Coastal Storms and Erosion: Managing for an Uncertain Future

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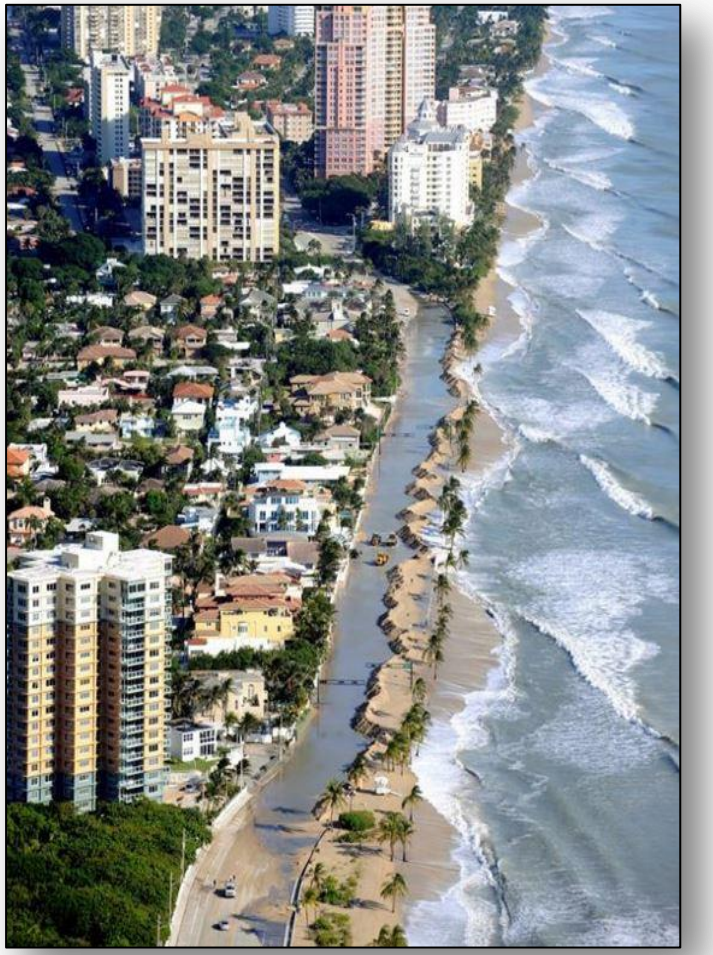
National Oceanic and Atmospheric Administration
Office for Coastal Management

American Geosciences Institute – Critical Issues Webinar

Planning for Coastal Storm & Erosion Hazards

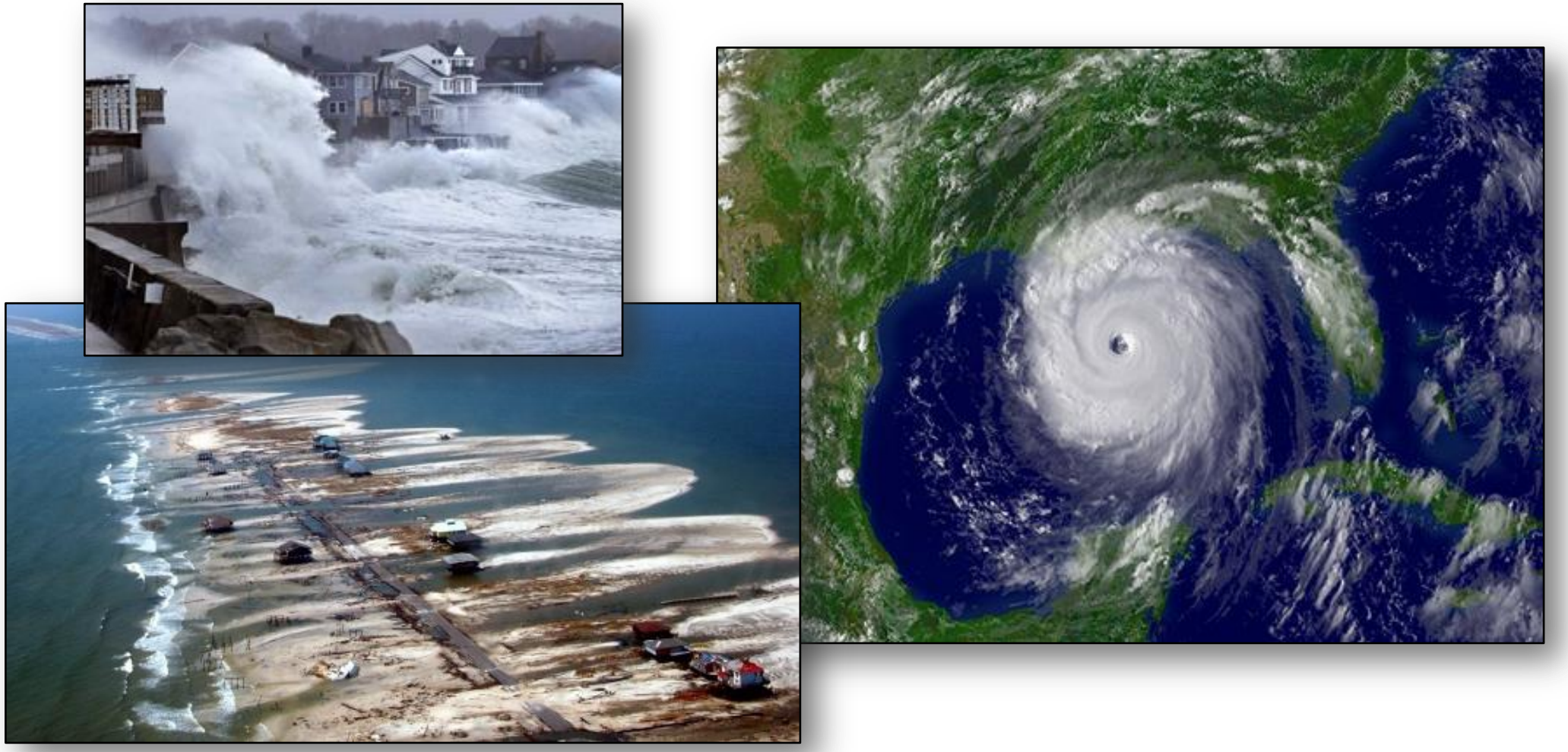
July 6, 2017



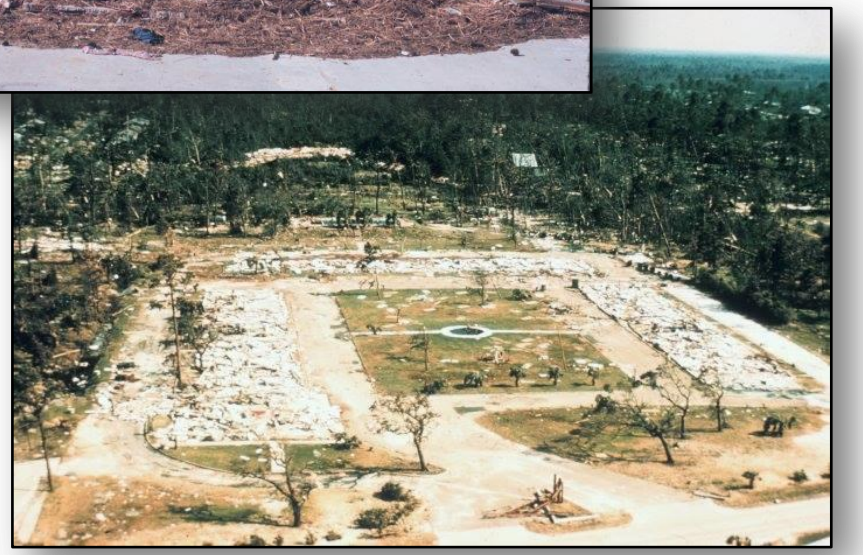
Presentation Roadmap

- Coastal storm and erosion impacts
- Past is not prologue
- Geoscience and risk management: a (mostly) happy marriage
- “You can do it. We can help.”

