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**2012-14 DIRECTORY OF
PROJECTS AND PEOPLE**
University of Wisconsin Sea Grant Institute



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University of Wisconsin Sea Grant Institute

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 32 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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MADISON

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From the Director

WISCONSIN SEA GRANT embodies the true spirit of the Wisconsin Idea. For 100 years, this has been a core value at the University of Wisconsin-Madison. Its premise is that the benefits of research move beyond the boundaries of campus to serve the state, nation and world.

We fund cutting-edge research on the University of Wisconsin System's flagship campus, and on the state's wealth of other public campuses and private institutions of higher education. These crucibles of discovery provide evidence-based models and tools. Our corps of outreach advisory specialists and communications professionals then extend the benefits to Wisconsin communities, and beyond.

The 30 new research projects and 22 outreach projects included in this *2012-14 People and Project Directory* provide a comprehensive approach to science for the sustainable use of Great Lakes resources. More than of 100 faculty, staff and students at Wisconsin campuses are represented.

The strength of the projects rests on the promise and prowess of Wisconsin's academic excellence and track record of top-flight research. The success of the outreach and communications efforts comes in the transfer of that science.

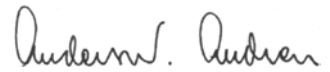
We also leverage our resources with two other programs to support regional research initiatives: The Lake Michigan Section of the Great Lakes Regional Research Information Network with Illinois-Indiana Sea Grant; and the Special Joint Request for Proposals Relating to the St. Louis River Estuary and/or Lake Superior, with

Minnesota Sea Grant. We gain further efficiencies when we collaborate with external partners such as the U.S, EPA, the Army Corps of Engineers and state agencies.

All 2012-14 projects are aligned with a strategic national plan crafted by the National Oceanic and Atmospheric Administration's National Sea Grant College Program and responsive to the specific needs within Wisconsin as laid out in the Wisconsin Sea Grant 2010-14 Strategic Plan. In addition, all research projects were reviewed via a rigorous mail peer-review process. All research proposals were then further reviewed and scored by an external technical review panel. The peer-review process was conducted in strict accordance with National Sea Grant Office guidelines, and representatives of the UW Sea Grant Advisory Council and our program officer from the National Sea Grant Office observed the technical panel proceedings.

We look forward to these benefits, which amplify the Wisconsin Idea:

- A greater understanding of our Great Lakes ecosystems and their improvement
- New ways to enhance the fisheries production-value chain
- Enriched coastal assets
- The means to address coastal vulnerabilities in the face of hazards.


Anders W. Andren, Director

Participating Institutions and Agencies 2012–14

University of Wisconsin Sea Grant Institute

Association of State Floodplain
Managers

Cornell University

East Carolina University

Eastern Michigan University

Illinois Natural History Survey

Michigan State University

Minnesota Department of Natural
Resources

NOAA Climate Program Office

NOAA Coastal Services Center

NOAA Great Lakes Environmental
Research Laboratory

NOAA National Ocean Service

Ohio State University Extension

Oregon Coastal Management
Program

Oregon State University

Pennsylvania State University

Purdue University

St. Norbert College

State University of New
York-Brockport

State University of New York-Oswego

State University of New
York-Plattsburgh

The Ohio State University

U.S. Army Corps of Engineers

U.S. Environmental Protection
Agency

U.S. Geological Survey

University of Illinois at
Urbana-Champaign

University of Michigan

University of Minnesota-Twin Cities

University of Minnesota-Duluth

University of Wisconsin-Extension

University of Wisconsin-Green Bay

University of Wisconsin-Madison

University of Wisconsin-Manitowoc

University of Wisconsin-Milwaukee

University of Wisconsin-Oshkosh

University of Wisconsin-Stevens Point

University of Wisconsin-Superior

University of Wisconsin System

Wisconsin Coastal Management
Program

Wisconsin Department of Natural
Resources

Wisconsin Department of Tourism

Wisconsin Department of
Transportation

Wisconsin Historical Society

Wisconsin State Laboratory of
Hygiene

Improve Great Lakes Ecosystem Health

National Sea Grant Goals:

- Sound scientific information to support ecosystem-based approaches to managing the coastal environment.
- Widespread use of ecosystem-based approaches to managing land, water and living resources on our Great Lakes coasts.
- Restored function and productivity of degraded ecosystems.

Wisconsin Sea Grant Needs:

Aquatic Invasive Species (AIS)

- To know why some water bodies are prone to invasion by nonnative species while others are not.
- Assessments of the near- and long-term effects of AIS on Great Lakes food webs, nutrient and contaminant transport, and the economic impacts of AIS on Wisconsin.
- A greater array of tools to deal with AIS control and management, including ballast water treatment technologies.

Water Quality

- To understand the sources, transport and fate of bacterial and viral pathogens and chemical contaminants in the Great Lakes; know the risks they pose to people and wildlife; and have tools and techniques to address these risks.
- Methods to address the problems the nuisance alga *Cladophora* causes for coastal communities, lakeshore power plants, beach goers and other Lake Michigan water users.

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- Methods to address nonpoint-source phosphorus inputs and other nutrient issues in Green Bay and Lake Michigan.
 - Techniques to reduce the adverse water quality impacts associated with Great Lakes marinas, ports and other lakeshore facilities.

Ecosystem Assessments

- To improve the design, function and assessment of coastal habitat rehabilitation restoration and remediation projects.
- Improved models of Lake Michigan and Lake Superior food web dynamics.
- To know the bioenergetics, trophic status and food web relationships of noncommercial and non-recreational fish species in Lake Michigan.
- Better knowledge of physical, chemical, biological and geological coupling and the current status and trends of nutrient inputs to Lake Michigan and Lake Superior during extreme precipitation events and other processes at the land-water interface.
- To understand the potential ecosystem effects of long-term low water levels for Lake Superior and Lake Michigan.
- An ability to monitor nearshore sedimentation and bathymetry

Education and Outreach

- Managers and the public who have up-to-date information on ecosystem change trends and insights that lead to adaptive management.
- Identification of critical coastal habitats and information leading to habitat protection and rehabilitation.

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- Shoreland property owners and local officials who know the value of coastal habitats and how to protect, restore and manage them.
 - To develop and implement a program to address water quality impacts in Wisconsin ports and harbors.

Healthy ecosystems are the foundation for life along the coast. However, increasingly rapid coastal development and other human activities are causing water-quality degradation, declining fisheries, wetlands loss, the proliferation of invasive species and a host of other challenges that need to be understood in order to restore and maintain these ecosystems. Ecosystem functioning does not respect traditional political boundaries, and responsible management of ecosystems requires new kinds of thinking and actions. Sea Grant is a leader in multidisciplinary, regional approaches to understanding and maintaining healthy ecosystems, identifying information gaps, setting research priorities, and coordinating information and technology transfer to those who need it. Wisconsin Sea Grant has fostered efforts to address statewide problems such as invasive species and water-quality issues and has staff specialists dedicated to tackling these problems. Sea Grant's regional consortia and networks and international contacts are particularly well suited to helping Wisconsin address ecosystem health at the state and regional level. Nowhere is an understanding of the linkages between terrestrial and aquatic environments more critical to resource quality, sustainability and management than in the Great Lakes region. With nearly 9,500 miles of shoreline, the Great Lakes are aquatic systems dominated by their coastal watersheds. Ensuring the health of the ecosystems of the Great Lakes and their vast watersheds is vital to ensuring the health of the residents of these basins.



