



Michigan Sea Grant 2021 Request for Proposals

Michigan Sea Grant College Program (MISG) is inviting proposals for innovative research projects and graduate research fellowships for the 2022–2024 funding period that begins on February 1, 2022. All MISG research project funds are awarded via a highly competitive process involving external peer review and external advisory panel recommendations.

MISG will support three types of research during this funding cycle:

- I. [Integrated Assessment \(IA\) Research Projects](#) — Research that uses Integrated Assessment methods to address important social and ecological issues affecting the Great Lakes. Funding up to \$75,000 per year. MISG has identified a set of priority topics listed [below](#).
- II. [Core Research Projects](#) — Basic core research on issues currently affecting the Great Lakes ecosystem. Funding up to \$100,000 per year. MISG has identified a set of priority topics listed below.
- III. [Michigan Sea Grant Graduate Student Research Fellowships](#) — Graduate student (M.S. or Ph.D.) research fellowships for one or two years. Funding up to \$50,000 total per fellowship.

General Information for Integrated Assessment and Core Research Proposals

Eligibility

Qualified researchers at universities and colleges, including tribal colleges, located in Michigan are eligible to be Principal Investigators on MISG-funded projects. However, project team members are not limited to researchers at these organizations. Note that PIs are required to submit a pre-proposal to be eligible to submit a full proposal. Pre-proposals not received by the deadline will not be considered. Investigators must submit their pre-proposals through [Michigan Sea Grant's RFP webpage](#), where the pre-proposal can be uploaded as a PDF. Investigators must submit a pre-proposal by the deadline in order to submit a full proposal. Projects approved for funding will run from February 1, 2022, through January 31, 2024. MISG encourages eligible applicants of all races, ethnicities, national origins, gender identities, ages, and academic status to apply.

Non-federal Match

All proposals require a 50% non-federal match. Principal Investigators are not required to document the source of the project match until submitting a full proposal.

Questions

Questions related to integrated assessment and core research pre-proposals and full proposals for this RFP, whether technical or content-related, should be submitted to the Michigan Sea Grant Research Program (MSG-RFPinfo@umich.edu) by the respective deadlines listed below. Responses to questions will be posted on the [Michigan Sea Grant RFP webpage](#).

Deadlines:

- **IA and core research pre-proposals are due by 5 p.m. (EST) March 15, 2021.**
 - Questions about research RFP pre-proposals are due by 5 p.m. (EST) February 15, 2021.
 - Responses will be posted by February 19, 2021.



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- Investigators encouraged to submit a full proposal for IA projects or core research projects will be notified no later than April 19, 2021.
- Guidelines for full proposals will be posted on the [Michigan Sea Grant RFP webpage](#) on March 24, 2021.
- **Full research proposals are due by 5 p.m. (EST) May 24, 2021.**
 - Questions about research RFP full proposals are due by 5 p.m. (EST) May 3, 2021.
 - Responses will be posted by May 8, 2021.
- **Notification of final proposal funding decisions occurs in early September 2021.**
- **Funding for new projects begins February 1, 2022, pending federal appropriations.**

See [below](#) for further details about Integrated Assessment proposals.

See [below](#) for further details about core research proposals.

General Information for Graduate Fellowship

Eligibility

Graduate fellowships will support a graduate student at an accredited Michigan university with support of a faculty member from that institution. Students must be enrolled in or admitted to a full-time graduate or professional degree program at an accredited Michigan academic institution. Students may be working toward a degree in any discipline related to Great Lakes coastal or ecosystem issues.

Non-federal Match

All proposals require a 50% non-federal match. Principal Investigators are not required to document the source of the project match until submitting a full proposal. Fellowship match may be identified through the fellow's home institution with assistance of the advising faculty, or by match from cooperating agencies or partners involved in the project.

Questions

Questions related to the Graduate Fellowship should be submitted to the Michigan Sea Grant Research Program (MSG-RFPinfo@umich.edu) by the deadline listed below. Responses will be posted on the [Michigan Sea Grant RFP webpage](#).

Deadlines:

- **Graduate Research Fellowship proposals are due by 5 p.m. (EST) May 24, 2021.**
 - Questions about the Graduate Research Fellowships are due May 3, 2021.
 - Responses will be posted by May 8, 2021.
- **Notification of final proposal funding decisions occurs in early September 2021.**
- **Funding for new projects begins Feb. 1, 2022, pending federal appropriations.**

See [below](#) for further details about Graduate Research Fellowship proposals.



