Minnesota Sea Grant

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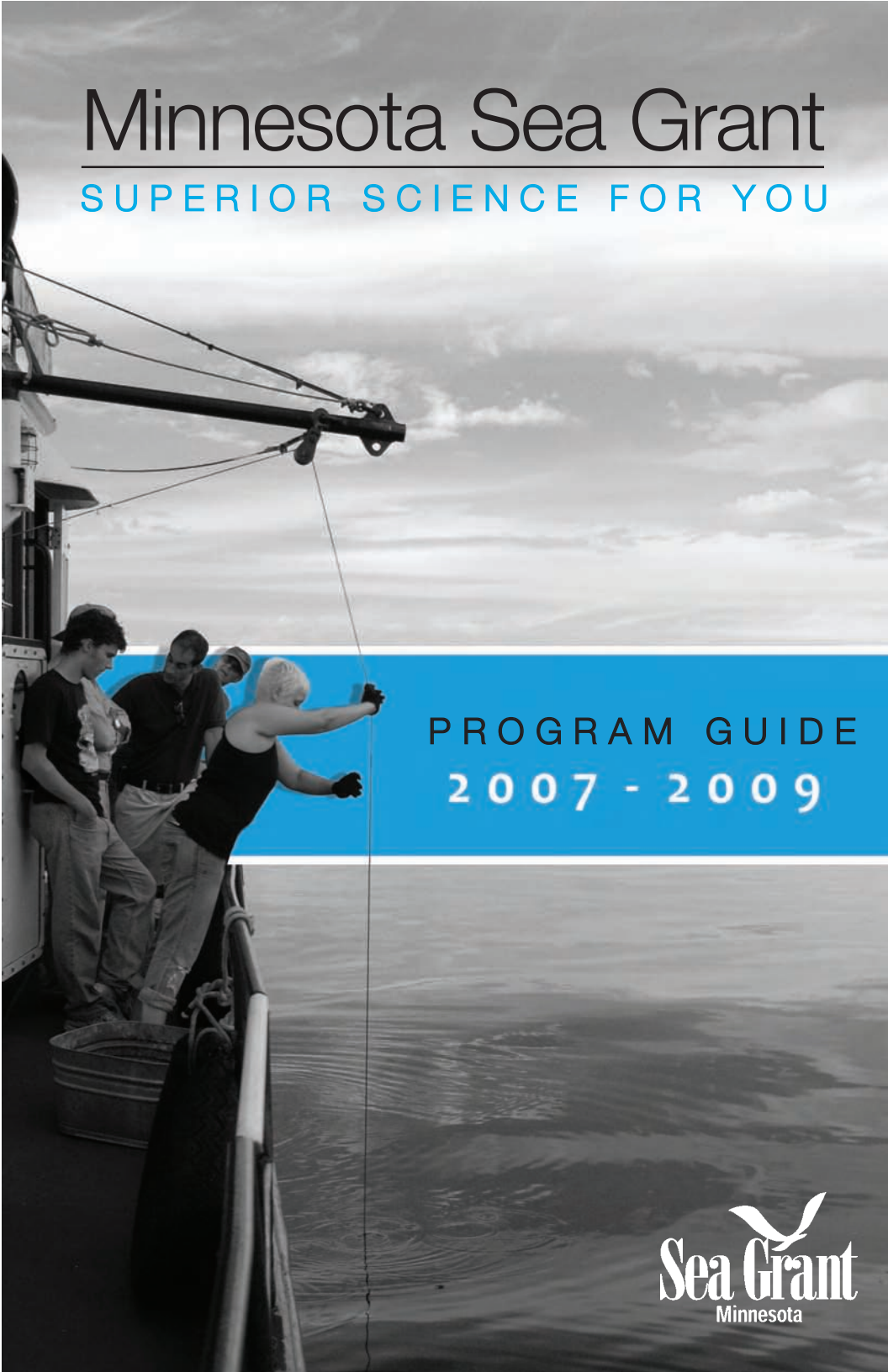

PROGRAM GUIDE

2007 - 2009

Sea Grant
Minnesota

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NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE

UMD DULUTH Reaching higher

UNIVERSITY OF MINNESOTA Extension SERVICE

Contents

Mission Statement

Minnesota Sea Grant facilitates interaction among the public and scientists to enhance communities, the environment, and economies along Lake Superior and Minnesota's inland waters by identifying information needs, fostering research, and communicating results.