Projects

Target Organ Toxicity and Blue Sac Syndrome

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Exposure of fish larvae to various chemicals causes blue sac syndrome, a cause of mortality in fish larvae in the lab and in the wild. This research will test the hypothesis that a birth defect involving the heart called “hypoplastic heart failure” causes the syndrome. This research project will test AhR2 agonists and non-AhR2 agonists for their ability to cause hypoplastic heart failure in zebrafish larvae. Results will help us understand the underlying cause of chemical-induced blue sac syndrome and recruitment failure in Great Lakes lake trout. Hatchery managers who encounter blue sac disease in hatchery stocks and aquatic toxicologists will find the results useful to better understand and evaluate the impacts of chemical exposure on feral populations. Ultimately, chemicals determined to cause hypoplastic heart failure in zebrafish may be useful in identifying heart teratogens that women may be exposed to during pregnancy that threaten the life of a fetus. [R/BT-25](#)

Influence of Regional Mercury Sources on Lake Michigan Tributaries: A 15-Year Comparison

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Fifteen years have passed since the completion of the first Lake Michigan Mass Balance Study by the U. S. Environmental Protection Agency (EPA), and during that period both industrial use and atmospheric emissions of mercury have been reduced in the Great Lakes Basin. Given the magnitude of these reductions, and new information on the residence time of mercury in aquatic ecosystems, the investigator believes a similar decrease in mercury loading has occurred in the tributaries of Lake Michigan. This project will coordinate with the 2010 EPA lakewide sampling of Lake Michigan as well as a proposed intensive on-lake mercury sampling by the U.S. Geological Survey through its proposed Great Lakes Restoration Initiative Project. [R/HCE-02](#)

Alteration of Nutrient Cycling and Food Web Structure by Profundal Quagga Mussels in Lake Michigan

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Since the mid-1990s, quagga mussels have been displacing zebra mussels in Lake Michigan. Although the effects of zebra mussels in the nearshore zone have been well studied, the quagga mussel has spread into the profundal region, and there has been virtually no assessment of profundal mussels' effects on nutrient cycling or food web dynamics in Lake Michigan. The objective in this Wisconsin-Illinois cooperative effort is to determine the role of the deepwater quagga mussel community in Lake Michigan's energy flow pathways and nutrient cycling. The project's main goals are: 1) to quantify plankton consumption by the mussels, 2) to quantify their phosphorus recycling, 3) to assess the impact of mussels on food supply to higher trophic levels and 4) to implement a hydrodynamic/biogeochemical model, with the specific goal of simulating the water column response to C and P dynamics within the benthic boundary layer.

R/HCE-02-10

Physical and Biological Processes Associated With Resuspension of Contaminated Sediments in the Sheboygan River Estuary

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Chin Wu, UW-Madison, (608) 263-3078, chinwu@engr.wisc.edu

Many persistent contaminants, such as PCBs, are strongly associated with smaller, fine sediments in the Great Lakes. This is particularly important in the lakes, rivers and estuaries, where sediments are subjected to resuspension, scouring and effects associated with varying water levels. This project will conduct field experiments at the estuary of the Sheboygan River, one of the "areas of concern" identified by the U.S. Environmental Protection Agency and the Wisconsin Department of Natural Resources, to quantify and compare several important forcing terms for sediment resuspension, including episodic storms, high-frequency lake seiches and snow-melt discharge. Using state-of-the-art imaging techniques, researchers will observe the response of mussels to suspended sediments through the measurement of particle fluxes both in the laboratory and in situ. Researchers will also evaluate to what extent the mussel filtration can alter the redistribution of contaminated sediments. R/HCE-03

Modeling the Interactive Effects of Dreissenid Invasion and Nutrient Loading on Autotrophic and Food Web Structure in Green Bay, Lake Michigan

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The introduction of zebra and quagga mussels has had a dramatic economic and ecological impact on lake ecosystems due to their remarkable ability to change primary productivity. Most research has focused on the open-water system, but this new research project will examine the impacts of mussels on primary production in bottom- and open-waters across the variable nutrient-enriched gradient of Green Bay and study the impacts across the aquatic food web. The researcher will measure primary productivity across the trophic gradient of the mussel-invaded Green Bay; use productivity models to estimate the impact on primary productivity, including the nuisance alga *Cladophora glomerata*; examine how changes in nutrient and sediment loading will affect autotrophic structure; and use stable isotopes to examine the trophic pathways supporting fish. [R/HCE-05](#)

Multigenerational Effects of Sublethal TCDD on Fish Reproduction and Development

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Richard Peterson, UW-Madison, (608) 263-5453, repeterson@pharmacy.wisc.edu

Studies of AHR agonists in fish using the prototype chemical 2,3,7,8

Tetrachlorodibenzo-p-dioxin (TCDD) have focused on lethality. This project will study the effect of brief exposure to TCDD at parts per trillion concentrations during early zebrafish development on the health and reproduction of adults and subsequent generations. Preliminary results show skeletal malformations and reproductive defects in the adults exposed in early life. Sex reversal, in which fish develop with male gonads and female bodies, is also observed. These effects severely impact population maintenance. These investigators recently discovered that TCDD represses the *sox9b* gene in zebrafish. Humans carrying *sox9* mutations have defects in skeletal formation and exhibit male-to-female sex reversal in which XY males appear to be female. The researchers aim to characterize the skeletal abnormalities caused by TCDD, identify the cause of the sex reversal and determine whether TCDD exposure during development produces adverse effects in subsequent generations. [R/HCE-06](#)

Linking Primary Production and Fish Along the Trophic Gradient in Green Bay, Lake Michigan

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Lake productivity has long referred to the productivity of the pelagic, open-water zone, but recent work indicates that bottom habitats may also be important contributors. Additionally, the ongoing spread of Dreissenid mussels in North America generally increases the importance of benthic production and processes in lakes. In this project, researchers define lake autotrophic structure as the distribution of the overall primary production between benthic and pelagic habitats. They propose to quantify changes in autotrophic structure along Green Bay's dramatic trophic gradient (ranging from hyper-eutrophic to oligotrophic) and use their field data to parameterize models estimating how changing Dreissenid grazing, nutrients and suspended sediments might be expected to affect autotrophic structure. They will also use stable carbon and nitrogen isotopes on contemporary fish and invertebrate samples, as well as archived scale samples, to test the hypothesis that the carbon sources underlying fish production track autotrophic structure across Green Bay's trophic gradient. [R/HCE-07](#)

Dreissenid Impacts on Nearshore Carbon and Phosphorus Dynamics in Lake Michigan

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The development of management goals and strategies for Lake Michigan relies on conceptual and numerical models that reliably simulate critical ecosystem processes. In the past decade, it has become apparent that these models require revision because of fundamental changes that have occurred in nutrient dynamics and energy flow. A number of these changes, including the decline of offshore plankton and invertebrate densities and the excessive growth of nuisance algae in the nearshore, have been attributed to the effects of filter-feeding Dreissenid mussels in the nearshore zone. Yet the mechanisms by which mussels influence energy and nutrient flow remain more conjectural than proven, leaving managers and policy makers without reliable models. This project will combine measurements of physical and biogeochemical processes in the Lake Michigan nearshore zone to quantify and model critical carbon and phosphorus fluxes, with an emphasis on the role of Dreissenids in mediating these fluxes. [R/HCE-09](#)

