

Digital Coast: Geospatial Information for Resilient Coastal Communities

Miki Schmidt and Josh Murphy

ULI Resilience and Risk in Coastal Regions

January 16, 2013



NOAA Coastal Services Center
LINKING PEOPLE, INFORMATION, AND TECHNOLOGY

Outline

1. Welcome and Introductions
2. Digital Coast Overview
3. Coastal Hazards Resources
4. Coastal Ecosystem Resources
5. Socioeconomic Considerations
6. Wrap-Up and Questions



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Outline

1. Welcome and Introductions
2. Digital Coast Overview
 - NOAA Coastal Services Center
 - Coastal Challenges
 - Barriers
 - Digital Coast Approach
 - Partnership and Contributors
 - Digital Coast Website
3. Coastal Hazards Resources
4. Coastal Ecosystem Resources
5. Socioeconomic Considerations
6. Wrap-Up and Questions



NOAA Coastal Services Center

- Provides the technology, information, and management strategies used by local, state, and national organizations to address complex coastal issues
- Constituents:
 - Coastal planners
 - Estuarine reserves
 - Natural resource agencies
 - Floodplain managers
 - Emergency officials
 - Conservation organizations



Coastal Challenges: Communities at Risk

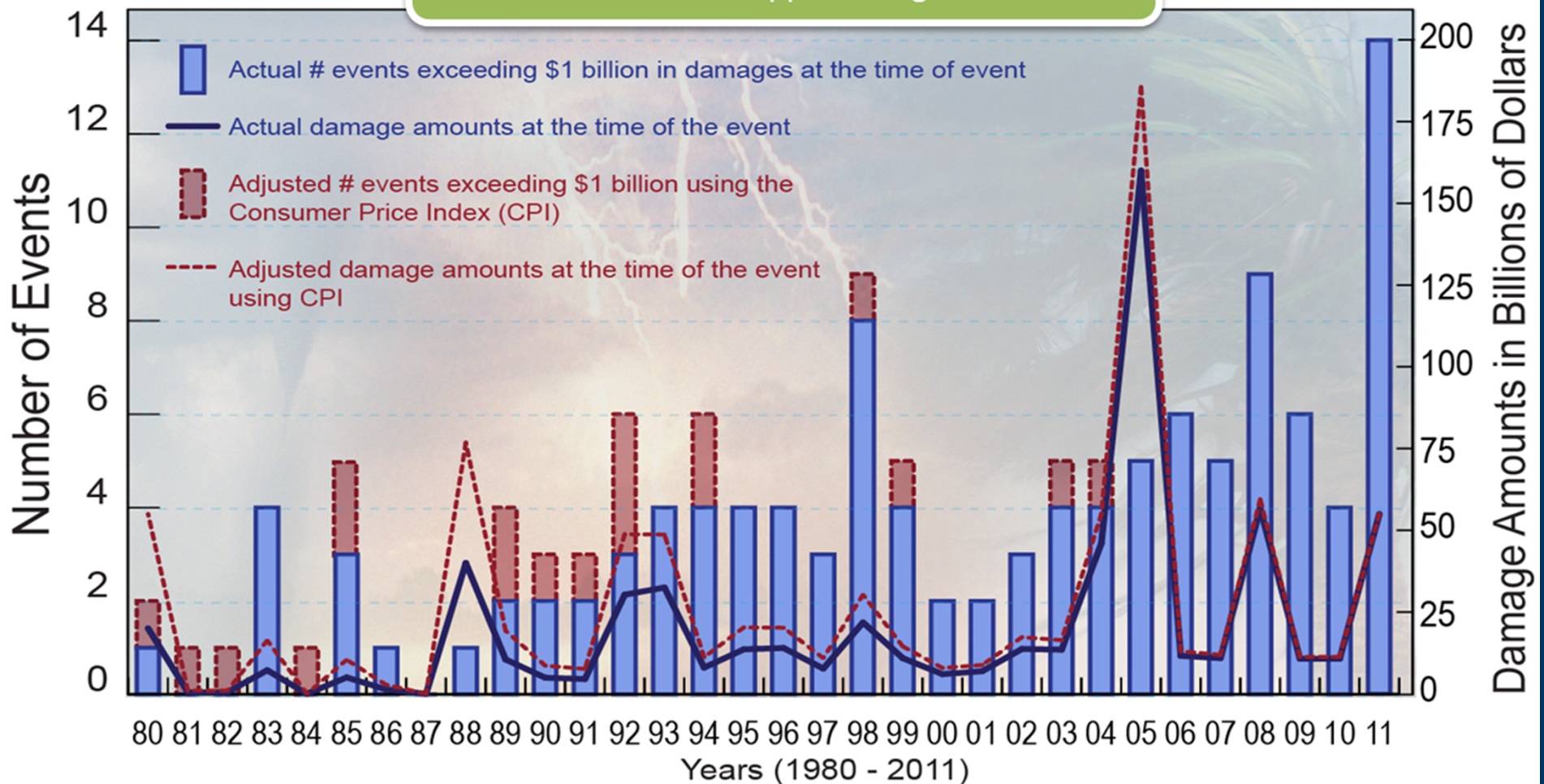


Coastal Challenges: Communities at Risk



Coastal Challenges: Communities at Risk

A Record 14 Disasters in the U.S. in 2011
Three more approaching \$1B



Coastal Challenges: Balancing Uses



Barriers

- Coastal data
- Data integration and accessibility
- Improved intergovernmental coordination
- Techie and non-techie tools
- Training
- Outreach and awareness

Sources: various surveys and constituent feedback



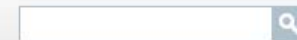
NOAA Coastal Services Center
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Digital Coast

- **Approach:** Bring the geospatial and coastal management communities together
- **Outcome:** A constituent-driven, integrated, enabling platform supporting coastal resource management that is used



Home About Data Tools Training Apply It Stories



DATA

TOOLS

TRAINING

APPLY IT

STORIES

TOP PICKS

- [Coastal Lidar](#)
- [Coastal Change Analysis Program](#)
- [Economics: National Ocean Watch](#)
- [Electronic Navigational Charts](#)
- [Emergency Response Imagery](#)

[ALL DATA >>](#)



More than just data...

Dive into the **Digital Coast** to get the data, tools, and training communities need to address coastal issues

[READ MORE >>](#)

Digital Coast Contributors

Federal

- NOAA
- U.S. Army Corps of Engineers
- U.S. Geological Survey
- Federal Emergency Management Agency
- U.S. Department of Agriculture
- Environmental Protection Agency

State

- Mississippi State Coordinating Council for Remote Sensing and GIS
- Northwest Florida Water Management District
- Maryland Department of Natural Resources
- Delaware Department of Natural Resources and Environmental Control
- South Carolina Department of Natural Resources

NGO

- Resources for the Future
- Management Association for Private Photogrammetric Surveyors

Academic

- University of South Carolina
- University of Texas
- University of Hawaii
- Scripps Institute of Oceanography

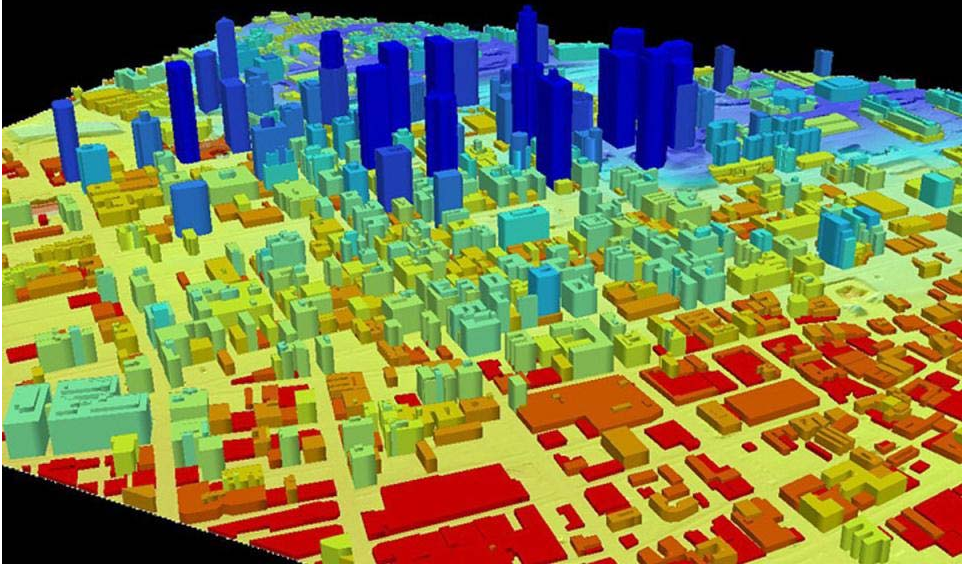
Private

- Fugro EarthData
- Sanborn
- Dewberry
- Woolpert
- PhotoScience

Digital Coast Partnership Group



LIDAR Data



A collage of economic data dashboards and a large dollar sign. The dashboards include:

- Contra Costa County, California:** Population, Population per SF, and Population in Poverty. Includes a bar chart for "Number of Jobs in Coastal Communities".
- Pacific County, Washington:** Ocean Jobs account for 1,387 in employees, \$28m in wages, and \$69m in goods and services. Includes the text "Ocean and Great Lakes Jobs = A Healthy Economy" and the URL www.csc.noaa.gov/snapshots/.
- Charleston County, South Carolina:** Population, Population per SF, and Population in Poverty. Includes a bar chart for "Number of Jobs in Coastal Communities".
- Rockingham County, New Hampshire:** Wetland Benefits Snapshot. Includes the text "Ocean Protecting Wetlands = Coastal Communities that Are Safer, Greener, and More Economically Productive" and a statistic: "13% (58,952 acres) of Rockingham County is wetland".