Research

Minnesota Sea Grant funds research projects with money we receive from the National Sea Grant Office and the University of Minnesota. We award this money biennially for one- to two-year projects that improve the understanding, use, and management of water resources, particularly those related to Lake Superior and Minnesota's inland waters. In 2007, Minnesota Sea Grant funded seven proposals that address our thematic areas.

Typically, lead investigators are affiliated with an academic institution in Minnesota. Scientists, a technical panel, and Minnesota Sea Grant's advisory committee review the proposals with input from the public. The 2007 research awards collectively totaled $606,900 with an additional $417,210 designated to support 8 graduate research assistants.

Putting Oceans and Great Lakes into Digital Circulation: A New Curriculum

Thematic Area:

Biotechnology

Funding:

$80,056

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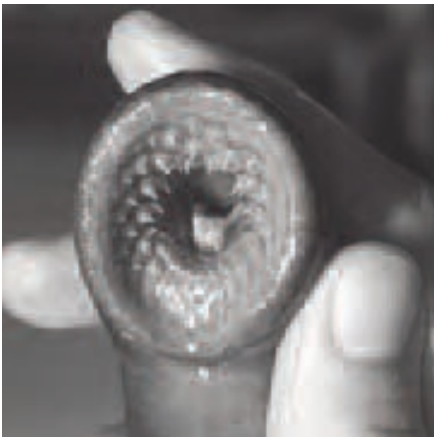
Water doesn't just sit in an ocean, estuary, or lake; it circulates. How it circulates depends on tides, storms, wind, and other forces. This relatively easy concept requires complex computer modeling to fully explain. One of these is the numerical Regional Ocean Modeling System (ROMS) model. Researchers and educators will cooperate to take ROMS from realms of advanced research and deliver it to high school and university students. Project leaders will create a way for students to watch how digital renditions of Lake Superior, Lake Erie, and the Chesapeake Bay respond to virtual winds, seasonal cycles, pollution spills, and other events. Supporting materials and workshops will help educators integrate the software package into curriculums. High school students, undergraduates, and researchers who have not traditionally used numerical models in their investigations will be able to work with this new tool to understand water movement.

Developing Cost-Effective Ways to Produce a Pheromone that Controls Sea Lamprey



Thematic Area:

Biotechnology

Funding:

$70,329

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Previous Sea Grant-supported work led to the discovery of a migratory pheromone that lures the invasive sea lamprey. This project seeks to develop practical, cost-effective ways to produce a major constituent of that pheromone. Sea lampreys are currently controlled by a pesticide that sometimes kills other fish, so the Great Lakes Fishery Commission is pursuing less toxic alternatives.

Pheromones (chemical signals that animals use to communicate) are non-toxic and target specific species. Both male and female lampreys rely on this pheromone to migrate into spawning streams. The commission hopes to use synthetically produced pheromones to confuse or lure lamprey into traps before they spawn. Field tests have demonstrated that the pheromone can increase capture rates by six-fold in small streams.

The problem is that producing the pheromone is costly. Researchers hope to develop a process to synthesize the most important part of the pheromone (petromyzonamine disulfate) more efficiently so that it can be produced in the relatively large quantities necessary to sustain sea lamprey control programs.

