

A DECADE OF THE DIGITAL COAST PARTNERSHIP PROGRAM: SUCCESSES AND OPPORTUNITIES

HEARING

BEFORE THE

SUBCOMMITTEE ON OCEANS, ATMOSPHERE,
FISHERIES, AND COAST GUARD

OF THE

COMMITTEE ON COMMERCE,
SCIENCE, AND TRANSPORTATION
UNITED STATES SENATE

ONE HUNDRED FIFTEENTH CONGRESS

SECOND SESSION

JUNE 5, 2018

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SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

ONE HUNDRED FIFTEENTH CONGRESS

SECOND SESSION

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A DECADE OF THE DIGITAL COAST PARTNERSHIP PROGRAM: SUCCESSES AND OPPORTUNITIES

TUESDAY, JUNE 5, 2018

U.S. SENATE,
SUBCOMMITTEE ON OCEANS, ATMOSPHERE, FISHERIES,
AND COAST GUARD,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
Washington, DC.

The Subcommittee met, pursuant to notice, at 10:00 a.m. in room SR-253, Russell Senate Office Building, Hon. Dan Sullivan, Chairman of the Subcommittee, presiding.

Present: Senators Sullivan [presiding], Wicker, Fischer, Inhofe, Young, Baldwin, Nelson, and Blumenthal.

OPENING STATEMENT OF HON. DAN SULLIVAN, U.S. SENATOR FROM ALASKA

The CHAIRMAN. The Subcommittee on Oceans, Atmosphere, Fisheries, and the Coast Guard will now come to order.

Today's hearing will focus on the Digital Coast Partnership Program. The Digital Coast Program is a project of NOAA that provides a collaborative, online data base of the most up-to-date coastal information made available to both the public and to private users.

Beyond just a database, the Digital Coast also provides tools for coastal communities to decipher and use the high tech mapping data to make accurate decisions and smart investments in their communities.

We have called this hearing at the request of my Ranking colleague, Senator Baldwin, but this is a topic of mutual interest for her and I, as well as this entire committee.

Alaska, for example, has more than 44,000 miles of shoreline, which more than doubles the shoreline of the entire Lower 48 of the United States. Given that three-quarters of Alaska's citizens live in coastal regions, publicly accessible coastal data is of vital importance for the safety of our citizens and my state's economy.

Economic activity in Alaska's coastal areas includes world renowned fish and shellfish industries, as well as the burgeoning recreation and tourism industries.

It is no secret that in recent years, the Arctic region has faced an unprecedented increase in vessel traffic, yet the necessary supporting infrastructure, and importantly data, does not match this growing demand.

Many areas of the Arctic have not been surveyed at all. Ever. And others have not been surveyed since World War II, over 70 years ago. To its credit, NOAA has recognized this need and has pursued increasingly robust plans for mapping in the Arctic.

With more data, Digital Coast will give our constituents more tools and knowledge to help all our coastal communities thrive.

In May of last year, the Senate passed Senator Baldwin's legislation, the Digital Coast Act, by unanimous consent. The bill is currently pending in the House, legislation which I was glad to be a cosponsor of, would authorize the next phase in coastal mapping at NOAA by ensuring that stakeholders will continue to have the data to make smart choices for economic development, shoreland management, and coastal restoration.

The legislation supports further development of the existing Digital Coast program by increasing access to uniform, up-to-date data to help communities get the information they need to manage their resources, respond to emergencies, and plan for long-term coastal resilience.

To date, the Digital Coast program has proved valuable in Alaska, aiding in the acquisition and processing of geospatial data, providing access to educational platforms, and establishing baseline data for a fishery restoration project in the Kiwalik River Watershed.

With improved data, the Digital Coast program will continue to benefit my state, as well as other coastal communities nationwide.

I look forward to hearing more from our witnesses, and I want to thank them for all being here today.

I now recognize Ranking Member Baldwin.

**STATEMENT OF HON. TAMMY BALDWIN,
U.S. SENATOR FROM WISCONSIN**

Senator BALDWIN. Thank you, Mr. Chairman.

I really appreciate your working with me to host this hearing. I wanted to thank you also for your partnership and the collaboration we have had on S. 110, the Digital Coast Act, which would formally authorize this important program.

Greetings to our distinguished panel. It is great to have you here.