I. Integrated Assessment Research RFP

Michigan Sea Grant (MISG) will support Integrated Assessment (IA) research projects that tackle important ecological and socioeconomic Great Lakes issues and that inform planning, policy, and natural resource management. Integrated Assessment researchers conduct a comprehensive analysis of relevant natural and social scientific information, working closely with stakeholders and MISG Extension educators. IA projects will often place an emphasis on identifying and engaging with key community stakeholders throughout their research, as this collaboration helps ensure the outputs and recommendations are usable and appropriate. Ultimately, the purpose of the assessment is to develop information, tools, and partnerships that will help decision makers better address the focal issue. Past IA projects have focused on issues such as barriers to green infrastructure implementation; updating decision analysis to inform Salmonine management; and synthesizing *Anishinaabe-gikendaasowin* (knowledge) within the Keweenaw Bay Indian Community to enhance stewardship and governance partnerships. IA topics identified for the 2021 RFP reflect challenging issues identified by the MISG Advisory Board, state and federal agencies, and local communities as follows:

- 1) Aquaculture feasibility for multiple systems
- 2) Valuation of Lake Huron's fishery
- 3) Nature-based tools for coastal resilience
- 4) Water use governance (collaborative research with EGLE Office of Great Lakes)
- 5) Economic impacts of aquatic invasive species
- 6) Ecotourism innovations in northeast Michigan
- 7) Environmental literacy programming in urban areas

These topics are further outlined under [2021 Integrated Assessment Research Topics](#) below. See [above](#) for details about eligibility, match, submission instructions, and deadlines. MISG encourages proposals that 1) recruit and engage with students and staff from underrepresented racial and ethnic groups, individuals with disabilities, or educational or economically disadvantaged backgrounds; and 2) proposals that benefit underserved communities in Michigan's coastal regions. See [Tips for a Successful IA](#) for the key elements of Integrated Assessments that will help projects be more competitive under this RFP.

Application Submission Information

Pre-proposal Requirements: Integrated Assessment Projects

1) **Title Page that includes:**

- a) Project title
- b) Principal Investigator
- c) Title and position(s)
- d) Institution
- e) Postal mailing address
- f) E-mail address
- g) Telephone number(s)
- h) Co-investigators and institutions

2) **Project Narrative:** Use standard formatting: 8.5 x 11-inch paper, 1-inch margins, and at least 11-point Times New Roman font; not to exceed 4 pages. Include the following sections:

- **Problem/Issue Statement:** 1-2 paragraphs.

- **Background:** Provide a brief description of the IA topic to be addressed, demonstrating awareness of the main issues and identifying potential stakeholders. This should include:
 - Origin of the issue
 - Why the issue is a complicated, challenging problem
 - How does the project engage with underserved communities
 - Who is or should be involved
 - Brief project objectives as they would appear in a full proposal
- **Project Approach:** Provide an overview of how you intend to develop the project, so reviewers can determine appropriateness of the approach for achieving the stated objectives. It is not necessary to explain analytic methods in detail.
- **Characterize the Solution Possibilities:** Address the potential options that could be considered, such as management actions, education, outreach programs, legislation, regulations, or other initiatives.
- **Project Team and Collaborators:** Identify the project team and individual responsibilities. Identify steps taken to recruit a diverse team including students, staff, and Co-PIs from underrepresented racial and ethnic groups, individuals with disabilities, or from disadvantaged backgrounds. Also, provide names and affiliations of all persons and institutions you intend to recruit as collaborators. Note that it is not necessary at this time to contact or secure a commitment from these individuals and organizations.
- **Data and Data Sets:** Funds for Integrated Assessments should primarily support analysis and communication of existing data, rather than collection of new field data. Stakeholder surveys, focus groups, observations, and interviews are permitted if used to support the goals of the Integrated Assessment process. Please identify any existing data sets you plan to use, their owners, and how you intend to access the data. You may also indicate your knowledge of closely related projects, briefly identifying those projects and their PIs. If you will generate new data, you will be required by NOAA regulations to submit a data management plan as part of your final proposal. The MISG data management plan can be found [here](#).

3) **Estimated Budget:** Total amount requested should include all direct and indirect costs, such as fringe benefits, student assistantships, etc. However, at this stage, a detailed budget is not required. Contact your University Research Program Office for fringe benefit and indirect cost rates. Non-federal matching funds should be 50% of requested amount, at least \$1 non-federal for every \$2 federal requested: i.e., if the PI requests \$80,000 in a year, they must provide at least \$40,000 in match for a total of \$120,000 put toward the project in the first year. However, Principal Investigators are not required to document the source of the project match until submitting a full proposal.

4) **Project Team Member Bio-sketches:** Please submit a two-page bio-sketch per project team member. These pages do not count toward the page limit. Include relevant project experience and up to five publications.

Pre-proposal Evaluation: Integrated Assessment Projects

Experts familiar with the technical and/or policy context of the focal issue will review and score pre-proposals. The goal is to identify one pre-proposal per topic that reflects the best understanding of the issue and has the most potential to affect policy and management. Pre-proposal reviewers typically



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include state or local government personnel and scholars, with input from one Sea Grant specialist familiar with the topic.

