



# **MICHIGAN SEA GRANT**

**UNIVERSITY OF MICHIGAN + MICHIGAN STATE UNIVERSITY**



# ANNUAL REPORT

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# Michigan Sea Grant 2022 Annual Report

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## **FOCUS AREA: Healthy Coastal Ecosystems**

*GOAL 1: Ecosystem sustainability is improved by better understanding of ecosystem services.*

### **ACCOMPLISHMENT: Animated videos showcase management successes and challenges for Great Lakes aquatic invasive species**

**Recap:** An animated “Managing Great Lakes Invaders” series tells engaging, concise stories about successes and ongoing challenges related to managing aquatic invasive species.

**Relevance:** Aquatic invasive species (AIS) are a significant problem in the Great Lakes, where they disrupt food webs, destroy habitats, and harm businesses and recreation throughout the basin. Dealing with these aquatic invaders can be a daunting challenge; scientists, elected officials, industry, and the public have successfully been working together to slow or stop their spread.

**Response:** MISG and the Great Lakes Aquatic Nonindigenous Species Information System (GLANSIS) produced an animated video series to showcase common invasion pathways, management success stories, and future research. MISG developed the five-part “Managing Great Lakes Invaders” series with AIS experts and partners. Each short video focuses on a different Great Lakes invasion story, including ballast water, sea lamprey, dreissenid mussels, and invasive carp, plus an overarching introductory video. The videos were embedded in a Story Map.

**Results:** The videos debuted in February 2022 for National Invasive Species Awareness Week. The videos have received 650–1,600 views each on YouTube. GLANSIS featured the series on Twitter, gaining their largest single increase in followers since the account’s creation. The associated Story Map is a flagship product for GLANSIS’s new Educator Hub. Other Sea Grant programs have incorporated the videos into AIS trainings and have proposed using the series in a study about AIS messaging.

**Partners:** NOAA Great Lakes Environmental Research Laboratory; Big Foot Media; Great Lakes Fishery Commission

**Project Number Index:** A/AS-28-B, R/CGLH-18

**Featured work?**

## **FOCUS AREA: Healthy Coastal Ecosystems**

*GOAL 1: Ecosystem sustainability is improved by better understanding of ecosystem services.*

### **ACCOMPLISHMENT: MISG helps inform biodiversity assessment and public engagement at new West Michigan park**

**Recap:** MISG leveraged community events and angler data to help Ottawa County Parks and Recreation and the Michigan Department of Natural Resources better understand fish populations at a new West Michigan park.

**Relevance:** Ottawa County is a popular recreation hub along Lake Michigan. In recent years, a 345-acre former sand mine was converted into Ottawa Sands County Park. The park includes forested dunes, an 80-acre inland lake, and riverfront wetlands. Already well-used by the community, the park is poised for further development to become a regional tourism highlight.

**Response:** In 2022, MISG partnered with the Michigan Department of Natural Resources and Ottawa County to conduct fisheries assessments and public outreach at Ottawa Sands. MISG staff supported a one-day fish sampling event at the park to engage students in measuring and identifying fish. Later, MISG leveraged angler data and a community fishing event to develop an improved assessment of the park's bass population.

**Results:** These efforts led to hands-on engagement opportunities for students and community members, some of whom caught the first or biggest fish of their lives. MISG used the bass data to develop two lesson plans for future field trips and laboratory exercises. The Ottawa County Parks Department expressed strong interest in the data and MISG's input as they move forward with habitat restoration, development, and possible changes to fishing regulations for the park.

**Partners:** Ottawa County Parks and Recreation Department; Michigan Department of Natural Resources; Grand Valley State University

**Project Number Index:** A/AS-28-C

**Featured work?**

## **FOCUS AREA: Healthy Coastal Ecosystems**

*GOAL 1: Ecosystem sustainability is improved by better understanding of ecosystem services.*

### **ACCOMPLISHMENT: MISG-funded intern and educators assist NOAA researchers with innovative study of Lake Huron acidification**

**Recap:** A MISG-funded intern worked with NOAA scientists at Thunder Bay National Marine Sanctuary to ramp up an innovative study of acidification in Lake Huron waters.

**Relevance:** In addition to causing climate change, excess atmospheric carbon dioxide can also lower the pH of seawater through a process called acidification. Ocean acidification disrupts marine creatures' ability to form and maintain calcium-based shells and can otherwise harm the survival and reproduction of many aquatic species. Computer models and early studies suggest that similar changes may affect the Great Lakes and other large lakes.

**Response:** NOAA scientists in Michigan are building a sensor network to track Lake Huron water chemistry for signs of changing pH and carbon dioxide levels. One of MISG's 2022 summer undergraduate interns worked with mentor and acidification project co-lead Stephanie Gandulla at the Thunder Bay National Marine Sanctuary to deploy sensors and collect samples in sanctuary waters. Teachers on a MISG-coordinated shipboard science workshop also participated in the sanctuary research.

**Results:** MISG's intern and the visiting teachers all participated in cutting-edge science alongside NOAA researchers. Another MISG intern is poised to work on the same project with Thunder Bay National Marine Sanctuary in 2023. While the acidification research is still in early stages, it's already garnering national media attention and raising awareness of climate change's widespread impacts on the Great Lakes.

**Partners:** NOAA Thunder Bay National Marine Sanctuary; NOAA Great Lakes Environmental Research Laboratory

**Project Number Index:** M/PM-64; C/CC-19; C/CC-25; M/PM-69; R/ERA-30

**Featured work?** YES



## **FOCUS AREA: Healthy Coastal Ecosystems**

*GOAL 1: Ecosystem sustainability is improved by better understanding of ecosystem services.*

### **IMPACT: MISG-funded researcher publishes papers and launches graduate students into STEM careers**

**Recap:** Dr. Tiffany Schriever, a Western Michigan University researcher, funded by MISG in 2018, published the results of her wetland biodiversity work and helped launch her graduate student team into STEM careers.

**Relevance:** Many of West Michigan's coastal dunes house sensitive and complex interdunal wetland ecosystems. These rare and hydrologically unique wetlands support some of Michigan's vulnerable, threatened, and endangered plants, insects, and animals. Despite their ecological significance and susceptibility to harm from lake level changes and human interference, interdunal wetlands on the eastern coast of Lake Michigan had never been thoroughly inventoried. Such an inventory would mark an important step toward understanding and safeguarding these delicate ecosystems.

**Response:** In 2018, MISG funded Dr. Tiffany Schriever, an assistant professor of biological sciences at Western Michigan University, to study the distribution patterns of amphibians, reptiles, and aquatic macroinvertebrates in Lake Michigan's interdunal wetlands. Schriever and her student research assistants conducted acoustic and transect surveys in 38 interdunal wetlands across five lakeshore parks. They also genetically sequenced macroinvertebrate samples to trace gene flow and distribution among species found in multiple wetlands.

**Results:** In 2022 and early 2023, Schriever and her research team published three articles. A paper in *Coastal Wetlands* highlighted a diversity gradient along the coastline. A *Freshwater Biology* paper emphasized the importance of maintaining connections among coastal wetlands. Their *Freshwater Science* article explored the genetic diversity of aquatic insects among fragmented wetlands. Three of Schriever's graduate students received first-author listing on the articles, and all three graduated and found work in their field.

**Partners:** Western Michigan University

**Project Number Index:** R/CGLH-5

**Featured work?**

## **FOCUS AREA: Healthy Coastal Ecosystems**

*GOAL 1: Ecosystem sustainability is improved by better understanding of ecosystem services.*

### **ACCOMPLISHMENT: Great Lakes biodiversity database forms new partnership to incorporate aquatic plants**

**Recap:** A new partnership will help build out the Great Lakes Water Life website as a complete atlas of life in the Great Lakes.

**Relevance:** The Great Lakes Aquatic Nonindigenous Species Information System (GLANSIS) is a NOAA database managed by MISG staff. GLANSIS's sister website, Great Lakes Water Life (GLWL), catalogs native aquatic species found in Great Lakes communities. GLANSIS and GLWL together aim to provide information on nearly all aquatic organisms in the region. Until recently, GLWL lacked entries for one major category of aquatic life: vascular plants.

**Response:** In 2022, GLANSIS received supplemental funds from the Great Lakes Restoration Initiative to subcontract with the Michigan Natural Features Inventory (MNFI) to add vascular plants to the Great Lakes Water Life database. MNFI has been generating and disseminating information about Michigan's species and habitats for 40 years and has been part of the Michigan State University Extension program since 2000.

**Results:** The two-year MNFI subcontract represents a new partnership for GLANSIS and GLWL, with the potential to greatly enhance datasets and outreach efforts for both teams. Incorporating vascular plants will make GLWL a complete atlas of life in the Great Lakes that provides effective education, outreach, and research tools.

**Partners:** Michigan Natural Features Inventory; NOAA Great Lakes Environmental Research Laboratory

**Project Number Index:** A/AS-28-B, R/CGLH-18

**Featured work?**

## **FOCUS AREA: Healthy Coastal Ecosystems**

*GOAL 2: Ecosystem-based approaches are used to manage land, water, and living resources.*

### **ACCOMPLISHMENT: Michigan Clean Marina Program recognizes waterfront facilities who steward Michigan rivers and lakes**

**Recap:** The Michigan Clean Marina Program is a voluntary certification program that recognizes marinas that maintain and improve Michigan's waterways through green infrastructure installations, improved waste capture methods, and other eco-friendly practices. The program reached a total of 98 certified Clean Marinas in 2022.

**Relevance:** Stationed along Michigan's rivers, inland lakes, and Great Lakes, marinas are a major line of defense in the fight against water pollution. Upgrading fuel pumps to prevent leaks, capturing and properly disposing of oils and cleaning fluids, adding native plants, and taking other environmentally friendly actions can help marinas protect and improve water quality. But upfront costs and lack of knowledge can prevent marina operators from exploring these improvement projects without external motivation and guidance.

**Response:** The Michigan Clean Marina Program (MCMP) is a voluntary certification program to recognize marinas that take stewardship actions to maintain and improve Michigan's waterways. MCMP provides guidance, a step-by-step action checklist, and promotional materials to help marinas showcase their improvements to clients and competitors. Certified Michigan Clean Marinas can apply for recertification every three to five years. MISG helped launch and manage MCMP and now fills an advisory role.

**Results:** In 2022, MCMP reached a total of 98 certified Clean Marinas. This includes 6 new certifications and 15 recertifications. These new program participants are showing their competitors and clients that environmental stewardship is a core business value and are taking meaningful steps to keep Michigan waterways clean and educate boaters who use their facilities in Great Lakes stewardship practices.

**Partners:** Michigan Boating Industries Association

**Project Number Index:** A/AS-28-K, C/CC-19, C/CC-20, C/CC-25

**Featured work?**



## **FOCUS AREA: Healthy Coastal Ecosystems**

*GOAL 2: Ecosystem-based approaches are used to manage land, water, and living resources.*

### **ACCOMPLISHMENT: GLANSIS database adds habitat suitability maps for invasive carp to Map Explorer tool**

**Recap:** The GLANSIS database's Map Explorer tool provides habitat suitability maps to help natural resources managers anticipate potential aquatic species invasions around the Great Lakes.

**Relevance:** By studying the habitat and food sources an introduced species prefers, researchers can predict its potential to invade and cause harm in the Great Lakes. Habitat suitability maps can help environmental managers tailor their aquatic invasive species (AIS) detection and monitoring efforts to areas where a nonindigenous species is most likely to thrive. But these maps and models can be hard to locate across numerous scientific publications and websites.

**Response:** The Great Lakes Aquatic Nonindigenous Species Information System (GLANSIS) database, managed by NOAA and MISG, provides information about current and potential aquatic invasive species. GLANSIS developed its Map Explorer interface to merge habitat maps with data points of locations where nonindigenous species have been found in the Great Lakes watershed, allowing users to explore habitats associated with nonindigenous species.

**Results:** In 2022, GLANSIS leveraged recent University of Michigan and NOAA research to add a collection of bighead and silver carp habitat suitability maps to the Map Explorer. This information can help managers determine where to look for carp introductions and take preemptive actions to prevent invasions. The team added several other layers and created a how-to guide. Adding research-based habitat suitability maps increases the Map Explorer's functionality and improves public access to research.

**Partners:** NOAA Great Lakes Environmental Research Laboratory

**Project Number Index:** A/AS-28-B, R/CGLH-18

**Featured work?**

## **FOCUS AREA: Healthy Coastal Ecosystems**

*GOAL 2: Ecosystem-based approaches are used to manage land, water, and living resources.*

### **ACCOMPLISHMENT: New tool improves regional transparency about nonindigenous species regulations and risk assessments**

**Recap:** Regulations that protect Great Lakes states and countries can be hard to keep up with. A new online tool displays the most up-to-date information on nonindigenous species regulation in the Great Lakes.

**Relevance:** The Great Lakes basin encompasses eight U.S. states and two Canadian provinces and their respective tribal and First Nations territories. These states and provinces, along with their federal governments and territories, have imposed regulations on invasive species and the trade of organisms to help protect the natural resources within their jurisdictions. The definitions and rules behind these overlapping policies can change over time with the discovery of new information and changing political climates.

**Response:** To improve regional transparency, the MISG-managed Great Lakes Aquatic Nonindigenous Species Information System (GLANSIS) developed a tool to display the most up-to-date information on nonindigenous species regulation in the Great Lakes. The tool is integrated into the GLANSIS Risk Assessment Clearinghouse in tandem with the Species Results Explorer, which provides access to different risk assessments for nonindigenous species conducted by various government agencies and academic institutions.

**Results:** Users can now search for a species, genus, family, or taxon to find both the risk assessments and regulations associated with the selection. Each entry contains a brief description of the regulation, the date it took effect, and a link to the source legislation or document. This is an important step toward improving clarity and cooperation in a complex and evolving legislative environment.

**Partners:** NOAA Great Lakes Environmental Research Laboratory

**Project Number Index:** A/AS-28-B, R/CGLH-18

**Featured work?**

## **FOCUS AREA: Healthy Coastal Ecosystems**

*GOAL 2: Ecosystem-based approaches are used to manage land, water, and living resources.*

### **ACCOMPLISHMENT: A collaborative approach helps inform salmonine management in Lake Michigan**

**Recap:** A MISG-funded research project engaged resource users and managers in a collaborative effort to help improve how decisions are made about resource use in Lake Michigan, as a model for the Great Lakes, to ensure long-term sustainability of fish populations based on sound scientific data and input from stakeholders.

**Relevance:** Fish populations in the Great Lakes are continually shifting and changing in response to regular, and now irregular, system change. Striking a balance between dynamic fish species populations and the needs of fishers can help decide the best way to use resources and implement protective measures. Shared management of resources will help meet the priorities of the fishers who depend on and value those fish while ensuring a healthy and resilient Lake Michigan fishery.

**Response:** MISG-funded researchers updated models using more than 10 years of additional data to inform management of Great Lakes salmonid populations. Then through a series of virtual and in-person workshops, researchers engaged resource users and managers in the scientific process, allowing everyone who is passionate and knowledgeable about these fish populations to work together. This shared sense of ownership, management, and joint decision-making regarding resources and solutions will help foster a healthy and more resilient fishery.

**Results:** The team hosted a two-day workshop and provided technical support on fish ecology and conservation and the use of Structured Decision Making as a means to integrate science with management. The results of this project may be used to help determine a salmonid stocking strategy that accounts for stakeholder desires regarding a productive fishery now and in the future for all of Lake Michigan.

**Partners:** Michigan State University; Michigan Department of Natural Resources; Wisconsin Department of Natural Resources; U.S. Fish and Wildlife Service; Lake Michigan Community College

**Project Number Index:** A/AS-28-F, R/NCF-5

### **Featured work?**

## **FOCUS AREA: Healthy Coastal Ecosystems**

*GOAL 3: Ecosystems and their habitats are protected, enhanced, or restored.*

### **ACCOMPLISHMENT: Saginaw Chippewa Indian Tribe teaches stewardship skills through Master Rain Gardener program**

**Recap:** MISG and partners helped the Saginaw Chippewa Indian Tribe host a Master Rain Gardener program to spread stewardship skills among the community, resulting in a new rain garden at the tribe’s cultural center.

