

Aquatic Ecological Services



Tremendous progress has been made in reducing water pollution and improving water quality over the last four decades, but many system-wide problems still exist. LimnoTech continues to help a variety of clients identify and understand the impacts of stressors on aquatic biota. More than 29,000 water bodies are currently listed as impaired in the United States, and many are so classified because of impacts from urban and rural sources on aquatic life uses.

The key to finding effective and sustainable solutions to environmental problems lies in understanding and untangling the complex relationships between aquatic systems and their biologic communities. The identification of stressors to aquatic systems is a challenge for which LimnoTech is uniquely able to provide effective service by applying innovative approaches in addressing these multifaceted issues.

As a leader in environmental science and water quality management for nearly three decades, LimnoTech has helped clients assess, create and implement workable strategies for identifying and addressing aquatic impacts on scales both large and small. Our experts offer diverse technical skills, experience, and expertise that enable us to provide a full range of services for monitoring and evaluating these complex environments.



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LimnoTech Services

LimnoTech ecological services include:

- Needs assessments and planning
- Urban and rural evaluations
- Fish and macroinvertebrate surveys and assessments
- Aquatic and riparian habitat surveys and assessments
- Watershed inventory & assessment
- Ecological indicator development and assessment
- Limnological studies, management and planning
- Wetland determination/delineation
- Ecological risk assessment
- Aquatic life use compliance, evaluation and support
- NPDES discharge evaluation and permitting
- Natural resource economic valuation and damage assessment
- Land use planning for watershed restoration and protection
- Streambank restoration planning & design
- Lake nutrient, dissolved oxygen, and nuisance algae control strategies
- Long-term monitoring



One of the keys to solving environmental problems lies in understanding the relationships between aquatic systems and their biologic communities.

Chicago Area Waterway System Habitat Evaluation and Improvement Study.

LimnoTech was contracted by the Metropolitan Water Reclamation District of Greater Chicago (the District) to conduct a study of physical habitat in the Chicago Area Waterway System (the CAWS), a network of approximately 78 miles of rivers and canals in and around Chicago. The objectives of the study were to inventory physical habitat in the CAWS, to determine the relative importance of physical habitat condition to fish in the CAWS, and to develop conceptual approaches for habitat improvement. Existing habitat assessment tools are not applicable because of the unique nature of the CAWS, including the fact that about 75% of the system consists of manmade canals, nearly all of the water in the system is secondary effluent, and a system of locks and dams induce a completely artificial hydrologic regime. To quantify biotic and habitat condition, LimnoTech developed a CAWS-specific fish index and a CAWS-specific non-wadeable habitat index, both of which underwent rigorous peer review. Using these tools, it was shown that habitat condition is severely limited in the CAWS, and that nearly half of the variability in fisheries health in the CAWS is attributable to the limitations of physical habitat. It was further shown that physical habitat is much more limiting to fisheries in the CAWS than water quality. Using advanced data analysis methods, it was possible to identify the most significant physical habitat attributes, which informed conceptualization of habitat improvement measures.



LimnoTech helps clients assess, create and implement workable strategies to address aquatic ecosystem challenges.

partners to develop a better quantitative understanding of the system.

Springhouse Run Stream Restoration Design.

LimnoTech is working with the District Department of the Environment (DDOE) and the U.S. National Arboretum to develop stream restoration design plans for Springhouse Run, an urbanized tributary of Hickey Run on the Arboretum property in Washington, DC. LimnoTech first compiled existing stream and watershed condition data and collected additional field data critical for design. LimnoTech also compiled and analyzed GIS survey data to establish existing condition cross-sections and the longitudinal profile of the stream. LimnoTech then conducted hydrologic and hydraulic modeling of the watershed and the stream channel to better understand critical bankfull peak flow rates and flood stages. LimnoTech applied natural channel design methods to specify critical design parameters and reference conditions to develop a stable, self-sustaining stream design. LimnoTech is currently working on the next design phase, which will include a more detailed hydrologic and hydraulic study that evaluates flood stages, stream velocity, shear stress, and stream power,

and compares existing and proposed flood conditions. The analysis will also evaluate and compare existing and proposed sediment transport for competency and capacity.

Lake Bathymetry Data Collection and Mapping, Cook County, IL.

The Cook County, Illinois, Department of Geographic Information Systems contracted with LimnoTech to map the bathymetry of approximately 50 lakes in the Chicago area. Using benchmarks established for each lake, LimnoTech field personnel established water surface elevations. Raw field data were processed and their quality checked using HYPACK and ArcGIS. Individual depth-point datasets were established for each lake. LimnoTech then constructed draft maps of each lake for approval by the FPDC Fisheries Department. The lake bathymetry data—field-collected and interpreted—accumulated in a LimnoTech-designed geodatabase, which will be integrated into the County’s enterprise GIS. The bathymetry data and maps will provide a foundation for future study and mapping of Forest Preserve lakes, including fisheries, fishing conditions, underwater and shoreline habitats, bottom substrate, aquatic vegetation, and public use. The bathymetry maps will help the County and the FPDC better manage, protect, and improve lake resources for conservation, ecology, fishing, and public safety.

Development of a Process-oriented Aquatic Ecosystem Model to Investigate Multi-stressor Interactions in Saginaw Bay, Lake Huron.

To identify and understand the alterations in the Saginaw Bay ecological structure and function in response to stressors such as zebra mussel invasion, nutrient loads, sediment loads, hydrology and water levels, and climate conditions, LimnoTech developed a coupled aquatic ecosystem modeling framework by linking EFDC (a hydrodynamic and sediment transport model) with an advanced aquatic ecosystem model (A2EM) that we developed by adding Dreissenid (zebra and quagga mussels) and Cladophora sub-models to our existing advanced eutrophication model. This model has quantified the relationship between nutrient loads, zebra mussel density, and physical (hydrodynamics, temperature, light) factors as stressors and algal blooms in this system. Model results have been used to advise water quality and fishery managers with regard to management decisions and to recommend research and monitoring activities of project