Economic DATA

Sea Level Rise VIEWER

Sea Level Rise and Coastal Flooding Impacts. The interface shows a map of a coastal area with a blue overlay indicating flooded regions. A sidebar on the left contains controls for "Sea Level Rise" and "Coastal Flooding Impacts".

Training



By the Numbers

Data

- Over 15 terabytes of high-resolution elevation data, land cover data, and orthoimagery
- Linkages to over 30 national-level coastal data sets

Tools

- An inventory of over 40 tools – many provide visualization and analysis capabilities without need for GIS software

Training

- 12 training courses, including several web-based options, and a webinar archive

Stories from the Field

- Over 50 narratives that demonstrate the application of geospatial information to coastal issues

Digital Coast Website



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[ALL DATA >>](#)



More than just data...

Dive into the **Digital Coast** to get the data, tools, and training communities need to address coastal issues

[READ MORE >>](#)

RESOURCES FOR HURRICANE SANDY RECOVERY

[Blog Post: Hurricane Sandy Geospatial Resources](#)

[Blog Post: Sifting Through the Volumes of Hurricane Sandy Post-Storm Data](#)

[Blog Post: Ensuring Your Picture is Worth a Thousand Words](#)

[Coastal Inundation Toolkit](#)



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Myrtle Beach, South Carolina



@CoastalService, #CoastalGeoTools



www.facebook.com/NOAACoastalServices

Visit <http://geotools.csc.noaa.gov>

Get Data Now

INTERACT



Contact Us

Please use this form if you have suggestions, questions, or content for the Digital Coast. This resource is focused on providing tools, training, and information for those who manage the nation's coastal resources.

Name

Email

Zip Code

What's New

DATA

[Environmental Sensitivity Index](#)

[Landsat Satellite Imagery](#)

[Bathymetry and Digital Elevation...](#)

WEBINARS



[Mapping and Visualizing Sea Level Rise and Coastal Flooding Impacts](#)

Learn more about the Sea Level Rise and Coastal

Geospatial Data



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DATA

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- [Coastal Change Analysis Program](#)
- [Economics: National Ocean Watch](#)
- [Electronic Navigational Charts](#)
- [Emergency Response Imagery](#)



NARROW YOUR RESULTS

Data Type

- [Benthic \(8\)](#)
- [Hydrography \(2\)](#)
- [Ocean Planning \(8\)](#)
- [Imagery \(8\)](#)
- [Land Cover \(7\)](#)
- [Elevation \(9\)](#)
- [Socioeconomics \(6\)](#)

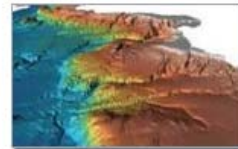
Resolution

- [High Resolution \(24\)](#)
- [Medium Resolution \(10\)](#)

Format

- [Tabular \(9\)](#)
- [Raster \(24\)](#)
- [Vector \(25\)](#)
- [Points \(8\)](#)

Items per page



Bathymetry and Digital Elevation Models
National Oceanic and Atmospheric Administration
Bathymetric and topographic data viewer and download tool for U.S. coastal areas

[More Info](#) [Get It Now](#)



Benthic Cover
National Oceanic and Atmospheric Administration
Nearshore benthic habitat polygons derived from aerial optical or swath acoustic imagery

[More Info](#) [Get It Now](#)



Benthic Grab Sample
National Oceanic and Atmospheric Administration
Nearshore point observations of bottom type, derived from physical sediment grab samples

[More Info](#) [Get It Now](#)



Benthic Sediment Profile Imaging
National Oceanic and Atmospheric Administration
Nearshore sediment point observations derived from the sediment profile imaging (SPI) camera system

[More Info](#) [Get It Now](#)



Benthic Single-Beam Acoustic

[Get Data Now](#)

FEATURED RESOURCES

[Mississippi Geospatial Clearinghouse](#)

Provides access to a comprehensive list of GIS resources of Mississippi

[IOOS Data Catalog](#)

Contains ocean observations from a comprehensive network of observing systems and data servers

[Additional Data Resources](#)

Lists many other national, state, regional, and local data resources

Geospatial Data

Enter Location
-76.914,38.865 or



no buffer ▼

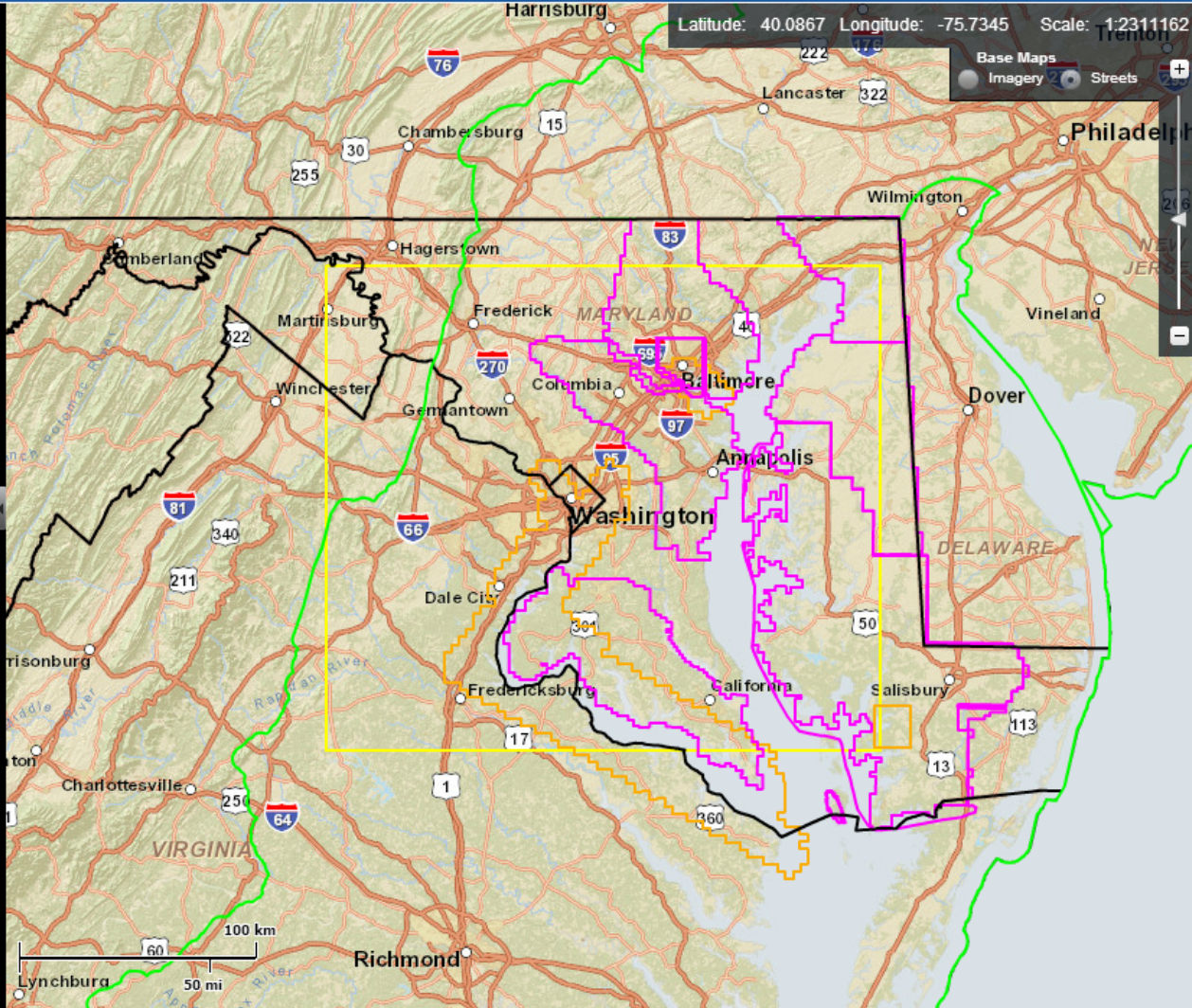
Refine Search

Data Type Licensed Data Include Data Provider

Results (24)

