



# Digital Coast: Tools to Promote County Resilience

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## About the National Association of Counties

The National Association of Counties (NACo) is the only national organization that represents county governments in the United States. Founded in 1935, NACo provides essential services to the nation's 3,069 counties. NACo advances issues with a unified voice before the federal government, improves the public's understanding of county government, assists counties in finding and sharing innovative solutions through education and research, and provides value-added services to save counties and taxpayers money. For more information about NACo, visit [www.naco.org](http://www.naco.org).

NACo is continuing to build online resources to assist local communities to address and communicate about climate change impacts. If you are using the Digital Coast tools, we want to hear about your activities. Please contact NACo to share your experiences and comments to support our continued efforts to build resources for coastal managers.

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NACo would like to thank the NOAA Coastal Services Center and the Mississippi Coordinating Council for Remote Sensing and Geographic Information Systems for their support of this effort.

Additionally, NACo would like to thank the Digital Coast Partnership organizations:

American Planning Association (APA): [www.planning.org](http://www.planning.org)  
Association of State Floodplain Managers (ASFPM): [www.floods.org](http://www.floods.org)  
Coastal States Organization (CSO): [www.coastalstates.org](http://www.coastalstates.org)  
National Association of Counties (NACo): [www.naco.org](http://www.naco.org)  
National Estuarine Research Reserve Association (NERRA): [www.nerra.org](http://www.nerra.org)  
National States Geographic Information Council (NSGIC): [www.nsgic.org](http://www.nsgic.org)  
The Nature Conservancy (TNC): [www.nature.org](http://www.nature.org)  
Urban Land Institute (ULI): [www.uli.org](http://www.uli.org)





# Digital Coast:

## Tools to Promote County Resilience

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# Abstract

This report provides an overview of Digital Coast, a suite of tools to analyze and communicate about coastal natural resource management issues.

Developed by the National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center, with support from partnership organizations, Digital Coast tools compose an effective resource – at no additional cost – that enables county and local stakeholders to promote resilience, build knowledge and capacity, conduct public outreach and education and achieve local natural resource management goals. Digital Coast offers powerful tools to assist users in accessing data on coastal vulnerability, simulating projections of impacts, creating publishable visualizations and ‘snapshots’ of potential future scenarios, and more.

The National Association of Counties (NACo) and the NOAA Coastal Services Center, along with other stakeholder organizations, formed the Digital Coast Partnership in 2008 to support this program and ensure that local officials, planners, GIS practitioners, environmental experts, community leaders, land-owners and other stakeholders can access and use the Digital Coast products and services. Likewise, feedback and testing from the Digital Coast Partner organizations has helped inform and shape tool development. The Partnership’s mission is to improve coastal economies and ecological wealth by helping communities address their challenges with just, cost-effective and participatory solutions.

The report provides background on Digital Coast, highlights a recent educational forum in Mississippi, and describes specific tools to address needs in three main topic areas:

- Natural Resource Management and Habitat Restoration,
- Land Use and Planning, and
- Outreach and Communication.

Digital Coast tools described here include the Coastal Resilience Decision-Support Framework, Coastal Change Analysis Program (C-CAP) Land Cover Atlas, the Sea Level Rise (SLR) and Coastal Flooding Impacts Viewer, CanVis, Coastal County Snapshots Tool, and the Economics: National Ocean Watch (ENOW) tool.

Finally, the report closes with an exploration of emerging trends and public policy initiatives before concluding with a look at how counties can move forward with Digital Coast.

## IMPORTANT TERMS

|                   |  |
|-------------------|--|
| <b>C-CAP</b>      | Coastal Change Analysis Program                    |
| <b>ENOW</b>       | Economics: National Ocean Watch                    |
| <b>NCA</b>        | National Climate Assessment                        |
| <b>GDP</b>        | Gross Domestic Product                             |
| <b>GEO</b>        | Geospatial Education and Outreach Project          |
| <b>GIS</b>        | Geographic Information Systems                     |
| <b>NACo</b>       | National Association of Counties                   |
| <b>NGI</b>        | Northern Gulf Institute                            |
| <b>NOAA</b>       | National Oceanic and Atmospheric Administration    |
| <b>MDEM</b>       | Mississippi Digital Earth Model                    |
| <b>SLR Viewer</b> | Sea Level Rise and Coastal Flooding Impacts Viewer |

# Digital Coast: Serving our Coastal Communities

In the United States, over 450 counties are located directly on open ocean, the Great Lakes, major estuaries or in coastal floodplains.<sup>1</sup>

The Pacific Coast, Atlantic Coast, Great Lakes Coast and Gulf Coast form the coastal United States. According to the National Oceanic and Atmospheric Administration (NOAA), nearly 40 percent of Americans (123.3 million people) lived in counties directly on the shoreline in 2010, with 16.4 million additional people residing in the coastal floodplain.<sup>2,3</sup> Over the last 40 years, this population steadily increased at a higher growth rate than the national average.<sup>4</sup> In 2010, coastal counties – dependent on healthy coasts, water resources, and stable infrastructure – contributed more than 55 percent (\$8.3 trillion) to the national economy.<sup>5,6</sup>

Coastal counties require special natural disaster and ecosystem management considerations. Recent studies indicate coastal communities will experience the “most costly and most certain effects of a warming climate.”<sup>7</sup> Changes to water levels, temperatures, habitats and storm frequency events provide formidable challenges to local planners, officials and property owners.

**Many coastal communities may be hesitant to undertake new resilience planning efforts due to confusion about future impacts, perceived information limitations and uncertainty about planning for the future.** However, understanding change is essential to supporting economic stability and growth, managing natural resources and planning for natural disaster response.