Mother Nature Always Bats Last



The More Things Change…



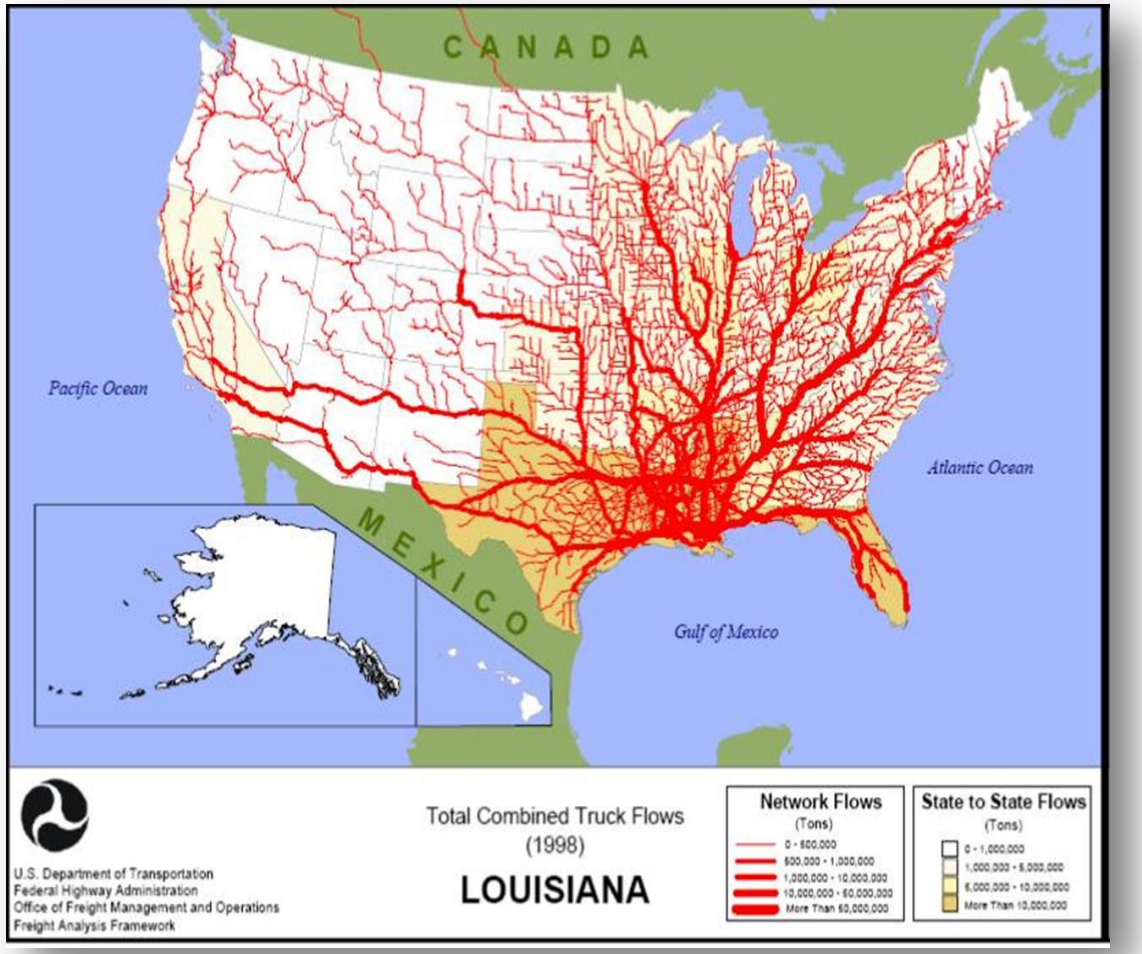
Camille
1969

Katrina
2005

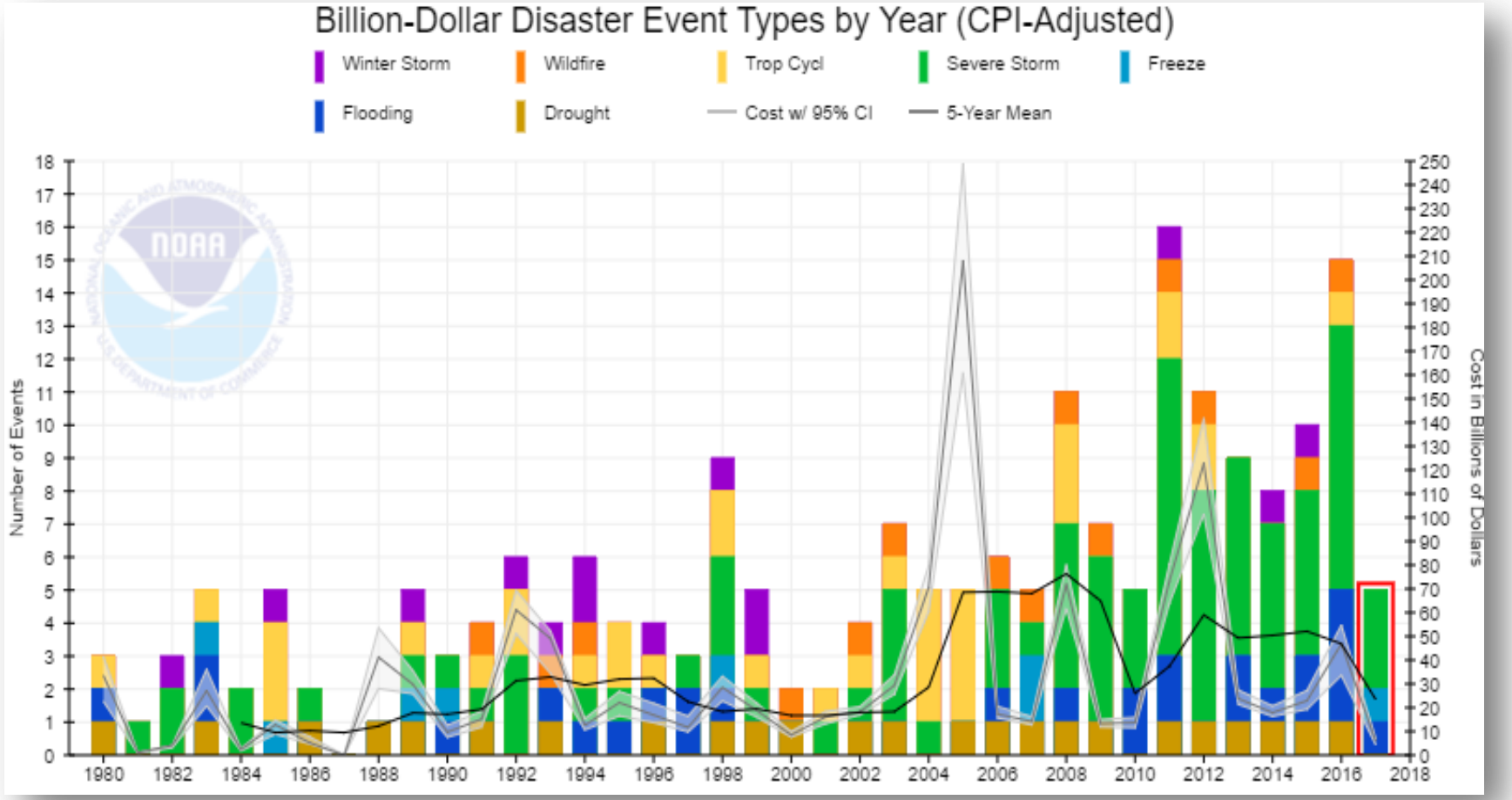
Coastal Storms are a National Concern

Coastal counties:

- **<10% landmass**
- **40% of U.S. population**
- **$7.9T goods and services**
- **$4.6T economic value of coastal ports**

