



# Great Lakes

## Outstanding Accomplishments in Research

NOAA's Great Lakes Environmental Research Laboratory (GLERL) conducts high quality research and provides scientific leadership on important issues in both Great Lakes and marine coastal environments leading to new knowledge, tools, approaches, awareness, and services. GLERL science supports protection of life and property, economic well-being, and sustained ecosystem health. Since its establishment in 1974, GLERL has taken an ecosystem approach toward understanding and explaining underlying processes in the Great Lakes and other coastal areas. More recently, GLERL has embarked on development of ecosystem forecasting capabilities that predict the effects of biological, chemical, physical, and human-induced changes on ecosystems and their components. These forecasts, both qualitative and quantitative, offer scientifically sound state-of-the-art estimations of likely outcomes. Key ecosystem forecasting themes include: Ecological Prediction; Aquatic Invasive Species; Physical Environment Prediction; and Environmental Observing Systems.

### Invasive Shrimp Species Discovered in Great Lakes

In July 2005, biologists at GLERL's Lake Michigan Field Station (LMFS) in Muskegon, MI, collected an invasive Mysid shrimp species that was previously not found in the Great Lakes. The impact of this new invasive species is yet unknown. Aquatic invasive species are a global problem that threaten the economic security of the United States. They reduce the beneficial uses of coastal ecosystems and resources, and increase costs for commerce and trade-related coastal industries. To maximize the benefits and effectiveness of NOAA's research investments towards understanding, preventing, responding to, and managing aquatic species invasions in U.S. coastal ecosystems, the agency established the NOAA National Center for Research on Aquatic Invasive Species (NCRAIS) at GLERL in July 2003. NOAA established



*Hemimysis anomala*  
invasive shrimp

NCRAIS to assure the effectiveness, and maximize the value, of its research investment in this issue. Coordination and advocacy for research within NOAA, as well as across agencies, and partnering with the academic and private sector are essential to achieving this goal.

### NOAA Great Lakes Lab Recognized for 'Green' Research Vessels



*R/V Laurentian was one of the first NOAA research vessels converted to operate on bio-based fuel and lubricants.*

GLERL converted a fleet of research vessels from petroleum-based to 100% bio-based fuel and lubricants, earning a White House Closing-the-Circle Award in the green purchasing category. This initiative reduced costs and has a positive impact on the work environment for the vessels' crews and researchers. GLERL operates research vessels throughout the Great Lakes region as scientific platforms for ecosystems research and other NOAA interests in the area. The lab has focused efforts on innovative ways to engineer, operate, and maintain these ships to support scientific missions and advance NOAA's larger mission as a steward of the marine environment. In 1998 an Executive Order called for the "greening" of government agencies through waste reduction, recycling, and the use of environmentally friendly and sustainable products including bio-products. GLERL's approach to this federal program was to focus on the use of bio-products on research vessels, to demonstrate environmental and operational benefits.

Research is at the center of all National Oceanic and Atmospheric Administration services. NOAA's Office of Oceanic & Atmospheric Research (OAR) conducts research, develops products, and provides scientific understanding and leadership to support NOAA's mission to meet our nation's economic, social and environmental needs.

National Oceanic and Atmospheric Administration (NOAA) Office of Oceanic and Atmospheric Research (OAR) OAR's mission is to conduct research, develop products, provide scientific understanding and leadership and to conduct outreach towards fostering NOAA's evolving environmental and economic mission.

## Great Lakes Operational Forecast System Successfully Transferred to National Ocean Service

The Great Lakes Operational Forecast System (GLOFS), developed by GLERL and Ohio State University was operationally transferred to the National Ocean Service in 2004. GLOFS provides lake carriers, mariners, port managers, emergency response teams, and recreational boaters with present and future conditions of water levels, water currents and water temperatures.

The Great Lakes Forecasting System combines two NOAA products: a “nowcast” for present conditions and “forecast” guidance for future conditions. Both use information generated by a three-dimensional hydrodynamic model that includes real-time data and forecast guidance for winds, water levels, and other meteorological parameters to predict water levels, currents, and temperatures at thousands of locations throughout the five lakes. Key products include data plots and animated map plots of water levels, water currents, and water temperatures.

