Do you have a *surface water* issue?
Indicators of surface water problems on and near coastal slopes include:

- Large exposed soil surfaces on steep slopes.
- Miniature troughs or larger gullies.
- Exposed length of drain pipes.
- Exposed foundations of stairways or other structures.
- Areas of decayed vegetation in low areas.
- Exposed soil surfaces on the top of the bluff.

Lake County Planning Commission

Do you have a *ground water* issue?
Indicators that a property might contain perched ground water and be vulnerable to water-induced slump failures include:

- Clay and till layers between the bluff top and the beach level.
- Wetlands near, or on, the property.
- Seeps or flowing springs emerging from the bluff face.
- Types of plants on the slope that need wet soil.
- Trees and large shrubs on the slope leaning toward the lake.
- Indications of perched ground water in drillers logs from water well drilling.
- A piece of land near the top of the slope that is at a slightly lower elevation than the adjoining land surface. This could be evidence of the first movement in a bluff slump sequence that may lead to the eventual sliding of the slumped section into the lake.
- Linear shore-parallel wrinkles in grassy slopes that may be indications of a gradual creeping of slope masses towards the water's edge.

Lake County Planning Commission

If you have a problem with water and bluff erosion, contact your city engineer, Lake County Soil and Water Conservation District, or the Lake County Stormwater Management Department

LAKE COUNTY PLANNING COMMISSION

Lake County Soil & Water Conservation District

125 E. Erie St
Painesville OH 44077

www.lakecountyohio.gov/soil
www.lakecountyohio.gov/planningcommission

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Issue 2 of 4, 2010

Along the Shore

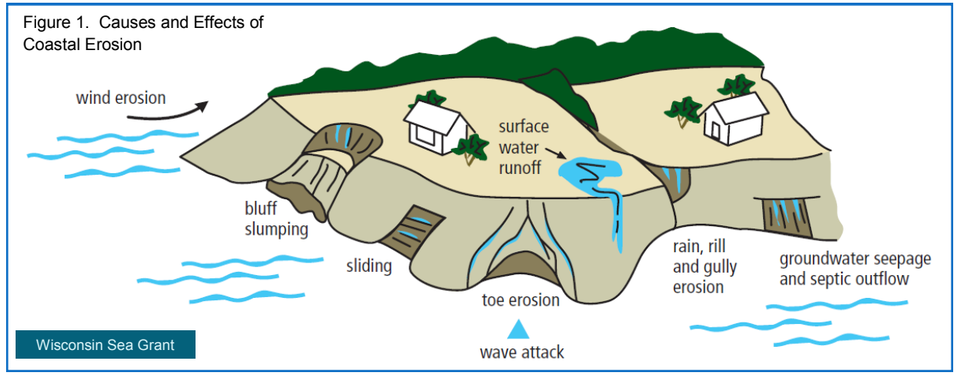
Living With Lake Erie as Your Neighbor

Inside this Edition:
Coast erosion processes and how people can affect them

Bluff Erosion 101

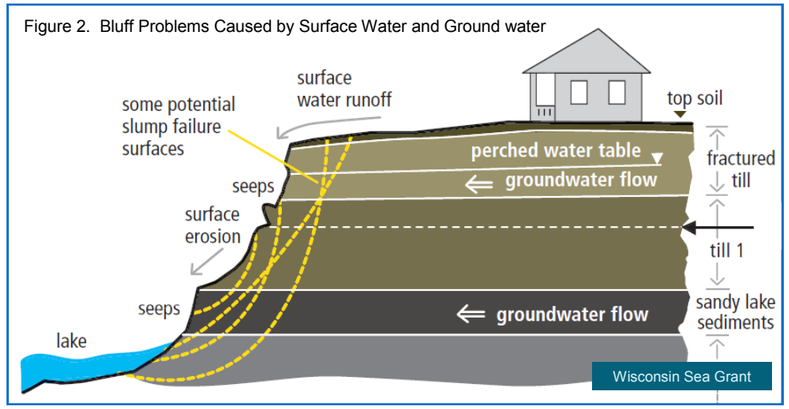
Erosion is the process that eats into or wears away the landscape. To many, this is the natural process in Lake Erie that doesn't require much attention. To local landowners and businesses along the shore, erosion represents a threat to their property. Lake County's coastal features range from gently sloping beaches to high, steep, nearly inverted bluffs. These profiles are shaped by coastal erosion processes.

