
*40th Anniversary Report of the University of Wisconsin Sea Grant College Program*

# 40

The occasion of its 40th anniversary provides me a special opportunity to recognize the University of Wisconsin Sea Grant College Program for its sustained excellence in research, education and public service. As a UW System program, UW Sea Grant has supported more than 750 research, outreach and education projects involving faculty, staff and students at nine UW System campuses and UW Extension, plus seven private colleges and universities. These projects have earned UW Sea Grant international recognition for cutting-edge research on freshwater fisheries and aquaculture, toxic contaminants and water quality, and ecological and coastal processes, and Sea Grant graduate assistantships have provided financial support for more than 600 Wisconsin students. Over the years the program has also trained hundreds of Wisconsin K-12 teachers and provided exceptional educational programs for tens of thousands of students and adults. Finally, Sea Grant outreach specialists have provided coastal communities and individuals alike with free advice and assistance on a wide range of concerns, ranging from toxic contaminants and water quality, to business management and natural coastal hazards, to fish farming and aquatic invasive species. Congratulations and keep up the good work!

## –Kevin P. Reilly, President, UW System

The Great Lakes and Wisconsin's surface waters represent one of our state's signature natural assets. To better understand and sustain this valuable resource, the University of Wisconsin Sea Grant Institute has for 40 years developed and implemented outstanding and highly successful programs of research, education and public outreach. Conducted under the auspices of one of the oldest and most distinguished programs of its kind, these initiatives have time and again proven their worth to Wisconsin's citizens and those who depend on this elemental resource. As we look ahead to bigger and more complicated challenges confronting our state's natural resources, and the Great Lakes in particular, it is essential that we have the knowledge and educational base to further good stewardship and wise use of our water resource. The University of Wisconsin Sea Grant Institute is a linchpin for this lofty effort as it builds on its decades of success. Sea Grant at 40 years old is a model of the type of institute that contributes to our high quality of life and makes Wisconsin a special place. Congratulations on 40 years of outstanding service in the interest of Wisconsin and its natural heritage!

## –Carolyn A. "Biddy" Martin, Chancellor, UW-Madison

Over the last 40 years, the UW Sea Grant Institute has been one of the most exciting and successful institutions in the UW-Madison Graduate School. During that time the Sea Grant program has provided a total of $117 million in grants to Wisconsin investigators that have supported hundreds of research, outreach and education projects spanning a wide range of academic disciplines. In the belief that research and graduate education go hand in hand, Sea Grant graduate assistantships have employed and provided financial support for 648 Wisconsin graduate students—a third of them women—that helped these students earn 399 master's degrees and 283 doctoral degrees. The Sea Grant Institute has also supported Knauss Marine Policy Fellowships for 20 Wisconsin graduate students, providing them the outstanding post-graduate educational experience of working for a year in federal agencies or as legislative aides on various coastal, ocean and Great Lakes issues in Washington, D.C. My congratulations and best wishes for continued success!

## –Martin Cadwallader, Vice Chancellor for Research and Dean of the Graduate School, UW-Madison

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Sea Grant is a unique partnership with public and private sectors combining research, education and technology transfer for public service. It is a national network of universities meeting the changing environmental and economic needs of people in our coastal, ocean and Great Lakes regions.



Publication No. **WISCU-Q-10-001** — Additional copies are available from:
Publications, UW Aquatic Sciences Center, 226 Goodnight Hall,
1975 Willow Drive, Madison, WI 53706-1177, USA Phone: (608) 262-3259
E-mail: *publications@aqua.wisc.edu* Web: *aqua.wisc.edu/publications*

Funding provided by the the National Sea Grant College Program, National Oceanic & Atmospheric Administration, U.S. Department of Commerce (grant no. NA060AR4170011, Project C/C-1)

First Printing: February 2010
Printed in the USA

# Table of Contents

# *From the* **Director**

It is my honor and privilege to introduce you to our quadridecadal report. As documented in these pages, the University of Wisconsin Sea Grant College Program has grown and matured into one of the nation's premier Sea Grant Colleges since the submission of the first proposal for federal funding to create the program in 1968.

Through the years, many people I've met have asked, "What is 'Sea Grant'?" The short answer is "sea" as in ocean and "grant" as in money—we provide grants for Wisconsin university research, outreach and education projects focused on addressing and resolving ocean, coastal and Great Lakes-related issues. Established by the National Sea Grant College and Program Act of 1966, Sea Grant was originally conceived to be the marine equivalent of our land-grant colleges and universities.

Ours was the first Sea Grant program in the Great Lakes region (today there are seven), and in 1972 it became the sixth program in the nation to achieve college status (today there are more than two dozen) in recognition of "sustained excellence in research, education and public service dedicated to the wise use of America's marine resources."

Headquartered at the UW-Madison Graduate School's Aquatic Sciences Center, UW Sea Grant today is part of a national network of 32 university-based programs funded through the National Sea Grant College Program, National Oceanic & Atmospheric Administration, U.S. Department of Commerce, with matching contributions from participating states and the private sector.

Throughout the years, the Wisconsin Sea Grant program has invested in high-priority Great Lakes research on such issues as fisheries management, water supply and quality, toxic contaminants risk assessment, fluctuating lake levels, coastal development, ecosystem dynamics, aquatic invasive species, freshwater aquaculture, seafood safety, and remote sensing and geographic information systems for real-time observations. The results of this research are shared with resource managers and the public through our integrated outreach program, which brings together the collective expertise of on-the-ground outreach and education specialists at UW-Green Bay, UW-Madison, UW-Manitowoc, UW-Milwaukee and UW-Superior. Our goal in doing so is to ensure vital research results are shared with those who need them most in ways that are timely, relevant and meaningful.

For this report, we have selected 40 major accomplishments to illustrate the breadth, depth and quality of Wisconsin's Sea Grant history and legacy over the last 40 years. As director of the program, I know that I speak for our entire staff when I say we are extremely proud to have funded nearly $120 million worth of projects that have accomplished so much while providing financial support for 648 graduate students as well as hundreds of Wisconsin faculty and staff at 16 public and private universities and colleges and statewide UW Extension.

**Anders W. Andren**
Director

**40** years

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# 40 years 40 milestones

Bob Rashid

## Since 1968, the University of Wisconsin Sea Grant College Program has meant . . .

**1** Funding totaling $117 million in grants that have supported more than **750** research, outreach and education projects conducted by **305** Wisconsin scientists, faculty researchers and academic staff at **16** public and private universities and colleges and statewide UW Extension.

**2** Financial support for 648 Wisconsin graduate students (33 percent of them women) via research and project assistantships that to date has helped 399 of them earn master's degrees and 283 earn doctoral degrees.

**3** Funding for the publication, reprinting and distribution of nearly 1,000 peer-reviewed scientific papers across a wide spectrum of professional journals. In addition, the UW Sea Grant Institute itself has published more than **400** public information, advisory, technical and educational publications.

**4** Knauss Marine Policy Fellowships for 20 Wisconsin graduate students that to date have enabled 10 men and an equal number of women to spend a year in Washington, D.C., working in federal agencies or as legislative aides on a variety of coastal, ocean and Great Lakes issues, many of which led to full-time federal government jobs after graduation.

**5** Continuous support for seminars and educational programs for college students, including UW-Madison's Limnology and Marine Science Program (formerly the Oceanography & Limnology Program), its "Problems in Oceanography" fall field studies course at Sapelo Island, Ga., and the Recent Advances in Limnology & Oceanography Seminar Series at UW-Milwaukee.