Sort by **Data Type (A-Z)** ▼

- 2011 Baltimore, MD IOCM Natural Color Imagery**
NOAA
Imagery 8,667 MB 
- 2008 Potomac River IOCM Natural Color Imagery**
NOAA
Imagery 54,494 MB 
- 2008 NOAA National Geodetic Survey Natural Color Imagery: Maryland**
NOAA
Imagery 536 MB
- 2006 Forest Fragmentation Land Cover**
NOAA
Land Cover 153 MB



Decision Support Tools



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NOAA COASTAL SERVICES CENTER

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TOOLS

TOP PICKS

- [Sea Level Rise Viewer](#)
- [Coastal County Snapshots](#)
- [Multipurpose Marine Cadastre](#)
- [ENOW Explorer](#)
- [Land Cover Atlas](#)



NARROW YOUR RESULTS

Platform

- [Desktop \(22\)](#)
- [Web \(25\)](#)

Focus Area

- [Climate Adaptation \(10\)](#)
- [Land Use Planning \(19\)](#)
- [Coastal Hazards \(25\)](#)
- [Ocean Planning \(19\)](#)
- [Coastal Conservation \(19\)](#)
- [Water Quality \(10\)](#)
- [Community Resilience \(33\)](#)
- [Coastal Economy \(14\)](#)

Function

- [Data Analysis \(19\)](#)
- [Classification \(14\)](#)
- [Change \(12\)](#)
- [Spatial Visualization \(35\)](#)
- [Non spatial](#)
- [Visualization \(4\)](#)

Data Type

- [Benthic \(9\)](#)
- [Hydrography \(4\)](#)
- [Ocean Planning \(11\)](#)
- [Imagery \(3\)](#)
- [Land Cover \(15\)](#)
- [Elevation \(23\)](#)
- [Socioeconomics \(11\)](#)

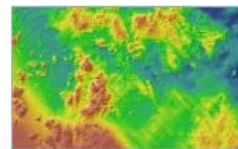
Items per page



Airborne LIDAR Data Processing and Analysis Tools
Florida International University
Assists users in classification of ground and non-ground lidar measurements and in additional lidar data analysis



Benthic Habitat Atlas of Coastal Texas
National Oceanic and Atmospheric Administration
Displays shallow water habitat for Texas coastal bays in an interactive viewer



Benthic Terrain Modeler
Esri, Massachusetts Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, Oregon State University
Derives benthic terrain classifications from input bathymetry



CanVis
National Oceanic and Atmospheric Administration, U.S. Department of Agriculture
Enables users to add objects to images in order to visualize impacts of future management decisions

FEATURED TOOL

[NOAA's State of the Coast](#)

Delivers quick facts and detailed statistics through interactive visualizations about coastal communities, ecosystems and the economy

TOOL RESOURCES

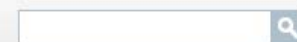
[Ecosystem-Based Management Tools Network](#)

Supports the implementation of ecosystem-based management tools in coastal and marine environments and the terrestrial environments that affect them

Training and E-Learning



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TRAINING

LEARN ABOUT

- [Technical Skills](#)
- [Effective Projects](#)
- [Working with People](#)
- [Coastal Issues](#)



NARROW YOUR RESULTS

Delivery Method

- Classroom, Instructor-led (10)
- Online, Instructor-led (3)
- Online, Self-guided (8)

Focus Area

- Climate Adaptation (5)
- Land Use Planning (8)
- Coastal Hazards (7)
- Ocean Planning (4)
- Coastal Conservation (4)
- Water Quality (1)
- Community Resilience (5)
- Coastal Economy (2)
- Broadly Applicable (11)

Course Content

- Technical Skills (8)
- Effective Projects (3)
- Working with People (8)
- Coastal Issues (12)



CanVis

Provides an introduction to CanVis software, a visualization tool used in project planning, policy making, and communication efforts; instruction includes tool demos (live or recorded) and classroom and Web-based training



Climate Adaptation for Coastal Communities

Conveys information and practical skills for incorporating climate considerations into planning processes, and provides time in class to apply what is learned to individual issues



Coastal Community Planning and Development

Provides examples and strategies to implement alternative development principles in coastal communities



Coastal Inundation Mapping

Provides information on coastal inundation issues and teaches spatial techniques for mapping inundation



Conducting Needs Assessments

Provides an introduction to needs assessments

DIGITAL COAST WEBINAR SERIES

[Mapping and Visualizing Sea Level Rise and Coastal Flooding Impacts](#)

Tuesday, January 15, 2013

[CanVis: A Tool for Visualizing Coastal Changes and Potential Adaptation Strategies](#)

Wednesday, February 6, 2013

UPCOMING TRAINING OPPORTUNITIES

NEW [View our training calendar](#)

FEATURED RESOURCES

[Webinars](#)

View a list of our archived and upcoming webinars

[Center for Land Use Education and Research](#)

Apply It

[Home](#)

See how Digital Coast resources are used to address coastal issues.



Use these tools to better understand and address the inundation issues facing coastal communities

▼ Understand

What is coastal inundation, its causes, and impacts?

[MORE >>](#)

- ▶ Identify
- ▶ Visualize
- ▶ Communicate
- ▶ Discover

Developed by the [Digital Coast Partnership](#)



Employ spatial techniques, resources, and examples to help communities prioritize their coastal wetland conservation efforts

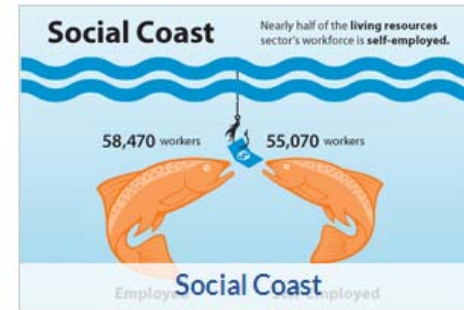
▼ Understand

Why are coastal wetlands valuable and how can they help in coping with sea level rise?

[MORE >>](#)

- ▶ Identify
- ▶ Prioritize
- ▶ Engage
- ▶ Discover

Developed by the [NOAA Coastal Services Center](#)



Address coastal issues with social science data and tools.

▼ What

What are the social sciences and social science data?

[MORE >>](#)

- ▶ How
- ▶ Get it

Developed by the [NOAA Coastal Services Center](#)

Stories from the Field



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STORIES

Stories from the Field



NARROW YOUR RESULTS

Region

- Northeast (8)
- Mid-Atlantic (12)
- Southeast (13)
- Gulf (10)
- West Coast (7)
- Great Lakes (5)
- Pacific (9)
- Alaska (1)

Focus Area

- Climate Adaptation (19)
- Land Use Planning (47)
- Coastal Hazards (31)
- Ocean Planning (12)
- Coastal Conservation (45)
- Water Quality (16)
- Community Resilience (30)
- Coastal Economy (12)

Data Type

- Benthic (5)
- Hydrography (6)
- Ocean Planning (7)
- Imagery (10)
- Land Cover (30)
- Elevation (28)
- Socioeconomics (5)



Adapting to Sea Level Rise in Miami-Dade County, Florida

County departments identify specific actions to adapt to climate change through the Roadmap for Adapting to Coastal Risk training.



Advancing Restoration in the Great Lakes Region

The Habitat Priority Planner and C-CAP data were used to identify and prioritize habitat restoration projects to meet goals identified in the Great Lakes Regional Collaboration Strategy.



Analyzing Sedimentation Processes to Guide Conservation in Oregon

C-CAP data helped in the development of a conservation plan for the Yaquina watershed.



Analyzing the Impacts of Hurricane Katrina on Forest Ecosystem Services

C-CAP data and additional land cover analysis highlight the loss of forests and related ecosystem services following Hurricane Katrina.