Identifying the Role of Bacteria in Accelerated Harbor Corrosion

Thematic Area:

Coastal Communities and Economies

Funding:

$49,967

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Steel is corroding more than twice as fast as expected in some areas of the Duluth-Superior Harbor. The Duluth Seaway Port Authority estimates that repairs to harbor steel could cost up to $100 million if the problem isn't addressed. To help determine corrosion causes, divers will scrape biofilm (the bacteria and microorganisms living on underwater surfaces) from highly corroded metal and from uncorroded metal within the harbor. Researchers will analyze these samples, looking for bacteria that are often associated with corrosion. Even if these iron-oxidizing and sulfate-reducing bacterial groups are not directly pitting the harbor's steel, this study could help to pinpoint why the corrosion has accelerated, and guide monitoring efforts by the U.S. Army Corps of Engineers, the Duluth Seaway Port Authority, and the companies that operate docks and slips in the harbor.

Rapid Identification of Bacteria Sources that Lead to Lake Superior Beach Advisories

Thematic Area:

Ecosystems and Habitats

Funding:

$100,000

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This project builds on previous Sea Grant research designed to pinpoint the sources of bacteria that contribute to beaches being "closed" (posted with "WATER CONTACT NOT RECOMMENDED" signs). Researchers will use two new genetic techniques (robotic-assisted gene probing and quantitative PCR) to more rapidly identify whether the sources of fecal bacteria at several Lake Superior beaches come from birds or humans. If the bacteria are from humans, the health risks may be more serious than if the sources are from waterfowl.

The researchers plan to take sand, sediment, and water samples at several Duluth beaches to see if bacteria vary daily in response to natural and human activities, including outflow from the sanitary district. They will also test drainage pipes and stream outlets entering the lake near the beach sites.

Their findings will help agencies post more accurate water contact advisories, verify contamination sources so they can be removed, and to detect unsuspected sources of fecal contaminants. The techniques developed will have widespread applicability to other coastal regions and areas of the Great Lakes.

Balancing Lake Superior's Carbon Budget

Thematic Area:

Ecosystems and Habitats

Funding:

$134,357

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Something doesn't add up. Over half of the carbon moving out of Lake Superior cannot be attributed to a source. Theoretically, the rate at which carbon exits the system should equal its entrance. Researchers think the most likely factor boggling calculations is an underestimate of primary production, the rate at which photosynthesis converts sunlight and carbon dioxide into organic matter. This study will improve estimates of lake-wide primary production and also generate the first estimates of how much plant matter is eaten by grazing organisms. To better address the affects of climate variation, researchers will evaluate the relationships among Lake Superior's carbon budget, temperature, and light. Since all life depends upon the transfer of energy—and therefore carbon—this project will refine our understanding of how the ecosystem functions, mold future investigations by scientists, inform management decisions by natural resource agencies, and inspire public awareness about the role of large lakes in the global carbon cycle.

Forecasting Shifts in Water Quality as Land Use Patterns Change

Thematic Area:

Ecosystems and Habitats

Funding:

$71,582

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Water quality usually deteriorates proportionally to increases in the amount of land sealed by roofs and pavement within a watershed. Thanks to the power of computerized mapping programs, land use (city or farm), land cover (bog or forest), and other spatial features can be quickly quantified. Associating such land information with aquatic data, researchers will determine how detailed mapping information must be to accurately predict water quality conditions in 18 North Shore streams. They will create a model for forecasting water quality based on landscape variables acquired through archived information and new data collected during field studies. After identifying which variables most influence the model, researchers will use the model to examine how various plans for building in the Amity and Lester watersheds of Lake Superior could affect water quality. The results of this investigation will help city planners, county zoning committees, resource managers, and citizens make decisions about land use with regard to water quality.

From Top to Bottom: Investigating the Daily Migration of Fish and Their Prey in Lake Superior

Thematic Area:

Fisheries

Funding:

$100,625

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Where fish and their prey go in Lake Superior on a daily basis remains unclear to scientists. This project proposes to measure the top-to-bottom (vertical) migration of prey fish, predatory fish, and an important zooplankton species, *Mysis relicta*, in western Lake Superior over various seasons. Researchers will conduct day and night surveys on the research vessel *Blue Heron* in the deep trench off Taconite Harbor (Schroeder, MN) in May through late September. They will also work with the US Geological Survey and their research vessel the *R/V Kiyi* to conduct day and night bottom and midwater trawls for fish.