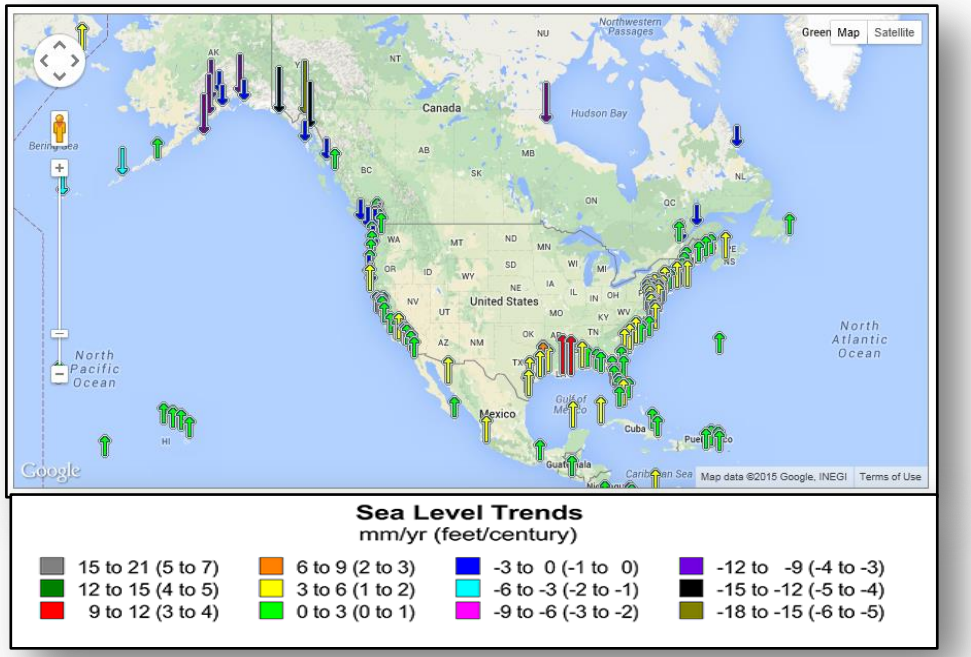


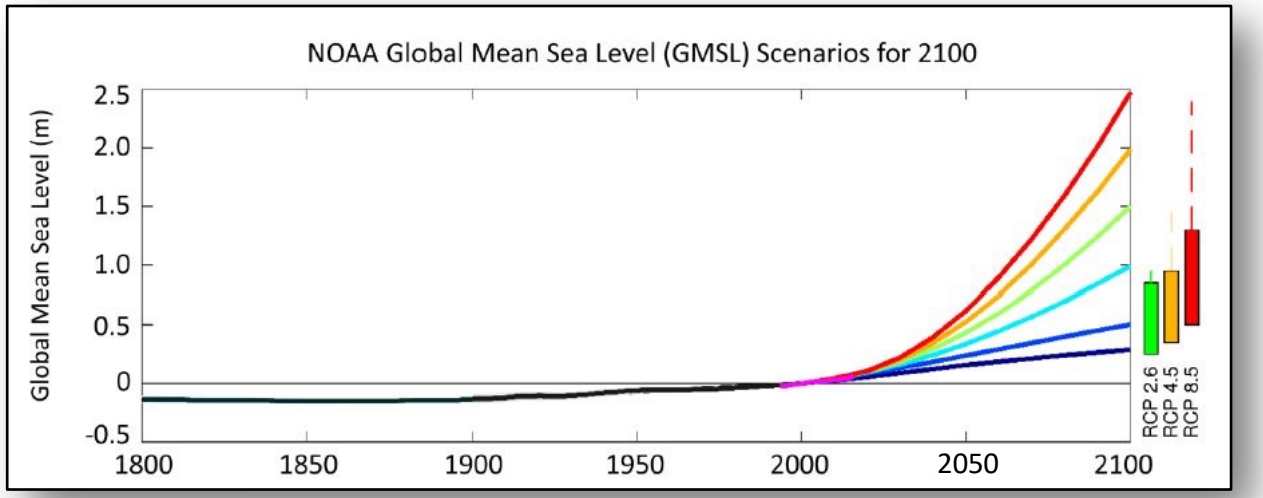
Billion Dollar Weather and Climate Disasters

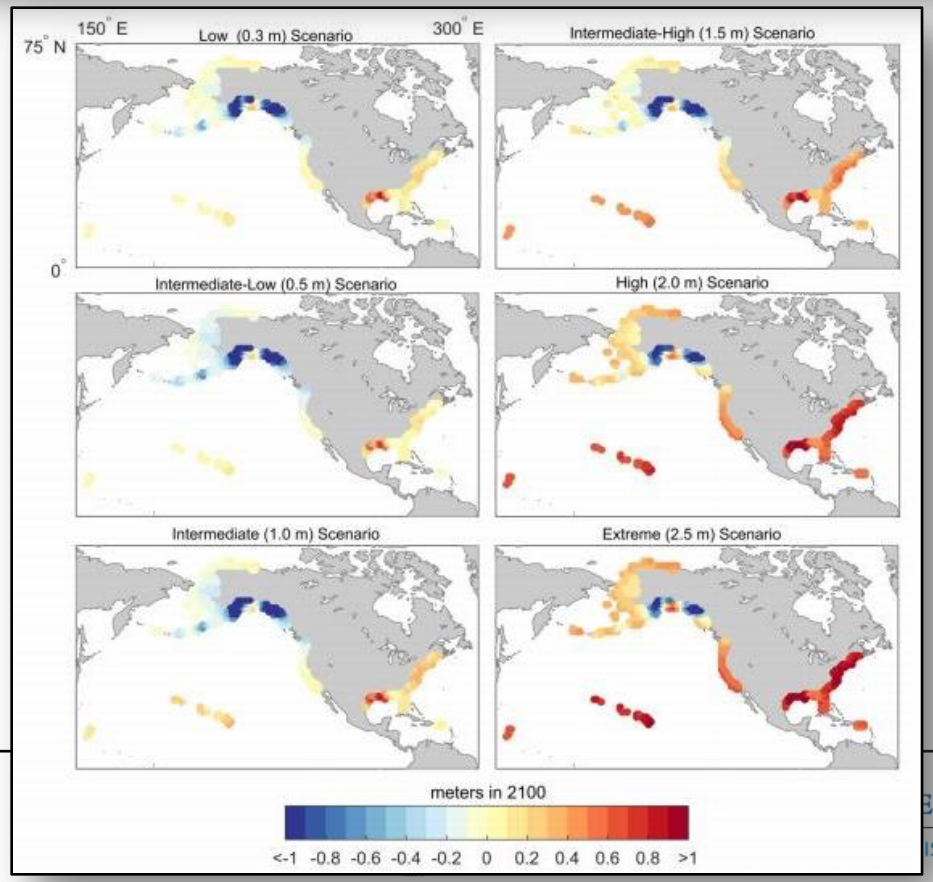


- 2005: Dennis, Katrina, Rita, Wilma ($206.3B)
- 2008: Dolly, Gustav, Ike ($42.1B)
- 2011: Irene, T.S. Lee ($17.3B)
- 2012: Isaac, Sandy ($71.8B)
- 2016: Matthew ($10.1B)

Past is Not Prologue





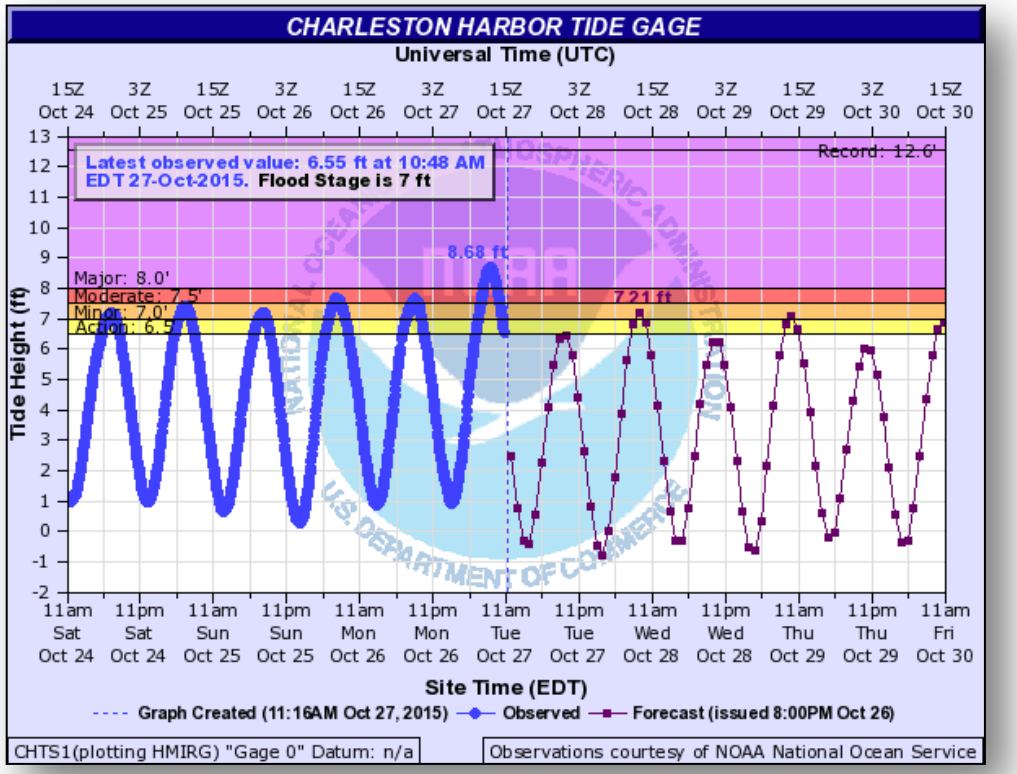


- Past sea level change has not been uniform, nor will future changes.
- Decision makers must manage *with* and *for* uncertainty.

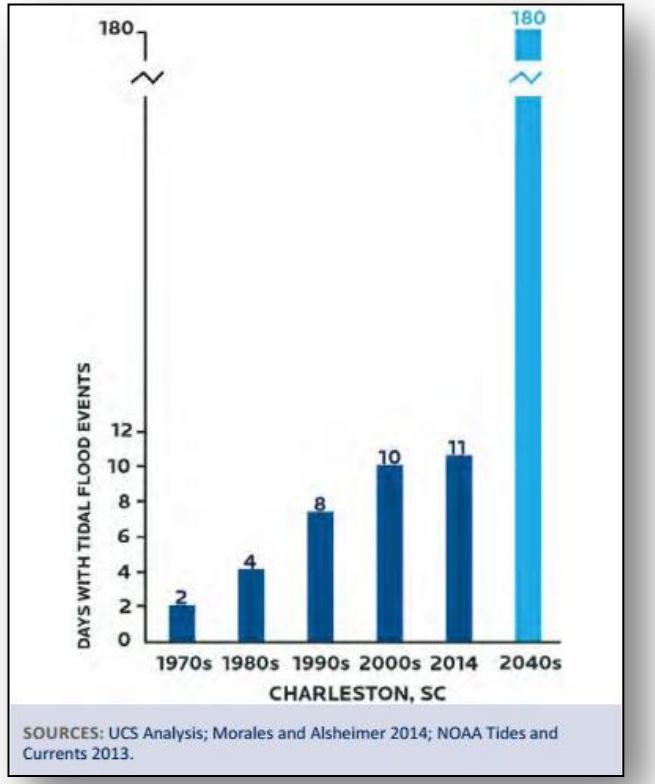
tidesandcurrents.noaa.gov/sltrends
www.globalchange.gov/nca4

