preserve the environmental and cultural integrity of Wisconsin Point.

*Keywords: Wisconsin Point, Coastal erosion, Hydrodynamic modeling, Shoreline resiliency, Dune habitats*

## **10. Quantifying footprint of atmospheric Hg point sources: concentrations in air and leaf tissue**

Eli Downing, Undergraduate research assistant for Johnson lab  
Noah Fish, Undergraduate research assistant for Johnson lab  
Cadence Bauer, Undergraduate research assistant  
Nate Johnson, University Minnesota Duluth  
Jennifer Brentrup, MPCA

The current effort to conduct a mercury total maximum daily load (TMDL) for water bodies in the St. Louis River Watershed has primarily quantified the transfer of mercury from different landscapes to water bodies without explicit links to atmospheric sources that have the potential to be reduced. The magnitude of atmospheric mercury sources in Minnesota compared to background mercury coming from outside the state is unknown. Through field observations, we will quantify the spatial distribution of mercury in proximity to atmospheric point sources in NE Minnesota and ascertain the size of the affected area around the sources. Passive air samplers have been placed at incremental distances around the sources to quantify the concentration of mercury in the air over an extended time period (1 to 3 months). Leaf samples have also been collected from aspen trees and analyzed to measure mercury concentrations in biological samples. Sampling will continue over the 2026 and 2027 calendar years. Initial results from the fall of 2025 of some passive air samplers and leaf samples are currently being analyzed. The results will help to discern the relative magnitude of mercury sources in NE Minnesota compared to background sources and help understand the potential for regional source reductions to impact mercury in surface waters and fish tissue.

*Keywords: Mercury, Concentrations, Mines, Air, Leaves*

## **11. Linking Common Tern (*Sterna hirundo*) diet and mercury exposure using eDNA**

Annie Bracey, Natural Resources Research Institute, University of Minnesota  
Andrew Wood, Natural Resources Research Institute, University of Minnesota  
Fred Strand, Wisconsin DNR  
Kara Snow, Natural Resources Research Institute, UMN  
Stephen Nelson, Natural Resources Research Institute, UMN  
Katie Edblad, Natural Resources Research Institute, UMN  
Sarah Janssen, United States Geological Survey  
Joel Hoffman, Natural Resources Research Institute, UMN

Dietary exposure to mercury can have significant negative effects on the health of both human and wildlife populations, particularly wildlife that are higher-order consumers. Due to food web biomagnification, mercury exposure risk generally increases with increased consumption of fish, but varies based on specific diet composition. To elucidate spatial and temporal variation in dietary routes of mercury exposure, environmental DNA (eDNA) sequencing was used to document the species composition and relative abundance of prey items consumed by Common Terns (*Sterna hirundo*), a state-threatened piscivorous waterbird. In 2023 & 2025, we collected fecal & feather samples (n = 191) from 77 chicks hatched at a

breeding colony in the St. Louis River Estuary (SLRE), Duluth, MN. We also collected samples at a breeding colony in Chequamegon Bay, Ashland, WI (n = 49 samples from 12 chicks). A minimum of three samples were concurrently collected from the same chicks from days 2 – 30 (at roughly week intervals), providing a longitudinal dataset from which to associate diet with mercury. We extracted DNA from fecal samples and sequenced a fish-specific barcoding gene to characterize prey composition and relative abundance. This allows us to document potential shifts in prey composition and relative abundance at distinct foraging locations (inferred from carbon and nitrogen stable isotope data) and to identify the age at which tern chicks are most susceptible to Hg exposure.

*Keywords: eDNA, mercury, diet, Common Tern,*

## **12. Cross-Species Susceptibility to Harmful Algal Bloom Toxins Microcystin-LR, Anatoxin-a, and Saxitoxin**

Kali Mattingly, SpecPro Sustainment & Environmental Contract to US Environmental Protection Agency  
Marissa Jensen-Brickley, US Environmental Protection Agency, Office of Research and Development  
Aabir Banerji, US Environmental Protection Agency, Office of Applied Science and Environmental Solutions  
Kasey Benesh, SpecPro Sustainment & Environmental Contract to US Environmental Protection Agency  
Alexander Cole, formerly US Environmental Protection Agency, Office of Research and Development

