Lake Erie Shore Erosion Management Plan

Ashtabula County: Reach AC 08

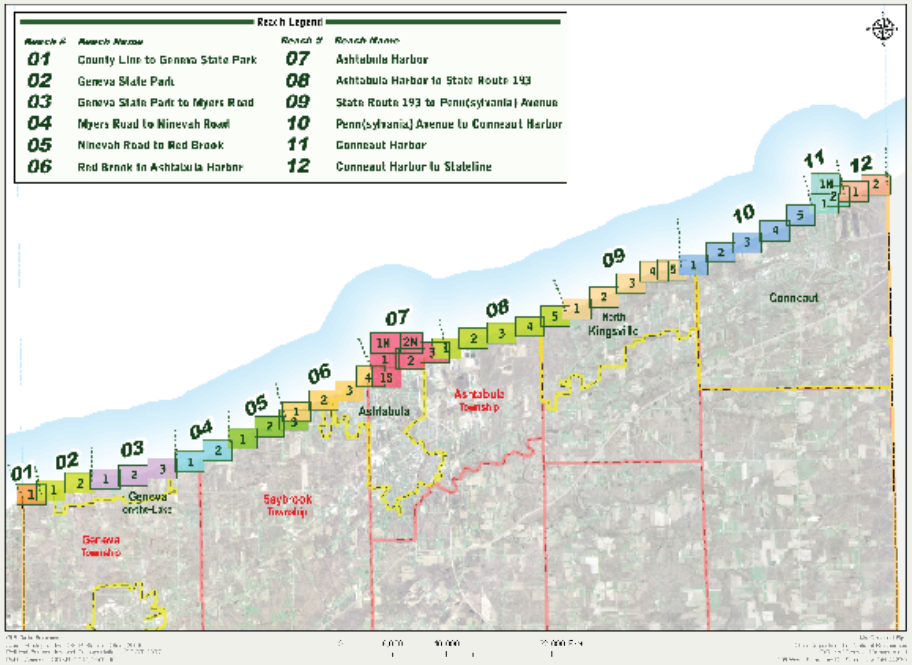
LESEMP

About the Program

In an on-going effort to assist property owners along Ohio's Lake Erie coast by providing free technical assistance, the *Lake Erie Shore Erosion Management Plan* (*LESEMP*) is being developed by the Ohio Department of Natural Resources through a partnership between the Office of Coastal Management, Division of Wildlife and Division of Geological Survey.

The *LESEMP* identifies the causes of erosion in specific areas called reaches which are stretches of shore with similar site conditions. The *LESEMP* then outlines the most likely means of successful erosion control based on reach-specific erosion issues, geology and habitat. The objective of the reach-based approach to erosion control is to simplify the decision process while enhancing the effectiveness of solutions to erosion related issues.

The *LESEMP* does not contain any regulatory oversight provisions.



Description

The reach from the east side of Ashtabula Harbor, beginning east of the First Energy facility, to State Route 193 is primarily undeveloped industrial property. Residential areas within this reach are mainly along the eastern margin with two residences in the west and one centrally located. The central residence of this reach appears be in an area where additional residences were once located but have since been lost due to erosion. The 60-foot high bluffs within this reach are composed of till capped with five to twenty feet of glaciolacustrine clay and/or sand. The nearshore is comprised of shale bedrock covered by a narrow band of silt, sand, and gravel immediately offshore. A few remnant structures, typically groins, are found within this reach; the largest and most noticeable of which is a long groin located along the far eastern residential area, north of the Overlook Drive-Englewood Avenue intersection. Beaches are essentially nonexistent as this reach is relatively sand poor. Any sand that is within the nearshore of this area will be captured on the western side of functioning groins because the flow of littoral drift is from west to east.

Two areas in the eastern half of the reach have been extensively studied by the Ohio Department of Transportation (ODOT) as they are attempting to devise future erosion control solutions for the sections of roadway that are currently close to the edge of the bluff. These sections are located on the west and east of Whitman Creek at the eastern end of the reach. Overall, erosion within this reach is likely to be toe erosion from wave action, coupled with slumping in the upper portions of the bluff. Slumping is especially likely within this reach due to the glaciolacustrine clay and sands that overlay the till. Debris flows in the clay could also be localized issues throughout this reach. Slumping and debris flows are both caused by an excess of surface and ground water on or within the bluff.

