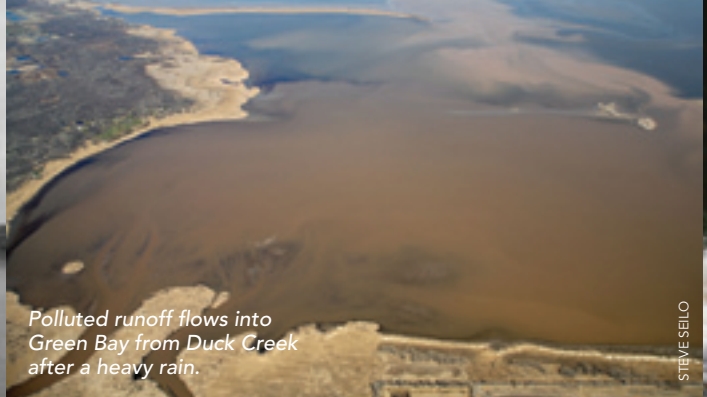


Paper mills discharged PCBs and other pollutants into the Fox River and Lower Green Bay.



Polluted runoff flows into Green Bay from Duck Creek after a heavy rain.

## Healing the Lower Green Bay and Fox River Area

### A fresh start for the world's largest freshwater estuary.

Kevin Harter

The world's largest freshwater estuary, Green Bay, sustained native cultures for centuries with its abundant fish, waterfowl and wild rice. French explorers, fur traders and many groups of immigrants were also drawn to what is now northeast Wisconsin by its natural resources. Commercial fishing, lumbering, and paper manufacturing industries flourished and led to Green Bay becoming a busy steamship and sailing port.

The region's development, however, left a legacy of toxic chemicals in the river and bay sediments. By 1927, sewage, oil slicks and waste from canning factories and paper mills plagued the river and lower bay. Fish kills became common as paper mill waste depleted oxygen from the water. Health concerns mounted, resulting in one of the earliest beach closings in the country in 1933. Perhaps the most significant toxic chemicals in the river, PCBs, were discharged from paper manufacturers in the mid-1950s through early 1970s.

Over time, agricultural businesses, especially dairying and cheese production, became important to the Fox River Valley economy. Increased farming, along with urbanization, led to greater environmental impacts from soil, nutrients and other pollutants that were carried to the river and streams by rain and snowmelt traveling over land (called "runoff" or "non-point pollution").

Today, the Lower Fox River Basin streams and lower Green Bay suffer from excessive loadings of sediment and nutrients, especially phosphorus. Nutrient inputs to Green Bay, the majority of which are from the Fox River, represent approximately one-third of the total nutrient loading to the Lake Michigan Basin as a whole. The excessive nutrients and sediments in the AOC result in degraded fish and wildlife habitat, an unbalanced

fish community, harmful algal blooms, and poor aesthetics.

The Lower Fox River is considered "impaired" under state and federal water quality regulations. Significant improvements have occurred over the years, but major reductions in nutrients and sediments are still required to achieve a river and bay that are no longer impaired.

With ongoing development and economic growth came the loss of habitat for native fish and wildlife as more people moved to the area, shipping and international commerce expanded, and non-native plants and animals established a foothold. More than 70 percent of Green Bay's wetlands have been lost to dredging, filling and invasive species. Water level changes in Lake Michigan have also reduced habitat; as water levels have decreased in recent years, non-native invasive plants have been able to expand into new wetland areas.

#### Responding to the challenge

Despite the big and complex problems facing the Green Bay watershed, partners in the area have risen to the challenge and responded patiently, persistently, and strategically. They have focused on projects that bring value back to our largest estuary by helping to achieve goals for cleaning up toxic pollutants, reducing nutrient loads, restoring habitat and improving fish and wildlife populations.

"There was a time it was really bad, but we are making progress, slowly, but surely," says Laurel Last, DNR's Area of Concern Coordinator for the Lower Green Bay and Fox River AOC. "If you talk to folks who have lived here for a long time, they say it is now much better than it used to be."

The Lower Fox River Contaminated Sediment Cleanup project is now in its fifth year of active remediation. This proj-



Construction of the rock spine structure of the Cat Island Chain restoration project is expected to be complete in fall 2013.



Phragmites stands crowd out native species.

ect was designed to reduce risk to human health and the environment due to the presence of PCBs in Fox River sediment. The lower seven miles of the project are in the Lower Green Bay and Fox River AOC. More than 662,000 cubic yards of sediment were dredged from the AOC in 2012. Completion of dredging, capping and sand covering for this project is anticipated in 2017.

