

Building Resilient Communities: Tools for Understanding and Communicating Coastal Risk

NOAA in the Carolinas 2012

**Doug Marcy
NOAA Coastal Services Center**



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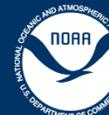
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Priority Issues

- Land-use planning
- Coastal and marine spatial planning
- Hazards and climate change

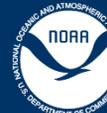


Coastal Communities: Vital to U.S. and International Economies

- 57 percent of U.S. gross domestic product is contributed by coastal watershed counties.
- Coastal counties contain 53 percent of the nation's population—but account for only 17 percent of U.S. land area (excludes Alaska).
- Coastal habitats help reduce impacts of floods, storms, and climate change on coastal communities by absorbing water, wave energy, and other stressors.



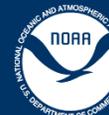
**U.S. population, 2010 census: 308 million, an increase of ~9 percent
Census projects 439 million in 2050**



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Everything has its price, even the weather.

- Economic Cost of Weather May Total \$485 Billion in U.S.
- From wildfires to flight delays to running our AC, "This research shows that a substantial percentage of the U.S. economy is linked to variability in weather."



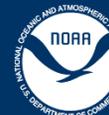
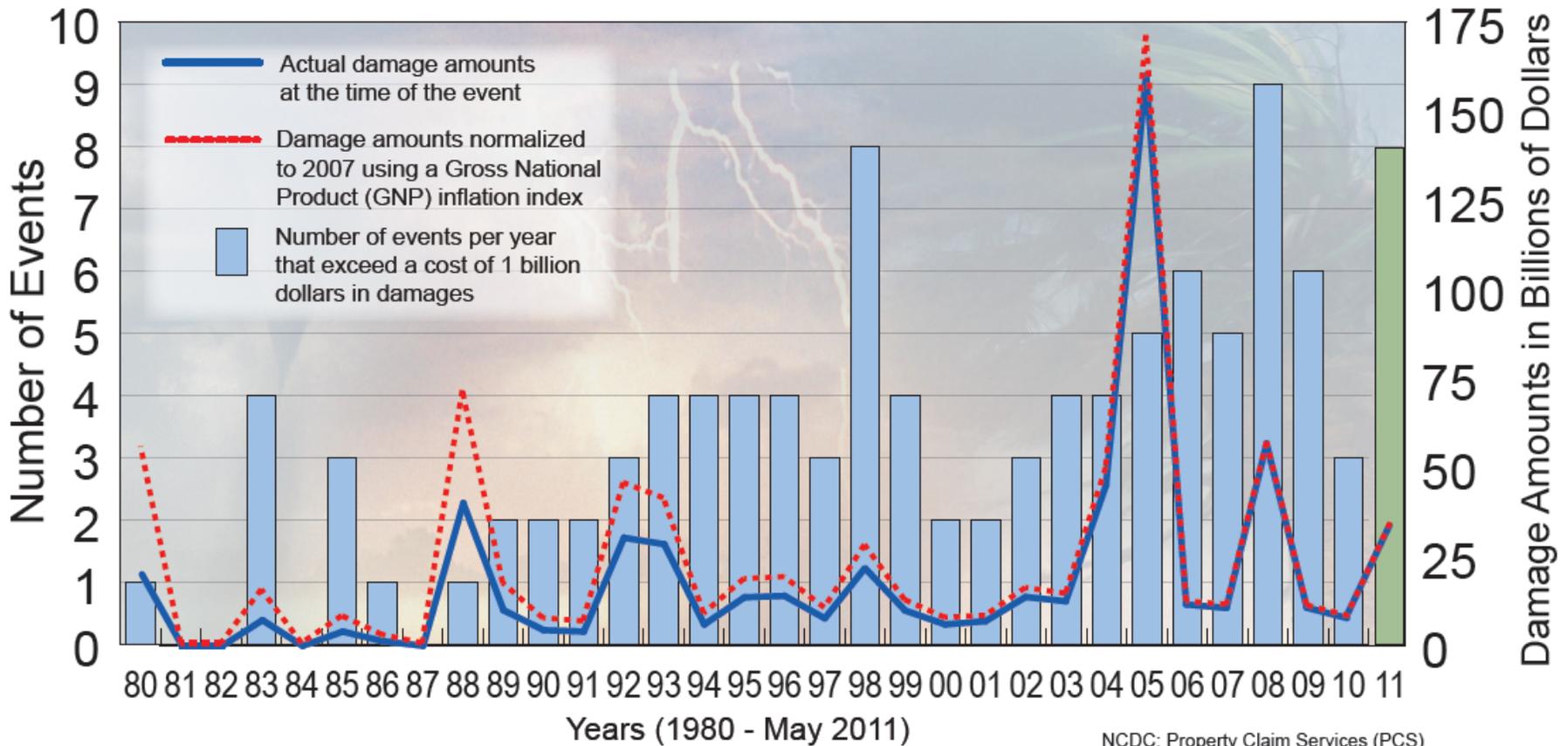
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A Growth Industry?



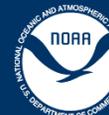
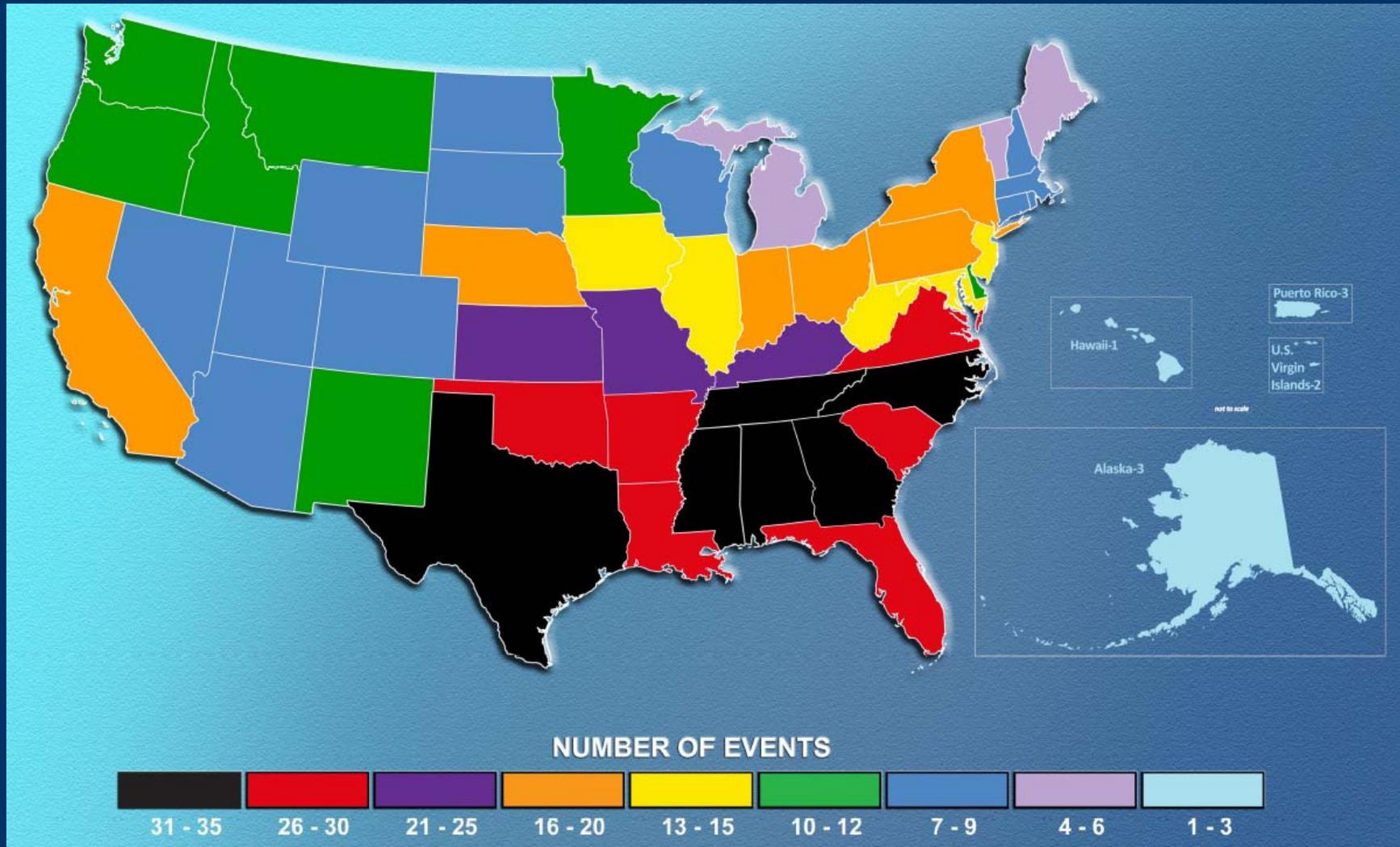
Billion Dollar U.S. Weather Disasters 1980 - May 2011

