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**2008-10 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 unique 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 of research, outreach, and education enhancing the practical use and conservation of coastal, ocean, and Great Lakes resources to create a sustainable economy and environment.



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## From the Director

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This directory presents the 2008–10 University of Wisconsin Sea Grant College Program, a statewide program of research, outreach, and education dedicated to the beneficial use of Great Lakes, ocean and coastal resources. Launched in 1968, Wisconsin Sea Grant is part of a national network of 32 university-based programs funded through the National Sea Grant College Program, National Oceanic & Atmospheric Administration (NOAA), U.S. Department of Commerce, with matching contributions from participating states and private sources.

Sea Grant is a highly competitive grants program that provides awards totaling about \$3 million annually to Wisconsin public and private universities and colleges. After conducting rigorous national peer reviews and expert panel reviews of all project proposals, our guiding principle for funding projects is to select those that can help meet national Sea Grant goals by using the strengths that our program and Wisconsin's academic community can bring to bear on them, while also taking into account the strategic research, outreach, and educational priorities of our parent institution, the State of Wisconsin, and the Great Lakes region. The UW Sea Grant College Program for 2008–10 is thus organized in an issue-oriented, thematic approach in accordance with National Sea Grant College Program themes and goals.

This directory presents a brief description of each of the 41 new and continuing research, outreach and education projects receiving UW Sea Grant support during 2008–10. In sum, these projects involve more than 100 faculty, staff and students at seven UW System campuses in addition to UW-Extension, Northland College, Carthage College and Lawrence University, five state agencies, four out-of-state agencies, seven out-of-state universities, and five federal agencies.

In “the Wisconsin Idea” tradition, UW Sea Grant Advisory Services and Communications staff will be partnering more than 200 public agencies, businesses, nongovernmental organizations and individuals on a variety of outreach and education projects during 2008–10 that involve a dozen units of UW–Madison and a dozen more at four other UW System campuses, 16 units of seven state agencies, two Wisconsin tribal governments, three regional organizations, five units of NOAA and five other federal agencies, and universities and state agencies in a half-dozen other states.

To learn more about our program and its activities, we invite you to visit our Web site at [www.seagrants.wisc.edu](http://www.seagrants.wisc.edu).



Anders W. Andren, Director

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## Participating Institutions and Agencies, 2008–10

### University of Wisconsin Sea Grant College Program

Carthage College	University of Michigan
Harvard Medical School	University of Minnesota
Iowa Department of Natural Resources	University of Puerto Rico
Iowa Department of Transportation	University of South Florida
Lawrence University	University of Wisconsin–Extension
Los Alamos National Laboratory	University of Wisconsin–Green Bay
Minnesota Department of Natural Resources	University of Wisconsin–Madison
Minnesota Department of Transportation	University of Wisconsin–Manitowoc
NOAA–Great Lakes Environmental Research Laboratory	University of Wisconsin–Milwaukee
NOAA–National Marine Fisheries Service	University of Wisconsin–Oshkosh
Northland College	University of Wisconsin–Stevens Point
The Ohio State University	University of Wisconsin–Superior
U.S. Environmental Protection Agency	University of Wisconsin System
U.S. Fish and Wildlife Service	Wisconsin Coastal Management Program
U.S. Forest Service	Wisconsin Department of Natural Resources
U.S. Geological Survey	Wisconsin Department of Tourism
University of Florida	Wisconsin Historical Society
University of Illinois–Urbana	Wisconsin State Laboratory of Hygiene

***National Sea Grant Goal:** Develop the scientific, technological information, and expertise needed to propagate and successfully culture fish with commercial and/or recreational value to the United States as well as the rest of the world.*

Wisconsin currently has a moderately sized yet diverse aquaculture industry that includes the production of food fish, baitfish, and fish for stocking. This is a priority area for Wisconsin Sea Grant because the industry has great growth potential, particularly in the area of food fish production, due to the state's ample supplies of high-quality water, land, labor, and markets. The most likely candidates for expansion in Wisconsin are yellow perch and other cool-climate, freshwater fish species. One major obstacle to achieving the state's aquaculture growth potential is conditioning these species to intensive culturing, including improving growth rates, reducing stress and disease, and controlling reproduction. Practical, cost-effective production parameters need to be developed, along with environmentally sound aquaculture systems focused on reducing water usage and waste effluents. Additionally, little is known about methylmercury (MeHg) levels in farm-raised fish in the Midwest; improved best management practices need to be developed in order to minimize inputs of MeHg to farm-raised fish and outputs to the environment.

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## Projects

### **Development of Yellow Perch Broodstocks for Selective Breeding**

*Frederick Goetz, UW-Milwaukee, (414) 382-1742, rick@uwm.edu*

*Fred Binkowski, UW-Milwaukee, (414) 382-1723, sturgeon@uwm.edu*

The recent decline of the yellow perch fishery in Lake Michigan and a corresponding loss of its commercial fishery have led to a shift toward aquaculture to replace this lost food resource, yet many unknowns add risk to developing a viable yellow perch aquaculture business. One is the need for a dependable supply of broodstocks with the ability to produce offspring at multiple times during the year. The investigators of this continuing project propose to evaluate broodstocks from wild perch derived from several geographic regions in the United States and determine genetic variation and phylogenetic relatedness of perch and their crossbreed offspring using DNA microsatellite markers. This project is testing the viability of this genetic marker approach for developing aquaculture broodstock capable of out-of-season spawning. [R/AQ-41](#)

### **Increasing the Efficiency of Yellow Perch Fingerling Production by Optimizing Pond Trophic Dynamics and Feed-Training Strategies**

*Christopher Hartleb, UW-Stevens Point, (715) 346-3228, CHartleb@uwsp.edu*

*Jeffrey Malison, UW-Madison, (608) 263-1242, jmalison@wisc.edu*

The overall goal of this project is to gain a better understanding of the food chain dynamics and feed-training methods used in the yellow perch aquaculture industry. The growth of the yellow perch aquaculture industry is constrained by the high cost of feed-trained fingerlings. Using eight ponds at two locations, the project will manipulate species-specific pond food chain dynamics and feed-training aquaculture methods. The project will use selected fertilizer regimes to identify and quantify plankton and benthic communities in pond culture systems, examine larval and post-larval prey selection and prey availability, and compare photo-periods, temperatures, and dietary regimes during the weaning period. At harvest, fish survival and net fish yield for each pond will be measured. The use of krill and a moist diet as transitional feeds to a conventional dry diet will also be evaluated. [R/AQ-42](#)

### **Evaluation of Sources and Uptake of Methylmercury in Farm-Raised Rainbow Trout (*Oncorhynchus mykiss*) and Yellow Perch (*Perca flavescens*)**

*Christopher Babiarz, UW-Madison, (608) 265-5085, babiarz@cae.wisc.edu*

Elevated methylmercury (MeHg) levels in fish are known to slow their growth rates, disrupt their reproductive success, and increase their rates of infectious disease; MeHg may also result in fish consumption advisories for humans, but little is known about MeHg levels in the most popular farm-raised fish in the Midwest. The goal of this research project is to determine the critical factors controlling MeHg concentrations in farm-raised rainbow trout (*Oncorhynchus mykiss*) and yellow perch (*Perca flavescens*) by tracking the quantity and quality of the feed, the growth stage of the fish, and the anaerobic conditions of the ponds. The resulting field- and laboratory-generated data will be used to calibrate a contaminant-accumulation model across species and method of aquaculture. Improved best management practices will be developed to minimize potential inputs of MeHg to farm-raised fish and to reduce the impact of mercury from aquaculture waste to the surrounding environment. [R/AQ-43](#)

### **Development of Yellow Perch Broodstocks for Genetic Selection: Assessing Reproductive Performance and Manipulation for Out-of-Cycle Spawning**