Cyanobacterial blooms, once rare in the St. Louis River estuary, are becoming more common. Bloom-associated toxins (cyanotoxins) may cause deleterious effects in humans, but effects are unknown for many other species. This is due in part to the limited number of species used in toxicology testing. Susceptibility to toxins can also be predicted by comparing target proteins for these toxins—species having functionally different proteins might have different susceptibility to a toxin. To expand our understanding of how common cyanotoxins (microcystin-LR, anatoxin-a, saxitoxin) impact a broad range of organisms, we obtained publicly available data extracted from controlled exposure experiments in the ECOTOXicology Knowledgebase (ECOTOX) and analyzed protein sequences using Sequence Alignment to Predict Across Species Susceptibility (SeqAPASS). ECOTOX provided ample toxicity data for microcystin-LR, whereas anatoxin-a and saxitoxin each have ~one-tenth as many studies (311 publications for microcystin-LR, 32 for anatoxin-a, 28 for saxitoxin). Most studies for microcystin-LR and saxitoxin tested effects in crustaceans and fish, while more than half of anatoxin-a studies focused on algae and plants. A subset of the species with studies in ECOTOX also had protein sequences available for SeqAPASS analysis. Susceptibility predictions from SeqAPASS tended to be corroborated by ECOTOX findings. SeqAPASS predictions were also available for hundreds of unstudied species per toxin and could help inform future work. Most species received “susceptible” predictions. Fungi were often classified as nonsusceptible to microcystin-LR, a finding that aligns with proposals to use fungi for bloom remediation. For anatoxin-a, we found evidence that invertebrates may be less susceptible than vertebrates, because invertebrates lack the protein variants that have been shown to bind strongly with anatoxin-a. Our efforts to predict which organisms might be differentially affected by toxic blooms will ultimately inform larger-scale estimates of blooms’ impacts on whole aquatic communities, in the St. Louis River estuary and beyond. **DISCLAIMER:** The views expressed in this article are those of the authors and do not necessarily represent the views or policies of the US Environmental Protection Agency. Any mention of trade names, manufacturers, or products does not imply an endorsement by the US Government or the US Environmental Protection Agency.

*Keywords: cyanotoxins, ecotoxicology, NAMs, risk assessment, synthesis*

### **13. Seasonal view of cyanobacterial species in St. Louis River Estuary and identifying potential bloom indicators**

Abigail Samson, University of Minnesota Duluth

Christopher Filstrup, Natural Resources Research Institute

Cody Sheik, University of Minnesota Duluth Large Lakes Observatory

In recent years, cyanobacterial algal bloom sightings in Lake Superior and its harbor have increased, suggesting that anthropogenic and climate factors may play a significant role in this phenomenon. Putative toxin-producing cyanobacterial genera, such as *Microcystis* and *Dolichospermum*, have been routinely observed in these isolated blooms in past seasons, raising concern about their ability to bloom extensively under the right conditions and potentially move into Lake Superior. Mechanisms behind these cyanobacterial blooms are hard to predict, and it is not clear which cyanobacteria will produce toxins in any given bloom. In 2025, 15 stations were routinely sampled every two weeks from May to October for water chemistry and microbial analyses. We additionally monitored six bloom-prone sites for water chemistry, microbial communities, and cyanotoxins to characterize cyanobacterial taxa as well as to make linkages between blooming/toxin-producing cyanobacteria and water chemistry in this heterogeneous environment. During our study, a single visible bloom occurred on October 3rd and was localized in the Barker's Island region of the estuary. Interestingly, water quality parameters measured at the bloom-prone sites across the estuary the day before showed increasing concentrations of the bloom indicators chlorophyll and phycocyanin. Molecular analysis of cyanobacterial communities is underway and will be used to identify potential microenvironments in the estuary that may be harboring bloom-forming genera. The data presented will be joined into a database to support bloom prediction and management strategies across the estuary. It will also be used to further develop the understanding of how cyanobacterial species in the tributary may move and proliferate into Lake Superior in a changing environment.

*Keywords: HABs, Water Quality, Lake Superior, toxins*

### **14. Spatial and Temporal Patterns of E. coli at Barker's Island and Wisconsin Point**

Sophie Husby, Lake Superior Research Institute

At the mouth of the St. Louis and Nemadji Rivers lie Barker's Island and Wisconsin Point. *Escherichia coli* concentrations at the swimming beach on Barker's Island and several points along Wisconsin Point are monitored throughout the swimming season (Memorial Day – Labor Day). This monitoring informs beach advisories and closures to reduce exposure to potentially harmful bacteria. *E. coli* concentrations at these beaches may be influenced by many environmental factors, including water clarity, rainfall, and river outflow. Concerns about *E. coli* concentrations have prompted portions of Wisconsin Point to be listed on the Wisconsin Department of Natural Resources Impaired Waters List since as early as 2008. Additionally, persistently high *E. coli* concentrations, along with restoration initiatives, led Wisconsin Point's Shafer beach to be closed for public use following the 2018 swimming season. Restoration of Barker's Island Inner Beach, completed prior to the 2019 beach season, aimed to reduce potential bacterial sources and initially showed success, as reflected by fewer advisories and closures in subsequent beach seasons. However, the frequency of advisories and closures due to *E. coli* has increased in recent years. Bacterial source tracking conducted before restoration identified probable sources of *E. coli* at Barker's Island, which were addressed during restoration, but post-restoration monitoring has not been conducted to identify which sources persist. Understanding beach trends in the context of historical land use and restoration history is crucial for effective management. Statistical analyses of spatial and temporal trends in *E. coli* concentrations were

evaluated in relation to environmental variables to inform the development of models and guide future beach management decisions to protect public health.