Past is Not Prologue – Redefining "Coastal Flood"

- Nuisance flooding / "King Tides" increasing
- Most infrastructure design, planning, and risk management activities are focused on rare but extreme events, not chronic flooding

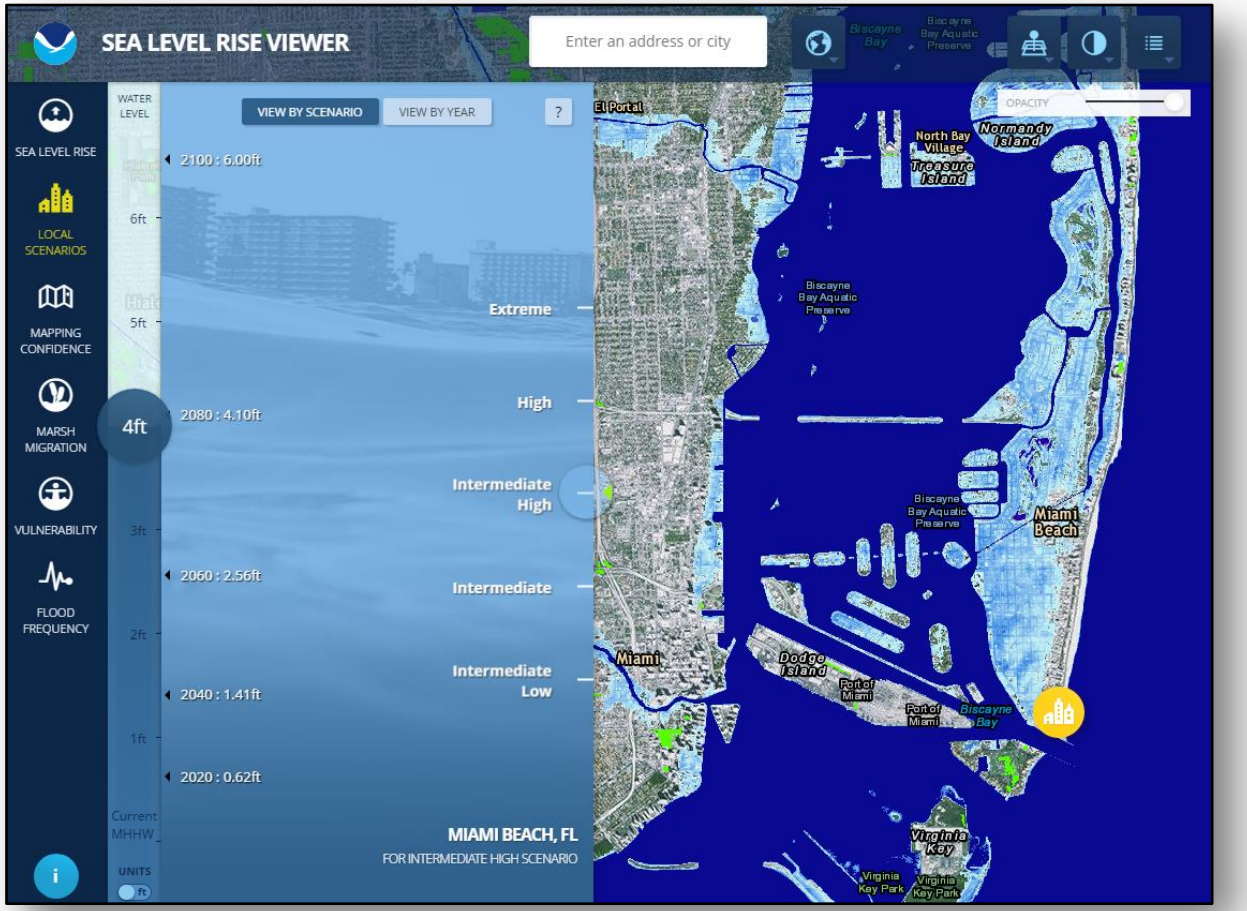


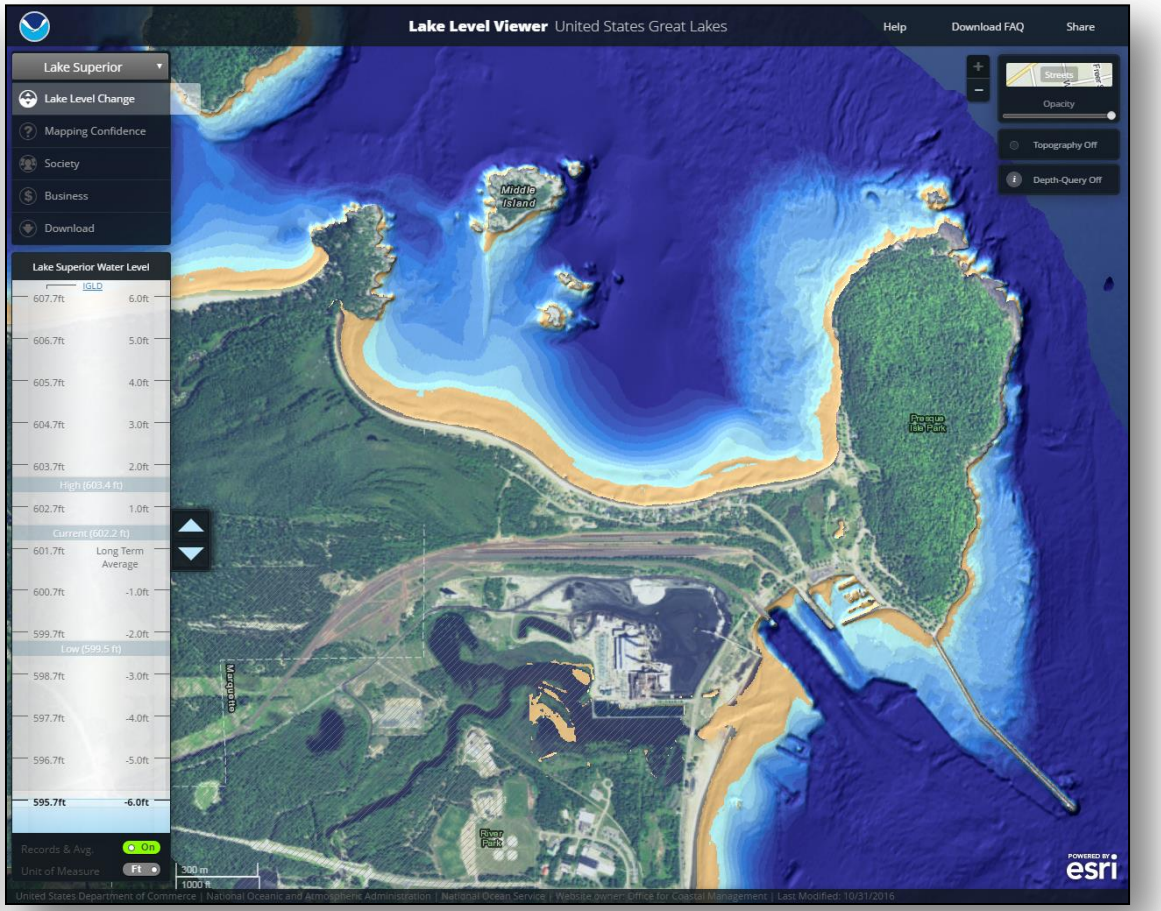
"Today's flood is tomorrow's high tide."



