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2018-20 DIRECTORY OF PROJECTS AND PEOPLE

University of Wisconsin Sea Grant Institute

Cover photo: Lake Michigan from the S/V Denis Sullivan, 2016.
Credit: Wisconsin Sea Grant

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Sea Grant is a partnership with public and private sectors combining research, education, outreach and technology transfer for public service. Sea Grant is a national network of 33 university-based programs enhancing the practical use and conservation of coastal, ocean and Great Lakes resources to create a sustainable economy and environment.

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INSIDE:

From the Director

The Straits of Mackinac, St. Marys River, Detroit River, Lake St. Clair, St. Clair River and Niagara River. Perhaps these hydrologic features are not as well-known outside their local regions as lakes Superior, Michigan, Huron, Erie and Ontario, but they are a critical aspect of the world's largest freshwater system. These rivers, straits and Lake St. Clair connect the Great Lakes to each other.

Connectivity. That's a pretty unique feature in the scheme of global water systems, and it mirrors the work Sea Grant does within the Great Lakes basin.

You could say that much like the St. Marys River or any of these other water bodies, Sea Grant is a connector. Our work to promote the sustainable use of the Great Lakes through research, education and outreach connects scientists with each other to advance the body of knowledge. It connects the science to resource managers, local officials and businesses so they can work more efficiently. It connects science with educators at all levels, from Pre-K to lifelong learners, and fosters stewardship. In turn, outreach efforts identify research needs and connect those to the researchers to ensure real-world findings are applicable immediately in coastal communities.

Because Sea Grant is a partnership of state and federal governments with academia, the program also connects our state's outstanding campuses to each other. Here, you will see that 22 institutions of higher learning are represented, along with state agencies — the Wisconsin Coastal Management Program, Wisconsin Historical Society and Department of Natural Resources, to name a few. Partners, like the Great Lakes Indian Fish and Wildlife Commission, and private industry, such as Superior Fresh and Susie Q. Fisheries, are connected, too.

This 2018-20 Directory of Projects and People, then, represents the latest compendium of this connectivity. As you pick it up, you join in the connectivity. I hope it informs and perhaps even inspires as you page through the 19 research projects and 29 outreach undertakings detailed here. This publication also includes other information about our program — websites, fellowship opportunities and contact information. Please feel free to connect with me if you want to explore even more what we will accomplish in the next two years to further the sustainability of the Great Lakes.

Best regards,

Jim Hurley, Director
Wisconsin Sea Grant

Participating Institutions and Agencies 2018–20

University of Wisconsin Sea Grant Institute

Central Michigan University

Cornell University

Great Lakes Indian Fish and Wildlife Commission

Michigan Department of Natural Resources

Michigan State University

National Park Service

NOAA National Weather Service

Northland College

The Ohio State University

Penn State

Red Cliff Band of Lake Superior Chippewa

State University of New York-Stony Brook

Texas A & M University

The Ohio State University

U.S. Army Corps of Engineers

U.S. Fish and Wildlife Service

University of Illinois at Urbana-Champaign

University of Michigan

University of Minnesota-Duluth

University of Minnesota-Twin Cities

University of St. Thomas

University of Vermont

University of Wisconsin-Extension

University of Wisconsin-Green Bay

University of Wisconsin-Madison

University of Wisconsin-Milwaukee

University of Wisconsin-Manitowoc

University of Wisconsin-Oshkosh

University of Wisconsin-Stevens Point

University of Wisconsin-Superior

University of Wisconsin-Whitewater

Wisconsin Coastal Management Program

Wisconsin Department of Natural Resources

Wisconsin Historical Society

Healthy Coastal Ecosystems

Wisconsin has more than 800 miles of shoreline adjoining the vast ecosystems of Lake Michigan and Lake Superior, including coastal, nearshore and deep-water environments. In Wisconsin, healthy coastal ecosystems, sustained by their surrounding watersheds, are the foundation of life along the coast.

Ecosystem health and associated ecosystem services can directly and indirectly affect both human health and socioeconomics at both individual and community scales. Maintaining the health of coastal ecosystems is a challenge because of the diversity of stressors involved as well as the temporal and spatial scales at which systems can be affected. Responsible management of these systems requires a comprehensive way of thinking and acting, often termed ecosystem-based management. Ecosystem-based approaches require coordination among federal, state and local jurisdictions and the active engagement of the people who live, work and play along the coasts. They also require an understanding of the characteristics of species, landscapes and their interactions within each ecosystem.

In general, increasingly rapid coastal development, a changing climate, greater demands on fisheries resources and other human activities have led to water-quality degradation, increased demands on water supplies, changes to fisheries stocks, wetlands loss, proliferation of aquatic invasive species and a host of other environmental, health and socioeconomic impacts. It is essential for decision-makers and Great Lakes coastal residents to understand the interconnectedness and interactions of these systems in order to maintain vital habitats and inform restoration efforts within ecosystems and watersheds.

The legacy of striving for healthy coastal ecosystems is a strong one for Wisconsin Sea Grant. A keystone effort was two decades of comprehensive, multidisciplinary research focused on Green Bay, Lake Michigan, making it one of the most rigorously studied estuarine systems of its size in the world. That baseline data has informed, for example, the U.S. Environmental Protection Agency's landmark national Green Bay PCB Mass

Balance Study that for the first time developed an input-output model of all sources, movement and fates of a chemical contaminant in an aquatic system. That work was completed more than 20 years ago, and Wisconsin Sea Grant continues in a leadership role for the promotion of a healthy ecosystem within Green Bay and other Wisconsin Great Lakes sites. With this strategic plan, the map to continue those efforts is in place.

Likewise, Wisconsin Sea Grant recognizes the challenge of ensuring that ecosystems research is shared beyond the laboratory and makes its way to the settings where it can be used to inform decision-making. The program has committed to bridging the gap between the acquisition of new scientific knowledge, or the validation of a scientific concept or model, and the actions necessary to apply those facts. This practice of actionable science encourages the sharing and use of evidence-based tools and data to inform discussions, debate and decisions for the achievement of healthy coastal ecosystems.

National and Wisconsin Sea Grant Goals

- Habitat, ecosystems and the services they provide are protected, enhanced and/or restored.
- Land, water and living resources are managed by applying sound science, tools and services to sustain ecosystems.

Anticipated Outcomes for Wisconsin and the Great Lakes Region

- Scientific understanding and technological solutions inform and improve conservation and the management of natural resources in Wisconsin and the Great Lakes Basin.
- Ecosystem science and conservation priorities for Wisconsin are those that are developed through stakeholder participation.

