

ASSESSMENT OF LAKE MICHIGAN SHORELINE EROSION CONTROL STRUCTURES IN RACINE COUNTY



BROCHURE

2008

Racine County includes about 14.8 miles of Lake Michigan shoreline, within which are more than 220 shoreline protection structures. A 1982 Lake Michigan coastal erosion management study, prepared by Racine County and the Southeastern Wisconsin Regional Planning Commission with assistance from the Wisconsin Coastal Management Program, estimated the economic value of the land and facilities within the 25-year and 50-year erosion risk zones within the County at \$6.4 million and \$12.9 million, respectively, in 1980 dollars. Since then, the number and value of developed properties along the Racine County Lake Michigan shoreline has increased. Many of these properties are protected from erosion by shore protection structures. These structures have varying degrees of effectiveness and may alter coastal processes that affect nearshore aquatic habitats.

SHORE PROTECTION STRUCTURE INVENTORY

Recently, a comprehensive inventory and assessment of shore protection structures along the Racine County shoreline was completed. This inventory was accomplished by Habitat Solutions NA and the Southeastern Wisconsin Regional Planning Commission (SEWRPC) in cooperation with Racine County; the City of Racine; the Villages of Caledonia, Mt. Pleasant, North Bay, and Wind Point; the Wisconsin Coastal Management Program; the Wisconsin Department of Natural Resources (WDNR); and the University of Wisconsin Sea Grant Institute. Funding for the project was provided by the U.S. Environmental Protection Agency through a grant administered by the WDNR. The project is documented in SEWRPC Memorandum Report No. 171 *Assessment of Lake Michigan Shoreline Erosion Control Structures in Racine County* (available at www.sewrpc.org/publications/search.asp). Completion of the project and provision of the project results to the local units of government and the public serves to implement a recommendation of the Racine County All-Hazards Mitigation Plan.

COASTAL EROSION ISSUES

What is Coastal Erosion?

Coastal erosion is the gradual wearing away of the shoreline due to natural processes.

Coastal erosion results in:

- Landward retreat of the shoreline
- Landward retreat of the bluff edge
- Narrowing or loss of beaches and dunes
- Narrowing or loss of coastal barriers and associated coastal wetlands
- Lakebed downcutting in shallow nearshore areas

Why is Coastal Erosion a concern?

- Property loss and damage
- Loss of infrastructure
- Threat to public health and safety
- Water quality degradation
- Loss of aquatic habitat

Why does Coastal Erosion Occur?

There are three primary causes of coastal erosion:

1.) Wave Attack

- Waves are generated by wind and storms and are climate driven. Impacts to the shoreline are a function of wave direction, magnitude (size), and frequency of wind and storm events.
- Lake Michigan is not “energy limited” so the waves can be large and powerful.
- Waves remove material from the base of bluffs making them unstable.
- Waves erode and transport sediments along the shore creating (or destroying) beaches and dunes.

TYPICAL SHORELINE PROTECTION STRUCTURES



Groin



Seawall (in foreground)



Revetment



Rubble

2.) Mass Wasting

- Several processes transport materials down slope driven primarily by gravity:
 - Soil Creep
 - Debris Flows
 - Slides and Slumps
- Steep, unstable slopes.
- Unconsolidated and consolidated materials – rates and types of failure are different.
 - Unconsolidated materials generally are more susceptible to mass wasting processes.
 - Consolidated materials (bedrock) are generally more resistant to mass wasting processes.
- Groundwater is a major contributor to mass wasting processes.

- Freeze/thaw failure mechanisms.

3.) Surface Water

- Precipitation and groundwater – Climate and human-driven (septic tanks, lawn sprinklers).
- Processes that transport materials down slope driven primarily by erosive effects of flowing water:
 - Ravine and gully erosion
 - Sheet and rill wash on unvegetated slopes.

SUMMARY OF INVENTORY DATA

Under the recent shore protection structure inventory, data were collected for a total of 380 separate structures representing 222 individual or composite structures (or shore protection systems)

along the Racine County Lake Michigan shoreline. Approximately 73 percent of the Racine County shoreline is currently protected, with the remaining 27 percent unprotected (primarily north of the Village of Wind Point).

