

# Ashtabula County: Reach AC 05



## 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.

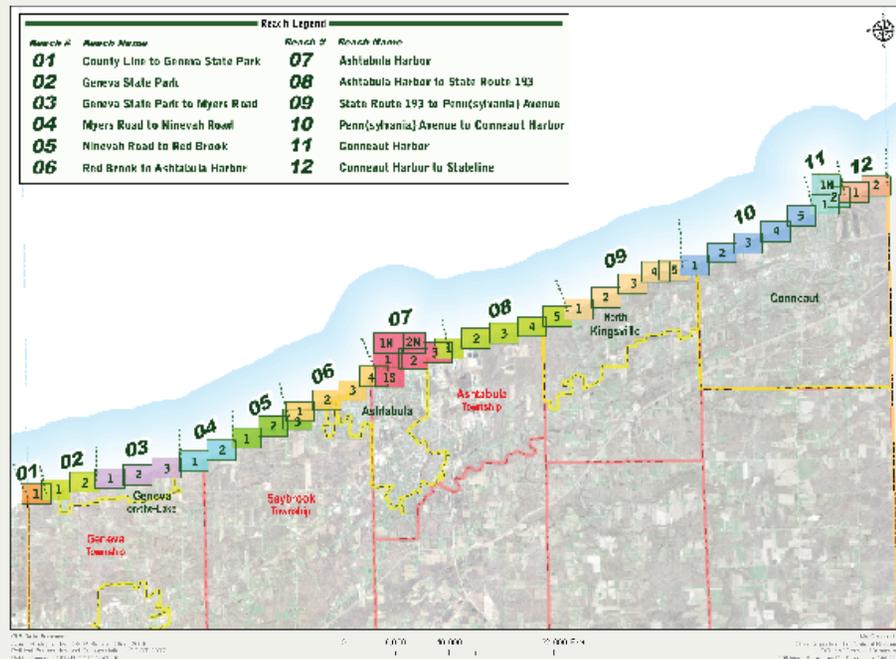
## Description

The Ninevah Road to Red Brook reach, including those areas from the east of Ninevah Road to the eastern jetty at Red Brook Marina, is mainly residential with the exception of Saybrook Township Park. Many of the residences within this reach appear to be located within 30 feet of the bluff edge. The bluffs, comprised of till with interbedded silt and clay, increase in height from west to east with heights ranging from 40 feet to nearly 50 feet at Red Brook. The nearshore is mainly comprised of shale covered in some areas by cobbles and boulders. The majority of erosion control structures within this reach are groins with several large revetments and seawalls. Some of the structures appear to be in disrepair, which may be making current erosion issues worse. Beaches are present throughout most of this reach and typically form on the western side of groins due to the flow of littoral drift from east to west. The one exceptionally large beach is located on the western edge of the Red Brook marina jetty.

Erosion within the Ninevah Road to Red Brook reach is mainly slumping, or the movement of material along the upper portions of the bluff. Upper bluff erosion witnessed in this reach is often due to excess surface and ground water on and within the bluff. When too much water is present, the bluff loses stability and a portion of the top of the bluff may move down the face of the bluff to a more stable location. To a lesser extent, certain areas are exhibiting erosion at the toe of the bluff. This erosion is caused by wave action and is more prevalent in those areas not protected by adequate beaches.

## 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 photo shows the area just east of Saybrook Township Park which contained a beach until high water levels in 1973. The beach has not returned. A revetment constructed in the shallow nearshore at this location further limits the potential for beach building.*

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 once 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 Ninevah Road to Red Brook was analyzed.

Between 1876 and 1973, recession rates within this area ranged from less than 1 to 3 feet per year, with the majority receding at less than 1 foot per year. Average recession rates were similar for the 1973-1990 time period, ranging from 0 to 3.1 feet per year. A majority of the rates within this time frame were less than 2 feet per year. In the 1990-2004 years, recession rates decreased with a range of 0 to 1.5 feet per year. In this time frame, only a few locations reported average rates above 0 feet per year. Two areas with consistently low rates include a small stretch of shore around the minor headland at the center of the reach, just west of Shadyside Avenue, and another small stretch at the eastern extent of the reach where a beach has formed due to the breakwater at Red Brook.

## 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, it appears sand is being captured within this reach as beaches are more pronounced along the western side of groins, at the headland located at the center of the reach, and at the eastern end of the reach next to the Red Brook jetty. It appears beach sizes have slightly increased since 1973, a year when beaches were almost completely absent from the area, likely due to high lake levels. During more recent high lake level years (i.e. 1997), beaches are present in greater size than in 1973.

Two locations within this reach have shown a more recent lack of beach presence. The area just east of Saybrook Township Park historically contained a beach. In 1973 the beach was absent and has not returned to this area. A revetment has been constructed in the shallow nearshore- at this location, thereby further limiting the potential for beach building. The second location, just to the east of Morningside Avenue, historically either lacked a beach or had only a small beach. As of 2006, this location had a moderately-sized beach, which could be attributed to the low to average lake levels. Should lake levels increase in the future, this location may see a more drastic drop in beach size as compared to the rest of this reach.

## Use of Shore Structures

As of 2006, few shore-parallel structures were located within this reach. Rather, this reach is dominated by groins, many of which were built decades ago. Over the past half century, it appears the overall number of structures has remained relatively constant. Many of the groins visible in the 1950s are still present. Alterations or additions have been made to several of these historic structures, while others are deteriorating and likely not functioning as intended due to their age and condition.