- Greater awareness and understanding of freshwater ecosystem functions and services they provide improve stewardship efforts among resource managers, communities and tribal entities.
- Declining biodiversity, habitats and ecosystem functions and services are restored and sustained in Wisconsin.
- Improved collaborative planning and decision-making lead to enhanced freshwater and Wisconsin coastal stewardship.
- Collaborations with state and regional partners and stakeholders support planning, research and technological solutions to address resource-management needs.
- Citizen science initiatives are engaged and contribute to improving our knowledge with respect to coastal communities and ecosystems.
- Wisconsin communities have access to information and understand projected changes within coastal ecosystems and how changes will impact coastal ecosystems.
- Wisconsin communities can access case studies, training and tools to improve their ability to plan, prepare and adapt to future ecosystem conditions.

Wisconsin Sea Grant Strategies

- Support research and outreach that bridges natural sciences, social sciences and policy studies to support more holistic management and restoration of Green Bay and its watershed.
- Support research and outreach to understand the environmental and socioeconomic effects of current and emerging challenges on Great Lakes ecosystem and human

health including, but not limited to, contaminants, aquatic invasive species, harmful algal blooms, bacterial outbreaks, physical processes, climate change, and changes to biodiversity and ecosystem structure.

- Support research and outreach to improve Great Lakes ecosystem health through innovations in measurement, predictive modeling and potential treatment or management approaches.
- Develop tools and approaches for preserving and restoring Great Lakes ecosystems that can also be used for outreach to stakeholders.
- Improve and enhance stakeholder access to and understanding of socioeconomic and environmental data, models and policy information in Wisconsin and the Great Lakes region that support ecosystem-based planning, decision-making and management approaches.
- Support research and outreach to develop dynamic and interoperable information systems to support adaptive management of Great Lakes ecosystems.
- Help residents, resource managers, businesses, industries and the agricultural sector understand the effects of human activities and environmental changes on coastal resources.
- Help managers incorporate public input in natural resource decision-making processes.

Projects

The Role of Indirect Photolysis in the Environmental Fate of Pesticides and Pharmaceuticals

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The presence of biologically active anthropogenic compounds (e.g., pesticides and pharmaceuticals) in the watersheds of the Great Lakes is of emerging concern to stakeholders and water quality managers. Natural processes, such as dissolved organic matter (DOM)-mediated indirect photodegradation, can transform many of these compounds. However, predicting the photodegradation rates of target compounds is difficult because DOM varies temporally and spatially, and current approaches rely on time- and labor-intensive analyses. The overall goal of our project is to assess how the molecular composition and photochemical reactivity of DOM with anthropogenic compounds changes as it moves from the St. Louis River into the St. Louis Estuary and then into Lake Superior. We plan to develop a transferable tool that will relate the photoreactivity of DOM with simple water quality measurements and predict the photodegration rates of target compounds in this sensitive ecosystem and other natural waters. Continuing project. R/HCE-31

Seasonal Depth Distribution of Round Goby in Lake Michigan, Emphasizing Cold Seasons

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Round gobies are significant in the diet of certain cold-water predators, even though they are a warm-water species (based on summer habitat and spawning). This project is evaluating these evolving predator-prey interactions by finding areas in which round gobies are most accessible to cold-water predators. An understanding of the cold season predator-prey interaction will facilitate management by allowing managers to better assess the best balance of predators, particularly the largely stocked salmons and trouts. The current shallowest U.S. Geological Survey trawls are both off the preferred substrate

and preferred summer depths for round gobies. In this novel and still evolving coastal ecosystem, management of round gobies is a balance between control of a nuisance species and management of the forage base. Continuing project. R/HCE-32

Changing Silica Dynamics in Lake Michigan: A Symptom of Altered Food Webs

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Erica Young, UW-Milwaukee
Hunter Carrick, Central Michigan University

Silica (Si) plays critical roles in carbon cycling, wetlands functioning and ecosystem structure, and it can limit the phytoplankton productivity on which fisheries depend. However, we understand the Great Lakes Si cycle very poorly. For example, dissolved Si in Lake Michigan has been increasing dramatically for years for reasons we don't understand, while recent work shows substantial uptake of Si in nearshore waters by blooms of green macroalgae and their epiphytic diatoms, organisms never considered important in the Si cycle. In this project, researchers will estimate dissolved and biogenic Si in different regions of Lake Michigan, characterize variations in nearshore dissolved Si in response to rainfall and upwellings, assess uptake and remineralization of Si from green macroalgal-epiphyte assemblages, and develop a model/budget for silica for a nearshore region of Lake Michigan. A citizen science component involving monitoring blooms and identifying organisms using cell-phone camera microscopes will be included. R/HCE-33

Naturalized *E. coli* in the Beach Environment and Implications for Beach Monitoring

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Beach closings due to contamination by untreated sewage or animal waste are a serious public health threat that has economic consequences. Fecal indicators such as *E. coli* are harmless organisms meant to demonstrate that pathogens may be present. However, *E. coli* persists in sand in the absence of any evidence of fecal pollution, suggesting that certain strains are adapted to the sand environment. Researchers have isolated >2500 *E. coli* from host sources and from sand and are examining genetic differences that could

explain their persistence in beach sand. Laboratory experiments, genome sequencing and comparative genomics will identify potential mechanisms of *E. coli* survival. QPCR assays for strains that are specifically adapted to beach sand are being developed. These assays, combined with other assessment tools, including source tracking approaches, will shed light on the extent to which Wisconsin's beaches are colonized with reservoirs of persistent *E. coli* strains. R/HCE-34

Transitioning Science to Management: Developing Models and Tools to Restore the Health of the Green Bay Ecosystem

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Hypereutrophic conditions are a persistent problem in Green Bay and a principal criteria for the southern bay's designation as an Area of Concern. Ecosystem restoration requires a significant and sustained effort to reduce nutrient inputs. Many new efforts are taking place in the region, but success requires the cooperation of the whole watershed and resource agencies armed with science-based predictive tools. Such tools are essential in an ecosystem that is witnessing massive alterations in agriculture and development and a changing climate. Researchers have assembled a comprehensive set of linked models of watershed loading, biogeochemical cycling and hydrodynamics that are informed by downscaled climate scenarios. Effective implementation requires translating that information into a form that is useable by stakeholders. Key outcomes are the refinement of a set of management analysis tools to help guide resource management and the engagement of those involved in land and water use across all sectors. R/HCE-35

A New Phosphorous Model for Lake Michigan

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Previous research has shown that the relationship between external phosphorus loading and algal production in Lake Michigan has changed — phytoplankton production in offshore waters has decreased while the production of nuisance benthic algae in the nearshore zone has increased. As a result, previous phosphorus loading targets may no longer be valid, and managers are uncertain as to whether there is an ideal loading rate that will result in minimal growth of nuisance algae in the nearshore while sustaining the pelagic plankton and fish community. Researchers will develop a whole-lake phosphorus model that couples nearshore and pelagic models they have recently constructed. The project goal is to produce a model that can be used to determine how both the pelagic and nearshore communities will respond to external phosphorus loads. The researchers will work closely with the Wisconsin Department of Natural Resources to ensure that products specifically address this agency's management needs. R/HCE-36

Spatial and Temporal Distribution of Benthic Macro-Invertebrate Community of Lower Green Bay, 1938-Present