NOAA/NESDIS/NCDC



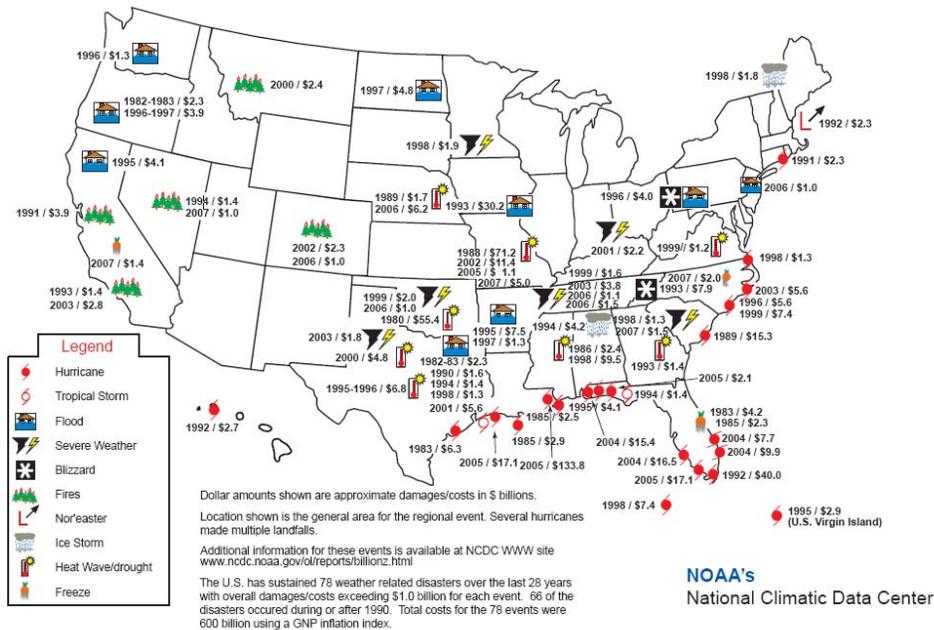
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Ready to Move?



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Billion Dollar Weather Disasters 1980 - 2007

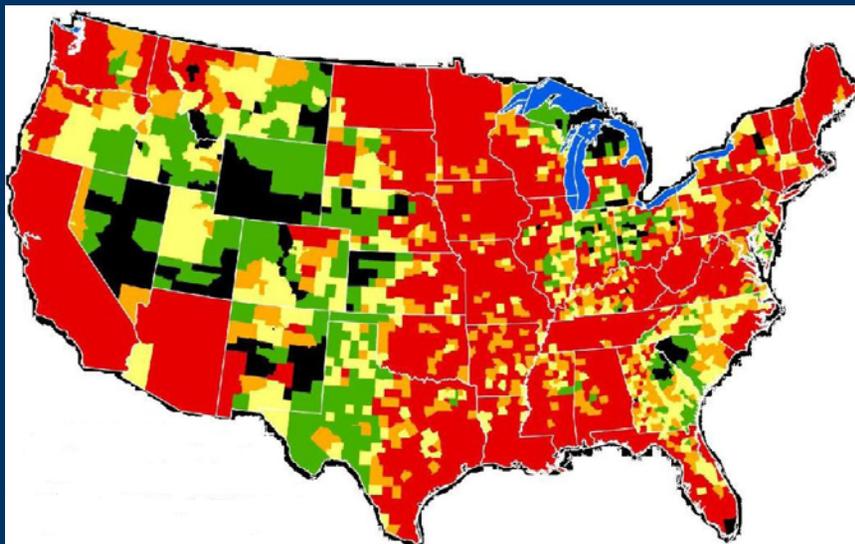


Ready Or Not, Here It Comes

Weather and Climate Extremes in a Changing Climate

*Regions of Focus:
North America, Hawaii,
Caribbean, and U.S. Pacific Islands*

Disaster Declarations 1965-2003



**U.S. Climate Change Science Program
Synthesis and Assessment Product 3.3**

June 2008

Providing Solutions to Barriers

More than just data...

- Coastal data
- Data accessibility
- Improved intergovernmental coordination
- Techie and non-techie tools
- Training
- Outreach and awareness
- Contracting for geospatial services



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One Solution: Digital Coast



Home About Data Tools Training Approaches ▾ In Action

More than just data...

The Digital Coast also provides the tools, training, and information needed to turn these data into the information most needed by coastal resource management professionals. [Read more...](#)



Welcome to the Digital Coast. If you have questions or comments, please [contact us](#). [Give us your feedback!](#)

Data

Learn more about the kinds of data available and download data.

Tools

Use these tools to turn data into the useful information your organization needs.

Training

Update your skills by participating in one of these training programs.

In Action

See how data and tools are used to address coastal management issues.

Approaches

Coastal Inundation Toolkit

Understand the basics and get the tools that will help make your community more resilient.

Offshore Renewable Energy Planning

Get the data and tools needed to make siting decisions.

Conserving Coastal Wetlands for Sea Level Rise Adaptation

Learn spatial techniques and get resources to prioritize wetland conservation.

Featured Resources

Social Coast

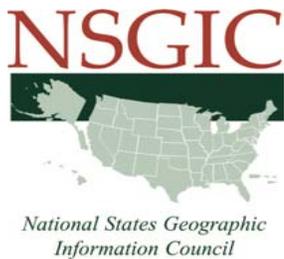
Social science data can help address coastal issues. Find highlights of economic and demographic data, and also tools and methods, that can be applied to solve real issues.

Sea Level Rise and Coastal Flooding Impacts Viewer

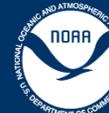
The Role of Land Use in Adaptation to Increased Precipitation and Flooding

Mississippi Geospatial Clearinghouse

Digital Coast Partnership



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Digital Coast Contributors

Mississippi State Coordinating Council
on Remote Sensing and GIS

NOAA National Geodetic Survey

U.S. Army Corps of Engineers

U.S. Geological Survey

NASA/NOAA/USGS Airborne Lidar Assessment
of Coastal Erosion (ALACE)

Federal Emergency Management Agency

National Geospatial-Intelligence Agency

U.S. Department of Agriculture

Northwest Florida Water
Management District

Southwest Florida Water
Management District

St. Johns River Water Management District

Maryland Department of Natural Resources

Oregon Department of Geology
and Mineral Resources

Texas Natural Resources Information System

Mississippi Department of
Environmental Quality

Scripps Institute of Oceanography
University of Texas

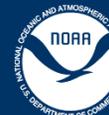
Delaware Department of Natural Resources
and Environmental Control

South Carolina Department of
Natural Resources

Florida Division of Emergency Management

Minnesota Department of Natural Resources

Management Association for Private
Photogrammetric Surveyors (MAPPS)