Past is Not Prologue

Visualizing rising sea levels… and rising and falling Great Lakes water levels





coast.noaa.gov/slr/
coast.noaa.gov/llv/

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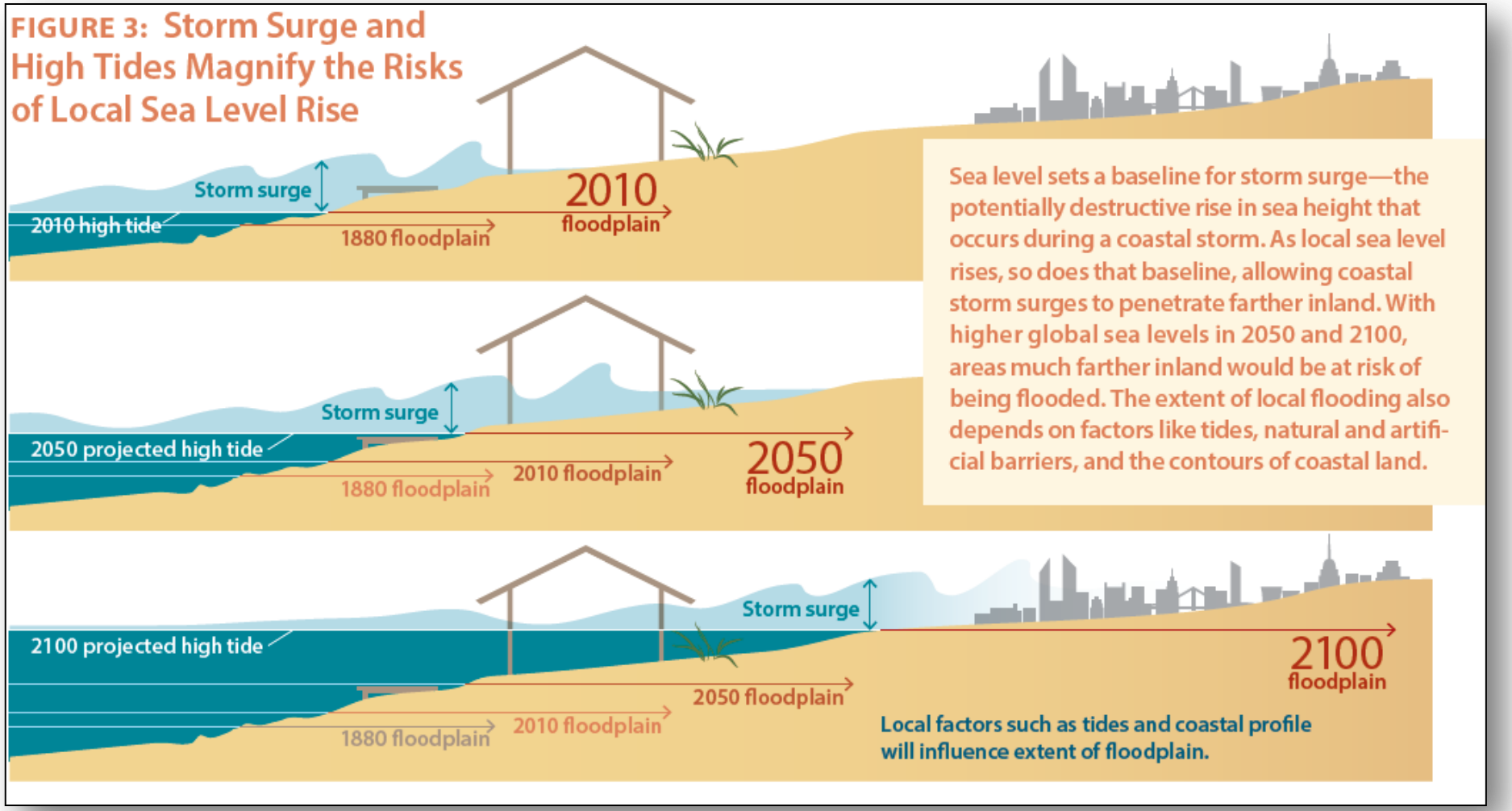
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Past is Not Prologue – Worsening Coastal Storms



Harnessing Science in Managing Coastal Risks

"Fair Weather" and Pre-Storm Opportunities

- Awareness building/risk communication
- Policy (at many levels)
- Planning (in its many flavors)
- Ordinances
- Permitting
- Resource management/restoration
- Pre-event data gathering, installing instrumentation, forecasts, and advisories

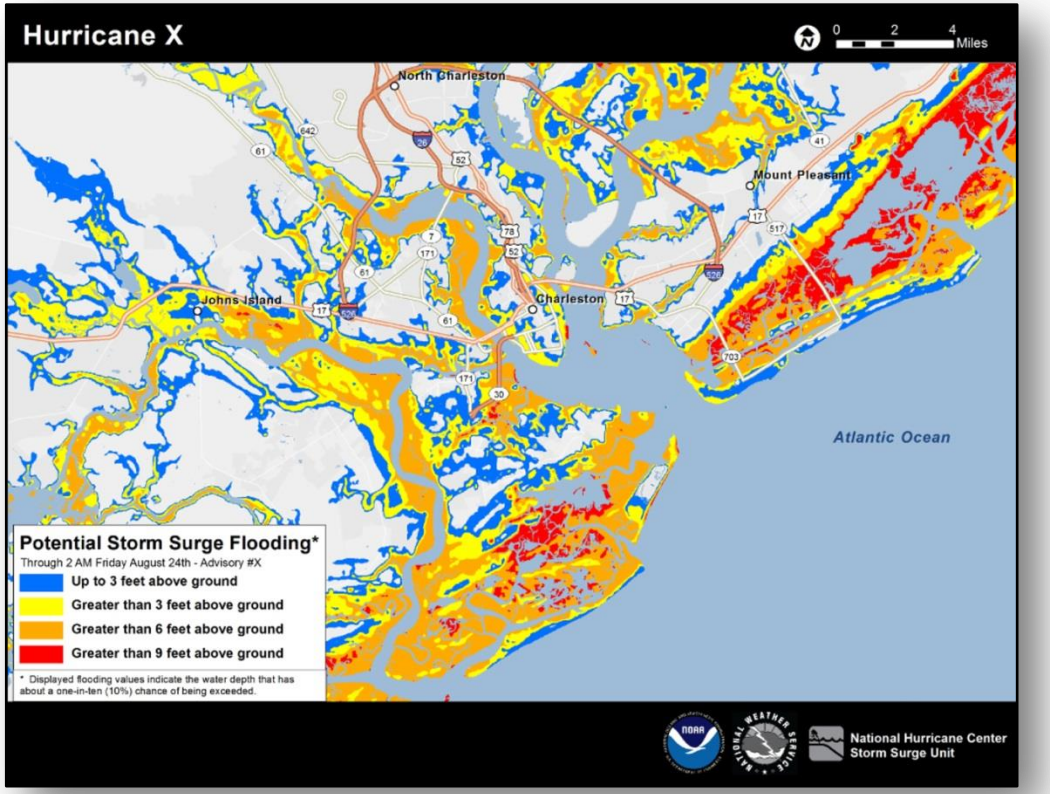
Mitigation and Pre-Event Preparedness

- Hazard Mitigation (State and Local)
- Pre-Disaster Recovery
- Post-Disaster Recovery
- Capital Improvements
- Land Use
- Climate Adaptation

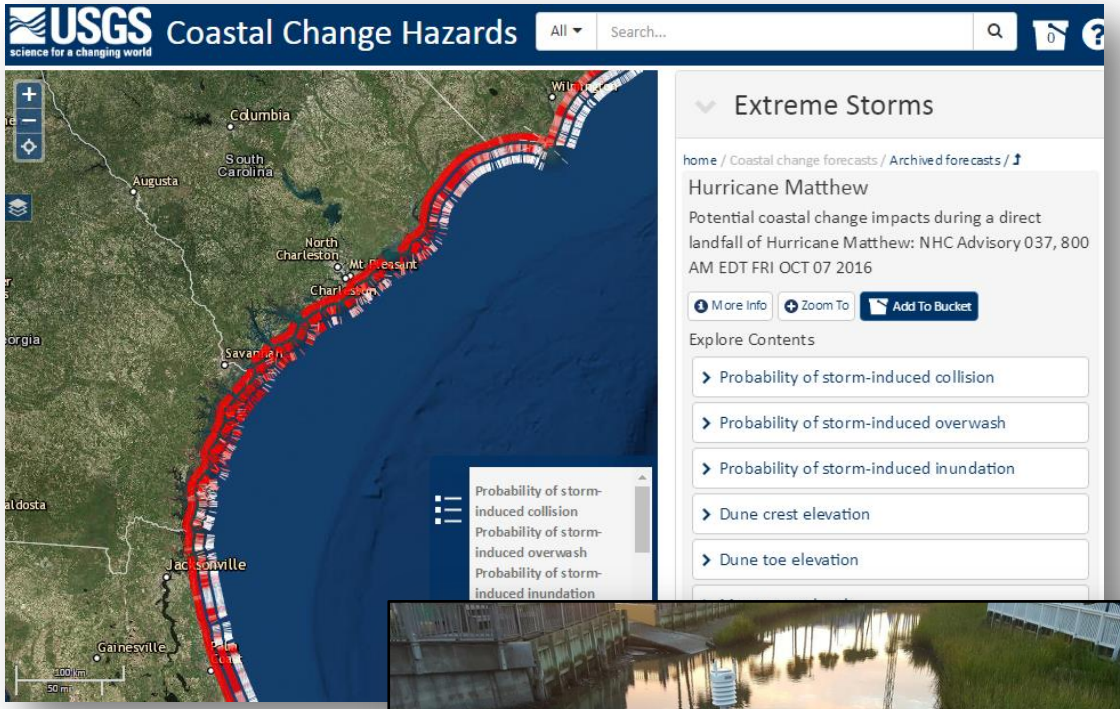
…and many more!