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Yellow perch are an important food fish in the midwestern United States, and given the reduced supplies of wild perch, there is a strong impetus to develop aquaculture of this species. However, the slow growth of perch is a significant bottleneck to aquaculture. The overall goal of the proposed research is to continue the development of genetically defined yellow perch broodstocks initiated in a past Sea Grant project. The first broodstock generation has now been produced from four wild North American perch population sites. Embryos, larvae, and fry were raised under identical conditions, and at 70 days postfertilization, their performance will be evaluated in a growth trial conducted under conditions mimicking intensive recirculation systems. The top performers from each of



the four sites will be genotyped and used to produce second generation stocks that will be evaluated for reproductive performance including fecundity, fertility, hatching success, and fry/larval survival. Since year-round fingerling production is desirable for commercial production, the ability of these strains to be photothermally manipulated to achieve out-of-cycle spawning will also be evaluated. [R/AQ-44](#)

### **Aquaculture Advisory Services for the Great Lakes Region**

*Fred Binkowski, UW-Milwaukee, (414) 382-1723, sturgeon@uwm.edu*

This continuing UW Sea Grant Advisory Services outreach and education project responds to the needs of practicing and prospective aquaculturists and aquaculture educators in Wisconsin and other Great Lakes states for efficient, accurate, and effective information and technology transfer. This multitiered outreach program in aquaculture—a Wisconsin Sea Grant priority area—provides education, hands-on training, and on-site technical assistance to meet the needs of vocational aquaculture educators and aquaculture entrepreneurs at all levels of development. The USDA's Regional Extension Facilitator for the U.S. North Central Regional Aquaculture Center is located at the same UW-Milwaukee facility as the investigator, reflecting Wisconsin's unique capacity for conducting regionwide aquaculture outreach. [A/AQ-1](#)

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***National Sea Grant Goals:** (1) Understand AIS impacts on aquatic systems and our economy; (2) understand the biology of invasive species to develop effective means of prevention and control; (3) identify safer and more effective control strategies, and (4) identify more effective and less expensive strategies to prevent new introductions.*

This theme is another Wisconsin Sea Grant priority area because of the significant threats to coastal and Great Lakes ecosystems as well as economic costs and human health risks posed by aquatic invasive species (AIS). From parasitic sea lampreys in the 1940s to zebra mussels in the 1990s, the Great Lakes in particular have been severely affected by invasions of nonindigenous aquatic species. Today, there are over 180 confirmed invasive species in the Great Lakes. Since 1990, the Great Lakes have been invaded at a rate of one new aquatic species a year, and some studies indicate the rate of introductions is likely to increase in the future.

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## Projects

### **Cercopagis Invasion of Lake Michigan: Predictable Responses or 'Invasional Meltdown' of the Planktonic Food Web?**

*Craig Sandgren, UW-Milwaukee, (414) 229-4279, sandgren@uwm.edu*

*John Berges, UW-Milwaukee, (414) 229-3258, berges@uwm.edu*

Like the spiny waterflea, *Bythotrephes cederstroemii* before it, the invasion of Lake Michigan by the fishhook waterflea *Cercopagis pengoi* is of great concern because it is a predatory zooplankton that competes with larval yellow perch and alewives for food. This new invasion offers an important opportunity to test the predictability of how Great Lakes ecosystems respond to repeated invasions by ecologically similar planktonic species. This continuing project examines Lake Michigan's ability to absorb this new invader by documenting the dynamics of competing predatory zooplankton populations. This work addresses a cross-cutting AIS and Fisheries priority of evaluating the effects of invasive species on Great Lakes food webs as well as an Ecosystems & Habitats priority of evaluating the importance of invertebrate species to planktonic food webs. [R/AI-2](#)

### **Reciprocal Spread of Invasive Species in Lake Michigan Coastal Habitats**

*M. Jake Vander Zanden, UW-Madison, (608) 262-9464, mjvanderzand@wisc.edu*

Coastal areas and ports of the Great Lakes have been a major focal point of research and monitoring for AIS. The spread of AIS is generally through human-assisted means (boat trailers, bait buckets, etc.), but one often-overlooked pathway is through tributaries in the Great Lakes watershed. This continuing project is studying the distribution and invasion processes of round goby from the Great Lakes and of rusty crayfish to the Great Lakes. Monitoring and modeling this movement with various management scenarios (e.g., dam removal, stream restoration, etc.) will help better understand options for future control in light of cross-habitat invasions between inland waters and the Great Lakes. This work addresses a cross-cutting AIS-Ecosystem & Habitats priority of research aimed at deterring, eradicating and/or controlling invasive species. [R/AI-3](#)

### **Predicting the Impact of Zebra Mussels on Trophic Transfers in Green Bay: Ecosystem Modeling and Lower Food Web Interactions with Fish**

*Bart DeStasio, Lawrence University, (920) 832-6727, bart.t.destasio@lawrence.edu*

*Tara Reed, UW-Green Bay, (920) 465-2284, reedt@uwgb.edu*

What role have zebra mussels played in recent changes in the plankton and fish communities and bottom-dwelling organisms of the Green Bay ecosystem? That's the question this project hopes to answer through a combination of ecosystem and bioenergetics models comparing conditions in the bay during the decade before and decade after 1993, when the bay was invaded by zebra mussels. Green Bay is particularly well suited for this study, and results from this continuing project will have broad applicability for inland lakes as well. Besides addressing the national goal of understanding the ecological changes caused by AIS, this project meets a Fisheries Theme priority of evaluating the biological impacts of AIS on the Great Lakes' fisheries. [R/LR-93](#)

### **Expanding Cattails and Shrinking Sedge Meadows: Reversible?**

*Joy Zedler, UW-Madison, (608) 262-8629, jzedler@wisc.edu*

Biologically diverse sedge meadows in Great Lakes coastal wetlands are being overrun by aggressive invasions of hybrid cattails. This project is evaluating the resilience of sedge meadows to this invasion and developing options for protecting and restoring these plant communities. This continuing effort complements that of other projects in this high-priority theme area and also addresses a cross-cutting Wisconsin priority in Sea Grant's Ecosystems & Habitats Theme of research for deterring, eradicating and/or controlling invasive species. [R/LR-96](#)

### **A Workshop Seminar on the Policy Environment in Southeastern Wisconsin for Effective Great Lakes Management of Invasive Species**

*Arthur Cyr, Carthage College, (262) 551-5750, acyr@carthage.edu*

Aquatic invasive species in the Great Lakes will be the focus of a seminar for communities in southeastern Wisconsin. The creation and implementation of policies to address invasive species in political, legal, and jurisdictional contexts will be presented as a collaborative effort between faculty members, students, and professionals from the surrounding community. The project will be carried out under the auspices of the Clausen Center, an interdisciplinary institute at Carthage College, located on Lake Michigan.

[A/AS-61-PD](#)

## Outreach programs

**Chicago Sanitary and Ship Canal Dispersal Barrier (Moy)**—UW Sea Grant’s AIS outreach specialist will continue to co-chair the Dispersal Barrier Advisory Panel, a multi-agency body that meets semiannually to advise the U.S. Army Corps of Engineers on the operation and development of the invasive species barrier in the Chicago Sanitary and Ship Canal.

**Hazard Analysis & Critical Control Point (HACCP) Training (Moy)**—UW Sea Grant will continue to participate in a Great Lakes Sea Grant Network project to provide workshops on applying HACCP principles to prevent the potential spread of AIS through wild bait harvest, aquaculture, and fish sampling activities. First used to successfully educate wild bait harvesters, this training is now being provided to field staff of the region’s state natural resources agencies.

**Computer Kiosk of AIS Information (Moy)**—“Great Lakes Alien Invasion,” a popular and award-winning touchscreen kiosk of information about a dozen invasive aquatic species created by Wisconsin Sea Grant, will continue to be made available over the next two years for use by passengers on the Lake Michigan car ferry *Badger* in the summer and by visitors to the Wisconsin Maritime Museum in Manitowoc during the winter.