Figure 1. Causes and Effects of Coastal Erosion



The erosion of a coastal slope occurs in response to several forces, including wave action, ground water seepage, unstable soils, and surface runoff. Figure 1 illustrates some of these contributing factors. Other factors include soil composition, weathering of the slope face by freezing and thawing, vertical cracks in upper slope soil, steep slopes, lake level changes, sandbars and lakebed slope, storm wave energy and duration, amount of precipitation, shore ice cover, shore orientation to winds, beach composition and width, presence or absence of shore protection, and type of shore protection. Given enough time and a stable slope base, erosion to a gentler slope and revegetation of the eroded slope face can stabilize a lakeshore bluff. However, in many places, wave erosion of the slope base prevents development of stability.

Figure 2. Bluff Problems Caused by Surface Water and Ground water



More specifically, surface and ground water are two critical components to understanding and addressing coastal erosion. Figure 2 illustrates the movement of water through layers of soil. In areas with a perched water table, the groundwater collects in the sand and gravel layers because the underlying soils prevent the downward movement of the water. Perched water tables occur seasonally or as a result of septic fields. The dashed white line shows the water

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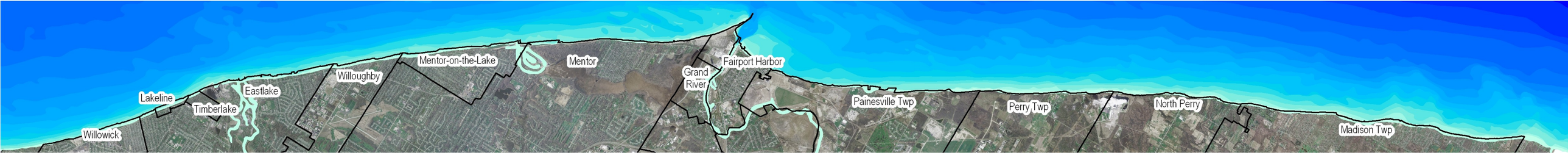


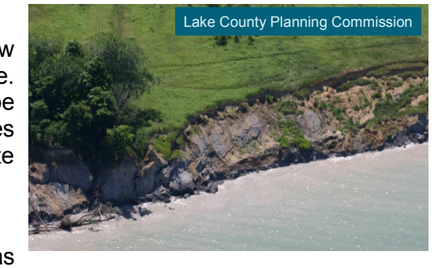
GENERAL COASTAL CONDITIONS

The Shoreline Edge Conditions Map was completed in 2004 for the Lake County Coastal Development Plan. Using aerial photography flown specifically for the 2004 Plan, the classifications are intended to serve as a general benchmark of existing conditions. Classifications were designated by coastal engineers solely on the aerial imagery. The reconnaissance showed that there is significant variability in the appearance (or lack thereof) of erosion, types of erosion control present and perceived effectiveness of protection strategies. Coastal planners use the data for establishing baseline conditions and historical reference.

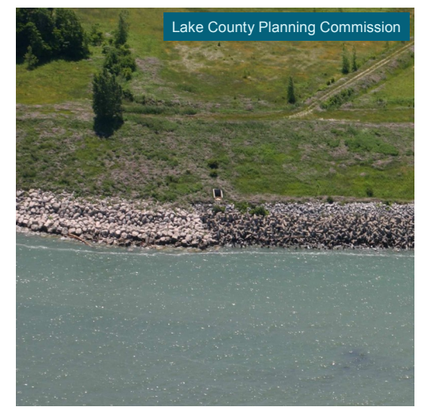
1. Natural stable shore

Areas of the shore where no apparent shore protection structure or treatment has been used. These areas are primarily natural sand beaches that work very well to protect the shore and bluffs from serious erosion or degradation as long as the longshore sediment transport system remains uninterrupted. Many of these areas are associated with the public parks and recreation areas located along the Lake County shore.

2. Natural unstable shore



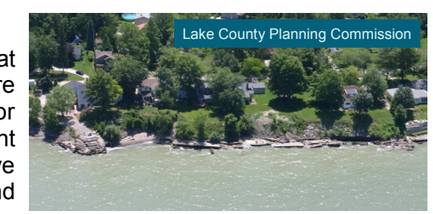
These areas do not appear to have any type of shore protection, and show active erosion resulting in the deposition of soil material directly into the lake. Most of these areas are banks and bluffs with waves acting directly on the toe of the bluff. On the positive side, these areas provide material that nourishes the littoral drift system. On the negative side these areas may threaten private residences, building structures, and land area.