**Relevance:** Rain gardens are an important stewardship tool. These strategically designed planting beds capture, slow down, and filter rainwater and runoff before it reaches nearby sewers or water bodies. Rain gardens full of native plants can be a relatively inexpensive and accessible way to reduce water pollution, minimize flood risk, support pollinators, and add beauty to public and private areas.

**Response:** In 2022, the Saginaw Chippewa Indian Tribe, MISG, and other partners hosted spring and fall Master Rain Gardener programs for the tribal community. Participants learned how to design and install rain gardens, then carry the lessons to others. The Master Rain Gardener series was called “Aki Nomaage — the teacher is Earth.” The organizers also hosted a May water celebration and plant giveaway.

**Results:** 24 total participants completed the spring and fall programs in 2022. The 13 fall participants installed a rain garden at the Saginaw Chippewa Indian Tribe’s Saganing Center in the shape of a sacred eagle feather. In December 2022, the North Central Region Water Network Green Infrastructure Community of Practice hosted a virtual meeting discussing pollution prevention programs on tribal land and the Aki Nomaage Master Rain Gardener program.

**Partners:** Washtenaw County Water Resources Commissioner’s Office; Washtenaw County Master Rain Gardener Program; Saginaw Chippewa Indian Tribe; Huron Pines

**Project Number Index:** A/AS-28-R, A/AS-28-A

**Featured work?**

## **FOCUS AREA: Healthy Coastal Ecosystems**

*GOAL 3: Ecosystems and their habitats are protected, enhanced, or restored.*

### **IMPACT: Meijer donation fuels innovative robot-powered beach clean-ups**

**Recap:** A donation from a major Midwest retail chain supported the purchase and use of innovative robotic beach sand plastics clean-up and water-based plastics removal technology, with logistics assistance from MISG.

**Relevance:** Meijer is a family-owned retail chain based in Michigan with more than 240 stores around the Midwest. The company donates to charities each year as part of a corporate commitment to community well-being. Being active in the Midwest, Meijer executives have expressed interest in using these donations to support Great Lakes protection and stewardship.

**Response:** In 2022, Meijer donated \$1 million to the Council of the Great Lakes Region (CGLR) Great Lakes Plastic Cleanup to fuel public education and clean-ups for waterfront plastic pollution. CGLR and partners acquired and deployed stormwater gutter filtration bins and remote-controlled robots to collect plastic from beach sand and marina waters. MISG helped coordinate robot acquisition, training, storage, and public marina and beach demonstrations. Sets of robots were stationed in both Traverse City and Muskegon.

**Results:** The clean-up robots were obtained in mid-2022 and piloted at a Muskegon beach and marina, collecting over 6,000 litter items. In 2023, the robots will be rolled out at 18 locations in Michigan, Ohio, and Wisconsin. Each outing will collect, sort, weigh, and itemize waste materials to better inform and educate the public and policymakers about plastic pollution. The robots gather notable attention from beachgoers and allow for direct waste-reduction education.

**Partners:** The Watershed Center Grand Traverse Bay; Grand Valley State University Annis Water Resources Institute; Council of the Great Lakes Region; Ohio Sea Grant; Cleveland Metroparks; University of Wisconsin Oshkosh; Meijer Corporation

**Project Number Index:** A/AS-28-A, R/CNH-2

**Featured work? YES**

## **FOCUS AREA: Healthy Coastal Ecosystems**

*GOAL 3: Ecosystems and their habitats are protected, enhanced, or restored.*

### **IMPACT: Volunteers pitch in to clear debris-choked Mill Creek**

**Recap:** Thanks to MISG expertise and connections, a group of Sanilac County residents recruited their community to contribute time, money, and hard work to clean up a tree-choked local creek.

**Relevance:** Mill Creek runs down Michigan’s “thumb” to enter Lake Huron in Sanilac County. Recently, residents noticed fallen trees and limbs blocking the creek’s flow. Debris altered the creek’s route, prevented salmon from reaching spawning habitat, and contributed to bank erosion by nearby subdivisions. Property owners formed a committee to seek solutions to the creek’s deteriorating conditions.

**Response:** The committee met with local MISG staff, who gave advice and introduced them to agency staff at the Michigan Department of Environment, Great Lakes, and Energy (EGLE) and Michigan Department of Natural Resources. The committee leveraged this expertise and momentum to recruit fellow homeowners for fundraisers and clean-up events.

**Results:** After receiving EGLE approval to clean up the creek, the committee and community partners raised more than \$700 in four days. Two dozen volunteers from the neighborhoods and local businesses spent a Saturday clearing a 1,000-foot stretch of the creek. Thanks to this hard work, Mill Creek can serve as a better habitat, recreational channel, and outdoor resource for surrounding communities.

**Partners:** Lexington Heights Homeowners Association; Michigan Department of Environment, Great Lakes, and Energy; Michigan Department of Natural Resources

**Project Number Index:** A/AS-28-A

**Featured work?**

## **FOCUS AREA: Healthy Coastal Ecosystems**

*GOAL 3: Ecosystems and their habitats are protected, enhanced, or restored.*

### **ACCOMPLISHMENT: Riverside release events stir public affection for iconic native lake sturgeon**

**Recap:** At riverside release events, hundreds of people sent nearly a thousand juvenile lake sturgeon to their new homes in Saginaw Bay tributaries.

**Relevance:** Lake sturgeon, a native Great Lakes fish that can reach 3-6 feet long and 50-150 years old, were once abundant in Michigan rivers and lakes. After European colonization, a century of overfishing and habitat destruction decimated lake sturgeon populations. Efforts are now underway by many organizations, including MISG, to restore historical lake sturgeon habitat, raise juvenile fish, release them into Michigan's rivers, and track their success as adults.

**Response:** MISG has played a major role in efforts to reintroduce lake sturgeon to Saginaw River tributaries. In 2022, MISG coordinated with many partners to hold multiple public riverside releases of juvenile fish, including releases in four separate cities on one day in both August and September. All of the fish were raised in hatcheries and tagged for tracking through state and federal recapture programs; some had additional tags for acoustic telemetry tracking.

**Results:** Hundreds of people attended eight August and September events to release over 800 juvenile lake sturgeon. Adults and children learned about lake sturgeon biology, met agency and hatchery staff, and hand-delivered young fish into the river. Events garnered substantial local news attention and public enthusiasm. Over 4,000 juvenile lake sturgeon have now been released since 2017, each one a step closer to restoring this iconic species.

**Partners:** Bay County Environmental Affairs and Community Development; Chippewa Nature Center; City of Frankenmuth; Flint River Watershed Coalition; Friends of the Shiawassee River; Michigan State University Department of Fisheries and Wildlife; Saginaw Bay WIN/The Conservation Fund

**Project Number Index:** A/AS-28-A

**Featured work?** YES



## **FOCUS AREA: Sustainable Fisheries and Aquaculture**

*GOAL 4: Seafood supply meets public demand and is safe, secure, and sustainable.*

### **ACCOMPLISHMENT: Citizen science programs engage anglers, generate useful data, and inform natural resources decision makers**

**Recap:** MISG's popular citizen science programs engage anglers, generate useful fishery data, and help inform natural resources management policy.

**Relevance:** Federal and state monitoring initiatives can only gather so much data about Great Lakes fish populations. Community science programs that target anglers can bring in a wealth of additional data about Great Lakes fisheries, as well as empowering community members to participate in the fishery management process.

**Response:** MISG's popular Great Lakes Angler Diary (GLAD) program recruits anglers to use an app to submit numerical and geographical data about fish they catch. A subset of GLAD, the Michigan River Steelhead Program, launched in 2020 to help tease out the proportion of wild vs. stocked steelhead being harvested in rivers around the state. Preliminary data helped the Michigan Natural Resources Commission and Michigan Department of Natural Resources make informed decisions about steelhead harvest limits.

**Results:** In the second year of the Michigan River Steelhead Program, steelhead data returns increased from 1,380 to 2,945. Volunteer numbers also rose from 199 in 2021 to 496 in 2022. Natural Resources Commission members and Michigan Department of Natural Resources personnel continued to attend steelhead programs in 2023 and expressed interest in using the results and discussions to inform future policy.

**Partners:** Brenton Consulting, LLC; Detroit Area Steelheaders; Great Lakes Salmon Initiative; Pentwater Sport Fishing Association

**Project Number Index:** A/AS-28-E

**Featured work? YES**

## **FOCUS AREA: Sustainable Fisheries and Aquaculture**

*GOAL 4: Seafood supply meets public demand and is safe, secure, and sustainable.*

### **ACCOMPLISHMENT: Great Lakes Aquaculture Collaborative gets fresh round of funding**

**Recap:** The National Sea Grant Office awarded the Sea Grant Great Lakes Aquaculture Collaborative an additional \$425,000 to continue advancing land-based aquaculture in the region.

**Relevance:** While poised to meet untapped potential for local food production, aquaculture remains a niche market in the Great Lakes region and is often misunderstood or overlooked by consumers. In 2019, MISG and other Great Lakes Sea Grant programs formed the grant-funded Great Lakes Aquaculture Collaborative (GLAC) to pursue grants, projects, and events that could support existing and potential aquaculture practitioners and generate interest among consumers.

**Response:** The initial funding enabled GLAC to host virtual and hybrid Great Lakes Aquaculture Day workshops from 2020-2022 to provide information and networking opportunities for new and existing aquaculture farmers and their consumers. GLAC also developed the Great Lakes Fresh Fish Finder website to help consumers find local sources of harvested, processed, or farmed fish around the region.

**Results:** In 2022, the National Sea Grant Office awarded GLAC \$425,000 to continue advancing land-based aquaculture in the Great Lakes region. The funds will enable the GLAC team to collaborate with aquaculture industry advisory groups; inform legislators about sustainable aquaculture; compare laws and regulations across jurisdictions; and foster synergies among private, state, and tribal organizations.

**Partners:** Michigan Aquaculture Association; Michigan Department of Agriculture and Rural Development; Michigan Department of Environment, Great Lakes, and Energy; Michigan Wholesale Baitfish Association; Minnesota Sea Grant; Wisconsin Sea Grant; Ohio Sea Grant; Illinois-Indiana Sea Grant; New York Sea Grant; Pennsylvania Sea Grant

**Project Number Index:** A/AS-28-G

**Featured work?** YES

## **FOCUS AREA: Sustainable Fisheries and Aquaculture**

*GOAL 4: Seafood supply meets public demand and is safe, secure, and sustainable.*

### **ACCOMPLISHMENT: Seafood safety training program sets up commercial fishers, processors, and hatchery operators for success**

**Recap:** MISG and the Great Lakes Indian Fish and Wildlife Commission provided two seafood safety training certification courses to help processors maintain a competitive advantage while meeting state and federal requirements.

**Relevance:** Commercial fishing operators and fish processors must follow strict guidelines to meet tribal, state, and federal requirements for health and food safety. The Seafood Hazard Analysis and Critical Control Point (HACCP) certification course is a federal regulation for ensuring that businesses handling seafood products stay up-to-date on requirements and best practices. This allows commercial fishers and processors to meet licensing requirements and provide a safe and healthy product for consumers.

**Response:** MISG regularly offers Seafood HACCP courses to train and certify employees at commercial fishing and fish processing businesses and related regulatory agencies. In 2022, MISG and the Great Lakes Indian Fish and Wildlife Commission (GLIFWC) provided two Seafood HACCP trainings in Michigan and Wisconsin. Holding these courses in Michigan and ceded territories boosts local seafood businesses and traditional fishermen, while the unique partnership with GLIFWC draws participants from other states and countries.

**Results:** 30 participants attended the two 2022 Seafood HACCP trainings. Most of the participants were from tribal businesses or regulatory agencies. The training course supports innovation, modernization, and networking among industry participants. Fish processors who complete this course are at a competitive advantage as they can meet tribal, state, and federal requirements while making value-added seafood products to help increase their revenue margins.

**Partners:** Keweenaw Bay Indian Community; Michigan Department of Environment, Great Lakes, and Energy; Michigan State University Extension; Michigan Wholesale Baitfish Association; Great Lakes Indian Fish & Wildlife Commission

**Project Number Index:** A/AS-28-H  
**Featured Work?**

## **FOCUS AREA: Sustainable Fisheries and Aquaculture**

*GOAL 4: Seafood supply meets public demand and is safe, secure, and sustainable.*

### **IMPACT: Workshop brings federal COVID-19 support and fresh momentum to Michigan inland fishing guides**

**Recap:** MISG's inland fishing guide workshop brought attention to an overlooked part of Michigan's fishing community and prompted guides to re-form a professional association for industry members.

**Relevance:** Anglers looking for guidance in Michigan can opt for a charter captain or a river guide. Charter captains operate in navigable sections of Michigan lakes and rivers, while guides work in upstream waters not federally designated as navigable. In summer 2021, as part of a COVID rapid-response project, MISG conducted its first survey of Michigan inland fishing guides. MISG successfully prompted state partners to include guides in federal CARES Act II relief spending plans.

**Response:** In 2022, MISG hosted the first Inland Fishing Guide Workshop to share results of the survey and to discuss changes to legislation, law enforcement, mandatory reporting, and CARES Act eligibility.

**Results:** More than 40 participants attended the workshop. At least one guide successfully applied for and received federal relief funds as a direct result of the workshop. Two groups of guides discussed parallel plans to form an industry association, and the Michigan Inland Guides Association was re-formed after the workshop.

**Partners:** Michigan River Guides Association; Michigan United Conservation Clubs

**Project Number Index:** A/AS-28-D

**Featured work?**

## **FOCUS AREA: Sustainable Fisheries and Aquaculture**

*GOAL 4: Seafood supply meets public demand and is safe, secure, and sustainable.*

### **IMPACT: MISG helps bring \$3.5 million in federal COVID-19 relief funding directly to fish-related businesses**

**Recap:** When Michigan state agencies began allocating \$6 million of federal COVID-19 relief funding in 2022, MISG helped ensure that 55 fish-related businesses received crucial support, totaling \$3.53 million.

**Relevance:** Commercial fishing, charter fishing, and aquaculture are important components of Michigan’s culture and economy. They provide jobs, recreational opportunities, tourism benefits, food security, sustainable protein sources, fish to stock in rivers and lakes, and more. In 2021, MISG leveraged COVID-19 rapid response funds to assess changes within and gather baseline data about Michigan’s commercial and charter fishing, seafood processing, and aquaculture industries.

**Response:** MISG’s findings helped the Michigan Department of Natural Resources (MDNR) develop spending allocations for \$6 million of the \$15 million of CARES Act II funding designated for fish-producing industries in Great Lakes states. MISG helped mail CARES Act funding applications to all of the state’s licensed fishing personnel, including charter and commercial fishers, seafood processors, inland guides, wholesalers, and aquaculture producers. MISG also provided application guidance at industry events.

**Results:** In 2022, MDNR reported 63 industry funding applications and 55 successful monetary awards totaling \$3.53 million of the available \$6 million. Funding was distributed to an aquaculture producer, 47 charter and 4 commercial fishers, and 3 wholesale businesses. These funds lent crucial assistance to local businesses during a time of economic upheaval. Remaining funds were reallocated to other projects designed to support those industries, including MISG’s “Mi Fresh Fish” marketing campaign ongoing in 2023.

**Partners:** Michigan Department of Natural Resources

**Project Number Index:** C/CC-22, A/AS-27

**Featured work? YES**

## **FOCUS AREA: Sustainable Fisheries and Aquaculture**

*Goal 5: Informed consumers understand the health benefits of seafood consumption and how to evaluate the safety and sustainability of the seafood they buy.*

### **ACCOMPLISHMENT: Mi Fresh Fish campaign aims to raise profile of commercial fishers, aquaculture farmers, seafood processors**

**Recap:** The “Mi Fresh Fish” educational marketing campaign aims to raise consumer literacy about fish raised, caught, or processed by local Michigan businesses.

**Relevance:** Businesses dependent on Great Lakes fish have struggled in the face of COVID-19 marketplace upheaval, labor shortages, changing fishery dynamics, and inflation. Despite continued interest in local and sustainable food, Michigan consumers often opt for the ease and availability of imported seafood instead of seeking out local products from Michigan commercial fishers, aquaculture farmers, seafood processors, wholesalers, and related industries.