I am really eager this morning to hear about the successes of the Digital Coast program over the last decade and the opportunities for the program moving forward. Our bill, as the Chairman said, has passed this Committee and the Full Senate twice now, but it has been sitting at the desk in the House awaiting consideration.

I believe that when folks hear the diverse and important applications of the Digital Coast program, hopefully our bill will not have to wait much longer.

Mr. Chairman, your state certainly has the longest coastline in the United States. No discrepancy there, no argument. But the Great Lakes are not, well, they are a little further behind, but we get to claim 4,500 miles of coast, and I do not have to tell you that our coastal communities are vibrant hubs of commerce and prosperity. In addition, Lake Michigan and Lake Superior are also sources of drinking water for millions of people.

That is why it has been a top priority for me to both restore and protect the environmental quality of the Great Lakes. To do that,

we simply must have robust, timely, and accurate data. Data that is not easily accessible does not get used.

That is why about 20 years ago in 1997 communities began asking NOAA, the National Oceanic and Atmospheric Administration, to develop a central clearinghouse for coastal data that would be readily available to decisionmakers at all levels, from neighborhood councils to the Federal Government.

Ten years ago this month, on June 30, 2008 NOAA launched the first phase of the Digital Coast platform. The first phase included high quality NOAA data.

In the decade since, the program has wisely begun to incorporate data from a vast array of sources including other Federal agencies, states and local communities, and from private companies like Quantum Spatial in Sheboygan, Wisconsin and Continental Mapping in Madison, Wisconsin.

In 2015, that equated to more than 70 terabytes of data, 50 tools, and 100 use stories, and 20 trainings on the Digital Coast platform.

The results speak for themselves. People are using Digital Coast. As of 2015, there have been more than 150,000 data downloads and about one million unique visits to the platform.

The benefits of this program fall into two main categories. First, it makes users more efficient because they can easily access the data, and it makes them more effective because the data and tools that are available are of the highest quality. This is why 3 out of 4 Digital Coast users surveyed say that they could not have completed their projects without the information and the tools available on the platform.

During Tyson Fettes' time as Racine County Register of Deeds, the County has done award winning work using the geospatial mapping tools available on Digital Coast to benefit Wisconsin residents, including the development of a new smart phone application that will aid in disaster assessment in the future.

Racine County, and its Lake Michigan coastal neighbors, knows that bluff erosion is a major concern, and one that Digital Coast tools are also helping to address.

The Wisconsin Coastal Natural Hazards Work Group, the Association of State Flood Plain Managers, and the University of Wisconsin Madison have mapped erosion hotspots along the coast. With this tool, planners can better predict the conditions that lead to bluff instability and collapse.

This tiny Digital Coast program, funded at \$1.7 million in Fiscal Year 2017, has been leveraged to save countless taxpayer dollars that would otherwise be spent duplicating effort or wasting time and money to find this data elsewhere.

That is why our bill has overwhelming support from across the aisle, across the Capitol, and across the country. In fact, Mr. Chairman, I would like to add these letters of support for the Digital Coast Act into the hearing record.

The CHAIRMAN. Without objection.

[The information referred to follows:]

QUANTUM SPATIAL, INC.
St. Petersburg, FL, January 16, 2017

Hon. JOHN THUNE,
 Chairman,
 Committee on Commerce, Science, and
 Transportation,
 United States Senate,
 Washington, DC.

Hon. BILL NELSON,
 Ranking Minority Member,
 Committee on Commerce, Science, and
 Transportation,
 United States Senate,
 Washington, DC.

Dear Chairman Thune and Ranking Member Nelson:

I write in strong support of S. 110, the Digital Coast Bill, and urge the Committee to mark up and report the bill favorably to the full Senate for its consideration. S. 110, introduced by Senator Tammy Baldwin, is a bill that would authorize the National Oceanic and Atmospheric Administration (NOAA) to establish a constituent-driven program to provide a digital information platform capable of efficiently integrating coastal data with decision-support tools, training, and best practices. The collection of coastal geospatial data will help inform and improve local, State, regional, and Federal capacities to manage their respective coastal regions.

Quantum Spatial is the largest, most technically advanced full-service geospatial solutions provider in North America. We apply the power of geospatial solutions to the decisions and processes that matter most to organizations. Quantum Spatial partners with organizations that map, model and manage their world. We provide advanced imaging and remote sensing technologies, backed by powerful modeling, visualization, and GIS tools. These geospatial services have strategic value to local and state officials for many uses including decision making associated with severe weather impacting our coastal communities.

