



RESEARCH FOR THE REAL WORLD



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University of Wisconsin Sea Grant College Program

Long-term economic development, wise stewardship and responsible use of Great Lakes and coastal resources is at the heart of the University of Wisconsin Sea Grant College Program mission. Sea Grant's challenge is to guarantee optimal benefits from these resources while ensuring they provide sustainable long-term growth.

UW Sea Grant meets this challenge through issue-oriented, interdisciplinary university research, outreach and education aimed at providing objective scientific information for anyone concerned with the management, development, use and protection of these resources. UW Sea Grant focuses on science-based resource management, non-regulatory problem-solving and exploration of the untapped potentials of the Great Lakes environment.

Sea Grant and the Inland Seas

Containing 95 percent of the surface fresh water in the United States, the Great Lakes are among our nation's most precious assets. More than 25 million Americans depend on the Great Lakes for their drinking water. These inland seas are the cornerstone of the U.S. steel and auto industries. The Great Lakes-St. Lawrence Seaway provides a crucial link between the nation's agricultural/industrial heartland and

overseas markets. The Great Lakes also support a world-class recreational fishery worth \$4 billion a year, and the lakes' commercial fisheries provide the nation with nearly 90 million pounds of fish annually.

Sea Grant in Wisconsin

The goal of Sea Grant research and outreach in Wisconsin is to increase human understanding of the Great Lakes system for the protection, sustainable development and wise stewardship of Great Lakes resources.

Over the last 25 years, UW Sea Grant research has focused on addressing Great Lakes pollution problems, determining the human health risks of toxic contaminants in Great Lakes fish, improving scuba diving safety, reducing property losses caused by coastal flooding and shore erosion, improving fisheries management, assisting with the development of freshwater aquaculture, and finding better ways to process and market fish and other seafood.



A Statewide Program

Headquartered at one of the United States' leading public research institutions, UW Sea Grant is one of the largest Sea Grant programs in the nation in terms of federal funding, with a total budget currently averaging more than \$3 million a year.

Each year, more than 150 Wisconsin faculty, staff and students participate in some three dozen Sea Grant-sponsored research, outreach and education projects at various UW System campuses as well as at the state's private colleges and universities.

Fulfilling "The Wisconsin Idea"

UW Sea Grant represents full extension of "The Wisconsin Idea" — the idea that the boundaries of the university are the boundaries of the state — because Wisconsin's true boundaries lie halfway across Lake Michigan and some 50 miles out on Lake Superior.

Strategically located at Green Bay, Madison, Manitowoc, Milwaukee and Superior, UW Sea Grant Advisory Services specialists convey research needs and research results between Great Lakes users and university scientists. These specialists also assist Wisconsin residents interested in aquaculture, fisheries management, coastal

engineering, marine education, water safety, water quality and coastal business development.

Internationally Recognized Research

The UW Sea Grant College Program is internationally recognized for its leading-edge research in fisheries, toxic contaminants and water quality, aquaculture and seafood technology, biotechnology, estuarine and coastal processes, diving physiology, policy studies, and innovative research initiatives.

Wisconsin Sea Grant scientists and staff are regularly called upon to provide objective technical advice to regional federal agencies and laboratories, including the U.S.-Canadian International Joint Commission, Great Lakes Fisheries Commission, U.S. Environmental Protection Agency, North Central Regional Aquaculture Center and NOAA's Great Lakes Environmental Research Laboratory, among others.

Fisheries

- **Development and application of computer models** of the bioenergetics of fish growth — an internationally recognized contribution to the advancement of fishery science as well as a practical forecasting tool now used by fisheries managers throughout the United States and abroad.
- **Exploration of the odor imprinting mechanism** by which anadromous salmonids relocate their natal streams to spawn, and the development of techniques for imprinting stocked trout and salmon to artificial odors.
- **Innovative application of acoustic technology** for measuring the distribution and abundance of fishes in connection with field studies of thermal niches, a key ecological concept involving the specific water temperature preferences of different species of fish.
- **Identification of the mechanisms** governing early life survival among Lake Michigan chubs — the American Fisheries Society's "Most Significant Contribution of 1987" for its insights into one of the great mysteries of fisheries ecology: What processes govern recruitment success in fish populations?

- Coordinated a Great Lakes-wide study of the prey preferences of lake trout and salmon in partnership with the region's other Sea Grant programs, the Wisconsin Department of Natural Resources and other Great Lakes fisheries management agencies.

Microcontaminants & Water Quality

- Long-term, fundamental research on the sources, movements, environmental fates and human health effects of PCBs (polychlorinated biphenyls), dioxins and other toxic contaminants that accumulate in Great Lakes water, sediments and fish.
- Major contributor of data, funds and expertise for the U.S. Environmental Protection Agency's landmark national Green Bay PCB Mass Balance Study — the first complete input-output model of all sources, movements and fates of a chemical contaminant in an aquatic system. The study concluded that removing PCB-contaminated sediments from the bay and Fox River was ill-advised, saving taxpayers and industry hundreds of millions of dollars in counterproductive clean-up costs.
- Identification of the atmosphere as a major source of PCBs and other toxic contaminants in the Great Lakes — and that the lakes also release contaminants in vapor form back into the air.

