

U.S. Army Corps of Engineers Institute for Water Resources

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April 19, 2017

Corps Releases Draft Shoreline Management Study for Lake Michigan

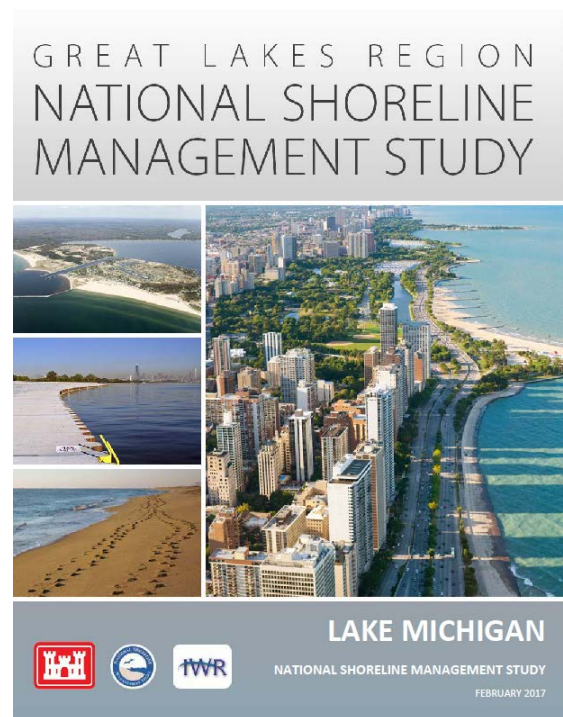
ALEXANDRIA, VIRGINIA. In March 2017, the U.S. Army Corps of Engineers released its draft “Great Lakes Region National Shoreline Management Study, Lake Michigan” report. The report provides an assessment of the effects of erosion and accretion upon socio-economics and the environment, and what management actions are being taken or are needed to maintain resilient shorelines.

The National Shoreline Management Study

The Congressionally authorized National Shoreline Management Study (NSMS) is the first undertaking in nearly a half century to document the physical, economic, environmental, and social impacts of shoreline change across each region of the U.S. Under the leadership of the Institute for Water Resources of the U.S. Army Corps of Engineers (USACE), NSMS is providing government policymakers, coastal engineers and scientists, and stakeholders with information about the coastal regions most in need of resilience planning.

The goal of the Great Lakes component is to prepare lake-specific reports inclusive of, but not limited to, the following:

1. Describe the physical, environmental, and economic aspects of erosion and accretion of the shoreline for the Great Lakes.
2. Describe regional characteristics including shoreline habitat, coastal and sediment processes, and specific features for the major regions of the Great Lakes, including differences throughout the Great Lakes.
3. Identify the economic and environmental impacts of erosion and accretion.
4. Identify the potential effects of future sea-level rise and climate change to the shoreline.
5. Describe the current approach within the Great Lakes in applying a systematic methodology to sediment and shoreline management.



Lake Michigan

Lake Michigan and its shorelines are truly a national treasure, providing residents and visitors with great opportunities for recreation contributing to social wellbeing, and are a critical economic resource to the four states surrounding the lake. Many of those shorelines are eroding, with tremendous consequences for the socioeconomic vitality of the lake's cities and communities, and threatening environmental resources.



The Illinois (and a small portion of Indiana's) Shoreline of Lake Michigan. *Source: Illinois Coastal Management Program website.*

Erosion of beaches and recession of bluffs has been well studied and documented over the last 50+ years, with bluff recession rates determined to be up to 15 feet per year.

The impacts of Lake Michigan water levels cannot be overstated. Water levels influence erosion and accretion along shorelines and in harbors, and impact beaches and dunes, infrastructure, dredging, shipping and boating, development plans, and wetlands/ecological communities.

Over the last 15 years, the federal government has expended \$203 million dollars to dredge federal harbors (both commercial and recreational), with the lion's share going towards commercial harbors. However, lake sector gross domestic product (GDP) in 2013 totaled nearly \$9 billion dollars in Lake Michigan coastal counties with tourism and recreation making up the majority of that value. Although not all of that value can be attributed to activities occurring in recreational harbors, it cannot be denied that these are hubs

of recreational activity (e.g., boating, fishing) and could be a factor for consideration to access greater dredging funding allocations in the future.

Given reduced federal spending on recreational harbors, the burden may shift to local communities to maintain recreational harbors and smaller commercial harbors during persistent low lake levels. This will likely mean increases in taxes for coastal county residents if counties take on dredging responsibilities or, if not, the communities themselves will be faced with the cost of maintaining channels depths at those marinas and harbors.

One potentially large erosion related cost across much of Lake Michigan is the more than 20 percent of the shoreline that is already hardened and will need to be maintained over the next many decades. The city of Chicago's \$300 million dollar shoreline armoring rehabilitation project is an extreme example of how costly it is to maintain these structures.

One of the environmental effects of erosion documented in Lake Michigan is the enhancement of habitat for the invasive species dreissenidae family of bivalve mollusks, i.e., zebra mussels and quagga mussels. Erosion of lake bottoms has created hard bottom habitats, ideal for the millions and millions of mussels.