*Keywords: E. coli, beach monitoring, water quality*

## **15. Two Decades of Change: Shifts in Aquatic Macrophyte Communities Across the St. Louis River Estuary**

Reed Schwarting, University of Wisconsin-Superior Lake Superior Research Institute

Dr. Nicholas Danz, University of Wisconsin-Superior

Dr. Jeremy Hartsock, Michigan State University Institute of Water Research

Understanding long-term shifts in aquatic macrophyte communities is critical for assessing ecological condition, restoration trajectories, and habitat quality in Great Lakes estuarine systems. The St. Louis River estuary has been the subject of numerous vegetation surveys over the past two decades, offering an uncommon opportunity to evaluate spatial and temporal variation in species composition within a highly dynamic freshwater estuary. In this study, we synthesize macrophyte data from multiple independent sampling efforts to quantify changes in community structure and floristic quality across key sub-embayments of the estuary. Only sites with sufficiently robust and repeated sampling were included in the analysis. Using harmonized datasets, we assess temporal trends in species richness, dominance patterns, floristic quality indices, and the distributions of native and introduced taxa. Spatial representation of these metrics—produced using contemporary cartographic methods—highlights localized patterns of resilience, degradation, and ecological recovery. This work provides an integrated, estuary-wide assessment of macrophyte community change and offers information relevant to ongoing management, restoration evaluation, and habitat conservation planning within the St. Louis River system.

*Keywords: Aquatic Macrophytes, Floristic Quality Assessment, Ecological Monitoring, Estuarine Vegetation Dynamics, Species Composition*

## **16. Improved Manoomin (*Zizania palustris*) stands following prolonged water level increase in Pokegama Bay**

Cecile Renfro, Lake Superior National Estuarine Research Reserve

Hannah Nicklay, Lake Superior National Estuarine Research Reserve

Kaitlin L. Reinl, Department of Biology, Rensselaer Polytechnic Institute

Kirsten Rhude, Lake Superior National Estuarine Research Reserve

Manoomin (Northern Wild Rice; *Zizania palustris*) is a culturally important wetland plant and an ecological keystone that was historically abundant in the St. Louis River Estuary. Ongoing large-scale reseeding and restoration efforts aim to combat substantial species decline resulting from centuries of pollution. Manoomin stewardship is at the forefront of land caretaking; however, extreme water fluctuations in the estuary raise concerns about Manoomin's well-being. From 2004 to 2012, the estuary underwent a period of abnormally low water levels, then subsequently pivoted to a period of inundation from 2014 to 2023. Since 2014, the Lake Superior Reserve has conducted annual vegetation surveys in an unseeded remnant wetland, Pokegama Bay. Here, we synthesize the status of Manoomin in Pokegama Bay over the course of high-water levels and in the subsequent decrease (2014-2025). We found an increase in Manoomin distribution from 6 plots in 2014 to 44 plots in 2025, and Manoomin distribution exceeded the number of plots with optimal depth (30-60 cm) from 2023-2025. Each year on average, Manoomin density increased by

2.5 stalks per plot, and plant height increased by 7 cm. Our study highlights that water fluctuations, even over long durations, can support the well-being of important plant relatives and thus support coastal wetland systems.

*Keywords: Manoomin, water level, water level change, monitoring, ecological keystone*

## **17. Allouez Bay Marsh Bird Habitat Restoration**

Rob Peterson, GEI Consultants, Inc.  
Tom Prestby, Audubon Great Lakes  
Molly Wick, Wisconsin DNR

The Allouez Bay wetland complex is a crucial coastal wetland for many species of declining birds, fish, and other wildlife. While there is still a diverse community of native plants and wildlife, this wetland is being degraded by non-native species, including invasive cattail (*Typha angustifolia* and *Typha x glauca*). Audubon Great Lakes (AGL) and Wisconsin Department of Natural Resources (WDNR) are leading a project with approximately a dozen other partners to restore degraded habitat for marsh birds, fish, and other wildlife in Allouez Bay in which invasive cattail was originally mowed and excavated in late 2024 to diversify the structure of the large coastal wetland to increase hemi-marsh conditions. The response of the wetland was monitored in 2025 by continued vegetation and avian monitoring, a partner team site visit, and drone imagery. Adaptive management, including follow-up cattail cutting by GEI Consultants was conducted in late summer. The poster will feature updated ground-level and drone photos showcasing the 2025 wetland response, including encouraging growth of native vegetation along the edges of excavated areas and in the access path, successful seeding on habitat mounds, and undesired yet unsurprising regrowth of invasive cattail in cut areas. The poster will also discuss lessons learned and next steps for the project.

