GLERL is...

The Great Lakes Environmental Research Laboratory (GLERL) carries out research and provides scientific products, expertise, and services required for effective management and protection of Great Lakes and coastal ecosystems. As part of the mission of the National Oceanic and Atmospheric Administration (NOAA) and the US. Department of Commerce, GLERL science provides for protection of life and property, economic well-being, and sustained ecosystem health. With a wide array of scientific disciplines on staff, and an ecosystem-level focus, GLERL contributes unique capabilities in support of intelligent and cost-effective Great Lakes and coastal resource management.

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GLERL

Great Lakes Environmental Research Laboratory

GLERL Research

Identify sources, pathways, and fate of toxic contaminants as they are cycled through aquatic ecosystems. Basic knowledge on how such compounds move through the food chain is essential for protecting public and ecosystem health and to reduce threats posed by such materials.

Observe, explain, and predict the natural forces driving waves, currents, storm surges, seiches and related physical phenomena. Such knowledge and forecasting abilities are vital for protecting life and property in shoreline zones, promoting safety in recreational boating and commercial shipping, and for effective search-and rescue, or spill recovery operations.

Explain and predict changes in water resources, lake water levels, and flows. By relying on complex computer-based models of the Great Lakes hydrologic cycle to predict short- and long-term changes in lake levels GLERL helps managers and decision makers identify most effective strategies to reduce costs and damages related to excessively high, or low, lake levels (i.e. impacts on commercial shipping, recreational boating, municipal and industrial water use, habitat and shoreline erosion).

Document, understand, and predict the distribution and extent of ice on the lakes over winter. Ice can impede commercial shipping, alter flow of water (via ice dams) and accelerate shoreline erosion through scouring and altered current flow. On the positive side, extended ice cover on the lakes can result in richer food sources on the lower food chain and increased production of certain commercial and sportfish species.

Develop remote sensing programs such as CoastWatch, which downloads imagery from NOAA environmental satellites and makes such data available to a diverse user community. In cooperation with the Michigan Sea Grant Program, this imagery is supplied via the internet to charter fishing boat captains who now rely routinely on the images for surface water temperature mapping, which helps guide them to areas on the lakes where chances of catch success are highest.

Develop and refine acoustical (sonar-based) methods to locate and study fish populations. Traditional trawl net methods are costly and destructive. The new acoustical techniques that GLERL scientists are exploring show much promise in determining fish population levels in a more efficient and nondestructive manner. This new knowledge will enrich understanding of fish population dynamics and enable more timely and effective management of this valuable resource.

Produce high-resolution mapping (bathymetry) of lake bottom regions. Although there is much existing detailed data on lake depth throughout the lakes, much of it has never been processed. Thanks to support of a NOAA Data Rescue effort, GLERL scientists in cooperation with other US and Canadian scientists have brought all available data together within detailed charts of the lake bottom. These new images promise to enrich understanding of how the Lakes were formed and structured, while offering biologists a better depiction of location and extent of important fish habitat.

Develop and apply radioisotope techniques to chronicle historical changes in Great Lakes and coastal sediments. By collecting cores of sediments (mud) from the lake bottom and analyzing them for the presence of certain radioactive materials (radioisotopes), GLERL scientists can estimate age of sediment layers and the rate at which they were deposited. This information provides valuable insight on changes in lake ecosystems over long periods of time, while allowing scientists to estimate how long toxic contaminants might continue to threaten lake health once they reach the lake bottom.

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Support and promote education and training of next-generation Great Lakes scientists. Through its Cooperative Institute for Limnology and Ecosystems Research (CILER), GLERL works with University of Michigan, Michigan State and other Great Lakes universities in providing part-time employment to undergraduate and graduate students. This frontline training in the lab and the field allows students to gain valuable work experience that is so essential in successful career start-up. Valuable post-doctoral work experience is made available through National Research Council Fellowship at the laboratory. In addition, GLERL scientists contribute to university education by serving as adjunct professors, teaching and lecturing in courses, and service on graduate committees.

Monitor and describe changes in abundances and structure of plant and animal communities. Distribution, abundance, and interactions among plant and animal species in Great Lakes foodwebs allow scientists to judge overall ecosystem health, predict growth and production of fish stocks and prescribe measures to insure sustained management of these vital resources.

Track the spread of invasive (exotic) species and determine their impact on Great Lakes and coastal ecosystem health. GLERL's research and monitoring efforts have led to increased understanding of how invasive (exotic) species, such as the zebra mussel, affect Great Lakes foodwebs.

Observe, describe and understand the role of episodic events and their impact on physical, chemical and biological processes. An episodic event is something that may happen in a relatively short period of time yet has a profound, long-lasting impact on an ecosystem. Through a jointly funded project between NOAA and the National Science Foundation, GLERL and university scientists are now studying episodic storm events in Lake Michigan. The 5-year-long project – Episodic Events: Great Lakes Experiment (EEGLE) is describing and explaining how spring storm events and associated waves and currents erode fine (clay) sediments from Lake Michigan nearshore areas. Because clay particles bind with both contaminants and nutrients that limit microscopic plant (algal) growth, knowledge of how/where these particles are moved will allow scientists to fully describe and understand this process, which so profoundly affects the lake's plant and animal communities.

Collect and build long-term databases of physical, chemical, and biological information within an integrated monitoring program. The health of lake and coastal ecosystems depends on the complex interplay of physical, chemical, and biological

Other Brochures available from GLERL:

- Decline in Lake Michigan Bottom Life
- GLERL's CoastWatch Program
- La Niña and the Great Lakes Region
- Waterborne Contaminants in the Great Lakes
- Zebra Mussels, Blue Green Algal Blooms, and Other Water Quality Problems in the Great Lakes
- EEGLE Program in Lake Michigan: Episodic Events: Great Lakes Experiment
- Fish Acoustics at GLERL
- Decline in Native Mussels in Lake St. Clair
- Water Levels in the Great Lakes (coming soon)

processes. Tracking changes of these processes over extended periods of time enables GLERL scientists to monitor how the lakes are changing and to better understand, explain, and predict how such factors interact and their overall impact on the ecosystem.

Provide scientific expertise, advice, reviews and recommendations. GLERL scientists serve on a wide array of advisory committees and boards providing officials in the US, Canada and state and local government, with critical technical knowledge and information ensuring sound, cost-effective decisions on Great Lakes management and protection.

Examine the potential impact of climate and global change on Great Lakes water quantity and quality. Little is presently known about how much the Great Lakes might change in response to global warming and climate change, and scientists at GLERL are collecting data and building computer-based models to understand and predict ecosystem impacts.

Investigate nearshore hydrodynamic processes affecting protection of health, life, property, and environmental quality. Nearshore lake and coastal regions are high use areas with big demands on water quantity and quality. However, such demands can make it more difficult to effectively manage and protect these valuable resources. Greater scientific understanding of nearshore ecosystems enables intelligent management decisions and continued environmental integrity.

Study how changes in Great Lakes foodwebs affect nutrient cycling and ecosystem production. The balance of plant and animal populations within a stable foodweb is essential for maintaining high water quality and productive commercial and sportfish stocks. Increased scientific insight into the foodweb's structure and function provides added ability to manage these resources on a sustainable basis.

For further information or to order additional materials, please contact:

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