Pre-proposals are reviewed based on the following four criteria:

- a) **Understanding of Context and Underlying Issues:** Does the pre-proposal identify underlying issues? Does the pre-proposal provide the appropriate setting for those issues?
- b) **Project Approach:** Is the pre-proposal in line with the goals of an Integrated Assessment, and is it likely to have a long-term affect (e.g., policy or management change)?
- c) **Preliminary Identification of Relevant Data Sources:** Does the pre-proposal identify how data will be accessed? Does it reflect an effort to contact others working on this issue and identify team members or collaborators who bring data or data access to the team?
- d) **Competency of Proposing Team:** Does the team have members who can carry out each element of the assessment? Have team members conducted similar work in the past? Is the team diverse including students, staff, and Co-PIs from underrepresented racial and ethnic groups, individuals with disabilities, or from disadvantaged backgrounds? Teams are not required to have experience with Integrated Assessments. However, teams must indicate their ability to assess status and trends and to identify causes and consequences of the issue.

After reviewing the pre-proposals, MISG typically encourages one team per topic to develop a full proposal to maintain a diverse and relevant research portfolio. This allows policy contacts and MISG staff familiar with the focal issue to work with a single research team as the full proposal is developed. Those encouraged to submit a full proposal are given a brief, anonymous summary of all feedback provided by reviewers and any additional recommendations from MISG staff. Note that all pre-proposal applicants are eligible to submit to the full proposal process and will receive full proposal application guidelines. **PIs must submit a pre-proposal to be eligible to submit a full proposal.**

2021 Integrated Assessment Research Topics

Several topics have been identified as high priority for IA projects. These topics align with focus areas of the [MISG 2018-2023 Strategic Plan](#). The specific research priorities identified as 2021 Integrated Assessment topics were developed in partnership with federal, state, and local government agencies, tribal representatives, and the MISG Advisory Committee, Management Team, and Extension educators. Each topic identifies a MISG Extension education staff and a policy contact; consultation with these contacts is not required at the pre-proposal stage but will be encouraged as teams develop full proposals. Research investigators are also invited to develop their own unique Integrated Assessment research proposal that fits within one of the 2018-2023 Strategic Plan Focus Areas for consideration. Additional material on Integrated Assessments, including a guide and example projects, can be found at the [Michigan Sea Grant website](#). The suggested focus area topics are summarized below.

Focus Area: Sustainable Fisheries and Aquaculture

Aquaculture

Policy contacts: Ed Eisch, MDNR; Steve Hussey, MI Department of Agriculture and Rural Development
MISG Extension contact: Lauren Jescovitch, Elliot Nelson

MISG is interested in funding research focused on barriers and benefits for aquaculture in Michigan. A range of technical, social, and economic issues present challenges to aquaculture operations, including the

application of new technologies, financing, real and perceived potential to negatively affect receiving waters, marketing, fish health issues, and connections with processors and distributors. A variety of aquaculture systems, products, and business models are being used throughout the region that could be applicable for development in Michigan. An Integrated Assessment would address the feasibility and barriers and identify a range of policy and management actions that would support an ecologically safe, efficient, and vibrant aquaculture industry in the state. MISG has identified three possible aquaculture industries as promising for further research in Michigan:

- Recirculating aquaculture has made substantive advances recently, especially in European countries. This land-based approach for aquaculture production has the potential to minimize discharge from the facility and reduce the possibility of disease or fish escaping from the facility; it requires, however, investment in technology, marketing, and an educated workforce. An Integrated Assessment would address questions about financial feasibility, technological challenges, and processing and transportation barriers, and could address policy and management practices that would be needed to support a recirculating aquaculture industry.
- Similarly, an assessment of the feasibility of aquaculture to support sustainable whitefish (also cisco and herring) production to market size could address baseline issues such as creating brood stock and survivability, marketing, and economic viability. Current whitefish aquaculture is mostly used for re-stocking, but the aquaculture industry, including Michigan tribal industries, would support more research into using whitefish aquaculture to produce food, especially for selling fresh fish in off-seasons.
- Further research is also needed to address the possible use of aquaculture to raise mussels, especially state-designated Endangered, Threatened, and Special Concern mussels, to restock restored and depleted habitats. Some work has been conducted by the Michigan Natural Features Inventory and Bay Mills tribe in the Detroit River, but research is needed into innovative approaches to rearing and growing mussels that could contribute to habitat restoration projects in Michigan rivers, lakes, and coastal areas by providing characteristic mussel fauna assemblages to enhance biodiversity in Michigan's aquatic ecosystems.