Through diet and growth studies on fish caught during the trawls, researchers will examine how energy flows through the food webs in these locations. They also hope to evaluate food web linkages between the deep and shallow habitats in the lake. Understanding these linkages and migration patterns will help natural resource agencies better manage commercially important fish species such as ciscoes, salmon, and lake trout.

Outreach

Minnesota Sea Grant staff members are dedicated to seeking and communicating information that could enhance Lake Superior and Minnesota's inland aquatic resources and economies. They convey community, agency, and business needs to university scientists and provide the results to resource users, managers, and decision-makers. In addition to providing research-based information through workshops, conferences, presentations, the award-winning *Seiche* newsletter, Web sites, publications, and the news media, Minnesota Sea Grant facilitates public policy discussions and forums. Staff cooperate with other Sea Grant programs, universities, agencies, tribal interests, the public, and industry on issues of mutual concern.

Minnesota Sea Grant creates publications based on funded projects and offers over 530 written, visual, electronic, and other products that make aquatic science accessible and relevant to multiple audiences. We fill 1,000 orders for publications annually. Most orders come from people who have seen our publications advertised through news releases, in our *Seiche* newsletter, and other outlets.

The Minnesota Sea Grant Web site (**www.seagrant.umn.edu**) features extensive information about our research programs, publications, and outreach activities. Over 690,500 visitors accessed our site in 2006. In 2007, we rebuilt the site, streamlining it, adding information, and providing a credit card ordering option for publications. News releases and the *Seiche* are posted on the site, usually before they get printed and mailed.

Our strategic media relations program is another method we use for outreach. In cooperation with the University of Minnesota News Service, we generated over 600 stories in our last funding cycle. These stories about Sea Grant projects reached a potential of 56.3 million people with an advertising equivalency of $297,600.

Minnesota Sea Grant outreach staff work from a four-year implementation plan with objectives and actions based on goals from our strategic plan. The implementation plan is revised every two years.

Extramurally Funded Projects

Minnesota Sea Grant staff team with non-Sea Grant institutions, agencies, and businesses to pursue ideas in keeping with Sea Grant's mission. Since our previous program guide was published, Minnesota Sea Grant has been involved in nine extramurally funded projects, totaling over $465,000. Other proposals are pending.

North Central Regional Aquaculture Center (NCRAC)

Years: 2006-2007

Funding: $1,000

Funding Agency: Michigan State University (USDA)

Partners: University of Minnesota Extension Service, Minnesota Department of Agriculture, Minnesota Aquaculture Association

Objectives: Strengthen linkages between NCRAC research and extension work groups, enhance the NCRAC extension network for aquaculture information transfer, develop and implement aquaculture education programs and materials for the North Central Region.

Baitfish Project

Years: 2006-2008

Funding: $10,000

Funding Agency: North Central Regional Aquaculture Center

Partners: Iowa State University, University of Wisconsin-Steven's Point and Madison, Wisconsin Sea Grant

Objectives: 1) Determine techniques and strategies for early season, indoor spawning of golden shiners and subsequent stocking into ponds that will provide growth to 3 inches by November of that year. 2) Develop economically viable culture techniques and strategies for growing spotfin shiners to market size. 3) Provide regular research updates related to this project to the baitfish industry through Web-based technologies, newsletters, fact sheets, workshops, or technical bulletins.

