

Environmental Restoration



Natural systems like lakes, rivers, streams, wetlands, floodplains, and estuaries provide important environmental functions including flood and sediment control, habitat, and pollution reduction. Human activity and natural disturbances can often upset the balance of these systems so that they are no longer capable of providing these functions. U.S. states have listed 40,000 water bodies as impaired, and many thousands of these are classified as having some functional impairment such as sedimentation/siltation, dissolved oxygen depletion, habitat alteration, or flow alteration. In addition to impairments within the water bodies, critical floodplain, wetland, streambank buffer, and riparian wildlife habitats are being impacted.

Communities, counties, watershed groups, industry, and agriculture are being tasked with restoring these resources, and protecting those that remain. It is unlikely that impaired water bodies can be completely restored to their natural condition, but it is often possible to restore their natural functions. The practice of restoring function to these water bodies is called Environmental Restoration.



We help clients create and implement workable strategies to address water body impacts

As a national leader in surface water quality and environmental science for more than 30 years, LimnoTech has helped clients create and implement workable strategies to address water body impacts, often while balancing regulatory requirements, budgetary constraints, and other

limiting factors. We have experience with streams, lakes, estuaries, and coastal waters in more than 200 watersheds.

LimnoTech Services

LimnoTech environmental restoration services include:

- Stream inventory and assessment
- Stream restoration
- Habitat and species surveying
- Streambank stabilization
- Riparian buffer restoration
- Hydrological and hydraulic modeling and design
- Habitat enhancement
- Dissolved oxygen augmentation
- Lake analysis and restoration
- Erosion mitigation
- Best Management Practice (BMP) retrofit design
- Fish passage design
- Wetland assessment and design
- Dam removal studies
- Hydrologic restoration/flow management



We work closely with stakeholders to develop tailored implementation plans for restoration and preservation of water resources.

The following project descriptions offer a sample of LimnoTech's experience in helping our clients resolve the challenges of environmental restoration.

Anne Arundel County Watershed Assessments.

LimnoTech has supported Anne Arundel County with watershed assessment and data collection efforts for three separate watershed studies. LimnoTech's efforts have included collecting and compiling physical data within the watersheds, and working with the County to identify and develop a plan for restoration and preservation activities.

Field information collected was used to develop priority rankings of stream reaches and subwatershed areas, and ultimately to inform decisions on land management and restoration and preservation activities. LimnoTech worked closely with the County and public stakeholders to develop a comprehensive report of watershed conditions and an implementation plan for restoration and preservation.



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 completed the conceptual design phase. For this, LimnoTech 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 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 with respect to both competency and capacity.

Integrated Hydrodynamic–Sediment Transport–Water Quality Model for the Lower Maumee River and Western Basin of Lake Erie. LimnoTech is developing a linked hydrodynamic–sediment transport–advanced eutrophication model to inform restoration and management decisions in the lower Maumee River and western basin of Lake Erie. Application of the modeling framework will include evaluation of how localized sediment accretion/erosion behavior changes relative to alternatives for dredged material placement, island building, etc. This

model will also be used to quantify the relationship between nutrient loads, zebra mussel density, and physical factors as stressors. The model will also support decisions on clean sediment management and watershed nonpoint source control. LimnoTech has contributed to the development of human and ecological risk assessments relative to contaminated sediments in the Ottawa River. We have also analyzed

bacteria sources and fate and transport in the system.

Upper Rouge Streambank Erosion Inventory Study.

Development in the Rouge River Watershed has been ongoing for decades, and one of the most significant impacts of urbanization is the effect on erosion and sedimentation in waterways. These effects include stormwater infiltration decreasing and runoff increasing; higher shear stresses on stream banks; and increased stream bank erosion. Erosion poses a threat to property, riparian habitat, and infrastructure.

This project prioritized stream bank erosion sites and recommended stream bank protection and erosion mitigation using best management practices. LimnoTech's approach to the project included three main components:

- *Field Inventory:* LimnoTech conducted stream bank inventory, entering inventory data into handheld computers with built-in GPS.
- *Site Scoring and Prioritization:* Inventory data were stored in a database, and numerical values were assigned to each site, allowing development of a score and priority ranking for each location.
- *Development of Conceptual Designs:* LimnoTech developed conceptual designs for stream bank protection and erosion mitigation for each of the sites ranked as "severe," including mitigation measures and techniques.