

# The Great Lakes GIS

*A bi-national, multi-agency effort to provide information required for holistic management and conservation of Great Lakes aquatic resources*

## *Origin and Funding Sources*

The Great Lakes Geographic Information System (GLGIS) is a basin-wide GIS that serves as a tool for science inquiry and a comprehensive resource for Great Lakes basin resource managers. The prototype for this project, the Lake Huron GIS, was initiated by members of the Great Lakes Fishery Commission's Lake Huron Technical Committee. The GLGIS has been generously funded by the U.S. Fish and Wildlife Service through the Great Lakes Fish and Wildlife Restoration Act, the U.S. Environmental Protection Agency, the Michigan Department of Natural Resources, and the Great Lakes Fishery Commission.

## *What is the GLGIS?*

The GLGIS is a *Geographic Information System* that provides resource scientists and managers with a centralized collection of spatially referenced data that span jurisdictional (i.e., state, federal, tribal, and local agencies) and habitat boundaries (i.e., nearshore, tributary, connecting channels, offshore, inland lakes, and terrestrial).

The GIS offers users access to an unprecedented amount of data relating to the Great Lakes basin and its resources. Thus, it is relevant to, and designed for, a variety of needs for use in many capacities. Queries addressing land and water systems and their biota can quickly be executed, alternative management scenarios can be explored, and scientific hypotheses can be tested. The final product enables decision makers to more effectively plan holistically for the basin's future, monitor its status, target protection and restoration efforts, and address key habitat issues.

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*Satellite image of Lake St. Clair.  
Image courtesy of the U.S. Geological Survey.*

## *A Watershed Ecology Perspective*

The GLGIS approaches Great Lakes basin data management with a holistic, *watershed ecology perspective*. The GLGIS strives to maintain ecosystem integrity at the watershed scale by including data relating to land and riverine systems, in addition to data for open water. Moreover, watershed boundary GIS layers enable users to summarize other data sets by watershed, facilitating comparison at the Great Lakes basin scale or at the scale of smaller sub-basins.

The GLGIS also affords end-users a *spatial perspective*, as ecosystem processes can be investigated in a spatial context (i.e., through the use of maps and spatial operations) and a *temporal perspective*, as the GIS interface allows for examination of phenomena through time.

## *A Habitat-Based Decision Support System*

Essential fish habitat, defined as the waters and substrate necessary for fish spawning, feeding, growth to maturity, is the foundation of fisheries production. Degradation of habitats through coastal development, contaminant and nutrient loadings, and loss of wetlands all may act to reduce fisheries production. Yet, despite increased attention to the importance of fish habitat, quantitative relationships between fisheries and habitat remain elusive and controversial.

The GLGIS strives to serve as a Decision Support System based on habitat quality, thus facilitating a link between fisheries and habitat.

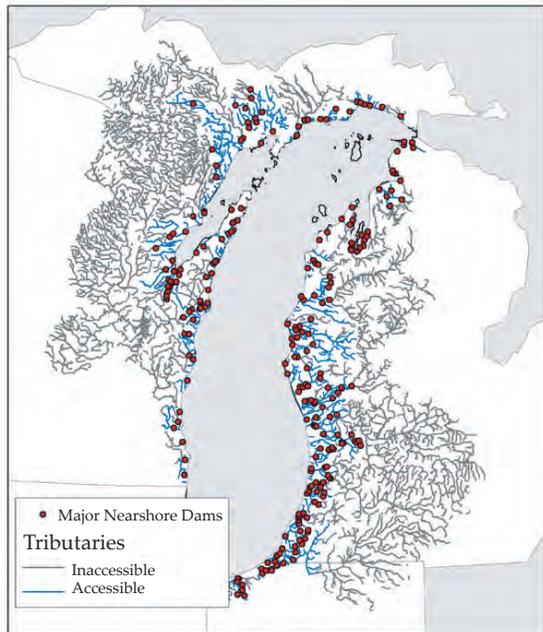
## How was the GLGIS Developed?

The GLGIS is expanding rapidly to meet the changing needs of fisheries biologists and managers. Data incorporation is driven by the demands of people who will actually be using the database, thus current issues and changing needs of managers and scientists determine how the GLGIS evolves.

Data are not limited to GIS files. Microsoft Access databases (e.g., charter boat/creel catch and harvest data, digital fish atlas), dBase tables (e.g., biological index tables), and images (e.g., aerial photographs, nautical charts, topographic maps) are also part of the repository.

## How is the GLGIS Used?

The GLGIS is a powerful tool for accessing and querying habitat data on a landscape scale and in designing assessment, rehabilitation, and enhancement projects for fish habitat. Depending upon their needs and abilities, end-users can develop their own projects or simply use the pre-built ArcMap projects. An example of a GLGIS application is:



**Dam removal scenarios.** Dams impair stream accessibility for Great Lakes spawners. The GLGIS can be used to address fish passage and habitat fragmentation issues that result from the 2,000+ dams in the basin. The map to the left shows stream accessibility for salmon, assuming they can pass dams five feet or less, in Lake Michigan tributaries based on dam height and location.

Although designed to examine basin-wide issues, the GLGIS can be employed at various spatial scales. For example, at a local level, the GLGIS has been used to support planning and management efforts by providing tools and information useful in writing the Thunder Bay Watershed Assessment in the Lake Huron basin.

## Education

Education is a critical element of the GLGIS. There are four resources designed to facilitate its use: premanufactured ArcReader and ArcMap project files (i.e., files that contain thematic collections of data); "mini-projects" (i.e., comprehensive directories that pertain to individual research projects); a self-paced tutorial; and, half-day to full-day guided workshops.

We welcome questions or comments regarding GLGIS data and use. Please contact the Great Lakes GIS Project Coordinator, Christine Geddes ([cgeddes@umich.edu](mailto:cgeddes@umich.edu)), at the Institute for Fisheries Research.

## Where Can I Find Out More about the GLGIS?

The GLGIS is currently being maintained by staff at the Institute for Fisheries Research in Ann Arbor, Michigan. For more information about the Great Lakes GIS project, visit the Great Lakes GIS web site at <http://www.glfrc.org/glgis/>. To acquire the GLGIS, please contact Christine Geddes via email ([cgeddes@umich.edu](mailto:cgeddes@umich.edu)) or phone (734.663.3554 x.121).

## Who are Project End-Users, Partners, and Contributors?

GLGIS end-users consist primarily of Great Lakes managers and researchers responsible for the management, protection, and conservation of Great Lakes resources. However, the GLGIS is available to anyone interested in the conservation and management of this system, including aquatic or terrestrial habitats draining into the Great Lakes.

The Great Lakes GIS is a success primarily as a result of the cooperation of the numerous agencies and individuals who continue to contribute data and ideas for product development. These collaborators include Department of Fisheries and Oceans Canada; Environment Canada; Ontario Ministry of Natural Resources; Michigan, Indiana, Ohio, and Pennsylvania Departments of Natural Resources; New York Department of Environmental Quality; U.S. National Oceanic and Atmospheric Administration; Michigan Office of the Great Lakes; U.S. Environmental Protection Agency; U.S. Fish and Wildlife Service; the U.S. Geologic Survey Great Lakes Science Center; and the University of Michigan.



Lake sturgeon

Image courtesy of the Department of Fisheries and Oceans.