Assessing and Managing Prop Scar Damage to

The Digital Coast In Action: Resources for Resilient Communities

- **To be resilient, coastal communities should consider:**
 - Risk and vulnerability to coastal hazards
 - Strengths and vulnerabilities of natural resources
 - Vibrant, healthy coastal economies



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LINKING PEOPLE, INFORMATION, AND TECHNOLOGY

Outline

1. Welcome and Introductions

2. Digital Coast Overview

3. Coastal Hazards Resources

- Coastal County Snapshots
- Sea Level Rise and Coastal Flooding Impacts Viewer
- Sea Level Trends
- Roadmap for Adapting to Coastal Risk
- Coastal Inundation Toolkit

4. Coastal Ecosystem Resources

5. Socioeconomic Considerations

6. Wrap-Up and Questions



Coastal County Snapshots

Welcome to the Coastal County Snapshots



The Coastal County Snapshots turn complex data into easy-to-understand stories, complete with charts and graphs.

Select Snapshot | Select County

Flood Exposure
The Flood Snapshot provides local officials with a quick look at a county's demographics, infrastructure, and environment within the flood zone.

[Frequently Asked Questions](#)

Ocean Jobs
The Ocean and Great Lakes Jobs Snapshot provides a quick look at the economic value of jobs that are dependent on the Great Lakes and oceans.

[Frequently Asked Questions](#)

Wetland Benefits
The Wetland Benefits Snapshot provides a quick look at how wetlands contribute to safer, cleaner, and more economically productive coastal communities.

[Frequently Asked Questions](#)

Announcements
The following data have been updated as of December 2012:

- Economic data in the Ocean Jobs and Wetland Benefits snapshots

Sea Level Rise Viewer

Sea Level Rise and Coastal Flooding Impacts

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION



Sea Level Rise Confidence Marsh

Vulnerability Flood Frequency

Sea Level Rise ?

6 ft SLR

Legend

- Water Depth
- Low-lying Areas
- Area Not Mapped
- Visualization Location

View Levees

Overview

Use the slider bar above to see how various levels of sea level rise will impact this area.

Levels represent inundation at high tide. Areas that are hydrologically connected are shown in shades of blue (darker blue = greater depth).

Low-lying areas, displayed in green, are hydrologically "unconnected" areas that may flood. They are determined solely by how well the elevation data captures the area's hydraulics. A more detailed analysis of these areas is required to determine the susceptibility to flooding.

Understanding the Map

Additional Information

Texas Glossary Share

Imagery Streets

Scholes Airport Terminal

Use the slider to view a simulation of sea level rise at this location.

Sea Level Trends


 Search

Home Products Programs Partnerships Education Help

Sea Level Trends

- Alabama
- Alaska
- California
- Connecticut
- Delaware
- Florida
- Georgia
- Hawaii
- Louisiana
- Maine
- Maryland
- Massachusetts
- New Jersey
- New York
- North Carolina
- Oregon
- Pennsylvania
- Rhode Island
- South Carolina
- Texas
- Virginia
- Washington
- Washington DC
- Island Stations

Sea Level Trend Table in mm/yr

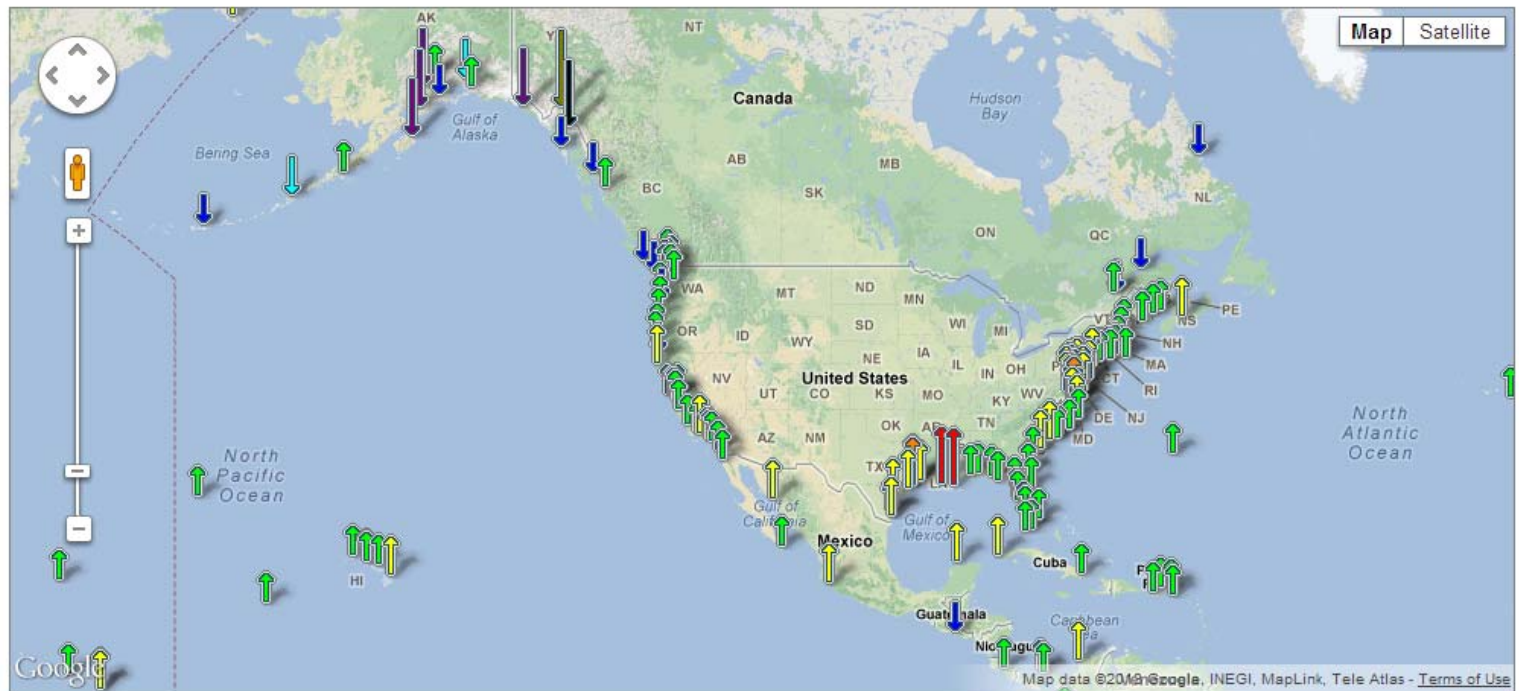
Sea Level Trend Table in feet/century

Global Stations

Global Sea Level Trend Table in

Sea Levels Online

East Coast West Coast Gulf Coast Alaska Hawaii Global



The map above illustrates regional trends in sea level, with arrows representing the direction and magnitude of change. Click on an arrow to access additional information about that station.

Sea Level Trends					
mm/yr (feet/century)					
9 to 12 (3 to 4)	3 to 6 (1 to 2)	-3 to 0 (-1 to 0)	-9 to -6 (-3 to -2)	-15 to -12 (-5 to -4)	
6 to 9 (2 to 3)	0 to 3 (0 to 1)	-6 to -3 (-2 to -1)	-12 to -9 (-4 to -3)	-18 to -15 (-6 to -5)	

Roadmap for Adapting to Coastal Risk

Roadmap for Adapting to Coastal Risk

[NOAA Coastal Services Center](#)

Overview

Approach

Training

Resources

Discover

OVERVIEW

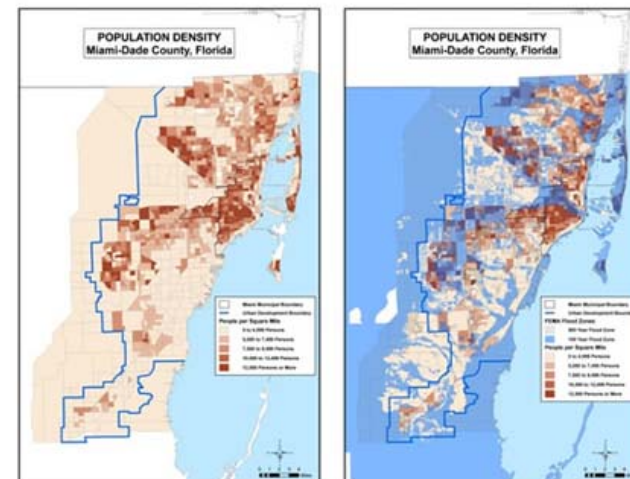
The Roadmap for Adapting to Coastal Risk provides a participatory approach for assessing a community's vulnerability to hazards—and for incorporating relevant data and information about hazards and climate into ongoing local planning and decision-making.