Recession /Erosion

The ODNR Division of Geological Survey has evaluated the recession of Ohio's Lake Erie shore over three time periods: 1876 to 1973, 1973 to 1990 and 1990 to 2004. Changes between the rates measured in each of the time periods can be attributed to development along the coast and natural factors

This reach contains high till bluffs that are exhibiting upper bluff erosion coupled with small to nonexistent beaches. Based on a review of historic aerial photography covering the last half century, sand has historically been limited.

such as lake level changes. In the first time period, low coastal development persisted along Ohio's coast with some of the lowest development rates in Ashtabula County. In the 1970s, development increased causing an increase in the use of shore structures to protect properties. It was during this time that the highest lake levels were also recorded and severe storms battered the Ohio coast. The coupling of storms and negative impacts of shore structures led to a general increase in recession rates. In the most recent time period, high lake levels were recorded once again, but the use of better designed shore structures worked to limit the rates of erosion. For the purposes of determining recession rates within this reach, the data for each time period for the area from Ashtabula Harbor to Route 193/North Main Street was analyzed.

Recession rates within this area ranged from less than 1 foot per year up to 5 feet per year between the years 1876 and 1938. Rates decreased to less than 1 foot per year to 3 feet per year during the years 1938-1973. The decrease of rates from the 1876 to 1973 time period is attributed to a lack of maintenance on the groins throughout the reach. Specifically, the groins around LaBounty Road, near the center of the reach, have significantly deteriorated over time. The poor functionality of these groins allowed for the natural distribution of sand along areas to the east (downdrift).

During the 1973 to 1990 time frame, average recession rates ranged from 0 to 7.3 feet per year, with a majority of the reach exhibiting rates within the range of 2 to 4 feet per year. Two areas of higher recession include the embayment forming in the headland at the western edge of the reach, roughly 675 feet east of Russell Drive, and the area north (both west and east) of LaBounty Road.

From 1990 to 2004 average recession rates decreased considerably from the time frame prior, with a range of 0 to 4.4 feet per year. A majority of the reach exhibited recession rates between slightly less than 1 foot per year to just over 2 feet per year, with a few areas of high rates. Rates also show greater variation within this period, as rates changed more on a property-by-property basis as opposed to being grouped in areas of higher or lower recession. The highest rates of recession found during this time period were in the area north of LaBounty Road.

Beaches/Sand Supply

Since sand supply is directly connected to beach presence, the size, number, location and widths of beaches are good indicators of sand supply. Based on a review of historic aerial photography covering the last half century, it appears sand has historically been limited within this reach. The long groin at the eastern extent of the reach was historically present, but the beach to the west of the groin has only been visible in the last decade or less. Prior to that, beach size in this area was negligible, likely providing only limited, if any, protection to the toe of the bluff from wave action. The presence of beaches in this area is highly susceptible to changes in lake levels (i.e. loss of sand with higher levels).

The most striking issue over the past half century and continuing today is upper bluff erosion caused by excess surface and ground water in and on the bluff. One example of the affects of this type of erosion is at the western side of the reach, near Russell Drive where State Route 531 turns from going north/north-east by south/southwest to a complete east-west orientation. At this "headland" the shore was once fairly uniform. Presently, this area has an undulated shape with the top of bluff closer to the road than in previous years. Another, and more prominent example of upper-bluff erosion, includes the areas to the west and east of Whitman Creek. Recession at Whitman Creek is evident by the old Lake Road bridge, currently

Reach AC 08 - Ashtabula Harbor to State Route 193

Map 1

◀ AC 07
Map 3

GIS Data Sources:
Aerial Photography - OSIP, State of Ohio, 2006
Political Boundaries and Transportation - ODOT, 2007
Public Access - ODNR OCM, 2009-10

0 250 500 1,000 Feet

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AC 08 ▶
Map 2

Reach AC 08 - Ashtabula Harbor to State Route 193

Map 2

GIS Data Sources:
Aerial Photography - OSIP, State of Ohio, 2006
Political Boundaries and Transportation - ODOT, 2007
Public Access - ODNR OCM, 2009-10