**Response:** MISG worked with Michigan Department of Natural Resources to secure \$543,100 in Michigan-allocated federal COVID-19 relief funds to support a Michigan fisheries consumer education marketing campaign. In 2022, MISG worked with a Michigan-based marketing company to conduct a consumer survey and hone the campaign’s message. Survey results indicated that only 17 percent of Michigan residents eat enough fish to meet federal nutrition recommendations. Michiganders mostly obtain seafood from grocery stores or restaurants.

**Results:** The survey and additional research shaped the “Mi Fresh Fish” campaign, which launched in January 2023 as a suite of social media ads driving traffic to a MISG-developed website highlighting the value of local fish and producers. The ads received 1.72 million impressions and 17,500 clicks in January and have continued generating substantial traffic. MISG and two Michigan fishery industry associations are planning a Mi Fresh Fish Expo in Lansing in June 2023.

**Partners:** Monte Consulting; Michigan Fish Producers Association; Michigan Aquaculture Association; Michigan Department of Natural Resources

**Project Number Index:** C/CC-22, C/CC-19, A/AS-27

**Featured work? YES**

## **FOCUS AREA: Resilient Communities and Economies**

*GOAL 6: Coastal economies are vibrant and resilient.*

### **IMPACT: Beloved Aldo Leopold Festival generates meaningful economic impact for small northern Michigan communities**

**Recap:** The Aldo Leopold Festival generates meaningful economic impacts by drawing nature lovers to the Upper Peninsula for springtime activities.

**Relevance:** Aldo Leopold is regarded as one of the most influential American naturalists of the twentieth century. He spent his formative years visiting northern Michigan's Les Cheneaux Islands, experiences which shaped his land ethic. His legacy is celebrated through a 1,700-acre nature preserve on Marquette Island in Lake Huron along the southeastern Upper Peninsula.

**Response:** For nearly a decade, the springtime Aldo Leopold Festival has drawn hundreds of visitors to the Les Cheneaux Islands for presentations, birding hikes, paddling excursions, wildflower tours, and other activities that celebrate the natural world. Local MISG staff assists with festival planning and programming, and also conducted an in-depth evaluation and economic analysis of the 2022 festival.

**Results:** In 2022, the Aldo Leopold Festival generated over \$50,000 in direct spending on food, lodging, and purchases at local businesses. This is significant economic activity for the region's small communities, especially before the summer tourism season. Of 163 attendees, 100 percent would recommend the event to a friend and said that they learned something more about the environment at the festival.

**Partners:** Little Traverse Conservancy; Clark Township Government; Hessel School House and Avery Arts and Nature Center; The Nature Conservancy; Applecore General Store; Woods and Water EcoTours.

**Project Number Index:** A/AS-28-R

**Featured work?**



## **FOCUS AREA: Resilient Communities and Economies**

*GOAL 6: Coastal economies are vibrant and resilient.*

### **ACCOMPLISHMENT: Coastwatch transition provides water surface temperatures in new, more sustainable package**

**Recap:** MISG's embedded NOAA liaison facilitated the development of an updated, sustainable CoastWatch tool to display water surface temperatures for recreational, commercial, and charter fishers.

**Relevance:** Recreational, commercial, and charter fishers can boost catch success by assessing water surface temperatures. In the 1980s, charter fishers collaborated with MISG and Michigan State University to create Sea Grant CoastWatch, which generated print-outs of water surface temperature contours from NOAA satellite data. Later, CoastWatch evolved into a real-time digital tool. However, technological advances and costly maintenance eventually left the website behind; the website ceased operating in early 2022.

**Response:** In 2022, MISG and NOAA's Great Lakes Environmental Research Laboratory (GLERL) developed a new NOAA CoastWatch product that better leverages NOAA's data infrastructure capacity. MISG's embedded Sea Grant-NOAA liaison facilitated the transition to a more sustainable model that uses NOAA's Great Lakes CoastWatch node to deliver surface water temperature data in a format familiar to Sea Grant product users. MISG coordinated with the Sea Grant CoastWatch steering committee to keep users informed during the transition.

**Results:** In mid-2022, GLERL launched an interim CoastWatch product site to display Great Lakes surface water contours near key ports, based on Sea Grant and angler input. Through the development process, GLERL's CoastWatch node manager forged new and productive relationships with several members of the Great Lakes sportfishing and charter fishing community, allowing NOAA to meet an objective for enhanced stakeholder engagement. Ceding the project to NOAA will save MISG \$6,000 annually.

**Partners:** NOAA Great Lakes Environmental Research Laboratory; Cooperative Institute for Great Lakes Research; Michigan State University

**Project Number Index:** A/AS-28-J, R/AS-30

**Featured work? YES**

## **FOCUS AREA: Resilient Communities and Economies**

*GOAL 6: Coastal economies are vibrant and resilient.*

### **IMPACT: Downriver Linked Greenways brings connectivity, publicity to Detroit-area communities**

**Recap:** In 2022, Downriver Linked Greenways continued its mission to raise community momentum around trail networks and outdoor recreation through grants, fundraisers, and a popular PBS television show.

**Relevance:** For decades, leaders in and around Detroit have sought ways to increase safe access to green spaces and trails for their communities. While much progress has been made, the existing trail networks still have gaps and poor conditions that prevent users from being able to access the whole network safely. This is true in Wayne County’s “Downriver” area, where not all communities have benefited equally from downtown Detroit’s urban revitalization movement.

**Response:** MISG staff provide leadership for Downriver Linked Greenways (DLG), a nonprofit collaboration dedicated to connecting southeast Michigan communities through networks of trails and greenways. The group has brought in millions of dollars in grants, donations, and federal support to fund trail design, construction, and maintenance. 2022 marked a year of significant publicity for Downriver communities and greenways projects.

**Results:** In 2022, DLG secured \$2.1 million from the Ralph C. Wilson, Jr. Foundation and \$4.1 million in federal appropriations for trail improvements and staffing. PBS hit TV show *Under the Radar Michigan* broadcast an episode featuring Downriver communities and recreation opportunities. While PBS viewer statistics aren’t available, the episode has 2,000 YouTube views. Host Tom Daldin led a Downriver bike tour to celebrate National Trails Day and raised \$2,500 for DLG.

**Partners:** Friends of the Detroit River; Brownstown Township; City of Flat Rock; City of Gibraltar; City of River Rouge; City of Riverview; City of Rockwood; City of Trenton; City of Wyandotte; Community Foundation for Southeast Michigan; Grosse Ile Township; Huron River Watershed Council; Huron-Clinton Metropolitan Authority; Riverside Kayak Connection; Wayne County

**Project Number Index:** A/AS-28-I

### **Featured work?**

## **FOCUS AREA: Resilient Communities and Economies**

*GOAL 7: Communities and water-dependent businesses use comprehensive planning to make informed strategic decisions.*

**ACCOMPLISHMENT: “Watersheds in Your District” maps help officials, residents connect with watersheds where they live**

**Recap:** MISG’s interactive “Watersheds in Your District” tool helps residents and officials understand the relationship between Michigan’s state legislative boundaries and their watersheds to promote conservation actions and collaboration.

**Relevance:** A watershed collects all the rain or snow from an area and drains it into a creek, river, or lake. Healthy watersheds reduce flood risk, support crops, filter pollutants, mitigate effects of climate change, and boost human well-being. However, land-based activities may harm watershed health. Officials and residents can take action to protect and restore Michigan’s water resources. However, the boundaries of Michigan political districts often do not match natural watershed boundaries.

**Response:** MISG created the “Watersheds in Your District” tool to help residents and officials understand the relationship between Michigan’s state legislative boundaries and its watersheds. Originally a set of downloadable PDF maps, the tool was updated in 2022 to include an interactive map showing the boundaries of each Michigan House and Senate district and how they intersect with one or more local watersheds. The website also contains contact information for watershed protection groups and environmental non-profits.

**Results:** The “Watersheds in Your District” tool can help officials and residents make informed decisions about the waterways where they live and work. They can also more easily contact local watershed groups to get information about local water quality and restoration activities.

**Partners:** University of Michigan Water Center

**Project Number Index:** A/AS-28-L, C/CC-19, C/CC-25

**Featured work?**

## **FOCUS AREA: Resilient Communities and Economies**

*GOAL 7: Communities and water-dependent businesses use comprehensive planning to make informed strategic decisions.*

### **ACCOMPLISHMENT: MISG facilitates Blue Economy project to advance NOAA goals in the Great Lakes region**

**Recap:** MISG is helping advance NOAA’s Blue Economy goals by facilitating a collaborative project to understand the current socio-economic contributions of water-dependent industries to the Great Lakes regional economy.

**Relevance:** The “Blue Economy” describes economic activity generated or sustained because of oceans or lakes. The Great Lakes region has unquestionably been shaped by shipping, recreation, fisheries, and other activities supported by nearby freshwater systems. Management, policy, leadership, and advocacy communities agree on the need to improve collection, analysis, and dissemination of Great Lakes Blue Economy data. Blue Economy development and valuation is also a national priority for NOAA.

**Response:** MISG’s embedded Sea Grant-NOAA liaison facilitated efforts to advance Great Lakes Blue Economy work, including a project developed by and with funding leveraged through NOAA’s Great Lakes Regional Collaboration Team. In 2022, the project team partnered with the Office for Coastal Management to launch a study to enhance understanding of water-dependent industries’ socio-economic contributions to the regional economy. MISG and NOAA co-hosted a stakeholder advisory workshop and secured additional funding from NOAA collaborators.

**Results:** This project will improve NOAA’s Economics National Ocean Watch product, giving Great Lakes communities helpful benchmarks for tracking economic development. MISG’s NOAA liaison joined an international Great Lakes Ecosystem Services Valuation Community of Practice (CoP) and presented at a meeting of the national Sea Grant Economic Valuation CoP. The liaison fostered new relationships among NOAA economists and the Ecosystem Services CoP, leading NOAA to join Canadian partners on an international proposal.

**Partners:** NOAA Great Lakes Regional Collaboration Team; NOAA Office for Coastal Management; NOAA Great Lakes Environmental Research Laboratory

**Project Number Index:** A/AS-28-K, R/AS-30

**Featured work?**

## ***FOCUS AREA: Resilient Communities and Economies***

*GOAL 7: Communities and water-dependent businesses use comprehensive planning to make informed strategic decisions.*

### **ACCOMPLISHMENT: New course delivers an introductory class in coastal planning and zoning**

**Recap:** Through a coastal planning and zoning course, MISG shares knowledge, decision-support tools, technologies, and approaches to protect and restore ecosystems so participants have a greater awareness and understanding for ecosystem-based planning, decision making, and management approaches.

**Relevance:** A 2021 survey of coastal jurisdictions in the United States and Canada found that 95 percent of respondents were concerned about coastal issues, and 90 percent were interested in coastal management training. Research also shows land-use decision makers prefer to have on-demand, self-paced learning opportunities.

**Response:** In 2022, MISG launched a new self-paced learning experience called the “Great Lakes Coastal Planning & Zoning Email Course.” The free course is delivered on demand via five email lessons, one per week for five weeks. The lessons consist of a key topic overview with links to additional content and resources. Topics include coastal dynamics, legal frameworks, zoning tools, and decision-making strategies.

**Results:** In 2022, 163 individuals registered for the course across 50 Michigan counties. As of December 2022, 13 registrants had completed a short-term evaluation survey. All agreed that the course increased their awareness of planning and zoning resources. More than half planned to share the information with others, and most responded that the course exceeded or far exceeded their expectations. The course earned an innovative programming award from the Community and Natural Resource Development Association.

**Partners:** Michigan State University Extension

**Project Number Index:** A/AS-28-K, R/AS-30, C/CC-19

**Featured work?**

## **FOCUS AREA: Resilient Communities and Economies**

*GOAL 9: Resilient coastal communities adapt to the impacts of coastal hazards and climate change.*

### **IMPACT: Climate roundtable sparks new NOAA climate equity collaboration in southeast Michigan**

**Recap:** Thanks to relationships and conversations facilitated by MISG, NOAA has invested in a new collaboration to support climate equity and resilient transportation projects in southeast Michigan.

**Relevance:** In 2021, MISG staff helped identify Detroit-area leaders and partners to participate in a roundtable with NOAA leadership to discuss climate change effects, opportunities for new and increased federal partnerships, and regional coordination in resilience planning. MISG's role facilitated new and more robust connections among NOAA's Great Lakes Regional Collaboration Team, Sea Grant, and local community groups and leaders who had not previously partnered with NOAA in the Detroit area.

**Response:** The roundtable sparked a new climate equity collaboration among NOAA, the Southeast Michigan Council of Governments (SEMCOG), and University of Michigan research partners. The project focuses on how disruptions to transportation access during major urban flooding events affect historically disadvantaged communities. Project partners will develop and incorporate an equity lens into SEMCOG's existing Flooding Risk Tool in an effort to integrate equity into transportation planning decisions.

**Results:** NOAA invested \$150,000 in the new collaborative project in 2022-23. This work will support transportation decisions that advance equity and climate resilience in seven southeast Michigan counties. The results of the pilot project will be shared with federal aid committees working at the local level to prioritize transportation improvement projects. Results will also support SEMCOG's Regional Transportation Plan and 2020 Climate Resiliency and Flooding Mitigation Study.

**Partners:** NOAA; Southeast Michigan Council of Governments; Detroit Homeland Security and Emergency Management; Wayne County Homeland Security; City of Detroit Office of Sustainability; EcoWorks Detroit; University of Michigan

**Project Number Index:** A/AS-28, R/AS-30

**Featured work?** YES

## **FOCUS AREA: Environmental Literacy and Workforce Development**

*GOAL 10: An environmentally literate public that is supported and informed by a continuum of lifelong formal and informal engagement opportunities.*

### **IMPACT: The Shore-to-Shore Birding trail draws visitors to hidden gems in the eastern Upper Peninsula**

**Recap:** The new Shore-to-Shore Birding Trail, which MISG helped launch, covers 400 miles and 40 birding points of interest in the eastern Upper Peninsula. The trail draws tourism revenue toward small communities and provides a venue for MISG public birding events.

**Relevance:** As COVID-19 restrictions limited recreational options, many Michiganders began turning toward new outdoor hobbies, including bird-watching. Birding is an easy, affordable way to enjoy backyard critters, explore local natural areas, or travel farther afield in search of key species. The hobby can bring tourism dollars to communities near major migratory pathways or unique habitats, and a passion for birds can inspire wildlife- and eco-friendly choices at home.

**Response:** In 2022, Michigan Department of Natural Resources, Michigan State University Extension, Luce-Chippewa-Mackinac Conservation District, and other partners launched a new eastern Upper Peninsula birding trail. The Shore-to-Shore Birding Trail is a self-guided driving, walking, and birding experience covering over 400 miles and 40 birding points of interest in 4 counties. Initial plans emerged from a 2017 birding trail workshop MISG co-hosted; MISG also organized follow-up meetings, wrote interpretive material, and helped purchase supplies.

**Results:** The trail website includes an interactive map, birding tips, and local sites. It's the third Upper Peninsula birding trail, solidifying the region as a destination for enthusiasts. The trail lends structure for visitors seeking a cohesive experience and draws tourism revenue toward small communities and hidden gems. MISG has already used the trail for multiple public events; in January 2023, MISG staff led 14 people on a Michigan Audubon weekend trip along the trail.

**Partners:** Michigan Department of Natural Resources; Chippewa/Luce/Mackinac Conservation District; Hiawatha National Forest; Seney National Wildlife Refuge; U.S. Fish and Wildlife Service; Bay Mills Indian Community; Sault Ste Marie Tribe of Chippewa Indians; EUP Regional Planning and Development Commission

**Project Number Index:** A/AS-28-R, A/AS-28-S, C/CC-19, C/CC-25

### **Featured work?**



## **FOCUS AREA: Environmental Literacy and Workforce Development**

*GOAL 10: An environmentally literate public that is supported and informed by a continuum of lifelong formal and informal engagement opportunities.*

### **IMPACT: Two Sea Grant-supported schools receive state funding for innovative place-based STEM education projects**

**Recap:** Two northern Michigan schools leveraged MISG support to successfully apply for state education grants to fund innovative freshwater education and stewardship projects.

**Relevance:** The Center for Great Lakes Literacy (CGLL) is a Sea Grant-led network that advances basin-wide Great Lakes literacy and stewardship by providing hands-on experiences, educational resources, and networking opportunities for educators, scientists, and youth. CGLL connects schools and teachers with potential funding sources to support place-based classroom activities and stewardship projects.