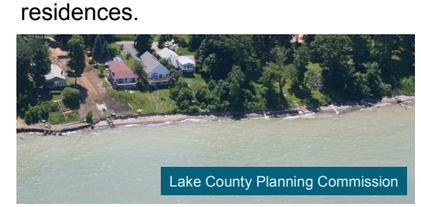
3. Protected shore – satisfactory

These areas consist of coast that has been armored or protected with some type of structure that has been placed along the shore. The structures range from vertical seawalls, to interlocking modular concrete units to rubble mound revetments and breakwaters. Areas in this category along the coast appear to be stable and provide a consistent, uniform treatment with a generally acceptable appearance. Traditional and commonly used shore protection structures that are constructed on and along the shore such as seawalls and revetments typically do not yield or sustain beaches. Structures that protrude into or are placed in shallow water such as breakwaters, jetties, and groins may create and/or sustain beaches.

4. Protected shore – unsatisfactory



These areas consist of coast that appears to have received shore protection treatment at some point in time, but still exhibit signs of erosion or ineffectiveness. Treatment types are extremely variable and inconsistent between and within sites, resulting in an extremely uneven and unattractive appearance. These areas tend to be associated with private properties and residences.



5. Protected shore – condition to be determined

These areas generally consist of coast with multiple types of shore protection whose specific type and/or effectiveness are not discernible from the existing photographs and data. As in category 4, these areas tend to be located along private properties and residences.

The complete catalog of imagery is available at the Lake County Planning Commission and the "Lake County Coastal Development Plan (including map) can be viewed at lakecountyohio.gov/planningcommission/publications/ coastaldevelopmentplans.

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table, and the materials below are saturated, making them more prone to erosion and movement. Surface water erosion occurs when water runs down the face of the bluff creating a gully effect. The gully rapidly washes away soil from the bluff causing destabilization. Surface water erosion can also occur with saturation at the top crest of the bluff face which can result in slumping near the bluff edge.

Ground water concerns are often more serious than visible surface water issues. Ground water infiltrates the property via surface water sources, such as runoff from impervious surfaces, lawn sprinklers, septic systems, or dry wells. The movement of water toward the slope face can cause movement of soil where the water emerges as seeps or springs, creating instability and erosion on the slope.

Lakebed erosion (downcutting) is also an important, and often invisible, variable of the coastal erosion process. This erosion is common along cohesive shore banks and bluffs of glacial till and clay. Where lakebed erosion occurs, it allows larger waves, and corresponding increasing energy, to reach the toe of the bluff and increase erosion recession rates. Lakebed erosion can also undermine the foundation of poorly designed shore structures (Figure 3).

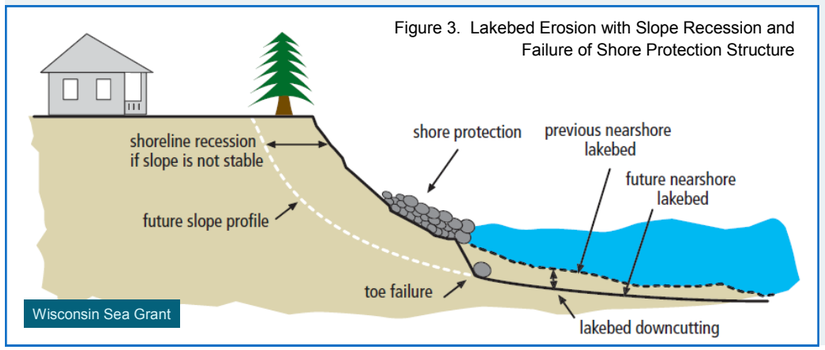

Figure 3. Lakebed Erosion with Slope Recession and Failure of Shore Protection Structure

These factors, along with typical wind and wave action, shape our coastal environment. The size, force and direction of waves are a function of lake levels, underwater features, wind direction, distance over open water, and which direction wind blows from (fetch).

All water has a perfect memory and is forever trying to get back to where it was. -Toni Morrison