

# Advancing Nature-based Solutions in the Great Lakes



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# Nature-based Solutions

The use of existing natural areas or engineered solutions that mimic natural processes to minimize flooding, erosion, and runoff.





# LIVING SHORELINES SUPPORT RESILIENT COMMUNITIES

Living shorelines use plants or other natural elements—sometimes in combination with harder shoreline structures—to stabilize estuarine coasts, bays, and tributaries.



**One square mile** of salt marsh stores the carbon equivalent of **76,000 gal of gas** annually.



Marshes trap sediments from tidal waters, allowing them to **grow in elevation** as sea level rises.



Living shorelines improve **water quality**, provide fisheries **habitat**, increase **biodiversity**, and promote **recreation**.



Marshes and oyster reefs act as natural **barriers** to waves. **15 ft** of marsh can **absorb 50%** of incoming wave energy.



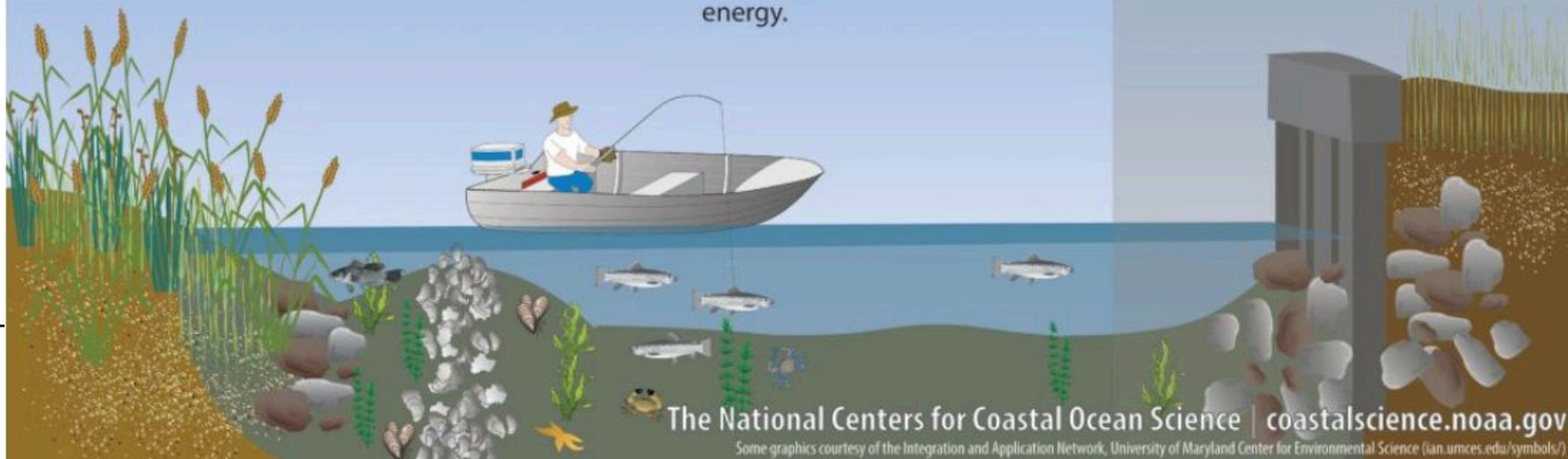
Living shorelines are **more resilient** against storms than bulkheads.