**Response:** In 2022, Michigan Governor Gretchen Whitmer announced \$205,000 in grants for 16 K-12 schools and educational partnerships to develop Great Lakes STEM education programs. The grants are a collaboration of Michigan Department of Environment, Great Lakes, and Energy and the Michigan Department of Labor and Economic Opportunity's MiSTEM Network to expand freshwater literacy and place-based STEM education. MISG and CGLL supported successful grant applications from two northeast Michigan schools.

**Results:** Alcona Community Schools received nearly \$7,000 to expand students' engagement with coastal and wetland habitats. Alpena Public Schools received \$8,000 to facilitate a program for students to collect real-world data about environmental issues in their home watershed. Both schools are active CGLL partners and members of the Northeast Michigan Great Lakes Stewardship Initiative network, which MISG helps lead.

**Partners:** Michigan Department of Environment, Great Lakes, and Energy; Michigan Department of Labor and Economic Opportunity

**Project Number Index:** A/AS-28-N

**Featured work?**

## **FOCUS AREA: Environmental Literacy and Workforce Development**

*GOAL 10: An environmentally literate public that is supported and informed by a continuum of lifelong formal and informal engagement opportunities.*

### **IMPACT: Northeast Michigan students get hands-on stewardship experience, thanks to MISG teacher training workshop**

**Recap:** MISG helped facilitate hands-on stewardship experiences for two northeast Michigan teachers and their students after a 2022 summer teacher training program.

**Relevance:** Students and teachers alike benefit from opportunities to put environmental literacy principles into practice. The place-based stewardship education (PBSE) paradigm empowers teachers to engage their students in meaningful, hands-on stewardship projects linking classroom with community. MISG helps lead groups like the Northeast Michigan Great Lakes Stewardship Initiative and the Center for Great Lakes Literacy to bring PBSE opportunities to Michigan's teachers and students.

**Response:** Each summer, MISG and education partners host the Lake Huron Place-Based Stewardship Education Summer Teacher Institute as a professional learning opportunity for educators. Participants explore Great Lakes-focused PBSE principles and projects that connect classroom learning to local environmental and social issues. They also network with community partners for content learning and field experiences. Thanks to additional Great Lakes Restoration Initiative funding, teachers receive \$500 stipends to help them implement future PBSE projects with their students.

**Results:** Attending the 2022 Institute empowered 24 educators to bring Great Lakes literacy to life for their students. Two northeast Michigan teachers facilitated a yearlong project about marine debris and community stewardship. They brought students to a state park to collect bird diversity data and learn about Lake Huron habitats from MISG and state and county agency staff. One of the teachers reflected that the program could only have happened with MISG's support and guidance.

**Partners:** Chippewa Nature Center

**Project Number Index:** A/AS-28-Q

**Featured work? YES**

## **FOCUS AREA: Environmental Literacy and Workforce Development**

*GOAL 10: An environmentally literate public that is supported and informed by a continuum of lifelong formal and informal engagement opportunities.*

### **ACCOMPLISHMENT: Indigenous Knowledges Symposium celebrates traditional land and water stewardship**

**Recap:** MISG-funded researchers collaborated with northern Michigan tribal partners to host an Indigenous Knowledges Symposium to celebrate traditional ecological knowledge and cultural principles of community, place, respect, and interdependence.

**Relevance:** Michigan's tribal communities hold a wealth of traditional ecological knowledge, reflecting cultural principles of community, place, respect, and interdependence. Their environmental stewardship approach relies on this knowledge along with scientifically sound planning and management. The Keweenaw Bay Indian Community (KBIC), the oldest and second-largest federally recognized Indian Tribe in Michigan, is working with MISG-supported researchers to document and share the Indigenous knowledge principles that frame their relationships with the land they inhabit and steward.

**Response:** MISG-funded researchers at Michigan Technological University partnered with KBIC and the Great Lakes Indian Fish and Wildlife Commission to host an October 2022 Indigenous Knowledges Symposium. The two-day symposium brought together Indigenous teachers, government agency staff, researchers, students, educators, and community members to listen, learn, and build relationships. Indigenous teachers led workshops about land-based frameworks for understanding climate change, relationships among humans and wildlife, respect for sacred plants like tobacco, and more.

**Results:** Over 70 attendees responded to a follow-up survey with positive feedback. Nearly half of respondents self-identified as natural resource or environmental professionals; half also said they'd attended out of personal interest, within or outside their professional capacity. One participant responded, "KBIC is my tribe, and climate change happens right in front of us. This gave me the opportunity to learn more about what effects are happening and how we can work together to make change."

**Partners:** Keweenaw Bay Indian Community; Michigan Technological University; Great Lakes Indian Fish and Wildlife Commission

**Project Number Index:** A/AS-28-R, R/SS-5, C/CC-19, C/CC-25  
**Featured work?**

## **FOCUS AREA: Environmental Literacy and Workforce Development**

*GOAL 10: An environmentally literate public that is supported and informed by a continuum of lifelong formal and informal engagement opportunities.*

### **ACCOMPLISHMENT: MISG staff help colleagues and partners facilitate effective hybrid meetings**

**Recap:** In an increasingly hybrid world, MISG staff help partners blend in-person and virtual tools and facilitation techniques to support high-quality events.

**Relevance:** COVID-19 restrictions prompted a boom in virtual events and engagement, which often facilitated reaching a much broader audience than in-person meetings or activities. As restrictions lift, organizations must weigh the pros and cons of hosting in-person, virtual, and hybrid events. Each format comes with benefits and challenges related to facilities, technology, expertise, staff availability, and audience buy-in.

**Response:** When the world pivoted to virtual engagement, MISG staff adapted quickly to new online facilitation tools and tactics. Now, partners often turn to MISG for advice or staff support to coordinate and facilitate virtual and hybrid meetings for their audiences. For example, MISG staff worked with the Lake Huron Citizens Fishery Advisory Committee (LHCFAC) to facilitate their regional quarterly meetings in a hybrid format. Staff provided technology, expertise, and time that the Advisory Committee lacked.

**Results:** Thanks to MISG’s facilitation support, LHCFAC advisors were able to host successful hybrid meetings and got strong positive feedback from participants. One state partner called it “the best hybrid meeting ever” and commended MISG staff for their problem-solving skills and attention to the virtual audience. MISG staff were able to pilot new technological tools and arrangements and refer best practices back to colleagues and partners, who have continued hosting successful hybrid events in 2023.

**Partners:** Lake Huron Citizens Fishery Advisory Committee; Jay's Sporting Goods

**Project Number Index:** A/AS-28-F, C/CC-19, M/PM-64

**Featured work?**

## **FOCUS AREA: Environmental Literacy and Workforce Development**

*GOAL 10: An environmentally literate public that is supported and informed by a continuum of lifelong formal and informal engagement opportunities.*

### **ACCOMPLISHMENT: Shipboard science workshop puts teachers side-by-side with Great Lakes researchers**

**Recap:** Three MISG-supported teachers experienced Great Lakes research and ecosystems through a shipboard science workshop.

**Relevance:** The Center for Great Lakes Literacy (CGLL) is a Sea Grant-led network that fosters informed and responsible decisions that advance basin-wide stewardship by providing hands-on experiences, educational resources, and networking opportunities promoting Great Lakes Literacy among an engaged community of educators, scientists, and youth.

**Response:** CGLL and the Great Lakes Sea Grant Network host summertime shipboard science workshops for teachers to experience hands-on Great Lakes research alongside scientists and natural resource managers. In 2022, three MISG-supported Michigan educators sailed from Muskegon to Alpena aboard the *R/V Laurentian*. During transit and while landside with partners from Thunder Bay National Marine Sanctuary, the educators gathered cutting-edge climate change data in Lake Michigan and Lake Huron.

**Results:** The teachers returned to their classrooms with real-world experiences and insights into Great Lakes research and ecosystems that will deepen their curriculum for years to come. One teacher noted that Sea Grant provides enriching experiences and a depth of Great Lakes literacy understanding that no technology could replicate.

**Partners:** NOAA Office of National Marine Sanctuaries

**Project Number Index:** A/AS-28-O

**Featured work?**

## **FOCUS AREA: Environmental Literacy and Workforce Development**

*GOAL 10: An environmentally literate public that is supported and informed by a continuum of lifelong formal and informal engagement opportunities.*

### **ACCOMPLISHMENT: MISG helps Lake Superior State University ramp up new public education centers for youth and adults**

**Recap:** With MISG’s help to develop and lead programs, Lake Superior State University has opened a public Discovery Center and Great Lakes Visitor Center in its new Center for Freshwater Research and Education.

**Relevance:** MISG has a staff member embedded at Lake Superior State University (LSSU), located in Sault Ste. Marie. This Upper Peninsula community sits at the nexus of three Great Lakes and has been shaped by shipping, tourism, tribal communities, and fisheries. LSSU operates a salmon hatchery to supplement Michigan Department of Natural Resources (MDNR) stocking programs. The hatchery hosts public tours and employs LSSU students; about 40 percent of today’s MDNR fisheries workforce are LSSU graduates.

**Response:** In 2018, LSSU broke ground for a \$14-million Center for Freshwater Research and Education (CFRE) to house community, educational, and research activities. The CFRE would include laboratories, a Discovery Center focused on K-12 educational partnerships, and a public Great Lakes Visitor Center. The CFRE construction project also allocated funds for renovating and expanding the campus hatchery.

**Results:** The LSSU CFRE and its visitors centers opened to the public in 2022. MISG’s embedded staff member helped develop 15 lesson and activity plans for the Discovery Center, assisted with 10 programs, and engaged with visitors ranging from pre-K to adults. The staff member also chaired the advisory committee for a Natural Resource Career and Technical Education program housed at the new facility.

**Partners:** Lake Superior State University

**Project Number Index:** A/AS-28-R

**Featured work?**

**FOCUS AREA: Environmental Literacy and Workforce Development**

*GOAL 10: An environmentally literate public that is supported and informed by a continuum of lifelong formal and informal engagement opportunities.*

**ACCOMPLISHMENT: GLANSIS team curates data for *Canadian Geographic* article about Great Lakes invaders**

**Recap:** MISG staff curated data for a *Canadian Geographic* magazine article about Great Lakes invasive species.

**Relevance:** Aquatic invasive species (AIS) are a major problem in the Great Lakes and St. Lawrence Seaway. AIS disrupt food webs, destroy habitats, spread diseases, and harm businesses and recreation throughout the basin. Their effects span the breadth of the Great Lakes region, affecting two nations, eight U.S. states, and two Canadian provinces. Mustering public support for funding and legislation can help fuel efforts for detecting, preventing, and managing AIS.

**Response:** In April 2022, *Canadian Geographic* magazine published a printed and digital article titled, “Space invasion: Is it too late to save the Great Lakes?” The article highlighted AIS and climate change as drivers of ecosystem instability and the conservation value of preventing new invasions. MISG’s Great Lakes Aquatic Nonindigenous Species Information System (GLANSIS) staff curated data for the article that became a map of common invasion vectors and likely arrival locations across the Great Lakes.

**Results:** *Canadian Geographic* has a wide reach. Their publications reach 4.3 million unique readers per month in print and online. About half of their audience lives in Quebec and Ontario, the two provinces bordering the Great Lakes. This provides a substantial platform for GLANSIS’ data and conservation content.

**Partners:** N/A

**Project Number Index:** A/AS-28-B, R/CGLH-18

**Featured work?**



## **FOCUS AREA: Environmental Literacy and Workforce Development**

*GOAL 10: An environmentally literate public that is supported and informed by a continuum of lifelong formal and informal engagement opportunities.*

### **IMPACT: Retired research vessel and restored wooden fishing boat will star in Michigan museum's new state-supported exhibit**

**Recap:** Northern Michigan's Besser Museum will construct a new exhibit featuring Lake Huron fisheries and aquatic invasive species, thanks to state funding received with MISG support.

**Relevance:** The Besser Museum for Northeast Michigan, located in Alpena, celebrates the art, science, and history of northeast Michigan. The museum is a member of the MISG-coordinated Great Lakes Fisheries Heritage Network, a statewide group of organizations that uplifts and leverages maritime artifacts and stories to advance coastal tourism, community development, and Great Lakes literacy and stewardship. The Besser Museum collection includes the *Katherine V*, a restored wooden fishing tugboat built locally in 1928.

**Response:** In 2020, the Besser Museum received the *R/V Chinook*, a 50-foot retired state research vessel used to study invasive species and their effects on Lake Huron fisheries. In 2022, MISG supported the Besser Museum's application for state funds to protect and interpret the *Chinook* and *Katherine V*. The proposed two-building exhibit would provide an immersive, interactive experience for visitors to learn about maritime heritage and aquatic invasive species.

**Results:** The Michigan Invasive Species Grant Program awarded the Besser Museum \$386,500 to construct and develop the exhibits. Thanks to the *Chinook*, this unique project is a direct bridge between the fishery heritage and natural resource management communities. The funding will expand and expedite the Museum's fisheries heritage projects, advance Great Lakes literacy and education experiences for museum visitors, and lend value to the Great Lakes Fisheries Heritage Network.

**Partners:** Besser Museum for Northeast Michigan; Michigan Department of Natural Resources; Great Lakes Fisheries Heritage Trail network; Northeast Michigan Great Lakes Stewardship Initiative network

**Project Number Index:** A/AS-28-I

**Featured work?**

## **FOCUS AREA: Environmental Literacy and Workforce Development**

*GOAL 10: An environmentally literate public that is supported and informed by a continuum of lifelong formal and informal engagement opportunities.*

### **ACCOMPLISHMENT: 4-H Great Lakes Natural Resources Camp gets teens excited about outdoor recreation and stewardship**

**Recap:** The award-winning 4-H Great Lakes Natural Resources Camp gets teens outside for a week of career exploration, leadership development, recreation, stewardship, and Great Lakes literacy learning.

**Relevance:** Hands-on experiences in the natural world can inspire students to pursue environmental careers, practice stewardship activities in their daily lives, and integrate classroom lessons about Great Lakes literacy.

**Response:** For decades, Michigan State University Extension has coordinated the 4-H Great Lakes Natural Resources Camp for teens aged 13-15. Participants snorkel, sail, fish, hike, and develop leadership skills and self-confidence while learning about Michigan's unique natural resources. MISG has a long history of helping organize logistics, recruit participants, and lead activities like fish dissections, wetland studies, and invasive species removals. MISG also recruits natural resource professionals who provide hands-on science experiences for campers.

**Results:** The 4-H Great Lakes Natural Resources Camp has won multiple educational and program awards from the U.S. Fish and Wildlife Service and National 4-H. In 2022, MISG staff helped provide leadership for 48 youth from 20 Michigan counties. Nearly all campers responded to an evaluation survey, and 75 percent rated the experience as "good" or "excellent."

**Partners:** Michigan 4-H; Michigan Natural Features Inventory; Sault Tribe of Chippewa Indians; Michigan Department of Natural Resources; U.S. Fish and Wildlife Service; Michigan State University College of Agriculture and Natural Resources

**Project Number Index:** A/AS-28-P

**Featured work?**

## **FOCUS AREA: Environmental Literacy and Workforce Development**

*GOAL 10: An environmentally literate public that is supported and informed by a continuum of lifelong formal and informal engagement opportunities.*

### **ACCOMPLISHMENT: 4-H Winged Wonders camp gives youth a “birds-eye view” of science and stewardship**

**Recap:** As birding grows in popularity, MISG helped Michigan State University Extension partners host an engaging, bird-focused youth summer camp.

**Relevance:** Birding is an easy, affordable way to enjoy backyard critters, explore local natural areas, or travel farther afield in search of key species. Bird-watching can instill or reinforce a strong environmental stewardship ethic and a passion for engaging with the natural world. The hobby exploded in popularity during the COVID-19 pandemic, and MISG has seen a strong appetite for high-quality bird-based learning experiences for adults and kids.

**Response:** In 2022, MISG staff helped Michigan State University (MSU) Extension run its 4-H Winged Wonders Camp. The traveling summer camp was hosted by MSU’s Tollgate Farm and Kellogg Bird Sanctuary. The camp taught kids aged 10-13 about wild and domestic birds by exploring forests, fields, and farms. During the five-day session, kids visited multiple sites, camped outdoors, interacted with research scientists, met raptors, and learned stewardship and leadership skills.