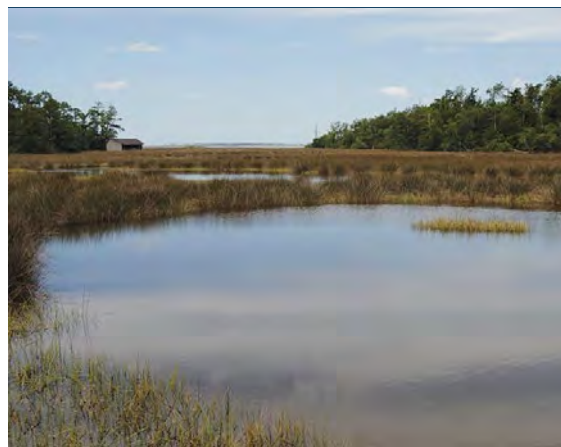
The National Association of Counties (NACo) has been working closely with partner organizations to develop coastal community support tools for coastal counties. In 2007, NACo surveyed local officials about coastal management issues facing their community. Sea level rise, coastal erosion, habitat changes and variation in lake levels emerged as major resiliency challenges.

Recognizing, among other issues, that many people need help turning data into useful decision-making guidelines, the Digital Coast Partnership was formed in 2008, bringing together NACo, NOAA, The Nature Conservancy (TNC), the American Planning As-

## DIGITAL COAST PARTNERS

- American Planning Association (APA)
- Association of State Floodplain Managers (ASFPM)
- Coastal States Organization (CSO)
- National Association of Counties (NACo)
- National Estuarine Research Reserve Association (NERRA)
- National Oceanic and Atmospheric Administration (NOAA)
- National States Geographic Information Council (NSGIC)
- The Nature Conservancy (TNC)
- Urban Land Institute (ULI)

sociation (APA), the Association of State Floodplain Managers (ASFPM), the Coastal States Organization (CSO), the National States Geographic Information Council (NSGIC), the Urban Land Institute (ULI), and the National Estuarine Research Reserve Association (NERRA) (see box above; note that ULI, CSO, and NERRA joined the partnership in 2012.). The Digital Coast Partnership has been supported in part by the Mississippi Coordinating Council for Remote Sensing and Geographic Information Systems.



*National Seashore wetland  
Source: Larissa Graham, the Grand Bay National Estuarine  
Research Reserve*

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This partnership works in tandem with the Digital Coast website. In addition to providing access to free data, this website provides several no-cost, user-driven technical tools for planners, local officials, landowners and more, helping them better understand climate change impacts and mitigate its effects. Additional resources and tools beyond the scope of this report can be found at the Digital Coast website: [www.csc.noaa.gov/digitalcoast](http://www.csc.noaa.gov/digitalcoast).

Though issues and stakeholders will fluctuate across regions, all coastal counties need support in managing their coastal resources. Digital Coast provides relevant coastal data, interactive tools, visualizations, case studies and training. This report highlights tools for managers of coastal natural resources (including coastal planners and officials), private landowners, developers and economic development authorities. Additionally, emergency and natural disaster responders can improve their services with these tools (see right box).

The next section provides an overview of one outreach effort to expand and support Digital Coast use by spotlighting a recent forum held in Mississippi. The report then discusses challenges identified at the forum, offering corresponding Digital Coast tools to address them. The final section highlights emerging needs and trends for coastal communities and next steps for Digital Coast.

### DIGITAL COAST STAKEHOLDERS

- County officials and appointees
- Managers of coastal natural resources (including coastal planners and officials)
- Private landowners and developers
- Economic development authorities
- Emergency and natural disaster responders
- Educators and students



# 2012 Mississippi Forum

With six counties either on the coast or in the coastal watershed, the State of Mississippi has taken substantial steps to understand vulnerabilities and encourage resilience planning.

To support utilization of Digital Coast tools, the state sponsored a one and a half day workshop for coastal officials, planners and stakeholders. The event, which took place in Biloxi, Mississippi, provided an opportunity for participants to

- identify key concerns and vulnerabilities,
- share natural hazards coping strategies, and
- learn about available resources.

All of the Digital Coast Partnership organizations (listed on page 5) participated in the forum, along with the NOAA Coastal Services Center, Mississippi State University, the Northern Gulf Institute (NGI) and NACo. (Please see the list of full participants in the appendix.) In an effort to improve communication of coastal

watershed risks and hazards, participants and organizers shared photos of high water marks, storm damage and maps of damaged areas. After group discussion, it was determined that data (including historical information), aerial imagery, utility data and communication tools were primary needs. After identifying these needs, participants and organizers discussed strategies to address those needs using available tools from Digital Coast and the Mississippi Digital Model (MDEM) (see SPOTLIGHT).

The forum increased awareness of Digital Coast and the Mississippi Digital Earth Model (MDEM), improving user confidence with detailed demonstrations. Participants received overviews of available tools, including Coastal Resilience Framework; Economics: National Ocean Watch (ENOW); Sea Level Rise (SLR) Viewer; and Coastal County Snapshots (all detailed in the following sections).

## OUTCOMES FROM THE MISSISSIPPI FORUM

### Reported resiliency challenges:

- Challenges supplying goods post 'event' (restoring power, moving supplies)
- Community resistance to change
- Lack of communication and coordination
- Economic and fiscal limitations
- Insurance increases cost-prohibitive for redevelopment
- Recovering from catastrophic events such as hurricanes and the 2010 Deepwater Horizon BP oil spill

### Identified paths to resiliency:

- Maintaining and expanding green infrastructure
- Adequate financial and data resources
- Clear communication with other levels of government
- Technical resources for analysis

## SPOTLIGHT: MISSISSIPPI DIGITAL EARTH MODEL (MDEM)

The **Geospatial Education and Outreach (GEO)** Project is an effort to provide geospatial education and data to Mississippi residents. The program provides workshops and educational support from introductory to advanced topics. Internally developed courses are offered at no cost to Mississippi local and state government employees. Additionally, follow-up support and implementation assistance is available.

The **Mississippi Geospatial Clearinghouse (MSC)** provides access to spatial GIS data resources of Mississippi and the Gulf region. The MSC aims to improve efficiency in acquiring and applying spatial data by enhancing distribution, capacity, and coordination. The **Mississippi Digital Earth Model (MDEM)** provides an intuitive interface for users to explore various attributes and view data.