**AIS Attack Packs (Moy)**—These AIS outreach backpacks contain preserved specimens, games, activities, maps, and other materials about invasive species and how their spread can be prevented. Wisconsin Sea Grant will continue to produce these packs during 2006-08 and provide them at no cost to high school students and nonprofit organizations interested in using them to teach others about invasive species.

**AIS Watercraft Inspectors (Moy)**—With continued support from the Wisconsin DNR, UW Sea Grant will field at least six AIS watercraft inspectors at coastal Wisconsin boat landings each summer during 2008-10 to instruct boaters and anglers on how to avoid spreading invasive species.

**AIS Information and Awareness (Wittman)**—During the last biennium, UW Sea Grant distributed over 175,000 “Zebra Mussel Watch” cards and more than 9,000 pieces of other AIS information. As it has for the last decade, Wisconsin Sea Grant will continue to produce and disseminate a variety of free AIS information during the next biennium, including “Protect Our Waters” brochures, “Stop Aquatic Hitchhikers!” stickers and “Zebra Mussel Watch” cards.

***National Sea Grant Goals:** Encourage and support a wide range of freshwater and marine biotechnology research for (1) restoring and protecting aquatic ecosystems; (2) improving risk characterization of toxicants to aquatic animal life; (3) enhancing aquaculture and seafood safety, and (4) developing new pharmaceuticals, biomaterials, and bioprocesses.*

From a scientific standpoint and particularly in Wisconsin, the study of freshwater aquatic organisms provides an essential complement to studies of marine organisms. For the Great Lakes region—which already supports a vibrant and growing biotechnology industry—biotechnology offers new opportunities for addressing such problems as toxic contaminants in Great Lakes fish and sediments and assisting in the restoration of native species.

Because persistent toxic chemical contaminants constitute a continuous threat to the health of Great Lakes aquatic life and fish consumers alike, it is a Wisconsin Biotechnology Theme priority to develop more accurate approaches for assessing and predicting the risks to feral fish populations exposed to persistent, bioaccumulative chemical contaminants; specifically, to develop gene microarrays in fish for identifying alterations in gene expression associated with chemical and physical stresses. Genetic information may also be vital in the effort to restore wild rice populations that have been weakened by inbreeding.

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## Projects

### **Latent Toxicity in Adult Zebrafish Following Early Life Stage Exposure to 2,3,7,8-Tetrachlorodibenzo-p-Dioxin**

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*Warren Heideman, UW-Madison, (608) 262-1795, wheidema@facstaff.wisc.edu*

Exposure to 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) in the early stages of fish development can have lasting influence. Sublethal concentrations of TCDD may adversely affect feeding, predation-avoidance behavior and reproduction in wild fish populations. This new project will use the small, nearly transparent zebrafish to determine whether sublethal levels of TCDD can disrupt development, damage organs, inhibit feeding, affect body growth, or diminish reproduction. Building on previous and continuing work by these investigators, this project will help determine whether such effects are permanent or reversible. [R/BT-20](#)

### **Parallel Toxicogenomic Resources for Zebrafish and Rainbow Trout: Identifying Conserved Molecular Biomarkers of Toxicant Exposure**

*Matthew Rise, UW-Milwaukee, (414) 382-1734, mrise@uwm.edu*

*Michael Carvan, UW-Milwaukee, (414) 382-1706, carvanmj@uwm.edu*

This continuing project will use genomic tools to identify toxicant-response molecular biomarkers in zebrafish and rainbow trout for use in assays evaluating the potential effects of exposure to persistent, bioaccumulative toxicants on fish. The investigators will combine DNA microarray work with quantitative reverse transcription-polymerase chain reaction methodologies to identify embryonic and larval genes responsive to dioxin (TCDD), polychlorinated biphenyls (PCBs) and methylmercury (MeHg) exposure. They plan to sequence about 20,000 toxicant-response transcripts for zebrafish and rainbow trout and create publicly accessible, functionally annotated, expressed sequence tag databases—a biomarker library that can be used as reference for examining toxicant responses among Great Lakes wild fish species. [R/BT-21](#)

### **Genomic Approach to Understanding TCDD Toxicity in Zebrafish**

*Warren Heideman, UW-Madison, (608) 262-1795, wheidema@facstaff.wisc.edu*

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

This continuing project will address gene expression changes in zebrafish associated with TCDD exposures. Besides being nearly transparent, the zebrafish is the first fish to have had its genome mapped, which makes it ideal for research on the genetic effects of exposure to toxic contaminants. The goal of the project is to determine whether different TCDD responses in tissues correspond to a distinct gene expression pattern. Using DNA microarrays, the investigators hope to determine whether gene expression patterns can be used to predict sublethal toxicity; if successful, the microarray approach may be used as a screening tool to predict responses in wild fishes. This work directly addresses the strategic priority of developing gene microarrays in fish for identifying alterations in gene expression associated with chemical and physical stresses. [R/BT-22](#)

### **Utilizing Molecular Genetic Markers to Develop Wild Rice Restoration and Management Guidelines for Great Lakes Coastal Habitats**

*Anthony Kern, Northland College, (715) 682-1699, akern@northland.edu*

American wild rice, a native emergent aquatic grass, once served important ecological, cultural, historical, and economic roles in the Lake Superior and Lake Michigan basins. Habitat loss and degradation have led to a dramatic change in wild rice populations, and restoration efforts have not proved successful, even in high-quality habitats, because of inbreeding and the associated loss of genetic diversity and fitness. The objectives of this project are to describe the genetic effects of fragmentation on threatened populations of wild rice, to perform genetic diversity studies on these remnant populations, and to quantify how inbreeding depression is affecting the subdivided populations. Knowledge of genetic diversity and patterns of inbreeding may play an important role in wild rice management and restoration efforts as well as helping identify the genetic threats facing imperiled wild life populations. [R/BT-23](#)

## Coastal Communities & Economies Theme

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***National Sea Grant Goals:** (1) Strengthen coastal planning through better evaluations of coastal resources and amenities (“natural capital”) and by educating coastal planners and decision makers; (2) stimulate integrated coastal management by constructing frameworks for sustainable development and developing decision-support systems, and (3) contribute to community and economic development by building leadership; supporting the development of science-based ocean, coastal and Great Lakes policies, and revitalizing economically depressed coastal communities.*

The continuing economic growth occurring within our nation’s coastal regions stimulates land use change and competing demands for the use of the shoreline. Without sound planning, it is likely that coastal degradation associated with coastal development and urbanization will continue. Sound planning can also help minimize risks to regional economies posed by such natural disasters as hurricanes, storm-driven coastal flooding and dramatic changes in sea level elevations caused by climatic variations. Balancing economic growth and coastal resource quality are important issues for all of the nation’s coastal communities—including those around the Great Lakes.

Wisconsin priorities in this national theme include developing and validating new techniques for economic valuation of Great Lakes resources, and applying geographic information systems (GIS) and other state-of-the-art techniques to improve coastal resources management and educating decision makers in the wise, science-based planning and development of coastal watersheds and shorelands.

While Wisconsin Sea Grant will not be funding any projects specific to this theme during the biennium, several projects in other themes have relevance to this one, and most of these priorities will be addressed through outreach program activities.

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### Outreach programs

#### **Wisconsin Coastal Guide (Hart/T. Dellinger/R. Dellinger/Karl/White/Yao)**

The Wisconsin Coastal Guide is an interactive Web mapping site that promotes coastal cultural tourism by linking the Great Lakes Circle Tour route with information about coastal attractions such as lighthouses, shipwrecks, beaches, and parks. This encourages travelers to take side trips off the busy state and federal highways and soak in the culture of the coast.

#### **Coastal Community Planning Reading List (Hart/Moser)**

Books about planning coastal communities are purchased by the Water Resources Library and available for statewide circulation. A resource guide helps publicize the reading list. The project provides access to books that help elected officials, government staff, and citizen planners guide the growth and development of their community.