Cleanup of PCB-contaminated sediments will address many Beneficial Use Impairments (BUIs), including degradation of benthos, degraded fish and wildlife populations, restrictions on fish and



# of Concern

White pelicans are one species that benefits from cleanup and restoration work.

STEVE WAGNER

Green Bay is the world's largest freshwater estuary.

TIM FEATHERS

wildlife consumption, bird or animal deformities or reproductive problems, fish tumors or other deformities, and restrictions on dredging.

To deal with the excessive loadings of sediment and nutrients, U.S. EPA approved a plan that establishes a "pollution budget" for these substances. The plan will drive the implementation of practices to reduce sediment and phosphorus loading to the river and bay. Government agencies, citizens, and non-profit organizations are working together to reduce the levels of these materials entering the river system and bay so the AOC waters can be healthy again.

"We are moving in the right direction. Things are progressing," says Jim Jolly, who has been with the Brown County Land and Water Conservation Department for nearly 30 years and is currently the interim director.

"We are working with agriculture to get phosphorus reductions and, over time, change how agriculture operates," says Jolly, who also coordinated a northern pike habitat restoration project.

### Multiple habitat restoration efforts are underway

Reconstruction of the Cat Island Chain, starting with building a 2.5-mile wave barrier along the remnant, began in 2012 after many years of planning by Brown County and the U.S. Army Corps of Engineers. Restoring the islands, along with the quiet water behind them, will lead to recovery of a significant portion of the lower bay habitat and will benefit sport and commercial fisheries, colonial nesting water birds, shorebirds, waterfowl, marsh nesting birds, amphibians, turtles, invertebrates and fur-bearing mammals.

The Duck-Pensaukee Watershed integrated inventory project, led by The Nature Conservancy, includes a wetland assessment and prioritization, fish barrier analysis and prioritization, a northern pike habitat assessment, sediment and nutrient data assessment and wetland restoration. This project will guide the

investment of habitat restoration dollars to the sites that can have the biggest impact within the AOC.

The coastal wetland restoration at the Point au Sable Nature Preserve Project was begun in 2012 to restore approximately 114 acres of coastal wetlands and adjacent uplands at Point au Sable, a prominent peninsula that forms the northeast "corner" of the AOC. This project will restore and improve habitat for numerous fish and wildlife species, including species of conservation concern, and also includes components of aquatic invasive species control (*Phragmites australis*), reduction of phosphorus inputs, and providing technical assistance to private landowners.

Adding to all of these efforts to restore the AOC is a project that asks citizens for their opinions about the appearance of the water and shoreline. The Volunteer Aesthetics Monitoring Program, established in 2011 and expanded in 2012, includes 11 monitoring sites throughout the AOC for which volunteers complete surveys. Information from these surveys will be used to determine the status of this impairment as well as identify problem areas and potential solutions.

"This AOC is complex and challenging, but it's an exciting time to be involved," Last says. "The PCBs are being cleaned up, people are working together to figure out how to meet the sediment and nutrient goals. There are some great restoration projects in progress and being proposed, and there is funding available through the Great Lakes Restoration Initiative. We are making some real progress here." •

Kevin Harter is a public affairs manager for the Department of Natural Resources.

To learn more about habitat restoration for northern pike watch the video at: [youtube.com/watch?v=1pTXnL9mmPo](https://www.youtube.com/watch?v=1pTXnL9mmPo)

### Estuary defined

Green Bay is the largest freshwater estuary in the world. An estuary is a partially enclosed body of water (such as a bay, lagoon, sound or slough) where two different bodies of water meet and mix.

Many estuaries are found where fresh water from a river flows into the salt water of an ocean. A freshwater estuary, on the other hand, can be found where fresh water from a river flows into the chemically distinct fresh water of a large lake (such as one of the Great Lakes). The mixing of water in this transition zone creates unique characteristics. For example, stream water typically has a higher temperature and more suspended solids than Great Lakes water. The mixing of river and lake water in a freshwater estuary can affect water temperature, turbidity, and chemical composition.

Estuaries are unique places that are valuable to the environment and society. Life is dynamic and diverse in estuaries. Some animals and plants specialize in, or adapt to, living in the unique conditions of estuaries. These unique habitats provide a safe haven and protective nursery for small fish, migrating birds and shore animals.

Estuaries act like huge sponges, buffering and protecting upland areas from crashing waves and storms and preventing soil erosion. They soak up excess water from floods and storm surges, and they help filter pollutants and runoff. People enjoy living near estuaries and the surrounding coastline where they can sail, fish, hike and enjoy bird watching. Because of their many benefits, estuaries are often the center of our coastal communities. •

Laurel Last is DNR's Lower Green Bay and Fox River Area of Concern Coordinator.