The Digital Coast is a web-based collection of data, tools, trainings, and case studies designed for coastal managers and technicians across the U.S. While the Digital Coast was developed, and is currently maintained by the NOAA Office for Coastal Management (OCM), hundreds of organizations and federal, state, and local agencies have contributed and make use of its content. The collection of high-quality, authoritative resources that comprise the Digital Coast is focused on coastal and ocean issues and is designed to support state and local decision makers charged with ensuring the public's safety and the wise management of coastal resources. The Digital Coast Program supports those involved in reducing flood risks, green infrastructure, coastal and ocean habitat, and renewable energy activities.

The Digital Coast program multiplies its impact to regional and state coastal management efforts by its "make once and use many times" architecture structure. According to an April 2015 report prepared by NOAA, annual net benefits have grown from about \$2.3 million in 2009 to more than \$6.7 million in 2013. Currently, benefits exceed costs by a margin of 3 to 1, with net benefits of \$25 million. Continued operation over the next 15 years is expected to yield a net benefit of \$117 million, equating to a return on investment of 411 percent. User surveys and the Digital Coast return on investment study have shown that by providing information in this manner, Digital Coast saves coastal managers and technicians both resources and time.

The Digital Coast Program is a federal-state-local partnership that provides valuable data and training to a diverse group of local, regional, and statewide coastal interests all of which goes to supporting, building, and sustaining the resilience of the coastal economy. For all of these reasons, we strongly support S. 110 and urge the Committee and your Senate colleagues to actively support this legislation.

Sincerely,

KURT W. ALLEN,
Vice President, Federal Vertical Lead,
 Quantum Spatial, Inc.

cc: Senator Tammy Baldwin

Digital Coast Partnership Advocacy Coalition

January 24, 2017

The Honorable John Thune, Chairman
The Honorable Bill Nelson, Ranking Member
U.S. Senate Committee on Commerce, Science, and Transportation
SD-512 Dirksen Senate Office Building
Washington, DC 20510

Dear Chairman Thune and Ranking Member Nelson:

The Digital Coast Partnership Advocacy Coalition commends Chairman Thune and Ranking Member Nelson for scheduling this hearing to markup S. 110, the Digital Coast Act of 2017.

Prior to the end of the 114th Congress, the Senate unanimously passed S. 2325, the Digital Coast Act of 2015 sponsored in a bipartisan nature by Sens. Tammy Baldwin (D-WI), Lisa Murkowski (R-AK), Dan Sullivan (R-AK), and Cory Booker (D-NJ). Last April, this committee reported S. 2325 favorably by a unanimous vote and included a technical amendment sponsored by the Chairman. Companion legislation, H.R. 4738, was introduced in the 114th Congress in the House by Reps. Dutch Ruppersberger (D-MD) and Don Young (R-AK).

The Coalition also wishes to thank Sens. Baldwin, Murkowski, Sullivan and Booker once again for their leadership in introducing the current bill subject to this hearing, S. 110. The strong bipartisan support for this measure is a demonstration of its broad appeal and value to the nation's communities. By consolidating coastal data from a variety of sources in one place and making it publicly accessible, NOAA's Digital Coast project is helping the coastal management community better plan for storms, flooding, natural disasters, and other challenges that impact vulnerable coastal communities.

Data included in the Digital Coast ranges from surveying, mapping and geospatial data to economic and demographic data to ecosystem data to satellite imagery. In addition to making this data publicly available online, the Digital Coast provides a wide array of visualization and prediction tools that dramatically improve the effectiveness and efficiency of coastal management projects around the country.

Over the next 15 years, NOAA predicts a 411 percent return on investment from the Digital Coast project. In addition to the return on investment, the Digital Coast has played a significant role in protecting communities and natural resources from damaging natural disasters. Furthermore, 75 percent of Digital Coast users surveyed by NOAA indicated that their projects would not have been possible without the Digital Coast.

We respectfully urge your action in reporting S. 110 favorably out of committee. In doing so, we deeply appreciate your recognition of the numerous benefits the Digital Coast can provide to coastal communities and those working to make them more resilient.