### STATE LEADERSHIP IN ACTION

In 2003, the Mississippi Legislature passed a bill establishing the Mississippi Coordinating Council for Remote Sensing and Geographic Information Systems and charged the state's Department of Environmental Quality with managing development of state digital computer model system. With expertise and leadership from Mississippi State University, this effort led to the creation of the Mississippi Digital Earth Model, along with capacity building funding to provide free education to make the tools accessible and widely implemented. In this way, state leadership stepped in to address local needs that may not be addressed by the Digital Coast.



*Destroyed beach houses in the aftermath of Hurricane Sandy, November 4, 2012 in Far Rockaway, NY.*

# Digital Coast Tools in Action

Coastal county officials and staff face unique development and natural disaster concerns.

Of the 22,000 miles of oceanic coasts in the United States, NOAA classified 50 percent as having either 'High' or 'Very High' levels of vulnerability in 2011.<sup>8</sup> Vulnerability levels can range substantially between locations. In contrast, 100 percent of Mississippi's 191 miles of coast were classified as High (16 percent) or Very High (83 percent) vulnerability that same year.<sup>9</sup> Identifying, understanding, and visualizing location-specific vulnerabilities empowers decision-makers to educate the public, create effective policy and plan for sustainable land use and development.

## **NATURAL RESOURCE MANAGEMENT AND HABITAT RESTORATION**

Changing climate, weather uncertainty and extreme events leave habitats vulnerable and difficult to restore. Because these problems have continued to emerge and capture more attention, few communities have put sufficient management plans into place to mitigate new threats. For example, sea level rise-induced erosion will change natural and built environments on both public and private lands. These changes can further weaken the natural resilience of cer-

tain ecosystems, causing more extreme erosion or losses during storm events. Managing ecological and socioeconomic risks today will lessen immediate and long-term impacts at the community and regional level.

## **Digital Coast Tool:** **Coastal Resilience Decision-Support Framework**

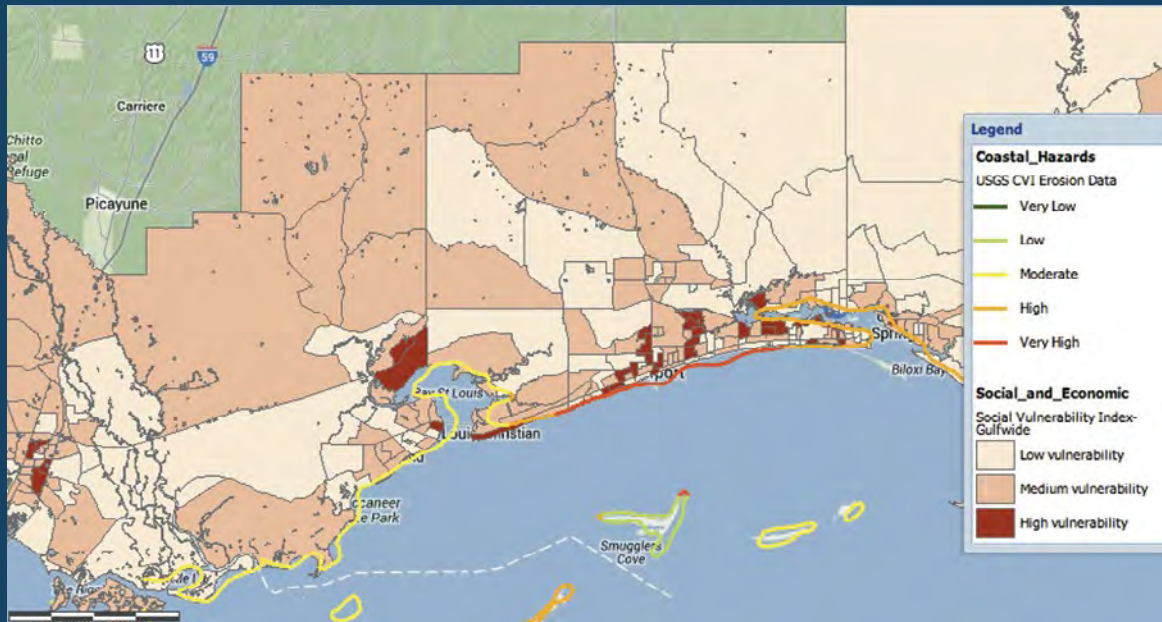
**WHO SHOULD USE THIS TOOL:** Planners, decision makers, natural resource managers

**WHAT THIS TOOL COVERS:** Coastal planning, zoning, land acquisition, ecological conditions, critical habitats, human communities at risk, erosion, sea level rise, oil spills, socioeconomic indicators, infrastructure

Created by The Nature Conservancy (TNC), the Coastal Resilience Decision-Support Framework supports conservation and restoration decisions with a four-step approach: 1) Raise Awareness, 2) Assess Risk, 3) Identify Choices, and 4) Take Action.



**FIGURE 1.**  
**VIEWING COASTAL MISSISSIPPI COUNTIES WITH THE COASTAL RESILIENCE DECISION-SUPPORT FRAMEWORK**



*Hazard coastal erosion is highlighted in the colored lines whereas the colored land mass indicates level of social and economic vulnerability.*

The tool can inform decisions related to coastal planning, zoning and land acquisition. Users create interactive maps that show a range of indicators, from storm surges and erosion to high-risk areas and social vulnerability. Because the maps are interactive, every community can adjust the indicators to show the most critical issues that affect or threaten to affect them.

The tool incorporates ecologic, social and economic indicators to establish relationships between these variables. It highlights current ecological conditions and critical habitats, habitat loss, potential future loss due to natural disasters, and human communities most at risk from this loss. The framework sources information from the U.S. Geological Service (USGS) erosion data, Habitat Migration and Sea Level affecting Marshes Model (SLAMM), oil spill data, employment data, socioeconomic data, infrastructure and a social vulnerability index.<sup>10</sup>

TNC’s Coastal Resilience Decision-Support Framework is available for New York and Connecticut, the Gulf of Mexico, the Florida Keys, Puget Sound, Southern California and the U.S. Virgin Islands. For learning tools see [www.csc.noaa.gov/digitalcoast/tools/coastalresilience](http://www.csc.noaa.gov/digitalcoast/tools/coastalresilience).