**Results:** 16 campers created life-sized nest replicas, put on educational skits, caught fish to feed to captive eagles at the sanctuary, sampled pond macroinvertebrates, helped Michigan Bird Observatory staff release newly banded songbirds, and brought their binoculars on morning bird-watching walks. MISG provided meaningful programming and logistical assistance and strengthened ties with MSU partners at Tollgate Farm and Kellogg Bird Sanctuary.

**Partners:** Michigan Bird Observatory; Kellogg Bird Sanctuary; Tollgate Center

**Project Number Index:** A/AS-28-P

**Featured work?**

## **FOCUS AREA: Environmental Literacy and Workforce Development**

*GOAL 10: An environmentally literate public that is supported and informed by a continuum of lifelong formal and informal engagement opportunities.*

### **IMPACT: MISG events and partnerships drive enthusiasm for birding and conservation around Michigan**

**Recap:** MISG's bird-loving staff members provide high-quality educational programs for new and experienced birders.

**Relevance:** As COVID-19 restrictions limited recreational options, many Michiganders began turning toward new outdoor hobbies, including bird-watching. Birding is an easy, affordable way to enjoy backyard critters, explore local natural areas, or travel farther afield in search of key species. The hobby can bring tourism dollars to communities near major migratory pathways or unique habitats, and a passion for birds can inspire wildlife- and eco-friendly choices at home.

**Response:** With multiple passionate birders on staff, MISG provides high-quality educational programs for new and experienced birders. In spring 2022, MISG delivered a four-part webinar series for adult learners called "Michigan Birding 101." MISG also hosted a 4-H youth series about birding and a fall Michigan Birding 101 series. Additionally, MISG helped conduct a 4-H Winged Wonders birding camp and led multiple public birding hikes.

**Results:** The spring Michigan Birding 101 series attracted 348 registrations, with more than 100 participating in each session. A survey done several months after the spring series captured more than 60 responses and highlighted that the material caused behavior changes in participants, leading to increased outdoor recreation and practices promoting bird habitat and conservation.

**Partners:** Michigan 4-H

**Project Number Index:** A/AS-28-P, A/AS-28-R

**Featured work? YES**

## **FOCUS AREA: Environmental Literacy and Workforce Development**

*GOAL 10: An environmentally literate public that is supported and informed by a continuum of lifelong formal and informal engagement opportunities.*

### **ACCOMPLISHMENT: Fishery workshops connect anglers, scientists, and lake managers around shared resources**

**Recap:** Recreational anglers, commercial fishers, charter operators, agency staff, and researchers alike benefit from having an annual forum to share and discuss the latest updates in Great Lakes fishery management.

**Relevance:** MISG hosts an annual fishery workshop series so scientists and lake managers can share best available data and management updates with commercial, recreational, and charter fishers. The open exchange of information ensures that professional and recreational fishers are knowledgeable about fishery and lake management and provides a regular forum for offering feedback and asking questions of lake managers.

**Response:** In 2022, MISG hosted eight virtual fishery workshops to provide recreational and commercial fishers, agency staff, and researchers a forum to discuss Great Lakes fishery management. Meetings addressed fishery issues in lakes Michigan, Superior, Huron, and St. Clair/Detroit River. One workshop served inland river guides; another occurred during the Michigan Fish Producers Association annual conference. Regionally tailored agendas featured angler catch data, forage or prey fish surveys, fisheries management activities, and citizen science opportunities.

**Results:** The workshops engaged 444 stakeholders in conversations about fisheries science and management. The events forged deeper partnerships with Michigan Department of Natural Resources staff and many others. Survey results showed that a majority attending each of the workshops agreed or strongly agreed the workshops helped them become more knowledgeable about policies and gave them the opportunity to give input to fisheries managers and researchers.

**Partners:** Michigan Department of Natural Resources; U.S. Geological Survey; Michigan Department of Health and Human Services; U.S. Fish and Wildlife Service; Michigan Fish Producers Association; International Wildlife Refuge Alliance; Lake Huron Sportsfishing Club; Michigan Department of Environment, Great Lakes, and Energy; Ohio Sea Grant; Purdue University Extension; Thunder Bay Walleye Club; U.S. Department of Agriculture Wildlife Services; University of Michigan Water Center

**Project Number Index:** A/AS-28-D, A/AS-28-R

## **Featured work?**

## **FOCUS AREA: Environmental Literacy and Workforce Development**

*GOAL 10: An environmentally literate public that is supported and informed by a continuum of lifelong formal and informal engagement opportunities.*

### **ACCOMPLISHMENT: Engaging online modules empower educators to bring Great Lakes literacy to life in the classroom**

**Recap:** MISG provided regional leadership for the development and launch of virtual, asynchronous short courses that make Great Lakes topics accessible and engaging for teachers and help them bring Great Lakes literacy to life in the classroom.

**Relevance:** Many educators are excited to bring Great Lakes literacy principles and lessons to their classrooms. But developing engaging, place-based, scientifically accurate material can be challenging for busy teachers. The Sea Grant-led Center for Great Lakes Literacy (CGLL) is well poised to serve this need.

**Response:** MISG provided regional leadership for CGLL's new series of innovative educational products called Great Lakes Literacy education explorations (GLLees). Each GLLee is a short course designed to get educators up to speed on topics like marine debris, vernal pools, or coastal erosion. Educators also get access to resource collections, classroom lessons, and ideas for hands-on community engagement. GLLees are virtual, asynchronous, and free, and participants earn education contact hours.

**Results:** Seventeen educators completed a Vernal Pools GLLee pilot in 2021-22 and plan to share the topic with 730 learners. Participants shared positive feedback that helped CGLL improve and relaunch the course in 2022. The relaunch included tools to help educators engage youth in related stewardship projects. By mid-2022, three GLLee modules were live with several more in development for 2023. MISG and regional partners presented about GLLees at the 2022 National Marine Educators Association Conference.

**Partners:** American Water Works Association; Michigan Natural Features Inventory; Michigan Nature Association; Ohio Sea Grant; New York Sea Grant; Pennsylvania Sea Grant

**Project Number Index:** A/AS-28-Q

**Featured work?** YES

## **FOCUS AREA: Environmental Literacy and Workforce Development**

*GOAL 10: An environmentally literate public that is supported and informed by a continuum of lifelong formal and informal engagement opportunities.*

### **IMPACT: Center for Great Lakes Literacy mentoring program sets first-year teacher up for success -- with her dad's help**

**Recap:** Teacher Bob Thomson is helping his daughter — and fellow teacher — engage students in water science and stewardship projects through the Center for Great Lakes Literacy Mentoring Program.

**Relevance:** The Center for Great Lakes Literacy (CGLL) is a Sea Grant-led network that fosters basin-wide Great Lakes stewardship by providing hands-on experiences, educational resources, and networking opportunities among an engaged community of educators, scientists, and youth. MISG and partners coordinate a CGLL mentorship program for educators at different stages of their careers. The program supported 10 mentor-mentee teacher teams through the 2021-22 school year.

**Response:** One successful mentorship duo is also a father-daughter team. Bob Thomson is an award-winning Michigan science teacher, long-time CGLL partner, and place-based education leader. His daughter, Liz Thomson, learned Great Lakes literacy and stewardship from him as a student. In the 2021-22 school year, she joined the mentor program as a first-year teacher in the neighboring county from her father's school.

**Results:** With Bob Thomson's mentorship, Liz Thomson is getting her middle school students out into wetlands and coastal habitats, using lessons he models and supports. Liz's students are now leading their own water science and stewardship projects. CGLL's story about Bob and Liz Thomson was picked up for distribution by the State of Michigan, NOAA, and the Great Lakes Restoration Initiative.

**Partners:** Great Lakes Stewardship Initiative; Michigan STEM Network; Michigan Department of Education; Michigan Department of Labor and Economic Opportunity

**Project Number Index:** A/AS-28-Q

**Featured work?**

## **FOCUS AREA: Environmental Literacy and Workforce Development**

*GOAL 10: An environmentally literate public that is supported and informed by a continuum of lifelong formal and informal engagement opportunities.*

**IMPACT: Center for Great Lakes Literacy helps teachers and students engage with place-based education, improve their communities**

**Recap:** The Sea Grant-led Center for Great Lakes Literacy helps hundreds of teachers and thousands of students engage with place-based education, community stewardship projects, and Great Lakes literacy principles.

**Relevance:** MISG staff co-lead the Center for Great Lakes Literacy (CGLL), a network that fosters basin-wide Great Lakes stewardship by providing hands-on experiences, educational resources, and networking opportunities among an engaged community of educators, scientists, and youth. MISG also co-leads NEMIGLSI, the northeast Michigan branch of the statewide Great Lakes Stewardship Initiative, which now has close ties with CGLL.

**Response:** In 2022, the CGLL team enhanced coordination with the Great Lakes Sea Grant Directors Network, established a new strategic communications initiative, launched a regional newsletter, and applied for GLRI funding to support future programming. The team also started a teacher mentorship program, developed innovative virtual learning materials, and presented at meetings and conferences.

**Results:** In 2022, CGLL secured \$2.4 million in federal Great Lakes Restoration Initiative funding for 2023-27 programming. More than \$700,000 of the funding is earmarked for MISG. CGLL also supported professional learning opportunities for 150 educators and directly impacted 3,800 youth. NEMIGLSI- and CGLL-supported teachers and students raised classroom salmon, ran community gardens, presented to city councils, cleaned up trash, collected water quality data, planted rain gardens, and took other community stewardship actions.

**Partners:** U.S. Environmental Protection Agency; EPA Great Lakes National Program Office; American Water Works Association; U.S. Environmental Protection Agency Great Lakes National Program Office; Illinois-Indiana Sea Grant; Lake Champlain Sea Grant; Michigan Science Teachers Association; Minnesota Sea Grant; New York Sea Grant; Ohio Sea Grant; Pennsylvania Sea Grant; U.S. Geological Survey; University of Michigan School for Environment and Sustainability; Wisconsin Sea Grant; University of Wisconsin-Milwaukee; NOAA B-WET Program

**Project Number Index:** A/AS-28-N

**Featured work? YES**



## **FOCUS AREA: Environmental Literacy and Workforce Development**

*GOAL 11: A diverse workforce that is skilled in science, technology, engineering, mathematics, and other disciplines critical to local, regional, and national needs.*

### **ACCOMPLISHMENT: Summer interns dissect fish guts, map urban forests, sample Lake Huron water quality, and more**

**Recap:** In 2022, MISG funded 10 undergraduate interns from seven Michigan colleges and universities to conduct Great Lakes research and stewardship projects around the state.

**Relevance:** MISG seeks to empower the next generation of environmental stewards by providing meaningful, funded internship opportunities to Michigan undergraduate students. Each MISG intern works on a Great Lakes stewardship project alongside a host business, non-profit, government agency, or academic institution. MISG works to recruit students underrepresented in environmental fields and facilitates participation in the National Sea Grant Community Engaged Internship program.

**Response:** In 2022, MISG funded 10 undergraduate interns from seven Michigan colleges and universities. The interns spent the summer analyzing hydrology in a Detroit urban forest, creating educational materials about trees and air pollution, evaluating yellow perch populations in Lake Michigan, and pursuing other stewardship projects in their communities. Many students delivered brief presentations about their work during a symposium in August 2022.

**Results:** The students helped university faculty and state agency staff advance research goals while reinforcing their own STEM career trajectories. Several interns engaged youth and adults through public events. One helped NOAA Sanctuary staff ramp up an innovative acidification study in Lake Huron, paving the way for another MISG intern to continue the project in 2023.

**Partners:** Michigan Department of Natural Resources; Thunder Bay National Marine Sanctuary; Detroit Zoological Society; Plaster Creek Stewards; Cadillac Urban Garden; University of Michigan; Michigan State University; Lake Superior State University; Central Michigan University; Calvin University; University of Detroit Mercy; Eastern Michigan University

**Project Number Index:** R/ERA-30, M/PM-64, M/PM-69, C/CC-19, C/CC-25

**Featured work? YES**

## **FOCUS AREA: Environmental Literacy and Workforce Development**

*GOAL 11: A diverse workforce that is skilled in science, technology, engineering, mathematics, and other disciplines critical to local, regional, and national needs.*

### **ACCOMPLISHMENT: GLANSIS provides aquatic invasive species data for ACT test practice materials**

**Recap:** Staff working on the Great Lakes Aquatic Nonindigenous Species Information System (GLANSIS) supplied a freelance writer with data to create ACT test practice materials about invasive carp.

**Relevance:** The ACT is a national standardized exam designed to test students' college readiness. Questions cover factual knowledge as well as reading comprehension and critical thinking. The ACT's science section challenges students to read scientific passages and interpret graphs and charts to answer multiple-choice questions.

**Response:** A freelance writer who develops ACT practice questions contacted MISG staff at the Great Lakes Aquatic Nonindigenous Species Information System (GLANSIS) in 2022. The writer asked GLANSIS staff for fresh, compelling aquatic invasive species data that could become engaging practice materials for the ACT science section. Staff eagerly seized the opportunity to apply GLANSIS data to raise awareness about invasive species and the database itself.

**Results:** The writer generated an ACT practice packet featuring background information and data about invasive carp and the threat bighead and silver carp pose to Lake Michigan. The packet includes a 450-word summary, 3 figures, and 21 questions drawn from data and research provided by GLANSIS and the NOAA-funded Cooperative Institute for Great Lakes Research. The materials are available for purchase and download through the educational resource hub "Teachers Pay Teachers."

**Partners:** Teachers Pay Teachers; Cooperative Institute for Great Lakes Research; NOAA Great Lakes Environmental Research Laboratory

**Project Number Index:** A/AS-28-B, R/CGLH-18

**Featured work?**

## **FOCUS AREA: Environmental Literacy and Workforce Development**

*GOAL 11: A diverse workforce that is skilled in science, technology, engineering, mathematics, and other disciplines critical to local, regional, and national needs.*

### **IMPACT: Former MISG graduate research fellow publishes round goby research, launches teaching career**

**Recap:** Since receiving a MISG graduate research fellowship in 2018-19, Corey Krabbenhoft has published papers about her fellowship research and launched a teaching career at the University of Buffalo.

**Relevance:** Round gobies are an invasive fish species inadvertently introduced to the Great Lakes around 1990. They thrived upon arrival and now inhabit all five Great Lakes and many tributaries. Round gobies eat eggs and larvae of native fish, aggressively prevent native fish from accessing spawning habitat, and steal bait from anglers. Understanding round goby invasion pathways and impacts in Great Lakes rivers is an important step toward more resilient habitats and recreation opportunities.

**Response:** In 2018-19, MISG funded Corey Krabbenhoft as a graduate research fellow. She was then a Ph.D. candidate at Wayne State University in Detroit. Her research involved surveying fish populations and habitat conditions in seven Michigan tributaries where round gobies were present or absent. She hoped to tease out conditions that promoted resilient native populations and conditions that paved the way for round goby invasions.

**Results:** Since completing her fellowship, Krabbenhoft and her advisor have published several papers about round goby invasions. A 2022 publication in *Biological Invasions* reported that invasion risk rises as urban and agricultural development replace natural streamside habitat. In January 2023, Krabbenhoft became an assistant professor at the University of Buffalo with her own aquatic ecology lab focused on freshwater ecosystems and conservation. She notes that MISG “definitely helped get me where I am today.”

**Partners:** N/A

**Project Number Index:** R/CGLH-8

**Featured work?**

## **FOCUS AREA: Environmental Literacy and Workforce Development**

*GOAL 11: A diverse workforce that is skilled in science, technology, engineering, mathematics, and other disciplines critical to local, regional, and national needs.*

### **ACCOMPLISHMENT: 2022 Great Lakes Bowl proceeds virtually during pandemic restrictions**

**Recap:** Along with a team of volunteers, MISG hosted a virtual trivia competition for high school students featuring marine and Great Lakes knowledge.

**Relevance:** The National Ocean Sciences Bowl (NOSB) is a national trivia competition for high school students. The annual quiz bowl-style tournament tests students on their knowledge of marine and Great Lakes biology, policy, chemistry, physics, economics, geography, and history. The winners of regional bowls advance to a national finals competition. NOSB participants often express a strong commitment to sustainability in marine environments, and many pursue STEM fields in college.