Living on the Edge: The Role of the Microbial Community at the Sand-Water Interface in Degraded Beach Water Quality and Ecosystem Health

Sandra McLellan UW-Milwaukee (414) 382-1700, mclellan@uwm.edu

Indicators of fecal pollution of beaches include *E. coli*, used historically in the Great Lakes, and Enterococci. Past studies demonstrate that sand acts as a reservoir for *E. coli*, which hampers beach-monitoring programs by introducing these bacteria into beach water in the absence of a primary source of fecal pollution. This project will evaluate the persistence and potential for growth of Enterococci in sand, especially compared with new alternative indicators such as Bacteroides sp. and Lachnospiraceae sp. The researchers will use culture and qPCR detection methods to discriminate between viable cells in sand reservoirs or accumulation of nonviable cells that are detected with DNA-based methods. They will also examine the role of the microbial community in excluding fecal bacteria and evaluate microbial community structure at contaminated and non-contaminated beaches. Microbial community structure may serve as an overall “indicator” for beach ecosystem health. [R/HCE-10](#)

Interactions Between Dreissenid Mussels and River Sediment Plumes After Resuspension in the Coastal Area Around Sheboygan Harbor

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Chin Wu, UW-Madison (608) 263-3078, chinwu@engr.wisc.edu

The presence of invasive zebra and quagga mussels in coastal areas of the Great Lakes may have a fundamental effect on the transport and redistribution of contaminants among the sediments, water column and biota because mussels are capable of removing a large amount of suspended particulates through filter feeding. This project will evaluate the interactions between the mussels in the coastal water near the Sheboygan Harbor and the river plume resulting from resuspension due to physical forcing and human disturbance (during and after dredging). State-of-the-art field instruments will be deployed to quantify the transport and deposition of contaminated sediment plume after resuspension. The exchange rate of suspended sediment particles between the water column and the benthic community colonized by Dreissenid mussels will be measured and calculated. Data will be used to validate hydrodynamic-biogeochemical numerical models with the purpose of facilitating the assessment of ongoing and future remediation efforts. [R/HCE-11](#)

Changing Benthic Metabolism in the Great Lakes (FY13 Start)

J. Val Klump, UW-Milwaukee, (414) 382-1700, vklump@uwm.edu

The Great Lakes have experienced arguably the largest short-term ecological shift in their history within the last decade and face a long-term climate shift in the decades to come. The invasion of Dreissenid mussels, the disappearance of Diporeia, and the predicted increasing temperatures and lengthening stratification have altered and will alter the role of benthic metabolism. The nearshore habitat is a complex of newly colonized cobble, gravel, hard clay and silty sands. Deepwater bottoms have been overrun with mussels. Production and respiration of oxygen are notoriously difficult to measure in such environments since many of the common methods—oxygen and pore water gradients, sediment or chamber incubations—all have limitations. The researchers propose to employ new, nondisruptive eddy correlation techniques to study oxygen exchange at the benthic boundary in a range of Great Lakes environments that have undergone or will undergo significant change. [R/HCE-12](#)

Assessment of Beach Remediation Efforts at Select Lake Michigan Beaches (FY13 Start)

Gregory Kleinheinz, UW-Oshkosh, (920) 424-1100, kleinhei@uwosh.edu

Water quality at more than 30 public beaches in Door County, Wis., has been monitored under the BEACH Act since 2003, using the fecal indicator bacterium (FIB) *Escherichia coli* (*E. coli*). Although sanitary survey analyses of these beaches have been performed and several beaches have been redesigned, assessment of the effects of beach redesign on water quality has not been included. This research will assess water-quality parameters (*E. coli* and Enterococci) during wet and dry weather at a newly redesigned Door County beach and a similar beach that has not yet been redesigned. A large historical database of FIB concentrations in beach water exists for these beaches and will be compared to post-redesign FIB concentrations. Since the U.S. EPA plans to implement rapid methods for beach water-quality measurements (qPCR for Enterococci), this study also will compare Enterococci concentrations with traditional culture and molecular methods. [R/HCE-13](#)

Stressor Gradients and Spatial Narratives of the St. Louis River Estuary (with Minnesota Sea Grant)

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The Wisconsin portion of this project will develop communication and education tools, including an open geospatial archive, a “deep map” that incorporates vignettes of local communities, augmented reality games and geo-tours of the estuary, ship-based activities and a diverse array of complementary online resources. Results of this project coupled with the monitoring and spatial narratives constructed from Minnesota research will guide implementation of the St. Louis River Habitat Plan; help prioritize monitoring, restoration and remediation activities; and enhance public awareness and understanding of estuaries in coordination with the development of the Lake Superior National Estuarine Research Reserve. [R/RegHCE-08-10](#)

Landscape Regulators of Biogeochemical Pattern and Process in the Saint Louis River Estuary (with Minnesota Sea Grant)

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Despite the importance of the St. Louis River Estuary in supporting fisheries, harboring unique ecological communities, delivering water and materials to Lake Superior and bolstering the regional economy, the biogeochemical processes that support this ecosystem are poorly known. In this study, researchers will conduct a spatially explicit characterization of biogeochemical processing rates within the estuary under high- and low-flow conditions. First, they will identify spatial and seasonal hotspots of nutrient and organic matter processing by combining longitudinal surveys of water chemistry with results from a dynamic estuary model. Second, they will characterize dissolved organic matter quality and rates of primary production and respiration at a series of stations along the estuary. Third, they will measure potential denitrification rates and controls at sites throughout the estuary. This will provide a baseline understanding of the biogeochemical processes supporting the estuarine ecosystem and identify the role of anthropogenic stressors in altering these rates. [R/RegHCE-09-12](#)

Constructing the Nearshore Lake Michigan Food Web Using Multiple Trophic Indicators (with Illinois/Indiana Sea Grant)

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Food web studies in Lake Michigan have focused primarily on the pelagic food web, due to the significant role of pelagic fishes in both commercial and sport fisheries. The trophic ecology of several nearshore species, particularly yellow perch, has received attention, but the nearshore food web as a whole is not well studied. In many parts of the lake, the nearshore fish community has changed from one composed of a mixture of species with moderate numbers to one dominated by high densities of the round goby, whose trophic role is not well understood. This project will use a combination of three methods—stomach content analysis, fatty acid analysis and stable isotope analysis—to construct the nearshore food web and assess how it varies with substratum and location. Results will be used to determine how individual species have responded to change in community structure and energy flow. [R/RegHCE-4](#)

Constructing the Nearshore Lake Michigan Food Web Using Multiple Trophic Indicators: Expansion Phase (with Illinois/Indiana Sea Grant)

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Outreach

Green Marina Outreach and Education (Harris/Clark) – This three-year project is in partnership with Michigan Sea Grant and Clean Marina Program managers in other Great Lakes states. Specialists Harris and Clark will develop online curriculum, deliver training through seminars and other public events, and formulate program evaluation tools. Funding source: Great Lakes Restoration Initiative. [A/GLRI-1](#)

Beach Information Communication System (Clark) – This three-year project is in partnership with Minnesota and Michigan Sea Grant. Specialist Clark will develop a beach information system where Great Lakes beach users will have immediate access to an unprecedented amount of data about beaches, including bacteria monitoring, harmful algal blooms, wave heights, water temperature, weather data and rip current forecasts. All of these pieces of information can help beach users decide if today's the right day to go to the beach, but nowhere is all of this information synthesized in one place. This project will bring these disparate sources of information together into a single "beach report" that users can sign up to receive in any of a multiple of formats. Examples of potential formats include Twitter notices, RSS feeds, email alerts and Facebook notices. Funding source: Great Lakes Restoration Initiative. [A/GLRI-2](#)

Enhance Coastal Community Sustainability/Resilience

National Sea Grant Goals:

- Healthy coastal economies that include working waterfronts, an abundance of recreation and tourism opportunities, and coastal access for all citizens.
- Coastal communities that make efficient use of land, energy and water resources and protect the resources needed to sustain coastal ecosystems and quality of life.
- Coastal citizens, community leaders, and industries that recognize the complex inter-relationships between social, economic and environmental values in coastal areas and work together to balance multiple uses and optimize environmental sustainability.
- Widespread understanding of the risks associated with living, working and doing business along the nation's coasts.
- Community capacity to prepare for and respond to hazardous events.
- Effective response to coastal catastrophes.