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Data and Tools

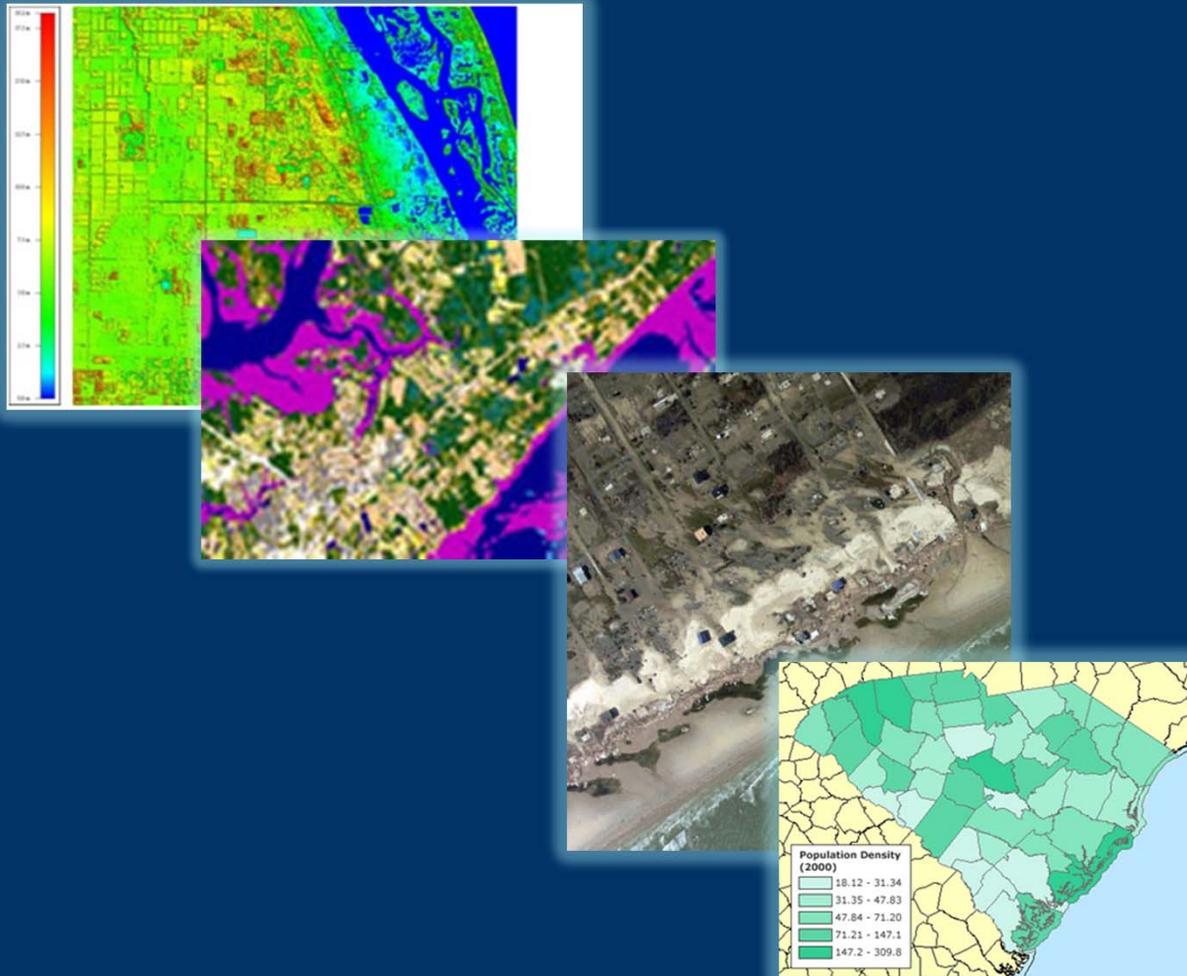
www.csc.noaa.gov/digitalcoast



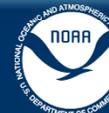
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Digital Coast Data

www.csc.noaa.gov/digitalcoast/data



- Elevation
- Benthic
- Orthoimagery
- Land cover
- Hydrography
- Marine boundaries
- Socioeconomic



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Nonpoint-Source Pollution and Erosion Comparison Tool (N-SPECT)

www.csc.noaa.gov/digitalcoast/tools/nspect



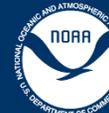
Features

Provides projections and maps of surface water runoff volumes, pollutant loads, pollutant concentrations, and total sediment loads

Helps users see areas that might benefit from changes to proposed development strategies

Processes digital elevation data quickly and easily

Provides a means to analyze "what if" land use change scenarios



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Historical Hurricane Tracks Tool

www.csc.noaa.gov/hurricanes/

Historical Hurricane Tracks
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Search: Storm Name / Year
HUGO 1989 [Go]

Refine Search
Category: [Add] Timeframe: [Add] Pressure: [Add]
Apply [Auto-apply]

Search Results (1) HUGO 1989 My Storms (0)

Share Print Clear Show all results
Add to My Storms

HUGO 1989 (60 Advisories)

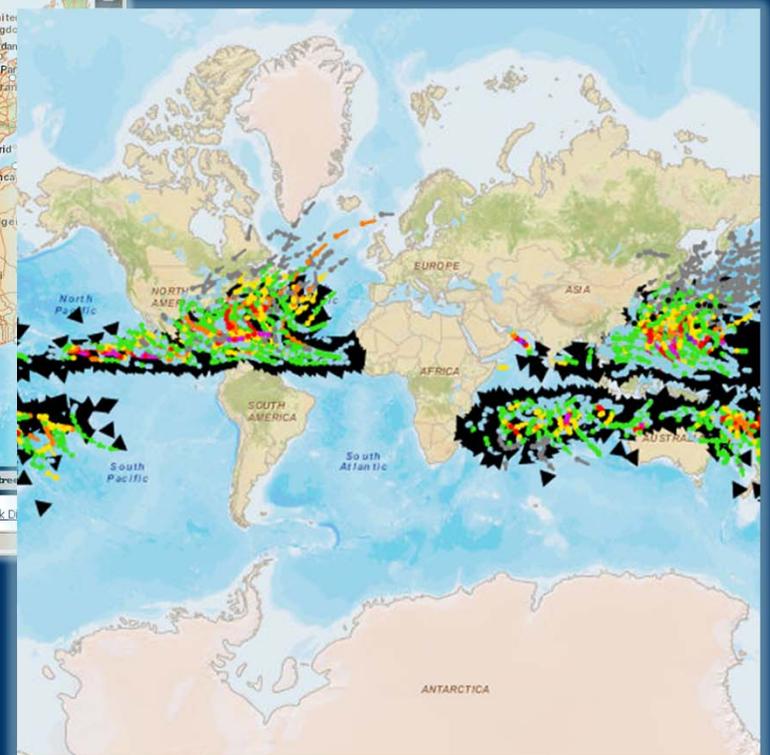
Date Time (GMT)	X,Y	Pres(mb)	MSW(kts)	Cat
Sep. 10, 1989 12z	-20,13.2	1010	25	TD
Sep. 10, 1989 18z	-21.6,13.3	1010	25	TD
Sep. 11, 1989 0z	-23.7,13.2	1009	30	TD
Sep. 11, 1989 6z	-25.5,13	1007	30	TD
Sep. 11, 1989 12z	-27.3,12.8	1005	30	TD
Sep. 11, 1989 18z	-29.2,12.5	1003	35	TS

Max. Sust. Wind (kts) vs. Pressure (mb) graph showing storm intensity changes over time.

Map: North Atlantic showing the storm track from the Caribbean to the coast of North America.

United States Department of Commerce | National Oceanic and Atmospheric Administration | National Ocean Service
Contact Us | Privacy Policy | Link D

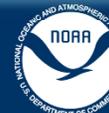
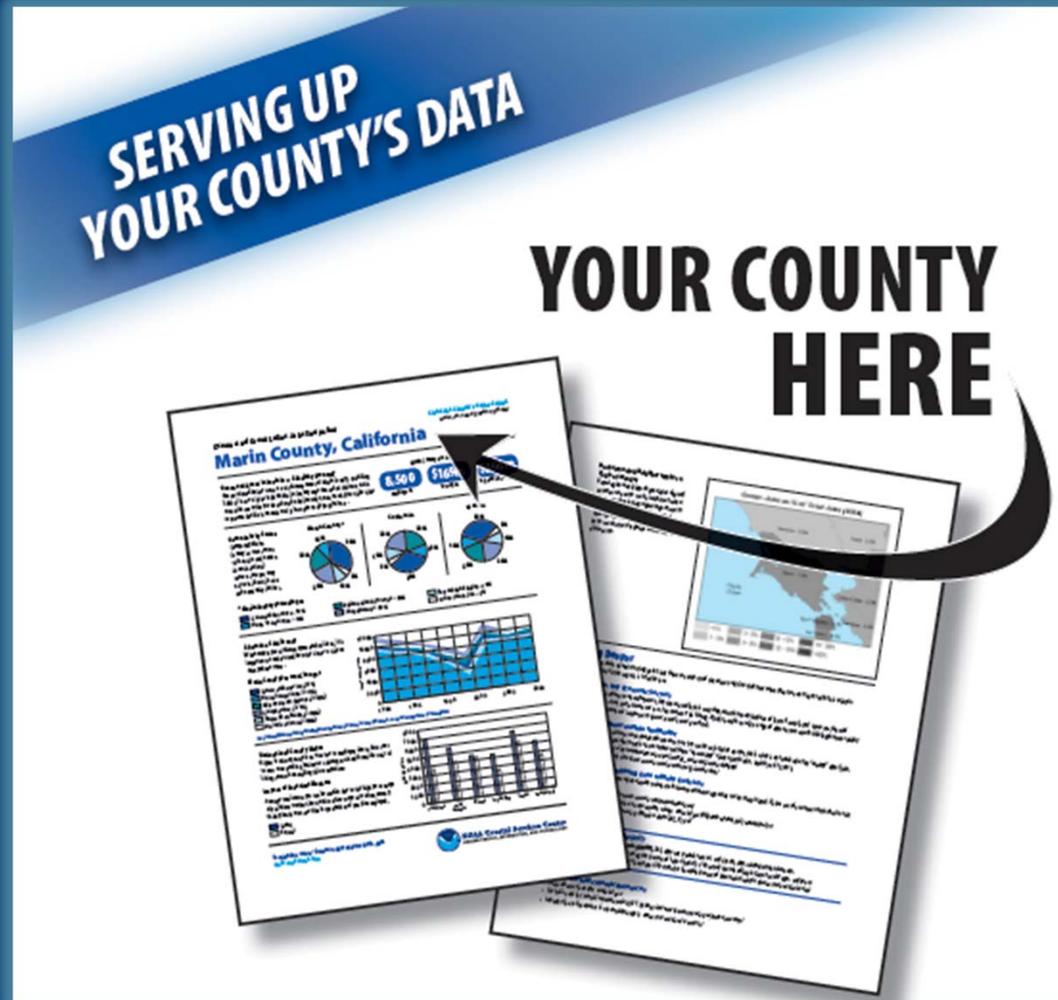
Transferring data from server.arcgisonline.com...