**6** A wide variety of K-12 and adult education programs, ranging from story hours for economically disadvantaged children in Madison to high-school aquaculture courses to "Grandparents University." The Madison JASON science and technology program (1995-2006) provided training for 495 teachers (83 percent of them women) as well as rich educational experiences for 21,921 students from 80 Madison-area schools. UW Sea Grant is also actively involved in the Great Lakes Center of Science Education Excellence project (2006-11), which has already provided more than 80 days of instruction for more than 1,350 teachers, including 225 from Wisconsin.

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**62**

marina operators saved more than

**$1 million**

in reduced ice damage and dock maintenance costs as a result of UW Sea Grant outreach

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A nationally unique diving physiology research program led to **significant improvements** in **the prevention, diagnosis and treatment** of **decompression sickness**

**7** Pioneering engineering studies of Great Lakes natural coastal processes that resulted in the creation of manuals and workbooks that have enabled lakeshore property owners, zoning commissions, real estate agents, lending institutions and insurance companies to better evaluate these risks and minimize potential property damage, especially during periods of high lake levels.

**8** The only university-based coastal engineering advice to lakeshore communities and property owners in Wisconsin and other Great Lakes states regarding natural coastal processes and ways to minimize the risks posed by storm surges, shore erosion and collapsing coastal bluffs. UW Sea Grant's coastal engineering outreach since the 1970s has also helped ports and marinas deal with such issues as dredge spoil disposal, facilities and infrastructure maintenance, and dock designs for accommodating changing lake levels and minimizing winter ice damage. A 1987 survey of 62 marina operators indicated they had saved more than $1 million in reduced ice damage and dock maintenance costs as a result of this outreach.

**9** Long-term support for a nationally unique diving physiology research program (1971-2008) that led to significant improvements in the prevention, diagnosis and treatment of decompression sickness, including the discovery that short, deep "bounce" dives can cause bone necrosis, "the chokes" and paralyzing spinal cord hits among recreational as well as commercial and military divers. Related sports psychology research developed a predictive test that is accurate in identifying nine out of 10 divers prone to panic, a leading cause of fatalities among novice and experienced divers alike.

**10** The creation of wristwatch "dive computers" capable of calculating and alerting divers to their remaining air supplies and the proper length of ascent decompression stops — now a standard part of scuba diving equipment worldwide. Related work included improved designs for snorkels, air regulators and stronger lightweight scuba tanks.

**11** Production of the longest-running science and environmental news program, *Earthwatch Radio*, which continuously provided five free two-minute programs weekly from Sept. 11, 1972, through May 22, 2007—a total of 8,874 scripts. At its peak, the program was being broadcast by more than 160 radio stations, reaching hundreds of thousands of listeners in the U.S. and around the world. Among its many awards was being named to the "Global 500 Roll of Honor" by the United Nations Environment Program. Eighty-six UW-Madison undergraduate and graduate student writers worked on the program during its 35-year run.

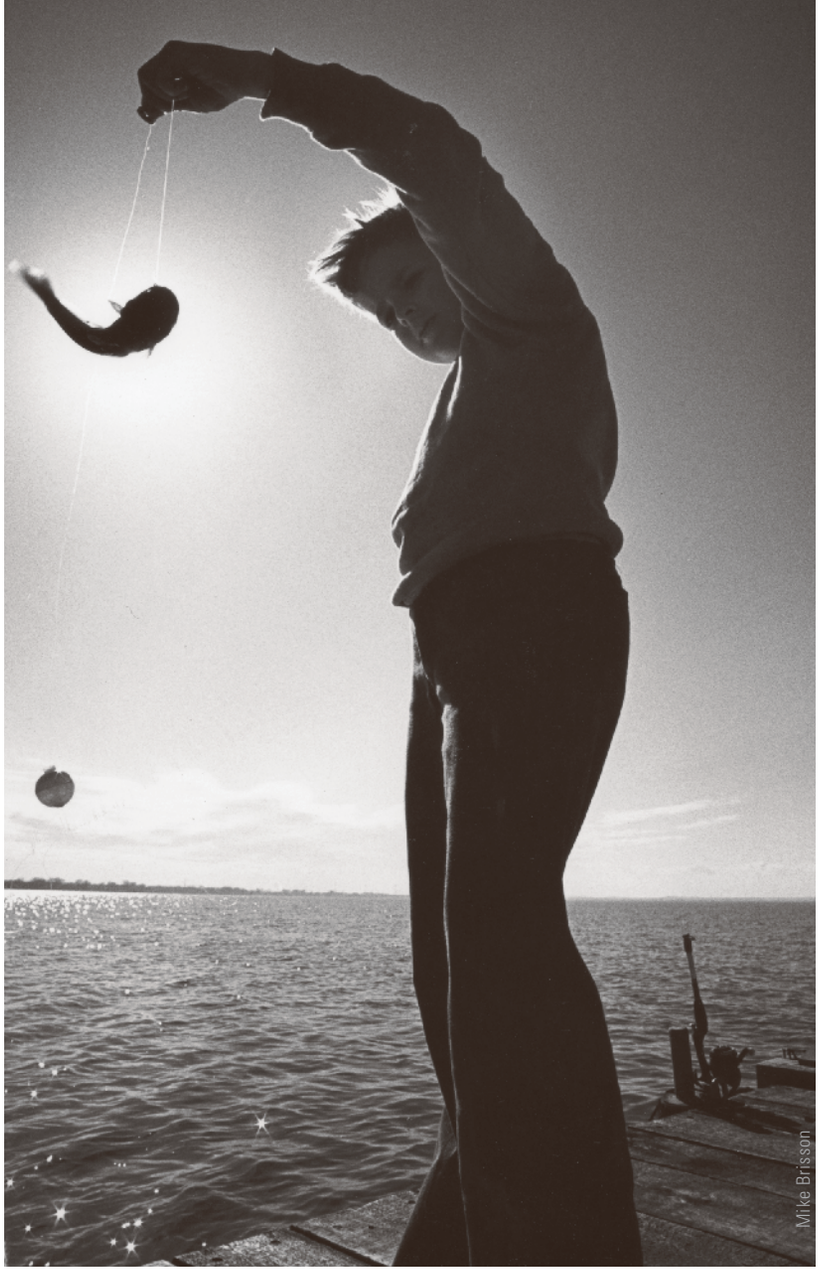
NOAA/NURP

**12** The development of computer models of the bioenergetics of fish growth—an internationally recognized advancement of fishery science as well as a practical tool now widely used by researchers and fisheries managers alike. It is also a popular teaching tool used by academic institutions throughout the United States and around the world. Recent work has included development of FishID 1.0, free software that provides an illustrated guide and taxonomic key to all fishes found in Wisconsin. This fish identification program has been adopted for use in universities, colleges and high-school classrooms and widely distributed among state fish managers and interested individuals throughout Wisconsin and beyond.

**13** Experiments that successfully imprinted trout and salmon stocked in the Great Lakes to artificial chemical odors, thereby proving the hypothesis that anadromous salmonids use their sense of smell to return to their natal streams to spawn—and solving what had been one of the great mysteries of nature.

**14** The development of acoustic sonar technology—widely known as fish-finders by anglers today—for measuring the distribution and abundance of fishes. This technology was developed in connection with field studies determining the thermal niches of fishes—which established the ecological concept that each species of fish prefers a specific range of water temperatures.

**The finding that PCBs can be passed on to nursing infants is today a standard warning in all sport fish consumption advisories**




**15** Long-term, fundamental research that developed the analytical capabilities needed to establish the sources, properties, movements, environmental fates and human health effects of polychlorinated biphenyls (PCBs), dioxins, mercury and other ubiquitous toxic chemical contaminants that accumulate in water, sediments and fish in the Great Lakes and other aquatic systems worldwide.