Mitigation and Pre-Event Preparedness

NOAA/National Weather Service Potential Storm Surge Flooding Map



USGS Coastal Change Forecasts and Storm Surge Sensor Deployment



www.nhc.noaa.gov/surge/inundation
marine.usgs.gov/coastalchangehazardsportal

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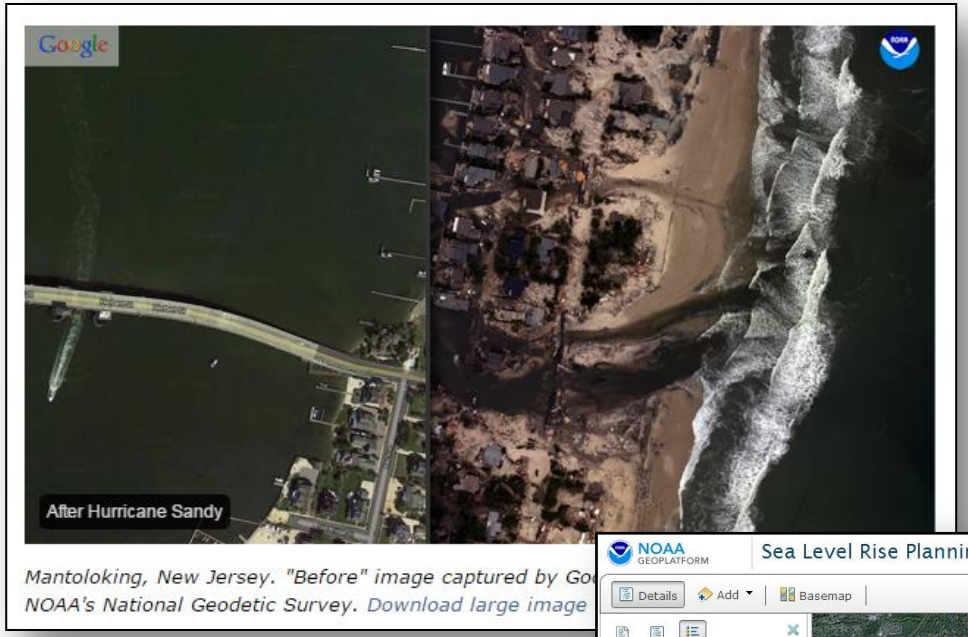
Harnessing Science in Managing Coastal Risks

After the Storm

- Storm observations and impact assessments – guiding response operations and short-term recovery
- New hazard analyses and risk assessments
- Post-disaster redevelopment planning
- Restoration project design
- Long-term monitoring

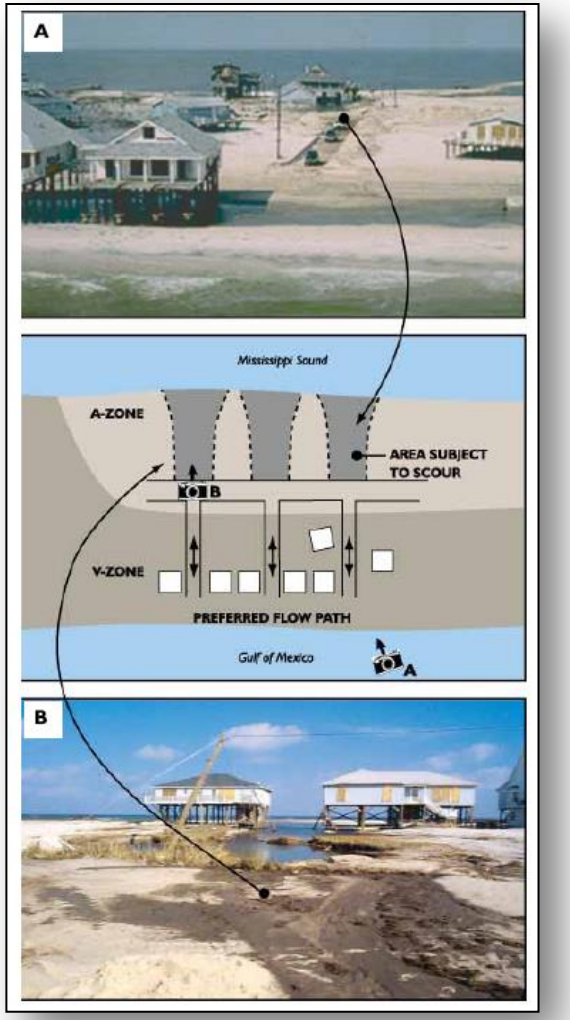
Post-Disaster Observations and Recovery Support



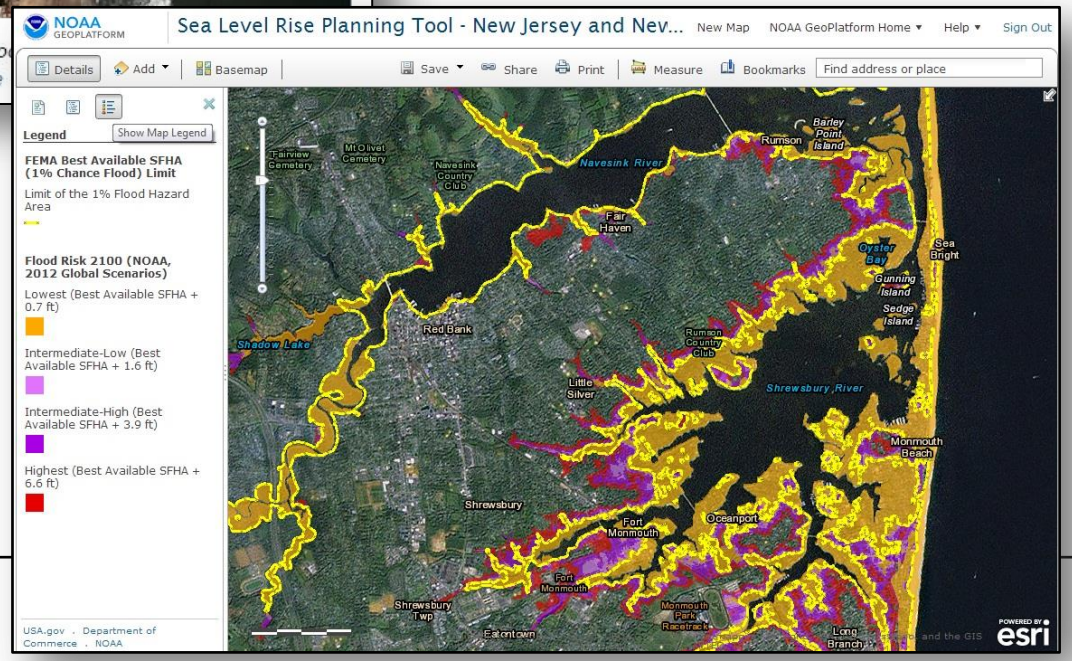
Mantoloking, New Jersey. "Before" image captured by Go
NOAA's National Geodetic Survey. Download large image

NOAA/National Geodetic Survey Pre-/Post-Event Imagery

FEMA Damage and Building Performance Assessments and Recovery Advisories

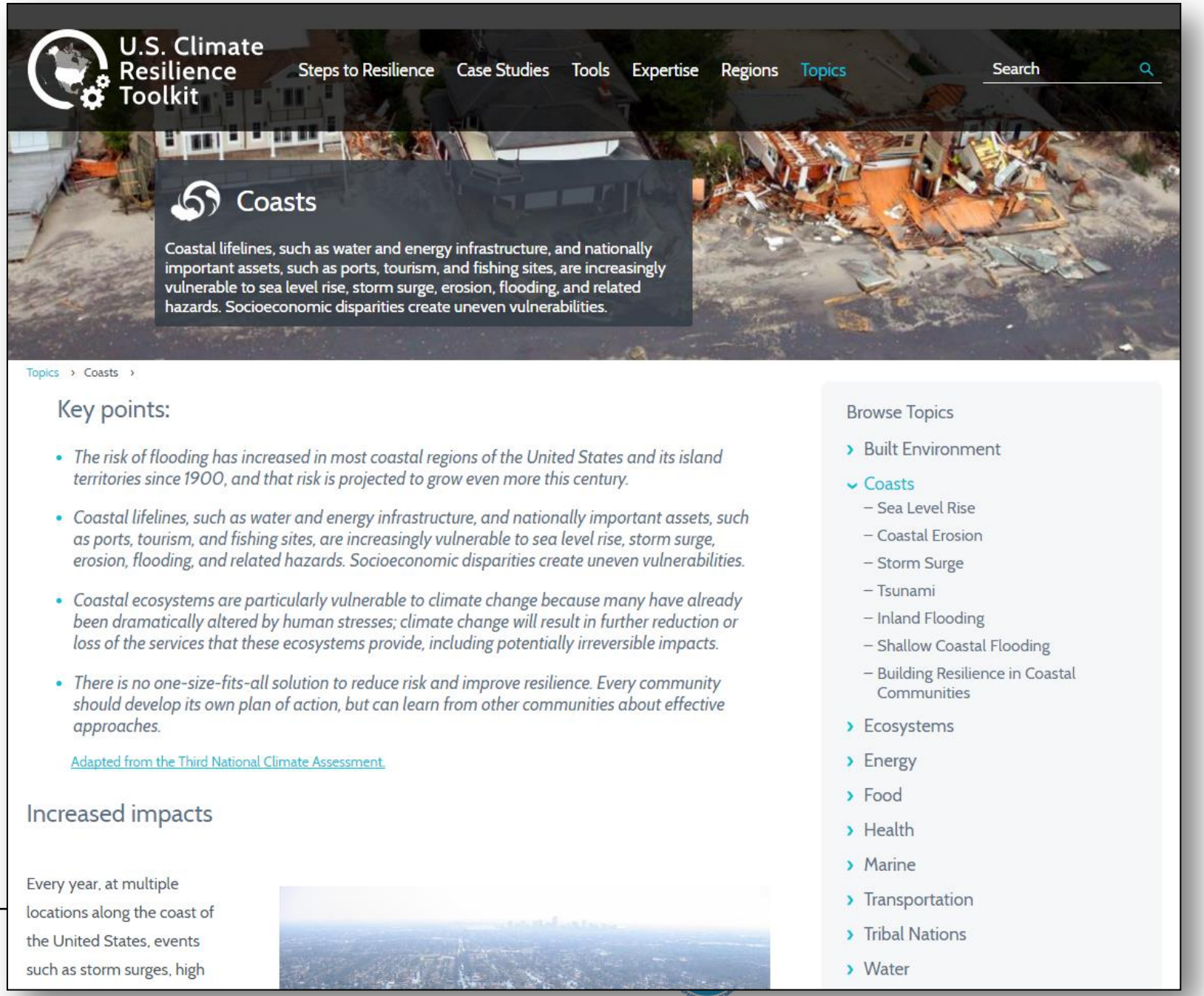


Interagency Post-Sandy Floodplain Mapping, with Regional Sea Level Rise Projections




