Natural History - continued from Page 1

Shore erosion has always happened along the Lake Erie coast, but unusually high water levels in the 1970's magnified the rates of shore erosion in many places. These high water levels occur when the upper lakes freeze over, preventing evaporation, and when there is an increased input of rainfall and snowmelt. Typically, the energy from waves is spread out over a beach area. However, when the lake level is higher, the waves strike directly at the base of slopes or cliffs. This is a minor issue along rocky shores, but much of the Lake County shore is soft shale or piles of glacial till, both of which are easily eroded. Removal of trees and shrubs from these steep slopes, and runoff from houses and roads built on the top of the slopes also increase vulnerability.

While every Lake County resident has a responsibility to protect water quality, lakeshore landowners have a more direct responsibility and more at stake. Many of the factors discussed above are out of an individual's control, however a responsible shore landowner should take steps to prevent or slow down shore erosion. Over the next few months, you will be receiving information about shore classifications, erosion rates, natural and man-made erosion prevention structures, and invasive species.

Five Interesting Facts about Lake County

- Lake County has 32 miles of coastline, 5.8 of which are accessible to the public.
- Approximately 9,000 boats are registered to Lake County residents.
- Of the 228.2 square miles that are in Lake County, 25.2 are impervious surfaces such as parking lots and roofs.
- There are 32.93 linear miles of rivers with State Scenic designations.
- Nine municipalities and 3 townships have Lake Erie coast.

This series of aerial photographs shows shore change from 1937 through 1978 and to 2004. Numerous lots and a roadway have been destroyed as waves repeatedly wash away the toe of the slope. Past attempts to stabilize the slope by dumping construction debris and other junk, concrete pours, and various engineering attempts have failed and may have even destabilized the slope further. The baseball fields on the left side of each picture are at Painesville Township Park.

LAKE COUNTY PLANNING COMMISSION

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Issue 1 of 4, 2010

Along the Shore

Living With Lake Erie as Your Neighbor

Inside this Edition:
How Lake Erie was formed, and what that means to shore management

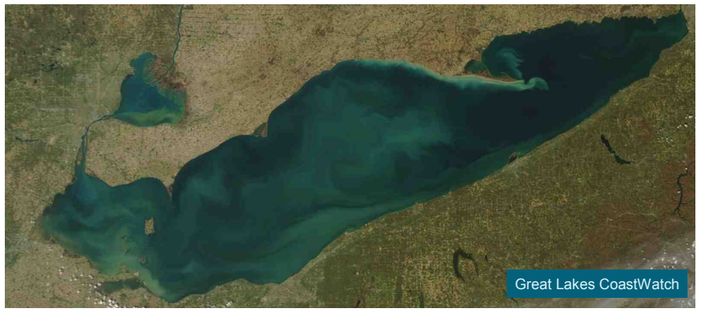
The Coastline and Lake County

Lake County is largely defined by its relationship with Lake Erie. The first Europeans who came to this area travelled by water. They then built their communities along the lakeshore and our rivers. This let them take advantage of the energy of water to make things, and the ease of transporting furs, lumber, and crops across the water to trade for other goods. While we now have other connections with the rest of the planet, Lake Erie is still an important force in our weather and our economy. Lakeshore landowners have a strong influence on the quality of this great natural resource, as well as a responsibility to understand how coastlines change with time. They need to consider these factors in order to manage their own property. This is the first of four fact sheets to help people who live along our Great Lake understand this role.

Natural History of Lake Erie

The Great Lakes - Superior, Michigan, Huron, Erie and Ontario - are a dominant part of the physical and cultural heritage of North America. Shared with Canada and spanning more than 750 miles (1,200 kilometers) from west to east, these vast inland freshwater seas have provided water for consumption, transportation, power, recreation and a host of other uses.

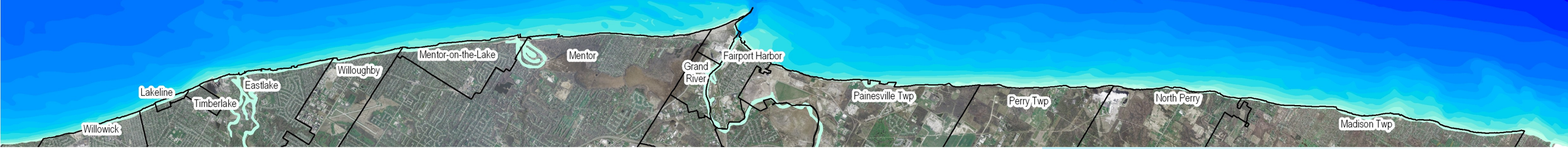
Lake Erie is the shallowest and the second smallest of the Great Lakes. It was formed by numerous glacial cycles, with ice over 5,000 feet thick that could advance over 200 feet in a year. These heavy, moving sheets of ice pushed across an ancient river valley and gouged out the softer areas of rock. This helps explain the difference in average depth between the deeper eastern part of the lake and the shallow western island region. The retreat of these glaciers opened up the waters of Lake Erie earlier than the more northern Great Lakes as well.



This recent photograph shows Lake Erie as seen from satellites. The open water is various shades of blue, green, and brown, depending on how deep the water is and how much sediment is in the water. Water takes about 2.5 years to travel from Toledo to Buffalo.

As the North American landscape changed, so did the Lake Erie shore. Once as far inland as Route 84, the current shore is very new in geological terms. This contributes to the dynamic nature of our coastline. Besides glacial rebound, other forces changing the shape of the shore are seasonal water level fluctuations, severe storms and the waves they create, and human influences.