**16** Identification of the atmosphere as a major source of toxins—trace metals like mercury, lead and cadmium as well as organic chemicals like PCBs, DDT and toxaphene—found in Great Lakes sediments and biota. Related work showed that at times the lakes may also be a significant source of PCBs when they release them in vapor form back into the air.

**17** Seminal research on the sources and cycling of phosphorus, nitrogen and other terrestrial nutrients in Lake Michigan and their effects on the lake's food web and algal blooms. Current research is examining whether the cycling of nutrients by zebra and quagga mussels may be a factor in the recent blooms of foul-smelling *Cladophora* in the lake—and whether bacteria harbored

in *Cladophora* mats is causing beach closings. Recent Sea Grant beach closure research used genetic markers to show that most of the *E. coli* contamination at Wisconsin beaches along Lake Michigan is from non-human sources—namely gulls.

**18** Two decades of comprehensive, multidisciplinary research focused on Green Bay, Lake Michigan, making it one of the most rigorously studied estuarine systems of its size in the world. One aspect of this research effort focused on defining the nutrient status and eutrophication process in the bay, resulting in a quantitative understanding of the cycling of nutrients—especially phosphorus—which turn out to be the most important pollutants entering the system. Related work created a nationally unique inventory of the various kinds and approximate amounts of toxic chemicals discharged by industries along the Lower Fox River, Green Bay's largest tributary. This abundance of knowledge has been critical to effective efforts to clean up the Fox-Green Bay system, which once had the reputation of being one of the most polluted in the world.

**19** Significant data, funds and expertise contributions to the U.S. Environmental Protection Agency's landmark national Green Bay PCB Mass Balance Study. Completed in 1993, the five-year, $12 million study developed the first complete input-output model of all sources, movement and fates of a chemical contaminant in an aquatic system.

**20** Technical advisory assistance to state and local officials in development of the Remedial Action Plan for the Lower Green Bay-Fox River Area of Concern. This was the first such plan to be completed as mandated by the U.S.-Canadian International Joint Commission for each of 43 severely polluted "Areas of Concern" around the Great Lakes basin.

**21** Definitive work showing how high levels of PCBs and similar toxic chemicals bioconcentrate as they move up the aquatic food chain to top predator fish. Further research showed PCB levels in different species of trout and salmon increase over time relative to the PCB levels of the specific kinds of prey that each species prefers to eat—a critical factor in establishing species-specific fish consumption advisories.

**22** The finding that PCBs accumulate in breast tissues and can be passed on to nursing infants via their mothers' breast-milk—today a standard warning to pregnant and nursing mothers in all sport fish consumption advisories.

**Identification of the atmosphere as a major source of toxins**—

trace metals like mercury, lead and cadmium as well as organic chemicals like PCBs, DDT and toxaphene

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Significant data, funds and expertise contributions to the U.S. Environmental Protection Agency's **landmark national Green Bay PCB Mass Balance Study**

**The World Health Organization has adopted the fish-specific toxicity equivalency factors created by Sea Grant research**

to assess the risks of recruitment failure in feral fish populations exposed to various toxic chemical contaminants

**23** The application of geographic information systems (GIS) and satellite imagery for analyzing and managing Great Lakes resources and coastal watersheds—technology fundamental to developing today's nascent Great Lakes Observing System. UW Sea Grant provided the first satellite-generated maps of Lake Michigan surface temperatures to charter fishing captains—a time- and fuel-saving guide on where to look for trout and salmon. Sea Grant also developed a coastal GIS training program for coastal counties. This helped leverage Wisconsin's $160 million investment in local land records modernization to better understand coastal issues. Other Sea Grant GIS outreach has included developing a unique online tool kit called the "Great Lakes Coastal Community Planning Resource" to promote comprehensive planning. The next step is development of the Wisconsin Coastal Atlas, which will serve as the portal to mapping data about the Lake Michigan and Lake Superior coasts of Wisconsin and function as the gateway to Great Lakes decision-support tools.

**24** Discovery of the mechanisms of PCB toxicity to fish and how that toxicity is linked to the specific chemical structure of different types of PCBs. Related work established the zebrafish as the prototype animal model for studying dioxin toxicity in fish and demonstrated that developing fish larvae are highly sensitive to dioxin's toxicity at environmentally relevant levels of exposure. The World Health Organization has adopted the fish-specific toxicity equivalency factors created by this research to assess the risks of recruitment failure in feral fish populations exposed to various toxic chemical contaminants. This work also points to toxic chemical contaminants as a primary suspect in the 40-year-old mystery of why stocked lake trout have failed to reproduce and re-establish self-sustaining populations in the four lower Great Lakes.

**25** Exploration and development of a wide range of basic aquaculture techniques for domestic production of perch, walleye and other cool-climate freshwater fishes. These include the development of fundamental fish propagation and husbandry techniques (spawning, egg incubation, fingerling production, habituating fish to formulated feeds, and disease control and treatment), identification of key environmental conditions for rearing fish (optimal water temperatures, oxygen levels and light intensities), identification of key nutritional and dietary requirements in fish feeds, manipulation of natural endocrine and genetic mechanisms to control gender and improve growth, and selective breeding of stress- and disease-resistant strains of fish.

**26** Identification of the specific compounds that give different species of fish their unique flavor profiles—a breakthrough in flavor chemistry and a substantial contribution to food science in general. Other UW Sea Grant seafood research examined potential new uses for underutilized species and fishery byproducts, such as fish oils and superabsorbent hydrogels.

**27** Identification of the bacterial processes that make fish smell and taste "fishy"—and the development of new processing and packaging techniques for keeping fish fresher and safer over longer periods of time.

**28** Identification of the socioeconomics and demographics of Great Lakes-related recreational activities and tourism, including the economic value of Wisconsin's Lake Michigan recreational and commercial fisheries—essential fundamental information for state, regional and federal policymakers.

**29** Comprehensive analyses of the rates of consumption of Great Lakes water by cities, industry and agriculture, and of the potential regional economic and hydrologic consequences of proposed diversions of Great Lakes water to other regions. Related research discovered that Lake Michigan water can be induced to flow to lakeshore wells in some areas to replenish groundwater supplies for neighboring coastal communities. This knowledge saved one community (Mequon) more than $500,000 in water filtration and well drilling costs.

**30** Initial development of the concept and practical applications of transferable discharge permits—the use of market forces rather than government edict to regulate and reduce water and air pollution. The trading of air emissions permits on the Chicago Commodities Market today is an outgrowth of this work, as are some of the proposed "cap and trade" solutions to controlling carbon dioxide and other greenhouse gas emissions.

**31** Nearly two decades of research and outreach on zebra mussels and other aquatic invasive species in the Great Lakes. Initiated in 1990, these efforts have included sponsoring a regional *Zebra Mussel Update* newsletter, statewide radio and television public service announcements, local workshops and international conferences, plus printing and distributing more than 3 million wallet-sized "Zebra Mussel Watch" cards in collaboration with 55 public- and private-sector partners in 31 states, and one Canadian province.

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**55**

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UW Sea Grant support has enabled archaeologists to document and nominate 35 Great Lakes shipwrecks for the National Register of Historic Places—

**Wisconsin now has more shipwrecks listed on the national register than any other state**

**32** Research and outreach aimed at preserving Wisconsin's Great Lakes cultural heritage. Early efforts in this area led to publication of a walking tour of Bayfield in 1979 and creation of the Bayfield Historic District in 1981. More recently, UW Sea Grant has partnered with the Wisconsin Historical Society to install 31 Maritime Heritage Markers near historically significant lighthouses, shipwrecks and other coastal sites.