LOST
CONFUSED
UNSURE
UNCLEAR
PERPLEXED
DISORIENTED
BEWILDERED

Bringing Together the Right Tools for the Job



toolkit.climate.gov

U.S. Climate Resilience Toolkit

Get Started | Taking Action | Tools | Topics | Expertise

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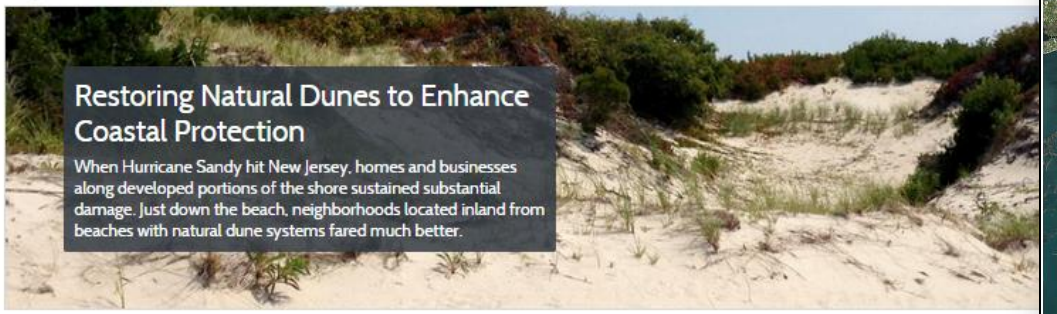
Taking Action › Restoring Natural Dunes to Enhance Coastal Protection ›



Restoring Natural Dunes to Enhance Coastal Protection

When Hurricane Sandy hit New Jersey, homes and businesses along developed portions of the shore sustained substantial damage. Just down the beach, neighborhoods located inland from beaches with natural dune systems fared much better.

Shifting sands

Barrier islands in New Jersey are like a ribbon of sand along the coast. The linear islands originally formed as ocean waves and currents pushed sediments from the ocean floor into beaches and dunes after the last ice age. Over the centuries, undisturbed dunes migrated back and forth across their beaches, moving inland or beachward as prevailing winds removed sand from one side of the dune and deposited it on the other.

Stressors and impacts

As homes and businesses crowded New Jersey's shore in the early- to mid-20th century, development encroached on the back (inland) side of natural dune systems, narrowing the width of beaches and reducing the area that could supply sand to either side of the dunes. Roads and other structures effectively pinned down the formerly dynamic system. Over the years, the height and protective abilities of the dunes diminished.

As glaciers melt and warming seawater expands, rising sea levels increase the risk of flooding along all coasts, especially during storms. When Hurricane Sandy hit New Jersey's beach in October 2012, neighborhoods that sit inland of developed beaches received the full brunt of the storm's waves and storm surge. In other areas, where natural beach dunes were still in place, damage was less pervasive.

Related Video: Dune Migration and Shoreline Protection

Natural dune systems = natural (green) infrastructure

Some shore communities are now recognizing the benefits of preserving or

Steps to Resilience:

- Step 1: Identify the Problem
- Step 2: Determine Vulnerabilities
- Step 3: Investigate Options
- Step 4: Evaluate Risks & Costs
- Step 5: Take Action

Tools:

Sea Level Rise Tool for Sandy Recovery ›

Coastal Change Hazards Portal ›

Topic:

Coastal Flood Risk › Coastal Erosion ›

Ecosystem Vulnerability › Biodiversity Conservation ›

Additional Resources:

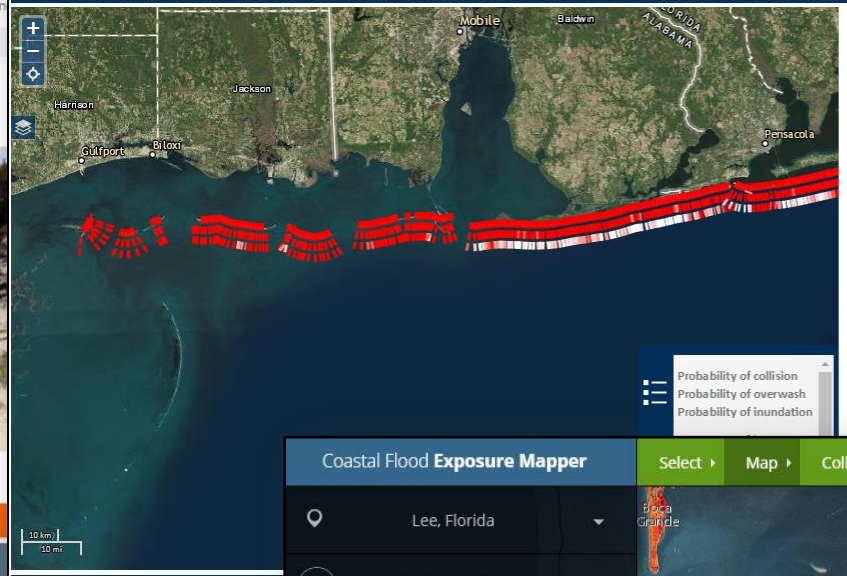
Climate.gov | Beachfront Q&A: Talking about dunes, development, storms, and sea level rise ›

The Nature Conservancy: Reducing Climate Risks with Natural Infrastructure ›

Coastal Dune Protection & Restoration: Using "Cape" American Beachgrass & Fencing ›

USGS science for a changing world — Coastal Change Hazards Portal

All | Search...



Extreme Storms

home / Coastal change forecasts / Hurricane scenarios /

Category 2

The probabilities of collision (dune erosion), overwash, and inundation for sandy beaches along the Gulf and Atlantic coasts during a generalized category 2 hurricane landfall.

More Info | Zoom To | Add To Bucket

Explore Contents

- Probability of collision
- Probability of overwash
- Probability of inundation
- Water levels

Coastal Flood **Exposure Mapper**

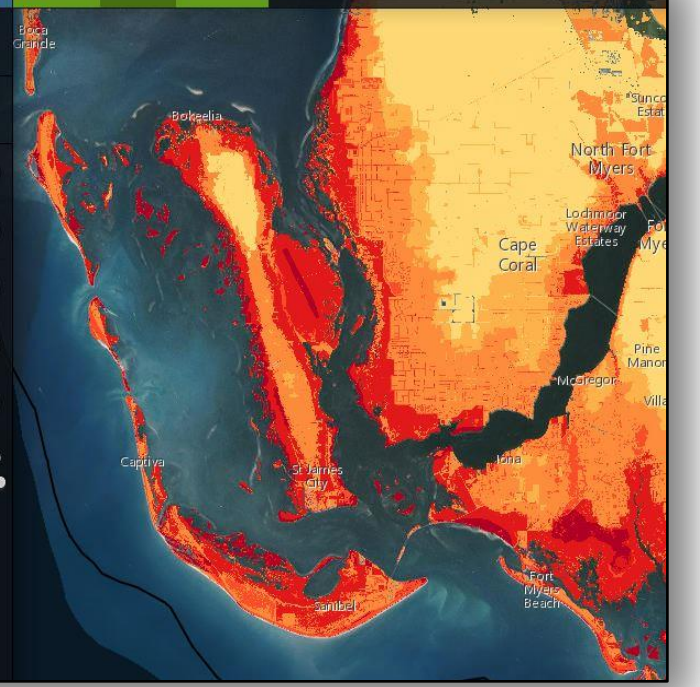
Select | Map | Collect | Tips | Resources | Case Studies | FAQ

Lee, Florida

Flood Hazards Map

- Coastal Flood Hazard Composite
- Shallow Coastal Flooding
- FEMA Flood Zones
- Storm Surge
- Sea Level Rise