**Response:** In February 2022, MISG hosted the regional Great Lakes Bowl for students in Michigan and surrounding states. Due to COVID-19 safety protocols, the event organizers (including MISG staff and volunteers) conducted the competition virtually using a variety of online programs and tools.

**Results:** 53 students from 11 teams were able to showcase their marine and Great Lakes knowledge at the 2022 competition. The top five teams received monetary prizes worth a total of \$1,500; all teams also received a packet of items including T-shirts, hats, posters, and certificates. The winning team competed in the national tournament later in 2022.

**Partners:** None

**Project Number Index:** M/PM-64, M/PM-69, C/CC-19, C/CC-25

**Featured work? YES**

## **FOCUS AREA: Environmental Literacy and Workforce Development**

*GOAL 11: A diverse workforce that is skilled in science, technology, engineering, mathematics, and other disciplines critical to local, regional, and national needs.*

### **IMPACT: MISG-supported graduate students make waves and reach educational milestones**

**Recap:** MISG-supported graduate students earned scholarships, received press coverage, and completed their programs in 2022 to become the next generation of Great Lakes and STEM researchers.

**Relevance:** Shaping the next generation of Great Lakes scientists and stewards is a crucial part of MISG's mission. In addition to K-12 programming and undergraduate internships, MISG provides or coordinates a variety of fellowship and mentoring opportunities for graduate students around the state. Several MISG-supported graduate students achieved major educational milestones or garnered media attention in 2022.

**Response:** MISG helped Ph.D. student Emily Liljestrand secure a NOAA Fisheries/Sea Grant Population and Ecosystem Dynamics Fellowship for 2019-2022. Liljestrand won an international scholarship for quantitative fisheries work in 2022 and completed her Ph.D. in 2023. MISG graduate fellow Dustin Brewer garnered media coverage for his migratory marsh bird research. MISG Associate Director/Extension Program Leader Heather Triezenberg mentored two graduate students, Barb Avers and Alexandra Benitez, who completed their programs in 2022.

**Results:** Each of these students represents a new member of the Great Lakes and STEM research communities who used MISG as a springboard into exciting educational and career milestones.

**Partners:** NOAA Fisheries; International Association for Great Lakes Research; Interlochen Public Radio

**Project Number Index:** A/AS-28-T, R/NCF-3, M/PM-64, C/CC-19

### **Featured work?**

## **FOCUS AREA: Environmental Literacy and Workforce Development**

*GOAL 11: A diverse workforce that is skilled in science, technology, engineering, mathematics, and other disciplines critical to local, regional, and national needs.*

**IMPACT: MISG helps create aquaculture career pathway that carries students from K-8 classrooms to college degrees and beyond**

**Recap:** MISG Extension Educator Elliot Nelson has worked with Lake Superior State University to create an aquaculture education and workforce development pathway that raises the industry's profile and carries students toward successful aquaculture careers.

**Relevance:** Aquaculture remains a niche market in the Great Lakes region and is often misunderstood or overlooked by consumers. Training future generations of aquaculture technicians and entrepreneurs is a key strategy for ensuring the industry's future viability and increasing its prominence and reputation in the public eye.

**Response:** In 2016, MISG hired Extension Educator Elliot Nelson to focus on crafting post-secondary aquaculture curriculum and other workforce development programs. Nelson is embedded at Lake Superior State University (LSSU), which operates a salmon hatchery and emphasizes freshwater fishery research. Nelson has spearheaded efforts like aquaponics teacher training workshops, an Aquaculture Challenge high school competition, middle school hatchery field trips, LSSU aquaculture curriculum development, and public outreach through LSSU's new Center for Freshwater Research and Education.

**Results:** Nelson and MISG and LSSU colleagues created an aquaculture education and workforce development pathway that carries students from K-8 learning, through hands-on experiences, into college programs, and toward aquaculture jobs. As of 2022, Nelson has worked with 200 educators, 1000 youth, and 500 Aquaculture Challenge participants. 25 LSSU students are enrolled in or have completed aquaculture degree programs he helped develop; recent graduates hold high-paying aquaculture jobs. This pathway also helps raise aquaculture's social capital.

**Partners:** Lake Superior State University

**Project Number Index:** A/AS-28-T

**Featured work? YES**

## **FOCUS AREA: Environmental Literacy and Workforce Development**

*GOAL 11: A diverse workforce that is skilled in science, technology, engineering, mathematics, and other disciplines critical to local, regional, and national needs.*

### **ACCOMPLISHMENT: Aquaculture Challenge student competition encourages STEM learning, innovation, and career development**

**Recap:** The MISG-led Aquaculture Challenge engages students in STEM learning, innovation, and career development by developing aquaponics systems and business plans.

**Relevance:** Aquaculture remains a niche market in the Great Lakes region and is often misunderstood or overlooked by consumers. Training future generations of aquaculture technicians and entrepreneurs is a key strategy for ensuring the industry's future viability and increasing its prominence and reputation in the public eye.

**Response:** The Aquaculture Challenge is a collaboration between MISG and Lake Superior State University. This science competition engages students in grades 8-12 from around the Midwest in a four-month venture to build and monitor aquaponics systems, create business plans, and cook seafood dishes. The competition aims to engage students in STEM content, push teams to develop innovative aquaculture designs and business models, and demonstrate the potential of future aquaculture-related career paths.

**Results:** In 2022, the MISG-led Center for Great Lakes Literacy provided outreach and team stipend support. Fourteen teams registered from six states, and 112 students completed at least some portion of the program. Seven teams completed the challenge, comprising 58 students and seven adult coaches. Team stipends totaling \$900 were distributed through grant funds from the North Central Regional Aquaculture Center.

**Partners:** Lake Superior State University; Michigan Science Teachers Association; North Central Regional Aquaculture Center

**Project Number Index:** A/AS-28-N

**Featured work?**

## **FOCUS AREA: Environmental Literacy and Workforce Development**

*GOAL 11: A diverse workforce that is skilled in science, technology, engineering, mathematics, and other disciplines critical to local, regional, and national needs.*

### **ACCOMPLISHMENT: Boat 2 School program engages Tribal students in commercial fishing and aquaculture activities, career pathways**

**Recap:** MISG’s Boat 2 School program coordinates field trips and hands-on experiences with Michigan’s commercial fishing and aquaculture industries for students at Northern Michigan tribal schools.

**Relevance:** Getting Michigan students acquainted with commercial fishing and aquaculture industries can open new career pathways and help youth engage more deeply with their community. In addition, fish is a culturally relevant local food source in Northern Michigan that is high in many key nutrients. However, fish consumption rates in the area are well below federal recommendations for a healthy diet.

**Response:** For 5 years, MISG has coordinated a “Boat 2 School” program with a local tribal school in the Upper Peninsula. The weeklong program immerses students in fisheries learning by visiting fish hatcheries and commercial fishing operations, collecting real fisheries data, and exploring career pathways in commercial fisheries and fisheries management. Students also learn about fish preparation techniques and the nutritional value of Great Lakes fish — and, of course, taste it for themselves.

**Results:** In 2022, over 60 students from the Sault Ste. Marie Tribe of Chippewa Indians and JKL Bahweting Anishnabe School participated in Boat 2 School activities. Students toured the Sault Tribe’s fish hatchery and a six-generation commercial fishing and processing operation, collected walleye diet data, and participated in other hands-on activities. Pre- and post-program assessments highlighted a large increase in students’ openness to eating local fish species and a rising interest in fish-related careers.

**Partners:** Sault Tribe of Chippewa Indians; JKL Bahweting Anishnabe PSA; Massey’s Fish Company

**Project Number Index:** A/AS-28-N

**Featured work? YES**



## **FOCUS AREA: Environmental Literacy and Workforce Development**

*GOAL 11: A diverse workforce that is skilled in science, technology, engineering, mathematics, and other disciplines critical to local, regional, and national needs.*

### **IMPACT: MISG workshop helps teachers set up classroom aquaponics systems to facilitate hands-on STEM learning**

**Recap:** K-12 teachers are incorporating aquaponics systems into their classrooms, thanks to MISG's guidance and stipend support.

**Relevance:** Aquaponics systems are a way to raise fish and plants without using soil. Simple aquaponics systems can be powerful teaching tools in K-12 classrooms by facilitating hands-on lessons in chemistry, biology, engineering, food systems, and stewardship. They may also be springboards for getting students interested in aquaculture careers.

**Response:** MISG hosted a 2022 Aquaponics Teacher Workshop in the eastern Upper Peninsula that covered the basics of aquaculture and aquaponics. Participants toured public and private aquaculture facilities, built their own aquaponics systems to take home, and received ready-made lesson plans and classroom activities. The workshop was co-hosted with Lake Superior State University with funding from the North Central Regional Aquaculture Center to cover costs and provide teacher stipends.

**Results:** A total of 14 teachers registered and 9 attended, traveling from as far as Detroit, Traverse City, and the western Upper Peninsula. Feedback from the workshop was positive. Multiple teachers expressed intent to set up aquaponics systems in their classrooms, with at least one teacher confirming a successful classroom operation.

**Partners:** None

**Project Number Index:** A/AS-28-N

**Featured work?**

## **FOCUS AREA: Environmental Literacy and Workforce Development**

*GOAL 11: A diverse workforce that is skilled in science, technology, engineering, mathematics, and other disciplines critical to local, regional, and national needs.*

### **IMPACT: High school student's energy efficiency research leaves lasting impact**

**Recap:** A MISG-supported high school student won a regional research competition in 2020 with a project that later solidified the local school board's decision to invest in upgraded windows for the school.

**Relevance:** The Department of Defense, National Science Teaching Association, and other federal and education groups administer an annual nationwide Junior Science and Humanities Symposium competition. High school students present original STEM research at regional Symposia to vie for scholarships and recognition. MISG serves on the advisory board for the Southeast Michigan Symposium, hosted by Wayne State University. MISG staff also mentor students and teams entering the regional competition.

**Response:** In 2020, about 25 students were invited to present their research at the Southeast Michigan Symposium. MISG staff mentored a senior student at Alcona Community High School who studied the energy efficiency of newer and older windows in her school building and their potential to save energy and money. The student found that newer windows provided meaningful energy savings. The student's research poster won first place and earned her a cash award.

**Results:** The MISG-supported student's research helped influence the Alcona Community School Board's decision to upgrade windows at the high school in 2021-22. The student is now studying at Northern Michigan University, and her winning poster is still on display at the high school to inspire future generations of STEM students.

**Partners:** Alcona Community Schools; Northeast Michigan Great Lakes Stewardship Initiative network; Wayne State University; National Science Teaching Association; Department of Defense

**Project Number Index:** A/AS-28-N

**Featured work?**

## National Performance Measures

Focus Area	Performance Measures		MISG 2022 Actual 2/1/21-1/31/22
ALL	Economic (market and non-market) benefits derived from Sea Grant Activities	Economic Benefit	\$3,095,470
		Businesses Created	0
		Businesses Supported	0
		Jobs Created	6
		Jobs Supported	31
		Patents/Licenses	0
SFA	Number of fishermen, seafood processing and aquaculture industry personnel who modify their practices using knowledge gained in fisheries sustainability and seafood safety as a result of Sea Grant activities		101
RCE	Number of communities that implemented sustainable economic and environmental development practices and policies as a result of Sea Grant activities		21
HCE	Number of acres of coastal habitat protected, enhanced, or restored as a result of Sea Grant activities		44
ELWD	Number of people engaged in Sea Grant-supported informal education programs		6056
ELWD	Number of Sea Grant-supported graduates who become employed in a job related to their degree within two years of graduation		6
HCE	Number of resource managers who use ecosystem-based approaches in the management of land, water, and living resources in ocean, coastal and Great Lakes areas as a result of Sea Grant activities		67
Cross-Cutting	Number of communities that implemented hazard resiliency practices to prepare for, respond to, or minimize coastal hazardous events as a result of Sea Grant activities		4
Cross-Cutting	Number of Sea Grant products (i.e., tools technologies, and information services) that are used by our partners/customers to improve ecosystem-based management		2
Cross-Cutting	Number of Sea Grant products that are used to advance environmental literacy and workforce development		10

## ***Economic Impacts and Benefits***

The economic impacts and benefits – including market and non-market valuations and jobs and business created or sustained – derived from Sea Grant activities.

<b>Economic Benefit of MISG</b>	<b>Economic Impact</b>	<b>Businesses Created</b>	<b>Businesses Supported</b>	<b>Jobs Created</b>	<b>Jobs Supported</b>	<b>Patents/Licenses</b>
Michigan Sea Grant Extension educator held 2 Seafood Hazard Analysis Critical Control Point trainings. Seafood HACCP regulations training is required to find or remain current on regulations for employment in the industry. This training provides skills necessary to execute the most efficient methods of seafood production while abiding by food safety standards, and also gives fish processors the opportunity to add value-added products to their operations. The Hazard Analysis Critical Control Point (HACCP) training, facilitated by Michigan Sea Grant Extension educators supported 5 new fish processing jobs in 2022. As of May 2022 wage according to the Bureau of Labor Statistics (National estimates of First-Line Supervisors <a href="https://www.bls.gov/oes/current/oes451011.htm">https://www.bls.gov/oes/current/oes451011.htm</a> , for new positions at the 25% percentile--more realistic for Michigan) is \$42,850. per job. Jobs supported numbered 31 and used the mean annual wage for someone who has already been working in the industry of \$58,820. 5 jobs x 42,850 = \$214,250.00. 31 x \$58,820 = 1,823,420. Total economic benefit: \$2,037,670	\$2,037,670	0	0	5	31	0
2021 MISG Undergrad Intern Simon Freeman has obtained a full-time position in 2022 as a Research Technician at Lake Superior State University's Center for Freshwater Research and Education in 2022 as a direct continuation of his MISG Internship project. His research on quantifying day versus night relationships between larval lake whitefish and zooplankton prey density and biomass in Lakes Michigan, Huron, and Superior will continue until 2024 with one publication already submitted. Clinical laboratory Technologists and Technician's 2021 median pay was \$57,800 per year according to the Bureau of Labor Statistics ( <a href="https://www.bls.gov/ooh/healthcare/clinical-laboratory-technologists-and-technicians.htm">https://www.bls.gov/ooh/healthcare/clinical-laboratory-technologists-and-technicians.htm</a> ) This position aligns well with his BS in fisheries and wildlife from Lake Superior State University. We assume the full salary benefit as this intern would not have been placed in this new position if it were not for the Michigan Sea Grant Internship Program.  Undergraduate Intern Job Placement = \$57,800 Research Technician at Lake Superior State University's Center for Freshwater Research and Education	\$57,800	0	0	1	0	0

<p>MISG is heavily involved with outreach, education, and research efforts that are focused on stopping the spread of AIS throughout the GL. AIS are incredibly detrimental to both the biological and ecological health of the GL ecosystem, and has major economic impacts for MI as a whole. As a result of this growing problem, MISG has developed and implemented numerous programs focused on addressing the rise of AIS in the GL. The MI Paddle Stewards program teaches paddlers how to identify and report aquatic invasive species through an online self-paced course that began in July 2020. The new digital format allows us to reach audiences in the Great Lakes, connecting rivers, tributaries and beyond. In partnership with NOAA's Great Lakes Environmental Research Laboratory and USGS Wetland and Aquatic Research Center, MISG also manages and staffs GL Aquatic Nonindigenous Species Information System (GLANSIS). The primary objective of GLANSIS is to provide a 'one-stop' information source for information on non-native species in the Great Lakes, providing a catalog of resources including species profiles, threat assessments, and AIS maps on a website that is openly available to researchers, managers, decision-makers, educators, and all interested stakeholders. The purpose of providing this wealth of information is to inform the management decisions that lead to prevention, rapid response, and control of AIS in the GL. Michigan Sea Grant staff provide advice and support to numerous groups at the Binational to local levels. (Great Lakes Panel on ANS, Regional AIS Collaboratives, Saginaw Bay Cisma, University Research Project committees, etc). A study published by Rosaen et al. in 2016 (<a href="https://www.andersoneconomicgroup.com/Portals/0/upload/AEG%20-%20AIS%20Impact_%2009-20-2016%20Public%20new.pdf">https://www.andersoneconomicgroup.com/Portals/0/upload/AEG%20-%20AIS%20Impact_%2009-20-2016%20Public%20new.pdf</a>) estimates that the aggregate cost of AIS to the Great Lakes region is significantly over \$100 million annually. Given that Michigan has a coastline on four of the five great lakes, it is massively impacted by the rise of AIS. As a result of the may successful outreach, education, communication, and reearch efforts that MISG has undertaken with regard to AIS, we are confident that we have had an impact. While these have been major efforts, we are nonetheless conservative in our estimated impact with reagrd to cost savings for the state. We can comfortably state that MISG's efforts have resulted in a 1% cost savings for the state of Michigan in the fight against AIS. \$100,000,000 in costs of AIS to the Great Lakes x 1% cost savings as a result of MISG outreach, education, and research efforts = \$1,000,000 in cost savings</p>	\$1,000,000	0	0	0	0	0
<b>Total</b>	<b>\$3,095,470</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>31</b>	<b>0</b>

## ***Fish and Seafood Professionals***

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The number of fishermen, seafood processing, and aquaculture industry personnel who modify their practices using knowledge gained in fisheries sustainability and seafood safety as a result of Sea Grant activities.