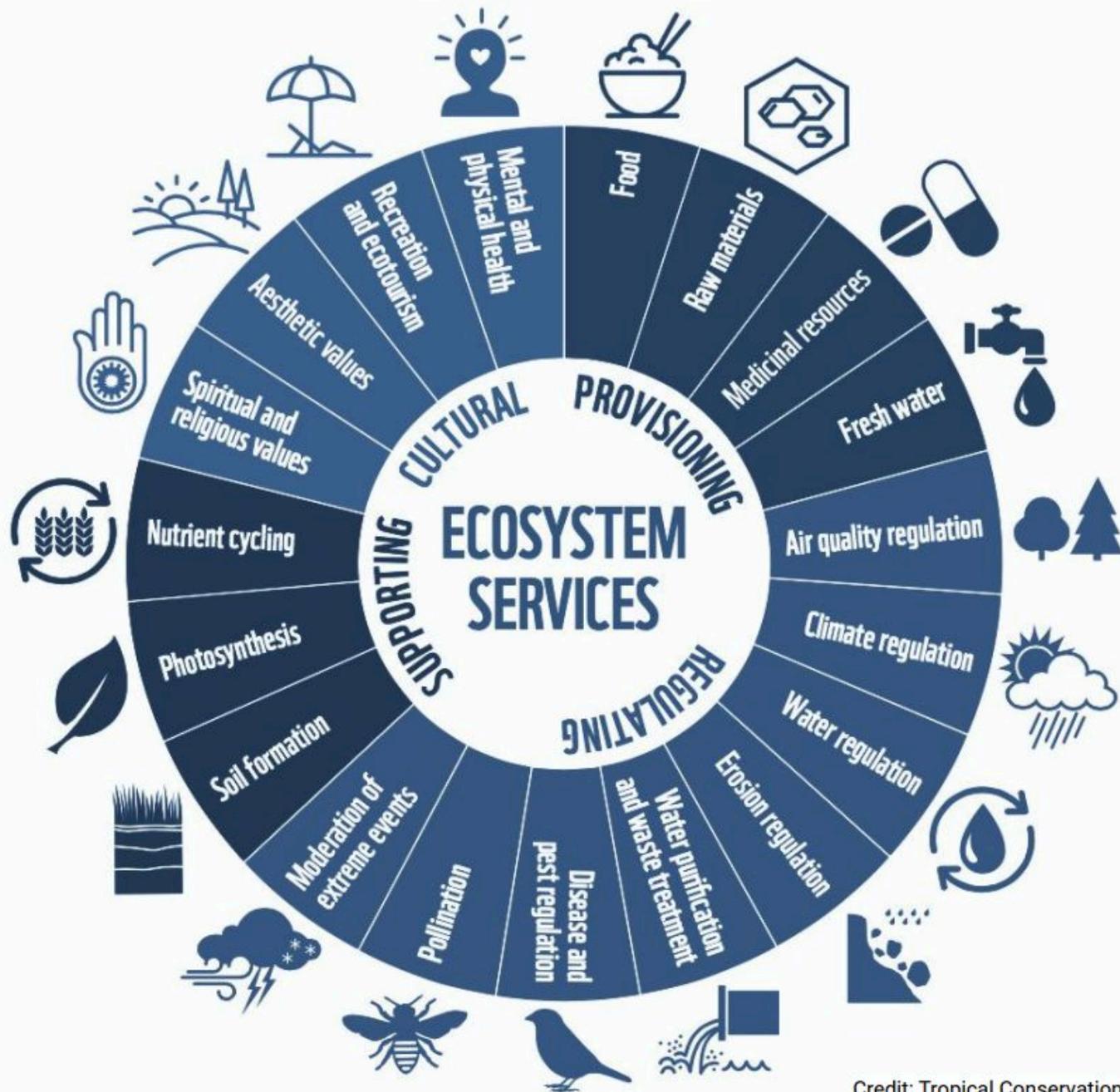


**33%** of shorelines in the U.S. will be **hardened** by **2100**, decreasing fisheries habitat and biodiversity.



Hard shoreline structures like **bulkheads** prevent natural marsh migration and may create seaward **erosion**.





Credit: Tropical Conservation Fund

# National Coastal Zone Management Program

34 State Programs



■ Participating States  
■ Nonparticipating States



# NOAA Partnerships



### LIST OF RESERVES

- Great Lakes**
- 1. Lake Superior, Wisconsin
- 2. Old Woman Creek, Ohio
- Northeast**
- 3. York, Maine
- 4. Great Bay, New Hampshire
- 5. Wiscasset Bay, Massachusetts
- 6. Narragansett Bay, Rhode Island
- Mid-Atlantic**
- 7. Hudson River, New York
- 8. Jacques Cousteau, New Jersey
- 9. Delaware
- 10. Chesapeake Bay, Maryland
- 11. Chesapeake Bay, Virginia
- Southeast**
- 12. North Carolina
- 13. North Inlet-Winyah Bay, South Carolina
- 14. ACE Basin, South Carolina
- 15. Sapelo Island, Georgia
- 16. Guana Tolomato Matanzas, Florida
- Gulf of Mexico**
- 17. Rookery Bay, Florida
- 18. Apalachicola, Florida
- 19. Weeks Bay, Alabama
- 20. Grand Bay, Mississippi
- 21. Mission-Aransas, Texas
- West**
- 22. Tijuana River, California
- 23. Elkhorn Slough, California
- 24. San Francisco Bay, California
- 25. South Slough, Oregon
- 26. Padilla Bay, Washington
- 27. Kachemak Bay, Alaska
- Pacific**
- 28. Heia, Hawaii
- Caribbean**
- 29. Jobos Bay, Puerto Rico