### International Field Years on Lake Erie

GLERL, in collaboration with researchers in the U.S. and Canada, is nearing the end of an extensive Lake Erie research endeavor. The project, International Field Years

on Lake Erie, began in May 2005 has become the largest international multidisciplinary research effort of its kind in Lake Erie’s history, involving approximately 40 scientists from NOAA, 17 different universities, and private institutions spread across 7 states and 4 countries. Fourteen observation moorings were being deployed in the lake to continuously collect data. The project is expected to yield improved understanding of processes leading to the development of HABs and forecast anoxic “dead zones” in the central and western basins of Lake Erie. This will provide decision makers with new tools to predict the occurrences of these events and to devise effective management strategies to diminish or eliminate them.

### Research Finds Vaccine Against Common Deadly Fish Virus

Ohio Sea Grant researchers have found that a unicellular alga, *Chlamydomonas reinhardtii*, can be used to vaccinate fish against the Infectious Hematopoietic Necrosis Virus (IHNV), which kills 30 percent of the U.S. trout population. The IHNV antigen is attached to the alga cells, which are then fed to fish, inducing an immune response to the virus. Successful trials of this vaccination process could lead to a major decrease in U.S. trout population deaths.

## PREEMINENT RESEARCH

Since the lab’s inception in 1974, GLERL scientists, with their wide array of scientific disciplines and expertise, conduct unique ecosystem research. This multidisciplinary approach has produced valuable insight into underlying physical, chemical, and biological processes in the lakes and how they affect ecosystem dynamics. GLERL research provides information and services to support decisions that affect the environment, recreation, public health and safety, and the economy of the Great Lakes and coastal marine environments. GLERL’s ongoing development of ecosystem forecasting models that predict the effects of biological, chemical, physical, and human-induced changes on ecosystems and their components will enable resource managers and policy makers to identify emerging threats to the integrity of the Great Lakes ecosystem and take pre-emptive, more cost effective actions to solve with such problems before they become more serious and expensive. GLERL conducts collaborative research with over 150 research institutions at the state, regional, national, and international levels. GLERL also conducts research with two cooperative institutes. Its primary partnership is with the Cooperative Institute for Limnology and Ecosystems Research, newly established in 2007, which is NOAA’s only Cooperative Institute dedicated to freshwater research. The Institute promotes collaborative research between GLERL and a consortium of ten universities in the Great Lakes basin.

## VALUE TO SOCIETY

GLERL provides coastal constituents and decision and policymakers at all levels with an understanding of the sources, pathways, fates, and effects of toxins; of natural hazards such as severe waves, storm surges, and ice; of ecosystems and their interactions, including the threat and impact of invasive species; of changes in water levels of the Great Lakes; and of regional effects related to global climate change. GLERL has been highly successful at studying and explaining Great Lakes and coastal ecosystem dynamics. Efforts now are focusing on developing the capability to predict where such ecosystems might be headed in the immediate and long-term. Such outlooks will give resource managers and policymakers an early warning on emerging changes and threats and allow them to take preemptive measures to protect ecosystem integrity, life and property, and economic well-being. The GLERL-based Center of Excellence for Great Lakes and Human Health (CEGLHH) focuses on understanding the inter-relationships between the Great Lakes ecosystem, water quality and human health. The Center employs a multidisciplinary approach to understand and forecast coastal-related human health impacts for natural resource and public policy decision-making, and develop tools to reduce human health risks associated with three research priority areas: beach closures, harmful algal blooms, and drinking water quality.

**To Learn More:** <http://www.glerl.noaa.gov>

**To Work or Study at OAR, Visit These Sites:**

NOAA Careers: <http://www.careers.noaa.gov>

Hollings Scholarships: <http://www.orau.gov/noaa/HollingsScholarship/>

Knauss Fellowships: <http://www.seagrant.noaa.gov/knauss/>