Fisheries

Policy contact: Randy Claramunt, MDNR

MISG Extension contact: Dan O'Keefe, Brandon Schroeder

What is the economic, social, and ecological value of Michigan's changing Lake Huron fishery? An interdisciplinary team of economists, and natural resource and social scientists is needed to assess the value of Lake Huron's fishery including commercial, recreational, and aquaculture industries. This research would develop a standard methodology to assess and compare the relative social and economic affects of commercial, recreational, and aquaculture fishery resources. The outcome of this research could be used to support a diverse fishery industry and identify best practices for resource stewardship. A second component of this research could address conflict between fishery user groups in the context of ecosystem-wide shifts in food webs because of invasive species. These discussions might open new recreational and commercial opportunities because of a more diverse fish community and ensure that resources are not wasted. An Integrated Assessment in this topic area could help commercial and recreational fishers collaborate to better understand and adapt to existing and future changes in the Lake Huron fishery and enhance value of the fishery based on shared interests.

Focus Area: Resilient Communities and Economies



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Tools for community resiliency

Policy contact: Ronda Wuycheck, MDNR, EGLE

MISG Extension contact: Mary Bohling, Martha Gerig

What nature-based solutions for shoreline protection and stabilization can help communities increase their resiliency to flooding and changes in water levels? What innovative, smart planning tools and resources could be developed to support community-level decisions to increase resiliency and adaptive capacity in coastal communities? What social equity issues exist that should be part of any community resilience planning effort? Communities need tools to assess stability of existing structures and identify innovative approaches to protect structures and natural resources such as beaches, coastal wetlands, and bluffs or dunes. This research could include both assessment and monitoring of coastal infrastructure and natural resources and visualization of different resiliency practices that could be applied across different regions and land uses of the state. Some innovative ideas include use of dredged materials to create natural barriers to slow waves and erosion or developing dynamic zoning plans to adapt to varying Great Lakes water levels. These innovative practices will help communities address issues of shoreline erosion and recession, loss of beaches, and affects on coastal infrastructure including harbors, marinas, and existing stabilization practices.

Water use governance

Policy contact: Emily Finnell, EGLE, OGL

MISG contact: Mark Breederland, Tyler Augst

Note: This topic was co-developed with Michigan's EGLE, and proposals that address both EGLE and MISG research objectives could be co-funded by EGLE and MISG for a project total of up to \$350,000. To be eligible for the additional EGLE funding (\$175,000), the PI would need to consult with EGLE about project design and include EGLE advisory oversight.

How can state agencies, institutions, and local and sovereign governments build capacity for water users to work collaboratively to identify and implement voluntary agreements to collectively reduce water use and accommodate new or expanded users? As part of Michigan's Water Use Program established under Part 327 Great Lakes Preservation of the Natural Resources and Environmental Protection Act, Water User Committees (WUC) can serve as a potential mechanism to create equitable solutions to water access and to prevent or resolve water use conflicts and adverse resource impacts (ARIs). WUCs are envisioned to be a collaborative, self-governed approach to resolve water use conflicts where the eventual outcome emulates what could be expected to transpire in civil litigation, but with the advantages of avoiding legal expenses and delays and potentially achieving a more desirable outcome for water users. Given the complexity of Michigan's water rights and laws, the state's water resources, and the potential for conflict, what information, tools, strategies, and resources are needed to build capacity for water users to develop realistic shared solutions to sustainably manage water use and ultimately build capacity for shared governance for water? This research would include the development of a WUC user manual and one or more case studies to convene WUCs with a small number of water users within a water management area. These committees would work collaboratively to identify and implement voluntary agreements to collectively reduce water use and accommodate new or expanded users. Tools and strategies developed for WUCs should be transferable and scalable in their application in terms of the number and diversity of water users within a water management area and complexity of water use scenarios. Case studies where established relationships and trust among users exist will be more likely to be successful. Potential case study scenarios include: 1) a WUC convened by either the water user(s) or by EGLE following a denial

by EGLE of a proposed new large withdrawal because of the likelihood of it causing an ARI; or 2) large-quantity water users come together to proactively manage local water resources and plan for future use.

Focus Area: Healthy Coastal Ecosystems

Economic impacts of aquatic invasive species

Policy contact: Ashley Elgin, NOAA-GLERL

MISG Extension contact: Rochelle Sturtevant

Aquatic invasive species (AIS) in the Great Lakes basin are one of the key causes of environmental change such as alterations of the food web, loss of keystone species, and shifting of the balance between pelagic and benthic production (benthification). AIS also affect coastal communities economically through altered fish populations or degraded beaches impacted by muck from benthification in the nearshore zones of the lower four lakes. Rigorous analysis is needed of the economic affects of AIS, both by individual species and in aggregate, at the scales of the Great Lakes basin and, specifically, in the coastal and open water areas of the Lake Huron-Michigan ecosystem. Identifying and quantifying the real costs of AIS will help to prioritize budgets for control and prevention. Defensible estimates of the economic impacts of AIS (individually and/or in aggregate) could also provide baseline information to measure how successful control programs are at lake or regional scales. A comprehensive analysis would incorporate both market (clogging of water intake pipes, reductions in commercial fisheries) and non-market (recreational fisheries, aesthetics, property values) valuations of AIS impact on ecosystem services.