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Reach AC 08 - Ashtabula Harbor to State Route 193

Map 3

GIS Data Sources:
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Reach AC 08 - Ashtabula Harbor to State Route 193

Map 4

GIS Data Sources:
Aerial Photography - OSIP, State of Ohio, 2006
Political Boundaries and Transportation - ODOT, 2007
Public Access - ODNR OCM, 2009-10

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Reach AC 08 - Ashtabula Harbor to State Route 193

Map 5

GIS Data Sources:
Aerial Photography - OSIP, State of Ohio, 2006
Political Boundaries and Transportation - ODOT, 2007
Public Access - ODNR OCM, 2009-10

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located along the shore (north of the present-day Lake Road), and the bluff encroachment upon the roadway on either side of the creek. Various studies and planning efforts have been conducted by ODOT to determine the best means of controlling erosion within this area, with the most recent report produced in late fall of 2008.

Summary

Overall, the Ashtabula Harbor to State Route 193/North Main Street reach contains high till bluffs that are exhibiting upper bluff erosion coupled with small to nonexistent beaches within the shore area. While the reach is mainly undeveloped industrial property, slumping is a significant issue that currently threatens State Route 531 at the eastern end and could lead to additional areas of threatened roadway.

Within this reach, a striking issue over the past half century and continuing today is upper bluff erosion caused by excess surface and ground water in and on the bluff.

Recommendations

The recommendations included below are options that may be applicable to properties within this reach and should only be used for planning purposes. Based on the above physical characteristics, the following recommendations are suggested for Ashtabula Harbor to State Route 193/North Main Street. Each recommendation includes a brief overview of the solution prior to addressing areas within the reach where the recommendation is best suited. For more information on any of the items listed below, please refer to the Glossary and Appendix: Erosion Control Solutions.

Toe Protection:

1. Revetments: Revetments along the toe of a bluff will aid in protecting against wave-based erosion. In areas without beaches, a structural measure may be necessary to protect the toe of the bank. The low-relief banks within this reach have relatively gradual slopes, which are ideal for revetment development. In essence, the revetments form a stable bluff slope, providing protection to the soil underneath while breaking up wave attacks. Since material eroded off the bluff is one source of beach-building sand, some regulatory agencies may require that one of the design components for a revetment be the inclusion of sand pre-filling in the amount equal to that which would have been added to the system over the life of the structure.

Revetments could be used at any location throughout this reach. When planning a revetment within this reach, consideration should be given to the bluff slope and whether re-grading or terracing would also be favorable. Construction activities for both the revetment and re-grading should ideally be performed at the same time to limit the disturbance to the bluff.

Bluff Modifications:

2. Re-Grading/ Terracing: Re-grade or terrace less stable bluffs to a more gradual slope. By creating a lower (flatter) slope angle or terracing the slope to a series of steps, instability caused by gravity's forces on the upper bluff is decreased. Re-grading is a non-structural approach to stabilize the bluff that leaves the shore relatively unaltered. When re-grading, also examine the toe of the bluff to determine if toe protection is needed and if a structural (revetment) or non-structural (beach nourishment) solution would be preferable.

Re-grading or terracing could be used at most locations within this reach.

In the areas where buildings or State Route 531 are too close to the bluff edge to re-grade or terrace, the best solutions may either be water management, structural protection of the property, or a combination of measures.

*3. **Surface Water Management**: Route surface water away from the face of the bluff. In areas where gullies or rills are forming, surface water is slowly eroding the face of the bluff. Re-routing water away from the bluff may involve changing gutter or driveway drainage. Terracing of the bluff can also be used as a means of intercepting and diverting seeping ground water. Sources of surface water include, but are not limited to roof gutter downspouts, runoff from driveways and sidewalks, precipitation, and sprinkler systems.*

The re-routing of surface water should occur throughout the Ashtabula Harbor to State Route 193/North Main Street reach. Attention to the signs of surface water will allow for early action on limiting erosion due to runoff.