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Benthic macro-invertebrate communities often have a disproportionate effect on Great Lakes aquatic communities. The benthic community of Green Bay has been surveyed periodically from the late 1930s through the 1990s. However, many sources of uncertainty regarding the benthic invertebrate community remain, and that limits our ability to understand the ecology of the system as a whole. The main objective of this project is to evaluate the current density and distribution of the entire benthic macro-invertebrate community in lower Green Bay and place this distribution in the context of historic

records. Researchers will also attempt to develop spatially explicit predictive models that can determine associations with surrounding abiotic and biotic features of the overlying waters that may influence observed macro-invertebrate distribution. The proposed research will have application to broader management objectives (e.g., Area of Concern delisting), ongoing hydrodynamic and phosphorous modeling, and research seeking to better understand fish foraging ecology and population dynamics. R/HCE-37

Outreach

Clean Marina Program (Noordyk) – The maintenance, operation and storage of recreational vessels have the potential to release pollutants to lakes and rivers. The Wisconsin Clean Marina Program promotes and celebrates voluntary adoption of measures to reduce pollution. The program is administered by the Wisconsin Marine Association with guidance and technical assistance from Sea Grant. A/AS-1

Restoring the Health of the Lower Fox River and Green Bay (Noordyk) – Lower Green Bay and 14 tributaries in the Lower Fox River Basin do not meet Wisconsin water-quality standards due to low dissolved oxygen. Excessive suspended solids and phosphorous cause nuisance and harmful algal blooms that have led to a dead zone in lower Green Bay. With partners, Sea Grant is working to address the challenges and improve water quality. A/AS-1

Wisconsin Aquatic Invasive Species Partnership Coordination (Campbell) – The Wisconsin Aquatic Invasive Species (AIS) Partnership consists of about 50 AIS professionals across the state who consistently and collaboratively implement programming at the local, regional and state level. Sea Grant helps coordinate this network, investigates information gaps and creates new outreach materials. A/AS-1

Great Lakes Sea Grant Network Habitattitude Surrender Collaborative (Campbell) – People purchase animals and plants for their aquarium or water garden. Or, people purchase animals as pets. Problems for the environment arise if they are accidently or intentionally released. The Great Lakes Sea Grant Network has a Habitattitude campaign, offering people the option to surrender a pet or plant for future rehoming versus releasing it. A/AS-1

Closing Aquatic Invasive Species Pathways (Campbell) – Aquatic invasive species (AIS) can enter an environment through a wide variety of pathways. Many pathways have been addressed but others remain. Some are subsets of previously addressed pathways, such as waterfowl hunters or wakeboard boats, while others are rarely exercised but are risky, such as Buddhist animal release. This project will identify and address all pathways. A/AS-1

Refining Aquatic Invasive Species Communication Techniques (Campbell) – With new invasions, there will be gaps in Wisconsin's aquatic invasive species (AIS) prevention efforts. Different approaches are needed to reach remaining stakeholders with AIS prevention messages and little work is being done currently to determine what techniques are effective. Sea Grant will contribute to this examination of effectiveness. A/AS-1

Great Lakes and Mississippi River Regional Coordination (Campbell) – The national Aquatic Nuisance Species Task Force strives to coordinate activities to prevent and control nonindigenous species within the United States. Six regional panels have been authorized by the task force to plan for, research, control and prevent aquatic nonindigenous species. These include panels for the Great Lakes and Mississippi River basins. Sea Grant plays a role on this task force. A/AS-1

Sustainable Fisheries and Aquaculture

The nation has witnessed the decline of many of its major fisheries while seafood consumption has increased and continues to be encouraged because of health benefits. To address the disparity between seafood demand and domestic harvests, the U.S. imports 90 percent of what is consumed, leading to a seafood trade deficit of more than $11.2 billion per year. With global wild fisheries harvests at a plateau of around 185 million tonnes, further increases in seafood production will have to come from aquaculture. Currently, more than 50 percent of seafood consumed globally is now produced from aquaculture. Since 2013, global seafood production has surpassed global beef production. There are no projected increases in wild-capture fisheries, but global aquaculture is predicted to increase by 33 percent over the next decade. These projections create opportunities for an expanded Great Lakes Basin aquaculture industry and for innovative marketing strategies for the wild fisheries industry.

The overall economic impact of the commercial, recreational and for-hire fisheries and aquaculture industries in the Great Lakes region is $7 billion annually. In Wisconsin, 1.4 million fishing licenses are issued each year, and anglers and the fishing industry deliver $2.75 billion in economic impact and 30,000 jobs annually. There are 70 commercial fishers in Wisconsin who rely on fewer than 10 species and have a combined harvest of $5 million annually.

Wisconsin's aquaculture industry contributes $21 million in annual economic activity and more than 400 jobs to the state. There is definitely room for growth in food fish aquaculture — additional opportunities exist for job creation and meeting the demand for finfish. The Midwest consumes more than 1 billion pounds of seafood products per year, but less than 4 percent comes from aquaculture operations in the region.

Wisconsin Sea Grant continues to play a leadership role in developing innovative technologies for all sectors of the seafood industry. In particular, the program has fostered the growth of urban aquaculture through research and outreach in the region's

metropolitan areas. It has also capitalized on educating consumers interested in the buy-local movement. Wisconsin Sea Grant's partnership with NOAA, state and tribal fisheries managers, seafood processors, fishing associations, the aquaculture industry and consumer groups will ensure safe, secure and sustainable supplies of domestic seafood, decreasing a reliance on seafood imports now and into the future.

National and Wisconsin Sea Grant Goals

- Fisheries, aquaculture and other coastal and freshwater natural resources supply food, jobs and economic and cultural benefits.
- Natural resources are sustained to support fishing communities and industries, including commercial, recreational and subsistence fisheries and aquaculture.

Anticipated Outcomes for Wisconsin and the Great Lakes Region

- Increased understanding and technological solutions aid Wisconsin aquaculture management and production.
- Partnerships enable the Wisconsin aquaculture industry to adapt and acquire innovative technologies.
- Freshwater resource industries employ technologies and reinforce strategies to ensure safe and sustainable Great Lakes fisheries and products.
- Consumers understand the health benefits of Great Lakes fish and purchase safe and sustainable products. Freshwater resource industries employ strategies that balance economic, community and conservation goals.

- Commercial and recreational fishers and aquaculturists in Wisconsin are knowledgeable about efficient, sustainable and responsible tools, techniques and uses of coastal and freshwater resources.
- Innovative solutions that increase understanding of climate impacts on state and regional fisheries and aquaculture are available and accessible to resource managers and fishing and aquaculture communities.
- Resource managers and fishing and aquaculture communities have access to science and tools to increase Wisconsin-based capacity to adapt to future resource-management needs.