Great Lakes Center for Ocean Science Education Excellence (COSEE)

Years: 2005-2010

Funding: $295,394

Funding Agency: National Science Foundation

Partners: Cooperative Institute for Limnology and Ecosystems Research, Great Lakes Environmental Research Lab, Great Lakes Sea Grant Network, Bay Mills Community College, College of Exploration, University of Wisconsin Extension, UMD Department of Education

Objectives: 1) Facilitate collaboration between Great Lakes researchers, educators, and students in grades 4-10; 2) Assist researchers in accessing educational organizations and using appropriate pedagogy; 3) Enhance teacher capabilities for accessing science information and delivering high-quality educational programs; 4) Integrate ocean and Great Lakes research into existing science education materials; 5) Make current Great Lakes research findings available to the public to encourage science literacy and appreciation of water resources; 6) Increase access to Great Lakes/ocean science information in underrepresented groups; 7) Facilitate direct student connections to Great Lakes/ocean science experiences; and 8) Collaborate with existing Centers for Ocean Science Education Excellence.

North Shore Community Futures: Aquatic Resources and Growth Scenarios

Years: 2006-2007

Funding: $7,500

Funding Agencies: Minnesota's Lake Superior Coastal Program

Partners: Natural Resources Research Institute, Arrowhead Regional Development Council, Lakewood Township, City of Duluth Planning Department

Objectives: Develop community growth scenarios for several locations along the North Shore of Lake Superior to demonstrate potential effects on natural resources based on existing zoning, a conservation design scenario, and a smart growth scenario. Under each scenario, indicators of protection of natural resources, costs of infrastructure building and maintenance, and community connectedness (distance to schools, services, businesses, etc.) will be generated for comparison.

Building Outreach Capacity for the Great Lakes Inventory and Monitoring Network

Years: 2005-2007

Funding: $15,000

Funding Agency: National Park Service

Objective: Increase the capacity of the Great Lakes Inventory and Monitoring Network to provide information about its mission and products to science partners, resource managers, and the general public.

Assisting Minnesota's Lake Superior Coastal Program to Implement its Communications Plan

Years: 2006-2007

Funding: $4,980

Funding Agency: Minnesota's Lake Superior Coastal Program

Objective: Increase awareness of grant opportunities, grant reporting and deadlines, results and products from funded projects, and overall program success by designing communications tools for public information exchange.

Educational/Outreach Support for the Great Lakes Observing System

Years: 2007-2010

Fudning: $11,600

Funding Agency: National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center

Partners: Great Lakes Sea Grant Network, Environment Canada, Great Lakes Commission, Great Lakes Fishery Commission, Great Lakes Information Network, International Joint Commission, Lake Carriers' Association, Large Lakes Observatory, Limno-Tech, Inc., Michigan Coastal Management Program, NOAA, U.S. Army Corps of Engineers, U.S. Coast Guard, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, U.S. Great Lakes Shipping Association, U.S. Geological Survey

Objective: Showcase the value that the Great Lakes Observing System regional association can provide to the Great Lakes-St. Lawrence River system in terms of coordination, facilitation, and integration.

Great Lakes Regional Research and Information Network

Years: 2006-2011

Funding: $80,000

Funding Agencies: The Ohio State University Research Foundation, NOAA

Partners: Sea Grant programs in Ohio, Illinois-Indiana, Michigan, and New York

Objectives: Identify and prioritize critical resource management problems and the associated research and information needs necessary for practical solutions; to develop a strategy and network to facilitate and enhance the value of Great Lakes research, education, and outreach.

Making a Great Lake Superior Conference 2007

Years: 2006-2007

Funding: $40,000

Funding Agencies: NOAA, U.S. Environmental Protection Agency

Partners: U.S. Environmental Protection Agency, Environment Canada

Objectives: Gather Lake Superior researchers, educators, local land use officials, and interested citizens together to help set a research, outreach, and education agenda for the Lake Superior Lakewide Management Plan.

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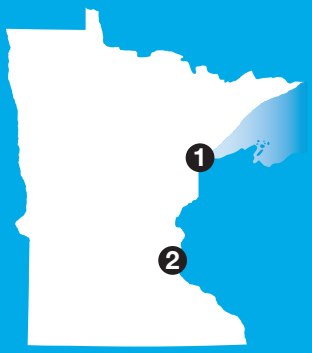

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