County Flood Exposure Snapshot

www.csc.noaa.gov/snapshots/

- Flood exposure
- Ocean jobs
- Wetlands benefits



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Critical Facilities Tool

www.csc.noaa.gov/criticalfacilities/

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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Home About Data Tools Training How-To Guides Publications Partnerships Technical Assistance

Coastal Resilience Index Critical Facilities Tool

[About This Tool](#)

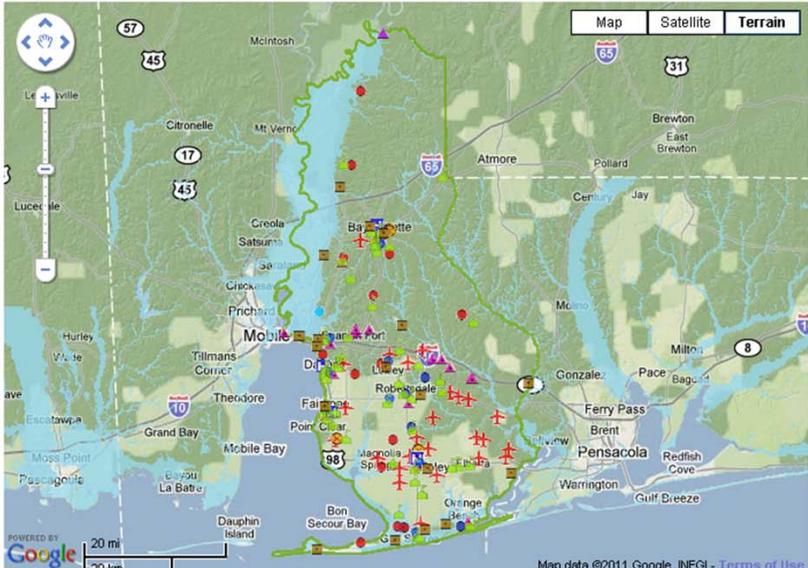
1. Check which elements to view: Map Results Table

2. Choose a State then County/Parish or Municipality

3. Choose Visible Facilities

All Facilities: On Off

- Airports
- Communication Towers
- Electric Power Facilities
- Emergency Operations Centers
- Fire Stations
- Hazardous Materials Sites
- Medical Care Facilities
- Oil Facilities
- Police Stations
- Potable Water Facilities
- Rail Facilities
- Schools
- Waste Water Facilities
- Flood Zone
- County/Parish



Map data ©2011 Google, INEGI - [Terms of Use](#)



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National Weather Service Flood Severity Inundation Maps

<http://water.weather.gov/ahps/inundation.php>

National Weather Service
Advanced Hydrologic Prediction Service

Home News Organ

Weather Forecast Office Greenville-Spartanburg, SC Lower Mississ

Lake Wind Advisory
View all valid statements/warnings

Hydrograph River at a Glance Download Inundation Mapping Weekly Chance of Exceeding Levels Ch

Image Type: Standard (Faster Download) Detailed (Slower)

Mouse Location Water Depth: Off Water Depth Function Off **Current Stage**

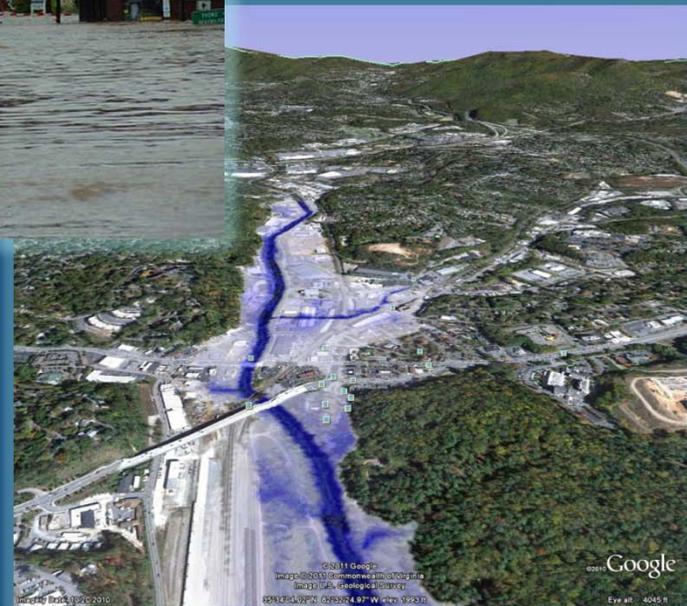
NAVD88	Stage
1,996.0	19.7
1,995.5	19.2
1,995.0	18.7
1,994.5	18.2
1,994.0	17.7
1,993.5	17.2
1,993.0	16.7

Major Flooding Begins

1,992.5	16.2
1,992.0	15.7
1,991.5	15.2
1,991.0	14.7

Moderate Flooding Begins

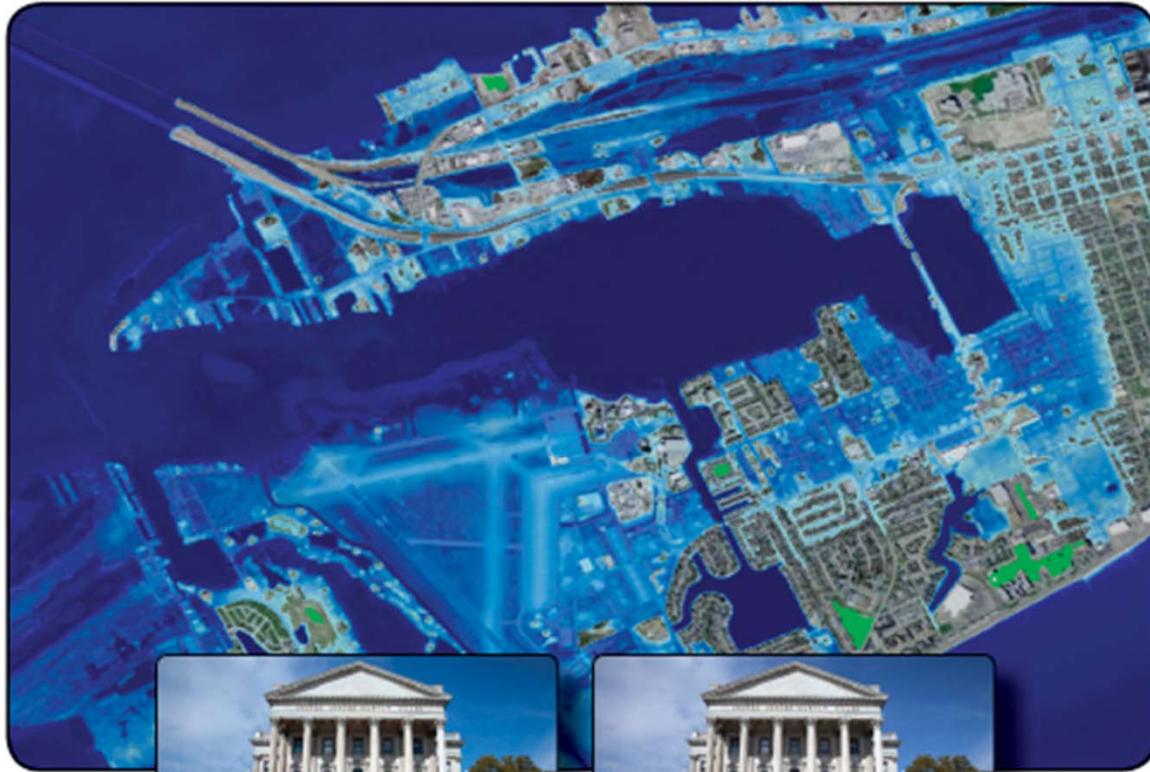
Transparency Level 100 Year Flood 500 Year Flood Floodway Data