Wisconsin Sea Grant Strategies

- Support research and outreach to better understand our Great Lakes fisheries, including status and trends, measurement and modeling techniques, future scenarios, and socioeconomic costs and benefits under different management approaches and environmental conditions.
- Support research and outreach to advance environmentally sustainable and robust recreational, commercial and subsistence Great Lakes fisheries.
- Better understand threats to Great Lakes fisheries, including, but not limited to, nutrient enrichment, invasive species, food web changes, genetics and climate change as well as effective responses.
- Identify and better understand the barriers to expansion of the aquaculture industry in Wisconsin and implement innovative partnerships to address scientific, business, economic, policy and legal challenges.

- Collaborate in identifying Great Lakes regional aquaculture opportunities and best-management practices.
- Support research that leads to a better understanding of the benefits and risks of consuming Wisconsin-produced fish.
- Support research and outreach that encourage the application of behavioral and consumer sciences toward consumer perception and preferences, food safety, labeling and certifications, seafood demand studies and promotion of local seafood.
- Support research and outreach to develop and improve economically viable and environmentally sustainable aquaponics operations, with an emphasis on business planning, risks and socioeconomics.
- Support research to develop and improve commercially viable and environmentally sustainable aquaculture practices and techniques, including nutritional value of feeds, broodstock selection, water supply and quality, husbandry, and disease and pathogen prevention and diagnosis.
- Support the development of environmental and economically sustainable aquaculture through workforce development and trainings, K-12 education and technical assistance.
- Support development of urban aquaculture in new markets and provide knowledge resources to existing operations.
- Investigate emerging species suitable for aquaculture in Wisconsin.

Projects

Food Web Interactions Among Walleyes, Lake Whitefish and Yellow Perch in Green Bay

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Green Bay supports important recreational, commercial and subsistence fisheries for walleyes, lake whitefish and yellow perch. These three species likely interact in many ways, including predation and diet overlap, but these interactions are poorly understood. A better understanding of these interactions is needed to guide management decisions because changes in population status of one species will likely affect fisheries for all three species. These potential effects translate into important socioeconomic trade-offs that must be considered in the decision-making process. To evaluate these trade-offs, fishery managers and stakeholder groups must first understand how the species interact. This research uses a multidisciplinary approach involving researchers from multiple University of Wisconsin campuses, resource agency personnel from two states and the U. S. Fish

and Wildlife Service. Researchers will combine extensive diet assessment with catch-at-age modeling and bioenergetics simulations and will actively engage stakeholders (anglers and commercial fishers) in the research process. R/SFA-15

Impact of Starter Microdiets for Raising Saugeye (Hybrid Walleye) Fry for Great Lakes Aquaculture

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The University of Wisconsin-Stevens Point Northern Aquaculture Demonstration Facility has advanced walleye food fish production to the point that a Wisconsin commercial walleye industry is emerging. Production of high-quality fry reared on commercial feed is key. Saugeye fry are currently produced, but survival rates are often highly variable, growth potential has not been fully realized and skeletal and developmental deformities are often present. At least part of these problems may derive from sub-optimal nutrition. A critical phase in fry production is the early stage of exogenous feeding, where fry digestive capabilities are limited and, traditionally, only live feeds have been used. However, live feeds are expensive and difficult to manage, and few culturists are willing to apply them to commercial saugeye larviculture. For successful commercial intensive production of saugeye as a food fish, the future lies in commercially produced starter microdiets. R/SFA-16

Supporting Wisconsin Aquaculture by Assessing the Marketing Needs of Producers and Perceptions of Consumers About Eating Locally Farmed Fish

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To better understand the limitations that are constraining the Wisconsin aquaculture industry and capitalize on the trend for local food, this social science research project will investigate consumer perceptions about farm-raised Wisconsin fish and the needs of Wisconsin fish farmers to effectively and sustainably grow their businesses. Researchers will conduct a statewide public opinion survey and perform qualitative interviews regarding perceptions about farm-raised fish. Based on the results, they will formulate and test-market different messaging strategies. They will also conduct a needs assessment to understand the marketing and operational needs of aquaculturists and identify opportunities to provide training and resources to help producers meet these needs. The resulting research findings and marketing material will be shared with regional aquaculturists and retailers (e.g., restaurants and grocery stores), and the project will include training social science scholars via graduate assistantships/fellowships in order to advance scholarship related to aquaculture. R/SFA-17

Outreach

Great Lakes and Food Web Ecosystem Ecology (Seilheimer) – The Great Lakes waters of Wisconsin support jobs and economic impacts through the harvest of fish by commercial, charter and recreational fishers. The food webs supporting these fisheries are dynamic systems and are influenced by factors such as invasive species, nutrient loading and resource management. This effort will support outreach, education and research in Wisconsin's Great Lakes ecosystems. A/AS-1

Commercial Fishing Industry Support (Seilheimer) – Wisconsin's commercial fisheries provide jobs, economic resources and food. This work will attempt to reduce conflicts between commercial fishers and anglers, increase efficiency of fishing methods and strive to understand better the dynamics of fisheries bycatch. The safety of fishers will also be a priority. A/AS-1

Marine Debris and Great Lakes Ghost Nets (Seilheimer) – Marine debris is a growing issue in the Great Lakes. Research is needed to understand the biotic impacts of micro-plastics, and outreach is needed on the impacts of marine debris on stakeholders and biota. Building on past work with the Great Lakes Indian Fish and Wildlife Commission and Apostle Islands Sportfishermen's Association, continued work on preventing and removing ghost nets is needed. A/AS-1

Great Lakes Aquaculture Extension (Binkowski) – Numerous publications on aqua-ponics have been produced, but the focus has not been on higher-valued species such as yellow perch, bluegill and hybrid bluegill. Sea Grant will produce a manual focused on these species. At this time, there are no specific aquaculture and aquaponic courses in the University of Wisconsin System's agricultural education schools. This effort will provide aquaculture and aquaponics education to fill the gap. Finally, Sea Grant will provide technical assistance to aquaculture practitioners on systems, biology, water chemistry, reproduction, spawning techniques, nutrition and production-cost estimates. A/AS-1

Aquaculture Outreach and Education: Continuous Activities (Wiermaa) – Sea Grant funding supports an aquaculture outreach and education position in collaboration with the University of Wisconsin-Stevens Point Northern Aquaculture Demonstration Facility, advancing sustainable aquaculture through outreach and education of facility research and demonstration projects, technical assistance to farmers on best-management practices, workforce development or training and public education. A/AS-1

Resilient Communities and Economies

Coastal communities provide crucial economic, subsistence, social and recreational opportunities for millions of people within the Great Lakes Basin. A 2011 study completed by the University of Michigan reported that more than 1.5 million jobs, generating $62 billion in wages are tied to the inland seas. The job breakdown is 994,879 in manufacturing; 217,635 in tourism; 118,550 in shipping; 118,430 in agriculture, fishing and food production; 38,085 in science and engineering; 10,980 in utilities; and 10,003 in mining. In Wisconsin, 173,969 jobs can be linked to the Great Lakes. To accommodate more people and activity while balancing demands on coastal resources, Wisconsin must develop innovative policies, institutional capacities and management approaches to increase community resilience.