Office for Coastal Management





# National Coastal Resilience Fund

**Since 2018 in the Great Lakes, 16 projects have been supported with 20 NCRF grants**

## **CHEERS (in OH). Objectives:**

- Connect people and communities to Lake Erie, program spaces that meet the needs of the community
- Protect critical infrastructure and expand natural habitat areas, and
- Celebrate the legacy, history, and significance of Lake Erie



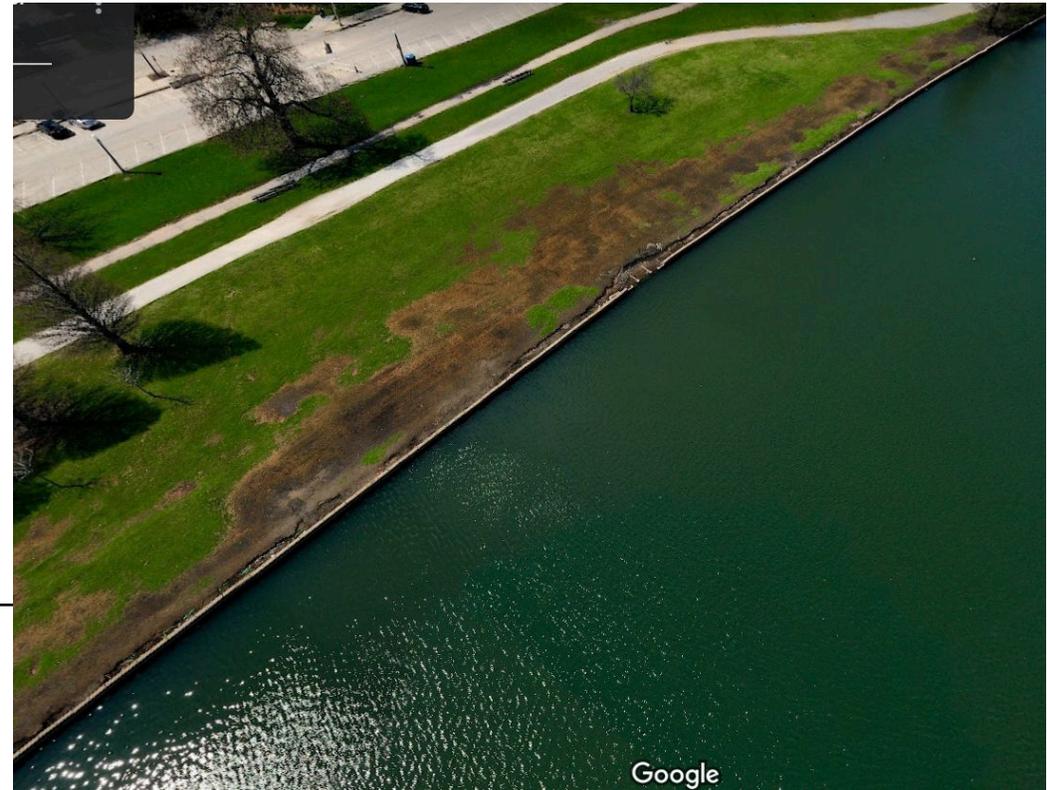
# Support for Engineering and Design

## State-prioritized projects:

- OCM partnership with the Coastal States Organization, LimnoTech/SmithGroup
- Have supported E&D for 8 projects thus far, more to come

## Municipality-prioritized projects:

- OCM partnership with the Great Lakes and St. Lawrence Cities Initiative, Dewberry/LimnoTech
- Currently supporting E&D for 2 projects, more to come