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Sea Level Rise and Coastal Flooding Impacts Viewer

www.csc.noaa.gov/slr/



CanVis

www.csc.noaa.gov/canvis/



Seattle Boardwalk – Sea Level Rise – Before



Seattle Boardwalk – Sea Level Rise – After



Charleston Customs House – 1.5m SLR - Before



Charleston Customs House – 1.5m SLR - After

Visualization

Alternatives

Communication

Training

www.csc.noaa.gov/training/



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Get Out Ahead of Coastal Hazards...

www.csc.noaa.gov/roadmap/

Approach that helps communities:

- analyze strengths and weaknesses to hazards and climate change
- incorporate risk and vulnerability information and data into existing plans and policies
- highlights products useful in assessing vulnerabilities



Roadmap for Adapting to Coastal Risk

technical assistance, web-based training, web resources



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The Social Vulnerability Story

What to consider...

Factors that contribute to
social vulnerability

Factors that contribute to
community resilience

The effects of current and
projected trends on existing
social conditions



The Infrastructure Vulnerability Story

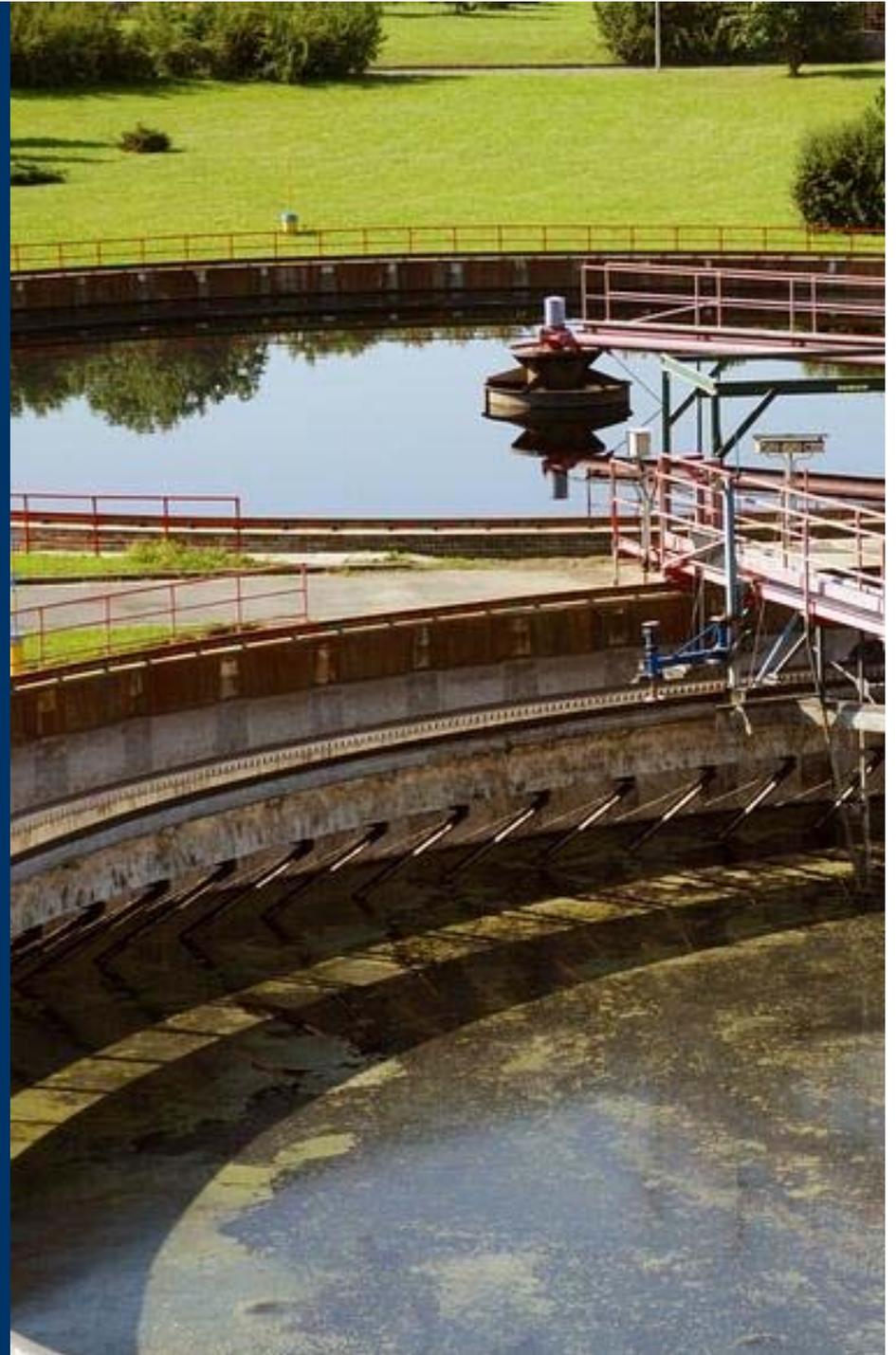
What to consider...

All types of infrastructure

What's exposed to hazards

Potential factors that contribute to infrastructure vulnerability

How existing policies will affect future infrastructure vulnerability



The Ecosystem Vulnerability Story

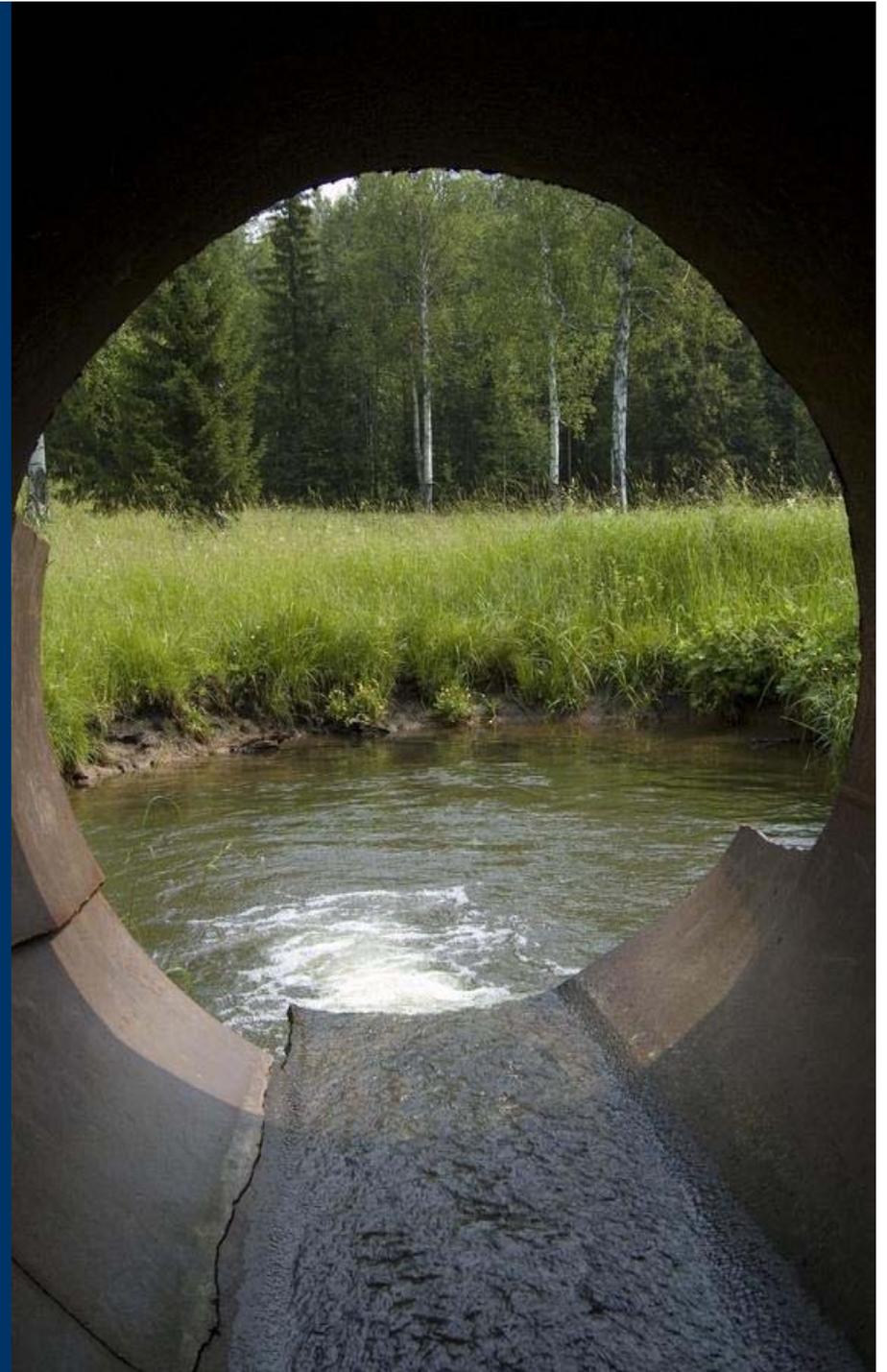
What to consider...