Wisconsin Sea Grant will continue to support cutting-edge research in the areas of marine-related energy sources, climate change, coastal processes, energy efficiency, preparedness, hazards mitigation, stormwater management and tourism. In Wisconsin, Sea Grant will engage diverse and shifting coastal populations in applying the best-available scientific knowledge to address increased resource demands and vulnerability. Ultimately, Wisconsin Sea Grant will bring its unique research and engagement capabilities to support the development of resilient coastal communities — both human and natural — that sustain diverse and vibrant economies, effectively respond to and mitigate natural and technological hazards and function within the limits of their ecosystems.

National and Wisconsin Sea Grant Goals

- Coastal communities use their knowledge of changing conditions and risks to become resilient to extreme events, economic disruptions and other threats to community well-being.
- Water resources are sustained and protected to meet existing and emerging needs of the communities, economies and ecosystems that depend on them.

Anticipated Outcomes for Wisconsin and the Great Lakes Region

- Members of the community, including the underserved, are aware of and understand changing conditions and hazards and the implications to their Wisconsin communities and are prepared to respond and adapt.
- Existing and innovative training programs improve community leaders' understanding of changing conditions in their Wisconsin communities and implement adaptive strategies.
- Wisconsin communities have access to information needed to understand the factors impacting ecosystems and participate in adaptive management planning.
- Wisconsin communities employ adaptive management strategies and apply tools to engage diverse members of the community to improve resilience and community sustainability.
- Members of the community, including the underserved, have access to information needed to understand how Wisconsin coastal economic activities and trends will impact environmental and community well-being.
- Communities have access to tools, services and technologies to adapt and grow resilient Wisconsin economies.
- Leaders in Wisconsin's coastal economic sectors understand how they can become more resilient through diversification and through conservation of ecosystem services.
- Community members throughout Wisconsin understand watershed functions and the services those watersheds provide to support communities and economies.
- Community members understand how actions will impact water quantity and quality and are able to make informed decisions.

- Wisconsin communities have access to sound science, data, tools and services to understand and anticipate changes in water quantity and quality.
- Wisconsin communities have diverse, sustainable economies and industries that support existing and emerging water-resource needs.
- Wisconsin communities have access to science, tools and technologies to protect and sustain water resources and make informed decisions.

Wisconsin Sea Grant Strategies

- Support research and outreach that will lead to a better understanding of how the sediment supply from coastal bluffs influences beach and nearshore sediment transport in order to guide sound shore protection and bluff stabilization choices and build more resilient coastal communities and economies.
- Support research and outreach to promote the development and implementation of green infrastructure practices.
- Develop and apply innovative geodesign methods to promote resilient coastal communities and understand the consequences of alternative development scenarios.
- Work with management and regulatory agencies, tribal entities and vulnerable and at-risk communities to reduce vulnerability to fluctuating water levels, storm impacts and a changing climate.
- Support research and outreach to understand the value of and opportunities for subsistence, tourism, and commercial and recreation-related activities in coastal communities.

- Support research and outreach that documents and preserves cultural and historical resources in coastal and marine areas, including those within or adjacent to the proposed marine sanctuary.
- Support research and outreach to develop or enhance community planning and visualization tools that demonstrate the benefits, risks and impacts of land use on the coastal environment.
- Support research that evaluates the impacts of increased climate variability and change on coastal communities.
- Support research and outreach to assess and share the impacts of human activities on Great Lakes water quality and supply, as well as coastal and near-shore habitats.
- Support environmental and socioeconomic research to protect the supply and quality of fresh water.
- Support research to document the socioeconomic contributions of water-dependent industries.
- Promote research and outreach for sustainable and resilient ports, harbors and marinas, including beneficial use of dredged materials and science-based decision-making related to the timing of dredging to minimize impacts on critical fish spawning habitat.
- Support research and outreach on nature-based shore protection along Great Lakes coasts.

Projects

The Hydrologic and Ecologic Effects of Green Infrastructure Within Urban Coastal Catchments

Steve Loheide , UW-Madison, (608) 265-5277, loheide@wisc.edu

There is increasing interest in green infrastructure strategies such as rain barrels, porous pavement, native landscaping, rain gardens and green roofs. Yet widespread adoption of these practices has been slow, in part due to lingering uncertainty in site-specific and lack of engagement by private homeowners. Realistic expectations of performance for sites with different fine-scaled characteristics under a range of weather scenarios is key to executing successful projects that encourage engagement by homeowners. By performing factorial modeling using ParFlow with Common Land Model, we will be able to explore these details at a larger scale than has been done before. By synthesizing our results into a visualization tool and set of guidelines, we will make these results easily accessible to planners, professionals, private residents and students and help to develop an informed citizenry that understands the impact of individual, distributed stormwater management decisions on broader hydrological and ecological outcomes. Continuing project. R/RCE-05

Flat-Bottomed Fleet: A Comparative Analysis of Great Lakes' Commercial Sailing Scows

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Tamara Thomsen, Wisconsin Historical Society

Scow-schooners were vital to emerging communities around the Great Lakes. Their shallow draft allowed access to many of Wisconsin's small, unimproved ports, connecting these communities with regional markets during our formative years as a state. Today, little documentation exists that illustrates how these flat-bottomed vessels were constructed. The wreck of the scow-schooner I.A. Johnson, built in 1867, was first

discovered in 2015. Wisconsin Historical Society archaeologists have photographed the site, but it remains otherwise untouched since the day it sank, providing a unique opportunity for baseline documentation, evaluation and interpretation. Seven scow-schooners have been documented throughout Wisconsin waters, and the discovery of the I.A. Johnson provides an opportunity to synthesize data through a comparative analysis of the scow-schooners. This effort will increase our understanding of construction features and provide a synthesis that will be used to interpret and develop preservation plans for other scow-schooners in the region. C/RCE-03

A Comprehensive Analysis of Sediment Delivery to Lake Michigan From Coastal Bluffs in Southeastern Wisconsin

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High lake levels are reducing beach area along the Lake Michigan coastline and allowing wave action to erode the bases of coastal bluffs at the highest rate of the past 30 years. Sediment budget calculations have shown that bluff erosion is the dominant source of sand and gravel-sized particles that are mobilized into beaches and the nearshore system. Researchers have found that the leading cause of bluff erosion is shallow to intermediate depth translational landslides. Therefore, estimating lake sediment budgets depends on an understanding of the mechanisms that lead to landslide failure. This study will provide a comprehensive analysis of bluff stability for bluffs affected by landslide failure coupled with an analysis of bluff composition to determine the composition of sediment contributions of coastal bluffs to the southeast Lake Michigan sediment budget. R/RCE-08

Characterizing and Forecasting Dangerous Currents on the South Shore of Lake Superior in Minnesota and Wisconsin