Sincerely,

American Planning Association
Association of State Floodplain Managers
Coastal States Organization
MAPPs
National Association of Counties
National Estuarine Research Reserve Association
National Society of Professional Surveyors
National States Geographic Information Council
The Nature Conservancy

cc: Fellow Committee Members

1856 Old Reston Avenue, Suite 205 - Reston, Virginia 20190 - (703) 787-6665

Statements of Support for the Digital Coast Act

Wisconsin

"Quantum Spatial is grateful for Senator Baldwin's leadership on this bill. The Digital Coast program employs state of the art technology to provide vital information to those local officials responsible for public safety in coastal communities all along the Great Lakes and elsewhere," said **Kurt Allen, Vice President of Federal Vertical Lead at Quantum Spatial, Inc.**

"Our nation's coasts are not only where the majority of our population lives and works, much of our nation's natural heritage and wealth in natural resources are also concentrated in these areas. Senator Baldwin's bill will strengthen the Digital Coast program, which has helped The Nature Conservancy's Wisconsin, Great Lakes and coastal conservation staff access and share data and tools with partners to improve resilience, enhancing the environment and economies of communities across the country," said **Todd Holschbach, Director of Government Relations at The Nature Conservancy in Wisconsin**

"Wisconsin's coastal areas are one of our state's most important and treasured natural resources and this bill will provide the kind of current, robust geospatial data that is required by those who are making critical decisions on how these regions will be managed and maintained in the future. As a Wisconsin-based engineering and geospatial firm, Ayres Associates recognizes the many benefits this bill will provide our clients throughout the state and applaud Senator Baldwin's leadership on this important issue," said **Kirk M. Contrucci, Vice President of Ayres Associates**

"Thanks to Senator Baldwin for introducing the Digital Coast Act of 2015, a bipartisan effort needed to realize the concept of a digitally and geospatially enabled view of the Nation's coastlines as recommended by the National Academy of Sciences. This bill addresses the urgent need recognized by the U.S. Oceans Commission, the PEW Commission, and several NAS reports, all of which have highlighted the need for up-to-date surveying, charting, remote sensing and analysis of our coast's, ports, shorelines and ocean resources critical to our Nations' environmental and economic well-being," said **David Hart, President of Continental Mapping Consultants, Inc.**

"Planners in Alaska support this legislation because good data and information not only helps our Alaskan communities but also provides the competitive edge our nation needs to interact in global commerce and address the effects of our planet's changing environmental conditions," said **Lauren Driskill, President of Alaska Chapter of the American Planning Association**

"Managing flood risk is a shared responsibility among the federal, state, and local level – private and public. As proof of the concept, the Digital Coast Partnership has already identified, developed and provided data and tools that are made widely and freely available to thousands of users. ASFPM is thrilled to support the Digital Coast Act which would officially authorize this effort and allow for the development of new datasets and tools that are critical for effective decision making by communities, states and others," said **Chad Berginnis, Executive Director of Association of State Floodplain Managers**

National

"Senator Baldwin and Senator Murkowski's leadership on coastal issues supports the work local communities do to manage risk and protect people and property from extreme weather and changing conditions. This legislation will directly improve local disaster response and hazard mitigation planning. This bill will help local communities minimize potential loss of life and damage to infrastructure, private property, and conservation areas. The Digital Coast Act is an important step for effective coastal management. It will provide these data points with additional planning tools, resources, and training planners need to build stronger, more resilient coastal communities," said **Cynthia Bowen, President of the American Planning Association.**

"Through access to data, planning tools and training, Digital Coast directly addresses constituent needs through improved capacity and skills of coastal decision-makers charged with enhancing coastal community resilience and better management of our estuaries. The Digital Coast Act is governance done right through cost effective partnerships – thank you to Senators Baldwin and Murkowski for your bi-partisan leadership in support of all the coastal communities that are critical to our nation's economy, said **Cory A. Riley, President of the National Estuarine Research Reserve Association (NERRA) and Director of the Great Bay National Estuarine Research Reserve.**

"MAPPS commends Senators Baldwin and Murkowski for their leadership in helping America's fragile coasts and shorelines through the Digital Coast Act. This legislation will create a program to utilize the extensive capabilities of the qualified private sector geospatial profession in the United States to implement recommendation of numerous reports that have highlighted the need for surveying, charting, remote sensing and geospatial data of America's coasts, harbors, ports, shorelines and ocean resources for economic growth, recreational activities, and conservation of our fragile coastal environment," said **John Palatiello, Executive Director of MAPPS.**