# Illinois Beach State Park - Data & Monitoring

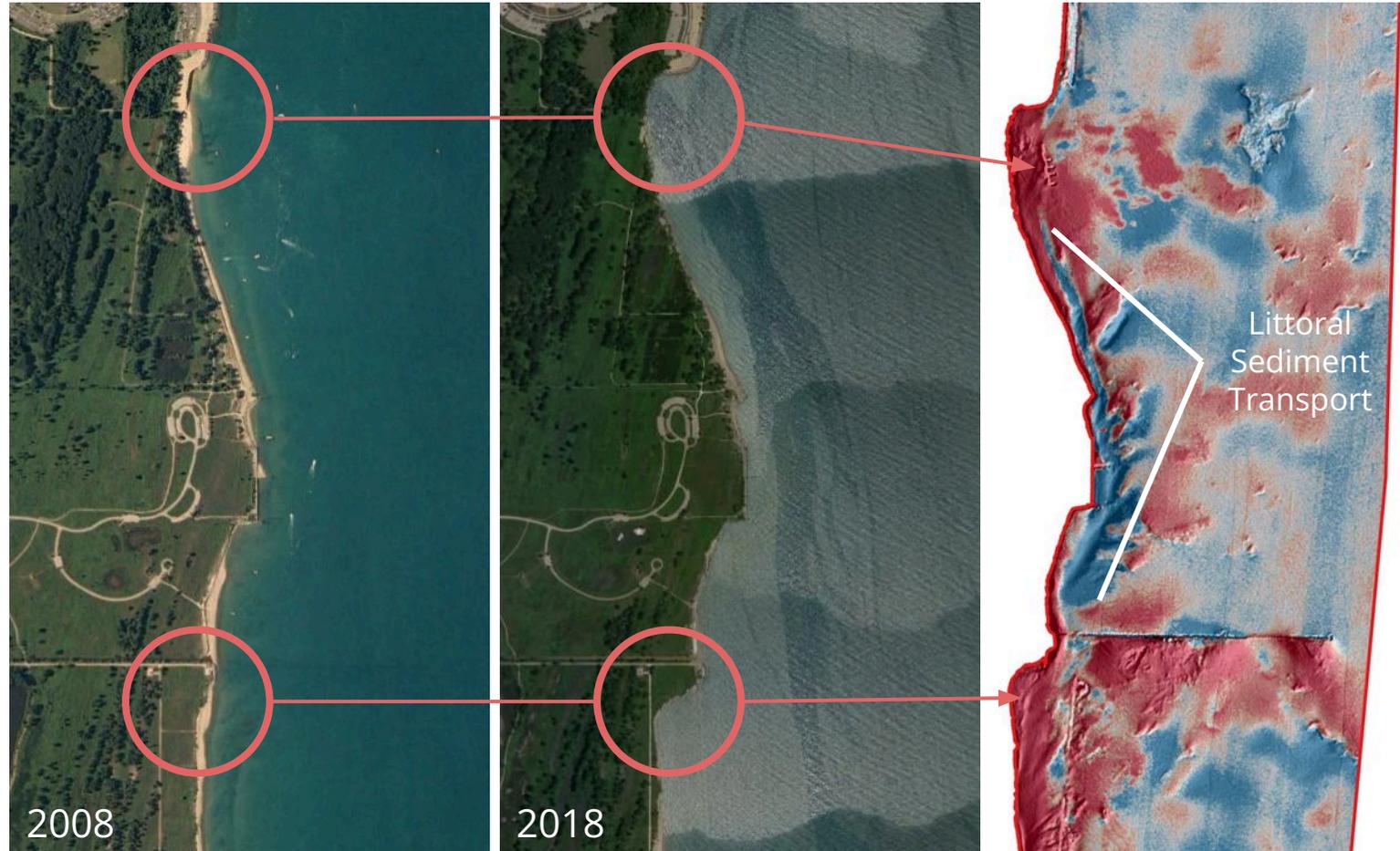
Coastal Erosion

Impact to coastal wetlands  
and habitat

Littoral sediment transport

**Red - erosion**

**Blue - deposition**



# Nature-Based Shoreline Guides



## MEASURING SUCCESS

MONITORING NATURAL AND NATURE-BASED  
SHORELINE FEATURES IN NEW YORK STATE

### FINAL REPORT

February 2020

Prepared For:



Prepared By:



With:



# Digital Coast: An Enabling Platform

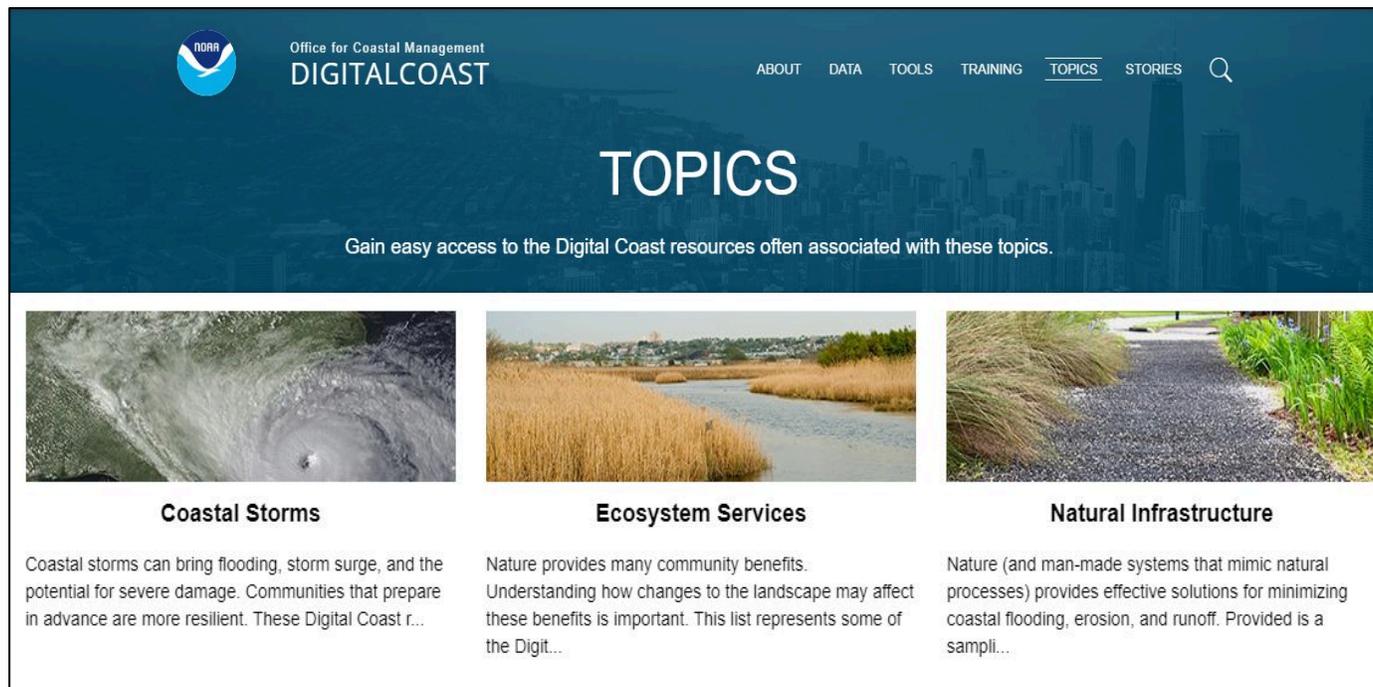
[coast.noaa.gov/digitalcoast](https://coast.noaa.gov/digitalcoast)

