# NEARSHORE HABITAT

## Guide to Minimize Impacts From Coastal Construction Projects

### Coastal Monitoring of Fish Populations and the Effects of Shore Structures

In 2011, the Ohio Department of Natural Resources (ODNR), the Ohio Environmental Protection Agency (Ohio EPA) and the University of Toledo (UT) resumed the monitoring of fish and invertebrate communities along Lake Erie's nearshore using methodologies developed by the Ohio EPA in a 1990s monitoring program.

The program uses electro-fishing and benthic (bottom substrate) sampling for invertebrates to assess species richness and abundance at selected sites along the shore, typically in less than six feet of water. Species richness is the number of different types of fish and invertebrates collected. Abundance is the quantity of each type.

As part of this program, a study compared the species richness of the fish communities to the type of shore conditions present at specific locations.

The study concluded that compared with natural/unaltered sites, altered shorelines including seawalls and revetments without vegetation, showed decreased species richness of both fish and invertebrates. However, altered shorelines with terrestrial vegetation, including trees, shrubs and native plants, had species richness results comparable to natural shores.

Study results suggest that incorporating vegetation into coastal projects that alter the shore may benefit the nearshore habitat and the fish communities along that portion of shore.

***The health of Lake Erie's world-class fishery is directly related to the quality of this Great Lake's nearshore habitats. Minimizing negative impacts of coastal construction projects, while preserving and restoring the physical characteristics of the nearshore, can positively influence the quality of the habitats that support the Lake Erie fishery.***

## The Nearshore

Recognized for a world-class sport fishery of yellow perch, walleye and smallmouth bass, Lake Erie is home to approximately 90 fish species. Depending on the location, time of year, habitat type and health of the nearshore, all 90 types of fish use and can be found in the nearshore. The nearshore is a key link in the aquatic life cycle and food web.

Physically, the nearshore extends lakeward from the water's edge to beyond the area of breaking waves. Nearshore habitats sustain the magnitude and diversity of Lake Erie's food web, which ultimately sustains the lake's sport fishery. Most of the production of plankton and invertebrates, both of which are food for fish, takes place in the nearshore. It is where forage fish such as minnows, spawn, grow and try to evade predators. Most fish spawn and spend their early life history in the nearshore; other fish spend their entire lives there.

Lake Erie's nearshore habitats have varied physical characteristics that interact with one another. Characteristics include the type of lake bottom materials, water depth, wave climate, shore type, geology and vegetative cover. Natural physical conditions at any given location will determine the nearshore's biological diversity. Diversity is impacted by alterations of the shore and nearshore by structures that control erosion, protect property and provide lake access.

*Native vegetation exists along the 1.6 miles of wild beach at the Lake Erie Bluffs Metropark in Lake County. The nearshore contains a mix of sand and cobble.*