<b>Program/Initiative</b>	<b># of People</b>	<b>Notes</b>
Regional Fishery Workshops (6 sessions)	58	323 registered for fishery workshops held virtually in 6 sessions targeting different areas, including: Lake Huron (Les Cheneaux, Saginaw Bay, Open Water), Lake Superior, Southern Lake Michigan, Southeast Michigan (Lake Erie, Lake St. Clair) Of the 99 survey respondents, 58 either agreed or strongly agreed with the statement: As a result of participating in this workshop, I plan to modify practices using knowledge gained in fisheries sustainability as a result of participation in Sea Grant activities.
Inland Guides Workshop	7	Of the 59 attending the Inland Guides workshop, 16 participated in a follow up survey and of those, 7 agreed or strongly agreed with the following statement: I plan to modify practices using knowledge gained in fisheries sustainability as a result of participation in Sea Grant activities.
Seafood HACCP programming	31	Aquaculture industry personnel renewed their Seafood HACCP certifications.
Seafood HACCP programming	5	Students received new HACCP certificates making them eligible for employment.
<b>Total</b>	<b>101</b>	

## ***Sustainable Coastal Development***

The number of communities that implemented sustainable economic environmental development practices and policies as a result of Sea Grant activities.

<b>Program/Initiative</b>	<b>Community Name</b>	<b># of Communities</b>	<b>Notes Regarding Changes Observed</b>
Clean Marina	City of Alpena Marina Club Royale Cass Lake Dry Dock Marina Elk Rapids Marina Hall's Sports Center Land's End Marine Unriehl Marina Wyandotte Marina	7	New Clean Marina Certificates
Clean Marina	Algonac Harbor Club DeTour State Harbor Elba-Mar Boat Club Fayette State Harbor Hammond Bay State Harbor Howe Marine Indian River Marina Mackinac Island State Harbor Manitou Beach Marina Mayea Marina Ottawa Beach Marina Pine Lake Marina Presque Isle State Harbor Safe Harbor Great Lakes Marina Straits State Harbor Village of Suttons Bay	16	Recertified Clean Marina Certificates
<b>Total</b>		<b>21</b>	

## *Acres Restored*

The number of acres of coastal habitat protected, enhanced, or restored as a result of Sea Grant activities.

Locations	Project Description	# of Acres
South Hennepin Marsh, an emergent wetland in the Trenton Channel is one of the most important remaining habitats for fish and wildlife in Michigan waters of the Detroit River. This project was identified in the 2002 Habitat Protection and Remediation, Detroit River: Final Completion Report for U.S. Environmental Protection Agency by Dr. Bruce Manny.	In 2021, additional funding was awarded by NOAA, allowing for construction. Following an open bidding process, E.C Korneffel Company was selected to construct the project. With work began in summer of 2021, with completion in 2022.	20
Sugar Island is an uninhabited, 29-acre island at the mouth of the Detroit River near Lake Erie. It is entirely owned by the U.S. Fish and Wildlife Service (USFWS) as part of the Detroit River International Wildlife Refuge. This area of the Detroit River serves as one of the most important spawning areas for western Lake Erie.	<p>NOAA continued funding the Sugar Island project, with a grant to Friends of the Detroit River, to further develop the plan and to conduct additional hydrodynamic modeling to verify feasibility of any changes to the initial concept plan. The funding supported final engineering, permitting, and construction documents as well. SmithGroup assisted FDR, USFWS and other project stakeholders with this work.</p> <p>Following an open bidding process, E.C Korneffel Work began in summer of 2021, and was completed by the end of 2022.</p> <p>This project established practical limits of upland, wetland and submergent habitat that can be restored within the degraded and eroded areas on and adjacent to Sugar Island's southerly end. 2,700 linear feet of coastal shoreline and 21 acres of coastal wetland will be restored, enhanced, and protected. Up to 2.5 acres of upland habitat will be restored and enhanced with native plantings.</p>	23.5
<b>Total</b>		<b>43.5</b>



## ***Informal Education Programming***

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The number of people engaged in Sea Grant-supported informal education programs.

<b>Event Name</b>	<b>Total # Engaged</b>
SG meetings/workshops	2760
Professional presentations	1508
community events	1259
Professional presentations	149
Earth Camp	20
GLANSIS Updates to the Great Lakes Panel	70
AIS in the Great Lakes Region	100
USGS NAS Summer Seminar Series "NOAA GLANSIS: Science Communication, Extension, Policy, Partnerships and Opportunities"	20
GLANSIS, Science Communication, Extension, Policy, Partnerships and More	20
Historic Patterns of ANS Distribution and Impact Derived from GLANSIS	50
GLANSIS Update	50
Joint Aquatic Sciences Meeting	50
<b>Total</b>	<b>6,056</b>

## ***Formal Education Programming***

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The number of people engaged in Sea Grant-supported formal education programs.

<b>Presenter Name</b>	<b>Event Name</b>	<b># of Teachers</b>	<b># of Student Participants</b>	<b># Students Reached via Teachers</b>
	All NEMIGLISI Projects	90	3803	42
	All Teacher training events (Teachers w/o students)	127		
	All K-12 other		574	
	January 2023 k-12		69	
Gregory Dick	Earth 112 "The Great Lakes"		200	
Vincent Deneff	Presentation on invasive species impacts on the Great Lakes at Pattengill Elementary school, Ann Arbor, MI		45	
<b>Total</b>		<b>430</b>	<b>2,548</b>	<b>45</b>

## ***Resource Managers***

The number of resource managers who use ecosystem-based approaches in the management of land, water, and living resources as a result of Sea Grant activities.

<b>Program/Initiative</b>	<b>People/Groups Participating</b>	<b># of Resource Managers</b>
Coastal Zone Management Program	Office of the Great Lakes, Michigan Environment, Great Lakes and Energy (EGLE) Water Resources Division.	3
Michigan Association of Planners	Planners from Michigan's Coastlines	20
GLANSIS	Great Lakes Panel on ANS	22
Leadership team for A Participatory Modeling Approach to Collaborative Water Governance in Michigan	Emily Finnell, Jay Wesley, Christopher Gothberg James Milne Andy LeBaron, Abigail Eaton, Simon Belisle	7
Advisory Board for A Participatory Modeling Approach to Collaborative Water Governance in Michigan	Pat Norris, Frank Ruswick, Paul Sachs, Pat Staskiewicz, Jeff Reicherts, Mike Eslick, Ben Tirrell, Alyssa Olson, Bud Sebastian, Ruth Kline-Robach, Zachary Curtis, Jon Bartholic, Frank Ettawageshik, Jimmie Mitchell, Megan Tinsley	15
<b>Total</b>		<b>67</b>

## *Hazard Resiliency Training*

The number of coastal communities that have adopted or implemented hazard resiliency practices to prepare for, respond to, or minimize coastal hazardous events.

County of Coastal Community	Name of Coastal Community	Number of Resiliency Trainings Provided	Community Hazard Resilience Increased
Alpena	Alpena	1	1
Oakland	Waterford Township	1	1
Antrim	Elk Rapids	1	1
Macomb	Harrison Township	1	1
Macomb	New Baltimore	1	1
Wayne	Wyandotte	1	1
St. Clair	Algonac	1	1
Chippewa	De Tour Village	1	1
Wayne	Grosse Ile	1	1
Delta	Garden	1	1
Presque Isle	Bearinger	1	1
Cheboygan	Indian River	1	1
Mackinac	Mackinac Island	1	1
Lenawee	Manitou Beach	1	1
St. Clair	Fair Haven	1	1
Ottawa	Holland	1	1
Allegan	Plainwell	1	1
Oakland	West Bloomfield Township	1	1
Presque Isle	Presque Isle	1	1
Lenawee	Manitou Beach	1	1
St. Clair	Fair Haven	1	1
Ottawa	Holland	1	1
Allegan	Plainwell	1	1
Presque Isle	Presque Isle	1	1
Muskegon	Muskegon	1	1
Emmet	Mackinaw City	1	1
South Haven, MI	Van Buren County	1	1
Pentwater	Oceana	1	1
New Buffalo	Berrien	1	1
St Joseph	Berrien	1	1
<b>Total</b>		<b>30</b>	<b>30</b>

## Sea Grant Products Developed or Used

Tools, technologies, or informational services developed by Sea Grant staff that are used by partners and customers to improve ecosystem-based management.

Name of Product	Developed (Yes/No)	Used (Yes/No)
<p><i>Carp Habitat Suitability Maps</i> within Map Explorer was developed by GLANSIS in 2022, expanding the capabilities of the Map Explorer Tool to include extensive carp habitat information. It is live on <a href="http://glerl.noaa.gov/mapExplorer.php">glerl.noaa.gov/mapExplorer.php</a> and includes grass carp, silver carp, bighead carp, and black carp.</p> <p><b>End Users: Research Scientists, Post-Docs, Graduate Students, Anglers</b></p>	Yes	Yes
<p>This newly developed <b>Regulation Widget</b> was built by GLANSIS primarily to help the state AIS coordinators (primary audience for the whole RA Clearinghouse) put the risk assessments into the context of the regulatory framework. Both state and federal level regulations are displayed in the map, with the latter portrayed in the inset graphics of the United States and Canada. Michigan Sea Grant uses this clear view of regulations to understand current policy in effect and compare gaps in policy yet to be addressed as a tool to bring to strategize where to focus future efforts and provide clearer data to policy makers and communities.</p> <p><b>End Users: Research Scientists, AIS Coordinators, Policy Makers, Public</b></p>	Yes	Yes
<p><b>The Educator Hub</b> was developed by GLANSIS went live in October 2022 designed as a portal specifically for teachers to pull from to enhance their lesson plans and resource list. This early form of the educator hub is the first release with more resources to come in 2023 and onward.</p> <p>(<a href="https://www.glerl.noaa.gov/glansis/educatorHub.html">https://www.glerl.noaa.gov/glansis/educatorHub.html</a>)</p> <p><b>End Users: Educators and Students</b></p>	Yes	No
Total	3	2

## Environmental Literacy Products

Products developed by Sea Grant staff that are used to advance environmental literacy and workforce literacy.

Name of Product	Developed (Yes/No)	Used (Yes/No)
<b>The Fish Notes Newsletter (Spring 2022 edition):</b> This newsletter produced by Michigan Sea Grant's Extension educator Dan O'Keefe targets anglers and other individuals interested in fisheries. The goal of the newsletter is to increase industry knowledge of sustainability practices. <b>Newsletters are sent out via email to 1600 subscribers</b> and are also posted on the MISG website. End users: newsletter subscribers, including resource management professionals, anglers, and the public	Yes	No
<b>Michigan Sea Grant Extension News Articles:</b> these article are created by the Michigan Sea Grant Extension educators. They released 29 articles during 2022 covering topics related to science, Sea Grant programming, and environmental literacy. Many of the articles link to informational videos and provide information on how to attend various outreach programs and participate in ongoing data collection efforts with MISG Extension educators. These articles were shared on the MSU Extension and MISG websites. End users: Media, the public, educators, students. <b>Several articles were read by media reporters and led to them contacting the Extension educator for more information, or to write their own story using quotes from the educator.</b>	Yes	Yes
<p><b>Email course:</b> In 2022 Michigan Sea Grant's Extension educator Tyler Augst launched a new self-paced learning experience called the Great Lakes Coastal Planning &amp; Zoning Email Course. This experience was developed in response to research showing gaps in planning and zoning for Great Lakes shorelines at the local level and land use decision makers' preference for on demand self paced learning opportunities. Five lessons are emailed inbox to the participant over five weeks. This course is meant as an introduction to coastal planning and zoning topics of interest. Each lesson provides some general information with plenty of links to more content to explore on the follow topics:</p> <p>Lesson 1: Introduction to course &amp; Coastal Processes of the Great Lakes  Lesson 2: Legal Framework for Shoreline Planning and Zoning  Lesson 3: Planning for Shorelines  Lesson 4: Zoning Tools for Coastal Communities  Lesson 5: Continuing Your Learning</p> <p><b>In 2022, 163 individuals registered for the email course across 50 counties in the state.</b> The class was written, organized and produced in 2021 with a public launch in January 2022. In a survey, one participant commented: "This course is a one stop resource for everything related to planning any activity around the Great Lake." Also 92% of survey respondents strongly agreed or agree that they had increased their knowledge about Great Lakes coastal planning and zoning, and 100% agreed or strongly agreed that as a result of the course they are aware of resources available on the topic to assist in planning and zoning.</p> <p>End users: Community and city planners, zoning officials, elected and appointed officials, coastal community residents, and the public.</p>	No	Yes

<p><b>Five fact sheets</b> for the Great Lakes Coastal Planning and Zoning email course. Downloadable fact sheets were developed by Michigan Sea Grant Extension educator Tyler Augst and the communications team for each of the five lessons in the course. The information is available online but the fact sheet is meant to be downloaded for further sharing by participants. <b>End users:</b> Community and city planners, zoning officials, elected and appointed officials, coastal community residents, and the public.</p>	Yes	No
<p><b>Online course for MI Paddle Stewards.</b> MI Paddle Stewards, which was previously held as an in-person event, was developed as an online self-paced course to continue training and certifying paddlers in methods for detecting, reporting, and preventing spread of aquatic invasive species. This program and its online course were designed by an MISG extension educator with assistance from the MISG communications team and in consultation with state invasive species professionals and Water Trail Managers. It consists of 5 units including MI Watch List species overview, Michigan Clean Boats, Clean Waters, proper cleaning methods for your craft, how to report an invasive species using the MISIN app, and additional resources. <b>In 2022, 48 people completed the course.</b> One participant provided great feedback about the course and was extremely interested in spreading the word. This individual is planning on educating others in her county and sharing education materials she received through the course. She wrote: "I just wanted to send a quick email and tell you that I absolutely loved taking the MI Paddle Stewards course! It was so well set up, and the perfect length. I've already shared information with several community members downstate, as well as shared the class with my community here in Ogemaw County. I really look forward to receiving a toolkit and starting to educate other paddlers! I am working on recruiting my husband and my mom to take the course as well, they both spend a lot of time on the water too "</p> <p>End users: Public, paddle-sport enthusiasts</p>	No	Yes
<p>Shore to Shore Birding Trail a 5-year project, was completed in spring of 2022. It had a soft launch in the spring, with additional promotions in the fall. <b>Promotions in the fall were picked up by news outlets and recognized MI Sea Grant for their efforts in supporting this trail. Extension educator Elliot Nelson hosted the initial visioning and planning meetings for this effort in 2021.</b> In addition he wrote a large portion of the interpretive material on the website. He also connected the MI DNR and LCMS Conservation District to web developers and print map developers. He also helped to acquire permission to put up the signs designating the trail. End users: Anyone using the trail</p> <p><b>Background on the program from the website (<a href="http://shoretoshorebirdingtrail.org/">http://shoretoshorebirdingtrail.org/</a>):</b></p> <p>The Shore to Shore Birding Trail was created by a team of local natural resource organizations recognizing the need for additional birding opportunities related to birding hot spots in the Eastern Upper Peninsula. Initial planning efforts began in 2017 when local DNR Wildlife Division staff attended the Michigan Birding Trail Network Workshop in Traverse City, Michigan, hosted by the Michigan Audubon Society in partnership with Michigan Sea Grant and Michigan State University Extension. Brainstorming continued at a local level until early 2019 when trail planning efforts picked up with multiple partners joining in on the effort of identifying locations, suitable habitats, writing interpretive information, designing signs, maps, and brochures, and gathering resources for each stop along the trail. From initial idea to grand-opening event, the Shore to Shore Birding Trail was made possible from 5 years of planning and dedication of natural resource enthusiasts and local organizations.</p> <p>Funding for this project came from the Michigan DNR and from the USDA Forest Service - Hiawatha National Forest Secure Rural Area Schools Self Determination Act of 2000 (RAC) grant</p>	Yes	Yes