Shore-perpendicular groins are the most prevalent type of shore protection, followed by shore-parallel revetments and seawalls/bulkheads.

Structure	Percent of Shoreline
Groins	37
Revetments	30
Seawalls and Bulkheads	10
Ad Hoc Rubble	8
Other	15

The most common building materials are large dolomite/limestone blocks that are ubiquitous to both old and new structures found along the shoreline, followed by large granite/metamorphic blocks that are typically associated with newer structures that have been built within the past two decades. Poured concrete seawalls, bulkheads, and solid groins comprise 15 percent of the structures.

Structure Composition	Percent
Dolomite/Limestone	35
Granite/Metamorphic	24
Poured Concrete	15
Concrete Rubble	8
Other	2

In general, 70 percent of these structures are considered to be in “good” condition, 15 percent of these structures are in “fair” condition, and 12 percent are considered to be in “poor” condition. Approximately 1 percent of the structures are “new”. With current Lake Michigan water levels near their historic lows, the current effectiveness of these shore protection structures is high.

Structure Condition	Percent
Good	70
Fair	15
Poor	12
Other	3

More than two-thirds of the shore-parallel structures are considered to be effective or highly effective at preventing erosion. These structures are designed to absorb or deflect waves impinging on the shoreline. Shore-perpendicular structures (primarily groins) are designed to trap and retain littoral sediments in order to build wide beaches that absorb wave energy and protect the lower bluff and adjacent upland areas from Lake-related erosion. However, when Lake Michigan water levels rise, the effectiveness of these structures (both shore-parallel and shore-normal) will diminish.

What Can Property Owners Do?

As a coastal property owner, there are several things that you can do to protect your property and the natural features of the shoreline:

- If you have just purchased coastal property and/or wish to install new shore protection, there are many sources of information available to you. Additional information is available from the sources listed below:
 - University of Wisconsin Sea Grant (www.seagrants.wisc.edu)
 - Wisconsin Department of Administration Coastal Management Program (www.doa.state.wi.us/section.asp?linkid=65&locid=9)
 - SEWRPC (sewrpc.org)
- Also, emplacement of shore protection within navigable waters of the United States is regulated by the U.S. Army Corps of Engineers – Detroit District and the Wisconsin Department of Natural Resources. Additional information and/or permitting requirements can be obtained from the following sources:
 - U.S. Army Corps of Engineers, Detroit District (www.lre.usace.army.mil/what/detroitresources)
 - Wisconsin Department of Natural Resources (www.dnr.state.wi.us/org/water/fhp/waterway)
 - Racine County Planning and Development Department (www.racineco.com/planningdevelopment/index.aspx)
- If you are deciding to develop or build on your property, you may not need to install shore protection if you provide an adequate buffer between your new home or business and Lake Michigan. It is recommended that you seek

advice from multiple sources during the planning and design phase to ensure that you minimize both risk to your property and potential impacts to the natural features of the shoreline. Retaining the services of a qualified professional engineer and/or coastal geologist is highly recommended.

- How water moves across or through your property can be an important factor that influences erosion. Water should be directed away from the bluff in order to reduce groundwater saturation and gully/stream erosion. Lawn sprinkler and/or septic systems should not be installed near the edge of the bluff. French drains and/or drain tile can be used to capture and redirect surface and groundwater to minimize erosion.
- Trees and vegetative cover that bind soil should be protected and maintained. Vegetation can be an extremely effective way to stop erosion and reduce bluff water saturation. Native

vegetation may be particularly effective as it has adapted to local climatic conditions.

- Just like your home, shore protection requires periodic inspection and maintenance in order to remain effective. You can do this yourself, or retain the services of a qualified coastal engineer or geologist to assist with an evaluation of your structure. Based on reconnaissance field work done in 2005, many structures along the Racine County shoreline will require repair or replacement within 3 to 5 years from 2005, especially if Lake Michigan water levels begin to rise.
- Periodic photographs of your property (annual or seasonal) will help to document the condition of your property and will provide a historical record of changes along the shoreline. This may be of considerable value when you decide to sell your property or if you decide to modify or improve your property in the future.

Prepared by Habitat Solutions NA and
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