

# Ashtabula County: Reach AC 04



## 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.

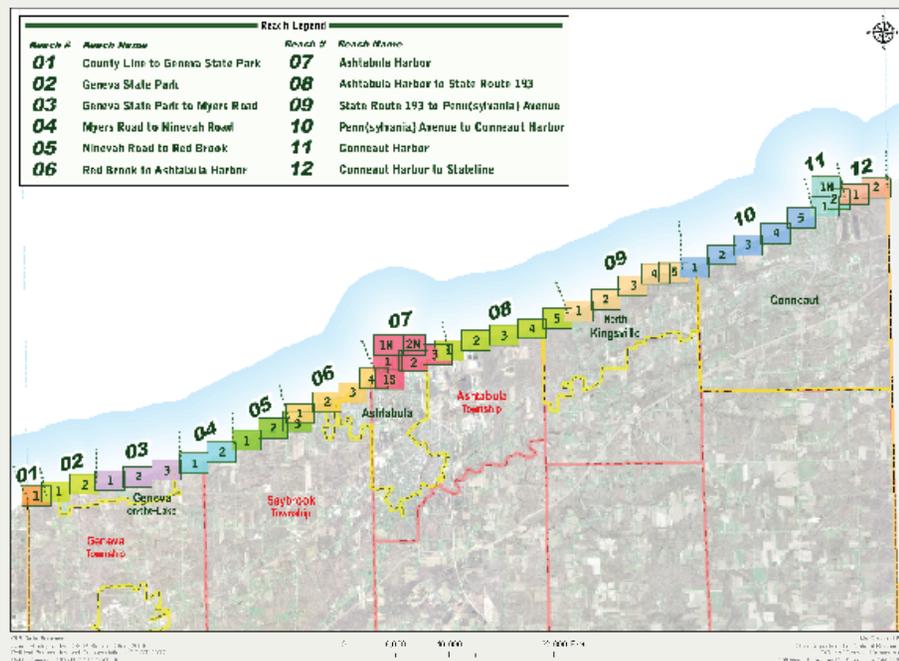
## Description

The reach extending from Myers Road to Ninevah Road contains a few residences interspersed among sections of land adjacent to State Route 531 (Lake Road) owned by the Ohio Department of Transportation (ODOT). Most residential buildings present are located back from the edge of the bluff. The bluffs within this reach increase in height from west to east ranging from 30 to 40 feet and typically are composed of till material with interbedded silt and clay. The nearshore is mainly comprised of shale covered in some areas by cobbles and boulders. Groins are common along many of the residential properties. Revetments front the three ODOT-owned properties, with each section of ODOT property separated by a section of residential properties. Small beaches are present on the west side of groins and a moderately-sized beach is located at the far eastern extent of the reach. A long groin located at the eastern boundary of the reach has caused a build-up of sediment on its western side coupled with an eroding embayment on the eastern side. Due to the flow of littoral drift from west to east, sand will commonly build up on the western side of structures, as is witnessed along the groins in this reach.

The medium to high bluff heights, characteristics of the bluff materials, and an overall lack of sediment within this reach make this an area that is especially prone to erosion. Waves approaching the toe of the bluffs cause erosion and undercutting. Erosion at the top of the bluff is typically caused by excess surface and ground water on and within the bluff. The water reduces the stability of the overlying soils and causes the upper portion of the bluff to slump. Even properties with adequate toe protection, either as beaches or structures, may experience erosion in the upper 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 throughout 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 the Ohio 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 worked to limit the levels of erosion. For the purposes of determining recession rates within this reach, the data for each time period for the area from Myers Road to Ninevah Road was analyzed.

Recession rates within this area ranged from less than 1 to 3 feet per year between the years 1876 and 1938, with an increase to 1 to 5 feet per year during the years 1938-1973. The increase within the 1876 to 1973 time period is thought to be caused by a decrease in beach widths in the area coupled with an increase in shore-perpendicular structures. A decrease in beaches

allows waves to reach farther onto the shore, causing greater erosion, while shore-perpendicular structures form updrift beaches at the expense of downdrift areas (i.e. increased erosion due to less sand).

During the 1973 to 1990 timeframe, the average recession rates ranged from 0 to 3.6 feet per year, with only one instance of rates above 3 feet per year. Rates decreased slightly from 1990-2004 with a range of 0 to 3.2 feet per year. Although the recession rates were relatively low, most of this reach exhibited some level of recession. The areas with the highest recession rates are those areas owned by ODOT, with surface and ground water management becoming the prominent causes of erosion in more recent years.