Visit the following sections for more Roadmap information and resources:

- [Approach](#) – learn about the Roadmap approach
- [Training](#) – sign up for the Web-based Roadmap training
- [Resources](#) – access resources that will help in your assessment and planning activities
- [Discover](#) – see how others are reducing community vulnerability to hazards

APPLYING THE ROADMAP APPROACH TO COASTAL INUNDATION

Visit the [Inundation Toolkit](#) for resources dedicated to coastal flooding and storm surge.



View other example storyboards, maps, and photos in the [Resources](#) section.

EXPLORE

[About](#)

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DIGITAL COAST PARTNERSHIP

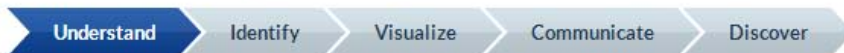
[About the Partnership](#)

MORE

[Privacy Policy](#)

Coastal Inundation Toolkit

Understanding Coastal Inundation



The first step is to understand what inundation is and why communities should be concerned.

INUNDATION AND COASTAL COMMUNITIES

What Is Inundation? Water covering normally dry land is a condition known as inundation.

Impacts

Inundation events are among the more frequent, costly, and deadly coastal hazards that can impact coastal communities in the U.S. In fact, riverine and coastal inundation causes the highest number of natural-hazard-related deaths. With coastal states supporting 81% of the U.S. population and generating 83% of U.S. gross domestic product, the potential for catastrophic loss from inundation events is greater in these states than in other areas of the country.

In addition, future inundation [risks](#) may be exacerbated by local changes in climate and sea level. It is important to know current inundation risks to understand the potential effects of changing conditions.

Causes

Episodic Coastal Inundation Events

There are four primary causes of significant inundation: storm surge, tsunamis, inland flooding, and shallow coastal flooding.

[← Back](#)

[More →](#)



Storm surge results from severe storms such as tropical cyclones (e.g., hurricanes, typhoons) and nor'easters, as strong winds combined with low pressure drive water onshore (NOAA, 2009). Hurricanes like Katrina (2005) and Hugo (1989), and the 1993 nor'easter (the "Storm of the Century"), caused extensive storm surge.

Longer-Term Coastal Inundation

Sea level rise is an increase in the mean level of the ocean. NOAA has been measuring mean sea level for over 150 years, with [tide stations](#) operating on all U.S. coasts.

[← Back](#)

[More →](#)

[About](#)

[Glossary](#)

[Resources](#)

Learn More

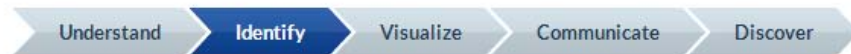
Listen to the [Diving Deeper: Tsunamis](#) podcast to learn more about the causes of tsunamis and how to prepare for them.

Visit the [Glossary](#) to view the definition of inundation terms commonly used throughout this website.

Learn about the Coastal and Inland Flood Observation and Warning ([CI-FLOW](#)) [project](#) and how riverine flooding and coastal flooding events affect each other.

Coastal Inundation Toolkit

Identify Coastal Inundation



When beginning a community risk and vulnerability assessment, it is important to identify a number of factors listed below.

KNOW WHAT YOU'RE DEALING WITH

To be more [resilient](#), a community must identify the factors that contribute to its [risks](#) and [vulnerabilities](#). What is the probability of a hazardous event occurring? What are the potential impacts to people, property, and natural resources? What members of a community may be more vulnerable because of their income, age, or where they live? Knowing this information can help communities prioritize strategies aimed at reducing the impacts of coastal inundation and climate change. Listed below are five approaches a community should explore during this process.

Engage Multidisciplinary Stakeholders in the Process. Engaging a diverse group of people in coastal inundation risk assessment planning at an early stage is critical and will provide valuable knowledge, experience, and resources in the decision-making process. A wide range of stakeholders and decision makers should be included, from local floodplain managers and local government officials to state coastal resource managers and area business and community leaders. The "[Introduction to Stakeholder Participation](#)" publication discusses some of the most important considerations and provides common techniques used to increase stakeholder engagement.

Identify Inundation Hazards. Identify what coastal inundation hazards may occur within your community and where they are located. Existing data, information, and resources can help in this identification. The geographic extent of the area of interest will help determine what data and resources are appropriate, and what questions can be answered.

Identify Community Strengths and Weaknesses. List what people, natural resources, businesses, and roads and other infrastructure are located in high-risk areas. Assessing what community assets are located in coastal inundation hazard areas helps prioritize where additional assessments should be conducted and provides a framework for identifying goals, methods, and activities for a community's risk and evaluation plan. The [Mapping Socio-Economic Variables Using 2000 Census Data](#) (PDF) document provides instructions on how to create socio-economic spatial data useful in a risk assessment. The [Roadmap for Adapting to Coastal Risk training](#) also explores data to use in an assessment.

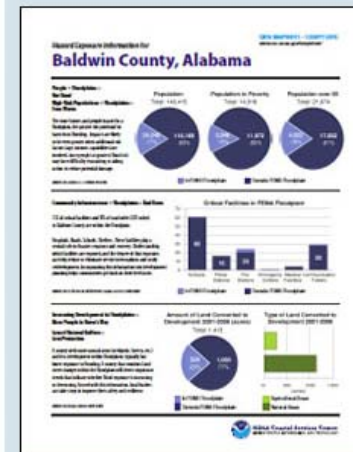
Identify Risk Behaviors. Many factors influence how people act in the face of risk. People interpret these threats according to their experiences, emotions, and values, along with the information they receive. Identifying behavioral barriers and benefits is the first step in helping decision makers understand people's risk behaviors, the best ways to communicate with them, and the methods to change these behaviors.

Identify and Visualize County Data. Seeing data visually displayed is often the best way to understand a situation. The [Coastal County Snapshots](#) Flood Exposure tool website is a good starting point. A full data visualization

About

Glossary

Resources



An example of a Flood Exposure report available through the [Coastal County Snapshots](#) tool.

[Get It Now](#) 

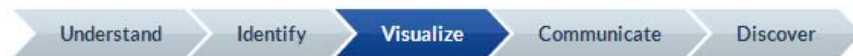
Learn More

To learn more about how to identify factors that impede individuals from taking risk-reducing actions, visit the [Community-Based Social Marketing](#) website.

Coastal Inundation Toolkit



Visualize Coastal Inundation



Visualizing inundation is important in understanding the potential extent and risks of inundation, and its impacts on the community.

VISUALIZE INUNDATION

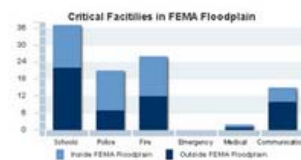
Visualizations can be helpful when trying to make sense of large, cumbersome data sets, as well as in analyzing trends and seeing the geographic extent of inundation events.

In this section, users will find examples of different types of resources that can help turn their data into visualizations. These resources include photos, map-viewing tools, data, and map-development guidance documents. The level of expertise needed to use these resources varies. Users with lower to moderate levels of GIS expertise may want to explore the ["Picture It"](#) and ["Graph It"](#) sections first. These sections focus on resources geared to help create simulation photos and ready-made map-viewing products. The more technical users, familiar with different data analysis techniques and GIS software packages, may want to explore the ["Build It"](#) section, where they can find mapping guidance and methods useful for creating their own maps and visualizations.



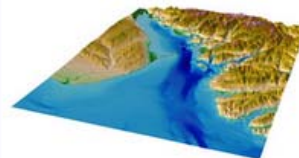
[PICTURE IT](#)

Photos, maps, and data viewers enable communities to see and understand inundation impacts



[GRAPH IT](#)

Large data sets and information can be displayed in more easily understandable graphs



[BUILD IT](#)

Training, data, and mapping guidance are available to assist users in building their own inundation maps

[About](#)

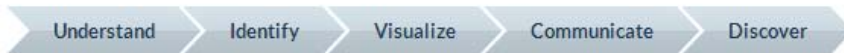
[Glossary](#)

[Resources](#)

Coastal Inundation Toolkit



Highlight Local Knowledge - Coastal Inundation



[Highlight Local Knowledge](#) [Create an Effective Message](#) [Help Them See the Issue](#)

HIGHLIGHT LOCAL KNOWLEDGE

Communication is a two-way street. Asking community members to share stories, experiences, and information helps them feel involved and keeps them engaged. Below are some techniques that can help them share their local perspectives.

Listening Session

A critical communication component includes hearing the perspectives of the target audience. A listening session is a helpful way to get community members to share their experiences and values with a planning team.