*Keywords: Allouez, Marsh, Bird, Hemi-marsh, restoration*

## **18. Lower St. Louis River Habitat Plan 2026 Update**

Rebecca Eiden, GEI Consultants, Inc

The Lower St. Louis River Habitat Plan (Habitat Plan) has served as the primary management framework guiding habitat remediation, restoration, and protection within the Lower St. Louis River Estuary since its adoption in 2002. Over the past two decades, coordinated restoration, monitoring, and management efforts, have led to substantial ecological progress, positioning the St. Louis River Area of Concern (AOC) for potential delisting in the coming years. Despite this success, the Habitat Plan itself has not been comprehensively updated to reflect the volume of work completed, advances in scientific understanding, or emerging management challenges. The Habitat Plan update is explicitly focused on addressing historical and ongoing anthropogenic sources of stress, including, but not limited to, altered hydrology, shoreline modification, and invasive species, that continue to influence habitat quality and complicate long-term planning, restoration, and monitoring efforts. This poster presents the history and evolution of the Habitat Plan, introduces the current update, and outlines a structured management framework that links sources of stress, stressors, and resulting ecological impacts. This framework provides a transparent and defensible approach for understanding how human activities influence habitat conditions and overall ecosystem integrity. A central goal of the Habitat Plan update is to define clear, measurable metrics that align with restoration and management objectives. As part of this effort, we highlight currently identified datasets and

invite Summit participants to contribute their knowledge of relevant datasets and monitoring tools. Participation input will help strengthen the Habitat Plan by identifying datasets and metrics that may not be well known, helping shape the plan to be scientifically robust and practical.

*Keywords: Habitat Plan Update*

## **19. Habitats of the St. Louis River Estuary: A Habitat Map**

Howard Veregin, Wisconsin State Cartographer's Office  
Kirsten Rhude, Lake Superior Reserve  
Kelly Beaster, Tsuga Ecological Consulting  
Jeffery Thompson, U-Spatial, University of Minnesota  
Olena Boiko, U-Spatial, University of Minnesota  
Carol Reschke, Shoreview Ecology  
Kristi Nixon, Natural Resources Research Institute, University of Minnesota  
Carl Sack, Fond du Lac Tribal and Community College  
Ann Buschhaus, Wisconsin State Cartographer's Office  
Valerie Ross Zhaawendaagozikwe, University of Wisconsin-Superior  
Emily Lockling, University of Minnesota-Duluth  
Chris Susnik, University of Wisconsin-Superior

This map shows the ecological habitats of the St. Louis River Estuary, based on the National Estuarine Research Reserve System Habitat and Land Cover Classification Scheme. The map encompasses a one-mile buffer around the St. Louis River up to the Fond du Lac Dam, as well as other key areas, including the Magney-Snively Natural Area in Duluth, MN and parts of the Nemadji River in Superior, WI. The map was derived from a mosaic of 2021-2022 NAIP (National Agriculture Imagery Program) imagery, using the UNET machine learning algorithm. Additional data layers were used to refine the classification. This map was created in close collaboration with the St. Louis River Habitat Workgroup, and will be used to support the efforts to update the Lower St. Louis River Habitat Plan.

*Keywords: habitats, land cover, restoration, habitat plan*

## **20. Mapping and Assessing Native Plant Communities in Duluth's St. Louis River Watershed**

Maggie Ross, GEI Consultants, Inc.  
Kelly Beaster, Tsuga Ecological Consulting  
Rob Peterson, GEI Consultants, Inc.  
Cole Webster, GEI Consultants, Inc.  
Gini Breidenbach, Minnesota Land Trust  
Kate Kubiak, City of Duluth

GEI Consultants, Inc. (GEI) partnered with Tsuga Ecological Consulting and the Minnesota Land Trust (MLT) to identify and assess native plant communities (NPCs) across approximately 10,000 acres of undeveloped land in the City of Duluth, within the St. Louis River Area of Concern (AOC) and the Lower St. Louis River watershed. Through a desktop analysis, GEI mapped NPC boundaries and classified NPCs following the Minnesota Department of Natural Resources NPC classification system. From June through October 2025, a team of plant ecologists completed meander surveys through NPC polygons to verify the NPC

determinations and to assess their ecological condition. Along each route, invasive species populations and rare plant occurrences were documented. Most NPC polygons across the city were assessed, with additional emphasis on the proposed Lester-Amity-Hawk Ridge natural area and Mission Creek/Rodney Paine Forest. Ecological condition of the NPCs ranged from areas of excellent ecological integrity to highly degraded. Key threats facing NPCs included buckthorn infestations (*Rhamnus cathartica*) that reduced species diversity, mortality of black ash (*Fraxinus nigra*) in mesic hardwood forests and swamps, and limited regeneration of desirable canopy species in forested systems. The project yielded significant discoveries, including multiple new populations of rare species including soapberry (*Shepherdia canadensis*), barren strawberry (*Waldsteinia fragaroides*), pale sedge (*Carex pallescens*), eastern hemlock (*Tsuga canadensis*), and floating marsh marigold (*Caltha natans*) along with the first documented occurrence of rough sedge (*Carex scabrata*) in Minnesota. GEI is currently processing the field data and translating it into a user-friendly format to support Duluth's natural resources program and regional partners. The results will identify areas of high ecological integrity for protection, prioritize degraded areas for restoration, and guide management and restoration actions compatible with NPCs.