**Nonpoint Education for Municipal Officials (Harris)**—NEMO is a national network of education programs coordinated by the University of Connecticut that teaches local land use decision makers about the relationship between land use and natural resource protection. During 2008–10, UW Sea Grant’s water quality specialist will provide NEMO presentations and educational materials to Wisconsin municipalities and counties in the Lake Michigan watershed.

**Local Watershed Stewardship Assessment (Harris)**—UW Sea Grant’s water quality outreach specialist is co-chair of the Lake Michigan Lakewide Management Plan Forum and works with them to assess and foster capacity for local stewardship in Lake Michigan watersheds. She will engage community leaders, agencies and interested groups in identifying water quality impairments and recommending ways to reduce the amount of pollutants in runoff to Lake Michigan. She also chairs the TMDL (total maximum daily load) Outreach and Public Involvement Committee for the lower Fox River watershed and will assist the Wisconsin Department of Natural Resources in developing TMDL targets for the Fox River.

***National Sea Grant Goal:** Enhance preparedness to prevent or greatly reduce human deaths, injuries, property and environmental damages, and associated economic losses caused by coastal natural hazards.*

This national theme is aimed primarily at mitigating the risks and damage posed by hurricanes and tsunamis along the nation’s saltwater coasts. In the Great Lakes region, the principal coastal natural hazards are coastal flooding, storm surges and wave run-up, especially during times of above-normal water levels, which can cause severe erosion and damage or destroy coastal structures. Conversely, below-normal water levels reduce navigation safety in shallow channels and the entrances to ports and marinas for mariners, commercial fishers and recreational boaters alike. Storms, extreme water levels and winter ice on these freshwater seas pose significant risks to profitable and safe navigation and to coastal infrastructure. Hazards for swimmers include coastal rip currents and bacterial contamination of beach waters. Hypothermia is an ever-present natural hazard to everyone exposed to these cold northern seas.

Wisconsin Sea Grant’s priorities in this thematic area are to (1) develop an understanding and communicate scientific, technical, and public information on the impacts of climate change on Great Lakes communities; (2) develop and apply geographic information systems (GIS) for assessing and reducing natural coastal hazard risks; (3) evaluate impacts of extreme Great Lakes water levels on coastal infrastructure; (4) develop an understanding and communicate to user groups the causes of and effective strategies for coping with coastal slope failures, shore erosion, and flooding due to storm waves, lakebed erosion, storm surges, and high Great Lakes water levels, and (5) increase public safety through greater awareness of Great Lakes hazards (navigation hazards, hypothermia, rip currents, bacterial contamination of beaches, etc.).

While Wisconsin Sea Grant will not be funding any projects specific to this theme during the biennium, several projects in other themes have relevance to this one, and most of these priorities will be addressed through outreach program activities.

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## Outreach programs

**Climate Change and Coastal Communities (Clark)**—Involving nearly every member of UW Sea Grant’s outreach staff, this new initiative addresses a NOAA goal of understanding climate variability and change to enhance society’s ability to plan and respond. The objectives of this outreach effort are to provide Great Lakes property owners, coastal facility managers, and local, state and regional decision makers with a comprehensive, up-to-date source of scientifically sound, nonadvocate information and technical guidance to help them prepare for the likely consequences of predicted climatic change. Our recent Wisconsin Coastal Management Program grant completed a series of climate change presentations that focused on what climate change scenarios would mean for Great Lakes communities and property owners. Outreach staff will continue to provide regional climate change prediction information and promote adaptive responses to anticipated changes.

### **Coastal Visualization (Hart)**

Information collected about coastal processes is often very technical in nature and difficult for coastal landowners to comprehend. UW Sea Grant’s GIS specialist will integrate animation, aerial photography, pictures, charts, and text to help the public better understand the natural process of coastal erosion, how local land development decisions affect coastal erosion, and the case for scientifically based coastal development setbacks. This includes developing integrated bathymetric/topographic digital elevation models along sections of the Great Lakes coast to visually illustrate changing lake levels and coastal setback alternatives.

**Coastal Engineering (Clark)**—A wide range of information about coastal erosion, recession, bluff slope failure, and storm surges along Wisconsin’s Great Lakes shores will be disseminated via publications, UW Sea Grant’s Coastal Natural Hazards Theme Web site, workshops for coastal property owners and, when appropriate, direct engineering assistance to coastal communities. UW Sea Grant’s coastal engineering specialist will provide direct access to coastal hazards information through partnerships with the Wisconsin Coastal Management Program and relevant regional and national agencies and organizations.

**Boating & Water Safety Education (Lubner)**—UW Sea Grant’s marine safety outreach specialist will continue to offer two to three accredited Great Lakes boating safety courses for at least 50 youths and adults annually. In cooperation with state and national partners, he will provide training for boating safety organizations, such as the U.S. Coast Guard Auxiliary and the U.S. Power Squadrons, and conduct seminars on hypothermia, maritime weather, and boating rules and requirements as requested.

**Rip Currents and Trap Nets (Lubner/Clark/Moy/Wittman)**—As part of a National Weather Service-U.S. Lifesaving Association-Sea Grant campaign to increase public awareness of rip currents, UW Sea Grant will continue to distribute annual news releases and provide Spanish as well as English versions of NOAA rip current warning signs and flyers free of charge to all of the state’s coastal public beaches. In partnership with commercial and recreational fishing groups, UW Sea Grant will also continue to provide annually updated posters showing the location of commercial fishing trap nets in state waters of the Great Lakes along with brochures on how boaters can avoid or escape entanglement in one. Trap net maps showing locations of nets in the Manitowoc-Two Rivers area are updated weekly and are posted online and are available at area boat ramps.

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## Digital Ocean-Great Lakes Geospatial Technologies Theme

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***National Sea Grant Goal:** Develop tools to assimilate data from distributed observatories, or individual networked ocean sensors, and then connect this assimilated data with the various existing computer models of ocean processes.*

Imagine placing the global ocean on a microchip. That's essentially what Sea Grant's Digital Ocean Theme aims to do by developing methods to create extensive digital representations, or models, of ocean resources and phenomena, such as El Niño events. Such models will be able to translate chemical, biological, and physical data into tools that will help us learn how best to use and tend to our marine resources.

As part of this national effort, Wisconsin Sea Grant's priority in this theme is to begin putting the Great Lakes on a microchip by developing research and monitoring tools, computer models, and methods for continuously tracking and assessing in real time the nature and extent of chemical, biological, geological, and physical changes in marine and Great Lakes waters. The ultimate goal is the seamless integration of data from observation systems in the Great Lakes and geographic information systems (GIS) data from the watershed with satellite remote sensing data.

## Projects

### **Geospatial Technologies for Land Use Planning in Great Lakes Coastal Communities**

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

This continuing project expands our geospatial technologies outreach activities aimed at enabling stakeholders to take advantage of such new technologies as integrated observation systems, automated retrieval of archived records, and visualization by empowering local, regional, and tribal governments to use GIS, Web mapping, and geospatial models in their planning efforts. This project also addresses a Coastal Communities & Economies priority of applying GIS and other advanced techniques to improve coastal resources management through science-based planning for watershed and coastal development. UW Sea Grant's GIS outreach specialist will work closely with the investigator to ensure effective transfer and application of this technology. [R/DO-1](#)

## Outreach programs

### **Wisconsin Coastal Data Catalog (Hart)**

UW Sea Grant is developing tools to make it easier to discover, acquire, and integrate geospatial data for the Great Lakes coasts of Wisconsin. This ranges from developing data catalogs to promote interoperable web mapping services to collaborating with the Robinson Map Library to acquire GIS data from coastal local governments.

### **Hydrologic Dashboard (Hart)**

The "hydrologic dashboard" is a Web browser interface to integrate and visualize distributed Web services in support of water resource management. The dashboard consumes Web services of stream flow and precipitation data from USGS gages and allows the user to visualize stream flow trends with maps of storm total precipitation and watersheds. This allows water resource managers and researchers to explore, define, and analyze the impacts of storm events since 2003.