How One Community Used Listening Sessions to Discuss Coastal Hazard Concerns

The Albemarle-Pamlico Conservation and Communities Collaborative and Albemarle-Pamlico National Estuary Program hosted seven listening sessions with coastal North Carolina community members. Information was shared on population growth and sea level rise, but more importantly, the team listened to community members' reactions and strategies.

Questions participants answered:

1. What changes are you seeing and experiencing in your communities and in your environment?
2. What do you think the impacts of these changes will be on your community as they relate to sea level rise and population growth?
3. What do you think are some of the solutions to these issues?

See the [community members' responses](#) and learn more about the results.

Why This Worked

Stakeholders more readily believed facts and experiences related by community members and neighbors than by an "outsider."

Social Media

Social media encourages community members to share their thoughts and notifies them of important community information. Social media can also be used to link those who



About

Glossary

Resources

Short on resources?

To save time and money, consider using Twitter, Facebook, or SharePoint with your community. This can help you and the stakeholders get information to and from the community.

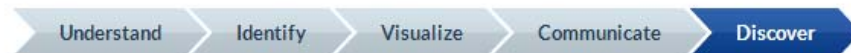
Coastal Inundation Toolkit



DIGITAL COAST
NOAA COASTAL SERVICES CENTER

Home About Data Tools Training Apply It Stories

Discover Coastal Inundation



MOVING FORWARD

You have the tools and the information. But [adaptation](#) planning for [inundation](#) still isn't easy. Seeing how other communities are addressing this issue can be very helpful. Below are a series of case studies that may generate some ideas of how a community can address inundation [risks](#).

Examples

[Engaging Communities in New Hampshire to Strengthen Resilience](#)

Partners in coastal New Hampshire are using the Roadmap approach as a framework for conducting hazard risk and vulnerability assessments throughout communities. One New Hampshire rural estuarine community came together during a series of interactive meetings to build momentum towards action. For more information on this effort, view [Building a Network of Champions in New Hampshire](#).

[Partners Build Capacity for Hazards Resilience in the Great Lakes](#)

Many national and local partners, including Digital Coast partners, have come together to provide hazards planning resources to communities throughout the Great Lakes.

[Community Works Together to Strengthen Resilience in Mississippi](#)

Local, state, and county leaders were brought together during a workshop to share stories about coping with natural and man-made hazards and to learn about helpful resources that are now available to strengthen resilience in their communities.

[Visualizing Flood Hazards with Residents and Floodplain Managers in Mississippi](#)

Local residents and floodplain managers in Biloxi, Mississippi, learned what their towns and neighborhoods could experience at various levels of sea level rise through potential flooding scenarios demonstrated using the [Sea Level Rise and Coastal Flooding Impacts Viewer](#).

[Managing Stormwater from Increased Heavy Rainfall \(Northeast Ohio\)](#)

Learn how communities in Northeast Ohio are better managing stormwater and encouraging residents to take action to help reduce flooding and improve their water quality.

[Using Green Infrastructure and Education to Reduce Stormwater Flooding \(Milwaukee, Wisconsin\)](#)

Read about how managers in the Milwaukee, Wisconsin, area are improving their stormwater system, incorporating green infrastructure, and educating residents to help reduce stormwater flooding.

About

Glossary

Resources

Learn More

[Find out what others are doing on climate change adaptation.](#)

[Learn more about protecting people and property rights.](#) (PDF)

Contribute a Story

To share a successful example of how a community, state, or region is addressing coastal inundation, or to provide other information that may be useful to users of this website, please contact Digital.Coast@noaa.gov.

Outline

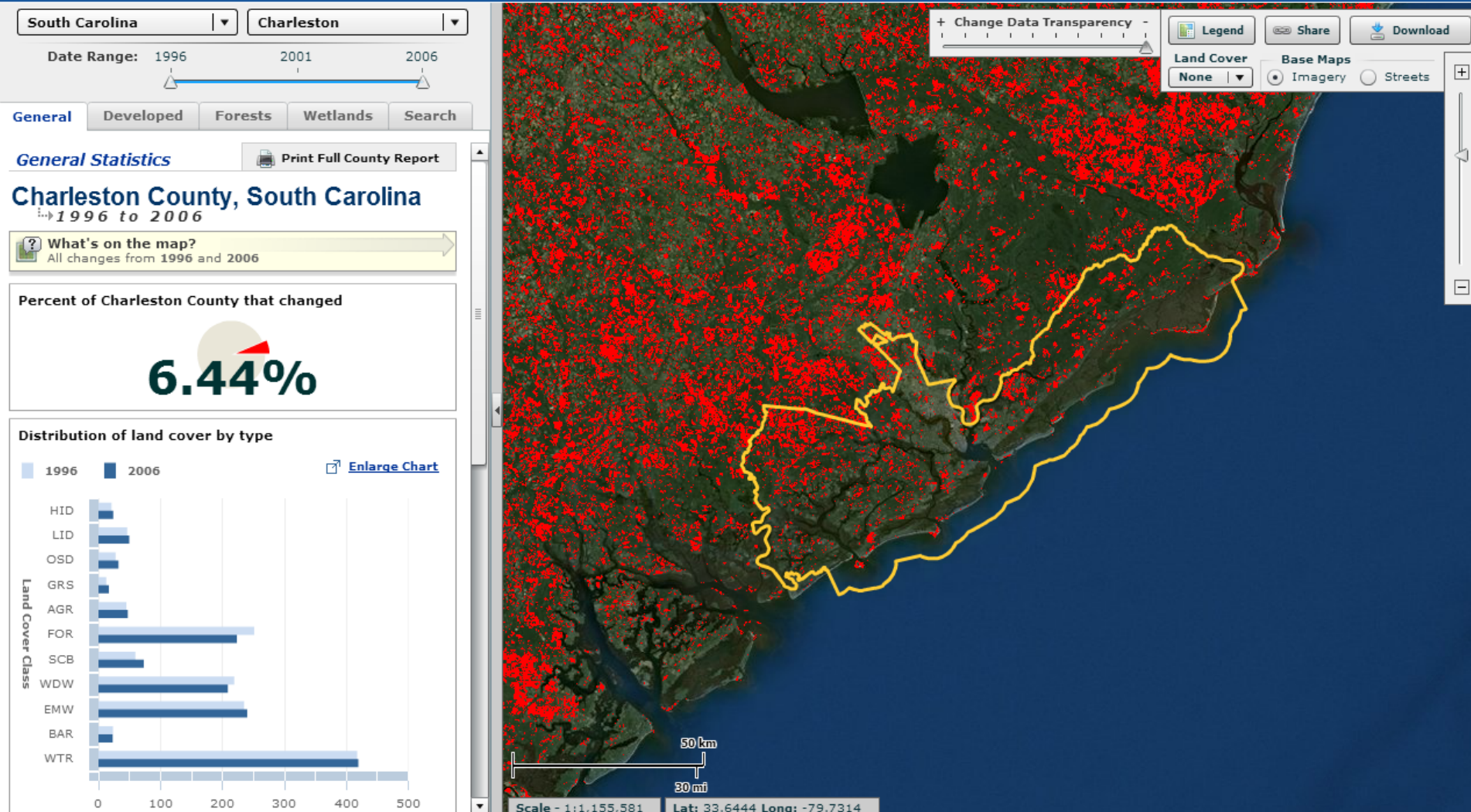
1. Welcome and Introductions
2. Digital Coast Overview
3. Coastal Hazards Resources
4. Coastal Ecosystem Resources
 - C-CAP Land Cover Atlas
 - Coastal Resilience Decision-Support Framework
5. Socioeconomic Considerations
6. Wrap-Up and Questions