Focus Area: Environmental Literacy and Workforce Development

Expanding ecotourism in northeast Michigan

Policy contact: Christine Witulski, Besser Museum of Northeast Michigan

MISG Extension contact: Brandon Schroeder

Web-based resources to enhance coastal tourism were developed as part of the 2010 North East Michigan Integrated Assessment (NEMIA), *Supporting Coastal Cultural & Eco-Tourism Businesses in Northeast MI Through the Development of Web-based Framework & Tools*. There is a need and opportunity to further enhance tourism resources in this region through multiple educational and interpretive tools that would contribute to economic development. Several ecotourism research opportunities have been identified in the northeast Michigan region including: 1) documenting, mapping, and interpreting ocean life zones and some of the Devonian fish species found in fossils within Rockport State Park and creating educational materials; 2) investigation of the underwater archeology resources found in Lake Huron and the Straits area recognizing the growing interest in geology and underwater archeology; and 3) enhancement of the regional fisheries heritage, an opportunity catalyzed by momentum of the fisheries heritage consortium in partnership with the National Park Service. This research could include collaboration with local, state, and federal partners such as the Besser Museum for Northeast Michigan, Michigan DNR, and the NOAA Thunder Bay Marine Sanctuary. This project could provide new and additional educational and interpretive materials that document the ancient and more recent history of the Great Lakes region as told through fossils, underwater archaeology, and fisheries heritage.

Environmental literacy programming in urban areas



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Policy contact: Mike Reed, Detroit Zoological Society

MISG Extension contact: Elliot Nelson, Meaghan Gass

What does environmental literacy look like when nature is perceived and valued differently, especially for underrepresented groups in Michigan? The COVID pandemic has changed people's interaction with the outdoors and nature. For example, young and non-male participation in fishing and hunting has increased, and the connection to the environment in urban communities may have changed as perceptions of natural areas shift from scary to safe (pers. comm. Randy Claramunt, Mike Reed). Have the science- and nature-based audiences become more diverse and why? Does connection to the environment in urban areas influence what children in these communities are interested in and may choose to study in school? The Great Lakes and humans in their watersheds are inextricably interconnected. How do connections to the natural spaces where youth live, learn, and play help them make informed and responsible decisions regarding the Great Lakes and their local environment? Does this change in connection to the environment influence how nature is valued? How do we continue to promote this reawakening of interest in our natural areas in a sustainable way while ensuring individuals feel engaged in the process? What does environmental literacy look like when nature and our education strategies are perceived differently?

Developing an Alternate Integrated Assessment

Research teams can propose an Integrated Assessment project for a topic not described in this RFP. When doing so, provide the following additional information:

- Explain why the issue is a wicked or challenging problem, how it relates to [Michigan Sea Grant's Strategic Plan](#), and why it is of interest to resource management agencies at the local, state, regional, tribal, or federal level.
- Demonstrate that the topic is amenable to analysis based on existing data and information.
- Secure a letter of support from a policy sponsor who has the authority to make or influence management decisions relative to the problem identified. It is not necessary for sponsors to provide funding for the project, but they should be willing to work with the process for two or more years beginning in winter 2022.



II. Core Research RFP

Michigan Sea Grant is accepting proposals for core research projects for the 2022-2024 funding cycle. The projects will run for two years, and the maximum annual research project budget is \$100,000 per year, for a total of \$200,000, including indirect costs. The proposal is also required to provide matching funds provided by the Principal Investigator of at least 50% of the amount requested from MISG. For example, if the PI requests \$100,000 in a year, then they must provide at least \$50,000 in match for a total of \$150,000 put toward the project in the first year. Matching funds must be from non-federal sources and may include faculty salaries, university overhead, equipment, ship time, etc. Lead scientists must have Principal Investigator standing at an accredited Michigan institution to be eligible for funding.

This is an open Request for Pre-Proposals (RFP), and university-based researchers are encouraged to submit research projects that fulfill critical research needs for the Great Lakes and coastal ecosystems — and that fit within the focus areas of the [Michigan Sea Grant Strategic Plan](#). MISG seeks to bring together innovative, diverse research teams from Michigan universities and, where possible, leverage active research programs conducted by federal and state agencies. MISG encourages proposals that recruit and engage with students and staff from underrepresented racial and ethnic groups, individuals with disabilities, or educational or economically disadvantaged background.