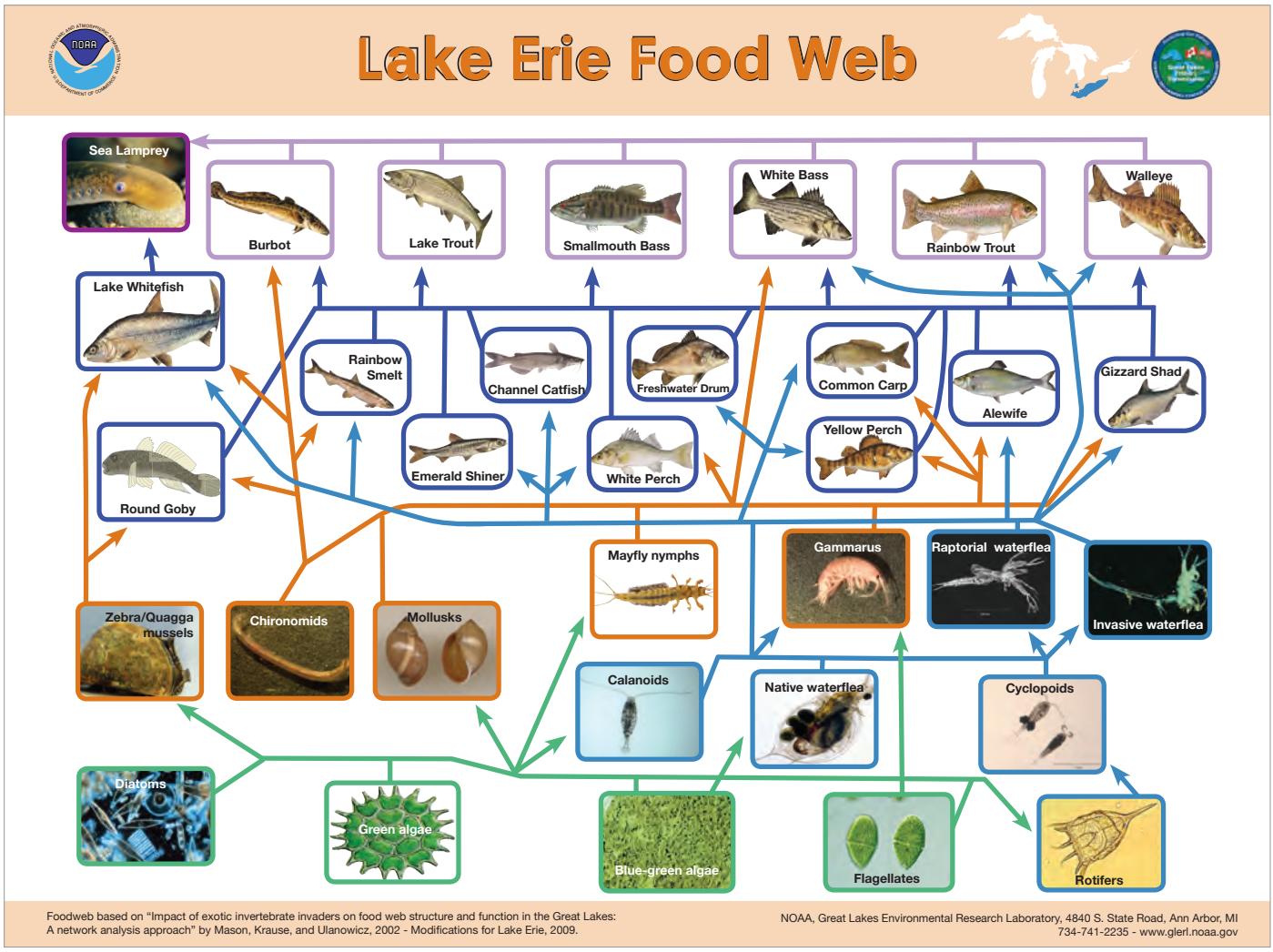
# Use of the Nearshore

The nearshore and shore areas of Lake Erie provide habitat for many animals including birds, snakes and fish. The nearshore is particularly important to fish as nearly every species use the nearshore at some time in their life cycle, whether for spawning, growth or feeding. The nearshore is where numerous fish species feed on plankton and invertebrates, and where larger fish forage upon smaller fish. Some fish, such as walleye and catfish, come from deeper water into the nearshore to feed at night; some fish, including walleye and steelhead, migrate through nearshore areas going to and from river and creek inlets and harbors.

Diverse habitat features are needed to support a variety of fish. For example, smallmouth bass and rock bass prefer rocky areas while yellow perch and northern pike are often found in nearshore areas with aquatic vegetation. However, the lakebed materials naturally present in the nearshore are often altered by construction projects and structures built along the shore. Through studies examining the number and type of fish present along the various nearshore habitat types, the chain of cause and effect is evident. If the nearshore is covered or changed, the fish, plankton and invertebrates that require that habitat have less area available for their life cycles. As a result, their potential contributions to the larger Lake Erie food web are reduced. Simply put: Less nearshore habitat, less fish.

The Lake Erie food web and fishery have been challenged by development and by aquatic invasive species - both of which have altered nearshore habitats. However, there is great potential for positively altering previously degraded nearshore habitats associated with structures, shores and uplands and minimizing impacts of future projects to nearshore habitats. This can be achieved by incorporating elements that are aligned with natural habitats into coastal project designs. Project designs must first consider that each reach along the shore is different, with unique geology, bottom materials and resulting habitat. An action that may yield positive results in one location may not work in another. With this in mind, there remain a number of concepts that benefit habitat, have a high likelihood of success, and can be applied along the shore. Some steps that can be taken to improve the nearshore habitat are presented on page 4.

Free technical assistance is available from the ODNR Office of Coastal Management at coastal@dnr.state.oh.us or 419-626-7980.



# Nearshore Habitat Degradation

When the shore and nearshore areas are hardened or filled, habitat diversity decreases. The modification of shore areas can cause water quality problems and changes to habitat that decrease the number of species capable of living and reproducing in nearshore waters. The following activities have major impacts on Lake Erie's nearshore habitats:

*In-water work during spawning*: Fish are especially sensitive to habitat disturbances during spawning periods. (eg. mid-March through June).

*Shoreline hardening*: Hardening the shore alters the connection between land and water; random dumping of material can disturb or destroy habitat areas. Hardening the shoreline/dumping displaces natural nearshore areas by covering shallow nearshore slopes and pushing the shoreline into deeper water. The deeper water may have different temperatures and lake bottom materials. Additionally, structures, especially vertical ones, can increase wave reflection. This causes alterations to the nearshore habitat when the energy that reflects off the structure scours the lake bottom and can also negatively impact the neighboring shore.