**33** Seminal and continuous funding crucial to creating and sustaining the Wisconsin Historical Society (WHS) Maritime Archaeology and Preservation Program for more than three decades. Sea Grant support has enabled WHS archaeologists to document and nominate 35 Great Lakes shipwrecks for the National Register of Historic Places. Wisconsin now has more shipwrecks listed on the national register than any other state in the nation. As a result, Wisconsin's Great Lakes waters are now being evaluated as a potential site of a new National Marine Sanctuary to "protect marine resources of national significance."

**34** Seminal support for research, outreach and education initiatives on the potential long-term effects of climate change in Wisconsin and the Great Lakes region. To date, these efforts have included a seminar series for professional groups and the public, a Web site and publication of a summary report. Recently, UW Sea Grant was awarded a two-year, $293,000 NOAA Climate Program grant to develop centralized training on the likely effects of climate change in coastal areas for Sea Grant extension and outreach specialists nationwide.

**35** Financial support for the publication of scholarly and popular books by the University of Wisconsin Press, including such classics as *Fishes of Wisconsin* by George Becker, emeritus professor of biology and former curator of fishes at UW–Stevens Point; *Lake Michigan in Motion* by Clifford Mortimer, former director of the Center for Great Lakes Studies and distinguished professor emeritus of biological sciences at UW–Milwaukee; and *Around the Shores of Lake Superior* and *Around the Shores of Lake Michigan* guides to historic sites by Margaret Beattie Bogue, professor emeritus of history and liberal studies at UW-Madison. The newest such publication is *People of the Sturgeon: Wisconsin's Love Affair with an Ancient Fish,* released in 2009 by the Wisconsin Historical Society Press.

WHS, Tamara Thomsen

**36** Sponsoring and/or hosting groundbreaking international conferences, including:

Underwater Mining Institute (1970-91)

International Conferences on Great Lakes Research (1972, 1985, 1989)

Great Lakes Rehabilitation and Restoration Symposium (1979-1983)

Transport, Fate and Effects of Silver in the Environment (1993-99)

Fourth International Zebra Mussel Conference (1994)

Fourth International Conference on Sturgeon (2001)

Third International Percid Fish Symposium (2003)

American Fisheries Society's 134th Annual Meeting (2004)

Eighth International Conference on Mercury as a Global Pollutant (2006)

**37** Organizing, hosting and/or sponsoring more than two dozen state/regional/national conferences, symposia and workshops on such topics as:

Great Lakes frontiers for industry (1968-69)

Dock and marina design (1970-91)

Conducting environmental impact analyses (1972)

Yellow perch aquaculture (1975-77)

Green Bay/Fox River research needs (1978, 1986)

Methods for analysis of organic chemical compounds in the Great Lakes (1980, 1985)

New concepts for Great Lakes fisheries management (1981)

Pollution permit trading for improving the environment (1982)

The future of Great Lakes resources (1983)

Composting fisheries byproducts (1991)

Halting PCB contamination of Green Bay (2003)

Great Lakes restoration and protection priorities (2004)

Climate change in the Great Lakes region (2007)

Awarded a two-year,

**$293,000**

NOAA Climate Program grant to develop centralized training on the likely effects of climate change in coastal areas for Sea Grant extension and outreach specialists nationwide

Staff members have been recognized with **78** professional awards over the last **35** years

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**38** Development and use of innovative and emerging information technology for Web-based applications for program management, outreach and education, including interactive project reporting, submission of project proposals and proposal peer reviews; an e-commerce publications store with secure credit card purchasing; and webcasts and teleconferencing, electronic newsletters, podcasting, blogging, online video and, most recently, a climate change wiki. Exceptionally popular Web sites developed by UW Sea Grant include Great Lakes shipwrecks, fishes and fisheries, and historic maps and charts.

**39** Accolades from federal program reviewers who have noted the exemplary quality of the University of Wisconsin Sea Grant College Program, citing its proposal development and project selection processes, its sophisticated online project reporting and management system, surveys of former graduate students, and its equity and diversity policies as Best Management Practices "worthy of emulation by other programs" nationwide. In addition, program staff members have been recognized with 78 professional awards over the last 35 years.

**40** Leadership at the regional and national Sea Grant network levels. The first and largest Sea Grant program in the Great Lakes region, UW Sea Grant managers pioneered the concept of focused research subprograms, led the development and implementation of Sea Grant's first strategic national communications plan, initiated the creation and adoption of national Sea Grant thematic areas, and most recently, initiated comprehensive network-wide training for providing science-based climate change outreach to all U.S. coastal communities.

## UW Sea Grant Staff Professional Awards (78)

1974

- Commendation for Objectivity and Quality Programming, Wisconsin Natural Resources Foundation (*Earthwatch Radio*)

1975

- Environmental Quality Award, U.S. Environmental Protection Agency-Region 5 (*Earthwatch Radio*)

1983

- Public Interest Award, Center for Public Representation Inc. (*Earthwatch Radio*)
- Special Merit Award for Visual Design/Specialty Pieces, Council for Advancement and Support of Education (Christine Kohler, Great Lakes fishes balloons and information card)

1985

- Third Place Award for Best News Story, University Relations Communicators Contest (Peyton Smith, news release)
- Honorable Mention, Midwest Association for Environmental Education (*Earthwatch Radio*)

1987

- First Place Award for Outstanding Writing, University of Wisconsin System Communications Contest (Peyton Smith and Stephen Wittman, *The Fisheries of the Great Lakes 1984-86*)
- First Place Award for Visual Appeal in the Image & Identity Visual Design Series, University of Wisconsin System Communications Contest (Christine Kohler, *Home Smoking/Pickling/Canning/ Freezing of Fish* pamphlet series)
- Silver Medal for Research Publications, Council for Advancement and Support of Education (*The Fisheries of the Great Lakes 1984-86*)
- Silver Medal for Special Program Publications, Council for Advancement and Support of Education (*The Fisheries of the Great Lakes 1984-86*)
- Silver Medal for Public Relations, Council for Advancement and Support of Education (*Lake Levels Update* newsletter and public information campaign)
- Bronze Medal for Radio News & Features, Council for Advancement and Support of Education (*Earthwatch Radio*)
- Bronze Medal for Radio Programming, Council for Advancement and Support of Education (*Earthwatch Radio*)
- Honorable Mention for Visual Design, University of Wisconsin System Communications Contest. (Christine Kohler, *The Fisheries of the Great Lakes 1984-86*)
- Honorable Mention for Specialty/Creative Writing, University of Wisconsin System Communications Contest. (Philip Keillor, *How to Use Fill Material in Stabilizing Shoreline Bluffs or Banks* fact sheet)
- Honorable Mention for Visual Appeal/Individual Pieces, University of Wisconsin System Communications Contest (Christine Kohler, "Tune in on the Earth" poster)
- Honorable Mention for Specialty/Creative Writing, University of Wisconsin System Communications Contest. (Lynn Frederick, *Great Lakes Charter Boat Fishing* fact sheet)

1989

- Bronze Medal Award for Radio News & Features, Council for Advancement and Support of Education (*Earthwatch Radio*)

1991

- Gold Medal Community Relations, Council for Advancement and Support of Education ("Zebra Mussel Watch" public awareness campaign and Zebra Mussel Update newsletter)
- Excellence in Environmental Education, Wisconsin Association for Environmental Education (*Earthwatch Radio*)
- Environmental Achiever Award, U.S. Committee for the UN Environment Program (*Earthwatch Radio*)
- Bronze Medal for Radio Programming, Council for Advancement and Support of Education (*Earthwatch Radio*)