For the 2021 RFP, MISG is particularly interested in proposals that address the following:

Lake Huron Coordinated Science and Monitoring related research priorities

As part of the Coordinated Science and Monitoring Initiative (CSMI), MISG works with federal and state agencies to identify research gaps for understanding and managing the Lake Huron ecosystem. CSMI funded research is conducted on a five-year cycle with the next cycle of field and analytical research conducted in 2022–2023. MISG is interested in supporting research project(s) that addresses one or more of the CSMI research gaps identified for Lake Huron. Below are several possible research priorities identified as priorities by the Lake Huron Partner Working Group that would also be priorities for MISG funded research.

- Research is needed to improve understanding of specific drivers in the Lake Huron food web in the context of change because of the introduction of Dreissenid mussels and other invasive species. Changes in primary production, fish community, and food web structure have the potential to influence transfer efficiency across trophic levels and spatial scales. Research about nutrient partitioning and transfer up the food web would be of use to managers to be able to better understand and predict fish productivity.
- Lake Huron CSMI partners have also prioritized research in the Saginaw Bay Area of Concern (AOC) to address contradictory challenges of managing nutrients to address both eutrophication and beneficial use impairments in nearshore waters and the concern about limited primary production in offshore waters to support healthy fisheries. Research could address the following questions:
 - What are the current nutrient conditions of Saginaw Bay and what progress has been made to identify interim phosphorus loading target for the Bay?
 - Is the annual loading target of 440 metric tons of Total P still appropriate?
 - What restoration criteria are appropriate to address eutrophication-related impairments while supporting desired productivity?

- How important is primary production within Saginaw Bay to the open-lake pelagic ecosystem?

Other core research priorities

Detecting invasive microorganisms

In the Great Lakes region, microorganisms have dominated (80%) newly established invasive species of the last 20 years. These species are highly diverse and include viruses, bacteria, fish parasites, algae, free-living protozoans, and zooplankton. The vectors for introduction of these species are equally diverse and include ballast waters; hitchhikers with other organisms; deliberately and accidentally introduced fishes, aquarium, and pond plants; and others that are unknown. Yet microorganisms remain severely underestimated in regional watchlists—they compose just 14% of the GLANSIS watchlist and less than 1% of the regional AIS Risk Assessment Clearinghouse. What are the risks of aquatic invasive microorganisms to the Great Lakes? Metagenomics research is needed to better understand and assess the risks that various groups of microorganisms (and individual species) pose for introduction, establishment, and affects in the Great Lakes region, especially through ballast water, for introduction of these species.

The role of Dreissenid veligers in Lake Huron food webs

The well-documented ecological and economic impacts of *Dreissena* in the Great Lakes include substantial changes to water clarity, food-web structure, and nutrient and energy cycling, and greatly increased infrastructure maintenance costs. What is less well understood is the affect of *Dreissenid veligers* on Great Lakes food web structure and function. Hydrodynamic models for Lakes Erie and Michigan have shown currents to be capable of spreading planktonic life stages of other non-native aquatic species, including long-shore transport of suspended materials from rivers and estuaries, and could help to explain veliger distribution patterns. Research is needed that could help explain temporal and spatial distribution patterns for *Dreissenid veligers*. Research is also needed to help understand the role of veligers in the Great Lakes food web including their quality as a food source, identifying their main predators, and quantifying the proportion of veligers in zooplankton diets.

Trophic pathways in Great Lakes food webs

Pathways of energy flow within and between lower and upper trophic levels are poorly known (because of lack of sensitive methods); these knowledge gaps need to be filled to manage the changing Lake Michigan and Lake Huron fishery. Omics methods are highly sensitive, have high-throughput, and are cheaper than traditional sampling and microscopic identification. Hence, research priorities for application of omics methodology focus on a) investigating temporal and spatial changes in the multiple trophic levels within the zooplankton and size-specific plankton groups and linkages to the recent ecological shifts; and b) mapping unknown trophic pathways from microbes to crustacean zooplankton. The information generated will help to enhance food web models and improve annual recruitment predictions. Ultimately, this insight will help with forecasting and sustainability of important economic fisheries.

See [above](#) for details about eligibility, match, submission instructions, and deadlines.

