

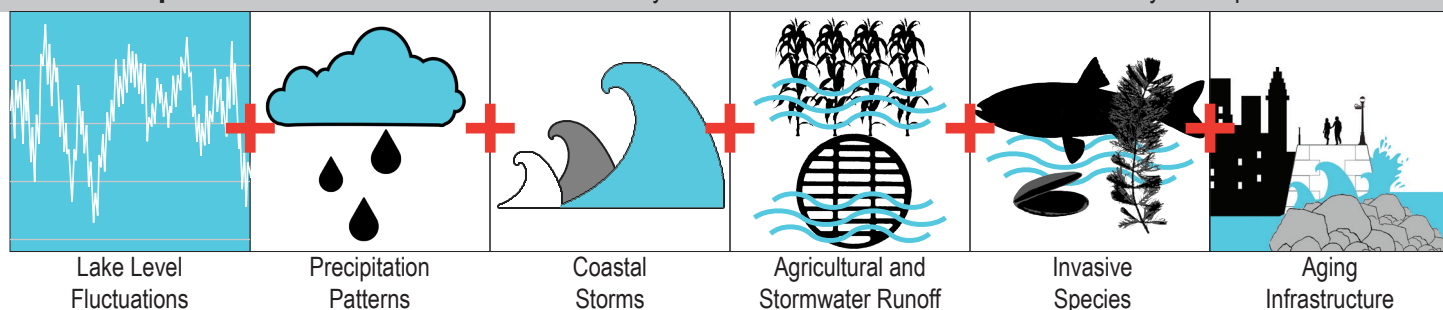
The opportunity for federal agencies, states, and local stakeholders to develop an infrastructure strategy for the future management of the Great Lakes coast

Introduction

The Great Lakes Coastal Resiliency Study (GLCRS) is a regional initiative of the eight Great Lakes States, working in collaboration with the Corps of Engineers, NOAA, USGS, FEMA and USEPA that was begun in late 2016. Coastal Resiliency is the ability of coastal areas to **withstand**, **recover** from, and **adapt** to disturbances and underlying stress while maintaining economic, environmental, social, and cultural values. The GLCRS will investigate opportunities to improve resilience within both the built and natural coastal environments. It will result in a plan that identifies vulnerable areas and recommends measures to increase resilience. Without such a plan, we expect increased risk of coastal damage in the future and management strategies that continue to address this problem through a piecemeal approach that is both inefficient and limited in effectiveness.