*Changes to nearshore substrates*: Construction projects often cover naturally occurring lake bottom materials such as sand and cobble with material that is less suitable than the native material. As a result, areas that were once prime habitat for specific species or supported activities such as feeding, spawning or as a nursery habitat, may no longer be suitable.

*Destruction of vegetation*: Both terrestrial and aquatic vegetation provide valuable habitat. Aquatic vegetation provides protection (hiding places) to young and small fish. Plants promote the growth of insects and worms that are food for fish. Terrestrial (land) vegetation positively influences the nearshore. Depending on the location and type, upland vegetation provides shade to shallow water areas, food and protection to animals living along or near the shore, and stabilizes bluffs and banks preventing sediment and nutrients from washing into the lake.

*Sedimentation*: The introduction of fine particles to nearshore waters can result from eroding bluffs/stream banks and the removal of vegetation during construction activities. It may harm fish eggs, impair fish respiration, decrease water clarity, reduce the growth of aquatic vegetation, and smother aquatic organisms living in the nearshore.

*Upland run-off and drainage*: Excessive or concentrated upland drainage and run-off of surface water to the shore reduces water quality by adding sediment and other contaminants to the nearshore.

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*Natural Shore: Sites that exist in a natural state with no man-made alterations.*

*Altered Shore – Hard Measures: Armored shores lacking vegetation.*

*Altered Shore – Soft Measures: Sites which include beach or bluff enhancements to stabilize the shore but mimic nature. These typically involve re-grading, planting vegetation and placing of beach nourishment. In some cases soft measures may be used in combination with small hard structures such as detached breakwaters or groins.*

*Recovering Shore: Sites that include armoring but have established vegetation.*

# Take Action to Minimize Impacts to Nearshore Habitat

*Impacts of coastal construction projects to nearshore habitats can be minimized by taking the following actions:*

*Assess potential impacts to habitat:* Planning for coastal projects should include a thorough study of habitats that could be impacted to determine the best approach to minimize habitat degradation/destruction. Input provided by state and federal agencies during regulatory review of projects should be fully considered and the project design modified to minimize or eliminate impacts. Agencies that provide remarks on the potential habitat impacts of permitted projects include the Ohio EPA, the ODNR Division of Wildlife and the U.S. Fish and Wildlife Service.

*No nearshore and in-water work during spawning season*:

Follow recommendations regarding environmental windows. In Ohio's portion of Lake Erie, environmental windows are set by the ODNR Division of Wildlife based on the reproduction cycles of fish. For most of Lake Erie, no in-water work is permitted from April 15 through June 30. For Maumee Bay and Sandusky Bay, the time period is March 15 through June 30. These restrictions are typically conditions of permits issued by the U.S. Army Corps of Engineers.

*Restore and maintain beach habitats*: Beaches provide an important habitat for plants and shorebirds as well as a soft transition from water to land. Design projects so they enhance existing beach areas or restore areas that have historically had beaches. Adding or preserving native vegetation can help stabilize beaches and provide habitat.

*Incorporate fish friendly features into structures*: In general, the use of natural material or porous type structures is better for habitat than artificial material and solid structures. Cobble placed at the toe of piers can provide both beneficial habitat and protection against scour of the lake bottom.

*Minimize the footprint of all structures*: Shore projects should be designed and constructed in a way that minimizes the area of lakebed or beach that the project occupies.

*Do not dump along the shore*: Dumping of materials (e.g. concrete rubble, construction debris, tires, garbage, yard waste, etc.) negatively impacts the nearshore by covering existing habitat, destabilizing and or de-vegetating the shoreline, and smothering plants and invertebrates living in the nearshore.

*Control upland water and sediment run-off and drainage*: Reducing excessive or concentrated run-off to the shore and minimizing soil exposure during and after project construction helps maintain water quality by reducing the amount of sediment and other contaminants that wash into the lake. Collecting surface water on the upland and routing it away from the lake, planting rain gardens to help filter surface water, installing rain barrels to collect rain water, and adding buffer strips along the top of bluff/bank can minimize negative impacts to nearshore habitats. Your local soil and water conservation district can provide information on best management practices for your area. Additional information can be found in ODNR's Rainwater and Land Development Manual.

*Establish or maintain native vegetation on the upland and beach areas*: Planting a variety of native vegetation on the upland and beach areas should be planned as a part of coastal projects. Information related to selecting and planting vegetation native to the Great Lakes can be found in *"Vegetative Best Management Practices – A Manual for Pennsylvania/Lake Erie Bluff Landowners"* published by Pennsylvania Sea Grant.

*Areas of Shoreline Park in Sandusky have been planted with native vegetation to help prevent erosion, sedimentation and excessive nutrients from flowing into the waters of Sandusky Bay. The fencing and netting keep Canada geese out while the plants grow.*

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