Application Submission Information

Pre-proposal Requirements: Core Research Projects

1) Pre-proposal cover page including:

- a) Project title
- b) Principal Investigator
- c) Title and position(s)
- d) Institution
- e) Postal mailing address
- f) E-mail address
- g) Telephone number(s)
- h) Co-investigators and institutions

2) **Project Narrative:** Use standard formatting: 8.5 x 11-inch paper, 1-inch margins, and at least 11-point Times New Roman font; not to exceed 4 pages. Include the following sections:

- **Statement of Research Need:** Describe how your research is relevant to and will build upon previous and concurrent studies and how it advances the body of knowledge or addresses an important problem for Michigan's Great Lakes. Does the project benefit underserved communities in Michigan's coastal regions?
- **Project Goals and Objectives:** Clearly state the hypotheses and objectives of your research, or the focus and objectives of your assessment. Do not describe how you will conduct the research or assessment; rather, convey what you will attempt to accomplish in the project.
- **Research Methods:** Identify how you will go about achieving the objectives set forth above. Provide ample information about the starting point for new methods and indicate the experimental design and statistical models you expect to use to achieve your objectives.
- **Research Relevance:** Provide a summary of the relevance of the project to Michigan's Great Lakes and the [Michigan Sea Grant Strategic Plan](#) and include any other state, federal, or private organizations involved in this proposal, including level of participation and funding.
- **Data Management Plan:** NOAA regulations require a data management plan to make data available within two years of award completion. If you will generate new data, you will be required to submit a data management plan as part of your final proposal. The MISG data management plan can be found [here](#).

3) **Budget Justification and Total Match:** Sea Grant investigators must include a 50% non-federal contribution in the budget, showing a match of at least \$1 for every \$2 of federal support requested. For example, if the PI requests \$100,000 in a year, they must provide at least \$50,000 in match for a total of \$150,000 put toward the project in the first year. The total budget amount must be distributed nearly equally over the two years (i.e., no front loading). Principal Investigators are not required to document the source of the project match until submitting a full proposal.

4) **Curriculum Vitae:** Not to exceed two pages per investigator. These pages do not count toward the page limit. Include relevant project experience and publications.

5) **References:** Include only those cited in the body of the proposal.

Pre-proposal Evaluation: Core Research Projects

Each pre-proposal will be reviewed by academic experts and their evaluations provided to the MISG Management Team. Principal Investigators whose projects are scientifically sound and aligned with the goals of the MISG research program will be encouraged to write a full proposal. Those proposals that address the 2021 RFP selected topics listed above will receive special consideration. Those encouraged to submit a full proposal are given a brief summary of all feedback provided by reviewers and any additional recommendations from MISG staff. Everyone who submits a pre-proposal is eligible to submit a full proposal and will be provided the full application guidance. **PIs must submit a pre-proposal to be eligible to submit a full proposal.**

Pre-proposals will be evaluated on the five criteria identified below:

- a) **Rationale:** Does the proposal identify the need, goals, and objectives of the proposed research?
- b) **Scientific Merit and Innovativeness:** Will the proposed research plan achieve the goals and objectives identified? Will the proposed research advance the state of science or discipline through use of state-of-the-art methods?
- c) **Professional Qualifications of the Investigators:** Are the qualifications (e.g., education, training, and experience of the investigators) and the record of achievement with previous funding adequate for the proposed research? Is the research team diverse and inclusive?
- d) **Relevance to MISG Research Priorities and Strategic Plan:** Is the proposed research relevant to current issues identified by state, regional, tribal, or federal agencies for Michigan's Great Lakes and to priorities described in the [Michigan Sea Grant Strategic Plan](#)?
- e) **Budget:** Is the budget reasonable and adequate to meet project objectives?



III. Graduate Student Research Fellowship RFP

Michigan Sea Grant is offering one- or two-year fellowships from 2022–2024 for graduate students enrolled full-time at Michigan universities and colleges who are interested in research relevant to current Great Lakes ecological, habitat, or fisheries management issues. This fellowship will provide support for a student’s research up to \$50,000 total per fellowship that could include tuition, stipend, travel, and research expenses.

Research fellows will work with an agency sponsor and faculty member at an accredited institution in Michigan to conduct a research project that supports existing Great Lakes agency research. Applicants submit a brief proposal for their research as part of the selection process and are expected to have letters of support from agency and faculty sponsors. Interactions with agency and MISG professionals are expected to enhance academic and professional development opportunities.

About the Fellowship

- Supports exceptional graduate students (M.S. or Ph.D.) engaged in research relevant to the Great Lakes, ongoing agency research, and to the [Michigan Sea Grant Strategic Plan](#). Examples of past fellowships can be found [here](#).
- Fellows will work with an agency mentor to ensure results are useful and contribute to ongoing Great Lakes research.
- Agencies include federal, state, and tribal agencies, NGOs, and local governments that conduct research on Great Lakes coastal issues. This could include natural or social science research.
- Fellowship funding will be available in February 2022, but the fellowship can begin in either 2022 or 2023, as appropriate, concluding by January 31, 2024.
- Support: Up to \$50,000 total for students, including tuition, stipend, and benefits.
 - Requires a 50% non-federal match (e.g., faculty salary).
 - A budget is required; see below.