*Keywords: Native Plant Community, Rare Species, St. Louis River AOC, Invasive Species, Ecological Assessment*

## **21. Evaluating the Effectiveness of Manoomin Hulls as Mulch**

Jerron Ojibway, Fond Du Lac Technical Community College  
Simon Councillor FDLTCC  
Steven Gebhard, Research Coordinator  
Kelsey Myhre FDLTCC garden Coordinator  
Erica-Resendiz-Alonso FDL Ojibwe School Garden Coordinator

As we come to know, Manoomin (wild rice) is a staple traditional food source of the Anishinaabe culture. The wild rice husks removed from the parching and winnowing process of harvesting wild rice are often discarded as a byproduct of the ricing process but may have beneficial uses as mulch. This project delves into the research questions regarding how effective wild rice mulch is at retaining soil moisture and its ability to sustain weed suppression. Six raised beds consist of varying thicknesses of wild rice hull mulch that received differences in the amount they were watered. We redesigned how we collected soil moisture measurements by installing sample ports on the sides of the raised beds for quick access of LabQuest data from the probe to measure daily soil moisture efficiently. Continuous data was recorded via HOBO sensors for soil moisture and temperature, as well as weather data. Weed suppression was measured by calculating biomass and recorded the number of weeds in each of the raised beds. In conclusion, the sustainable impact on agriculture with the usage of wild rice hulls suggests a viable aspect in the agricultural industry. The data from this study will be used to recommend how use of certain depths of Manoomin hull mulch can be practical in gardening and in the agricultural industry.

*Keywords: Manoomin Hulls, soil moisture, weed suppression*

## **22. Ground Truthing Remote Sensing Data for Manoomin (Wild Rice)**

Eric Omdahl, University of Wisconsin-Superior, Great Lakes Indian Fish & Wildlife Commission (GLIFWC)

Manoomin (Wild Rice) is a culturally sacred and ecologically important plant for Indigenous communities. This project aims to improve monitoring of wild rice populations using Synthetic Aperture Radar (SAR) data

from the Sentinel-1 satellites, processed via Google Earth Engine (GEE). Ground truthing is conducted through field visits to verify and calibrate the remote sensing data. The methodology enables accurate classification of wild rice beds and estimation of abundance, allowing for tracking changes over time. Results will support traditional harvesters' Manoomin stewardship and contribute to conservation strategies that safeguard wild rice habitats. By integrating Indigenous knowledge with advanced technology, this work strengthens community capacity in natural resource management.

*Keywords: Manoomin, Wild rice, Ground truthing, Remote sensing, Traditional ecological knowledge*

### **23. Dangers of Sulfate Pollution**

Thomas Anderson, Tamarack Water Alliance

Sulfate based water pollution continues to be a controversial topic as the Minnesota Pollution Control Agency (MPCA) works to enforce sulfate standards on the Minnesota range. "Closer to home", proposed high sulfide mining near the St. Louis River watershed threatens to impact the St. Louis River and Estuary. This poster presentation will outline the three main impacts of sulfate pollution, their potential effects on the environment and impacts to human health. Specifically, sulfate pollution can result in acidification due to the creation of sulfuric acid in the environment over time, increased production of highly toxic methylmercury that can bio accumulate in fish and the destruction of wild rice beds.

*Keywords: Sulfates, AMD, methylmercury, wild rice, health*

### **24. Roots, Shoots, and Gases: How Plant Functional Groups Influence Peatland Mesocosm Greenhouse Gas Emissions**

Daniel Rudolph, University of Minnesota-Twin Cities, Department of Bioproducts and Biosystems Engineering

Dr. Christian Lenhart, Department of Bioproducts and Biosystems Engineering, University of Minnesota

Dr. Natalie Hunt, Department of Bioproducts and Biosystems Engineering, University of Minnesota

Emily Deering, Department of Bioproducts and Biosystems Engineering, University of Minnesota

Jackson Brady, Department of Bioproducts and Biosystems Engineering, University of Minnesota

Alex Ly, Department of Bioproducts and Biosystems Engineering, University of Minnesota