1992

- Global 500 Roll of Honor, United Nations Environment Program (*Earthwatch Radio*)

1995

- Bronze Medal for Individual In-House Publications, Council for Advancement and Support of Education (*1994-96 Sea Grant Program Directory*)
- Magellen 4-Star Web Site, The McKinley Group (UW Sea Grant Institute)

1996

- Gold Medal World Wide Web Site, Council for Advancement and Support of Education ("Madison-Area JASON '96" Web site)
- Apex Award of Excellence in Media Relations and Publicity, Communications Concepts Inc. ("Can America Save Its Fisheries?" National Press Club Issue Forum)

1997

- Gold Medal World Wide Web Site, Council for Advancement and Support of Education ("Madison-Area JASON '97" Web site)
- Gold Award, University & College Designers Association (Tina Yao, "Madison-Area JASON '97" Web site)
- Addy Award for Design, Madison Advertising Federation (Tina Yao, "Madison-Area JASON '96" Web site)
- Great Lakes Information Network's Web Site of the Month, Great Lakes Commission (UW Sea Grant Institute Web site)

1998

- Gold Medal World Wide Web Site, Council for Advancement and Support of Education ("Madison-Area JASON IX")

1999

- Friend of Science Education Award, Wisconsin Society of Science Teachers (Madison JASON, Global Change Education, and Operation Pathfinder projects)
- Allen H. Miller Sustained Service Award, Wisconsin Land Information Association (Allen H. Miller, geographic information systems development)
- Excellence Award for Coastal and Ocean Resource Management, NOAA Coastal Services Center (GIS training of local government personnel)
- Walter B. Jones Award for Excellence in Coastal and Marine Graduate Study, Wisconsin Coastal Management Program and Division of Emergency Government (David Hart)
- Outstanding Contributions to the Coastal Hazards Work Group, Wisconsin Coastal Management Program (Philip Keillor, David Hart)
- Outstanding Educational Program Team Award, American Distance Education Consortium ("Exotic Species Day Camp")
- The People's Choice Award for Innovative Products, Sea Grant Week 1999 (Lake Superior shipwreck dive guides)

2000

- Silver Award, University and College Designers Association (Tina Yao, "Underwater Exploration" Web site)
- Apex Award of Excellence, Communications Concepts Inc. (*Littoral Drift* newsletter)
- Aquaculture Education Award, Wisconsin Aquaculture Association (Frederick Binkowski)

2001

- Outstanding Achievement Award, Great Lakes Panel on Invasive Species (Philip Moy)
- Journal of Great Lakes Research Editor's Award for Outstanding Support of the Review Process, International Association for Great Lakes Research (Philip Keillor)
- Bronze Medal for Special Program Publications Packages, Council for Advancement and Support of Education (Wisconsin Great Lakes shipwreck dive guides)
- StudyWeb® Academic Excellence Award, Lightspan Inc. ("Gifts of the Glaciers" Web site)
- Achievement Award, United States Coast Guard Auxiliary (James Lubner)
- Outstanding Involvement Award, Wisconsin Department of Natural Resources (James Lubner)

2002

- William Q. Wick Award for Visionary Career Leadership, National Assembly of Sea Grant Extension Program Leaders (Allen H. Miller)
- Appreciation Award for Outstanding Service to the SGA Program Mission Committee, Sea Grant Association (Anders W. Andren)
- Best Web Site on Great Lakes Regional Culture, Michigan State University Center for Great Lakes Culture ("Wisconsin's Great Lakes Shipwrecks" Web site)
- Great Lakes Information Network's Web Site of the Month, Great Lakes Commission ("Wisconsin's Great Lakes Shipwrecks" Web site)
- Special Recreational Service Award, City of Greenfield Parks and Recreation Department (James Lubner)

2003

- Outstanding Program Award, Great Lakes Sea Grant Extension Program Leaders (preventing the spread of aquatic nuisance species by aquaculture and baitfish operations)
- Superior Program Award, Great Lakes Sea Grant Extension Program Leaders ("Using Mass Media to Inform Anglers about Invasive Species" project)
- President's Award for Meritorious Service to the National Sea Grant Network, Sea Grant Association (Stephen Wittman)
- Award for Aquaculture Outreach and Education, National Association of County Agricultural Agents (Frederick Binkowski)

2004

- Jack Christie-Ken Loftus Award for Distinguished Contributions to Healthy Great Lakes Ecosystems, Great Lakes Fishery Commission (Philip Moy)
- William Q. Wick Award for Visionary Career Leadership, Assembly of Sea Grant Extension Program Leaders (Philip Keillor)
- Superior Program Award, Great Lakes Sea Grant Program Leaders (John Karl, "Diving Into History" underwater archaeology project)
- Excellence in Research Publications Design, University and College Designers Association (Tina Yao, *2004-06 Sea Grant Program Directory*)
- Multitype Library of the Year Award, Wisconsin South Central Library System ("Wisconsin's Water Library" project)
- Great Lakes Information Network Web Site of the Month, Great Lakes Commission ("Wisconsin's Water Library")
- Auxiliary Membership Service Award, United States Coast Guard, Dept. of Homeland Security (James Lubner)

2005

- First Place in Web-Based Outreach, Sea Grant Week 2005 ("Wisconsin's Great Lakes Shipwrecks")
- Judges Award for Outstanding Impacts in Communications, Sea Grant Week 2005 ("Great Lakes Alien Invasion" computer kiosk)
- Excellence in Design Award, University and College Designers Association (Tina Yao, *2002-04 Sea Grant Biennial Report*)
- Commendation, Academic Staff Assembly Executive Committee (Allied Drive Story Hour project)

2006

- Silver Medal Individual Institutional Relations Publication, Council for Advancement and Support of Education (*2002-04 UW Sea Grant Biennial Report*)
- Historic Preservation Award, Wisconsin Historical Society (UW Sea Grant Institute, support of Great Lakes shipwreck archaeological research, outreach and education)
- Great Lakes Information Network Web Site of the Month, Great Lakes Commission ("Wisconsin's Maritime Trails" Web site)

2007

- Distinguished Service Award, Wisconsin Land Information Association (David Hart)

2008

- Superior Outreach Programming Award, Great Lakes Sea Grant Program Leaders (8th International Conference on Mercury as a Global Pollutant)
- Early Career Award, Great Lakes Sea Grant Program Leaders (David Hart)
- Classified Employee Recognition Award (CERA), UW-Madison (Linda Campbell)

2009

- Distinguished Service Award, American Water Resources Association-Wisconsin Section (James Hurley)
- Mid-Career Award, Great Lakes Sea Grant Program Leaders (Victoria Harris)
- Award of Excellence for Environmental Writing, Global Environmental Communications, LLC (Stephen Wittman, *Climate Change in the Great Lakes Region Summary Report*)

# RECENT ACTIVITIES


## BRADFORD BEACH ON THE REBOUND

Like many beaches on the Great Lakes, Bradford Beach in Milwaukee is frequently closed because of polluted water. Sandra McLellan, a molecular biologist with UW–Milwaukee's Great Lakes WATER Institute, has been using DNA analysis of water samples to determine the source of the bacteria that results in the closings—crucial information for resource managers trying to solve the problem. Her work revealed that most of the bacteria is of non-human origin. Based on these findings, a team of park managers, biologists, government agencies and members of the general public agreed that on-site stormwater treatment was needed. Milwaukee County has contributed $1.5 million to the cleanup effort currently underway.