Layers Opacity 100%



toolkit.climate.gov

coast.noaa.gov/floodexposure

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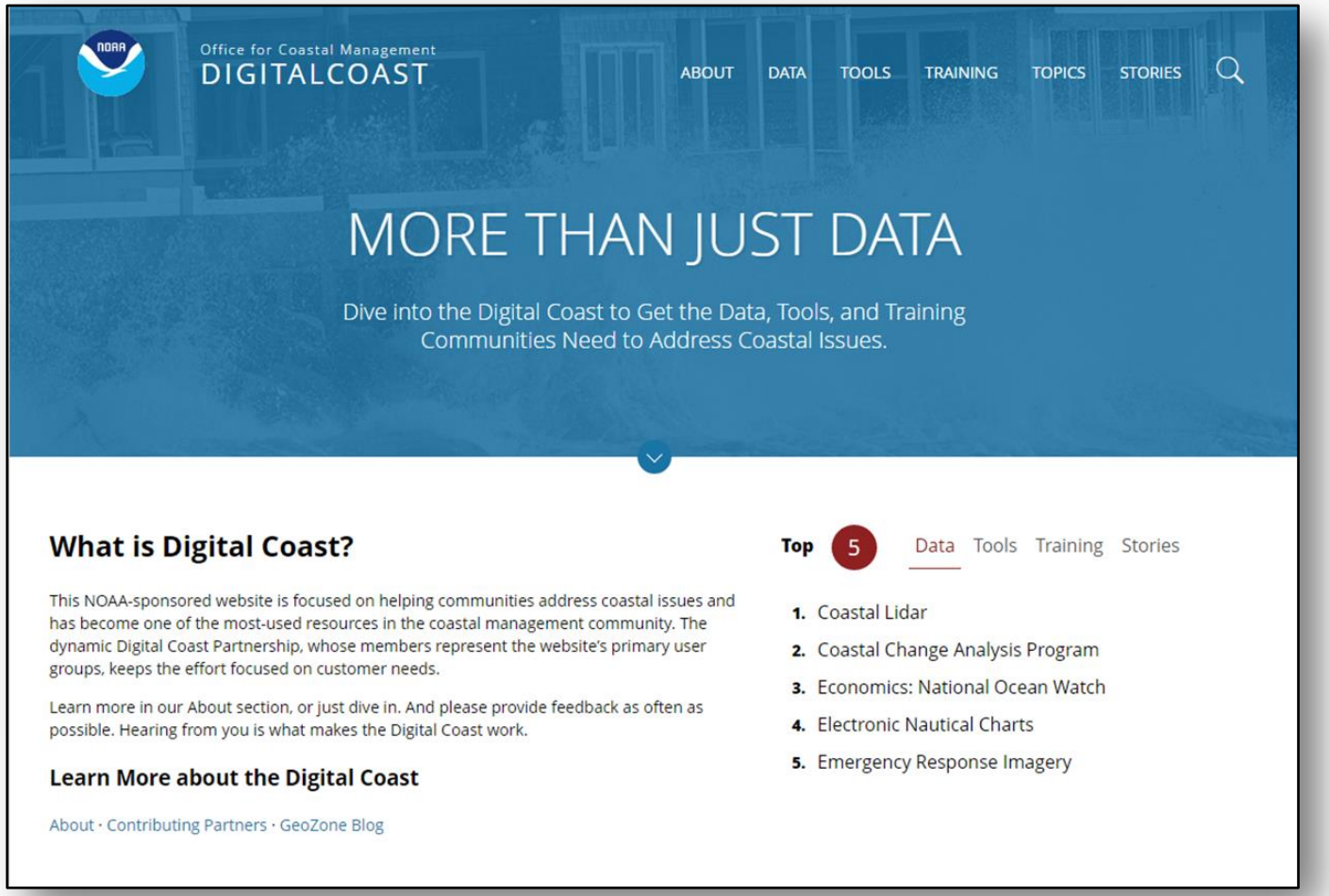
NOAA Digital Coast – Partnership and Website

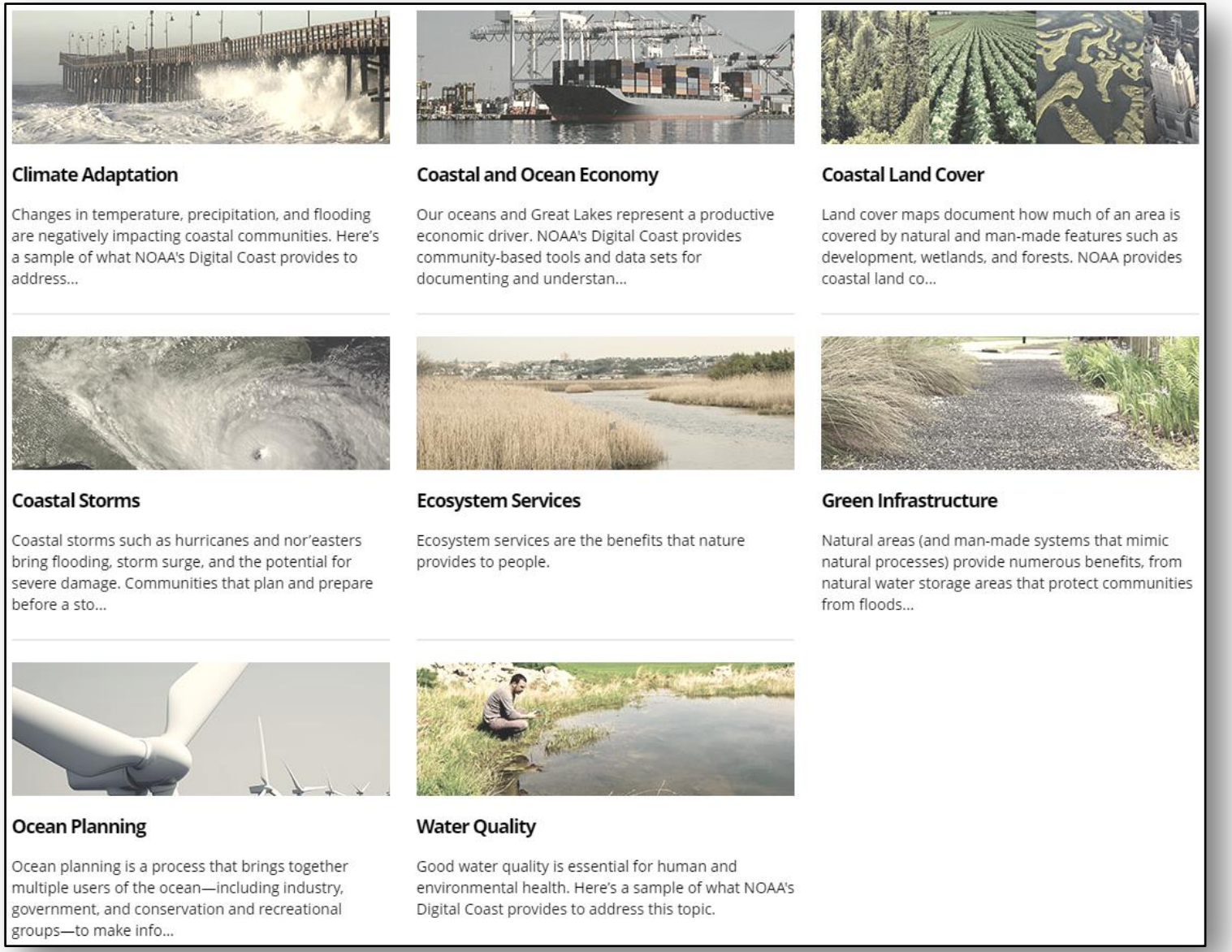
A constituent-driven, integrated, enabling platform supporting coastal resource management that is not just useful – it is used

- **Data**
- **Tools**
- **Training**
- **Stories**
- **Topics**



Digital Coast: Dive in by Topic

Quick links to the top Digital Coast resources communities use to address common coastal management issues



Climate Adaptation

Changes in temperature, precipitation, and flooding are negatively impacting coastal communities. Here's a sample of what NOAA's Digital Coast provides to address...

Coastal and Ocean Economy

Our oceans and Great Lakes represent a productive economic driver. NOAA's Digital Coast provides community-based tools and data sets for documenting and understan...

Coastal Land Cover

Land cover maps document how much of an area is covered by natural and man-made features such as development, wetlands, and forests. NOAA provides coastal land co...

Coastal Storms

Coastal storms such as hurricanes and nor'easters bring flooding, storm surge, and the potential for severe damage. Communities that plan and prepare before a sto...

Ecosystem Services

Ecosystem services are the benefits that nature provides to people.

Green Infrastructure

Natural areas (and man-made systems that mimic natural processes) provide numerous benefits, from natural water storage areas that protect communities from floods...

Ocean Planning

Ocean planning is a process that brings together multiple users of the ocean—including industry, government, and conservation and recreational groups—to make info...

Water Quality

Good water quality is essential for human and environmental health. Here's a sample of what NOAA's Digital Coast provides to address this topic.

Summary

- We can't afford not to plan for and mitigate the impacts of coastal storms and erosion
- Geoscience can help address decision-maker needs throughout the risk management lifecycle
- Resources, training, and technical assistance are only a few mouse-clicks away

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