*4. **Ground Water Management**: Remove ground water from within the bluff. Drainage should be installed in areas with excess water in the bluff which are visible as seeps or springs in the middle of the bluff. A subsurface drainage system should remove water from an upper layer within the bluff (often a sandy layer), and should exit at the lake level to limit lower bluff erosion. Sources of ground water include, but are not limited to leaking septic systems, underground pipes and swimming pools.*

This reach is exhibiting a high degree of slumping, which is likely caused by unmanaged excess ground water. By managing the amount of ground water within the bluff, properties within the entire reach could see a reduction in upper bluff erosion.

*5. **Vegetation**: Encourage growth of vegetation along the bluff slope. Where possible plant vegetation, preferably native species, along the bluff to remove excess ground water while retaining soil strength. It is also possible to simply allow the natural succession of native plant species to grow along the bluff.*

The area from Ashtabula Harbor to State Route 193/North Main Street has such high levels of water throughout the bluff, that planting vegetation will be a significant benefit for all properties. Vegetation removes excess moisture from the bluff soils, thereby reducing the potential for erosion. Increasing the vegetative cover on the bluff will act to reduce both surface and ground water.

Management and Monitoring:

*6. **Bluff-Top Management**: Keep heavy materials, equipment and structures well back from the edge of the bluff-top. This applies to the placement of debris/yard waste near or over the edge of the bluff. Shrub and grass clippings can become saturated with water and greatly increase the weight on the bank/bluff's slope, directly causing slumping. Any structure (concrete decks, stone walls) or heavy object (vehicles, boats) placed near the bluff edge will increase the stress within the soil and can lead to slope failure.*

This recommendation is applicable to the entire reach from Ashtabula Harbor to State Route 193/North Main Street.

*7. **Coordination of Projects**: Continuation of similar erosion control measures along a stretch of shore will often yield more effective protection than the installation of multiple types of structures adjacent to one another. Most erosion control measures function better when used over large areas of the shore.*

Revetments could be used at any location throughout this reach. Re-grading or terracing could be used at most locations within this reach. The reach has such high levels of water throughout the bluff, that planting vegetation will be a significant benefit for all properties.

Should any new erosion control measures be built within this reach, consideration should be given to the application of the solution over multiple properties. By constructing projects over a larger area, the solution is often more effective at controlling erosion while limiting the potential negative impacts.

8. Water Management-Monitoring: Monitor the bluff for any changes to the amount/flow of water. Any changes in water patterns on a bluff could be signs of potential future failure planes (i.e. areas of slumping or sliding). Regular monitoring of the bluff will allow for the early detection and correction of these smaller problems, which will likely be less costly than measures taken after the issues worsen.

Similar to all reaches within Ashtabula County, this reach must give consideration to the high levels of surface and ground water present within the region. The entire county receives more precipitation than other counties to the west, and therefore will always need to be aware of water on and within the bluffs. Careful monitoring throughout this reach will allow for pro-active measures to reduce excess surface and ground water.

9. Shore Structure Management-Monitoring: Monitor and maintain shore structures. Routine monitoring of shore structures will allow for early detection of any potential failures. Smaller repairs performed more frequently will be less costly and can often increase how long the structure will be effective at controlling erosion. If removal of an aged or deteriorating structure is necessary, consider the above recommendations as potential future solutions.

Any new structures built within this reach should be monitored periodically to determine effectiveness and to identify issues early on. Alterations to structures early in the process may allow for easier and less costly fixes while limiting any negative impacts of the structures.

References:

- Carter, Charles H. and Donald E. Guy. Report of Investigations No. 122, Lake Erie Shore Erosion, Ashtabula County, Ohio: Setting, Processes, and Recession Rates from 1876 to 1973. State of Ohio, Department of Natural Resources, Division of Geological Survey, Columbus, 1983.
- Ohio Department of Natural Resources, 1998 Final Coastal Erosion Area (CEA) Mapping
- Ohio Department of Natural Resources, 2010 Final Coastal Erosion Area (CEA) Mapping

Signs of surface water erosion include gullies caused by water flowing over the bluff face. Quickly moving water washes away soil and dirt from the bluff face. Additionally, standing water on top of the bluff near the bluff edge adds extra weight to the land. If this water remains for a long time, the bluff may not be able to withstand the added weight and slumping near the bluff edge could occur.

Learn More:

LESEMP Webpages: ***ohiodnr.com/tabid/20501.default.aspx***

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