# EARTHWATCH

original photo by Bob Rashid

## COSEE

The Wisconsin Sea Grant College Program is an active participant in the Great Lakes Centers for Ocean Sciences Education Excellence (COSEE), funded through the National Science Foundation. COSEE's aim is to increase aquatic sciences literacy by having teachers of grades four through 10 collaborate with Great Lakes scientific researchers. Aquatic experts lead teachers in hands-on learning opportunities on shipboard research cruises and in classroom workshops. In 2008, classroom teachers learned aboard the research vessel *Lake Guardian* while cruising Lakes Ontario and Michigan. Sea Grant's Education Outreach Coordinator Jim Lubner has served as one of a team of instructors for these excursions and as faculty advisor.

## WATER EXHIBITIONS

Sea Grant co-sponsored several exhibits to help enhance public awareness of water resources. "Making Maps, Mapping History" brought together a collection of rare maps to trace the evolution of mapmaking and the influence of the Great Lakes on the history of Wisconsin. The Web site *greatlakesmaps.org* features an online version of the exhibit, as well as the only complete digital collection of the U.S. Lake Survey maps from the late 1800s. In 2008, in conjunction with the art exhibit "Mami Wata: Arts for Water Spirits in Africa and its Diasporas," Sea Grant helped organize the public lecture series "Water Matters" that focused on the role of water resources in a changing climate.

## "EARTHWATCH" SIGNS OFF

After 35 years on the air, *Earthwatch Radio* delivered its final story on May 22, 2007.

Inspired by Earth Day, *Earthwatch* was the first radio program in the nation to focus on environmental news. Launched in 1972 by UW–Madison students and staff at the Sea Grant Institute and the Institute for Environmental Studies, the weekly series of two-minute programs became the longest-running program of its kind in the world.

*Earthwatch* was widely recognized for its concise and accurate reporting. It was used by as many as 160 outlets, and program scripts were later posted on the Web and sent to 300 subscribers. *Earthwatch* was also one of the first science and environmental programs to embrace podcasting, enabling Internet users to download and play the program at their leisure.

# REMEMBERING PHIL KEILLOR

With deepest sorrow we note the passing of Phil Keillor, Wisconsin Sea Grant's coastal engineering specialist for nearly 30 years. Keillor died Feb. 27, 2009, of injuries sustained while ice skating with his daughter and granddaughter. He was 71.

During his three decades with Wisconsin Sea Grant, Keillor earned a national reputation for the technical assistance, guidance, and educational services he provided to coastal communities along Wisconsin's shores, throughout the Great Lakes, and beyond. Along the way, he deeply impressed colleagues and co-workers with his competence, his integrity and his respect for everyone he encountered, on the job and off.

Bob Rashid

## THE VALUE OF CLEAR WATER

How much is clean water worth? UW–Madison researchers Bill Provencher and Rich Bishop and Ph.D. student Rebecca Moore tackled this question by conducting a mail survey of 610 landowners who lived on or near Green Bay. Not surprisingly, the willingness to pay for improved water quality varied according to two things: existing conditions and how close the property was to the water. The estimated annual value residents were willing to pay ranged from near zero for inland residents to $513 for shorefront residents of Brown County. Overall, for landowners in the 14 townships of the study area, the value of the water-quality improvements is about $10 million per year.

## LOOKING BACK TO LOOK AHEAD

Pickled fish hold clues for two UW-Madison scientists piecing together the historical Great Lakes food web. Food web ecologist, Jake Vander Zanden, and graduate student Stephanie Schmidt have been analyzing fish preserved as long as 100 years ago. Using a technique called stable isotope analysis, Vander Zanden and Schmidt measured the carbon and nitrogen levels in tiny slivers of fish tissue. These values compose a chemical signature for the fish and provide information that allows the scientists to discover the ecological roles that these fish historically filled. Piecing the historical food web together helps biologists manage the current one, especially in reintroducing native fish whose populations have been eliminated.

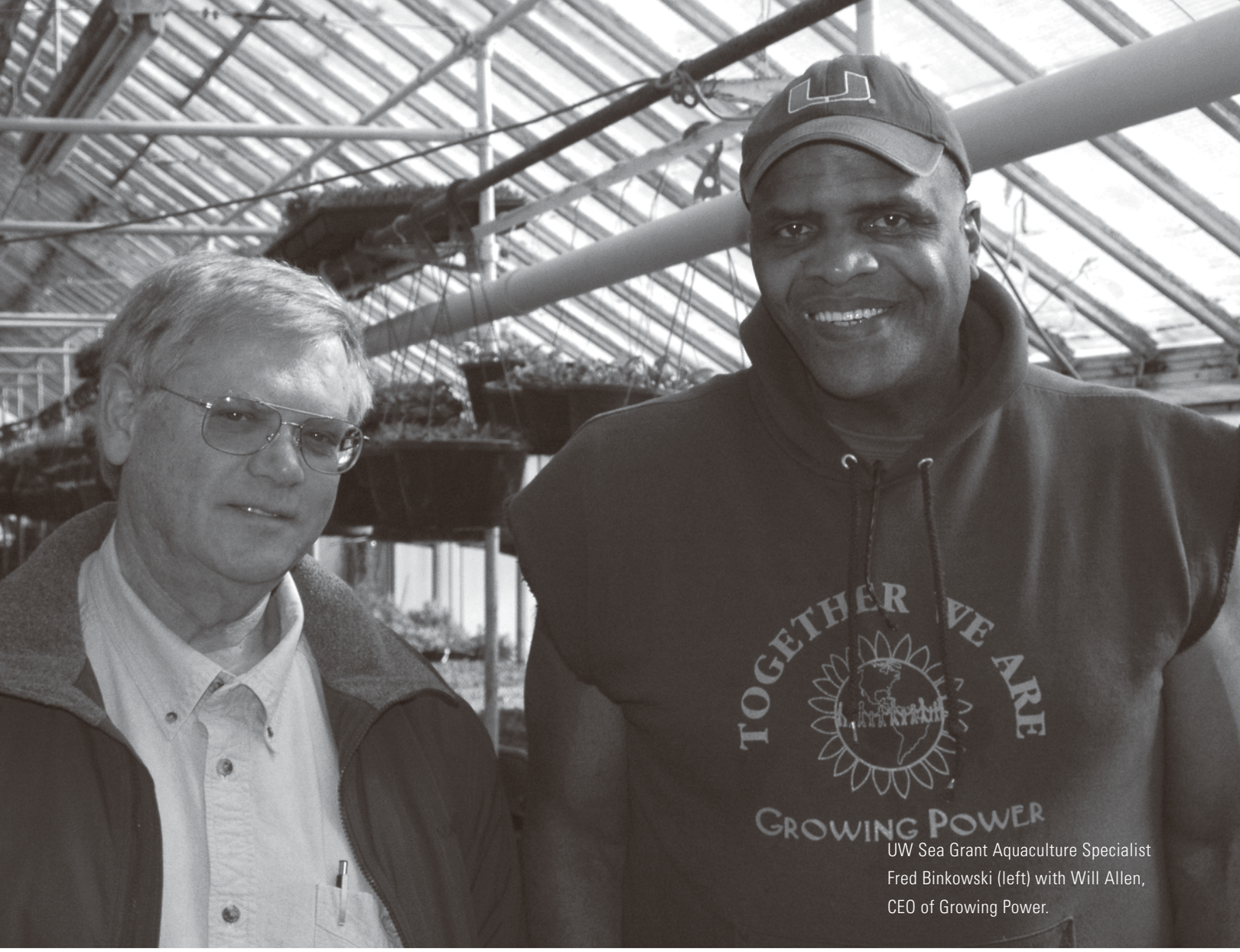
## PATENT AWARDED FOR WATER TREATMENT DEVICE

A water treatment apparatus developed in a business partnership between Sea Grant and Pentair Water Treatment (Sheboygan) received a patent in July 2009. The device consists of a UV-lightbulb surrounded by a stack of 30 plastic rings coated with titatania ($TiO_2$) that distribute the UV rays. The photocatalytic process rids contaminated water of organics, heavy metals and bacteria. Since no filters are used, this system has fewer maintenance requirements than other point-of-use drinking water treatment systems. Marc A. Anderson, a UW-Madison engineering professor, and Ph.D. student Timothy Lee were awarded a Sea Grant-Industrial Fellowship from 2004-06 resulting in the development of this product.