**Data:** 94 terabytes of imagery; over 16 trillion lidar data points

**Tools:** Over 80 decision-support and visualization tools

**Training:** Over 170 instructor-led trainings, case studies, publications, quick references, videos, and webinars

**Technical Assistance:** HQ and regional staff



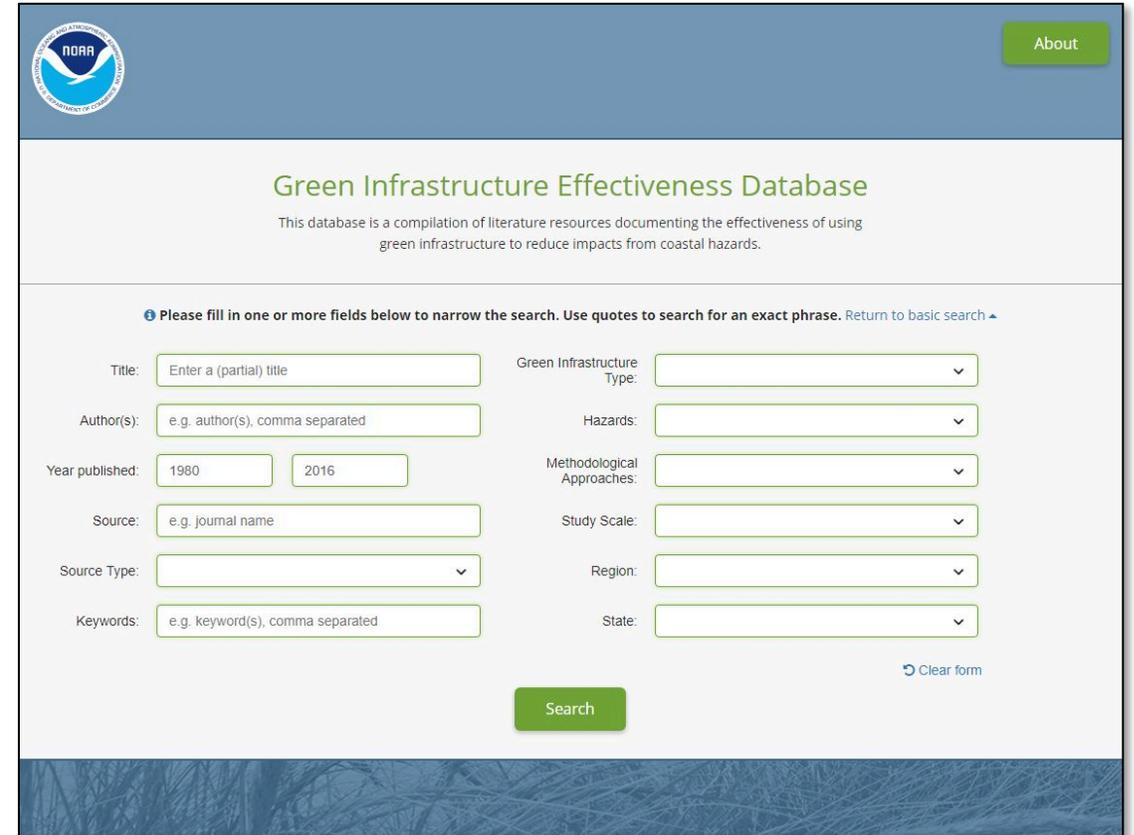
The screenshot shows the Digital Coast website interface. At the top left is the NOAA logo and the text 'Office for Coastal Management DIGITALCOAST'. A navigation menu includes 'ABOUT', 'DATA', 'TOOLS', 'TRAINING', 'TOPICS' (which is highlighted), and 'STORIES', followed by a search icon. The main heading is 'TOPICS' in large white letters. Below it is a sub-heading: 'Gain easy access to the Digital Coast resources often associated with these topics.' The page features three topic cards:

- Coastal Storms:** Accompanied by a satellite-style image of a storm. The text below reads: 'Coastal storms can bring flooding, storm surge, and the potential for severe damage. Communities that prepare in advance are more resilient. These Digital Coast r...'
- Ecosystem Services:** Accompanied by a photograph of a wetland with tall grasses and water. The text below reads: 'Nature provides many community benefits. Understanding how changes to the landscape may affect these benefits is important. This list represents some of the Digitit...'
- Natural Infrastructure:** Accompanied by a photograph of a gravel path through a natural area with grasses. The text below reads: 'Nature (and man-made systems that mimic natural processes) provides effective solutions for minimizing coastal flooding, erosion, and runoff. Provided is a sampli...'