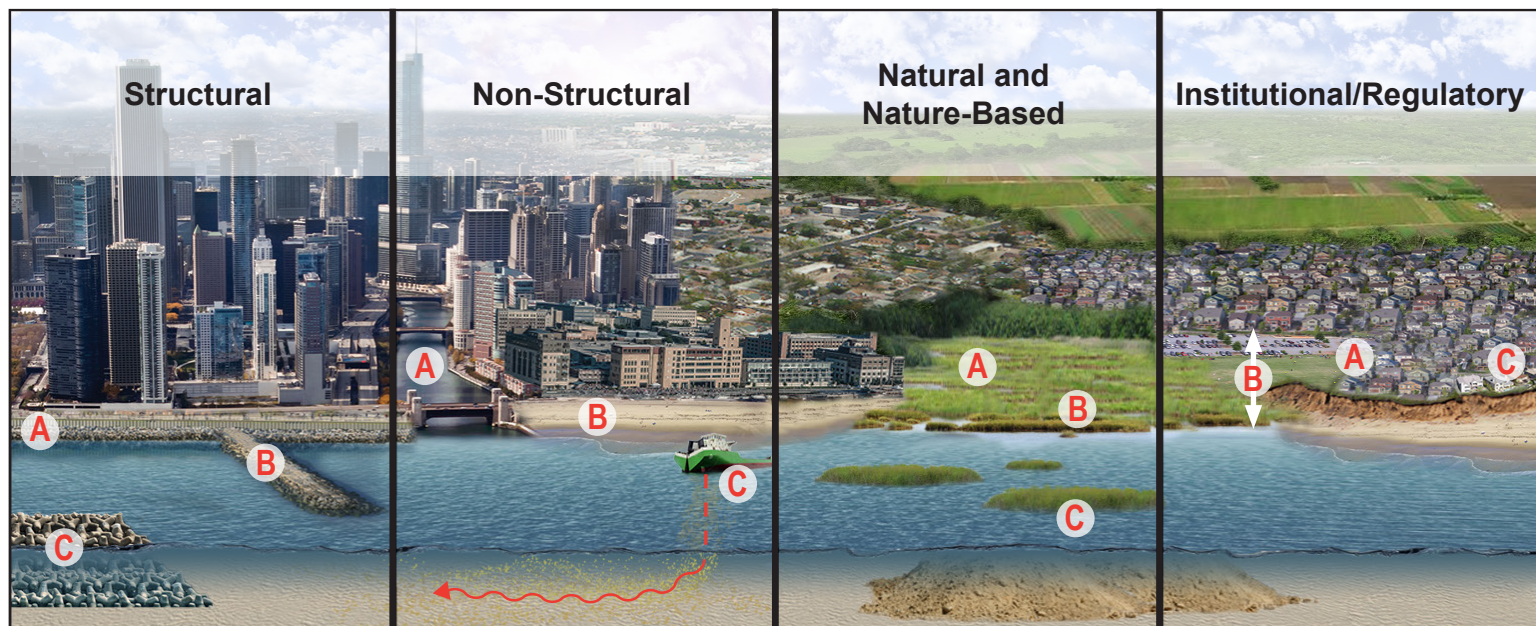


Risk Examples - Risk is additive and affects vulnerability. Coastal areas are more vulnerable when they are exposed to more risks



Recommendations

An array of structural, non-structural, natural, nature-based, institutional, and regulatory measures will be evaluated for their ability to improve coastal resilience. Based on the results of a risk-based vulnerability assessment, combinations of these measures will then be recommended to address the reach-specific needs of the Great Lakes coast.



A. Coastal Armoring
B. Groins
C. Breakwaters

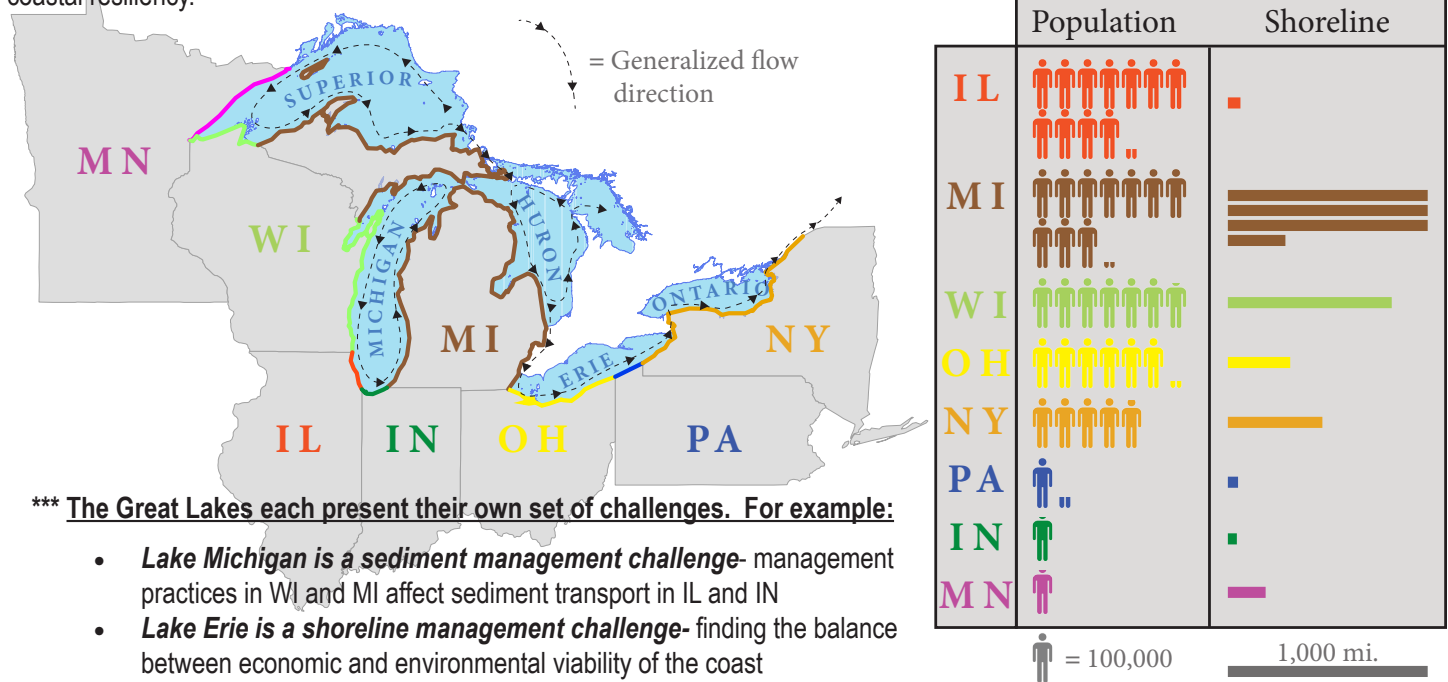
A. Dredging
B. Beach Nourishment
C. Littoral Sediment Supply