secured by the Chippewa Luce Mackinac Conservation District, as well as many hours of volunteer time donated by project partners. This funding supported a full feature website, printed trail map, educational panels along the trail, roadside signage and a kickoff event to celebrate the grand opening of the trail in 2022. <b>End users:</b> General public, or anyone stopping at the location		
<b>360 video of trout farm:</b> MISG Extension educator Lauren Jescovitch created a 360 video and presented it in May 2022 during the Great Lakes Aquaculture Collaborations "Finding Fish For Food or Fun" webinar - <b>55 attended the webinar.</b> The full webinar is also posted online for additional viewing. Full webinar - <a href="https://www.youtube.com/watch?v=zv9zzm7_4xo">https://www.youtube.com/watch?v=zv9zzm7_4xo</a> Lauren's video: <a href="https://drive.google.com/file/d/13h9r3mdi7M8eIQh8lcpp_52bG79R6inP/view?usp=share_link">https://drive.google.com/file/d/13h9r3mdi7M8eIQh8lcpp_52bG79R6inP/view?usp=share_link</a> <b>End users:</b> Webinar participants, general public	Yes	No
<b>Recording of webinar presentation on Spring Migration.</b> After in-person event given by MISG Extension educator Elliot Nelson, the recording was placed online at the Lyon Township Library. Elliot Nelson, shared facts, photos and more about Michigan's spring bird migration. <b>End users:</b> Webinar participants, general public	Yes	No
<b>The fact sheet: PFAS in Fish</b> fact sheet was created under the direction of Extension educator Lauren Jescovitch to help educate the public on where to get more information about PFAS in Michigan-caught fish. She provided the handouts to commercial fishers who planned to use them to hand out to their retail customers. <b>End users:</b> Commercial/retail fishers, general public.	Yes	No
Great Lakes Literacy education exploration (GLLee) opportunities developed on a Google Classroom site, offer introductory professional learning (with educator contact hours) for formal and nonformal educators hoping to get their feet wet with Great Lakes Literacy while engaging youth in Great Lakes learning experiences and stewardship opportunities. MISG Extension educator Meaghan Gass was instrumental in learning the Google Classroom software and developing a way for several Great Lakes Sea Grant educators to contribute to the curriculums. GLLee Topics include: <b>Coastal Erosion (Best suited for students in grades 6-12)</b> What? Coastal erosion is the process by which strong wave action and coastal flooding wear down or carry away rocks, soils, and sands along the coast. Driving Question? How does coastal erosion shape the shorelines of the Great Lakes and impact our ecosystems and communities? <b>Total graduates reported: 2</b>  <b>Marine Debris (Best suited for students in grades 4-12)</b> What? Marine debris is any human-made material that can end up – on purpose or by accident – in our rivers, ocean, and Great Lakes. Driving Question? How does marine debris impact our Great Lakes and animals (including humans) and plants that depend on this freshwater resource? <b>Total graduates reported: 20</b>  <b>Vernal Pools (Best suited for students in grades 6-12)</b> What? Vernal pools are “wicked big puddles” and ecologically serve as the “coral reefs of our northern forest ecosystems.” Driving Question? How do vernal pools (seasonal woodland wetlands) benefit the Great Lakes region? <b>Total graduates reported: 17</b>	Yes	Yes

<p>Upon finishing the Google Classroom assignments, educators complete a course evaluation. After completing the evaluation, the participant receives a contact hour certificate (3 hours) along with a fully navigable resource with all of the linked activities for the topic. The evaluation serves as a trigger to automatically send the certificate to each participant.</p> <p><b>End Users:</b> Elementary and secondary educators</p>		
<p>Chiara Zuccarino-Crowe created <b>GLSGN by-the-numbers one pager</b>, entitled: “<b>Great Lakes Sea Grant Network, a Smart Investment Across the Region</b>” in collaboration with MISG Comms Team for use at regional outreach events. First handed out at the Sea Grant booth at the Joint Aquatic Sciences Meeting (JASM) in Grand Rapids - 5/15/22 - 5/20/22pdf located on G-drive: <a href="https://drive.google.com/drive/u/0/folders/1KfqC1m8pJ1GesAteQ31tIAGq9ygGG03w">https://drive.google.com/drive/u/0/folders/1KfqC1m8pJ1GesAteQ31tIAGq9ygGG03w</a></p> <p><b>End Users:</b> Policy Makers, Educators, General Public</p>	Yes	No
<p><b>The GLANSIS Data Dictionary</b> includes descriptions and information for the products, tools, and data that GLANSIS serves. The primary purpose of the data dictionary is to make GLANSIS language and processes more transparent, providing clarity to individuals seeking information on metadata and explanations of the criteria used with detailed visual and text.</p> <p><b>End Users:</b> Researchers, Educators, Students, Resource Managers</p>	Yes	Yes
<p>The five-part <b>short video series, Managing Great Lakes Invaders</b>, was developed by Michigan Sea Grant and the Great Lakes Aquatic Nonindigenous Species Information System (GLANSIS). This series explains how invasive species have entered the Great Lake water system and highlight success stories of ongoing management efforts that aim to protect and restore the Great Lakes. These videos were developed with the goal of providing engaging video content to educators and students to increase awareness and understanding of effects invasive aquatic species. These videos are publicly available on YouTube.</p> <p><b>End Users:</b> Educators, Students, General Public</p>	Yes	Yes
<p>Michigan Sea Grant Communications team created six digital editions of Upwellings. Michigan Sea Grant distributed this via email lists (around 2,500 subscribers, over 40% open rate) and posting on social media and the MISG website. Content included informative articles written by MISG staff, posts written by MISG-supported student fellows and interns about their funded work, notices about funding opportunities, resources for educators, announcements about upcoming public programs, and more.</p> <p><b>End users:</b> General Public, Researchers, Educators</p>	Yes	No
<b>Total</b>	<b>12</b>	<b>7</b>



# Program Metrics

The Metrics page is used to report Michigan Sea Grant metrics data.

These data are used to explain the scope and work of the National Sea Grant College Program.

**Annual Report Year:** February 1, 2020 - January 31, 2021

Sea Grant Staffing	Number of Individuals	Number of FTE's	Number of FTE's
		(Funded by Federal Sea Grant \$)	(Funded by Match and Non-Sea Grant \$)
Administrative	5	2.60	0.65
Communications	4	3.60	0.10
Extension	14	5.82	8.18
Education	0	0	0
Research	28	9.78	1.96
Individuals Staffing the Program in All Areas	51		

Core Funding (not NSI's)	Number of Proposals	Number of Institutions Involved	Number from Home Institution
Pre-proposals Submitted	13	5	5
Full Proposals Submitted	12	4	4
Proposals Funded	11	4	4

	Number
Volunteer Hours	875

	Number of New Students	Number of Continuing Students	Number of Degrees Awarded
Sea Grant-Supported Undergraduate Students	10	0	0
Sea Grant-Supported MS/MA Graduate Students	2	1	1
Sea Grant-Supported PhD Graduate Students	1	1	1
Other Sea Grant-Supported Professional Degree Graduate Students	0	0	0

	Number
<b>Number of P-12 Students Reached through Sea Grant-Trained Educators or Directly through Sea Grant Education Programs</b>	4,691
<b>Number of P-12 Educators Who Participated in Sea Grant Education Programs</b>	217
<b>SG-Sponsored/Organized Events</b>	50
<b>Attendees in SG Meetings/Workshops</b>	4399
<b>Public or Professional Presentations</b>	42
<b>Attendees at Public or Professional Presentations</b>	1,657
<b>Clean Marina Program Certifications</b>	27
<b>HACCP Certifications</b>	20

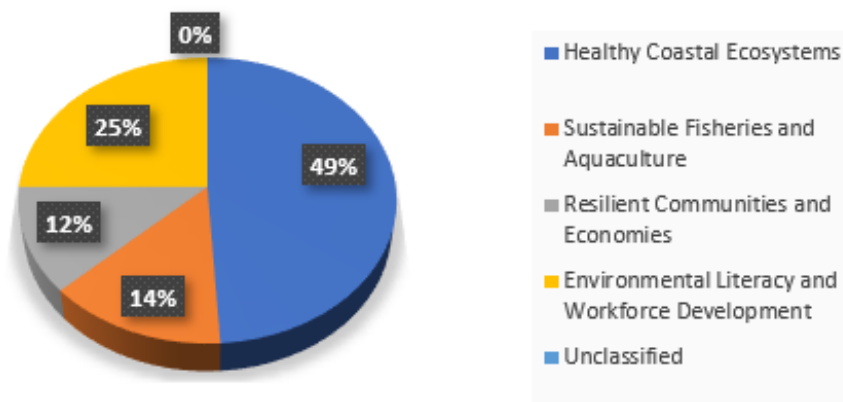
## Leveraged Funding

Influenced by Michigan Sea Grant			
Title	Leveraged Amount	Fund Start Date	Fund End Date
Clean Vessel Act - Boating Pumpout Grants Program (MDNR, C/CC-25)	\$92,010	10/1/2022	9/30/2025
Tools and Tactics for Sustainable Small Harbors – Phase II - EGLE (Michigan Department of Environment, Great Lakes, and Energy (EGLE), Pending addition of associated project: R/CCD-44.)	\$50,000	8/1/2022	1/31/2024
Advancing Great Lakes Aquaculture Collaborative (Minnesota Sea Grant, A/AS-28)	\$17,000	9/1/22	8/31/24
CARES Act II (Consortium for Ocean Leadership, A/AS-28)	\$543,840	8/4/2022	8/21/2023
Strengthening Coastal Communities Resilience in the Great Lakes Region (MDNR, C/CC-19)	\$260,851	5/1/2022	6/30/2024
RG-2202-11515 - DOWNRIVER LINKED GREENWAY (Ralph C. Wilson, Jr., A/AS-28)	\$2,031,300	6/1/2022	6/1/2025
<b>Total</b>	<b>\$2,995,001</b>		

## Estimated Level of Effort by Focus Area

National Focus Area Name	SG Federal	Match	Pass Through	Federal + Match + Pass Through	LOE without Leverage (%)	Leveraged (Managed)	LOE with Leverage (%)
Healthy Coastal Ecosystems	\$843,813	\$522,882	\$0	\$1,366,695	51%	\$17,000	49%
Sustainable Fisheries and Aquaculture	\$258,391	\$140,458	\$0	\$398,849	15%	\$0	14%
Resilient Communities and Economies	\$254,022	\$86,323	\$0	\$340,345	13%	\$0	12%
Environmental Literacy and Workforce Development	\$466,967	\$96,631	\$0	\$563,598	21%	\$142,010	25%
Unclassified	\$0	\$0	\$0	\$0	0%	\$0	0%
<b>Total</b>	<b>\$1,823,193</b>	<b>\$846,294</b>	<b>\$0</b>	<b>\$2,669,487</b>	<b>100 %</b>	<b>\$159,010</b>	<b>100 %</b>

## Estimated Level of Effort by Focus Area



## Distribution of Effort across Focus Areas by Project

Project Title	Program Project ID	Federal + Match + Pass Through	Leveraged (Managed)	% HCE	% SFA	% ELWD	% RCE
FY 2020 COVID-19 Related Rapid Response for Fish Producers and Charter Fishing Industries (MISG Extension)	A/AS-27	\$30,003		100%	0%	0%	0%
MISG Extension administration, fiscal, communications, and other activities along outreach or engagement continuum, partnership development, technical assistance, workforce development, or research engagement.	A/AS-28	\$427,515	\$17,000	100%	0%	0%	0%
Engaging Communities in Biodiversity Conservation	A/AS-28-A	\$8,351		100%	0%	0%	0%
Aquatic Invasive Species Educational Initiatives	A/AS-28-B	\$ 29,624		100%	0%	0%	0%
Habitat Restoration Initiatives	A/AS-28-C	\$33,362		100%	0%	0%	0%
Michigan Sea Grant Extension Regional Fisheries Workshops	A/AS-28-D	\$56,986		0%	100%	0%	0%
Citizen Science for Great Lakes Anglers	A/AS-28-E	\$70,474		0%	100%	0%	0%
Planning for the Future of Great Lakes Fisheries	A/AS-28-F	\$70,716		0%	100%	0%	0%
Exploring and Expanding Michigan's Aquaculture Industry	A/AS-28-G	\$13,909		0%	100%	0%	0%
Seafood HACCP	A/AS-28-H	\$23,405		0%	100%	0%	0%
Coastal Recreation and Tourism	A/AS-28-I	\$58,789		0%	0%	0%	100%
Coastwatch	A/AS-28-J	\$2,847		0%	0%	0%	100%
Coastal Zone Development, Use, and Planning	A/AS-28-K	\$57,301		0%	0%	0%	100%
Water Infrastructure	A/AS-28-L	\$28,180		0%	0%	0%	100%
Natural and Anthropogenic Hazards	A/AS-28-M	\$20,435		0%	0%	0%	100%
Place-based education	A/AS-28-N	\$24,401		0%	0%	100%	0%
Classroom and Shipboard Education Connections	A/AS-28-O	\$23,242		0%	0%	100%	0%
Camps and Community Youth Programs	A/AS-28-P	\$27,248		0 %	0 %	100 %	0 %
Sustained Professional Learning Opportunities for Youth Educators	A/AS-28-Q	\$13,867		0 %	0 %	100 %	0 %
Community Education	A/AS-28-R	\$16,344		0 %	0 %	100 %	0 %
Educational Resources Development	A/AS-28-S	\$36,187		0 %	0 %	100 %	0 %

Workforce Development	A/AS-28-T	\$26,276		0%	0%	100%	0%
FY 2020 COVID-19 Related Rapid Response for Fish Producers and Charter Fishing Industries (MISG Communication)	C/CC-22	\$3,705		100%	0%	0%	0%
Omnibus FY 2022-2023: Communications	C/CC-25	\$262,033	\$92,010	0%	0%	100%	0%
Knauss Fellowship McCarthy_Riley	E/McCarthy_Riley	\$66,500		0%	0%	100%	0%
Omnibus FY 2022-2023: Program Development	M/PD-71	\$15,000		100%	0%	0%	0%
Omnibus FY 2022-2023: UM Administration	M/PM-69	\$384,369		100%	0%	0%	0%
Omnibus FY 2022-2023: MSU Administration	M/PM-70	\$46,509		100%	0%	0%	0%
A Novel Method for Quantifying Dreissenid Veliger Contributions to Lake Huron Zooplankton Communities	R/CGLH-14	\$149,577		100%	0%	0%	0%
An experimental test of conspecific attraction as a tool for influencing breeding habitat selection by migrating rails	R/CGLH-15	\$56,248		100%	0%	0%	0%
Direct impacts of invasive on the freshwater microbiome	R/CGLH-16	\$56,737		100%	0%	0%	0%
Intraspecific Variation: Sources and Implications for Fishes in a Changing Environment	R/CGLH-17	\$61,209		0%	100%	0%	0%
Development of a probabilistic compound flood hazard assessment tool and evaluation of countermeasures for economically challenged Great Lakes cities	R/CNH-10	\$66,558		0%	0%	0%	100%
MISG Environmental Internship Program	R/ERA-30	\$67,500		0%	0%	100%	0%
Sources of Walleye Recruitment and Natural Reproduction in Saginaw Bay	R/NCF-6	\$102,150		0%	100%	0%	0%
Omics-informed mapping of Microcystis predation defense trade-offs to improve GL harmful algal bloom models	R/WQ-12	\$125,695		100%	0%	0%	0%
A Participatory Modeling Approach to Collaborative Water Governance in Michigan	R/WQ-13	\$106,235		0%	0%	0%	100%
Tools and Tactics for Sustainable Small Harbors – Phase II - EGL	N/A	\$50,000		0%	0%	100%	0%