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Richard Axler, University of Minnesota Duluth

Dangerous currents in Lake Superior have been responsible for deaths and many rescues, yet no forecasts are available that cover the entire coastline. To address this issue, researchers plan to characterize and forecast dangerous currents and build a collaborative community on the Minnesota-Wisconsin south shore of Lake Superior. Characterization of dangerous currents will be conducted using remote sensing analysis, field measurements and cross-scale modeling, which will improve understanding the mechanisms of generating dangerous currents. Forecasts of dangerous currents will be provided through an Integrated Nowcast-Forecast Operational System for Dangerous Currents in Lake Superior, which integrates real-time water observations and a high-fidelity nearshore circulation model to predict real-time (nowcast) and future (forecast) information of dangerous currents. Lastly, a collaborative framework for dangerous current watches, warnings and advisories will be built through outreach and education and coordination and communication. Jointly funded with Minnesota Sea Grant. R/RCE-09

The Impact of Reengineering on Both Beach Water Quality and the Economic Value of the Beach

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Matthew Winden, UW-Whitewater
Nilay Sheth, UW-Oshkosh

Based on extensive monitoring, researchers at UW-Oshkosh carried out mitigation at five beaches in northern Wisconsin, including redesigning each beach, treating storm-water and naturalizing the shoreline surrounding the beach area to promote natural sand retention and wave action. An unintended benefit of this work has been a significant increase in beach usage at beaches that have undergone these redesign plans. Researchers will assess the physical, chemical and biological water-quality parameters after mitigation to ensure the remediation was successful. In addition to these more standard measures, choice valuation and economic impact analysis will be used to determine what features are used by beachgoers who visit a location and how much money they spend on the beach trip. The beach improvement assessment will be of critical importance when other communities assess best-management practices at their beaches and whether investment of public funding goes to support mitigation. R/RCE-10

Risk-based Assessment and Management (RAMAN) Online Visualization Tools for Health of Bluff, Beach and Nearshore Environments on Wisconsin's Coast

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Qunying Huang, UW-Madison
Adam Bechle, Wisconsin Coastal Management Program
Gene Clark, Wisconsin Sea Grant

Risks from coastal bluff and shoreline erosion threaten personal safety, property and infrastructure along Great Lakes coastlines. Researchers will identify hazards near coastal structures on bluffed and sandy coasts through measurements of bluff and shoreline recession, bluff profiles, nearshore sediment thickness and nearshore sediment transport. Assessments of hazards will be conducted using observed data and models of bluff

stability, shoreline change and sediment budgets to predict bluff/shoreline positions. The outcomes of the hazard assessment will be intersected with socioeconomic indexes to provide direct and indirect risk assessments — the first estimates in Wisconsin of expected damages to property from coastal erosion. Risks will be communicated to management, planners and stakeholders through a spatial web portal and 3-D interactive bluff erosion visualization. Overall, this project will provide managers and stakeholders with the information needed to take targeted actions along the coast and understand potential positive and negative impacts of coastal protection measures. R/RCE-11

Outreach

Coastal Engineering Project, Grant Proposal Review and Permit Assistance (Clark) – Great Lakes shoreline and coastal regions continue to receive pressure from both occasional weekend vacationers, and especially, year-round property owners and developments. Record levels of waterfront activities as well as the high demand for coastal property have created increased levels of human pressure on fragile shoreline areas. Sea Grant and state and federal governmental partners will meet critical needs of property owners, resource managers, lenders, insurers, engineers, realtors and local, regional and statewide agencies with natural coastal hazard awareness, permit review assistance, grant proposal reviews, coastal engineering guidance, education opportunities and shoreline management tools. Special emphasis will be placed on harbors. A/AS-1

Great Lakes Nature-Based (Green) Coastal Shoreline Protection Coastal Engineering Outreach and Promotion of Appropriate Use in Great Lakes Applications (Clark) – Nature-based coastal shoreline protection uses a range of nature-based stabilization techniques combined with traditional "grey" methods to provide a proven and cost-effective alternative. Grey solutions involve concrete, steel and stone shoreline protection. The keys to successful green installations have been a wise choice of location

and material/design selections. This effort will continue efforts to partner with stakeholders, learning from successful nature-based demonstration projects, identifying locations and providing outreach. A/AS-1

Harbor Dredging Beneficial Use of Dredged Material Outreach and Project Assistance (Clark) – The maritime industry relies on adequate water depth in harbors and connecting channels for navigation. Maintaining that depth in areas of natural accumulation of sediments requires periodic dredging. Slightly more than half of the dredged sediment is disposed of in specifically designed confined facilities. Sea Grant and its private sector and governmental partners will work to raise awareness about the value of dredged material as a sustainable resource that can be beneficially used. A/AS-1

Port and Harbor Infrastructure Outreach and Project Assistance (Clark) – Sea Grant will continue to provide education, research and outreach concerning the accelerated freshwater corrosion seen in Lake Superior port, harbor and marina structures. This will include hosting the research and outreach steering committee's website and production of communications products. Varying Great Lakes water levels have increased the deterioration and failure of many timber and concrete structures. There is an increased need for non-advocacy science-based repair and rehabilitation information and Sea Grant is an ideal source for this information. A/AS-1

Coastal Engineering Outreach, Project Assistance and Promotion of Using Non-Biased Science-Based Information in Determining Environmental Dredging Windows (Clark) – Great Lakes harbor and port navigation channel dredging serves the commercial shipping industry. These channels are also areas used by native fish and other aquatic species for spawning, migrating and/or living. In an attempt to minimize disruption of the natural use of the region by aquatic life during the dredging of the navigation channel, permitting agencies establish protective "environmental dredging

windows." Setting accurate windows is a difficult task. This effort will use science-based data to better justify proper environmental dredging windows in a coordinated and collaborative approach. A/AS-1

Tackling Barriers to Green Infrastructure (Noodyk) – Extreme rainfall events are expected to continue to increase in the Great Lakes region, causing more frequent and intense flooding and water-quality problems. Green infrastructure is a proven and effective means to improve water quality and habitat. It can reduce flooding damage and stormwater pollution and volume, but there remain critical barriers to its implementation. Based on the work of 1000 Friends of Wisconsin, Sea Grant developed "Tackling Barriers to Green Infrastructure: An Audit of Local Codes and Ordinances," a workbook to help communities audit, revise and prioritize codes to smooth green infrastructure implementation. A/AS-1

Building Resilient Coastal Communities (Noordyk) – Great Lake coastal communities are faced with storm hazards, including bluff and shoreline erosion, runoff pollution and flooding. The increasing frequency and severity of weather events make planning for coastal storm hazards an important part of helping communities become more resilient to climate change. This effort will focus on planning and mitigation actions to reduce storm hazards impacts. A/AS-1