C-CAP Land Cover Atlas

C-CAP Land Cover Atlas

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

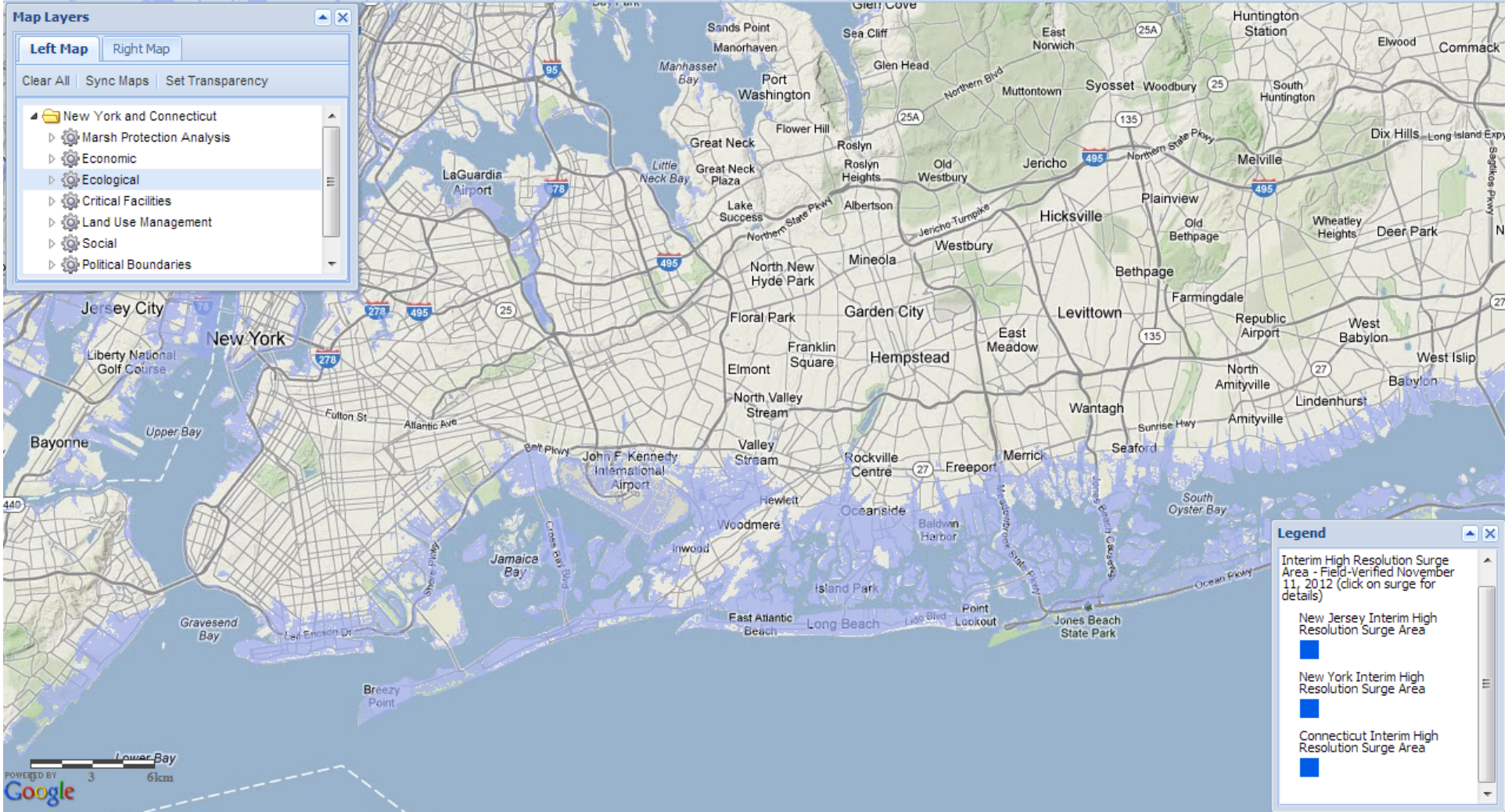


Coastal Resilience Decision Support

Coastal Resilience: New York and Connecticut



Map Layers | Legend | Change to Split View | Marsh Explorer | Flood Scenarios | Super Storm Sandy | Background | Help | Bookmark Link



LAT: 40.863 N LON: 73.713 W

Outline

1. Welcome and Introductions
2. Digital Coast Overview
3. Coastal Hazards Resources
4. Coastal Ecosystem Resources
5. **Socioeconomic Considerations**
 - Social Coast
 - ENOW Explorer
 - State of the Coast
 - Port Tomorrow
6. **Wrap-Up and Questions**



Social Coast



Home About Data Tools Training Apply It Stories

Social Coast

Using Social Science Data and Tools



What Are the Social Sciences and Social Science Data?

How Can Social Science Data Help Me?

Where Do I Get Started?

Get the data, tools, methods, and additional support for applying social science to coastal management issues.

[Learn More](#)

The Social Coast - data and tools to address the people side of complex coastal issues.

[Share your story](#) [Follow us on Twitter](#)

HIGHLIGHTED RESOURCES

[Social Coast Webinar](#)

This webinar will



[ENOW National Report](#)

Report and



[Econ 120](#)

A series of two-minute videos



ENOW Explorer



ENOW Explorer
NOAA Coastal Services Center

[Home](#) | [Resources](#) | [Download](#) | [Reset](#) | [Tips](#) | [Help](#)

[Clear All](#)

Single Year | **Change**
2005 | | | | | | | | | | 2010

Charleston County, SC | **South Carolina** | **Southeast** | **Coastal U.S.**

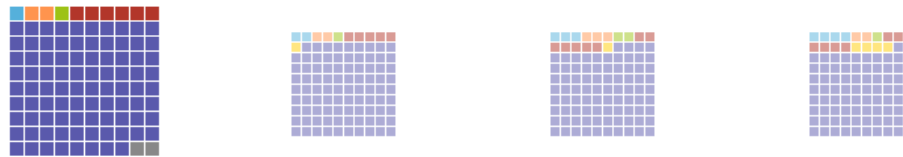
[Compare](#) [Clear](#) [Compare](#) [Clear](#) [Compare](#) [Clear](#)

Establishments

1,065



[Map It](#)

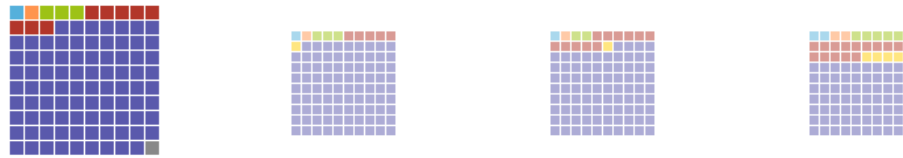


Employment

24,149



[Map It](#)

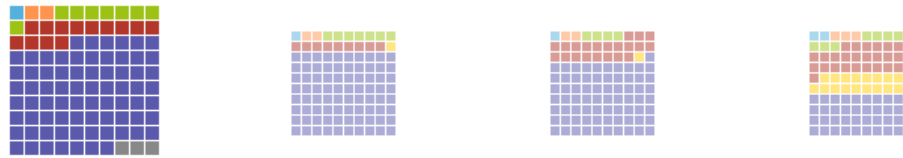


Wages

\$523.4 Million



[Map It](#)

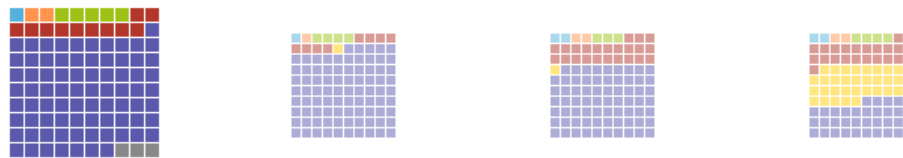


GDP

\$1.1 Billion



[Map It](#)



Indicators ?

Sectors ?

- All Ocean Sectors
- Living Resources
- Marine Construction
- Ship and Boat Building
- Marine Transportation
- Offshore Mineral Extraction
- Tourism and Recreation

State of the Coast



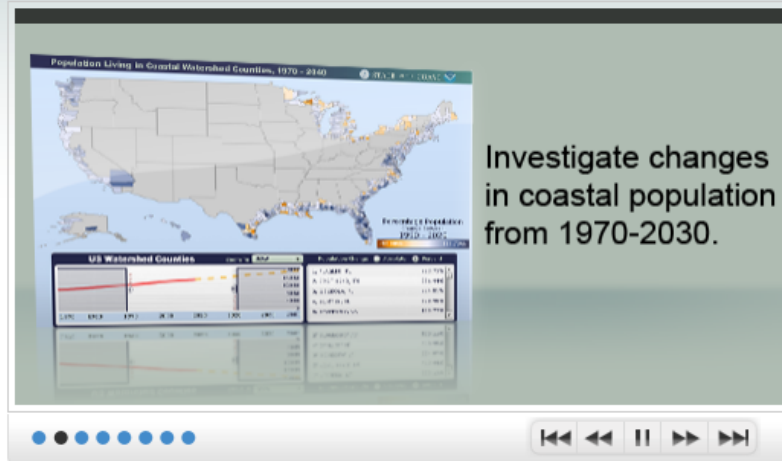
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
UNITED STATES DEPARTMENT OF COMMERCE

Search

NOAA'S STATE OF THE COAST

HOME ABOUT FEATURES COMMUNITIES ECONOMY ECOSYSTEMS CLIMATE

Our nation's coastal ecosystems are vital to our economy and quality of life; however, the health of these resources is in decline. Explore this site to gain a deeper appreciation of the connections among healthy coastal ecosystems, a robust U.S. economy, a safe population, and a sustainable quality of life for coastal residents... and the consequent need to better understand, manage, and protect our nation's coastal resources.