Erosion is a direct result from lower lake levels and from revetments/bulkheads causing undercutting and lakebed erosion. Directly related to the invasion of these mussels is the decline of *Diporeia* which is the primary food source for populations of preyfish, now in decline. Zebra and quagga mussels are also directly implicated in the die off of tens of thousands of waterfowl, because of the mussel's ability to concentrate the Type E botulism bacteria.

Sediment budgets have been established in a few locations, such as the 172 miles of shoreline from Ludington, Michigan, to Michigan City, Indiana, that serve as a basis for long term planning and a systems approach to shoreline project evaluation and management. Regional sediment management demonstrations have been conducted successfully along the Indiana shoreline from Michigan City Harbor to



Illinois Beach State Park shoreline.
Source: fmanos.wordpress.com

Burns Waterway Harbor, Lower Lake Michigan/Indiana, Calumet Harbor and Calumet River. A new effort to evaluate the entire shoreline from Waukegan Harbor to the Wisconsin border is being initiated to evaluate the best approach to the erosion and accretion issues along that shoreline.

Lake Michigan's shorelines are managed by a combination of federal, state, and local government authorities. State and local shoreline management is generally project or by *project without comprehensive evaluation* of the influence that individual projects, such as groins

or revetments, can have upon downdrift shorelines. State and county staff is faced with limited resources when evaluating proposals for structures along the shoreline. Evaluating shorelines on a system wide basis can be accomplished with USACE leadership in implementing the Regional Sediment Management Program working closely with state, county, and city governments and the wide range of stakeholders.

The states of Michigan and Wisconsin have established setback regulations to control new development along shorelines. A number of counties in Wisconsin are very aggressive in managing their shorelines, as are a number of counties in Michigan. Much of the land along the shorelines of Illinois and Indiana has been developed, and hardened, and thus, these states have less need for setback regulations on a statewide basis. Other shoreline management alternatives are being pursued by state coastal zone management programs and county governments in those two states.

In general, developed shorelines should be protected from the forces of erosion. The approaches to protection depend upon the local characteristics of shorelines and the associated development. Management measures may include such hard engineered structures as revetments, bulkheads, groins, or breakwaters. Where it can be accomplished, this report encourages soft approaches to shoreline management, such as managed retreat, setback ordinances, and application of technical and engineering knowledge of natural factors to reduce the rate of erosion.

For example, in some cases, dewatering approaches to bluff erosion can help stabilize bluffs. Erosion will continue but, depending upon local conditions, dewatered and stabilized bluffs can sometimes lower the overall rate of erosion.

Another example is the use of vegetation and biologs as an alternative to hardened shorelines; they are the more cost effective in many cases and are gaining political traction across Lake Michigan.

The key is ensuring that the forces of erosion, rates of erosion, local topography, and available approaches, both hard and soft approaches, are well understood, along with downdrift shoreline considerations, by the local residents and those responsible for building and maintaining the components of Great Lakes infrastructure.

The U.S. Army Corps of Engineers prepared the Lake Michigan Potential Damages Study in the early 2000s that assessed the effects of varying lake levels and potential impacts, developing a suite of new tools and models that are available for similar assessments in the other lakes. In addition, the Federal Emergency Management Agency (FEMA) has assessed potential flood damage from storm events, also developing a number of tools, such as flood insurance maps, that may be useful to state and local planning authorities.

Sediment and shoreline best management plans for Lake Michigan should be developed by collaborative partnerships of federal, state, and local entities, including the private sector, academia, and non-government organizations. The focus should be on sediment and shoreline management for the littoral cells within each of the lakes.

Climate change will have numerous impacts to the Lake Michigan shorelines, due to warmer water temperatures, reduced ice cover, likely lower lake levels or at least increased variations, and possibly increased storminess. The effects of reduced winter ice cover as a result of climate change, and associated impacts to beaches, natural resources, and shoreline infrastructure are poorly understood, but the risks are likely to very significant.

Lake Michigan does not have an overarching plan for sediment and shoreline management and coastal resiliency, which is especially important in view of climate change, potentially increased variation in lake levels, changes in amounts of precipitation/runoff, and vulnerabilities to coastal flooding.

Summary

The NSMS report on Lake Michigan is a good step in the direction of moving towards a comprehensive assessment and development of plans for on-the-ground actions to build resiliency into state coastal economic development and environmental programs. These plans would promote resiliency within the Lake Michigan community, incorporate protection of critical infrastructure, and assess vulnerable shorelines and risks to people and ecosystems.

The Great Lakes project teams are currently working to prepare reports on the remaining Great Lakes and anticipate releasing those over the course of the next several months. The draft Lake Michigan Report can be downloaded at <http://www.nationalshorelinemanagement.us/>. Please direct any questions related to this report to Lynn Greer, Outreach Program Specialist, Great Lakes and Ohio River Division Public Involvement Specialist, Lynn.M.Greer@usace.army.mil.

Learn More

For more information, www.iwr.usace.army.mil/Missions/Coasts

National Shoreline Management Study website: www.nationalshorelinemanagement.us

(Download the draft Report here)

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The U.S. Army Corps of Engineers (USACE) Institute for Water Resources (IWR) was formed to provide forward-looking analysis and research in developing planning methodologies to aid the Civil Works program. IWR is a field operating activity under the supervision of the Director for Civil Works, USACE.