## STARTING A PUBLIC DISCUSSION ABOUT CLIMATE CHANGE

The “Climate Change in the Great Lakes Region: Starting a Public Discussion” seminar series provided public and professional forums for initiating discussions of global climate change by bringing it down to a more local level. Eighteen seminars covered the causes of climate change and its potential effects on Wisconsin and Great Lakes coastal communities, including Great Lakes water level issues, coastal habitats and biodiversity, fisheries, invasive species, temperature and precipitation issues and agriculture, public health issues, and coastal tourism and economic effects. The project Web site *seagrant.wisc.edu/climatechange* archives the presentations, making them available to much larger statewide, regional, national and international audiences.

Carolyn Rummery Betz




UW Sea Grant Aquaculture Specialist Fred Binkowski (left) with Will Allen, CEO of Growing Power.

## GROWING POWER/ URBAN AQUACULTURE

Urban aquaculture is a new initiative for Wisconsin Sea Grant. The program originated in a partnership between Aquaculture Outreach Specialist Fred Binkowski and Will Allen, a MacArthur Foundation Genius Award recipient and CEO of Growing Power, an innovative nonprofit operation in Milwaukee. About 10,000 yellow perch fingerlings are being raised in the greenhouse along with sprouts, spinach and salad greens using a unique three-story re-circulating system. Detoxified nutrient-enriched water from the fish tanks is used to feed the plants, saving water, fertilizer and energy costs. Growing fish in an urban setting can provide high-quality food while cutting transportation costs, creating jobs and taking advantage of abandoned warehouses.

## SPEARHEADING THE HISTORY OF AN ANCIENT FISH

The UW Sea Grant Institute, Wisconsin Department of Natural Resources, Wisconsin Historical Society Press, and the nonprofit organization Sturgeon For Tomorrow collaborated to publish the book *People of the Sturgeon: Wisconsin's Love Affair with an Ancient Fish*. Featuring stunning full-color and historical photographs, the book examines the natural and cultural history of this ancient fish in the Lake Winnebago region, including sections on sturgeon research, management and protection; spearfishing; cultural significance; and a look at the sturgeon's future throughout the Great Lakes region. Volunteers aided the project by collecting more than 60 oral history interviews that will be archived at the Oshkosh Public Museum.


The Marshfield High School team toured the USS *Wisconsin* in Norfolk, Va., following their victory at the 2009 National Ocean Science Bowl.

James Lubner

# MARSHFIELD WINS OCEAN SCIENCE BOWL

Marshfield High School captured first place at the 12th annual National Ocean Science Bowl competition held in late April 2009 in Washington, D.C. Marshfield has competed at the national level in the past, but this is the first time they claimed victory. "This team represents the best of the best," said Marshfield High School Principal Gordie Sisson. The UW Sea Grant Institute is one of the financial sponsors of the Lake Sturgeon Bowl, the Wisconsin regional competition of the National Ocean Sciences Bowl. Sea Grant's Education Coordinator Jim Lubner accompanied the students to the event.

## SPREADING THE WORD ABOUT WORLDWIDE MERCURY POLLUTION

Wisconsin Sea Grant played a vital role in planning, organizing and hosting the Eighth International Conference on Mercury as a Global Pollutant. A total of 1,150 people attended the conference, which featured plenary technical sessions and presentations on the sources, transport, behavior, fate, effects and remediation of mercury in the global environment. This was the first conference in the series to produce a policy-relevant declaration of the state-of-the-science regarding global mercury pollution, titled "The Madison Declaration on Mercury Pollution." The United Nations Environmental Programme, which sets U.N. policy on toxic contaminants and human exposure, requested copies of the declaration and supporting papers for its 2007 meeting in Nairobi, Kenya.

## MAKING SENSE OF A TANGLED WEB WITHIN LAKE SUPERIOR

The story of food web interactions in Lake Superior is anything but straightforward. With Sea Grant funding, Jim Kitchell, director of the UW-Madison's Center for Limnology, and his colleagues are developing a computer model of the interactions between 48 fish species and three invertebrates in the lake. Of particular importance is the sea lamprey *(Petromyzon marinus)*, an invasive parasitic fish. Fishery managers control the lamprey populations to protect vulnerable fish populations, but complete control is impossible. Knowing which species are being eaten by lampreys in which parts of the lake can help managers target control efforts, protecting the most fish at the lowest cost.

## SAMPLING WATER FROM SPACE

Two satellites soaring 435 miles (700 kilometers) above Earth are giving UW-Madison scientist Jonathan Chipman new perspectives on algae blooms in Green Bay. Although remote sensing cannot replace traditional, in-the-water measurements of water clarity or suspended solids, it can make similar measurements from thousands of locations every day, covering large areas any time the skies are clear.

The technology essentially uses light to probe the water. When sunlight, or electromagnetic radiation, reaches the surface of Earth, the chemical composition of the surfaces it strikes determines how much of each wavelength is reflected back to the satellites. This information can be used, after processing with mathematical filters Chipman has developed, to produce real-time information about water quality in Green Bay.