Protective functions of key natural resources

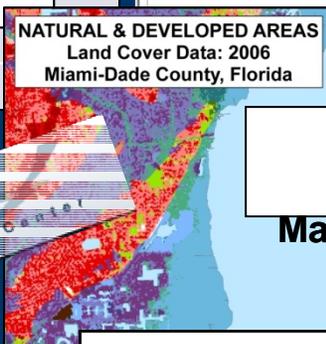
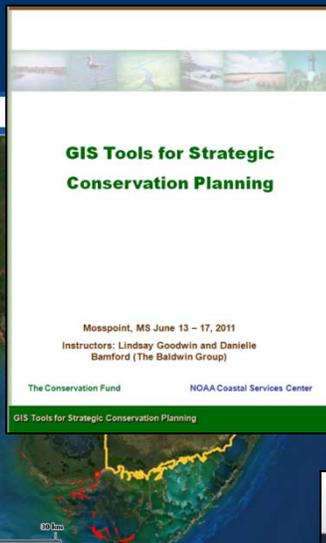
Additional benefits of key natural resources

Potential stressors to ecosystem

Current policy impacts on the future vulnerability of ecosystem



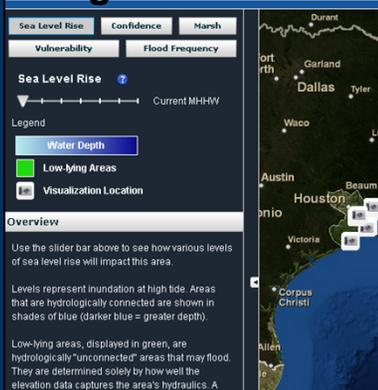
CSC Tools & Resources Included



Coastal Inundation Mapping Training



Coastal Use and Coastal Flooding Impacts



Green Infrastructure Short Course



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Coastal Inundation Mapping Training

www.csc.noaa.gov/training

Understand inundation

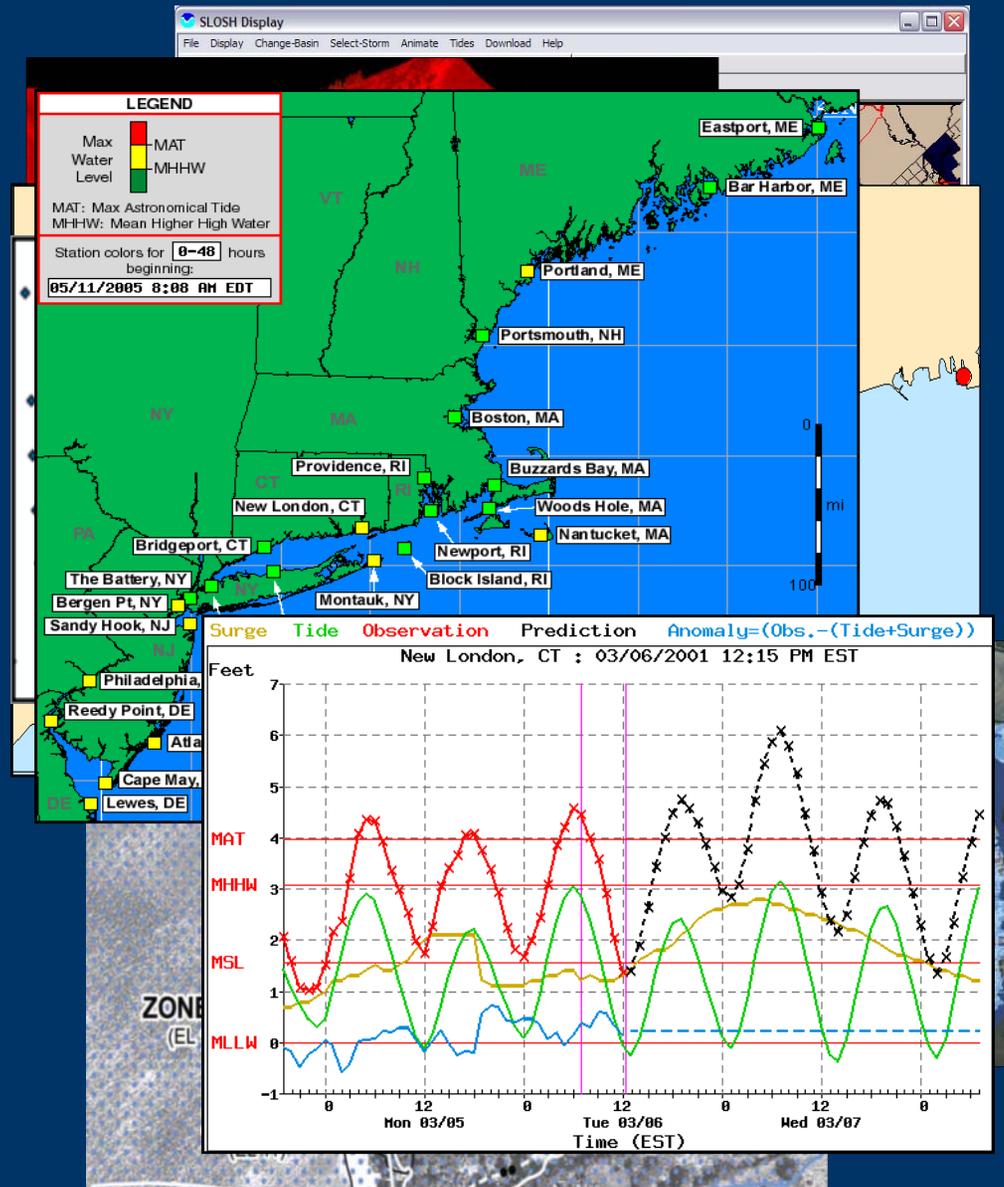
Learn about mapping products

Access data

Perform data conversions

Map inundation using GIS

Identify and use coastal and ocean observation data



Climate Adaptation Training

Recognize the changes and variability in climate and climate's influence on coastal communities

<http://www.csc.noaa.gov/training/>

Identify opportunities to leverage a range of governance mechanisms to integrate adaptation strategies into their existing efforts

Examine methods for conducting hazard, vulnerability, and risk assessment as it relates to climate change

Evaluate the strengths and weaknesses of adaptation strategies

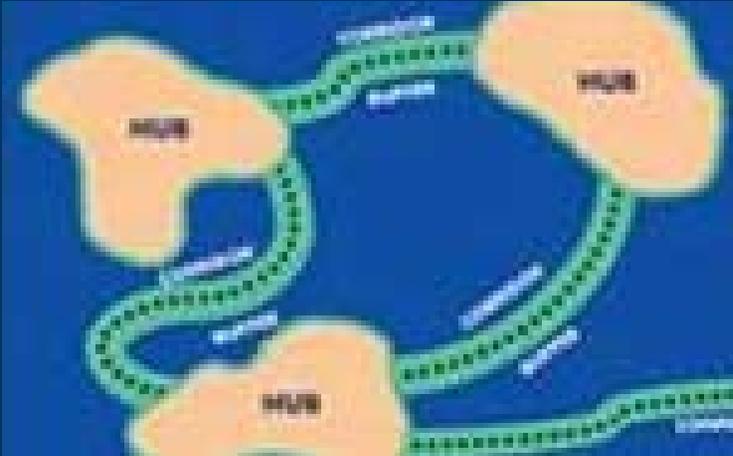
Apply climate communication research concepts and findings to enable effective communication with target audiences



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GIS Tools for Strategic Conservation

<http://www.csc.noaa.gov/digitalcoast/training/gisforscp.html>



Teaches green infrastructure concepts to help planners communicate and integrate natural resource conservation into planning efforts that support coastal community resilience.