### **GLOS Outreach and Education (Hart/Lubner)**

Along with other Sea Grant programs in the Great Lakes region, UW Sea Grant promotes use of the Great Lakes Observing System through outreach and education activities.

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***National Sea Grant Goals:** (1) Develop a quantitative understanding of the structure and function of critical nearshore habitats and coastal ecosystems, and (2) identify the processes that control the transport, transformation, and fate of biogeochemically important materials in the nearshore area, the impact of riverine inflows, and the influence of watershed management on coastal and estuarine systems.*

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.

Wisconsin Sea Grant's priorities related to this theme include developing technologies for better spatial and temporal characterization of nearshore environments and coastal ecosystem dynamics, better understanding of Great Lakes food webs and how invasive species affect them, increased information about amphibians' immunocompetence and pathogen resistance, and improving the design, function, and assessment of coastal habitat rehabilitation and restoration projects.

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## Projects

### **Lake Superior Food Web Dynamics: Modeling at Multiple Scales**

*James Kitchell, UW–Madison, (608) 262-3014, kitchell@wisc.edu*

Trophic interactions occur at multiple scales, ranging from predator-prey interactions that govern population dynamics and community structure to daytime-nighttime vertical and horizontal migrations that regulate the daily feeding activity and growth rates of individual aquatic species. This continuing project will develop a model to assess diel changes in predator-prey encounters as a function of time of day, depth, and nearshore versus offshore habitats. Complementing a Minnesota Sea Grant study, this work is novel in developing the first simulation model of diel changes in predator-prey relationships specific to the Lake Superior food web. [R/EH-1](#)

### **Ecological Immunology and Pathogen Resistance of Amphibians in Stressed Great Lakes Ecosystems**

*William Karasov, UW–Madison, (608) 263-9319, wkarasov@facstaff.wisc.edu*

This multi-institutional, multi-disciplinary research program hypothesizes that contaminants will depress immunocompetence and pathogen resistance of amphibians of the Great Lakes. The project will test the impacts of two congeners of PCB (126, 70), one heavy metal (Cd), and a mix of polybrominated diphenyl ethers (PBDEs) on the immunocompetence of leopard frogs exposed during development. The resistance of contaminant- and noncontaminant-exposed frogs to three types of pathogens common in microbially contaminated habitats in the Great Lakes will then be evaluated. The researchers will develop biomarkers for immunocompetence in amphibians for use by natural resource managers for diagnostic and remediation purposes in the Great Lakes region and will facilitate prediction of toxicological effects on amphibians at other times and/or other regions. Knowledge about the sensitivity of a native frog to PBDEs and infection from pathogens common in microbially contaminated habitats in the Great Lakes will be extended. [R/EH-2](#)

## Outreach Programs

**“The State of the Bay” Web Site (Harris)**—A “State of the Bay” Web site is being developed to educate local officials, user groups, and students about the chemical, physical, and biological interrelationships of the Green Bay, Lake Michigan, ecosystem and the impacts of human activities on its water resources. Representing a partnership of UW Sea Grant and UW-Green Bay, Green Bay Metropolitan Sewerage District, Wisconsin Department of Natural Resources (WDNR), and the Science & Technical Advisory Committee for the Lower Green Bay and Fox River Remedial Action Plan, this Web site will report on the status of beneficial-use impairments in lower Green Bay, identify emerging problems, and document progress toward meeting the objectives of the Lower Green Bay and Fox River Remedial Action Plan.

**Critical Coastal Lands Acquisition (Hart)**—UW Sea Grant’s geographic information system (GIS) specialist is working with the Wisconsin Coastal Management Program and the WDNR to provide GIS support for the development of a Coastal and Estuarine Land Conservation Plan. This involves integration of digital parcels with tax assessment data for coastal counties to determine different classes of public ownership and the use of an interactive “smart board” to help stakeholders prioritize coastal land acquisition.

**Fox River-Green Bay Restoration (Harris)**—UW Sea Grant’s habitat restoration specialist will continue to be actively involved in remediation and restoration efforts regarding the heavily contaminated Fox River estuary and lower Green Bay. An active member of the Green Bay Remedial Action Plan Biota and Habitat Work Group, she is helping the work group, U.S. Army Corps of Engineers, and Brown County Port Authority design the restoration of a chain of barrier islands in southern Green Bay using dredged materials from the navigation channel.

***National Sea Grant Goals:** (1) Develop an ecosystem perspective in renewable resource management; (2) understand the ecological changes effected by exotic aquatic species; (3) restore habitat and ecological conditions required by native species, and (4) understand ecological variability and its role in resource management practices.*

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. Alewife and smelt replaced the native forage fishes. Thriving recreational fisheries have developed around the introduced Pacific salmon species. New invaders—such as zebra mussels, round goby, ruffe, and white perch—pose different and equally significant challenges. Key research challenges include developing ways to control the spread of exotics, creative methods for reducing their adverse ecological effects, and the combination of conceptual and analytical tools required to evaluate the future of fishery restoration efforts. Projects specifically related to the control of invasive species can be found in the aquatic invasive species theme section.

Additional Wisconsin priorities in this theme include the development of methods and models to improve management of Great Lakes commercial and recreational fisheries from a whole-ecosystem perspective and identification of the factors and conditions necessary for rehabilitation of self-sustaining populations of lake trout and other native fish species. Our changing climate will affect the fisheries in unpredictable ways, necessitating further research on the effects of rising water temperatures on fish populations as well.

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## Projects

### **Hydrodynamics, Chlorophyll and Larval Fishes**

*John Janssen, UW-Milwaukee, (414) 382-1733, jjanssen@uwm.edu*

The strength of each year class of fish is largely determined by the end of its larval stage. In spring, when larval fish emerge, the hydrodynamics of changing water temperatures and density in Lake Michigan cause wedges of warm coastal water to be carried away from shore, creating plumes of relatively warm water that temporarily concentrate chlorophyll and the plankton that larval fish feed on. This continuing project will examine the effect of such thermal structures on the survival and growth of nearshore and open-water populations of larval fish. If variations in year-class strength of these can be related to hydrodynamic changes in chlorophyll concentrations, it will be strong evidence that fish recruitment can be affected by changes in chlorophyll concentration caused by invasive plankton consumers like zebra mussels as well as changes in climate. [R/FI-1](#)

### **Lake-Wide Sustainability of Lake Trout Stocks in Lake Superior**

*Michael Hansen, UW-Stevens Point, (715) 346-3420, mhansen@uwsp.edu*

A meta-population model will be developed to evaluate lake-wide sustainability of recently restored lake trout stocks across Lake Superior, building on a stochastic, age-structured population model that was developed under a previous Sea Grant-funded project. The hypothesis is that long-term sustainability of individual stocks within Lake Superior is enhanced by the presence of other stocks in the lake through immigration. Movement among stocks and effects of environmental factors will be modeled. The model will mimic combinations of recreational and commercial fishery harvest by simulating probability distributions for key population parameters, such as population abundance and recruitment. Research will be coordinated through the Lake Superior Technical Committee representing all state, federal, and tribal agencies with jurisdiction on Lake Superior. Fishery managers on Lake Superior will be given a tool for estimating short-term harvest quotas and for simulating long-term effects of management strategies. [R/FI-2](#)

## Outreach program

**Critical Outreach Issues in Great Lakes Fisheries (Moy)**—This outreach project is directed at resolving the conflict between commercial and recreational fishers over trap netting in the Sheboygan-Manitowoc-Two Rivers area of Lake Michigan. UW Sea Grant's Advisory Services fisheries specialist will work with area commercial fishers, anglers, and area businesses to reduce friction through the production and distribution of posters and weekly updated maps showing trap net locations and handouts that describe how to identify trap nets and avoid or escape entanglement.