Peatlands are one of Earth's largest carbon sinks, storing 30% of the planet's terrestrial organic carbon in their soil and plant biomass. However, drainage has converted many of these wetland ecosystems from natural carbon sinks to significant sources of atmospheric carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>). To understand these critical climate ecosystems, studying the ecophysiology of plant functional groups (PFGs), organic rich soils, and water table regime interaction is crucial for restoration and future greenhouse gas (GHG) management. This experiment used controlled mesocosms to evaluate the effects of varying peat soil types and plant functional group composition on CO<sub>2</sub> and CH<sub>4</sub> fluxes under a consistent water table regime. Twenty seven peatland mesocosms were established using three peat soil types: fibric (F), hemic (H), and sapric (S), and three vegetation treatments: shrub dominated communities, graminoid dominated communities (sedges and grasses), and lastly, bare peat. All mesocosms were maintained at a water level 10 cm below the peat surface. This experiment ran during the field season from Spring 2025 through Fall 2025. Shrub treatments consisted of *Rhododendron groenlandicum* (Labrador tea) and *Chamaedaphne calyculata* (leatherleaf), harvested from one of our drained peatland sites in Aitkin County, Minnesota. Graminoid

treatments included *Carex lacustris* (Lake sedge), *Carex stricta* (Tussock sedge), and *Scirpus cyperinus* (Wool grass), which were purchased from a native plant nursery. CO<sub>2</sub> and CH<sub>4</sub> fluxes were measured weekly using a LiCOR chamber based gas analyzer, alongside additional soil and water chemistry parameters. This study complements ongoing field-based peatland research conducted by the University of Minnesota and The Nature Conservancy through a collaborative partnership. By isolating the roles of plant functional group composition and peat soil type on greenhouse gas fluxes, this research aims to inform peatland restoration strategies that optimize sequestration while minimizing methane emissions, supporting peatland revegetation as a nature-based climate strategy.

*Keywords: peatland, plant communities, greenhouse gas flux, restoration, climate change*

## **25. News from NE Wisconsin Freshwater Collaborative Team**

Robert Fish, UW-Green Bay NERR  
Emily Tyner, UWGB NERR  
Amy Carrozzino-Lyon, UWGB  
Lynn Terrien, UWGB  
Sam Betancur UWGB

This poster presentation will offer updates from the Northeast Wisconsin Freshwater Collaborative team and UW-Green Bay NERR (in progress). Updates include Manoomin restoration and Wild Rice in the Classroom, Freshwater Highschool Scholars program, undergraduate and graduate program successes and opportunities, workforce development potential, and Tribal partnerships and engagement with the Oneida and Menominee Nations.

*Keywords: NE WI Update, Green Bay NERR, FCW*

## **26. The Enduring Lake Superior Communities Program**

Melissa Burke, Lake Superior National Estuarine Research Reserve  
Natalie Chin, Wisconsin Sea Grant  
Karina Heim, Lake Superior National Estuarine Research Reserve

Communities along Lake Superior's coastlines are facing intensifying environmental challenges—from stronger storms to shifting seasonal patterns. The Enduring Lake Superior Communities program offers a structured, yearlong opportunity for teams of local decision-makers in Douglas, Bayfield, Ashland, and Iron counties to proactively address these challenges. With technical support, planning tools, and discretionary program funds, participating teams work toward a self-determined resilience goal or project. Whether it's developing preparedness plans, tracking flood impacts, or engaging residents in resilience conversations, the program helps communities move from ideas to action. Together, we're building enduring communities equipped for a changing future.

*Keywords: Resilience, environmental challenges, resilient communities*

## **27. A Practical Framework for Monitoring and Managing Invasive Species Impacts to Wetland Health in the St. Louis River Estuary**

David Grandmaison, Minnesota Department of Natural Resources  
Jimmy Marty, Emmons & Olivier Resources, Inc.  
Drew Harry, Emmons & Olivier Resources, Inc.

Non-native, invasive species threaten the floristic quality and ecological integrity of coastal wetland plant communities in the St. Louis River Estuary, yet their distribution and impacts remain poorly understood. Beginning in 2025, the Minnesota Department of Natural Resources, in partnership with Emmons & Olivier Resources, Inc., initiated early detection invasive plant surveys and rapid floristic quality assessments at eleven priority sites selected by the project's Technical Team. No new invasive species infestations were detected. Floristic quality scores for shallow open-water plant communities frequently exceed those of regional reference sites. Non-native and hybrid cattail was the most widespread threat to habitat quality across surveyed sites. The 2025 survey results have informed the development of Site Stewardship Plans, which will guide invasive species management actions beginning in 2026. This project provides a practical framework for practitioners to evaluate invasive species impacts and use survey data to establish management goals, prioritize actions, and protect coastal wetlands within the St. Louis River Estuary. Funding for this project was provided by the Great Lakes Restoration Initiative through Focus Area 2.