**LAND USE AND INFRASTRUCTURE PLANNING**

In 2012, the National Climate Assessment, conducted by the U.S. Global Change Research Program, confirmed climate change impacts will significantly threaten coastal energy and water systems, transportation infrastructure and public

health and safety.<sup>11</sup> However, development of naturally resilient ecosystems (such as coastal wetlands) increases vulnerability by replacing the natural with the built environment. Between 2004 and 2009, an estimated 84,100 acres of intertidal wetlands and 276,160 acres of fresh and saltwater wetlands disappeared in the United States.<sup>12</sup>

As natural disasters and sea level continues to threaten coastal communities, land use and infrastructure planning must incorporate new data into adaptation, land use and development.

**Digital Coast Tool: Coastal Change Analysis Program (C-CAP) Land Cover Atlas**

**WHO SHOULD USE THIS TOOL:** Coastal managers, planners, decision makers, public communicators

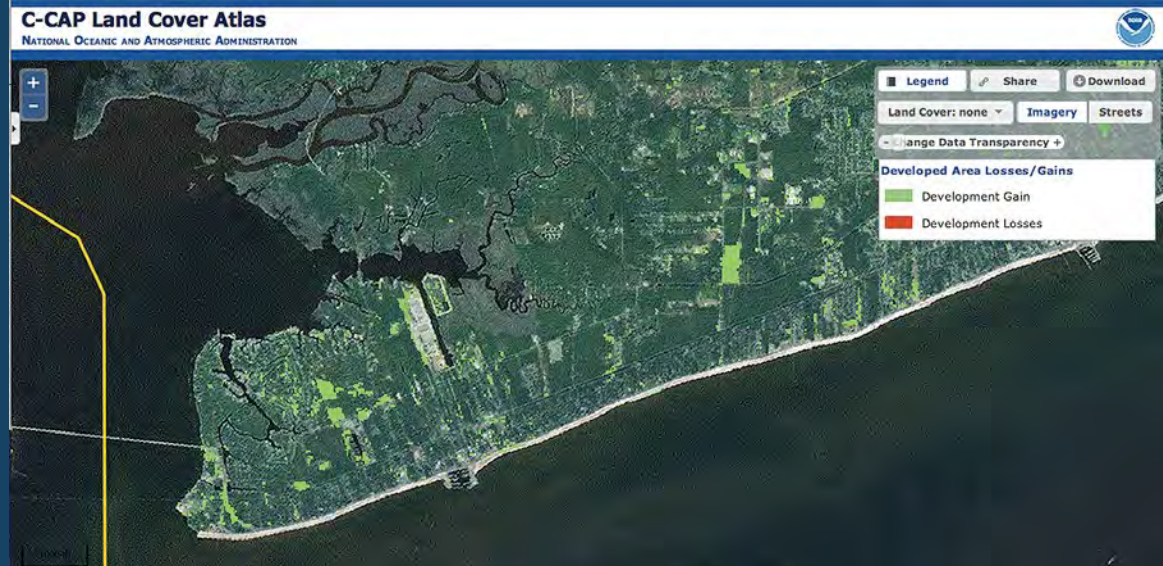
**WHAT THIS TOOL COVERS:** Land cover over time, wetland loss over time, development

Land cover data allows coastal managers to understand current status and past trends in land cover. Digital Coast’s C-CAP tool provides county analysis of the size, shape and variables of land features in order to develop planning and strategies. Importantly, the tool does not require advanced technical expertise in geographic information software (GIS), but instead processes data and provides easy-to-understand graphics.

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**FIGURE 2.**

**COASTAL CHANGE ANALYSIS PROGRAM (C-CAP) SHOWS GROWING DEVELOPMENT IN HARRISON, MISSISSIPPI FROM 1996-2006**



This tool currently provides regional land cover and land use change data for the years 1996, 2001 and 2006; additional data and updates will be added as they become available. By viewing changes over time, users can quickly understand land use change over time (see Figure 2). The Land Cover Atlas allows users to query specific land use cover changes, producing summary reports and supporting data tables to aid in communication and decision-making. This can be particularly useful for making difficult zoning and long-term planning decisions on damaged properties. An educational webinar, prepared by NOAA, is available online here: [www.csc.noaa.gov/digitalcoast/webinar/archive](http://www.csc.noaa.gov/digitalcoast/webinar/archive) to learn more about this tool.

#### **OUTREACH AND COMMUNICATION**

When providing feedback to NACo at the April 2012 forum, officials, planners, and other decision-makers expressed a need for communication tools that will allow them to more effectively address coastal community issues. Limited public understanding of coastal risks can slow efforts to protect long-term economic and ecological health. To combat these difficulties, Digital Coast provides a number of tools specifically focused on supporting counties' communication efforts, both internally and with the public.

### **Digital Coast Tool: Sea Level Rise (SLR) and Coastal Flooding Impacts Viewer**

**WHO SHOULD USE THIS TOOL:** Coastal managers, planners, decision makers, and public communicators

**WHAT THIS TOOL COVERS:** Land cover use over time, wetland loss over time, impacts on development, public outreach and communication

Scientists expect the frequency and impact of coastal flooding to continue to increase.<sup>13</sup> Recent estimates suggest that sea level rise will be somewhere between 0.6 to 2.0 feet by the year 2100.<sup>14</sup> Coastal managers need help determining flood vulnerability and appropriate steps to reduce risk. Digital Coast's SLR and Coastal Flooding Impacts Viewer help managers interpret this impact with visualizations and useful data. With map elevation data and incorporating hydrodynamic modeling of ocean surface changes, coastal inundation threats can be discerned. Users are able to adjust the degree of sea level rise, examining how and where tidal flooding will occur at higher sea levels. The tool can also overlay social and economic data to show potential development and infrastructure impacts, highlighting at-risk businesses and neighborhoods. Additionally, this tool models the potential impact to wetland features as a result of the chosen SLR scenario.