FEATURED



Southeast Regional Factsheet
Discover the Southeast's Coastal Communities, Economy, and Ecosystems



Coastal Population

Beach Closures

Water Use



Coastal Economy

Recreational Fishing

Commercial Fishing

Ports

Energy Production



Overall Coastal Health

Invasive Species

Coral Reefs

Nutrient Pollution and Hypoxia

Chemical Contaminants



Coastal Vulnerability

Population in the Coastal Floodplain

Federally-Insured Assets along the Coast

Port Tomorrow



Hazard Risks Checklist

Resilience Planning Tool

Does the port community collaboratively and proactively evaluate and address hazard risks to marine transportation system resources?

Hazard Threats

- Identify information and trends related to hazard risks and probabilities.
- Explore event histories and future outlooks for weather-related disasters (hurricanes, coastal storms, flooding), geological events (earthquakes, tsunamis), technology-related events (oil spills, chemical incidents), and chronic hazards (sea level rise, lake level variability, shoreline erosion).

Transportation Exposure

- Identify potential impacts of hazards on marine transportation system infrastructure and operations.
- Consider the location of transportation system assets such as port terminal facilities and equipment, road infrastructure, rail infrastructure and intermodal connections.
- Identify potential alternatives or contingencies for operating with impacts to high risk infrastructure.



Checklist



Port Profiles



Local Maps

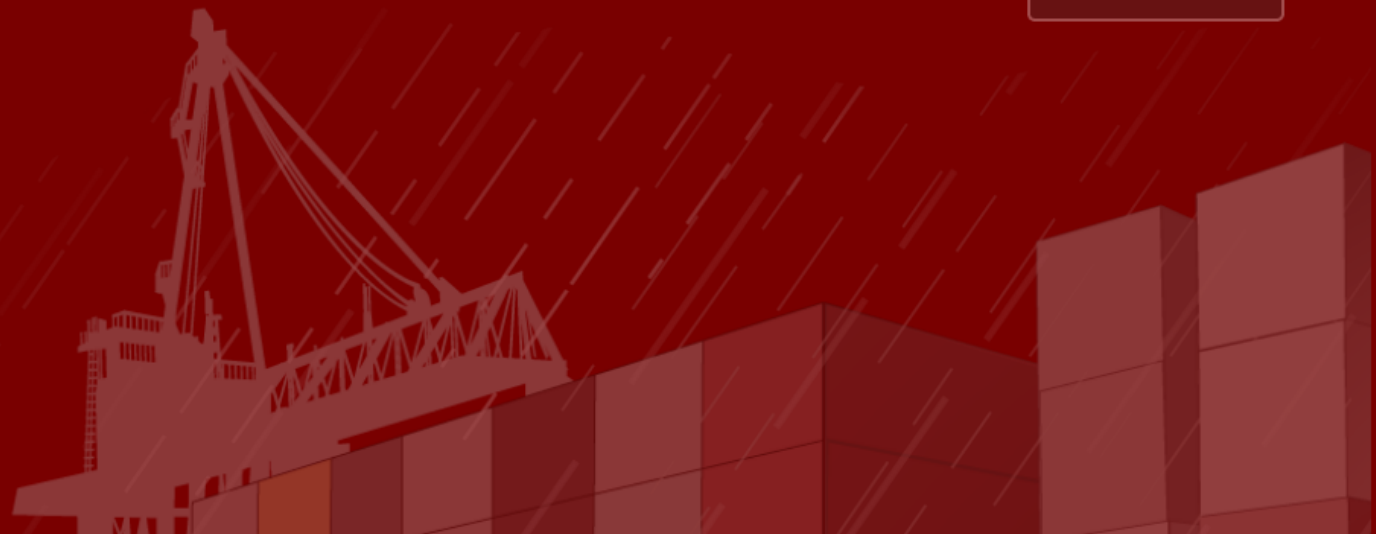


Local Story

Critical Infrastructure Exposure

- Identify potential impacts of hazards on critical community support infrastructure and facilities.
- Consider the location and exposure of community infrastructure assets such as water, wastewater, energy and solid waste, as well as critical support service facilities and routes for security, fire protection and medical services.
- Identify critical interdependencies potential consequences for marine transportation.

Related Data and References

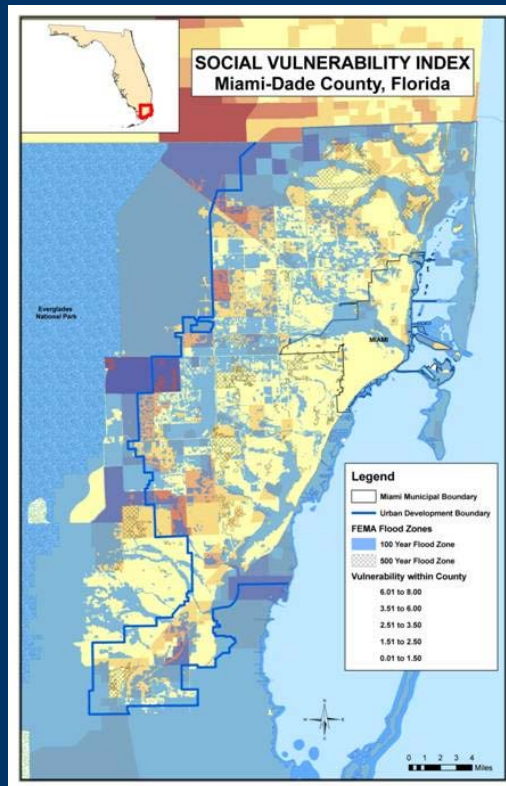


Outline

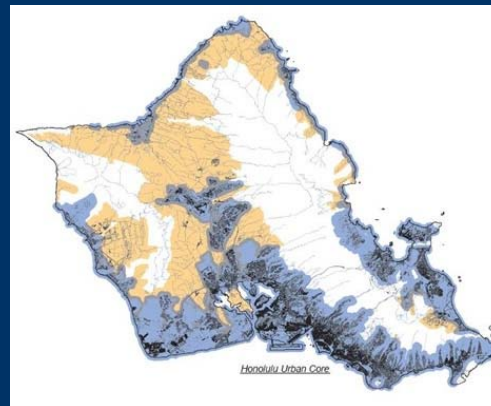
1. Welcome and Introductions
2. Digital Coast Overview
3. Coastal Hazards Resources
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5. Socioeconomic Considerations
6. **Wrap-Up and Questions**
 - Stories from the Field
 - Best Practices
 - For More Information



Stories from the Field: Planning for Resilient Communities



Miami-Dade, FL



Honolulu, HI



Long Island, NY



Best Practices

- Make geospatial information accessible to all levels of technical proficiency
- Focus on outcomes, not just data access
- Maintain community-focused approach: demonstrate how you listen and take action
- Build relationships with federal agencies to facilitate transparency in government
- Don't try to be everything to everyone



For More Information

The screenshot displays the NOAA Digital Coast website interface. At the top, the NOAA logo and 'DIGITAL COAST NOAA COASTAL SERVICES CENTER' are visible. A navigation menu includes 'Home', 'About', 'Data', 'Tools', 'Training', and 'In Action'. A left sidebar lists 'DATA', 'TOOLS', 'TRAINING', and 'IN ACTION'. The main content area features a 'TOP PICKS' section with links to Coastal Lidar, Coastal Change Analysis Program, Economics: National Ocean Watch, Electronic Navigational Charts, and Emergency Response Imagery. A 'More than just data...' section encourages users to explore data, tools, and training. A central banner for 'REGISTRATION WILL OPEN SOON' for 'COASTAL GEOTOOLS' is set for March 25 to 28, 2013, in Myrtle Beach, South Carolina, with a 'Get Data Now' button. Below this, a 'What's New' section lists recent updates under 'DATA', 'TOOLS', and 'STORIES FROM THE FIELD'. A 'WEBINARS' section highlights a December 5th webinar titled 'Dive into the Data: A Virtual Intro to the Ocean and Great Lakes Economy'. A 'NEWS FROM OUR PARTNERS' section includes articles from NACO and CNREP. A right sidebar contains social media links and a 'Subscribe' form.

www.csc.noaa.gov/digitalcoast

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