About 80% of the water in Lake Erie comes from the upper lakes. The water that fills Lake Erie comes mostly from the Detroit River. Other major inputs include the Maumee, Portage, Cuyahoga and Grand Rivers. Smaller rivers, such as the Chagrin and Euclid Creek also contribute. The approximately 219,000 cubic feet of water per second flowing into the western end of the lake combine with the prevailing southwestern winds to create a longshore current. This current moves the water in Lake Erie towards Buffalo and Niagara Falls, and unstable shore materials can be carried away as well.



Threats to Lake Erie and its Shore Residents


Lake SWCD

Lakeshore dumping has often been done by people who believe that the added material will help prevent erosion. In fact, dumping increases erosion hazards by adding weight to the slope and preventing plant growth.

Shore erosion is a complex regional issue, involving many factors. The shore of Lake Erie is exposed to natural erosional forces, including storms and wave action, natural changes in lake water level, and the fact that water is generally moving in one direction (west to east) creating a longshore current. While hundreds of breakwaters, jetties, and other structures have been built along the Lake County coast to attempt to protect the shore from these forces, there is no permanent way to stop them. Lakeshore landowners sometimes speed up the rate of lakeshore erosion by their land management choices. The photo on the left is a failed attempt by a Lake County resident to reinforce a bluff with construction debris. Removing the vegetation from the bluff kills the roots that help to hold the soil in place and leaves the slope exposed to the direct force of the falling rain. This is often done in an attempt to improve the view or change the elevation of the land on top of the bluff. Another common problem is runoff from impervious surfaces being directed over the edge of a slope. This concentrated flow of water can create a gully that works inland towards the source of the water. These topics will be discussed further in this series.

Nonpoint source pollution is the mixture of chemicals and debris that are picked up by rainfall and snowmelt and washed off of our urban and suburban landscape, as well as farm fields. Common nonpoint source pollutants include fertilizer, sewage, animal waste, soil, and petroleum compounds. Lakeshore and inland residents need to be aware of the ways they contribute to this pollution problem. However, lakefront property is more susceptible to erosion, and people who live along Lake County's shore are exposed to the runoff from everyone's yards, roofs, and driveways each day.


NOAA

This current meter shows the effects of just one of the hundreds of invasive species introduced into the Great Lakes. It is completely encrusted with zebra mussels.

Invasive species are changing the biological composition of the lake - they take over habitat and food sources that native plants and animals need to survive. Since the opening of the Welland Canal between Lake Ontario and Lake Erie, new plant and animal species have been introduced to Lake Erie. Some of the more well-known invasive species are sea lamprey, round gobies, and spiny water fleas. Recently, the Asian Carp has been receiving much attention as well. Invasive species are introduced by cargo vessels, via the St Lawrence Seaway, or the Chicago Ship Canal, as well as by the thousands of recreational boats that are moved in between the Great Lakes and other bodies of water. Zebra mussels can cause costly shutdowns if they clog the inlet pipes of factories and power plants.

Commercial fishing on Lake Erie has been going on for centuries, causing changes to the Great Lakes ecosystem along the way. Walleye and other large fish were harvested for use as fertilizer and animal feed.


Rutherford B Hayes Presidential Center

Water withdrawal is a reoccurring theme in the region. The Great Lakes hold over 20% of all fresh, non-frozen water in the world, which makes the system attractive during times of drought in other parts of North America and the world. There are numerous international agreements and treaties, including the Great Lakes Compact, that protect Lake Erie from "consumptive uses" which would remove water from the watershed. A large withdrawal of water from the system would change lake levels and erosion patterns for lakeshore residents.

Overfishing and resource extraction have been altering the ecosystem in the Great Lakes almost since their discovery. In fact, the first ship that wrecked in the Great Lakes was returning to Niagara from Green Bay with a load of beaver pelts. As the fur trade slowed down, fishing, logging and mining became dominant industries of the region. Overfishing has greatly decreased the numbers of several predatory fish species, including muskellunge, pike, and sturgeon. The combination of overfishing and introduction of invasive species can change how the living plants and animals in the lake affect the chemistry of the water and the effects of water turbulence on the shore.

Common Invasive Plants to Avoid

While planting a lakeshore bluff is a great way to protect it from erosion, some plant species can cause problems. The following plants can actually create problems and should be avoided.


Wisconsin DNR, University of Wisconsin Herbarium

English Ivy - On the surface, English ivy seems like a great choice for quickly covering a slop with vegetation. However, this vine is a tough competitor and will kill trees and other plants that may already be established. Eventually you will have what is sometimes referred to as an "ivy desert" where nothing else is growing. The shallow roots of English ivy are not very good at holding soil together, and don't provide much protection to the slope underneath.


Paul E. Berry, University of Wisconsin Herbarium

Crown Vetch - This legume has been widely used to cover road cuts and other disturbed areas. It does have a sturdy root system that is well-adapted to mineral soils, but it will also outcompete other vetation. Rills and gullies can develop unnoticed under a dense canopy of crown vetch and remain hidden until they are quite large. Crown vetch is very popular with deer as well.


Wisconsin DNR, University of Wisconsin Herbarium

Russian-olive - this shrub is another commonly used non-native plant. It will quickly outcompete other trees and shrubs underneath a canopy of native trees, and as the taller trees die, there will not be other trees to replace them. Very few animals bother with the leaves or flowers for a food source, though some birds eat the seeds. This allows the Russian-olive to be distributed into other areas where it isn't wanted.

Confused by what you should or shouldn't plant? Contact Lake SWCD for a list of recommended native plants.

Nothing is softer or more flexible than water, yet nothing can resist it. -Lao Tzu