*The overall lack of beaches in this reach of Ashtabula County has led to increased susceptibility to wave-based toe erosion. These photos show one of the small areas along the eastern portions of the reach where a narrow beach is present. The glacial-till/clay bluff at the back of the beach is experiencing surface water and ground water erosion. The photo on the left was taken looking west. The photo on the right was taken looking east.*

## 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 photographs, it appears sand has been minimally present over the past half century as exhibited by the narrow to non-existent beaches throughout this reach. Beaches provide natural protection to the toe of a bluff, adding to its overall stability. This can result in lower erosion rates at locations where beaches are present. In this reach, however, the overall lack of beaches has led to increased susceptibility to wave-based toe erosion. The one area at the eastern end of the reach where beaches have been present in recent history will likely be more stable due to the protection provided by the beaches.

Similar to toe erosion, erosion on the upper portion of the bluff has led to a significant loss of land within this reach. A good example of upper bluff erosion is along the ODOT-owned properties. In the 1970s, a revetment was placed along most of the three ODOT-owned areas to mitigate toe erosion. Drainage was installed at these locations in the 1980s after it was recognized that the bluff was still eroding due to surface and ground water issues. As of 2006, the revetments are still present, yet erosion of the bluff along these parcels continues due to erosion along upper portions of the bluff caused by excess ground and surface water. All areas throughout the Myers Road to Ninevah Road reach, including those fronted by beaches, are susceptible to upper bluff erosion.

## Ohio Department of Transportation

The ODOT-owned properties between Myers Road and Ninevah Road are referred to as Phase 1 of a 2008 ODOT plan for State Route 531. The plan includes an assessment of roadway protection options for the three areas within this reach as well as an area in the east that straddles Ashtabula Township and the Village of North Kingsville.

## Summary

Overall, the reach from Myers Road to Ninevah Road is comprised of high till bluffs with minimal beach presence except along the last one-third of a mile before Nineveh Road. There are relatively few erosion control structures within this reach; existing structures consist mainly of revetments with a

few shore-perpendicular structures. The areas where the toe of the bluff is protected by revetments and the beach at the eastern edge of the reach will most likely exhibit erosion of the upper bluff until adequate drainage systems are installed to handle the excess surface and ground water that is present within the bluff. Since the beach at the eastern end of this reach was present during the higher water levels of 1973 and 1997, it is expected that the beach will still be present in the future even if lake levels rise.

## Recommendations

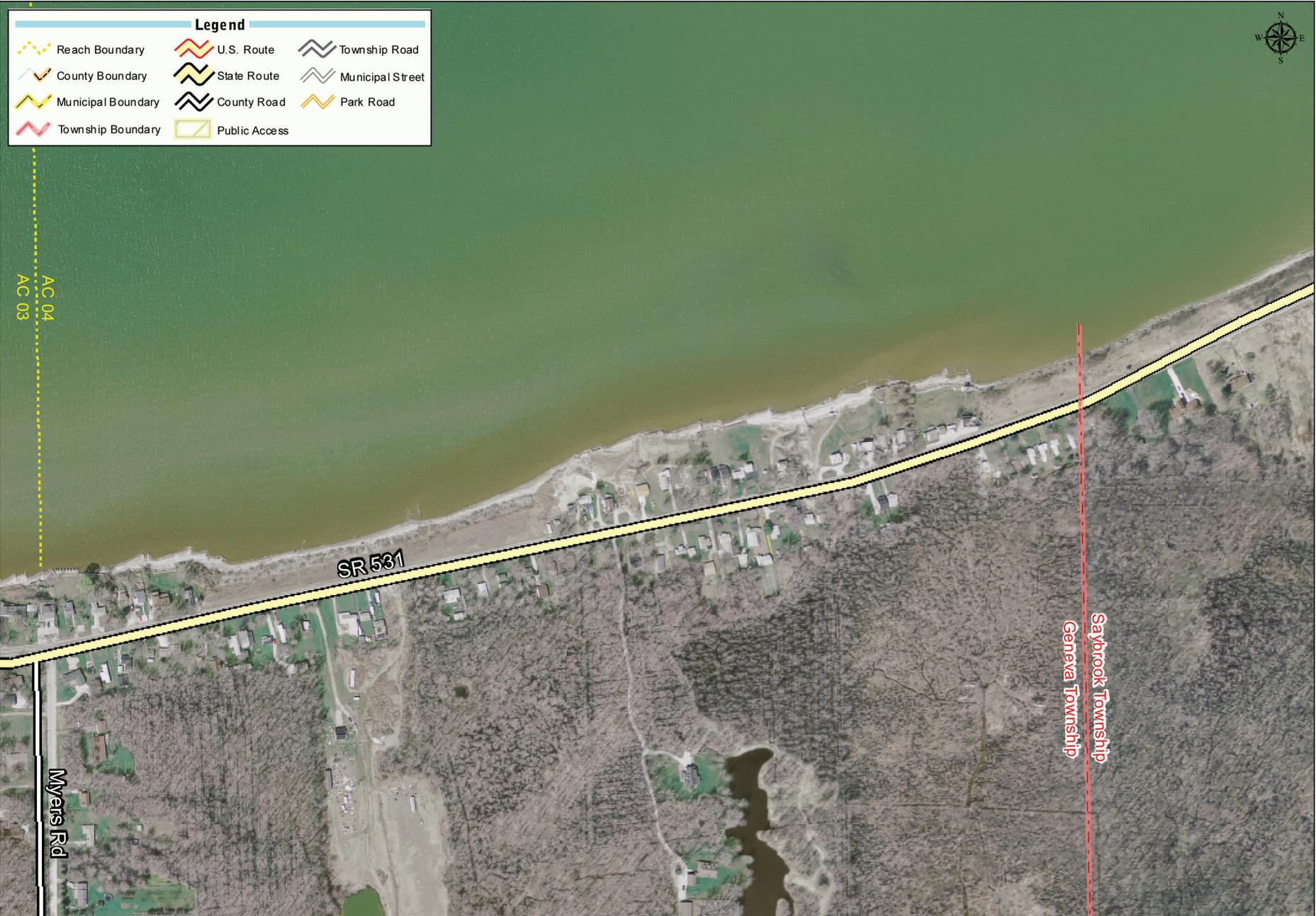
The recommendations included below are options that may be applicable to properties within this reach and should only be used for planning purposes. Based on the above physical characteristics, the following recommendations are suggested for the reach between Myers Road and Ninevah Road.