## FED REVIEW RATES US 'PERFECT'

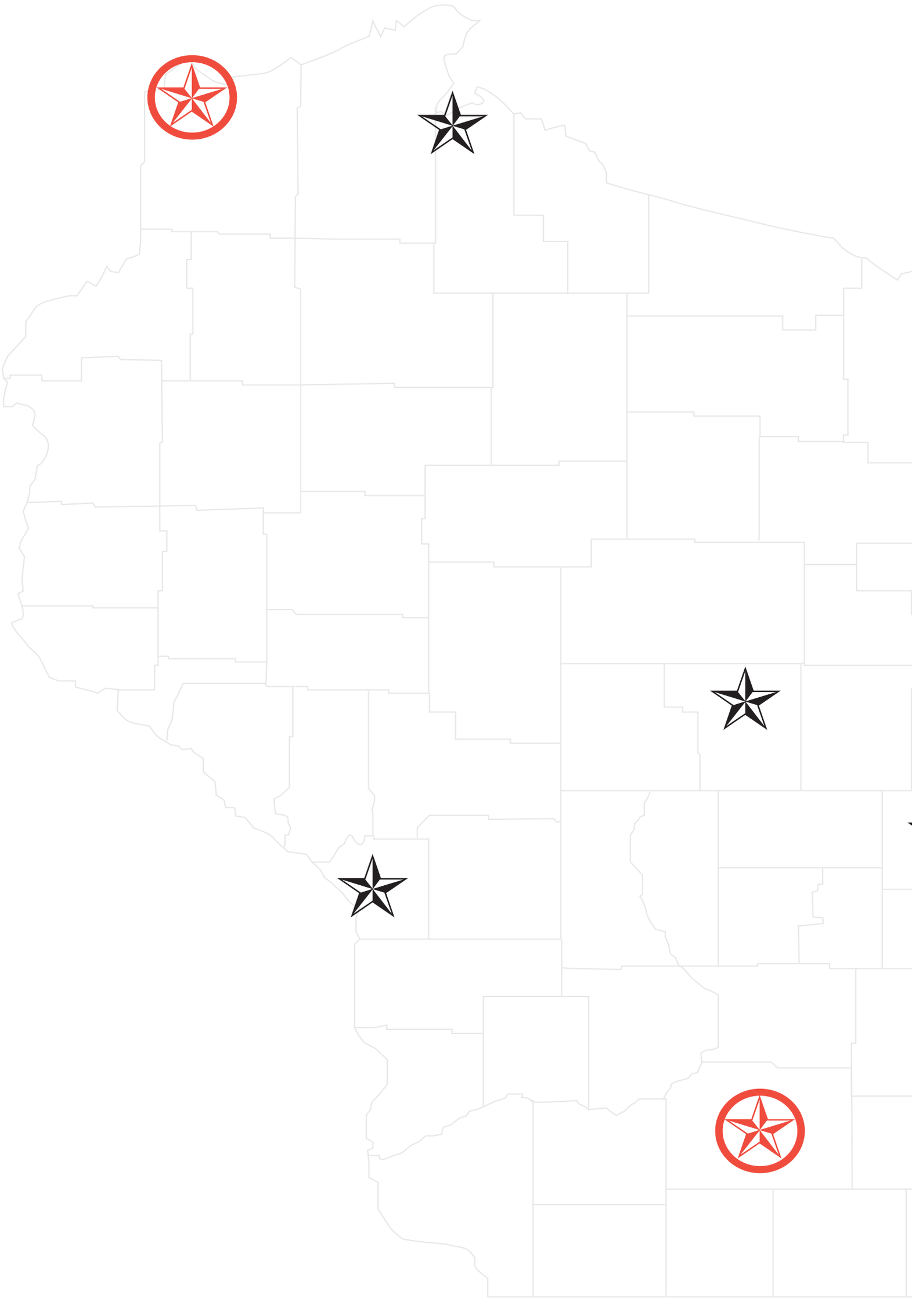
The Wisconsin Sea Grant College Program was awarded a perfect score by the federal Program Assessment Team conducting a five-year performance review in 2006—the first time that any of the nation's 32 university-based Sea Grant programs got a perfect score.

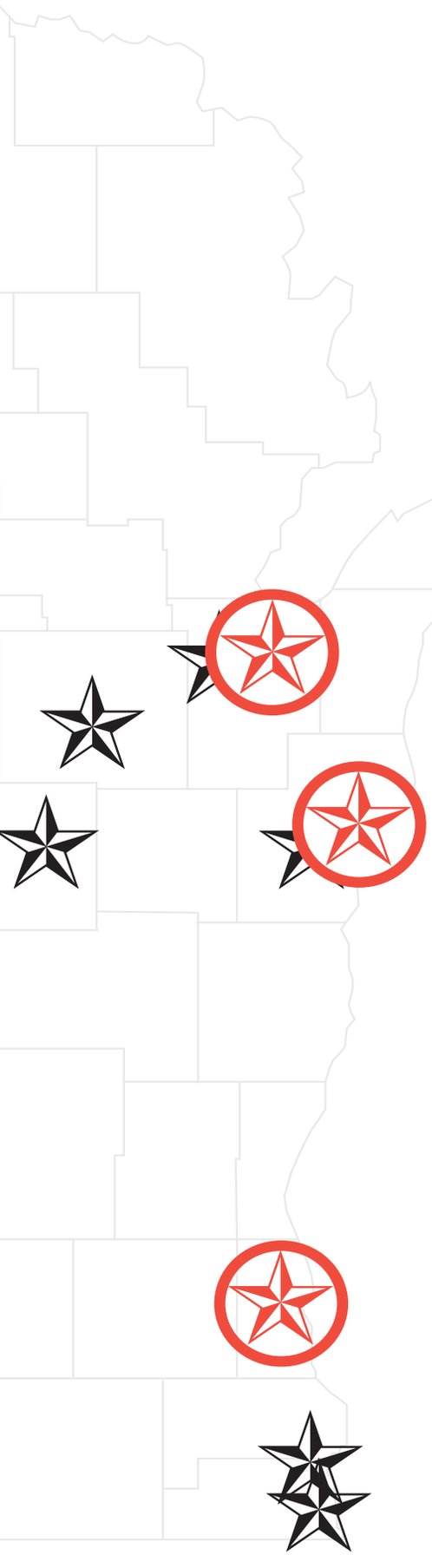

Undergraduate student Lauren Simmons works on the water flea project.

# TINY WATER FLEAS MAY HAVE BIG CONSQUENCES

Could water fleas that are barely visible to the naked eye cause an "invasional meltdown" of the food web in Lake Michigan? Craig Sandgren and John Berges from UW–Milwaukee are studying the carnivorous zooplankton spiny water flea (*Bythotrephes cederstroemi*) and fishhook water flea (*Cercopagis pengoi*) to find out. The water fleas occupy the same critical spot in the food web, and their diets will play an important role in determining how much damage they will do. Continuing research will show whether they are competing against each other for food or dividing and conquering, with each devouring separate types of zooplankton and leaving little for other species.

# APPENDICES





# WISCONSIN CAMPUSES
## Awarded Sea Grant Funds since 1968

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Lawrence University (Appleton)

Marquette University (Milwaukee)

Medical College of Wisconsin (Milwaukee)

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Silver Lake College (Manitowoc)

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UW-Madison

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UW-Oshkosh

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UW-Stevens Point

UW-Superior

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UW campuses with
Sea Grant advisory specialists

Universities and colleges funded

KNAUSS FELLOWS

The National Sea Grant College Program established the Dean John A. Knauss Marine Policy Fellowship in 1979 to provide a unique educational experience for students interested in ocean, coastal and Great Lakes resources and national policies affecting those resources. The program matches highly qualified graduate students with hosts in the legislative and executive branch of government in the Washington, D.C., area for a one-year paid fellowship cosponsored by the student's state Sea Grant program. The program is named in honor of one of Sea Grant's founders, former NOAA Administrator John A. Knauss.

1982 William H. Horns
1983 Carolyn Rumery (Betz)
1984 Daniel Farrow
1987 Jeffrey Busch
1991 Carol Richardson
1994 Christopher Behr
1996 Scott Atkinson
1996 Patricia Cicero
1997 Sheri Moor
1997 Paula Souik
1999 Jeffrey Ripp
2000 Christian Lenhart
2002 Karl Gustavson
2004 Colleen Corrigan
2005 Diane Pansky
2007 Jeffrey Watters
2008 David Bylsma
2008 MaryLee Haughwout
2009 Chelsea Lowes
2009 Sue Vang

Pictured L to R: Carolyn Rumery (Betz), Jeffrey Busch, Christopher Behr, Scott Atkinson, Patricia Cicero, Jeffrey Ripp, Christian Lenhart, Karl Gustavson, Colleen Corrigan, Diane Pansky, Jeffrey Watters, Chelsea Lowes, Sue Vang

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2. Warren Heideman, Gene Woock, Moira Harrington, Donald Stewart, Sumner Richman, Scott Atkinson, Clifford Kraft, Fred Binkowski, Margaret Bogue, Vicki Pierce, Ali Seireg, Larry Crowder, Stephanie Good
3. James Kitchell, Anders W. Andren, Martha Kohler, Jim Hurley, Gemma May, Mary Stanosz, Richard Hoops, Warren Downs, William Karasov, Tina Yao, Peyton Smith, Victoria Harris, H.J. "Bud" Harris
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