See [above](#) for details about eligibility, match, and deadlines.

Application Submission Information

Online Submission Process:

- Graduate Fellows will submit their application package by 5 p.m. (EST), May 24, 2021. A pre-proposal is not required for the fellowship.
- Please allow sufficient time for all application materials to be received before the deadline. Late applications will not be accepted. We suggest that fellowship applicants access the [Fellowship Application Submission Form](#) to complete Parts 1 and 2 at least two weeks before the deadline. This step will initiate a system-generated request for recommendation letters and allow enough time for those letters to be received by the deadline.
- After applicants complete Part 2 of the online application form, the academic advisor and agency sponsor will receive a system-generated request for the letter of recommendation with instructions on how to log in and upload the letter as a PDF.
- After completing Parts 1 and 2 of the online application (be sure to click “save”), applicants will receive an email with a Fellowship Code that is required for logging in to complete the online submission.

- Complete [Budget Form 90-4](#) (XLS) to describe the proposed budget. Upload this as part of the online application.

Proposal Requirements: Research Fellowship

- **Research project narrative:** 1-2 pages describing the goals, approach including theoretical background if applicable, methods, and expected outcomes and how this research is relevant to the sponsoring agency.
- **Career goal statement:** 1 page maximum describing the student's career objectives and how the proposed research project will help to support those objectives.
- **Undergraduate and graduate transcripts:** Unofficial copies are acceptable.
- **Letters of recommendation:** One from primary academic advisor and one from an agency sponsor.
- **Budget:** The budget should outline proposed expenses (e.g., tuition, stipend, research expenses, travel, supplies, etc.) up to \$50,000 total and a timeline for up to 2 years. The budget should also indicate the source and allocation of the 50% non-federal match (e.g., \$25,000 non-federal match for a \$50,000 funding request from MISG for a total of \$75,000 for the project).
 - Use [Budget Form 90-4](#) (XLS) to develop the proposed budget. Each year must be separately detailed in the budget spreadsheet, including budget justification, with an overall project budget summary included, as well.
 - Commitment Letter confirming match requirement from university/institution.
- **Curriculum Vitae (CV):** Two pages maximum and must include contact information for the graduate student applicant and primary advisor(s).
- **Data Management:** NOAA regulations require a data management plan to make data available within two years of award completion. If you will generate new data, you will be required to submit a data management plan as part of your final proposal. The MISG data management plan can be found [here](#).
- **NEPA:** All research projects are required by NOAA under the National Environmental Protection Act to submit an abbreviated Environmental Compliance Questionnaire. The form can be found on this [webpage](#), and MISG research staff are available to assist you with filling out the form.

Please note that applications that do not meet the requirements specified above may be rejected without review.

Proposal Evaluation: Research Fellowships

Fellowship applications will be evaluated on the five criteria listed below:

- a) **Quality of Research Proposal and Integration with Agency Research:** Is the research proposal clearly stated and the outcomes achievable? Does the proposed research topic address a relevant agency concern or question? (30 pts)
- b) **Research and Career Goals of the Student:** How does the student's proposed project fit in with their stated career aspirations? Will the proposed project benefit the student's stated research or career goals? (30 pts)
- c) **Academic Ability and Relevancy:** How does the student's academic history support the proposed research topic? Does the student's educational background and experience lend itself to the successful execution of the proposed research topic? (10 pts)
- d) **Communication Skills:** How well can the student communicate with a variety of stakeholder audiences, both technical and non-technical? (10 pts)



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- e) **Support from Faculty and Agency Advisors:** What kind of support will the student receive from faculty and relevant agency advisors? (20 pts)

Three external reviewers, possibly including representatives from Great Lakes agencies (state or federal) and academia, will review all qualified Graduate Research Fellowships proposals. Members of the MISG Management Team and two of the external reviewers will interview fellowship applicants in mid-to-late summer 2021. The MISG Management Team will make funding decisions based on external reviews and rankings, with consideration for availability of funding, prior award performance of applicants, balance across institutions, focus areas, and applicant diversity, as well as programmatic needs, objectives, and priorities. Notification of funding decisions will occur in September 2021, and fellowship research will be conducted within the 2-year period from February 1, 2022, through January 31, 2024.

About the Michigan Sea Grant Research Program

Michigan Sea Grant supported research studies an array of issues affecting the Great Lakes and Michigan's coastal areas, including Integrated Assessments and basic research. The goals are to develop information, create tools and build partnerships that will improve decision making for particularly challenging coastal issues in the state and to fulfill critical research needs for the Great Lakes and coastal systems. See: www.michiganseagrant.org/research

About Michigan Sea Grant

Michigan Sea Grant helps to foster economic growth and protect Michigan's coastal, Great Lakes resources through research, education and outreach. See: www.michiganseagrant.org