*Keywords: invasive species, habitat restoration, St. Louis River Estuary, cattail management, floristic quality*

## **28. The Management of Invasive Knotweeds (*Fallopia* spp.) across the Lake Superior Basin of Wisconsin**

Ramona Shackelford, Northwoods Cooperative Weed Management Area  
Dara Fillmore, Wisconsin Department of Natural Resources

The Northwoods Cooperative Weed Management Area (NCWMA) has documented 368 sites of Japanese (*Fallopia japonica*), giant (*F. sachalinense*), and Bohemian (*F. x bohemicum*) knotweeds within its four-county region of northern Wisconsin (Ashland, Bayfield, Douglas, and Iron Counties). Recently, knotweed infestations have been found spreading along rivers including the Amnicon and Eau Claire Rivers in Douglas County and the Montreal River in Iron County. Knotweeds can also spread easily along roads due to mowing. Since 2021 the NCWMA has treated between 88 and 145 sites each year using GLRI funding managed by the Wisconsin DNR. Sites typically need to be treated annually for multiple years to be eradicated. This poster will explain treatment methods and display examples of infestations before and after treatments over multiple years.

*Keywords: Invasive species, knotweeds, herbicide*

## **29. GLISSnet at 5 years: monitoring for newly introduced invertebrates in the St. Louis River estuary and beyond**

Chelsea Hatzenbuhler, SpecPro Sustainability and Environment  
Anett Trebitz, US EPA/OASES  
Greg Peterson, US EPA/OASES  
Andrew Chang, Smithsonian Environmental Research Center  
Chris McMahon, Smithsonian Environmental Research Center

Kevin Mitchell, Smithsonian Environmental Research Center  
Monaca Noble, Smithsonian Environmental Research Center  
Greg Ruiz, Smithsonian Environmental Research Center  
Brian Steves, Smithsonian Environmental Research Center  
Jennifer Carney, Smithsonian Environmental Research Center  
Greg Tschann, Smithsonian Environmental Research Center  
Lindsay Butler, Smithsonian Environmental Research Center  
Lana Fanberg, University of Wisconsin – Superior

The Great Lakes Introduced Species Sentinel Network (GLISSNet) has been operational for five years now. Organized by the Smithsonian Environmental Research Center, GLISSNet is a growing collaborative network and currently includes partners from the US Environmental Protection Agency (EPA), the Lake Superior Research Institute (LSRI) at the University of Wisconsin Superior, Fisheries and Oceans Canada, Moss Landing Marine Laboratories, EcoAnalysts, and the US Coast Guard. The GLISSnet approach is designed in parallel to a program already established in coastal marine bays and estuaries, providing a critical data resource to evaluate invasion dynamics and community characteristics across these coastal ecosystems. The sampling program began in the St. Louis River estuary in 2021 and expanded to include Sandusky Bay in Lake Erie in 2024; both locations receive extensive commercial ship and recreational boat traffic capable of introducing new aquatic species with both domestic and overseas origins. The monitoring targets benthic invertebrates and zooplankton over a large spatial extent (e.g., 50 broadly distributed sites) via a suite of gears (e.g., PONAR grabs, Hester-Dendy samplers, oyster-crate samplers, zooplankton tows) and employs both conventional taxonomy and DNA methods to determine the organisms present. Annually, we evaluate the performance of the various components of our sampling effort and estimate the completeness of our sampling of non-native species in the region. This poster will present results from the GLISSnet surveys conducted in the St. Louis River estuary over the years 2021 through 2025. The views expressed in this abstract are those of the author(s) and do not necessarily represent the views or policies of the U.S. Environmental Protection Agency.

*Keywords: invasive, aquatic invertebrates, early detection monitoring,*

### **30. First evidence of *Hemimysis anomala* (bloody red shrimp) establishment in Lake Superior**

Kristin Huelsbeck, University of Minnesota Duluth  
Donn K. Branstrator, University of Minnesota Duluth  
Gabriella M. Thelen, University of Minnesota Duluth  
Michael Nagel, University of Minnesota Duluth  
Lauren R. Isbell, University of Minnesota Duluth  
Lana M. Fanberg, Lake Superior Research Institute  
Heidi Schaefer, Lake Superior Research Institute  
Meghan E. Brown, Hobart and William Smith Colleges  
Matthew C. TenEyck, Lake Superior Research Institute

We report evidence of the first confirmed establishment of the nonindigenous malacostracan *Hemimysis anomala* in Lake Superior. Samples we collected in 2025 from two locations within the Duluth-Superior Harbor, a major inland shipping port in the Great Lakes, contained juveniles, adult males, and adult females, indicating a reproducing population. Additionally, we document earlier evidence from 2018 samples we collected in the harbor that contained two juvenile specimens. These results represent the fifth and final

Great Lake to be colonized by *H. anomala*, and its westernmost known distribution within the Great Lakes basin.