**Lake Michigan Fisheries Forum (Moy)**—UW Sea Grant's fisheries specialist will continue to chair periodic meetings of the Lake Michigan Fisheries Forum, an advisory body formed by the Wisconsin Department of Natural Resources (WDNR) to address issues related to Lake Michigan fisheries. The forum facilitates information exchange between the WDNR and interested groups and individuals, promotes discussion of issues of concern, develops consensus among diverse interests on matters of common concern, and provides public advocacy for policies of general interest.

**History of Sturgeon in the Lake Winnebago System (Kline/Binkowski)**—Sturgeon populations throughout the northern hemisphere, including the Great Lakes region, have been driven to the brink of extinction by overharvest, pollution, loss of habitat, and dams. The largest and healthiest remaining lake sturgeon fishery in the world exists in Wisconsin, which has been successfully managing its sturgeon stocks for more than 100 years. The goal of this outreach project is to raise the profile of a native species once common throughout the Great Lakes region and recognize Wisconsin's leadership in sturgeon research, management, and conservation. A collaborative effort involving a UW Sea Grant science writer and sturgeon researcher, WDNR sturgeon fishery manager, Sturgeon for Tomorrow, and the Wisconsin Historical Society, this project will create a Web site, illustrated historical book, and traveling educational display documenting the lake sturgeon's prominent place in the state's cultural heritage.

## Marine & Aquatic Science Literacy Theme

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***National Sea Grant Goal:** Provide national leadership in the development of well-prepared professionals who understand marine and aquatic science and research, and to be a leader in enhancing public aquatic sciences literacy from “cradle to grave.”*

Virtually every serious study of national goals for the new millennium underscores the critical importance of education to national prosperity. To sustain a growing economy, we must also be stewards of the natural environment upon which all life depends.

UW Sea Grant contributes to this national Sea Grant theme by providing leadership in the development of well-prepared professionals who understand and are conversant in Great Lakes and aquatic science, by supporting teachers to advance and develop their scientific skills through formal and informal educational opportunities, and by extending science education beyond schools to families and communities. In pursuit of institutional as well as thematic priorities, UW Sea Grant is creating opportunities for K–12 teachers—especially those of underrepresented groups—to increase their marine/aquatic science literacy.

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## Projects

### **Navigating to Knowledge: Deepwater Archaeology and Geocaching in Support of Wisconsin's Maritime Heritage**

*John Broihahn, Wisconsin Historical Society, (608) 264-6496, john.broihahn@wisconsinhistory.org*

*John Karl, UW-Madison, (608) 263-8621, jkarl@aqua.wisc.edu*

This project will develop outreach materials to inform the public about the historical, cultural, and economic significance of the Great Lakes, waterborne commerce, and seafaring life and to foster stewardship and preservation of Wisconsin's Great Lakes shipwrecks. Specifically, it will provide archaeological documentation of six nineteenth-century deepwater shipwrecks of historical and recreational significance using high-resolution photo mosaics, still and video images, and diagnostic measurements. Ten shoreside geocache courses requiring learning about Wisconsin's maritime heritage will be developed to increase the public's knowledge of and involvement with these shipwrecks. A geocache is a high-tech "treasure hunt" using a hand-held GPS unit instead of a compass to find a hidden container or cache. Products will be incorporated into the Web site [www.wisconsinshipwrecks.org](http://www.wisconsinshipwrecks.org) and will be shared via multimedia presentations and new roadside historic markers. [C/ML-2](#)

### **Lake Sturgeon Bowl, Wisconsin's Regional Academic Competition for the National Ocean Sciences Bowl and Teacher/Student Professional Development**

*Caroline Joyce, UW-Milwaukee, (414) 227-3365, caroline@uwm.edu*

*Russell Cubel, UW-Milwaukee, (414) 382-1711, rcubel@uwm.edu*

The Lake Sturgeon Bowl serves as a regional education outreach site of the National Ocean Sciences Bowl (NOSB), an academic tournament fostering an interest among high school students in ocean and aquatic sciences. Students are exposed to career opportunities associated with ocean and aquatic systems while teachers are provided with networking opportunities and professional development in marine and freshwater systems. The bowl connects both teachers and students with University researchers and graduate and undergraduate students.

The Lake Sturgeon Bowl has experienced a three-fold growth in the number of competitors and teams since it hosted the first regional contest five years ago. A new addition to this continuing project is the diversity initiative, which provides support to under-represented groups to prepare them for the competition. Cosponsors include the University of Wisconsin-Milwaukee, Great Lakes WATER Institute, and School of Continuing Education. [E/ML-8](#)

### **"Water Matters: A Lecture Series"**

*Henry Drewal, UW-Madison, (608) 263-9362, jhdrewal@wisc.edu*

UW Sea Grant is cosponsoring a lecture series that will help enhance public awareness and understanding of water resources issues in the context of a changing climate. This lecture series is part of the public programming accompanying Mami Wata: Arts for Water Spirits in Africa and its Diasporas, a major traveling exhibition at the UW-Madison Chazen Museum of Art, which runs from October 18, 2008, through January 11, 2009. A collaborative effort also involving the Water Resources Institute, Department of Art History, American Indian Studies Program, Center for Limnology, and Chazen Museum of Art, the series will include presentations by UW and Northland College faculty, a geographer from UC-Berkeley, and an artist/activist. [E/ML-12-SE](#)

### **Aquatic Sciences Exploration: Onboard and Online**

*Carmen Aguilar, UW-Milwaukee, (414) 382-1700, aguilar@uwm.edu*

The "Aquatic Sciences Exploration: Onboard and Online" program provides immersion science learning to middle and high school students and teachers during authentic research cruises on Lake Michigan. Distance learning communication technologies such as wireless shipboard-based interactive videoconferencing will allow participants to share and distribute their findings with others. The program will provide the mechanism to test both the hands-on, hypothesis testing components ("onboard") and the distance learning component ("online") using pre-assessment, formative, and summative evaluations as components of the program material. The program promotes encourages the inclusion of under-represented students from the Milwaukee area. [E/ML-9](#)



## Outreach Program

**Great Lakes Center for Ocean Science Education Excellence (Lubner)**—The goal of this five-year Great Lakes Sea Grant Network project is to implement a Great Lakes Center for Ocean Science Education Excellence (COSEE), which is designed to help teachers deliver high-quality educational programs in aquatic sciences by creating dynamic linkages between Great Lakes researchers and 4th- to 10th-grade educators and their students. The goal of the seven regional COSEEs is to help U.S. citizens become more scientifically literate and environmentally responsible through standards-based science curricula and programs. Funding sources: National Oceanic & Atmospheric Administration and National Science Foundation

**Science of the Great Lakes for the K–12 Classroom (Lubner)**—In partnership with such organizations as Discovery World at PIER Wisconsin, the Schlitz Audubon Nature Center and UW Great Lakes WATER Institute, UW Sea Grant’s education coordinator will continue to develop programming for K–12 teachers on a diversity of Great Lakes issues. Courses and workshops provide educators with content knowledge about the Great Lakes and hands-on activities for use in their classrooms. Courses often include on-the-water and other field experiences that are available for credit.

**Marine Science at Sea: A Hands-on Laboratory (Lubner)**—This three-credit UW–Milwaukee course provides a hands-on, shipboard opportunity to learn the basics of oceanography and nautical science. Students sail aboard the *S/V Denis Sullivan*, a replica of an 1880s three-masted schooner, for two weeks as it travels from its winter port in Florida to Bahamian waters. They become members of the crew and engage in all aspects of shipboard operations while learning about the physical, chemical, biological, and geological aspects of the ocean as well as the history and culture of the Bahamas.

**Grandparent’s University (Lubner/Moy)**—This Wisconsin Alumni Association “university” is a two-day program of coursework in a number of subject areas that is offered each summer for youngsters and their grandparents. UW Sea Grant and the UW–Madison Center for Limnology will 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.