- Definitive work showing how the levels of PCBs and other toxic chemicals in Great Lakes fish bioaccumulate through the aquatic food web.
- Epidemiological studies of Great Lakes fish consumption, PCB levels and the relative health of the people of Green Bay, Sheboygan and other Wisconsin communities.

Estuarine & Coastal Processes

- Two decades of comprehensive, multidisciplinary research focused on Lake Michigan's Green Bay, making it one of the most rigorously studied estuarine systems of its size in the world and contributing significantly to reversing its previous status as one of the world's most polluted bays.
- Engineering studies of coastal erosion, bluff slumping and flooding — and the creation of manuals and workbooks to help lakeshore property owners, zoning commissions, real estate agents, lending institutions and insurance companies evaluate these risks.
- Development of satellite remote imaging and Geographic Information System technology for analysis and improved management of Great Lakes resources and coastal watersheds.

Aquaculture

- Exploration and development of a wide range of techniques for the domestic production of perch, walleye, rainbow trout and other cool-climate, freshwater fishes.
- Development of basic fish propagation husbandry techniques, including spawning and egg incubation, fingerling production, pond management, habituating fish to formulated feeds, and disease control and treatment.
- Identification of key environmental conditions for rearing fish, including optimal water temperatures, oxygen levels and light intensities, and the identification of key nutritional and dietary requirements for developing higher quality and less costly fish feeds.
- Manipulation of natural endocrine and genetic mechanisms to control gender and increase the growth of perch and walleye, and selective breeding of new stress- and disease-resistant strains of these fish.

Seafood Technology

- 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.

- **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.

Policy Studies

- **Cost-benefit analyses** that established the economic justification for extending the Great Lakes-St. Lawrence Seaway shipping season to year-round.
- **Determination of the economic value** and impacts of Wisconsin’s Lake Michigan recreational and commercial fisheries — essential fundamental information for state and federal policy- and decision-makers.
- **Comprehensive analyses** of the rates of consumption of Great Lakes water by cities, industry and agriculture, and of the potential regional economic and hydrologic impacts of proposed diversions of Great Lakes water to other regions.
- **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 air and water pollution. The trading of air emissions permits on the Chicago Commodities Market today are an outgrowth of this work.

- Creation and successful application of a dynamic “bioeconomic” fisheries management model to evaluate the costs and benefits of alternative strategies for rehabilitating Green Bay’s valuable yellow perch fishery.

Diving Physiology and Safety

- Prototype development of wristwatch “dive computers” that calculate and alert a diver to remaining air supplies and the proper length of ascent decompression stops — now a standard part of scuba diving equipment.
- Leading research on the prevention, diagnosis and treatment of decompression sickness— including the risks diving poses to the fetuses of pregnant women, and the discovery of “limb bends,” “the chokes,” bone death, and paralyzing spinal cord hits among commercial and recreational divers who repeatedly make short, deep “bounce” dives.
- Investigation of the under-estimated risks of panic among divers, especially in cold waters like the Great Lakes, and the development of a test that predicts with 88 percent accuracy which novice divers are prone to panic.

Outreach and Education

- Graduate student assistantships that provide both research experience and financial support, helping nearly 400 Wisconsin students earn their master's and doctoral degrees since 1968.
- Winner of 30 professional awards for the high quality of its communications, outreach and educational programs, including three Gold Medals from the prestigious national Council for the Advancement and Support of Education in the last six years alone.
- Sponsor of eight Wisconsin students selected for Knauss Marine Policy Fellowships, a national Sea Grant program of one-year internships with federal legislators and agencies in Washington, D.C., for graduate students interested in national policy-making on marine, ocean and Great Lakes resources.



- **Sponsor of Earthwatch Radio** — a 25-year-old weekly series of five two-minute public service programs co-produced with the UW-Madison Institute for Environmental Studies. The nation's longest-running program on science and the environment on radio today, Earthwatch was named to the United Nations Environment Programme's *Global 500 Roll of Honor* in 1992.
- **Host and organizer of Madison JASON**, part of an interactive science and technology program involving nearly 2,000 Madison-area students and teachers annually.
- **Sponsor or host of numerous state, regional, national and international conferences** on such topics as toxic contaminants, dock and marina design, underwater mining, the future of Great Lakes resources, aquaculture, and zebra mussels and other nonindigenous species.
- **Production of more than 600 reports and publications** since 1968. Some 750,000 copies have been distributed on request, along with millions of fact sheets, *Zebra Mussel Watch* cards and other public information handouts.

For more information, contact:

Anders W. Andren, Director

UW Sea Grant Institute

1800 University Avenue

Madison, WI 53705-4094

Phone (608) 262-0905

Visit our award-winning World Wide Web site:

www.seagrant.wisc.edu

Celebrating 25 Years as a National Sea Grant College

Established in 1968, the University of Wisconsin Sea Grant Program is a unique partnership of federal, state, university and private sectors that reflects the "The Wisconsin Idea" in action. In October 1972, U.S. Secretary of Commerce Peter G. Peterson designated the University of Wisconsin a Sea Grant College for its "sustained excellence in research, education and public service dedicated to wise use of America's marine resources."

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