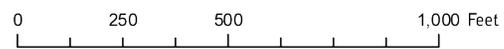
*This photo illustrates the narrow to non-existent beaches throughout the reach.*

Reach AC 04 - Myers Road to Ninevah Road

Map 1



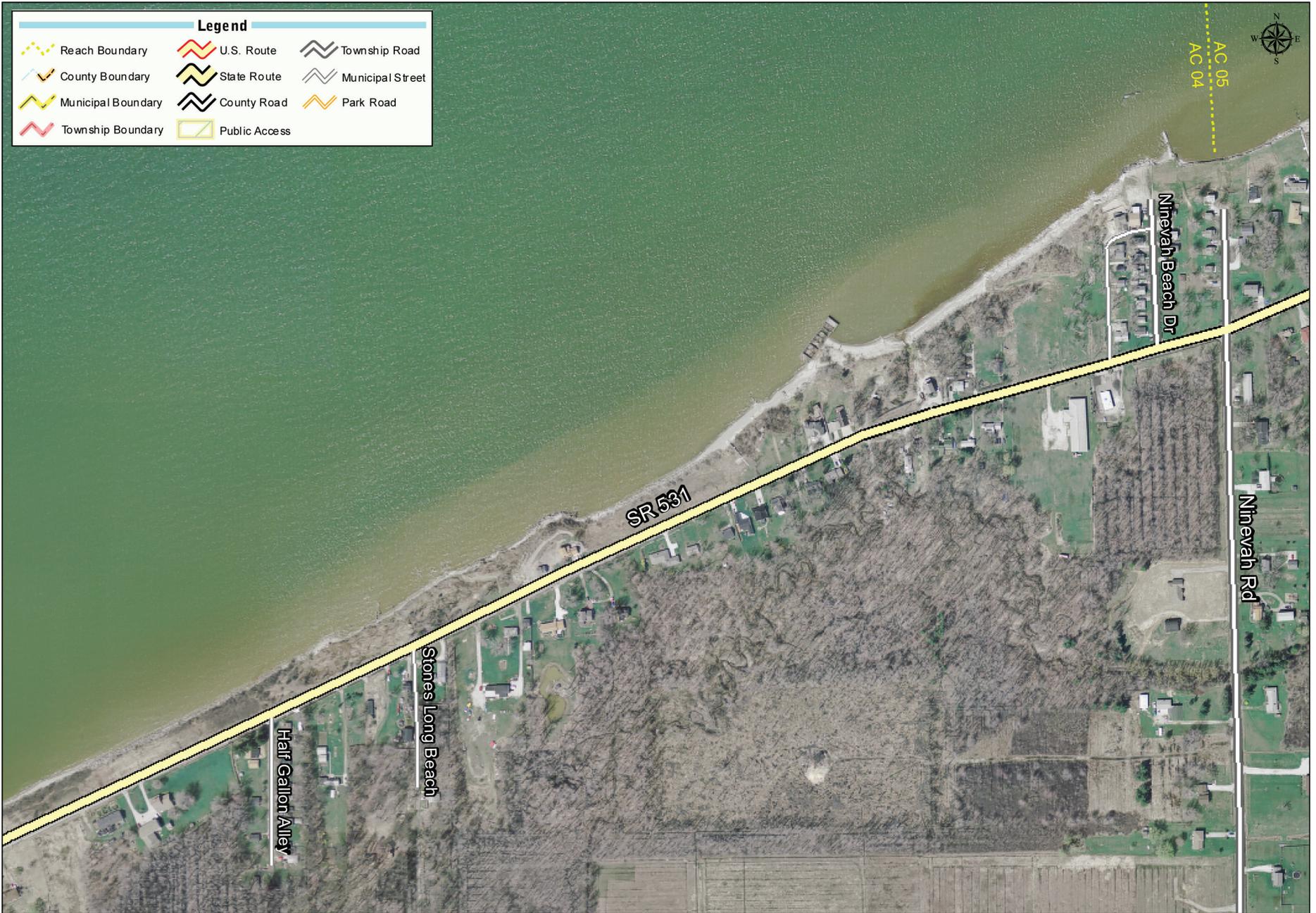
GIS Data Sources:  
 Aerial Photography - OSIP, State of Ohio, 2006  
 Political Boundaries and Transportation - ODOT, 2007  
 Public Access - ODNR OCM, 2009-10