Participants in the Mississippi Forum identified many applications for this tool including land use planning, zoning, legislation development and transportation

**FIGURE 3.**  
**DIGITAL COAST'S CANVIS TOOL IN ACTION**



CanVis shows 'Before' and 'After' a shoreline softened with green infrastructure for Maryland's Department of Natural Resources

infrastructure planning. The SLR visualizations isolate high-risk areas so that appropriate land acquisition and adaptation tactics can be launched as soon as possible. Digital Coast provides this informational video for first time SLR Viewer users, while this recorded webinar provides more in-depth instruction.

## Digital Coast Tool: CanVis

**WHO SHOULD USE THIS TOOL:** Coastal managers, planners, decision makers, public communicators

**WHAT THIS TOOL COVERS:** Sea level rise, coastal inundation, green and grey infrastructure, visual impediments, planning, public communication and outreach

Digital Coast's CanVis creates some of the images for the SLR Viewer, but is also a stand-alone tool. The software allows users to input digital images and use the existing library of objects to create before and after photos of different scenarios. The tool creates an image of a selected variable, such as sea level rise, on a familiar landmark, structure or location (see Figure 3). Users of CanVis have simulated sea level rise, wind turbines installation, urban streetscapes, and green infrastructure projects (see CanVis in Action). These visualizations provide powerful tools for use in public meetings, planning sessions and grant applications.

This tool is available for free download online, along with a variety of support tools (located online here: [www.csc.noaa.gov/digitalcoast/tools/canvis/support/tools](http://www.csc.noaa.gov/digitalcoast/tools/canvis/support/tools)).

## SPOTLIGHT: SHOPPING CENTER HAZARDS EXHIBIT AT BILOXI, MS (HARRISON COUNTY)

In partnership with the Coastal Hazard Outreach Strategy Team (C-HOST), the Mississippi-Alabama Sea Grant Consortium set up a hazard outreach exhibit at Edgewater Mall in Biloxi, Mississippi. Using the SLR Viewer, among other Digital Coast tools, project organizers demonstrated potential flooding impacts on local residents, private property owners and floodplain managers. Using a large screen at the exhibit site, participants could see areas of their town and community impacted by different sea level rise scenarios.

### RESULTS

Twelve local coastal managers and dozens of community members participated in this event, zooming into specific neighborhoods of interest for the individuals. The event increased awareness of the tool for the floodplain managers, as well as for use by private residents. Additionally, the activity increased awareness of sea level impacts, shifting from abstract notions to clearly visualized science-based predictions.



## Digital Coast Tool: Coastal County Snapshots Tool

**WHO SHOULD USE THIS TOOL:** Coastal managers, planners, decision makers, public communicators

**WHAT THIS TOOL COVERS:** Ocean jobs, wetland benefits, and flood risk

Though reliable data is increasingly available, the ability to produce simple and easy-to-understand charts and graphs remain a challenge. The Coastal County Snapshots Tool creates useful ‘snapshots’ of demographic, infrastructure, and land-use development data.

This easy-to-use tool allows users to select a county from a map of the United States, from which the software creates a breakdown of three snapshot options:

- Flood Exposure,
- Wetland Benefits, or
- Ocean and Great Lakes Jobs.

Flood exposure and wetlands benefits are created with a variety of different data sets while ocean jobs is a highly detailed single data set tailored to provide information geared towards counties. The Coastal County Snapshots Tool allows users to tell a story about their county using this data.

The Ocean and Great Lakes Jobs snapshot uses nationally available data from the coastal services center that is tax-based (though it does not capture self-employed). See **Digital Coast Tool: Economics: National Ocean Watch (ENOW) Data** later in this report for more information.

The Wetland Benefits snapshot provides data on wetland economic value by highlighting businesses’ output related to wetland function. The snapshot provides a glimpse into wetlands’ ability to reduce flooding impacts in the floodplain and improve water quality. This snapshot links to a highly functional ArcGIS map that allows users to zoom in to a finer resolution.

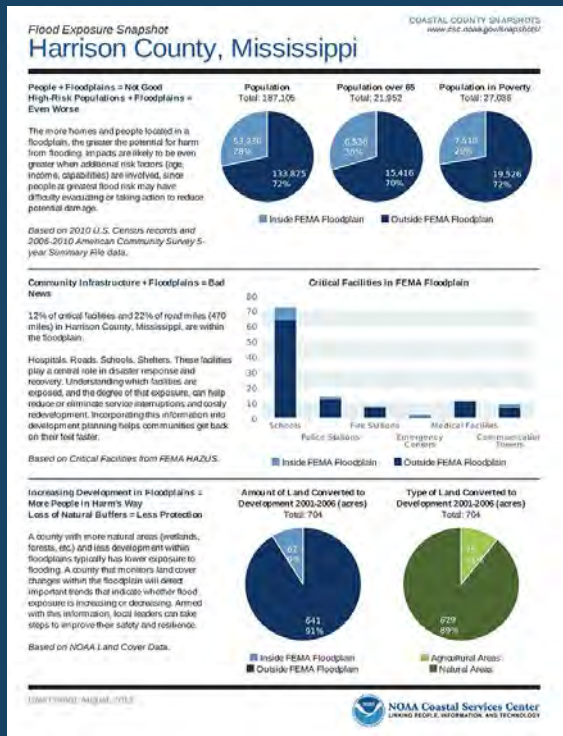
Finally, the Flood Exposure snapshot shows a breakdown of population (total population, population in poverty, and population over 65), critical facilities (such as hospitals, schools, and fire stations), and the amount and type of land developed in the floodplain (see Figure 5). This snapshot combines multiple data sets on the population and infrastructure within the floodplain, using the Federal Emergency Management Agency (FEMA) maps to identify flood boundaries. Finally, the snapshot identifies ‘Next Steps’ and provides a list of resources for further research and analysis.

For further information on using this tool, see this webinar developed by NOAA, located online here: [www.csc.noaa.gov/digitalcoast/webinar/archive](http://www.csc.noaa.gov/digitalcoast/webinar/archive).