Wisconsin Sea Grant Needs:

Sustainable Development

- To know the effects shoreline structures have on coastal habitat.
- Techniques to predict and prolong the life of coastal infrastructure.
- State-of-the-art “Smart Growth” coastal development planning tools that are user friendly and accessible to planners and decision makers.
- Technologies to provide ready access to ecosystem-based Great Lakes information for local, tribal, state and federal decision makers.

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- Remote sensing data to improve our understanding of the physical, chemical, biological and geological coupling at the land-water interface and make these improved data access and visualization technologies available to decision makers.
 - A Great Lakes Observing System and decision-support tools for Great Lakes resource managers and coastal planners.

Sustainable Economies

- Determination of the value of Great Lakes and coastal businesses, property, infrastructure and facilities.
- Ability for waterfront businesses to remain financially viable while satisfying state and federal environmental regulations related to protecting the Great Lakes and coastal ecosystems.
- Offshore wind energy and other forms of alternative energy in Great Lakes and coastal environments, communities and ecosystems.
- Energy conservation and alternative energy sources for water-based businesses, lake-shore industries and coastal communities.

Resilient Communities

- To know what causes extreme changes in Great Lakes water levels, the economic impacts of these changes and their effects on coastal infrastructure and coastal communities.
- To know what effect climate change will have on stormwater hydrology and the potential effects on coastal communities and Great Lakes industries.

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- GIS, visualization technology, computer-aided designs and other technologies to assess and reduce the risks of coastal erosion, storm wave run-up and other natural hazards to coastal structures.

Education and Outreach

- Marina and harbor operators who can adapt to changing lake levels and infrastructure impacts associated with climate change
- Integration of habitat protection and rehabilitation into coastal development plans and infrastructure design.
- Local and tribal government officials who are aware of the ecosystem effects of urban areas and development in coastal watersheds and who know how to integrate land use planning, zoning and future development planning for environmentally safe, sustainable economies.
- Information about the effects of climate change on Great Lakes coastal erosion, storm-water hydrology, water quality and wave run-up so that Great Lakes users can improve public safety through greater awareness of Great Lakes hazards.

Wisconsin's coastal communities provide economic, social and recreational opportunities for millions of Americans, but decades of population growth have transformed our coastal landscapes and intensified demand on finite coastal resources. The increase in population has resulted in new housing developments and recreation facilities, a new generation of energy development activities, port expansions and a growth in business activities.

These changes are placing tremendous pressure on coastal lands, water supplies and traditional ways of life. To accommodate more people and activity, and to balance growing demands on coastal resources, we must develop new policies, institutional capacities

and management approaches to guide the preservation and use of Great Lakes resources. Wisconsin Sea Grant helps our diverse and growing coastal population apply the best available scientific knowledge and uses its extension and education capabilities to support the development of healthy coastal communities that are economically and socially inclusive, are supported by diverse and vibrant economies, and function within the carrying capacity of their ecosystems.

Economic growth since 1950 has increased the urbanization of Great Lakes coastal areas—with corresponding increases in pollution and environmental degradation. Great Lakes urban shorelines have significant appeal, as evidenced by the demand for recreational, business and residential developments near the water. Communities and the state must balance economic and environmental values, manage the impacts of stormwater runoff and waste disposal, and consider needs for transportation, recreation and commerce—all while maintaining the integrity of coastal ecosystems that provide critical habitat and nursery areas for native aquatic species.

Protecting the water quality of the Great Lakes is essential to the region and the nation. Millions of Americans depend on the Great Lakes for drinking water, and the lakes support multibillion-dollar fisheries, shipping/boating and tourism/recreational industries. Population growth and development pose an increasing threat to water quality from chemical contaminants and nutrient loading as well as increasing demand for Great Lakes water. We urgently need to develop and support management programs designed to protect and enhance the quality of this vital ecosystem. Sea Grant is developing new observational technologies and interpretive geospatial technology to help foster development of the Great Lakes Observing System. Our overarching goal is to help the Great Lakes region maximize its environmental remote sensing capabilities to provide critical, real-time data for a broad suite of users, including resource managers, researchers, homeland security interests, the commercial navigation industry and the recreational boating community.



Projects

Davidson's Goliaths: Documenting James Davidson's Remaining Vessels in Wisconsin and His Contributions to Naval Architecture

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From 1870 to 1903, the James Davidson shipyard in West Bay City, Mich., pushed the limits of wooden ship construction beyond anything the world had ever known. At a time when other shipyards had converted to iron and steel, Davidson continued setting new size records for wooden vessels. Four of Davidson's vessels have been archaeologically documented in Wisconsin; this project includes documenting the remaining two—the Australasia, which lies off Whitefish Dunes State Park, and the Adriatic, which lies within the city of Sturgeon Bay, Wis. Documentation of the Australasia will include constructing an interpretive display in partnership with Whitefish Dunes State Park. Documentation of the Adriatic will aid decision makers in development of the Sturgeon Bay waterfront while preserving an important historic vessel. Collected data will be used to evaluate and nominate both sites according to National Register of Historic Places criteria. [C/SCD-02](#)

An Economic Spatial-Dynamic Model of Great Lakes Coastal Development

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This continuing project is focused on two land development issues. First, it is looking at the effects of coastal (shoreline and nearshore) land use policies and management tools on the spatial dynamics of private subdivision. Second, researchers hope to provide local Great Lakes governments and planning agencies with GIS tools that can be combined with econometric models of the subdivision decisions of private landowners to create a dynamic, spatial forecast of the effect of various landscape policies and management options. [R/CC-01](#)

**The Wisconsin Coastal Atlas:
Building a Coastal Spatial Data Infrastructure for Wisconsin**

Stephen Ventura, UW–Madison, (608) 262-6416, sventura@facstaff.wisc.edu

Coastal web atlases have emerged as an important resource to help organize and present maps and data about coasts and make them more relevant to decision making about coastal management. The Wisconsin Coastal Atlas (WCA) will serve as the primary portal to geospatial data about the Lake Michigan and Lake Superior coasts of Wisconsin. It will be organized into four sections—maps, tools, learn and search. The primary Web-mapping interface will provide an overview of the Wisconsin coastal zone. A gallery of additional mapping interfaces will provide customized perspectives related to specific coastal issues. The atlas will allow users to search a catalog of coastal geospatial data. The catalog for the atlas will connect to distributed catalogs maintained by other data custodians, allowing discovery, assessment and download of a network of coastal geospatial data. In addition, the WCA will serve as a gateway to spatial decision support tools relevant to the Great Lakes and as a site to learn more about coastal issues and places. The research undertaken as part of this project will frame the WCA as an important building block of an eventual Great Lakes coastal atlas and will promote adaptive management of the Great Lakes at an ecosystem scale. [R/SCD-01](#)