# Green Infrastructure Effectiveness Database

The database has **over 300 literature sources**. Users can search by:

- 32 green infrastructure types
- Author
- Year
- Geography (i.e., region, state)
- Scale (e.g., site, watershed)
- Hazard of interest
- ... and more



The screenshot shows the search interface for the Green Infrastructure Effectiveness Database. At the top left is the NOAA logo. In the top right corner, there is a green button labeled "About". The main heading is "Green Infrastructure Effectiveness Database" in green text, followed by a subtitle: "This database is a compilation of literature resources documenting the effectiveness of using green infrastructure to reduce impacts from coastal hazards." Below this is a search instruction: "Please fill in one or more fields below to narrow the search. Use quotes to search for an exact phrase. Return to basic search ▶". The search form consists of several fields: "Title" (text input), "Author(s)" (text input), "Year published" (two checkboxes for 1980 and 2016), "Source" (text input), "Source Type" (dropdown menu), "Keywords" (text input), "Green Infrastructure Type" (dropdown menu), "Hazards" (dropdown menu), "Methodological Approaches" (dropdown menu), "Study Scale" (dropdown menu), "Region" (dropdown menu), and "State" (dropdown menu). A green "Search" button is located at the bottom center, and a "Clear form" link is at the bottom right.

[coast.noaa.gov/digitalcoast/training/gi-database.html](https://coast.noaa.gov/digitalcoast/training/gi-database.html)

Marshes with and without sills protect estuarine shorelines from erosion better than bulkheads during a Category 1 hurricane

Rachel K. Gittman <sup>a,\*</sup>, Alyssa M. Popowich <sup>a,1</sup>, John F. Bruno <sup>b</sup>, Charles H. Peterson <sup>a,b</sup>

**The Effectiveness, Costs and Coastal Protection Benefits of Natural and Nature-Based Defences**

Siddharth Narayan , Michael W. Beck, Borja G. Reguero, Iñigo J. Losada, Bregje van Wesenbeeck, Nigel Pontee, James N. Sanchirico, Jane Carter Ingram, Glenn-Marie Lange, Kelly A. Burks-Copes

Economic valuation of suspended sediment and phosphorus filtration services by four different wetland types: A preliminary assessment for southern Ontario, Canada

Tariq Aziz , Philippe Van Cappellen

**Muskegon Lake Area of Concern Habitat Restoration Project:  
Socio-Economic Assessment Revisited**

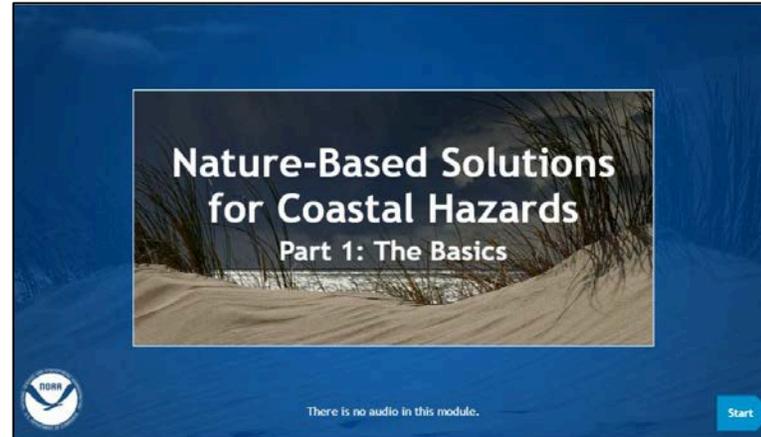
Measuring the economic benefits of Saginaw Bay coastal marsh with revealed and stated preference methods

John C. Whitehead <sup>a,\*</sup>, Peter A. Groothuis <sup>a,1</sup>, Rob Southwick <sup>b,2</sup>, Pat Foster-Turley <sup>b</sup>

# Nature-Based Solutions for Coastal Hazards Training

## Course Topics:

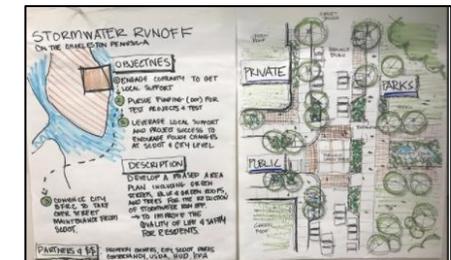
- Coastal hazards
- Nature-based infrastructure practices, benefits, co-benefits
- Design, maintenance, costs
- Planning, funding, partners



## Part 1: The Basics (Online)



## Part 2: Developing a Strategy (In-person\*)



# Lingering needs or concerns

- More information
- Project examples/case studies
- Help with funding
- Data
- Avenues for collaboration/networking
- Concerns about regulatory hurdles



Thank you!  
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[coast.noaa.gov](http://coast.noaa.gov)