"The provisions of the Digital Coast Act will significantly enhance the Digital Coast project through the creation of a sustainable program to utilize geospatial technologies to map and monitor the coastal waterways of the United States, providing an invaluable benefit to the public, and to the professionals whose charge is to protect their health, safety, and welfare," said **Curtis W. Sumner, Executive Director of National Society of Professional Surveyors (NSPS).**

"The Digital Coast Act will increase the resiliency of coastal communities, as well as improve high accuracy mapping programs. This important legislation will allow NOAA's Office for Coastal Management to continue to develop new and useful tools and training to aid local planning and coastal management efforts," said **Molly Schar, Executive Director of the National States Geographic Information Council.**

"Coastal and community resilience are vital planning priorities in New Jersey. The information and insights provided by the Digital Coast Act will help New Jersey planners protect communities from future hazards and enable a smarter process for making decisions about how our cities and towns grow. Better data make for better plans and that benefits everyone in New Jersey. This legislation is an important step forward," said **Charles Latini, President of New Jersey Chapter of APA**

A statement of support from the **Digital Coast Partnership Advocacy Coalition:**

"The Digital Coast Partnership Advocacy Coalition commends Chairman Thune and Ranking Member Nelson for scheduling this hearing to markup S. 110, the Digital Coast Act of 2017. Prior to the end of the 114th Congress, the Senate unanimously passed S. 2325, the Digital Coast Act of 2015 sponsored in a bipartisan nature by Sens. Tammy Baldwin (D-WI), Lisa Murkowski (R-AK), Dan Sullivan (R-AK), and Cory Booker (D-NJ). Last April, this committee reported S. 2325 favorably by a unanimous vote and included a technical amendment sponsored by the Chairman. Companion legislation, H.R. 4738, was introduced in the 114th Congress in the House by Reps. Dutch Ruppersberger (D-MD) and Don Young (R-AK). The Coalition also wishes to thank Sens. Baldwin, Murkowski, Sullivan and Booker once again for their leadership in introducing the current bill subject to this hearing, S. 110. The strong bipartisan support for this measure is a demonstration of its broad appeal and value to the nation's communities. By consolidating coastal data from a variety of sources in one place and making it publicly accessible, NOAA's Digital Coast project is helping the coastal management community better plan for storms, flooding, natural disasters, and other challenges that impact vulnerable coastal communities. Data included in the Digital Coast ranges from surveying, mapping and geospatial data to economic and demographic data to ecosystem data to satellite imagery. In addition to making this data publicly available online, the Digital Coast provides a wide array of visualization and prediction tools that dramatically improve the effectiveness and efficiency of coastal management projects around the country. Over the next 15 years, NOAA predicts a 411 percent return on investment from the Digital Coast project. In addition to the return on investment, the Digital Coast has played a significant role in protecting communities and natural resources from damaging natural disasters. Furthermore, 75 percent of Digital Coast users surveyed by NOAA indicated that their projects would not have been possible without the Digital Coast. We respectfully urge your action in reporting S. 110 favorably out of committee. In doing so, we deeply appreciate your recognition of the numerous benefits the Digital Coast can provide to coastal communities and those working to make them more resilient."

Senator BALDWIN. And with that, I look forward to hearing the great success stories from our witnesses and thinking through what the next 10 years might mean for the Digital Coast.

Thank you.

The CHAIRMAN. Thank you, Senator Baldwin.

I want to welcome our witnesses who came from all over the United States. Let me introduce them.

We have, first, Ms. Nicole LeBoeuf, who is the Deputy Assistant Administrator for NOAA, the National Ocean Service part of NOAA.

Mr. Paul Barnes, he is the Director of Geographic Information Services, Harrison County, Mississippi.

Mr. David Millar, Director of Government Accounts Americas from Fugro. He will be showing a short, 3 minute video following his testimony.

And Mr. Tyson Fettes, the Register of Deeds in Racine County, Wisconsin.

Each of you will have 5 minutes to deliver your oral statement. A longer written statement will be included in the record.

I see the Ranking Member for the whole Committee is here. Senator Nelson, would you like to say a few words?

**STATEMENT OF HON. BILL NELSON,
U.S. SENATOR FROM FLORIDA**

Senator NELSON. Mr. Chairman, this Subcommittee is so important that I felt compelled.

The CHAIRMAN. Well, we know that, but thank you very much for saying that. We really appreciate you being here.

Senator NELSON. Thank you and to the Ranking Member.