**“Great Lakes Maps” Web Site (Reeb/Moser/Dellinger)**—A “Great Lakes Maps” Web site is being developed to enhance public awareness and understanding of Great Lakes history, culture, and resources. Partnering with UW Sea Grant are UW–Madison Wisconsin’s Water Library, UW–Milwaukee American Geographical Society Library, UW–Madison Space Science and Engineering Center, UW–System Wisconsin Digital Collections Center, Wisconsin Historical Society Library and Archives, and United States Library of Congress Map Collections. This Web site ([www.GreatLakesMaps.org](http://www.GreatLakesMaps.org)) will feature an exhibit of all 76 charts produced by the U.S. Lake Survey from 1852–1882 as well as a collection of over 30 downloadable maps tracing the evolution of map-making since the 1600s and the historical influence of the Great Lakes on the history of Wisconsin.

**Water Quality Education Outreach (Harris)**—UW Sea Grant’s water quality outreach specialist will continue to organize and host the “Edge of the Lake” seminar series at UW–Green Bay during 2008–10 and at least three forums/workshops annually for local officials, decision makers, and citizens. She also will teach a five-week course on Wisconsin’s water resources for the Institute for Learning in Retirement at UW–Green Bay.

**Allied Drive Story Hours (Moser)**—The staff of UW Sea Grant’s Wisconsin’s Water Library will continue its series of story hour programs for children in Kindergarten and First Grade in the Allied Drive neighborhood of Madison. Each story hour is organized around a water-related theme and includes art projects and snacks. These monthly events are conducted in partnership with the UW–Madison School of Library and Information Studies, the Madison School & Community Recreation Safe Haven Childcare Program, and several special UW–Madison libraries.

**Applied GIS Workshops for Urban Planners (Hart)**—As part of his affiliation with the UW-Madison Department of Urban and Regional Planning, UW Sea Grant’s GIS specialist teaches an applied GIS workshop focusing on coastal and environmental resource management issues each spring semester. Past courses have focused on using GIS to explore alternatives for rebuilding the Hurricane Katrina-devastated areas of New Orleans and conducting a detailed land use inventory for the rapidly changing Historic Walker’s Point neighborhood in Milwaukee.

**Web Mapping for Great Lakes Education (Hart)**—This project involves showing teachers how to tap into the growing amount of online data and maps about the Great Lakes. A focus will be on how to use Google Earth to develop lessons and activities about Great Lakes issues.

**Wisconsin’s Water Library (Moser)**—UW Sea Grant will continue to develop and promote “Wisconsin’s Water Library” ([www.aqua.wisc.edu/waterlibrary](http://www.aqua.wisc.edu/waterlibrary)) during the next biennium. All Wisconsin residents as well as UW System faculty, staff, and students can check out any library materials free of charge. Materials can be picked up at the library or sent to the user’s local public library for pick up and return, providing easy access to the nearly 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.

***National Sea Grant Goal:** Improve the safety, quality, shelf life, and marketability of existing and new seafood and seafood-derived products.*

This national theme aims to develop new ways for Americans to reap the bounty of our waters on a sustainable basis. Sea Grant-sponsored research and technology transfer in this thematic area help the seafood industry by improving processing technology, products, and methods for assuring seafood safety. As wild fish stocks decline, we need to find new ways to reduce waste and by-catch by improving fishing gear, developing markets for underused species, and ensuring the safety and quality of products through better storage, processing, and packaging techniques.

Examples of previous Wisconsin Sea Grant-supported research and technology transfer in this theme include applying Hazard Analysis Critical Control Point methods in commercial processing to ensure seafood safety, developing super-absorbent gels from fish protein extracts, and finding ways to use omega-3 fatty acids common in fish oils as nutraceuticals—foods or food additives that confer nutritional, therapeutic, or preventative medical benefits to individuals at risk for cardiovascular disease, certain forms of cancer and diabetes, hypertension, and other health problems.

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Outreach Programs

**Commercial Fisheries for Siscowet and White Perch (Moy)**—A Wisconsin Sea Grant priority in this theme is to develop new markets for seafood and Great Lakes fisheries products and by-products, including creating new fisheries and finding novel uses for by-catch, invasive exotic fishes, and underutilized species. Fuel costs have placed some of Wisconsin’s commercial fishers at risk of business failure and may preclude expansion into potential new fisheries such as siscowet (fat trout). During 2008-2010 UW Sea Grant’s fisheries specialist will work with commercial fishers and other entities to investigate alternative fuels and ways to improve energy efficiency. He will also continue working with the Wisconsin Department of Natural Resources and Green Bay commercial fishers to explore interest in and test the feasibility of developing a new gillnet fishery on Green Bay, Lake Michigan, based on the white perch, an invasive species. A commercial market for white perch could provide local fishers with a much-needed alternative to the depressed native yellow perch fishery as well as help control the population of an invasive species in the bay.

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*National Sea Grant Goals: (1) Resolve water quality, beach access, coastal land use and development, and similar coastal issues; (2) reduce contaminants, nutrients, and other nonpoint-source pollution from urban watersheds; (3) enhance ports, harbors, and marinas to meet growing demands for service while addressing concerns about impacts on the local community and environment, and (4) resolve conflicts over existing and proposed uses of coastal space and resources.*

Economic growth since 1950 has sparked increased urbanization of coastal areas—with corresponding rises in pollution and environmental degradation. In an urban setting, a shoreline has significant appeal, as shown in the demand for recreational, business, and residential developments near the water. Communities and states must balance economic and environmental values, manage the impacts of nutrient 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 countless species.

Millions of Americans and Canadians depend on the Great Lakes for drinking water as well as the multibillion-dollar fisheries, shipping, and tourism/recreational industries the lakes support. Wisconsin Sea Grant’s principal priorities in this theme area include identifying the mechanisms, sources, and fate of bacterial and viral contamination responsible for beach closings in the Great Lakes and other coastal areas; developing tools, technologies, methods, and strategies for the maintenance of Great Lakes harbor and marina infrastructure, and evaluating potential impacts of changing climate and lake levels on the vulnerability of coastal urban infrastructure.

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## Projects

### **Evaluation of the Algal Nuisance *Cladophora* and its Effect on *E. coli* and Beach Closure**

Gregory Kleinheinz, UW-Oshkosh, (920) 424-1100, [kleinbei@uwosh.edu](mailto:kleinbei@uwosh.edu)

Colleen McDermott, UW-Oshkosh, (920) 424-1102, [mcdermot@uwosh.edu](mailto:mcdermot@uwosh.edu)

In recent years, the growing number of beach closings has coincided with growing amounts of the nuisance alga *Cladophora* washing up on the shores of Lake Michigan. In this new study, a multidisciplinary team of investigators is testing the hypothesis that there may be a link between *Cladophora* mats and elevated *E. coli* counts that trigger beach closings. The results could have widespread implications for management of this nuisance alga and for interpretation of sources of the coliform bacteria that lead to beach closings. [R/UC-1](#)

### **Development and Application of Molecular-Based Methods for Identifying Sources of Fecal Pollution at Lake Michigan Beaches**

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

The indicator organism for determination of beach closures is *E. coli* bacteria. The diverse sources of *E. coli*—ranging from human sewage to gull feces—make it difficult to develop appropriate and effective mitigation strategies. This continuing project proposes to refine methods that use genetic markers to pinpoint sources of fecal contamination, validate these methods in the field, and develop methods to help better address sources of contamination. [R/UC-2](#)

### **Understanding Biological Impacts of Metals in Coastal and Urban Waters of the Great Lakes: Ligand-Interactions, Novel Biochemical Endpoints, and Model Development**

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Amy L. Prasch Landreman, UW-Madison, (608) 224-6230, [praschal@mail.slh.wisc.edu](mailto:praschal@mail.slh.wisc.edu)

The objective of this project is to measure and model the bioconcentration of methylmercury and the toxicity of copper and cadmium to phytoplankton in coastal regions of the upper Great Lakes. Field studies will be selected to provide key geochemical parameters and a range of both urban and rural influences on the phytoplankton *Chlamydomonas reinhardtii*. Comparisons between observed and predicted bioconcentration or toxicity will be used to test the adequacy of the predicted biotic ligand models and to identify possible modifications needed to achieve targeted accuracy in the predicted values. The results will ultimately provide the tools needed to assess the sensitivity of coastal regions to metal toxicity and methylmercury bioaccumulation. [R/UC-3](#)

### Outreach Programs

**Cladophora and Beach Closings (Harris/Karl)**—UW Sea Grant's water quality specialist (Harris) will continue to educate Lake Michigan coastal residents about the suspected causes and potential solutions to the *Cladophora* nuisance algae problem as well as its possible role in beach closings. A video documentary on *Cladophora*, produced by UW Sea Grant's exhibit developer (Karl), will support this effort.