Characterization of the Water Environment at the Apostle Islands, Lake Superior

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The Apostle Islands National Lakeshore on Lake Superior is a treasured landscape, popular recreation area and a sensitive ecosystem. The 21 islands constitute a complex and poorly understood water environment. The investigator plans to observe and model the water environment at the Apostle Islands 1) to better understand the processes by which dangerous extreme (freak) waves are generated in popular areas of the park, 2) to identify at three spawning sites in the region a turbulence threshold that facilitates egg development and 3) to develop “nowcasting” and forecasting models to aid park managers and visitors in wisely using this resource. This limnological research study has also received support from the National Park Service at the Apostle Islands National Lakeshore and various citizen groups. [R/SCD-03](#)

The Wisconsin Coastal Atlas as a Foundation for Effective Spatial Decision-Support Tools Addressing Great Lakes Management

Stephen Ventura, UW-Madison, (608) 262-6416, sventura@facstaff.wisc.edu

The Wisconsin Coastal Atlas (WCA) (wicostalatlantlas.net) provides access to maps, data and tools to support decision making about the Great Lakes. It builds on many years of collaboration between Wisconsin Sea Grant and the Land Information and Computer Graphics Facility at UW-Madison to leverage sizeable investments made by local governments in land information systems and apply geospatial technologies to the sustainable management of the Great Lakes. This second phase of the WCA will incorporate satellite imagery and open-water observations in order to: 1) communicate water quality trends in Green Bay, 2) reduce conflicts between recreational fishermen and trap nets in Lake Michigan, and 3) improve the safety of water sports on the Great Lakes. The project will develop and apply social-science methods to evaluate and improve the effectiveness of spatial decision support tools and establish a webinar series to promote the development of a Great Lakes Coastal Atlas Network. [R/SCD-04](#)

Geotools for Fostering Citizen Engagement and Understanding of the Socio-Environmental Complexities of Great Lakes Coastal Estuaries

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Spatial narratives have been framed as conceptual tools for synthesizing multiple forms of bioregional knowledge for community-based decision making and stewardship. While the spatial narrative has been useful in several research and outreach applications, it has not yet been truly operationalized as a digital “geotool” or evaluated for its utility for citizen engagement and spatial literacy. In this project, researchers are partnering with the Applications Prototype Lab of Esri, a global leader in geographic information systems solutions, to develop a spatial narrative geotool application that allows coastal community groups to form digital spatial narratives for their own estuary-based bioregions and place-based issues. The project will evaluate citizen experiences and engagement in coastal estuaries with the geotool through a social science research design. With new modes of place-based learning, social media and participatory decision making, spatial narratives could be valuable in advancing spatial literacy and thoughtful dialogue around environmental sustainability in coastal communities. [R/SCD-05](#)

Algal Bioremediation of Wastewater Inputs to Great Lakes Ecosystems (FY13 Start)

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Future sustainability of coastal communities demands a reduction of nutrients in effluents from wastewater treatment plants, and population growth is increasing pressure on communities' infrastructure to manage and treat wastewater. Algal species like *Cladophora* can tolerate and take up high concentrations of nutrients, and this can be exploited for nutrient remediation of wastewater. The researchers have already shown in laboratory tests that *Cladophora* can deplete sewerage effluent of soluble reactive phosphorus to <5 ug/L and also provide a good biomass feedstock for biofuels production, offering combined sustainability benefits for use in remediation of wastewater. This project aims to develop algal nutrient remediation of wastewater that will provide cost savings to coastal communities and offer more sustainable options to improve lake ecosystem health. [R/SCD-06](#)

Assessment and Evaluation of the NOAA Climate Services Portal

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Scientists, educators, decision makers and the general public turn to various sources for climate information. Investigators will conduct a literature review to determine the types of information sources. Guided by those findings, researchers will then design an evaluation tool and apply it to plumb the perceptions of the NOAA Climate Services Portal. Funding source: Supplemental grant from the NOAA Sea Grant Office. [A/AS-65](#)

Outreach

Climate Change Adaptation and Wisconsin's Coastal Communities: Connecting With Users (Moy/Hart/Clark) – Advisory Specialists Moy, Hart and Clark will work with coastal communities to inform planners and decision makers about the current science on climate adaptation. Moy, Hart and Clark served as co-chairs of the Coastal Communities Working Group of the Wisconsin Initiative on Climate Change Impacts, and they will collaborate with coastal communities, non-governmental organizations, and university, state and federal agencies to conduct a comprehensive needs analysis to determine climate impacts, vulnerabilities and possible adaptation plans. Funding source: Supplemental grant from the NOAA Sea Grant Office.

Great Lakes Observing System – Teaching with Great Lakes Data (Hart) – As part of the Great Lakes Observing System education activities, Sea Grant is enhancing the “Teaching with Great Lakes Data” lessons that utilize real-time observation data and models to promote to better understand waves and water safety. Funding source: Great Lakes Observing System.

Great Lakes Observing System – Adaptive Management Needs Assessment (Hart) – The Great Lakes Sea Grant Network is developing an adaptive management needs assessments for three priority user communities—public health managers, fisheries managers and ecosystem restoration professionals. Funding source: Great Lakes Observing System.

Climate Adaptation Implementation Assistance for Coastal Communities in Wisconsin and Minnesota (Hart/Schomberg) – This is a joint project of Wisconsin and Minnesota Sea Grant to provide climate adaptation implementation assistance for Great Lakes communities. A half-time climate adaptation specialist based at Wisconsin Sea Grant will focus on the Lake Michigan coast of Wisconsin through collaboration with the Wisconsin Initiative on Climate Change Impacts. A second half-time specialist based at Minnesota Sea Grant will focus on the Lake Superior coast of Minnesota and Wisconsin through collaboration with the Lake Superior National Estuarine Research Reserve. Funding source: Great Lakes Restoration Initiative.

Coastal Hazards Workshops (Clark/Hart) – This project is in partnership with the Wisconsin Department of Natural Resources (WDNR) Office of the Great Lakes and the Wisconsin Coastal Management Hazards Team to conduct a series of coastal hazard workshops for two specific audiences. The first audience included regional and county zoning administrators, building inspectors, and land and water conservation staff while the second audience will include WDNR water management specialists as well as zoning management specialists and basin supervisors. These workshops will educate these specific specialists to assist them in reviewing and permitting projects along the Great Lakes shorelines and to consider the impacts of future development projects. The goal of these workshops is to convey knowledge gained through experience, education and work of the Wisconsin Coastal Hazards Workgroup team.

Preparing Coastal Communities for Climate Change: Translating Model Results to Prepare Ports, Harbors and Stormwater Management Facilities in an Era of Climate Variability and Scientific Uncertainty (Clark/Hart) – This Great Lakes Sea Grant Network project involves two tasks: 1) the creation of economic tools or scalable models for evaluating the potential Great Lake economic impacts to navigation and port, harbor and marina infrastructure due to climate-induced variations and 2) the visualization of shoreline and water level change for three Great Lakes harbors based on updated climate change and lake level scenarios. Funding source: NOAA, Climate Program Office.

