Developing New Strategies for Restoring Coastal Wetland Functions for the Great Lakes Restoration Initiative

This project is funded by the Great Lakes Restoration Initiative (GLRI), an interagency program that addresses the most significant environmental problems in the Great Lakes ecosystem. Results from U.S. Geological Survey (USGS) scientific studies and monitoring are helping guide the restoration effort. The GLRI is made up of five focus areas that address these issues:

- Cleaning up toxic substances and areas of concern
- Combating invasive species
- Promoting nearshore health by protecting watersheds from polluted runoff
- Restoring and protecting habitats and wildlife
- Tracking progress and working strategically with partners

More information is available on the USGS GLRI Web page (*http://cida.usgs.gov/glri/*).

Project Background

Great Lakes Coastal Wetland Habitat

The western shore of Lake Erie has lost over 95% of its wetland habitat since the 1860s. Remnant coastal wetlands open to Lake Erie have been severely degraded by altered hydrology, nutrient and sediment loading, and invasive species, while an extensive network of earthen dikes maintains actively managed diked wetlands. The diked wetlands historically provided critical migratory waterbird habitat, but their isolation from Lake Erie limited certain wetland services such as providing fish habitat and improving water quality. More specifically, a lack of suitable coastal wetland habitat has negatively impacted numerous species of commercially and recreationally important Great Lakes fish that depend on productive wetland habitats to feed (e.g., longnose gar, channel catfish, bowfin), spawn (e.g., northern pike, yellow perch), or provide protection for juveniles (e.g., gizzard shad, emerald shiner, largemouth bass).

Northern Pike

USGS scientists are focusing on restoring natural water flow and ecological processes between coastal wetlands in the U.S. Fish and Wildlife Service (USFWS) Ottawa National Wildlife Refuge (ONWR) and Lake Erie to improve fish and wildlife habitat. This initial project is developing sustainable approaches for restoring coastal wetland function, increasing ecosystem resilience, and serving as a foundation for coastal wetland restoration projects throughout the region.

Site and Project Description

Map of Crane Creek

The Crane Creek wetland complex is located in the ONWR along the southern shore of western Lake Erie in Ohio. This project targets data collection in coastal wetlands and two diked wetlands that have been isolated from Crane Creek since the 1940s, except during flood events. However, local results are guiding regional wetland restoration and management strategies.

Objectives and Approach

Objective 1: Reconnection

Characterize 5 years of ecosystem response to reconnection of diked wetlands and their parent water body.

Approach

- Work with the USFWS, Ducks Unlimited, and other partners to construct and operate a structure that reconnects a diked wetland to Lake Erie, thus allowing exchange of water, fish, mussels, and other wildlife.
- Conduct field sampling of fish, birds, invertebrates, plants, water quality, and water levels to quantify response of reconnected wetlands.
- Characterize variability of water levels and biota composition across the landscape by comparing data collected at several sites.

Water-control structure connecting a managed pool to Crane Creek

GLRI 71-2013

Objective 2: Sustainable strategies

Develop sustainable strategies for consistent sampling among study sites and contribute to the delisting of Beneficial Use Impairments (BUIs).

Approach

- Analyze data to develop a long-term sampling strategy and work with the USFWS, the Ohio Enviromental Protection Agency, The Nature Conservancy, and other partners to identify ways to contribute to the delisting of BUIs.

Researchers sampling wetland flora and fauna

Objective 3: Documentation and support

Provide design and monitoring guidance for other wetland reconnection projects throughout the Great Lakes and support widespread integration of adaptive management principles.

Approach

- Provide guidance and communicate project results to partners, regional managers, and international audiences through oral/ poster presentations, webinars, and written products.
- Work with partners to include adaptive management principles in the long-term management plans for rehabilitated wetland sites.

Example of fish and native freshwater mussels that use coastal wetland habitats

Outcomes

This project has:

- restored a historical connection between Lake Erie and a diked wetland
- improved habitat for migratory waterbirds, waterfowl, and commercially and recreationally important fish
- contributed to the delisting of BUIs in the Maumee River Area of Concern (AOC)
- provided new information relevant to future restoration planning throughout the Great Lakes coastal zone
- developed a foundation for regional strategies for coastal wetland restoration and management

Longnose gar

Recent Highlights

Through partnerships with the USFWS and Ducks Unlimited, a water-control structure was constructed at the study site to restore hydrologic connection between a diked wetland and Lake Erie waters for the first time in nearly 40 years!

Constructed water-control structure that allows critical fish passage

Intense data collection by USGS researchers and close interaction with refuge managers have led to an unprecedented look at the system response of this large wetland restoration action.

Fish species richness and abundance in the restored wetland increased significantly (over 10x in some cases) since wetland habitats were reconnected.

Commercially, recreationally, and ecologically important species (e.g., northern pike, largemouth bass, white bass, emerald shiner, gizzard shad) are using the restored habitat extensively now that they have access.

High-resolution sonar data have shown that huge numbers of fish are moving through the structure at all times of the day throughout the ice-free year.

Multitudes of preyfish

The reconnected wetland continues to be a sink for phosphorus, nitrogen, and sediment from Crane Creek. High levels of sediment and nutrient retention (~50%) have been observed during the passage of storm or flood events that move large quantities of water into the wetland. These data show the potential water quality improvements associated with this type of wetland restoration and provide baseline data that can be used to promote further restoration efforts in the Maumee AOC and other Great Lakes coastal areas.

The results of this study have led to further wetland reconnection projects throughout the Great Lakes basin. Numerous GLRI projects have included water-control or fish-passage structures as a direct result of our work, and the ongoing monitoring at ONWR has helped shape wetland management decisions regionally.

Winter at Crane Creek

Great Lakes RESTORATION

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