Lake Erie Shore Erosion Management Plan

Ashtabula County: Reach AC 12

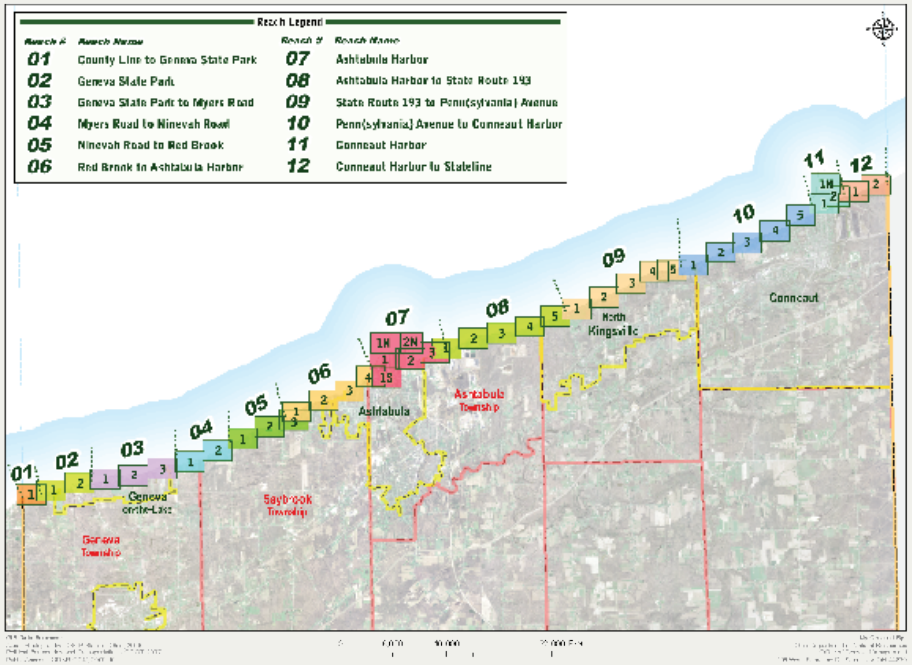
LESEMP

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 southeastern Conneaut Harbor breakwater to the state line (Stateline Road) is an undeveloped industrial stretch of shore. The bluffs range in height up to 40 feet and are composed of glacial till capped with glaciolacustrine clay, silt and sand. The shale bedrock nearshore is covered with a thin band of sand and gravel immediately offshore. Centrally located is Turkey Creek, an area of lower elevation due to the floodplain of the water body. Sand is present along the shore to the west and east of the creek mouth. Throughout the rest of the reach, beaches are extremely small and absent during high lake levels. Any sand present within this area will be moving from west to east, with an accumulation of sediment on the western side of structures or headlands. East of the Turkey Creek's eastern beach is a small embayment that has been slowly forming over the past half century.

As of February 2011, shore structures absent from this reach. In the late 1960s, a series of three timber groins were located on the slight headland between Turkey Creek and the embayment. Another timber groin was present in the eastern margin of the embayment and a small timber groin was located just east of the embayment. As of the early 1970s all of these structures were absent from the shore. Between the 1960s and 1980s there was an abundance of timber located parallel to the shore. This timber did not provide adequate protection of the shore from waves as the timber would have moved quite readily in a storm and during a period of high wave activity. The lack of shore structures and the minimal size of beaches allows for higher rates of erosion from wave attacks. Waves approaching the toe of the bluffs cause erosion and undercutting. At the top of the bluff, erosion is caused by excess surface and ground water. The water reduces the stability of the overlying soils and causes the upper portion of the bluff to slump or slide as a single mass down the face of 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

such as lake level changes. In the first time period, low coastal development persisted across 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 recorded and severe storms battered Ohio's coast. This 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 again, but the use of better designed shore structures helped to limit the rate of erosion. For the purposes of determining recession rates within this reach, the data for each time period for the area from Conneaut Harbor to the state line was analyzed.

Between 1876 and 1973, average recession rates ranged from less than 1 foot per year to 3 feet per year, with a majority of the reach receding at less than 1 foot per year. The main reason for the low recession rates is the reduction of wave action from the breakwater structures at Conneaut Harbor. Due to their large size, the breakwaters in effect reduce wave action within and downdrift of the harbor. The structures also limit the transport of sand from the west leading to the lower sand levels within this reach. From 1973 to 1990, average recession rates increased dramatically with a range of 0.1 feet per year (at only a few locations) to 8.8 feet per year. The higher recession rates were grouped at two locations. The first area is directly adjacent to the southeastern breakwater at Conneaut Harbor. In this area, the recession rates ranged from 2.7 feet per year to 8.4 feet per year. The second location is at a slight embayment forming at the eastern extent of the reach. Recession rates along this area ranged from 1.6 feet per year to 8.8 feet per year.