[A/AS-62](#)

Enhancement of the Wisconsin Coastal Guide (Hart) – The project enhances the Wisconsin Coastal Guide by completing a comprehensive inventory and classification of public access sites, enhancing panorama photos, partnering with Portal Wisconsin to map the calendar of cultural events in coastal communities, developing a map interface for “stories” that communicate the special nature of the Great Lakes, and adding several new map features to include nature centers, museums, marinas, geocaches, state natural areas and wildlife refuges. Funding source: Wisconsin Coastal Management Program.

[A/WCMP-4](#)

Ports, Harbors and Marinas Initiative (Clark/Harris) – Wisconsin Sea Grant will assist Great Lakes ports, harbors and marina managers and owners with all aspects of port, harbor and marina infrastructure maintenance and repair, dredging technology and dredged material disposal, and facility management. A single non-advocacy source for reliable, up-to-date information to help managers and owners is critical to the operation and maintenance of our ports, harbors and marinas. New techniques need to be verified and information disseminated to assist managers with their project investigation studies and repairs. Wisconsin Sea Grant will partner with the Great Lakes port, harbor and marina managers, in addition to other regional and national entities, to establish a direct link between managers experiencing operational problems and valuable resources for technical information and engineering assistance.

Support Sustainable Fisheries and Aquaculture

National Sea Grant Goals:

- A sustainable supply of safe seafood to meet public demand.
- A healthy domestic seafood industry that harvests, produces, processes, and markets seafood responsibly and efficiently.
- Informed consumers who understand the importance of ecosystem health and sustainable harvesting practices to the future of our domestic fisheries, who appreciate the health benefits of seafood consumption and who understand how to evaluate the safety of the seafood products they buy.

Wisconsin Sea Grant Needs:

Fisheries

- New and improved models for sustainable management of Great Lakes fish and fisheries.
- Successful rehabilitation efforts for native Great Lakes fish species.
- New markets and uses for traditionally harvested Great Lakes species as well as underutilized and established nonnative species.

Aquaculture

- Sustainable, cost-effective intensive production technology and domestication methods for economically important farm raised species.
- Improved growth and reproductive success of farm raised species to enhance the sustainability of Wisconsin's aquaculture operations.
- Techniques to reduce the risk of VHS and other pathogens associated with baitfish production and distribution.

Education and Outreach

- Consumer education and communication products to help them understand and evaluate the benefits, risks and ecological consequences of their seafood purchases.
- Aquaculture producers who understand how to apply the methods and techniques developed through research.

Many major U.S. fisheries are in decline, while seafood consumption and demand are rising. The consequence is an \$8 billion seafood trade deficit. Through its research, extension and education activities and work with partners, Sea Grant has produced important discoveries that have aided the stabilization and recovery of many endangered fisheries. According to the NOAA Aquaculture Program, fish farming is in its infancy in the U.S., amounting to just over \$1 billion of a \$70 billion worldwide industry. In Wisconsin, aquaculture sales in 2005 totaled \$7 million. Aquaculture creates important new opportunities to meet the increased demand for seafood, but a number of questions need to be addressed for its full potential to be realized.

Seafood safety is a growing concern as international trade increases and fish diseases and toxic contamination become bigger problems. Sea Grant has several key roles to play in advancing public understanding of the nature of these problems and opportunities. Through the use of its research, extension and education capacities, Wisconsin Sea Grant supports the kind of informed public and private decision making that can lead to a sustainable supply of safe seafood long into the future.

Wisconsin has a diverse, moderately sized aquaculture industry for the production of food fish, baitfish and fish for stocking. The industry has good growth potential, particularly in the area of food fish production, because of the availability of new technology, ample supplies of high-quality water, land, labor and markets. The most likely candidates for expansion in Wisconsin are cool-climate, freshwater fish species. To achieve the state's aquaculture potential, within the framework of biosecurity standards, additional research

needs to focus on intensive culturing techniques, such as developing genetically defined domesticated broodstocks and controlling reproduction, advancing early life stage finfish culture technology, improving nutritional requirements as a function of growth and managing fish health. Practical, cost-effective production parameters are needed, along with the development of environmentally sound recirculating aquaculture systems focused on reducing water usage and managing effluents.

The sustainability of Wisconsin's commercial fishery is threatened by changes in fish communities caused by invasive and introduced species, a changing climate and economic pressures deriving from higher fuel costs for its fishing fleet. The fisheries of the Great Lakes have been strongly influenced by ecological changes brought about by deliberate as well as unintentional introductions of exotic species. Sea lampreys contributed to the collapse of native fish populations. New invaders—such as zebra mussels, quagga mussels, round goby, ruffe and white perch—pose significant challenges.

Key research challenges include developing ways to control the spread of exotics, creative methods for reducing their adverse effects on native fish populations, and the combination of conceptual and analytical tools required to evaluate fishery sustainability and restoration efforts, particularly with regard to how all of these might be affected by climate change. Improvement in the fuel efficiency of charter and commercial fishing boats is another important need.



Projects

Urban Aquaculture—A Game Changer

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UW-Milwaukee WATER Institute personnel, supported by Wisconsin Sea Grant, will provide technical assistance in all aspects of urban aquaculture with expertise in biological, chemical, physical and economic parameters. Sea Grant will use this opportunity to involve new people and potential investors in the urban setting, which has the advantage of product availability near consumer demand and reduces transportation costs. Sea Grant and the WATER Institute are in a unique position to act as advisors for aquaculturists working in a number of settings because both organizations have extensive experience in establishing and maintaining many types of fish-rearing systems. Investors who have questions on the marketability of urban aquaculture systems will come to appreciate the benefit of growing food locally, the creation of jobs in an urban environment and the balance of risks associated with starting a new business. In addition, Sea Grant's communications staff will produce outreach products to further support and promote urban aquaculture. (This project also fits within the “Enhance Coastal Community Sustainability and Resilience” focus area.) Also supported by the NOAA Sea Grant Aquaculture Extension and Technology Transfer 2010 competition. [A/AQ-02](#)

Fishing Tournament Organizers and Professional Anglers: Preventing the Spread of AIS by Extending AIS-HACCP and the Stop Aquatic Hitchhikers Campaign in the Great Lakes (Moy)

– Most public information campaigns related to preventing the spread of aquatic invasive species (AIS) have been directed toward recreational boaters. However, recent unpublished research and anecdotal information suggests that fishing tournaments may serve to exacerbate the transport/colonization risk posed by zooplankton and disease organisms. This project will train professional anglers and tournament organizers in preventing the spread of AIS and produce brochures and booklets to help anglers become part of a broader citizen AIS monitoring network. (This project also fits within the “Enhance Coastal Community Sustainability and Resilience” focus area.) Funding source: NOAA Sea Grant Office. [A/AS-64](#)

Climate Change Increases Sea Lamprey Impact in Lake Superior

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The average summer surface water temperature of Lake Superior has increased by about 3.5°C over the past three decades. Warmer water temperatures have increased the duration of thermal stratification and lengthened the period of lake trout's preferred thermal habitat (9-11°C) by up to twofold. Because lake trout are the preferred host of sea lamprey, changes to their thermal habitats alter the feeding and growth of sea lamprey, among the greatest threats to Lake Superior fisheries. While control efforts have been tremendously successful at reducing lamprey abundance, climate change raises questions about how increasing water temperatures in Lake Superior will change the parasitic behavior of remaining lamprey. This project will develop bioenergetic models that estimate effects of climate warming on sea lamprey growth in multiple regions of Lake Superior. Combining these results with information about host abundance and stable isotope-based estimates of lamprey diet in Lake Superior, the project will determine how increased lamprey growth may influence mortality of native lake trout. [R/SFA-02](#)