**FIGURE 4.**  
**THREE COASTAL COUNTY SNAPSHOT TYPES**

| SNAPSHOT                   | FLOOD ZONES | LAND COVER | DEMOGRAPHICS | ECONOMICS | INFRASTRUCTURE | AVAILABLE COUNTIES |
|----------------------------|-------------|------------|--------------|-----------|----------------|--------------------|
| Flood Exposure             | ✓           | ✓          | ✓            |           | ✓              | 342                |
| Ocean and Great Lakes Jobs |             |            |              | ✓         |                | 448                |
| Wetlands Benefits          | ✓           | ✓          |              | ✓         |                | 342                |

**FIGURE 5.**  
**COUNTY FLOOD EXPOSURE SNAPSHOT TOOL**  
**HIGHLIGHTING HANCOCK COUNTY, MS**



**COUNTY FLOOD EXPOSURE SNAPSHOT TOOL**  
**HIGHLIGHTING HANCOCK COUNTY, MS**



**CASE STUDY:**  
**RED CROSS STORIES FROM THE FIELD COASTAL**  
**RESILIENCE PLANNING WITH COASTAL COUNTY**  
**SNAPSHOTS: FLOOD EXPOSURE DATA**

In the coastal Gulf, Louisiana and Mississippi are vulnerable to a combination of hazards from both natural sources and the built environment. Additionally, many communities have higher than average percentages of vulnerable residents based on income, disability, age and other factors requiring additional assistance in event occurrences. Because of its role in emergency response, the Red Cross is actively engaging residents in the response and recovery process. This enhances community resilience with improved knowledge of local hazards and by communication with residents.

**Results**

In this process, the Red Cross is using the Coastal County Snapshots Flood Exposure Tool to visually communicate hazard event vulnerability. By using the socioeconomic features of this tool, the Red Cross can highlight data on elderly and impoverished residents residing in a floodplain as well as numbers of critical facilities. This information provides important context in planning and recovery efforts.



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## Digital Coast Tool: Economics: National Ocean Watch (ENOW) Data

**WHO SHOULD USE THIS TOOL:** Coastal managers, planners, decision makers, public communicators

**WHAT THIS TOOL COVERS:** Establishments, employment, wages, GDP, living resources, marine construction, marine transportation, offshore mineral resources, ship & boat building, tourism & recreation

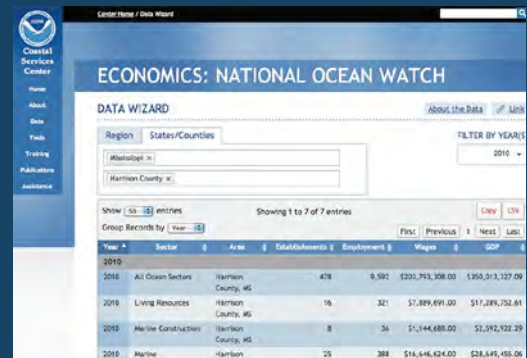
The Gulf Coast alone holds over 500,000 coastal related jobs and creates nearly \$100 billion in gross domestic product (GDP).<sup>15</sup> The ENOW tool uses the same socioeconomic data as the Coastal County Snapshots tool described above, for four economic indicators: establishments, employments, wages and gross domestic product.

Understanding the size and composition of coastal economic activity helps governments, businesses, and individuals better manage the natural resources these jobs depend on. NOAA's Coastal Services Center produces this with data from the Bureau of Labor Statistics (BLS) and the Bureau of Economic Analysis. Data are available for the nation, eight regions, 30 coastal states and 402 counties.

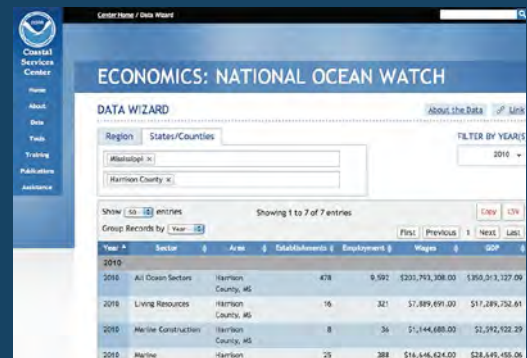
ENOW identifies economic activities within six main sectors: living resources, marine construction, marine transportation, offshore mineral resources, ship and boat building, and tourism and recreation. Because these vary significantly between local communities, ENOW allows users to cross-compare economic activity on the county, state and national level. One feature of the ENOW tool, the ENOW Explorer generates charts representing how much of a county's economy is sourced from coastal resources. It also provides side-by-side comparisons of same scale geographies (for example, county with county). Finally, the interactive tool can show changes over time with annual data from 2005 to 2010.

Finally, the ENOW Data Wizard creates easy to interpret results of the geographic and temporal scope used in the original ENOW tool (see Figures 6 and 7). The feature allows a user to quickly determine a county's contribution in terms of employment, establishments, wages and GDP to the state and/or national economy.

**FIGURE 6.**  
ENOW EXPLORER HIGHLIGHTING THE  
STATE OF MISSISSIPPI



**FIGURE 7.**  
ENOW DATA WIZARD FOR HARRISON  
COUNTY, MISSISSIPPI



## STORIES FROM THE FIELD: DIGITAL COAST IN ACTION

Digital Coast's *Stories from the Field* is a repository of various applications of Digital Coast tools. It features exciting examples of groups working together, advancing goals, addressing issues, and pooling resources with improved information and emboldened outreach tactics.

Hundreds of approaches, graphics, and results are featured on an interactive map and listed by topic. Examples come from all four U.S. coasts, just a few are below:

- Analyzing the Impacts of Hurricane Katrina on Forest Ecosystems
- Examining Flood Exposure Data along the Mississippi and Louisiana Coasts
- Adapting to Sea Level Rise in Miami-Dade County, Florida
- Assessing Hazard Vulnerability and Resilience in Coastal Communities of the Delaware Bay



# Emerging Needs and Trends

Effective coastal resilience requires communication among a wide range of individuals.

Stakeholders can both understand and participate in discussions of flood vulnerability, ecosystem resilience and sustainable development.

When discussing additional needs from Digital Coast, users suggested:

- Expanding future sustainable development scenarios (for example showing positive results from protecting vulnerable land);
- Refining the scale of some tools to reach municipalities and individual lots; include insurance information, utilities and service providers;
- Greater connectivity between the information scales; and
- Peer-learning opportunities and network for support and sharing best practices.