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Technical Assistance



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Coastal Geospatial Services Contract

“Take the headache out of the process.”

<http://www.csc.noaa.gov/idiq/geospatial.html>



- Four prime contractors with over 90 subs
- No overhead charges to states



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Learn from others...

www.csc.noaa.gov/roadmap/

- **Miami-Dade County, FL**
 - Sustainability Plan
 - Climate Adaptation
 - Water Supply & Salt Intrusion
- **Delaware County, PA**
 - Hazard Mitigation Planning
 - Redevelopment & Brownfields
 - Watershed Planning
- **Town of Southold, NY**
 - Comprehensive Plan Update
 - Conservation Planning

Planning for Hazards and Climate Change Impacts: One County's Approach

Miami-Dade County, Florida

Like most coastal areas, Florida's Miami-Dade County is vulnerable to climate change. With the county's unique topography, computer models predict that sea level rise will increase flooding on both the eastern and southwestern boundaries of the Everglades, causing the county and its infrastructure, people, and natural resources to be "squeezed." The county's major economic sectors, agriculture and tourism, will suffer greatly.

But many Miami-Dade officials believe that... implement enhanced mitigation and... sustainable, livable community.



Regional Methods for Mapping Sea Level Rise Inundation Vulnerability in Southeast Florida

Prepared By:

Diana UmPierre, GISP
Senior Geographer
South Florida Water Management District (SFWMD)



In Coordination With:

Southeast Florida Regional Climate Change Compact
Inundation Mapping & Vulnerability Assessment
Work Group



With Significant Support From:

NOAA's National Ocean Service (NOS), in particular
Coastal Services Center and CO-OPS



March 2012



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Publications, How-To Guides, Reports, Websites

www.csc.noaa.gov/publications

PUBLICATIONS

Filter by Category:

PERIODICALS



Coastal Services Magazine

This bimonthly trade publication brings new ideas to coastal resource management programs.

Special Editions - Local Strategies for Addressing Climate Change: [Volume 1](#) and [Volume 2](#)

Fellow News

A quarterly newsletter that provides information about the Coastal Management Fellowship Program.

Products and Services Catalog

Describes the products and services offered by the NOAA Coastal Services Center.

MAILING LISTS

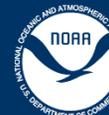
- Coastal Connections Newsletter
- Coastal Services Magazine
- Digital Coast Updates
- Coastal GeoTools
- Map Services Notification Group

[Subscribe](#)

COASTAL RESOURCE MANAGEMENT CUSTOMER SURVEY

Constituents of the NOAA Coastal Services Center are polled regarding their needs and capabilities.

[See the Results](#)



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Approaches and Resources



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Climate Adaptation

The screenshot shows the NOAA Coastal Climate Adaptation website. At the top left, it says "Coastal CLIMATE Adaptation" with "CLIMATE" in large green letters. To the right is a "Sign In" link and a search bar. Below this is a navigation menu with links for "CCA Home", "Resources", "Blog", "Calendar", "Groups", "Get Started", and "Register".

The main content area features a "Monthly Feature" section with a photograph of a marina and palm trees. The text reads: "Monthly Feature", "San Diego Bay Sea Level Rise Adaptation Strategy", and "ICLEI".

Below the feature is a "RESOURCES" section titled "By Category or State". It lists various resource categories with green arrow icons: "Adaptation and Action Plans", "Case Studies and Strategies", "Climate Change Communication", "Climate Change Science and Impacts", "Guidance and Guidebooks", "Outreach Materials", "Policies and Legislation", "Risk and Vulnerability Assessments", "Stakeholder Engagement", and "Training and Workshop Materials". To the right of the list is a map of the United States with state abbreviations (NH, MA, RI, CT, NJ, DE, MD) and insets for Alaska, Hawaii, and Puerto Rico.

At the bottom, there are three sections: "Blog" (Read about climate news.), "Calendar" (Don't miss these upcoming events.), and "Getting Started?" (This short list will help.). Each section has a "Launch" button with a play icon.

Join a Community of Practice.

Contribute to the website by uploading your resources

Share your thoughts on posts in the Blog.

Post upcoming climate-related events



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Coastal Inundation Toolkit

www.csc.noaa.gov/inundation/

The screenshot displays the Coastal Inundation Toolkit website. At the top, a navigation bar features five chevron-shaped buttons labeled 'Understand', 'Identify', 'Map', 'Communicate', and 'Discover'. Below this is a browser window showing the website's header with the 'DIGITAL COAST' logo and 'NOAA Coastal Services Center' text. A search bar is located on the right. The main navigation menu includes 'Home', 'Data', 'Tools', 'Training', 'Approaches', and 'In Action'. A sub-menu for 'Approaches' is open, highlighting the 'Coastal Inundation Toolkit' with sub-links for 'Home', 'About', 'Glossary', and 'Resources'. The main content area is divided into six boxes, each representing a step: 'Understand' (basic information), 'Identify' (county exposure and impacts), 'Map' (potential impacts), 'Assess' (community risk and resilience), 'Communicate' (risk information), and 'Discover' (real communities). Below these is a 'Highlighted Resources' section featuring a resource titled 'Building Resilient Coastal Communities: Counties and the Digital Coast' with a brief description and a thumbnail image of a coastal wetland. To the right of this section is a large image of a flooded city street. The footer contains 'Digital Coast Partnership Group' and 'Contact the Digital Coast'.

Understand Identify Map Communicate Discover

Coastal Inundation - Digital Coast

DIGITAL COAST
NOAA Coastal Services Center

Home Data Tools Training Approaches In Action

Approaches

Coastal Inundation Toolkit
Home About Glossary Resources

Understand
Understand basic information about coastal inundation

Identify
Identify your county's exposure and examine potential impacts

Map
Map inundation to "see" potential impacts

Assess
Assess community risk, vulnerability, and resilience

Communicate
Communicate risk information to your community

Discover
Discover how real communities are addressing this issue

Highlighted Resources

 **Building Resilient Coastal Communities: Counties and the Digital Coast**
This publication by the National Association of Counties highlights many of the Digital Coast resources that county officials can use to address coastal flooding, habitat conservation, and land use issues.