Novel Epidemiologic and Diagnostic Approaches for Reducing the Impact of Viral Hemorrhagic Septicemia Virus on Aquatic Ecosystems in Wisconsin

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Viral hemorrhagic septicemia virus (VHSV) is an invasive pathogen that threatens the health and sustainability of Wisconsin's aquatic ecosystems. In Wisconsin, the virus has been found in the Lake Michigan and Lake Winnebago watersheds. Despite the potential economic and ecological damage that could ensue if VHSV spreads to other areas of Wisconsin, adequate tools for predicting and managing the emergence of the virus are lacking. This project seeks to develop and distribute novel epidemiological and diagnostic tools for predicting the emergence and spread of VHSV. Specifically, it will develop non-lethal laboratory diagnostics to detect VHSV antibodies and use them to construct and validate a predictive model of VHSV transmission. This effort will allow the future course of VHSV transmission to be forecast from current measures of fish demographics and infection status, thus improving our ability to monitor and manage the disease in Wisconsin's wild fisheries. [R/SFA-03](#)

Effectiveness of a Lake Trout Refuge at Gull Island Shoal, Lake Superior

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Lake trout were the predominant fish predator in Lake Superior before stocks collapsed from exploitation and sea lamprey predation. In Wisconsin waters of the lake, the Gull Island Shoal refuge, created in 1976 to prevent depletion of a remnant lake trout stock, enabled the stock to recover by providing recruitment to the entire Apostle Islands area. Previous research has shown that growth and recruitment of lake trout in the Apostle Islands region changed from density independent during early recovery to being density dependent at present, which indicated that the population was nearing carrying capacity and may be able to sustain harvest. This project will thoroughly evaluate historical effectiveness and future need for the Gull Island Shoal Refuge on lake trout stocks residing in Wisconsin waters of Lake Superior. [R/SFA-04](#)

GIS-Based Analysis of Sustainable Domestic Aquaculture Development in Wisconsin

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The overall hypothesis for this project is to determine if location characteristics of aquaculture operations are significant for determining success or failure of commercialized operations in Wisconsin. Specific objectives are to: 1) develop a predictive aquaculture farm model using a multi-criteria evaluation procedure in GIS and 2) synthesize current data about existing aquaculture farms into the GIS model based on common culture methods and species to improve the model's efficaciousness and using these data further refine a predictive model for particular species or culture-system selection for future aquaculture operations. [R/SFA-05](#)

Development of a Submersible Electroshocking Sampler for Invertebrates and Larval Fishes in Rocky Habitats

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The Dreissenid mussel invasion has resulted in increased benthic production, especially in rocky habitat, which increases the importance of quantifying the inhabitants of these areas. Assessing the density of invertebrates in rocky aquatic habitat is a long-standing

challenge for aquatic ecologists, but significant innovations using electroshocking are evolving. In coastal waters, electroshocking appears to be effective at drawing the most numerous arthropods from crevices and under stones to where they can be suction sampled, but the present configuration is designed to collect small fishes. The researchers will develop and test a system in which the electroshocking apparatus is not attached to a submersible but dangled from a boat and positioned by hand using an attached submersible video camera. They also propose to modify the system to either include a suction sampler or to generate water flow so that electroshocked animals drift into a net. [R/SFA-07](#)

Genetic Analysis of Virulence Factors of the Fish Pathogen *Flavobacterium Columnare* (FY13 Start)

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Flavobacterium columnare is a common fish pathogen that causes columnaris disease in wild and farmed freshwater fishes and results in devastating losses in the aquaculture industry. The disease has been recognized for nearly 100 years, but a lack of genetic tools to manipulate the bacterium has hampered identification of the mechanisms of pathogenesis. The researchers developed robust genetic tools and procedures for *Flavobacterium johnsoniae* and recently demonstrated that some of these function in *F. columnare*; they propose to adapt additional genetic tools for use in *F. columnare*. *F. johnsoniae* GldN is a component of a novel protein secretion system. The researchers suspect that *F. columnare* GldN is involved in secretion of the chondroitinase CslA, and that GldN and CslA are needed for virulence. To test these hypotheses, wild-type, gldN mutants and cslA mutants will be examined for ability to cause disease in the model zebrafish system and in yellow perch. [R/SFA-08](#)

Outreach

A Comprehensive Regional Public Outreach Campaign on AIS (Moy) – Using an array of tools, Invasive Species Specialist Moy will work with Minnesota Sea Grant to coordinate the work of the Great Lakes Sea Grant programs and other external partners to educate students, sportsmen, recreational boaters and the general public about aquatic invasive species in both Lakes Michigan and Superior. Funding source: Great Lakes Restoration Initiative through Minnesota Sea Grant. [A/GLRI-3](#)

Wisconsin Department of Natural Resources and Sea Grant Partnership for AIS Prevention (Moy) – This project, supported by the Wisconsin Department of Natural Resources (WDNR) with Great Lakes Restoration Initiative (GLRI) funds will support an aquatic invasive species (AIS) outreach coordinator to promote county- and municipal-level AIS prevention, control and education activities in Wisconsin's Great Lakes' drainage basins. Over the two-year project period, the outreach specialist will develop partnerships and increase awareness of WDNR AIS grants and other support to assist local AIS prevention efforts. In addition, the WDNR has provided GLRI funds to significantly expand the continuing AIS watercraft inspection project. This includes support for a coordinator and nine watercraft inspectors who will be stationed at Great Lakes boating access sites.

Great Lakes and Mississippi River Interbasin Study (Moy/Kline) – Conducted with the U.S. Army Corps of Engineers and the Sea Grant Great Lakes Network, this project will evaluate the impact of charter fishing on the Great Lakes and Mississippi River. Charter fishing business owners will receive written surveys, and Wisconsin Sea Grant will assist Ohio Sea Grant in presenting the results. This project is part of a larger effort to examine the economic impacts of establishing an ecological separation between the Great Lakes drainage basin and the Mississippi River drainage basin at the Chicago area waterway system.

Great Lakes Commercial Trap Nets Location (Moy) – In order to diminish entanglement events between sport anglers' equipment and commercial fishing nets, Sea Grant works with the Lake Michigan commercial whitefish fleet to make the GPS coordinates of commercial trap nets available to anglers on its website and in printed maps in some locations. Last year, the project expanded from the Sheboygan and Two Rivers/Manitowoc area into Door County.

Promoting the Stop Aquatic Hitchhikers! Campaign Throughout the Triathlon Community (Campbell) – The triathlon community has the potential to be a vector for aquatic invasive species (AIS). Wetsuits, which are commonly used during the swim portion of the event, have long been known to be a vector for AIS while swim course markings used by event organizers are often transported to multiple event sites, creating another potential vector for AIS. The sport is experiencing rapid growth and the potential for triathlon-mediated invasions is increasing. This project will educate triathletes and event organizers on the impacts of AIS, and what steps they can take to prevent the spread of AIS.