Since not all of these may be feasibly included in Digital Coast, users can also turn to Stories from the Field (see Box 7) to learn about best practices and connect with organizations that have found solutions to meet their needs. Moving forward, Digital Coast aims to support counties in addressing challenges by working closely with counties to incorporate feedback and improve tools with county needs in mind.

## **PUBLIC POLICY**

Effective adaptation and mitigation will require participation from all levels of government. Digital Coast can be used on the local, state and national level to address coastal resiliency concerns. As this report shows, some states and counties are taking the lead. Mississippi sponsored the forum discussed earlier wherein participants were shown where to access data, how to use the tools and whom to consult for future questions. Not only does Mississippi showcase solid partnership engagement, but it is also taking proactive steps to improve resilience through the Digital Coast.

Using the Digital Coast, all levels of government may be equipped to create reports and develop project proposals with standardized data and imagery. As states take action to improve resilience, local planning will remain indispensable for actualizing efficient use of funds and addressing specific community needs. While communication among states, counties, regions and cities continues to be a challenge, the Digital Coast helps to bridge that gap by increasing familiarity of the issues, leveraging shared information and promoting efficiency.

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Digital Coast:  
Tools to Promote  
County Resilience

# Counties Moving Forward with Digital Coast

Especially because of budget challenges and natural disaster uncertainty, counties can leverage Digital Coast's flexible resources to address economic development, public health and environmental concerns.

More than just a tool, Digital Coast is a collaborative community. Users should feel empowered to reach out, receive support, provide feedback and seek training and technical skills to enhance community health and resilience. Development of these tools is largely based on feedback from user needs and experiences. Involvement with Digital Coast gives county staff and officials access to available tools, while their feedback to Digital Coast improves tools for future usability and applicability. In all, Digital Coast tools empower county leaders to forge ahead in reaching their resiliency goals.

NACo aims to help counties move forward with Digital Coast to meet their coastal resiliency needs and improve resiliency in their communities. Counties can contact Digital Coast or NACo to learn about upcoming training opportunities and tool advancements (see contact info on inside cover). Additionally, counties should consider reaching out to their state's county associations to leverage Digital Coast resources and achieve broader regional and state level goals that directly impact counties.





## DIGITAL COAST PARTNERSHIP ORGANIZATIONS

- American Planning Association (APA): <http://www.planning.org/>
- Association of State Floodplain Managers (ASFPM): <http://www.floods.org/>
- Coastal States Organization (CSO): <http://www.coastalstates.org/>
- National Association of Counties (NACo): <http://www.naco.org>
- National Estuarine Research Reserve Association (NERRA): <http://nerra.org/>
- National States Geographic Information Council (NSGIC): <http://www.nsgic.org/>
- The Nature Conservancy (TNC): <http://www.nature.org/>
- Urban Land Institute (ULI): <http://www.uli.org/>

## FURTHER RESOURCES

- Adapting to Sea Level Rise in Miami-Dade County, Florida: <http://www.csc.noaa.gov/digitalcoast/stories/slr-miamidade>
- Analyzing the Impacts of Hurricane Katrina on Forest Ecosystems: <http://www.csc.noaa.gov/digitalcoast/stories/katrinaforest>
- Assessing Hazard Vulnerability and Resilience in Coastal Communities of the Delaware Bay: <http://www.csc.noaa.gov/digitalcoast/stories/delawarebay>
- CanVis: <http://www.csc.noaa.gov/digitalcoast/tools/canvis>
- CanVis download and support tools: <http://www.csc.noaa.gov/digitalcoast/tools/canvis/support/tools>
- Coastal Change Analysis Program (C-CAP) Land Cover Atlas: <http://www.csc.noaa.gov/digitalcoast/tools/lca/>
- Coastal Change Analysis Program (C-CAP) webinar: [https://noaacsc.adobeconnect.com/\\_a1005979616/p6myf2ofrue/?launcher=false&fcsContent=true&pbMode=normal](https://noaacsc.adobeconnect.com/_a1005979616/p6myf2ofrue/?launcher=false&fcsContent=true&pbMode=normal)
- Coastal County Snapshots Tool: <http://www.csc.noaa.gov/digitalcoast/tools/snapshots/>
- Coastal Resilience Decision-Support Framework: <http://www.csc.noaa.gov/digitalcoast/tools/coastalresilience>
- Coastal Resilience Planning with Coastal County Snapshots: Flood Exposure Data: <http://csc.noaa.gov/digitalcoast/stories/flood-exposure>
- Digital Coast: <http://www.csc.noaa.gov/digitalcoast/>
- Digital Coast SLR informational video: [http://www.csc.noaa.gov/digitalcoast/\\_/video/SLV\\_first\\_time\\_tips/story.html](http://www.csc.noaa.gov/digitalcoast/_/video/SLV_first_time_tips/story.html)
- Digital Coast SLR webinar: [https://noaacsc.adobeconnect.com/\\_a1005979616/p3h5x2ubnkc/?launcher=false&fcsContent=true&pbMode=normal](https://noaacsc.adobeconnect.com/_a1005979616/p3h5x2ubnkc/?launcher=false&fcsContent=true&pbMode=normal)
- Digital Coast webinar series: <http://www.csc.noaa.gov/digitalcoast/webinar/archive>
- Economics: National Ocean Watch (ENOW) Data: <http://www.csc.noaa.gov/digitalcoast/data/enow>
- Economics: National Ocean Watch (ENOW) Explorer: <http://www.csc.noaa.gov/digitalcoast/tools/enow>
- Economics: National Ocean Watch (ENOW) webinar: [https://noaacsc.adobeconnect.com/\\_a1005979616/p8rikazsmm8/?launcher=false&fcsContent=true&pbMode=normal](https://noaacsc.adobeconnect.com/_a1005979616/p8rikazsmm8/?launcher=false&fcsContent=true&pbMode=normal)
- Examining Flood Exposure Data along the Mississippi and Louisiana Coasts: <http://www.csc.noaa.gov/digitalcoast/stories/flood-exposure>
- Geospatial Education and Outreach (GEO) Project: <http://www.geospatial.msstate.edu/>
- Mississippi Coordinating Council for Remote Sensing and Geographic Information Systems: <http://www.giscouncil.ms.gov/gis/gis.nsf>
- Mississippi Digital Earth Model (MDEM): [http://www.deq.state.ms.us/Mdeq.nsf/page/MDEM\\_Home?OpenDocument](http://www.deq.state.ms.us/Mdeq.nsf/page/MDEM_Home?OpenDocument)
- Mississippi Geospatial Clearinghouse (MSC): <http://www.gis.ms.gov/portal/default.html>
- National Oceanic and Atmospheric Administration (NOAA): <http://www.noaa.gov/>
- Sea Level Rise (SLR) and Coastal Flooding Impacts Viewer: <http://csc.noaa.gov/digitalcoast/tools/slrviewer>
- Shopping Center Hazards Exhibit at Biloxi, MS (Harrison County): <http://csc.noaa.gov/digitalcoast/stories/biloxi>
- Stories from the Field: [http://www.csc.noaa.gov/digitalcoast/stories/list?items\\_per\\_page=All](http://www.csc.noaa.gov/digitalcoast/stories/list?items_per_page=All)