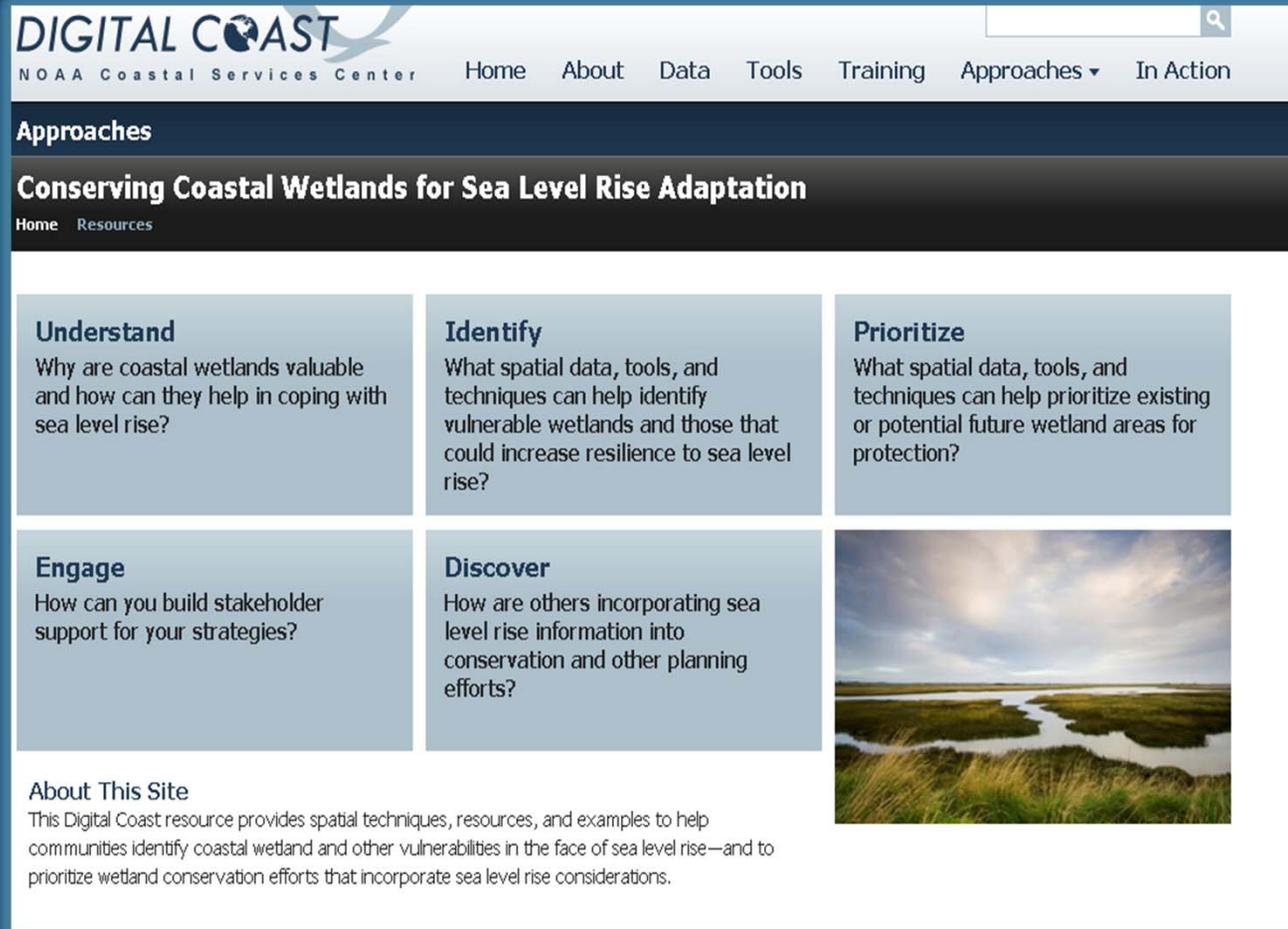


Digital Coast Partnership Group [Contact the Digital Coast](#)

Done

Conserving Coastal Wetlands

<http://www.csc.noaa.gov/digitalcoast/wetlands/>



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Home About Data Tools Training Approaches ▾ In Action

Approaches

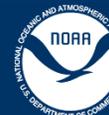
Conserving Coastal Wetlands for Sea Level Rise Adaptation

Home Resources

<p>Understand</p> <p>Why are coastal wetlands valuable and how can they help in coping with sea level rise?</p>	<p>Identify</p> <p>What spatial data, tools, and techniques can help identify vulnerable wetlands and those that could increase resilience to sea level rise?</p>	<p>Prioritize</p> <p>What spatial data, tools, and techniques can help prioritize existing or potential future wetland areas for protection?</p>
<p>Engage</p> <p>How can you build stakeholder support for your strategies?</p>	<p>Discover</p> <p>How are others incorporating sea level rise information into conservation and other planning efforts?</p>	

About This Site

This Digital Coast resource provides spatial techniques, resources, and examples to help communities identify coastal wetland and other vulnerabilities in the face of sea level rise—and to prioritize wetland conservation efforts that incorporate sea level rise considerations.



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Offshore Renewable Energy Planning

<http://www.csc.noaa.gov/energy/>

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Home About Data Tools Training Approaches ▾ In Action

Approaches

Offshore Renewable Energy Planning

Home

Understand

Understand basic information about renewable energy planning and how a marine spatial planning approach is beneficial

Identify

Identify information about the marine environment from a natural and human-use perspective

Inventory

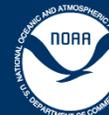
Inventory data and tools to visualize components of the marine environment

Analyze

Analyze potential locations for renewable energy applications with available tools

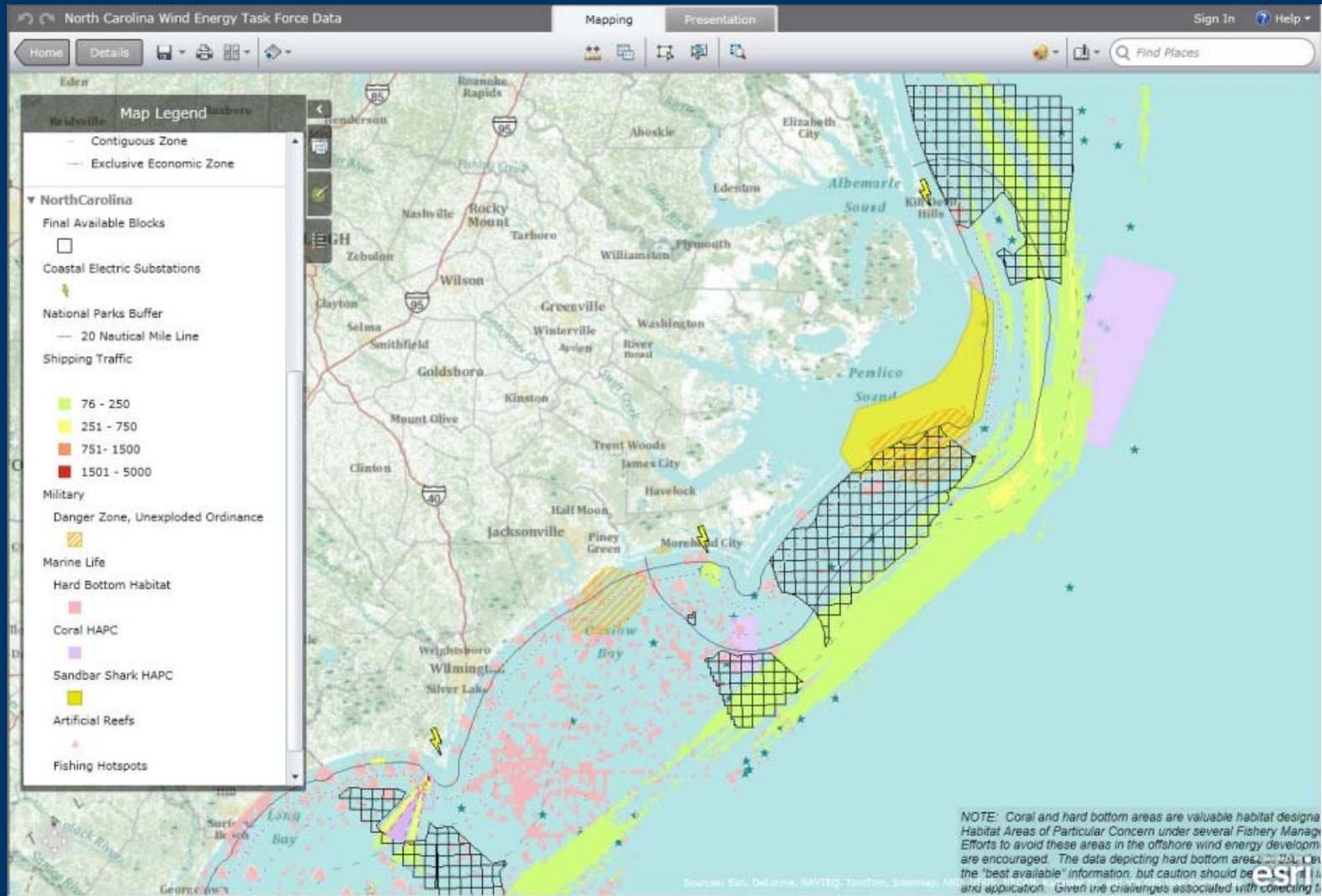
Discover

Discover what other coastal communities are doing to address ocean-siting issues



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North Carolina Renewable Energy Task Force

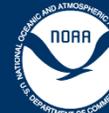


True Resilience !!



Source: San Francisco
Water Management District

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