What is so great about the tool that we are talking about this morning is that it allows folks to visualize sea level rise and what it means for coastal communities.

Mr. Chairman, my state is one of those coastal communities. Twenty-one million people live in Florida; 75 percent of the population of the state is along the coast. Needless to say that the effects of sea level rise is already having its effect, considerably, with water sloshing over the streets in Miami Beach and Fort Lauderdale.

Lo and behold, I found out much further north on the west coast, not the Atlantic Coast, the mayor of Sarasota told me, and I said, "Send me some pictures," and indeed, that is what is happening.

We had a field hearing three years ago down in Miami Beach. One of the scientists testified that it is not projections. It is not forecasts. It is actual measurements.

Over the last four decades, the sea has risen in southeast Florida from 5 to 8 inches. He said, this scientist, by the way, a dear friend, a former member of the astronaut corps who sadly has passed away from cancer. But he said, "By the end of the century, the intensity of hurricanes, including rainfall near the centers of hurricanes, may increase. But even if hurricane frequency and intensity do not change," but we have a season on the forecast this year, Lord knows, please, do not let the forecast be right, that this is going to be a terrible hurricane season. "But even if the hurricane frequency and intensity do not change, rising sea levels and

coastal development will likely increase the impact of hurricanes and other coastal storms on the coastal communities and infrastructure.”

They say a picture is worth a thousand words. Well, here it is, a sunny day; sunny day king tide flooding in Miami Beach. There we go. Can you show that one too?

At another field hearing in West Palm Beach just last year, the Broward County Resilience officer showed a video of a man biking along a City of Fort Lauderdale, sidewalks submerged in seawater.

Then we took the Committee to St. Petersburg, where the city has designed its new pier out of floating docks to accommodate sea level rise.

And then we could go to see tidal flooding and sea level rise in Sarasota. What I just mentioned, the Vice Mayor, this is Sarasota. Now, this is much further north than Miami and Fort Lauderdale, and on the opposite coast, the Gulf Coast. And so, those pictures as you can see.

Or St. Augustine, Florida much further north on the Atlantic Coast, where the Public Works Department is seeing nuisance flooding from high tides that overwhelm their storm system, their storm water system.

Despite all these examples, the sea level rise are on sunny days. The NASA scientist at our hearing back in 2014 was talking about climate that could exacerbate the damage from hurricanes. Warmer ocean water fuels hurricanes making them more intense and the sea level rise compounds storm surge and rain-induced flooding.

So here are some more pictures. Take a look at north Florida. Jacksonville, this is during Hurricane Irma. This is very far north of Jacksonville. Jacksonville is near the Georgia line.

Well, do you want to take a look at Puerto Rico? Hurricane Maria absolutely ravaged the island. It is not an exaggeration to say that climate change and sea level rise are putting peoples’ lives and property at risk.

So the real question is, what are we going to do about it? There are two pieces to a solution.

One is we are going to have to stop putting so many greenhouse gases in the atmosphere so fast. That is called “climate mitigation,” and it means we must invest in new technology, in the economy of the future. Things like wind, solar, electric vehicles, and more efficient buildings.

Number two, we are going to have to make our communities more resilient to the greenhouse gases and the warming that we have already got in the system. This is called “climate change adaptation.” You do not have to agree with climate science to know that this makes sense. It has already been done in Miami Beach with tens of millions of dollars of huge pumps that are used to now get the water off the streets.

We are talking about strengthening building codes to withstand wind events; restoring the function of floodplains so that when 2 or 3 feet of rainwater gets dumped, it can absorb and recede; and rebuilding natural flood protection, like sand dunes and beaches. I am committed to doing both of those solutions.

Mr. Chairman, you are very kind to let me expound, but as the Ranking Member of the Full Committee, I felt like it is necessary

that since your Ranking Member is experiencing these effects of climate change and sea level rise in my state of Florida that I need to bring it to the attention of the Committee.

Thank you, Mr. Chair.

The CHAIRMAN. Thank you, Senator Nelson.

Now I want to turn to our witnesses for their testimony. You will have five minutes each to deliver your oral statement and a longer written statement will be included in the record, if you so wish.

We will begin with Ms. LeBoeuf.

**STATEMENT OF NICOLE LEBOEUF, DEPUTY ASSISTANT
ADMINISTRATOR, NATIONAL OCEAN SERVICE,
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION,
U.S. DEPARTMENT OF COMMERCE**

Ms. LEBOEUF. Chairman Sullivan, Ranking Member Baldwin, of course Senator Nelson, and members of the Subcommittee.