Leverage Geographic Information Science to Promote Adaptive Coastal Management (Hart) – Sea Grant collaborates with partners to apply geospatial technologies to understand better Great Lakes coastal management and in the next four years will 1) continue development of the Wisconsin Coastal Atlas as a component of a coastal spatial data infrastructure for the Great Lakes region and as an interoperable data catalog searchable as part of a global network of coastal atlases; and 2) demonstrate how narrative maps, place-based learning, 3-D visualization and emerging geospatial technologies can be used to promote resilience to coastal hazards and ecosystem-based management. A/AS-1

Sustainable Great Lakes Tourism (Hart) – Deep travel can both sustain local economies and promote stewardship of scenic and cultural resources. The Wisconsin Coastal Guide is an interactive web mapping site promoting coastal heritage tourism along the Great Lakes Circle Tour route. This project will enhance the guide with an image-rich interface, promote a new inventory of coastal public access and develop place-based learning activities in the spirit of British letterboxing that promote discovery and exploration of cultural heritage and scenic resources of the Great Lakes coasts in Wisconsin. A/AS-1

Environmental Literacy and Workforce Development

An environmentally literate person is someone who has a fundamental understanding of the systems of the natural world, the relationships and interactions between the living and non-living environment and the ability to understand and use scientific evidence to make informed decisions regarding environmental issues. Moreover, a Great Lakes-literate person understands the essential principles and fundamental concepts about the characteristics, functioning and value of the Great Lakes; can communicate accurately about the Great Lakes' influence on systems and people in and beyond his/her watershed; and is able to make informed and responsible decisions regarding Great Lakes and watershed resources. Wisconsin Sea Grant advances these literacy principles in formal and informal learning environments throughout the state to produce a diverse and skilled workforce that is engaged and able to address critical Great Lakes needs.

The efforts build on a rich educational tradition in the state — historically strong high school graduation rates and top-ranked K-12 schools, as well as a vibrant network of higher learning and vocational-technical institutions serving all state citizens. Geographically, Wisconsin is situated in the nation's heartland with its shifting economy — from traditional manufacturing sectors to a diversified economy. Technology and jobs resulting from the freshwater resources of the state provide a solid platform for potential growth.

National and Wisconsin Sea Grant Goals

- An environmentally literate public that is informed by lifelong formal and informal opportunities that reflect the range of diversity of the nation's coastal communities.
- A diverse and skilled workforce that is engaged and enabled to address critical local, regional and national needs.

Anticipated Outcomes for Wisconsin and the Great Lakes Region

- Wisconsin communities are knowledgeable and equipped with the best available science and technology in order to contribute to adaptive management planning processes and stewardship.
- Teachers and students are better informed in science, technology, engineering and mathematics fields and can employ their knowledge to support sustainable practices within their communities throughout Wisconsin.
- Stakeholders develop a sense of awareness, understanding and stewardship in order to sustain watershed, coastal and freshwater ecosystems and resources.
- Communities implement sustainable strategies when managing Wisconsin's natural resources and make decisions based on information acquired through informal science education.
- All members of a community are enabled to explore and pursue the variety of occupations that are essential to sustain the state's coastal communities and ecosystems.
- College-level courses, internships and fellowships provide increased literacy, experience and preparedness in all areas of watershed, coastal and freshwater ecosystems for all students, with a particular focus on those from under-represented groups.
- Undergraduate and graduate students, particularly those from under-represented groups, are supported and have access to formal and experiential learning, training and research experiences.
- Employment in all sectors of the U.S. marine and freshwater resources enterprise expands and diversifies.

- The existing and future workforce is able to adapt and thrive in changing environmental, social and economic conditions.

Wisconsin Strategies

- Support research that will provide robust data about the current level of Great Lakes and water literacy in Wisconsin students to serve as a foundation for future education efforts in the state.
- Work with education partners to promote Great Lakes literacy principles within formal and informal learning environments.
- Develop pre-K-12 resources that address the Great Lakes literacy principles and support state and national educational standards.
- Support education projects that incorporate innovative technologies or practices in Great Lakes education.
- Support a graduate student and post-graduate fellows program to provide emerging professionals with opportunities to practice stakeholder engagement and actionable science and to connect them with the full range of Sea Grant activities and Great Lakes-related employment opportunities.
- Support research projects that engage and train graduate and undergraduate students and lifelong learners about Great Lakes and marine resources.
- Promote the intersection of the arts, sciences and humanities to inspire a science-informed society.
- Promote place-based learning as a way to engage citizens in local stewardship.
- Identify and promote Great Lakes-related career pathways in Wisconsin.

Projects

Deeper Under the Surface: An Underwater Photography Program for Coastal, Tribal and At-Risk Youth Bridges the Arts and Sciences to Foster Strong Community Connections to Wisconsin Great Lakes

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Ian Karl, Northwest Passage
Ben Thwaits, Northwest Passage

Underwater photography brings the beauty and function of aquatic systems to light. In Under the Surface, we teach under-represented and at-risk youth the art and science of underwater photography in Wisconsin's Great Lakes watersheds. The stories of exploration, healing and discovery of Lake Superior and related systems simultaneously give voice to our most vulnerable youth and our waters. Additionally, basing classroom science programs on student-driven inquiry has brought a natural resources perspective and ecological thinking to populations that have not succeeded in a traditional classroom environment. With the power and validity of our programming model firmly established in previous projects, we aim to deepen the educational and therapeutic impact for participants, deliver programming to more groups, share curricula with more schools, and further connect the public to our waters and our youth. E/ELWD-10

Rivers2Lake: Mentoring Teachers to Integrate Great Lakes Literacy

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Tony Janisch, Bad River Watershed Association

Over five years, the Rivers2Lake Education Program, a foundational program at the Lake Superior National Estuarine Research Reserve, has built a community of educators dedicated to sharing the Great Lakes with their students. Rivers2Lake teachers engage PreK-12 students in outdoor and inquiry-based learning through mentoring, with the effects of the program lasting well beyond their year of participation. By partnering with the Superior Rivers Watershed Association, the National Park Service and the Bayfield,

Ashland and South Shore school districts, the program now reaches much of the Lake Superior shore of Wisconsin. Building collaborative relationships with teachers and schools is at the center of Rivers2Lake. Professional mentors at the reserve and Superior Rivers meet with enrolled teachers at least twice per month, collaborate on curriculum, plan field experiences, co-teach in their classrooms and often provide assistance to alumni teachers as well. E/ELWD-11

Earth Partnership Indigenous Arts and Science: Indigenizing Water Stewardship
Cheryl Bauer-Armstrong, UW-Madison, (608) 262-5264, cherylbauer@wisc.edu
Building on a successful model for engaging Native American youth in meaningful culturally based science learning, project partners are committed to deepening learning experiences unique to the Red Cliff community by integrating scientific data and ecological knowledge from the reservation and Ceded Territory into scientific lessons and involving students in the process. Native youth will participate in a year-round for-credit field course, including watershed investigations and monitoring to assess and address threats to water quality on Red Cliff land. Students will identify and implement water stewardship projects and share their data and experiences with peers in multiple classrooms and in the community. Community members, youth and teachers will participate in seasonal events to strengthen school-community relationships. This project is a partnership with the Red Cliff Band of Lake Superior Chippewa, the Great Lakes Indian Fish and Wildlife Commission and the School District of Bayfield. E/ELWD-14