## Summary

Overall, the Ninevah Road to Red Brook reach consists of high till bluffs with increasing beach sizes relative to previous years. In the last half century, the number of shore structures, mainly groins, appeared to have remained relatively constant while beach presence and size both increased. Of greatest concern for this reach is the threat of slumping of the upper bluff. If left unmitigated, slumping has the potential to cause serious damage to property and buildings located near the bluff edge.

Reach AC 05 - Ninevah Road to Red Brook

Map 1



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

Reach AC 05 - Ninevah Road to Red Brook

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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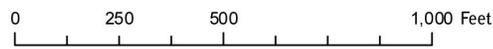
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Reach AC 05 - Ninevah Road to Red Brook

Map 3



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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## 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 reach from Ninevah Road to Red Brook. 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.

### 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.*

This recommendation is applicable to the entire reach from Ninevah Road to Red Brook. Even in the areas where sand has been present throughout the past half century sand resources should be conserved as it is a limited and valuable resource. The construction of shore structures should take note of this recommendation as sand can be lost during these processes.

2. **Beach Nourishment:** *Supplement the current sand supply with beach nourishment, also known as beach fill or pre-fill. Beach nourishment can increase the size and effectiveness of existing beaches. Additionally, beaches protected by groins and detached breakwaters will benefit from initial nourishment (pre-fill during or directly after construction) and periodic re-nourishment. The sand used in these projects should be acquired from an upland source.*

Two areas within this reach would function well with beach nourishment. The first location includes those properties in the western portion from Ninevah Road to Saybrook Township Park where beaches have formed since 1973. This area contains a series of groins which originally functioned to form beaches and with nourishment, would function well to retain those beaches. The second area where beach nourishment should be promoted is the area between the headland just west of Shadyside Avenue and Morningside Avenue. This location also relies on groins for the capturing of beach materials, and shows greater fluctuations in size over the years.

The long, continuous beach between Billow Beach and the Red Brook

western breakwater has been increasing in size according to the review of aerial images. It is unlikely that this stretch will need beach nourishment, except in the rare case of significant storms coupled with higher lake levels.

### Toe Protection:

3. **Detached Breakwaters:** *Detached breakwaters may be useful in areas where beaches are present or likely to form. Detached breakwaters aid in retaining a beach by limiting the wave energy reaching the shore causing sediment to settle out and be deposited. As opposed to groins which trap sand moving along the shore, properly designed and constructed detached breakwaters are intended to allow alongshore movement of sand. An initial beach nourishment (pre-fill) and periodic re-nourishment will often be advantageous to creating and retaining the beach landward of the breakwater while limiting impacts to neighboring shorelines. Some regulatory agencies may require pre-fill and periodic nourishment as one of the design components for a project that includes detached breakwaters.*

Detached breakwaters will function well within this reach in those areas already highlighted under beach nourishment. By constructing detached breakwaters, sand will still be retained along the shore, but more sand will move to areas downdrift.

4. **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 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.*

Throughout this reach, revetments can be used along any property looking to protect the toe of the bluff. In places where revetments and seawalls currently exist, it is recommended that a revetment be used for future toe protection. There are also areas within the western portion of the reach where limited sand is present along the shore, but the amount may not be adequate for toe protection. For instance, the area from just west of Haywood Drive to just east of Oakwood Beach Drive and the area in front of Saybrook Township Park have minimal sand fronting the properties. These areas should consider a revetment for future toe protection.

## Bluff Modifications:

**5. 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.*

At present, it appears a majority of the houses in this reach are located close to the bluff edge. Due to the close proximity of buildings to the edge of the bluff, re-grading may be somewhat limited within this reach. Terracing could be used to a greater extent if the current bluff slope at a particular site is not too steep. In the areas where buildings are too close to the bluff edge to re-grade or terrace, the best solutions may either be ground and surface water management, structural protection of the property, or a combination of measures.

**6. 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 Ninevah Road to Red Brook reach. Attention to the signs of surface water will allow for early action on limiting erosion due to runoff.

**7. 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



*Portions of this reach have narrow beaches bisected by groins, many of which were built decades ago and may be in need of repair.*

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.

**8. 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:

**9. 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 bank/bluff edge will increase the stress within the soil and can lead to slope failure.*

This recommendation is applicable to the entire reach Ninevah Road to Red Brook.

**10. 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.*

Most of the areas throughout this reach could coordinate projects so long as the sand levels within the project areas are consistent. Differences in the abundance of sand may result in the installation of different shore protection projects in two adjacent areas, limiting the feasibility of project coordination.

**11. Water Management-Monitoring:** *Monitor the 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 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 Ninevah Road to Red Brook reach must give consideration to the higher 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.

**12. 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.*

Most of the present-day shore structures were constructed decades ago, some are a half century old. If these older structures have not been significantly repaired over the years, it is likely they will require repairs or even replacement if they are notably deteriorated. If a new erosion control measure is installed, consider the above recommendations, with structural and non-structural solutions provided. A combination of recommendations may be the most likely solution. Combination solutions may include re-grading and revetment development or the construction of a detached breakwater and pre-fill. Also consider if incorporating a drainage system into the bluff is necessary because those systems can be installed while other construction is occurring, limiting the time the bluff is disturbed.

### 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)

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