A. Conservation
B. Wetland Creation
C. Barrier Island Creation

A. Land Use Planning
B. Setbacks/Zoning
C. Resilient Design Standards

Study Area

The study area encompasses over 5,200 miles of shoreline along the five Great Lakes and their connecting channels in the states of IL, IN, MI, MN, NY, OH, PA and WI. Approximately 4.2M people live within 2 miles of these coasts. Populations, buildings, infrastructure, industries, navigation systems, cultural resources, ecosystems, coastal landscapes, and natural processes are at risk in areas with low coastal resiliency.



*** The Great Lakes each present their own set of challenges. For example:

- **Lake Michigan is a sediment management challenge**- management practices in WI and MI affect sediment transport in IL and IN
- **Lake Erie is a shoreline management challenge**- finding the balance between economic and environmental viability of the coast

What could be impacted?

- Existing shore protection infrastructure
- Transportation, power, and sewer/stormwater infrastructure
- Major population centers (Chicago, Detroit, Cleveland, Milwaukee, Buffalo, Toledo, Green Bay, Erie, Duluth)
- 60 commercial harbors moving >123M tons (USACE 2015)
- "Maritime" economy in the Great Lakes is valued at \$17.3B and includes 293,000 jobs (NOAA 2014)
- Cold-rolled steel production critical for automobile sector
- Fishing economy - Recreational (\$14.3B), Commercial (\$55.5M), and Charter (\$105M) sales/revenue supported by spending (retail, lodging) and support industries (USACE 2014)
- Recreational boating (1/3 of nation's registered boaters)
- Expansive real estate development
- Littoral sediment transport processes
- Coastal habitats (wetlands, bluffs, dunes, beaches, etc.)
- Biodiversity (natives, threatened & endangered species, etc.)

Resilience, Vulnerability, and Risk

The GLCRS will look at a range of potential future conditions that take into account climate variability, shoreline development, watershed loadings from agricultural and urban land uses, invasive species, storm damage, and other stressors affecting coastal resilience. It will then map coastal vulnerability over the project area.

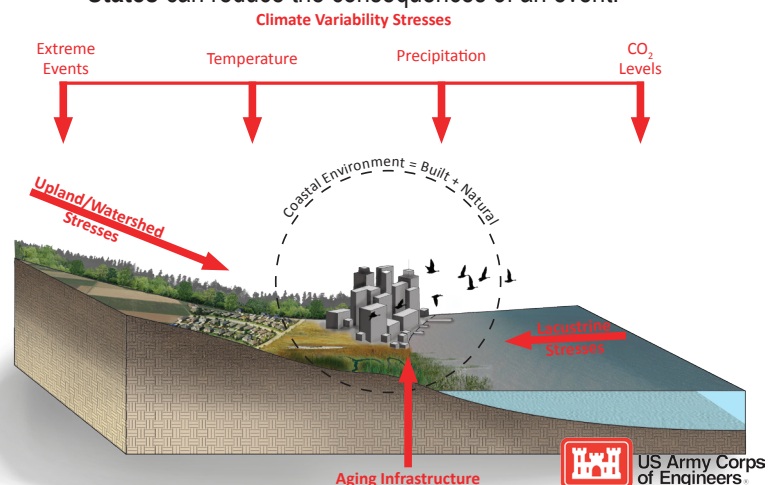
Coastal vulnerability: The *inability* of an area to withstand, recover, and adapt when exposed to a disturbance.

The GLCRS will utilize a risk-based vulnerability assessment to guide investments in coastal resiliency.

Risk-based vulnerability assessment: Using the likelihood of a disturbance and the magnitude of its potential consequence to map coastal vulnerability.

Risk = (probability of an event) X (consequences of an event)

- **Federal agencies** can manage risk and uncertainty of an event.
- **States** can reduce the consequences of an event.



The Great Lakes Coastal Resiliency Study will provide value to the nation as an infrastructure investment strategy for the Great Lakes coast. The region is committed to increasing resilience and reducing risk.