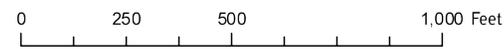
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Reach AC 04 - Myers Road to Ninevah Road

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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 Office of Coastal Management  
 105 West Shoreline Dr, Sandusky, OH 44870

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 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 bank. The low-relief banks within this reach have relatively gradual slopes, which are ideal for revetment*



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.

*development. In essence, the revetments form a stable bank slope, providing protection to the soil underneath while breaking up wave attacks. Since material eroded off the bank 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.*

Due to the protection measures at the ODOT-owned properties, revetment use is already common throughout this reach. A continuation of the revetments already located within this reach could be a good option for the currently unprotected properties throughout the reach.

## Bluff Modifications:

2. **Re-Grading/ Terracing:** *Re-grade or terrace less stable banks/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 bank/bluff is decreased. Re-grading is a non-structural approach to stabilize the bank/bluff that leaves the shore relatively unaltered. When re-grading, also examine the toe of the bank/bluff to determine if toe protection is needed and if a structural (revetment) or non-structural (beach nourishment) solution would be preferable.*

Re-grading is a feasible option for most of the residential properties within this reach. Re-grading is not recommended for those areas where infrastructure is located near the top of the bluff. This would include those areas where State Route 531 (Lake Road) is currently in close proximity to the top of the bluff.

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 Myers Road to Ninevah Road 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.

The upper bluff erosion exhibited throughout this reach shows that ground water is a significant issue for all properties. Attention should be paid to wet soil along the bluff face, areas of slumping, and any discharge pipes located along the bluff. These are potential signs that ground water could be an issue at the site.

**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.

Vegetation is of particular importance to all properties within this reach because of the excess surface and ground water on and within the bluffs. Planting vegetation can reduce the threat of upper bluff erosion by reducing the excess 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 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 the eastern edge of Myers Road to Ninevah Road.



Proper ground and surface water management can help alleviate shore erosion along reaches of coast that have water within the bluff face and/ or near the top. This photo shows drainage installed which redirects water away from the surface. The 2009 Office of Coastal Management factsheet "Causes of Erosion: Surface and Ground Water" provides more information on this topic.

**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.

The reach from Myers Road to Ninevah Road is already segmented by the three sections of ODOT-owned property, leading to an area where the grouping of projects is more likely to occur. First, the ODOT-owned properties function as a grouped project due to the length of the properties. The residential properties located between the ODOT properties are essentially grouped already and could have experience more success if one project is installed over the length of the properties. Finally, if the residential properties connect to the ODOT erosion control projects a third type of grouping may occur involving public and private lands.

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, the Myers Road to Ninevah Road 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.



State Route 531 (Lake Road West) in Ashtabula County is shown along the left of this picture. Land areas north of the road experience high rates of erosion. The Ohio Department of Transportation has a plan to address the erosion; a timeline for plan implementation is being developed.

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.

Structures within this reach have been built or modified during a variety of time periods. Observing any changes in the structures will allow for early detection of necessary modifications or repairs. Should new erosion control measures be installed, following the above recommendations will be beneficial to the long-term success of the project.

### 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](http://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](mailto:coastal@dnr.state.oh.us) | [ohiodnr.com/coastal](http://ohiodnr.com/coastal)

ODNR Division of Wildlife [ohiodnr.com/wildlife](http://ohiodnr.com/wildlife)

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