Thank you for the opportunity for the National Oceanic and Atmospheric Administration, or NOAA, to provide its views on the successes of the Digital Coast, and on opportunities for the future.

NOAA appreciates the Subcommittee's interest and support for the Digital Coast and its contributions to the economic and environmental resilience of our Nation's coasts and Great Lakes.

My name is Nicole LeBoeuf. I am the Deputy Assistant Administrator for NOAA's National Ocean Service. As a proud steward of our Nation's coastal resources, NOAA is pleased to see the tangible impacts that Digital Coast has made on the ground across the United States.

What is Digital Coast? We have already heard some of that. Thank you for the very generous and, of course, accurate assessment.

Digital Coast is a web-based resource of data, tools, trainings, and case studies tailored specifically to assist coastal managers, policymakers, and other decision officials in addressing complex coastal issues. Now in its eleventh year, Digital Coast provides a high return on investment, is a leading public-private partnership, and supports economic development. In short, Digital Coast is government done right.

As coastal communities and populations continue to grow, they are confronted with changing environmental conditions. They increasingly rely upon Digital Coast to understand and prepare for these changes. One out of every three coastal communities in the United States has used Digital Coast resources, and NOAA continues to improve Digital Coast based on their stated requirements.

NOAA created the Digital Coast Partnership to strengthen our connection to its diverse stakeholders. The Partnership consists of eight national organizations, some represented here today, that work with NOAA to ensure that coastal communities have the data, tools, and information they need to make informed decisions and to help identify needs as they emerge. These organizations drive the Digital Coast, and NOAA responds with the products and services to meet their needs.

Digital Coast offers a high return on taxpayer investment. Its current benefits exceed its cost to taxpayers by a margin of 3 to 1, with net benefits of over \$25 million since its inception.

Continued operation of the Digital Coast, as it exists today for the next 15 years, would yield an estimated benefit of approximately \$117 million to taxpayers. That is over a 400 percent return on investment.

The Digital Coast operates as a leading public-private partnership by reducing costs to businesses and to the public by offering valuable data and information, while supporting as many as 1,500 high tech, private sector jobs. Moreover, these data are collected to the same specifications as the Federal Government, ensuring seamless usability of these data across geographic boundaries.

The Digital Coast supports economic development. Local, State, and national decisionmakers use the Digital Coast as a tool to make investment decisions that fuel economic growth while balancing other concerns.

For example, many coastal communities use Digital Coast to make smart economic development and investment decisions when weighing the risks of proximity of critical infrastructure projects near current and future flood-prone areas.

NOAA is eager to facilitate Digital Coast's continued effectiveness by strengthening our relationships with the public and private sector; by increasing the availability of core coastal datasets; providing improved decision support tools and training; by expanding collaborations through the Digital Coast partnerships; and by enhancing the Digital Coast platform overall. These priorities are outlined in the Digital Coast Strategic Plan spanning 2016 to 2021.

Once again, I appreciate the opportunity to testify today. I thank the Committee for highlighting the importance of the Digital Coast in growing our economy and in meeting our society's needs for a safe, secure, and healthy coastal environment.

Thank you for acknowledging the Digital Coast's decade of success and accomplishments.

I welcome any questions you may have about the Digital Coast and NOAA's foundational role in it.

Thank you.

[The prepared statement of Ms. LeBoeuf follows:]

PREPARED STATEMENT OF NICOLE LEBOEUF, DEPUTY ASSISTANT ADMINISTRATOR,
NATIONAL OCEAN SERVICE, NATIONAL OCEANIC AND ATMOSPHERIC
ADMINISTRATION, U.S. DEPARTMENT OF COMMERCE

Chairman Sullivan, Ranking Member Baldwin, and members of the Subcommittee, thank you for the opportunity for the National Oceanic and Atmospheric Administration (NOAA) to provide views on the successes of the Digital Coast Partnership Program (Digital Coast) and opportunities for the future. NOAA and the Department of Commerce appreciate the Subcommittee's interest and support for the Digital Coast's contributions to the economic and environmental resilience of coastal and Great Lakes states, regions, and the Nation.