During the 1990 to 2004 time frame, average recession rates decreased with a range of 0 feet per year to 5.3 feet per year. The high recession rates continued within the area directly east of the Conneaut Harbor breakwater, with this area showing rates from above 1 foot per year to 5.3 feet per year. Throughout the rest of the reach, rates range from below 1 foot per year to almost 2 feet per year. The embayment near the state line did not recede at the elevated rates found in the prior time period.

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 images, beaches within this reach have remained relatively small throughout and change widths according to changes in lake levels. For instance, when lake levels were near the long-term average or below, beaches tended to be larger than when lake levels were significantly higher. Additionally, beach sizes decreased or were smaller up until the last decade, during which beaches appear to be increasing in size or present more frequently. The one exception to this general trend is the area adjacent to and eastward of the shore-connected harbor breakwater at the western margin of the reach. This location has historically exhibited rapid erosion since the construction of the breakwater. Although this site has recently shown decreased recession, a beach has not reformed where sand was once present.

Summary

Overall, the reach from Conneaut Harbor to the state line is an undeveloped and does not appear to have any buildings or infrastructure threatened by erosion. The till bluffs are exhibiting the most erosion directly south and east of Conneaut Harbor's southeastern breakwater and at the slight embayment in the eastern portion of the reach. Historic recession has fluctuated drastically with the main cause of erosion being wave attacks at the toe of the bluff. Secondary erosion issues are caused by surface and ground water, both of which are affecting this area.

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 upon the above physical characteristics, the following recommendations are suggested for the Conneaut Harbor to state line reach. 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.

Reach AC 12 - Conneaut Harbor to Stateline

Map 2

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

My Created By:
Ohio Department of Natural Resources
Office of Coastal Management
105 West Shoreline Dr, Sandusky, OH 44870

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Sand Management:

*1. **Conserve Sand Resources**: Conserve sand resources within the shore and nearshore areas. Sand is a limited resource in constant fluctuation. Avoid removing sand from the system; sand moved or excavated during construction along the shore should be placed in the nearshore, not on the upland and should not be incorporated into the construction project.*

The reach from Conneaut Harbor to the state line has a limited amount of sand within the shore area, as exhibited by the small to non-existent beaches throughout. By conserving the already limited resource, some areas may be able to retain what little beach is present. Retaining sand and beaches within the shore area will be beneficial for protecting the toe of the bluff from wave action.

Toe Protection:

*2. **Revetments**: Revetments along the toe of a bank will aid in protecting against wave-based erosion. In areas without beaches, a structural measure may be necessary to protect the toe of the bluff. The low-relief bluffs 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 throughout this reach. When constructing a revetment, consideration should be given to the overall slope of the bluff, with re-grading or terracing done along upper portions of the bluff as necessary. By conducting all work during the same time period, disturbances to the bluff are minimized.

Bluff Modifications:

*3. **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 could be applied to any property within this reach. Creating a more stable slope will provide stability to the 40-foot high bluff. When re-grading, also consider if the toe of the bluff requires a structural solution, such as a revetment. By combining the re-grading and revetment construction, bluff disturbances are limited and the new bluff slope will more likely be retained. Changing the slope of the bluff without protecting the toe can lead to undercutting of the bluff, which causes the bluff slope to become less stable.

*4. **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 Conneaut Harbor to the state line reach. Attention to the signs of surface water will allow for early action on limiting erosion due to runoff.

*5. **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 bank erosion. Sources of ground water include, but are not limited to leaking septic systems, underground pipes and swimming pools.*

Along the shore of this reach, it is likely that all properties require some level of ground water management because of the bluff heights and composition (i.e. sand over till). The installment of ground water drainage systems will aid in stabilizing the upper portions of the bluff, while limiting the potential for debris slides from overly saturated clay layers.

*6. **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.*

High levels of surface and ground water throughout this reach make every property well suited for the placement of vegetation along the bluff. Due to the height and slopes of the bluffs, specific species and types of vegetation may be better suited for different areas of the bluff (i.e. trees along the lower bluff).

Management and Monitoring:

*7. **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 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 Conneaut Harbor to the state line.

*8. **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.*

When following the above erosion control recommendations, consider similar grouping of projects to achieve the desired results. By coordinating projects among multiple properties, or over a large area of one property, the results may benefit a larger portion of the primary residence(s) while limiting the negative impacts to neighboring locations.

*9. **Water Management - Monitoring**: Monitor the bank/bluff for any changes to the amount/flow of water. Any changes in water patterns on a bank/bluff could be signs of potential future failure planes (i.e. areas of slumping or sliding). Regular monitoring of the bank/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, the Conneaut Harbor to the state line 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.

*10. **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

Learn More:

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

ODNR Office of Coastal Management
105 West Shoreline Drive, Sandusky OH 44870
419.626.7980 | ***coastal@dnr.state.oh.us*** | ***ohiodnr.com/coastal***

ODNR Division of Wildlife ***ohiodnr.com/wildlife***

ODNR Division of Geological Survey ***ohiodnr.com/geosurvey***

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