Aquaculture Industry and Education (Binkowski) – The U.S. imports more than 80 percent of the seafood it consumes. Aquaculture can fill some of that gap with domestically produced fish, raised through either a recirculating aquaculture system or an aquaponics system. Sea Grant offers outreach services on both systems in a variety of settings in Wisconsin, and in the Midwest, including in two Wisconsin high schools to inspire young people.

Safe and Sustainable Seafood Consumer Education (Moy/Kline/Conklin) – Consumers often have questions about which fish is healthiest for their families, and many people are interested in purchasing more of their food from local sources. This educational campaign will primarily target grocery store consumers, providing facts about the health benefits, risks and sustainability of locally produced seafood. As a pilot project, Sea Grant will partner with one grocery store and focus on providing information about Wisconsin farm-raised fish. The campaign will be developed based on consumer surveys to determine information needs, and may include fact sheets, news

releases, social media, recipes posted on the Sea Grant website and YouTube.com, cooking presentations, free samples and information stations. Depending on the preliminary success of the campaign, Sea Grant will then partner with other organizations and enlarge its focus to encompass Great Lakes fisheries.

Cross-cutting Goals—Education

National Sea Grant Goals:

- Sound scientific information to advance understanding of the nature and value of our coastal, ocean and Great Lakes resources; to identify new ways to conserve and use these resources; and to support evaluation of the environmental impacts and socio-economic trade-offs involved in coastal decision-making.
- An informed public that understands the value and vulnerability of coastal, ocean and Great Lakes resources, and demands informed science-based decisions about the conservation, use and management of these resources, and a well-trained workforce that will make this a reality.
- Decision-making processes that involve the full-range of coastal interests, which integrate efforts of public and private partners at the federal, regional, state and local levels, and provide mechanisms for establishing common understandings and generating outcomes that balance multiple interests.

Wisconsin Sea Grant Needs:

- Awareness, understanding and knowledge of Great Lakes issues and aquatic science among students and teachers at all levels and adults of all ages throughout Wisconsin and beyond.
- Public understanding and awareness of Great Lakes history, culture, resources and current issues surrounding water supply, water quality, ecosystems and habitat.

The 2004 U.S. Commission on Ocean Policy Report emphasized restoring and sustaining our coastal environments requires an informed citizenry that understands the value and vulnerability of these resources. NOAA has also identified ocean and aquatic literacy as a strategic priority. Sea Grant has long supported K-12, undergraduate, graduate, professional and technical education, and remains committed to advancing coastal and

Great Lakes literacy. This is accomplished by using Wisconsin Sea Grant's strong university partnerships and its education and extension capacities to develop educational programs for schools, professional education and workforce training. We also help teachers develop their scientific knowledge and skills to bring aquatic science to their students more effectively. We foster lifelong learning by extending aquatic-science education to local communities, museums, parks and other public venues. One of our long-standing priorities is to provide opportunities for graduate and undergraduate students to participate in all kinds of Sea Grant program activities.



Projects

Lake Sturgeon Bowl, Wisconsin's Regional Academic Competition

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The local qualifier for the National Ocean Science Bowl (NOSB), Wisconsin's Lake Sturgeon Bowl (LSB), allows high school teachers and students to advance their ocean and aquatic sciences literacy. Seventy-eight percent of Wisconsin students surveyed responded that participating in the LSB helped them increase their interest in freshwater and ocean science, while 67 percent of their coaches stated that the LSB resulted in an increased infusion of marine science into their classroom teaching. LSB is a vehicle not only for developing student interest in ocean and aquatic sciences but also for meeting professional development needs of high school teachers—especially those of underrepresented groups. Further, as a measure of success, Wisconsin's LSB champion Marshfield High School went on to claim the national championship of the NOSB in 2009, 2010, 2011 and 2012. In addition, Wisconsin has been selected by NOSB as the national competition site in 2013. [E/ML-19](#)

Outreach

Grandparents University (Moy/Kline) – This Wisconsin Alumni Association university is a two-day summer program of coursework in a number of subject areas for youngsters and their grandparents. Sea Grant and the UW–Madison Center for Limnology collaborate to offer a popular course on the study of lakes that includes taking water samples aboard a research vessel, hands-on operation of underwater robotic technology and activities involving aquatic invasive species.

Wisconsin's Water Library (Moser) – Sea Grant will continue to develop and promote Wisconsin's Water Library (aqua.wisc.edu/waterlibrary). All Wisconsin residents can check out any library material free of charge. Materials can be picked up at the library or sent to the user's local public library for pickup and return, providing easy access to the more than 30,000 items in the collection. The library develops annotated reading lists emphasizing coastal and Great Lakes ecosystems, provides water facts to help educate residents about the importance of water, and provides a lending library and activities for children through Wisconsin's Water Library for Kids. The library also provides all levels of reference and referral service to any Wisconsin resident on a wide range of water-related inquiries.

Library Services to Underserved Populations (Moser) – The staff of Wisconsin's Water Library will continue to expand its services to underserved populations. In addition to involvement in story times for early-elementary students in the Allied Drive neighborhood of Madison, the library collaborates with the Head Start Program for preschoolers at the Ho-Chunk Nation in Wisconsin Dells. As with the program at Allied Drive, each story hour is organized around a water-related theme and includes art projects. These bimonthly events to underserved populations are conducted in partnership with organizations, including the UW-Madison School of Library and Information Studies, the Madison School and Community Recreation Safe Haven Childcare Program and the Ho-Chunk Nation, Head Start Program.

Coastal Engineering Reading List and Resources (Moser) – Through a generous grant from the Friends of UW-Madison Libraries, books about coastal engineering are available in support of the outreach and research activities of Sea Grant’s coastal engineer. As the demands of coastal development and investment continue to increase, so do the possibilities for increased loss of valuable property, habitat and life. Solid coastal engineering information is essential to address the challenges faced by coastal communities in Wisconsin. A reading list is available that includes both books and additional resources. The list can be found on the Water Library’s website: aqua.wisc.edu/waterlibrary

Sea Grant Fellowships/Scholarships

Dean John A. Knauss Marine Policy Fellowship

seagrant.noaa.gov/knauss

Contact: Anders W. Andren, 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-one Wisconsin students have been among those selected for Knauss fellowships since 1982. Funding source: NOAA Sea Grant Office.

Sea Grant/NOAA Fisheries Graduate Fellowship

seagrant.noaa.gov/funding/fisheriesgradfellowship.html

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.

Funding source: NOAA Sea Grant Office and National Marine Fisheries Service, NOAA.

Carl J. Weston Memorial Scholarship

Contact: Mary Lou Reeb, assistant director, University of Wisconsin Sea Grant Institute, (608) 262-0905, mlreeb@aqu.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/projects

Online Project Reporting System

aqua.wisc.edu/ipro

Current and Past Projects

seagrant.wisc.edu/projects

Great Lakes Resources

great-lakes.net

NOAA National Sea Grant

seagrant.noaa.gov

Special Program Resources

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 facts sheets, posters, books and maps.

Social Media Channels

seagrants.wisc.edu

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

Wisconsin's Water Library

aqua.wisc.edu/library

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. The library also maintains aqualog2.blogspot.com, a lively and engaging blog.

National Sea Grant Library

ngsd.gso.uri.edu

The National Sea Grant Library is the official archive of a wide variety of Sea Grant documents. The 40,000-plus-record database is easily searchable and is a comprehensive source on coastal issues.

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