**Ports-Harbors-Marinas Maintenance & Growth Issues (Clark)**—UW Sea Grant's coastal engineering specialist will continue to help Wisconsin ports, harbor, and marina managers and owners identify and respond to facility-related issues, such as maintenance dredging, the accelerated corrosion of sheet pilings in Duluth-Superior harbor, and deteriorating timber piles and crib structures observed at Wisconsin's other major ports.

**Urban Coastal Infrastructure Value & Vulnerability (Hart)**—UW Sea Grant's GIS specialist is using land information records to develop an inventory and indices of coastal land valuation and ownership. These indices will be coupled with other datasets, such as land elevation, to assess the vulnerability and value of coastal property and infrastructure likely to be affected by fluctuations or extreme changes in Lake Michigan water levels.

**Clean Marina Program (Harris/Clark)**—UW Sea Grant's water quality specialist and UW Sea Grant's coastal engineering specialist are initiating a "Clean Marina" program for the state of Wisconsin. This program promotes Best Management Practices relating to marina nonpoint-source pollution prevention and focuses on marina owners and operators as well as Best Management Practices for individual boat owners.

**Beneficial Re-Use of Dredged Material (Clark)**—UW Sea Grant's coastal engineering specialist will continue to promote the beneficial reuse of Great Lakes harbor and marina dredged material. Once considered a waste product, this dredged material is finding new use for beach nourishment, habitat creation and restoration, landfill cover material, construction fill, and more. As a member of the Great Lakes Commission dredging team, the coastal engineering specialist partners with many Great Lakes agencies to demonstrate the value of harbor dredged material and promote its use.

**Wisconsin Sea Grant Goal:** Provide an opportunity for university scientists and engineers to undertake original and innovative Great Lakes, coastal, and ocean research, especially work that reaches beyond the established national Sea Grant research, outreach, and education themes.

Investigations of the Great Lakes and ocean environments may be sweeping or sharply focused, aimed at specific locales or at vast regions. They may examine short or long periods of time; they may explore specific technologies or generic problems. Given the breadth of research possibilities, UW Sea Grant encourages scientists and engineers to undertake innovative and original research projects that fall outside the confines of present Sea Grant thematic areas. This includes the development of initiatives that take full advantage of special opportunities, apply state-of-the-art scientific techniques and new technologies, and tap the full spectrum of unique talents available in the Wisconsin scientific community.

Potent areas for future research include the ocean's role in climate change and the potential effects of climate change on Great Lakes hydrology and ecosystems and the application of state-of-the-art technology to marine resource utilization and ocean exploration.

### **Dean John A. Knauss Marine Policy Fellowship**

[www.seagrant.noaa.gov/knauss/knauss.html](http://www.seagrant.noaa.gov/knauss/knauss.html)

*Contact: Anders W. Andren, Director, UW Sea Grant Institute, (608) 262-0905*

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

*Funding source: National Sea Grant Office, National Oceanic & Atmospheric Administration*

### **Sea Grant Industrial Fellowship**

[www.seagrant.noaa.gov/funding/industryfellowship.html](http://www.seagrant.noaa.gov/funding/industryfellowship.html)

This fellowship provides support for graduate students who are pursuing research and development projects in topics of interest to a particular industry or company. In a true partnership, the student, his/her faculty advisor, the local Sea Grant program and industry personnel work together on a project from beginning to end.

*Funding source: National Sea Grant Office, National Oceanic & Atmospheric Administration*

### **Sea Grant/NOAA Fisheries Graduate Fellowship**

[www.seagrant.noaa.gov/funding/fisheriesgradfellowship.html](http://www.seagrant.noaa.gov/funding/fisheriesgradfellowship.html)

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

*Funding source: National Sea Grant Office and National Marine Fisheries Service, National Oceanic & Atmospheric Administration*

### **Carl J. Weston Memorial Scholarship**

*Contact: Mary Lou Reeb, UW Sea Grant Institute, [mlreeb@aqu.wisc.edu](mailto:mlreeb@aqu.wisc.edu)*

Established in 1995, the Carl J. Weston Memorial Scholarship fund provides support for deserving undergraduate students working on Wisconsin Sea Grant-supported projects.

*Funding source: Dr. and Mrs. Carl B. Weston*

## Useful Wisconsin Sea Grant Web Sites for Investigators, Staff, and Students

### Wisconsin Sea Grant-Great Lakes Online

[www.seagrant.wisc.edu](http://www.seagrant.wisc.edu)

Find links to and launch searches of all UW Sea Grant Web sites, including Wisconsin activities in each of Sea Grant's national theme areas and various products of UW Sea Grant-funded research, outreach, and education.

### Funding

[www.seagrant.wisc.edu/funding](http://www.seagrant.wisc.edu/funding)

Provides links to information about grant opportunities, graduate student competitions, and more.

### Interactive Project Reporting Online (iPRO) System

[www.aqua.wisc.edu/ipro](http://www.aqua.wisc.edu/ipro)

Permits project investigators to manage, report progress, and view information about their project(s), including results, accomplishments, benefits, student activities, and budget.

### Projects

[www.seagrant.wisc.edu/projects](http://www.seagrant.wisc.edu/projects)

Information about the research, education, and outreach projects currently funded by UW Sea Grant.

### Great Lakes Internet Resources

[www.greatlakesseagrant.org](http://www.greatlakesseagrant.org)

### National Sea Grant Network

[www.seagrant.wisc.edu/communications/national](http://www.seagrant.wisc.edu/communications/national)

Links to online directories of federal and university Sea Grant staff nationwide and the Web sites of every Sea Grant program, the National Sea Grant Library, and the Sea Grant Association.

## Special Program Resources

### Aquatic Sciences Chronicle

[www.aqua.wisc.edu/chronicle](http://www.aqua.wisc.edu/chronicle)

Published four times a year, this four- to eight-page newsletter reports on the activities of the Wisconsin Sea Grant and Water Resources programs. It is available free of charge to anyone interested in receiving it. To get on the mailing list, contact Linda Campbell (see "Key Contacts").

### Aquatic Sciences Center Publications

[www.aqua.wisc.edu/publications](http://www.aqua.wisc.edu/publications)

This Web site features an annotated listing of our most popular publications, including brochures, fact sheets and posters, as well as online access to a wide range of other UW Sea Grant and Water Resources program information. The site includes an online shopping feature that allows users to make purchases with a credit card or obtain items free of charge.

### Wisconsin's Water Library

[wri.wisc.edu](http://wri.wisc.edu)

This UW-Madison library contains nearly 30,000 volumes of water-related information, with particular emphasis on issues concerning Wisconsin and the Great Lakes, available for loan to all Wisconsin residents. The collection also contains publications from state Water Resources Research Institutes nationwide. For more information, contact Anne Moser (see "Key Contacts").

### National Sea Grant Library

[nsgd.gso.uri.edu](http://nsgd.gso.uri.edu)

As the official national program archive, the NSGL maintains a complete collection of Sea Grant-funded documents on a wide variety of subjects. The NSGL's searchable 36,000-record bibliographic database contains citations and abstracts of all Sea Grant publications and online access to a full-text copy of many of these documents as well.



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