Outreach

Improve Environmental Literacy of Lake Michigan Coastal Communities (Peroff) – Sea Grant has developed a variety of educational programs for students and teachers. Social science tools and theories are often needed to better understand stakeholders with diverse cultural backgrounds, beliefs and values, and to learn how to effectively engage them in solving complex water problems. Combined with outreach and community engagement, social science tools, methods and theory will be used to both assess and improve environmental literacy and, in effect, build capacity and environmental stewardship among coastal communities. A/AS-1

Promote Environmental Justice in Wisconsin's Coastal Communities (Peroff) – Sea Grant is initiating projects and outreach efforts to increase access to and responsible use of coastal resources and opportunities among disenfranchised communities — ensuring water-related risks do not negatively affect one group over another. Social science tools and theory can be applied to local or regional environmental justice projects and may overlap with subjects such as water safety, tourism/recreation, response to severe weather and disasters, water quality, traditional ecological knowledge and others. A/AS-1

Great Lakes Education Collaboration and Coordination in Wisconsin (Kline) – Sea Grant's education outreach specialist supports outreach activities and coordinates peer-reviewed education project grant funding as part of Sea Grant's biennial requests for research proposals. These activities track closely with other NOAA programs in the state, as well as other Wisconsin education partners, to coordinate activities, priorities and leverage funds for Great Lakes education in order to increase Great Lakes literacy. A/AS-1

Coordination of Wisconsin Participation in the Center for Great Lakes Literacy (Kline, Moser, Gen) – The Center for Great Lakes Literacy (CGLL) is building upon the framework of the Great Lakes Literacy Principles, with a vision to develop a Great Lakes-literate public capable of effectively contributing to the environmental, economic and social sustainability of the Great Lakes. Signature CGLL offerings include annual Great Lakes Shipboard Science workshops aboard the EPA's *R/V Lake Guardian;* webinars and social media postings featuring Great Lakes issues; land-based watershed workshops that facilitate strong community-school partnerships resulting in action-oriented stewardship and restoration activities; Great Lakes Awareness Day events for the public at prominent educational institutions — aquariums, zoos, museums, etc.; Limno Loan Program for Hydrolab water-quality monitoring equipment; Educator Day at the International Association for Great Lakes Research Conference; and citizen science and other volunteer activities that create opportunities for adults to become involved in watershed restoration. A/AS-1

Great Lakes Education in the Wisconsin Idea (Kline) – The foundation of Wisconsin's public university system is the "Wisconsin Idea," the premise that knowledge gained on state campuses should be shared with all state citizens to improve their quality of life. Sea Grant partners with a wide variety of University of Wisconsin and other outreach programs to support K-12 and public enrichment programs. A/AS-1

Pre-K Through Gray Education (Moser) – Sea Grant provides programming in formal and informal learning environments to help create a Great Lakes-literate society through the Wisconsin Water Library and outreach programming, reaching all levels of learners. A/AS-1

Arts, Sciences and Humanities (Moser) – Sea Grant is fostering an interdisciplinary collaboration among water science, the arts and humanities, sponsoring public events connecting the disciplines. A/AS-1

Library Collections and Outreach (Moser) – The Wisconsin Water Library preserves water-related publications in both print and digital format. Historical records maintained by libraries are vital in order to preserve past research and data that are necessary for sound decisions. A/AS-1

Index of Project Investigators

Sea Grant Fellowships/Scholarships

Dean John A. Knauss Marine Policy Fellowship

seagrant.noaa.gov/knauss

Contact: James P. Hurley, director, University of Wisconsin Sea Grant Institute, (608) 262-0905

This competitive program provides an opportunity for one-year expenses-paid internships with a federal legislator or an agency in the Washington, D.C., area. Twenty-four Wisconsin students have been among those selected for Knauss fellowships since 1982.

Sea Grant/NOAA Fisheries Graduate Fellowship

seagrant.noaa.gov/NMFS-SG-Fellowship

This program in population dynamics and marine resource economics was established by NOAA Sea Grant and NOAA Fisheries for Ph.D. candidates who are interested in either of these two disciplines.

Great Lakes Commission/Sea Grant Fellowship

glc.org/about/scholarships-fellowships

Contact: James P. Hurley, director, University of Wisconsin Sea Grant Institute, (608) 262-0905

A successful fellow will work with members of the Great Lakes' science, policy and information/education communities to advance the environmental quality and sustainable development goals of the Great Lakes states.

J. Philip Keillor Wisconsin Coastal Management – Sea Grant Fellowship

go.wisc.edu/7x4056

Jennifer Hauxwell, assistant director for research and student engagement, University of Wisconsin Sea Grant Institute, (608) 263-4756

Named in honor of longtime Wisconsin Sea Grant Coastal Engineer J. Philip Keillor, this one-year opportunity provides on-the-job education and training opportunities in coastal resource management and policy.

Carl J. Weston Memorial Scholarship

go.wisc.edu/k25679

Contact: Terri Liebmann, assistant director for operations, University of Wisconsin Sea Grant Institute, (608) 262-0905, terri@aqua.wisc.edu

The Carl J. Weston Memorial Scholarship was established in 1995 to aid undergraduate students working on Wisconsin Sea Grant-supported projects. Funding source: Dr. and Mrs. Carl B. Weston.

Useful Websites

University of Wisconsin Sea Grant Institute
seagrant.wisc.edu

Funding Opportunities
seagrant.wisc.edu/home/ProjectsandFunding/Funding.aspx

Current and Past Projects
seagrant.wisc.edu/home/ProjectsandFunding/Funding.aspx

NOAA National Sea Grant
seagrant.noaa.gov

Aquatic Sciences Chronicle

aqua.wisc.edu/chronicle

Published four times a year, this newsletter reports on the activities of Sea Grant and its complementary program, the University of Wisconsin Water Resources Institute. Visit the website to review current and past issues, and sign up for free delivery, either in print or electronically.

Sea Grant Publications

aqua.wisc.edu/publications

This well-stocked virtual publications center offers dozens of items for free download or at a reasonable cost to cover their production and shipping. Find fact sheets, fish recipes, posters, books and maps.

Social Media Channels

seagrant.wisc.edu

Visit the Sea Grant home page and look for the links to many social media channels, including Twitter, Flickr, Facebook, YouTube and the blog Great Lakes Takes. It's a convenient way to connect, get program updates or access information in alternate formats like video or audio podcasts.

Wisconsin's Water Library

waterlibrary.aqua.wisc.edu

This library contains more than 30,000 volumes of water-related information, with particular emphasis on Wisconsin and Great Lakes issues. Any state resident can access and benefit from the collection.

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