*Keywords: Hemimysis, Duluth-Superior Harbor*

### **31. Post Wildfire Impacts on Water Quality in Northern Minnesota Lakes**

Shawnee McMillian, Natural Resources Research Institute  
Christopher T. Filstrup, Natural Resources Research Institute, University of Minnesota, Duluth  
Jerald Henneck, Natural Resources Research Institute, University of Minnesota, Duluth  
Jennifer A. Brentrup, Minnesota Pollution Control Agency, St. Paul  
Ian McCullough, Colorado Mountain College, Breckenridge

Wildfires in Minnesota are increasing in frequency and severity and have the potential to alter ecosystem functioning within freshwater lakes. Few studies have focused on water quality changes in inland lakes following fire exposure. Wildfire research has concentrated on the Western region of the US, leaving a notable lack of studies in lake-rich regions such as Minnesota, where smaller inland systems may be particularly sensitive to post-fire disturbances. This study examined 30 inland lakes (15 control and 15 burned) in northern Minnesota between 2022 and 2025. The 15 burned lakes were located within the area affected by the 2021 Greenwood Fire, while the 15 control lakes were outside the burn zone. We found that (1) NMDS analysis showed that burned catchment lakes clustered in association with water quality vectors for TP, TN, DOC, and TSS, underscoring fire-related impacts on nutrient dynamics. (2) Lakes receiving runoff from burned catchments had higher concentrations of total phosphorus (TP), total nitrogen (TN), total suspended solids (TSS), and dissolved organic carbon (DOC) and decreased Secchi depths in both years when compared to the control lakes; and (3) TP, TN, and DOC concentrations all decreased from 2022 to 2025, while water temperature and acid neutralizing capacity (ANC) increased. These findings demonstrate that lakes within burned landscapes experience measurable shifts in water quality for many years post fire, reinforcing the critical need for continued investigation into ecosystem resilience and health.

*Keywords: Wildfire, Lakes, Water Quality, Minnesota*

### **32. Water Quality Changes Due to Burn Severity After Two Northern Minnesota Wildfires**

Liana Sweezer, Natural Resources Research Institute, University of Minnesota, Duluth  
Christopher T. Filstrup, Natural Resources Research Institute, University of Minnesota, Duluth  
Jerald Henneck, Natural Resources Research Institute, University of Minnesota, Duluth  
Jennifer A. Brentrup, Minnesota Pollution Control Agency, St. Paul  
Ian McCullough, Colorado Mountain College, Breckenridge

Over the past several years, there have been multiple wildfires in Minnesota, including the 2021 Greenwood and 2025 Brimson Complex fires. While the Greenwood fire was started by a lightning strike and the Brimson fire was started by a campfire, both fires occurred during moderate to severe drought conditions in the state and were exacerbated by the unusually hot and dry conditions. This study focused on 30 lakes (15 burned and 15 control) in and around the Greenwood fire and 6 lakes (3 burned and 3 control) in and around the Brimson fire. Greenwood data was used from 2022 (the year directly following the fire), while Brimson data was only collected in 2025 (starting one month after the fire). GIS was used to determine the burn severity, slope, and land cover in each lake's watershed. These factors were compared to the monthly water quality data to examine the relationship between burn severity and temporal water quality shifts. Most of

the Greenwood fire burn area had a high-moderate or high burn severity, leading to more changes in water quality than in the Brimson fire burn area, which was dominated by low and low-moderate burn severity. These findings demonstrate the role of burn severity in post-wildfire chemical and topographical changes that influence water quality in inland lakes.

*Keywords: wildfires, GIS, water quality*

### **33. Water Quality Stability Following the Brimson Complex Fire**

Mia Hallett, Natural Resources Research Institute  
Jerald Henneck, Natural Resources Research Institute  
Shawnee McMillian, Natural Resources Research Institute  
Christopher Filstrup, Natural Resources Research Institute

Wildfires are becoming more frequent, more severe, and less predictable, as demonstrated by recent wildfires in northern Minnesota. Despite increasing wildfires, research on their effects on water quality are mainly limited to streams and rivers in the western United States. This project was designed based on our previous findings on lakes impacted by the 2021 Greenwood Fire. The lakes from the Greenwood study have shown a decrease in water clarity and pH as well as an increase of total phosphorus, total nitrogen, total suspended solids, and dissolved organic carbon. These results occurred one year post fire, when monitoring began, and have persisted through 2025. The effects of the Greenwood Fire indicate that a high severity wildfire can impact water quality for a sustained period. The research regarding the Brimson Complex Fire investigates whether a less severe fire will evoke a similar response, in a shortened timeframe. The Brimson project studied six lakes (three burned, three control) in northeast Minnesota following the Brimson Complex Fire. Burned lakes were located in the burn zone while control lakes were in the surrounding area. Biological, chemical, and physical water quality data was collected starting one month after total fire suppression and continued monthly, from June through October. We found that the water quality parameters of the fire impacted lakes were not significantly different from that of the non-impacted lakes; with the exception of total nitrogen. The dissimilarity in findings highlight the importance of continued water quality monitoring and wildfire management.

*Keywords: Water, wildfire*

### **34. Climate Youth Labs (CY-Labs): Elevating Youth Voices to Promote Climate Resiliency**

Eric John Diel, Red Lake Schools