## Appendix B

### ATTENDEES OF MISSISSIPPI FORUM

- Paul Barnes, Southern Mississippi Planning and Development District (MS)
- Patrick Bonck, Harrison County (MS)
- Diana Bowen, Coastal States Organization (DC)
- John Bowie, EPA – Gulf of Mexico Program (MS)
- Lori Cary-Kothera, NOAA (SC)
- Karen Clark, Southern Mississippi Planning and Development District (MS)
- Carrie Clingan, National Association of Counties (DC)
- Nanc Cofer-Shabica, NOAA (SC)
- James Davenport, National Association of Counties (DC)
- Marian Hanisko, NOAA (MS)
- Joel Herr, NVision Solutions Inc. (MS)
- Flinda Hill, Mississippi Power (MS)
- Sharon Hodge, Northern Gulf Institute – Mississippi State University (MS)
- Ken Holland, Gulf Regional Planning Commission (MS)
- Avia Huisman, Mississippi Department of Marine Resources (MS)
- Cragin Knox, Waggoner Engineering, Inc. (MS)
- Grant Larsen, Mississippi Department of Marine Resources (MS)
- Julien Lartigue, NOAA (MS)
- Joel Lawhead, NVision Solutions Inc. (MS)
- Mitch Love, Harrison County (MS)
- Rebecca Love, NOAA (SC)
- Charles Meador, University of Southern Mississippi (MS)
- Michael Miller, City of Gulfport (MS)
- Tom Mohrman, The Nature Conservancy (MS)
- Robert Moorhead, Geosystems Research Institute – Mississippi State University (MS)
- Zsolt Nagy, Mississippi Geographic Information – AECOM (NC)
- Gunnar Olson, Mississippi State University (MS)
- Coen Perrott, Mississippi Department of Environmental Quality (MS)
- Benedict Posadas, Mississippi Extension (MS)
- Rhonda Price, Mississippi Department of Marine Resources (MS)
- Susan Rees, U.S. Army Corps of Engineers (AL)
- David Rogers, Harrison County (MS)
- Nelle Ruffin, Mississippi State University (MS)
- Scott Samson, Mississippi State University (MS)
- Nicholas Schmidt, NOAA (SC)
- James Schwab, American Planning Association (IL)
- Tracie Sempier, Sea Grant – University of Southern Mississippi (MS)
- Edward Shambra, City of Biloxi (MS)
- Robyn Shaw, Harrison County (MS)
- Judy Steckler, Land Trust for the Mississippi Coastal Plain (MS)
- Jim Steil, Mississippi Automated Research Information System (MS)
- Richard Stickler, City of Biloxi (MS)

- 1 NOAA. (2013). *National Coastal Population Report*, <http://stateofthecoast.noaa.gov/features/coastal-population-report.pdf>
- 2 NOAA. (2013). National Ocean Service: Ocean Facts, <http://oceanservice.noaa.gov/facts/population.html>
- 3 NOAA. (2013). State of the Coast: Coastal Floodplain, 2013, <http://stateofthecoast.noaa.gov/pop100yr/welcome.html>
- 4 NOAA. (2013). *National Coastal Population Report*.
- 5 The 2010 United States GDP is estimated at USD 14.4 trillion (in 2012 dollars), World Bank, 2012, Data: GDP (Current U.S.\$) <http://data.worldbank.org/indicator/NY.GDP.MKTP.CD>
- 6 Burkett, V.R. and Davidson, M.A. [Eds.]. (2012). Coastal Impacts, Adaptation and Vulnerability: A Technical Input to the 2012 National Climate Assessment. [http://downloads.usgcrp.gov/NCA/technicalinputreports/Burkett\\_Davidson\\_Coasts\\_Final\\_.pdf](http://downloads.usgcrp.gov/NCA/technicalinputreports/Burkett_Davidson_Coasts_Final_.pdf)
- 7 Ibid.
- 8 NOAA, (2013), State of the Coast: Vulnerability, <http://stateofthecoast.noaa.gov/vulnerability/>
- 9 Ibid. (Percentages don't add up to 100 due to rounding.)
- 10 Mohrman, Tom, (2012), Decision Support and Coastal Resiliency, *Presentation*, <http://www.naco.org/programs/csd/Documents/Coastal%20Counties/Mohrman%20Gulf%20Decision%20Support%20Presentation.pdf>
- 11 Burkett and Davidson.
- 12 Ibid.
- 13 Ibid.
- 14 NOAA, (2013), Vulnerability of our coasts to Sea Level Rise, <http://stateofthecoast.noaa.gov/vulnerability/welcome.html>
- 15 NOAA. (2013). Data Results from ENOW Explorer. <http://www.csc.noaa.gov/enow/explorer/>



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[linkedin.com/in/NACoDC](https://linkedin.com/in/NACoDC)