My name is Nicole LeBoeuf and I am the Deputy Assistant Administrator for NOAA's National Ocean Service, within the Department of Commerce. As a steward of the Nation's coastal resources, NOAA is pleased to see the tangible impacts the Digital Coast has made on the ground in communities across our Nation. The Digital Coast is helping to grow the U.S. economy, safeguard our citizens, sustainably manage our valuable coastal and ocean resources, and find compatible solutions to sometimes competing economic, societal, and environmental goals.

The Digital Coast is a web-based resource of data, tools, and trainings designed to help coastal managers and technicians across the Nation address complex coastal issues. As coastal economies and populations continue to expand and are confronted with changing environmental conditions, coastal communities increasingly rely on the Digital Coast to prepare for these changes. It has quickly become one of the

most widely used resources for coastal communities to easily find authoritative, high-quality information to make wise infrastructure investments, help communities prepare for impending changes and disasters, and drive economic growth. Now in its eleventh year, the Digital Coast is cost-effective, provides a high return on investment, contributes to the economy, and is a true partnership with private companies, universities, and federal, state, and local agencies. In short, the Digital Coast is government done right.

I am excited to visit Senator Sullivan's great State of Alaska later this month to gain a better understanding of the unique coastal challenges impacting the region and its present and future needs. In recent meetings between NOAA staff and the state, non-profit organizations, private companies and local communities, the message was clear that reliable data are needed. There is no doubt that Alaska, like many coastal states, still needs basic geospatial and other data to make informed decisions. NOAA is committed to working with state partners and other Federal agencies to help provide that information in cost-effective ways that meet the diverse needs of coastal communities.

Addressing the Needs of Coastal Communities

NOAA created and continues to improve the Digital Coast in response to the needs of coastal communities. Before 2007, coastal planners, managers, and other decision-makers did not have ready access to data relevant to coastal issues. They also needed easy-to-use tools, training, and information resources to use the data to its full potential. Our daily interactions with partners, our project work, and surveys to constituents allowed us to develop the Digital Coast based on their needs. The Digital Coast leverages technology to meet user needs and operates under three guiding principles: 1) Inform coastal decision-making; 2) Provide value for the target audience and for the nation; and 3) Evolve continuously and sustainably.

The Digital Coast offers hundreds of state-of-the-art products, from high-resolution data sets to interactive mapping tools. Several of Digital Coast's tools are specifically designed to help locate data at an individual user's local scale. For example, the Coastal County Snapshots tool provides county-level educational information on topics such as flood exposure, ocean and Great Lakes jobs, and wetland benefits. The Coastal Flood Exposure Mapper also helps communities assess their coastal hazard risks and vulnerabilities by creating customized maps that show the people, places, and natural resources exposed to coastal flooding. Finally, the Digital Coast's training academy provides over 125 online and in-person learning resources to ensure that users have the necessary skills to apply the Digital Coast's data and tools to make sound coastal management decisions.

Digital Coast has been instrumental in supporting local, state, and national decision-making that promotes economic growth. Counties use Digital Coast information in their economic development strategies when weighing investment decisions. In the Great Lakes, officials used Digital Coast economic data to pinpoint natural resources that support recreational activities, which helped them determine where to focus their attention to boost local tourism and recreation. Turning to our oceans, the U.S. Coast Guard's ocean vessel traffic data represents one of the most popular data sets, but it is large and cumbersome to use. The Digital Coast reformats the raw data to address this issue, saving users hundreds of hours.¹ Lidar data, which is high-resolution elevation data, is another popular Digital Coast dataset that NOAA provides, and over 30,000 individuals have downloaded the customized data.² Offering this high-resolution elevation data not only saves consumers money; we have heard from some smaller engineering companies that they could not do their jobs without this resource.

Lastly, the Digital Coast provides tools to inform shared solutions among diverse users of coastal resources. For example, the Bureau of Ocean Energy Management used Digital Coast data to assess potential impacts of offshore wind energy development on the tourism and recreation industry in over 100 Atlantic coast counties.

The Digital Coast Partnership

NOAA created the Digital Coast Partnership to solidify our connection to our diverse customers on a long-term basis. The Digital Coast Partnership is a group of eight national organizations that work with NOAA to ensure coastal communities have the relevant data, tools, and information needed to make informed decisions

¹National Oceanic and Atmospheric Administration. (2015). *Projected Benefits and Costs of the Digital Coast*. Available at <https://coast.noaa.gov/data/digitalcoast/pdf/benefits-costs.pdf>

²National Oceanic and Atmospheric Administration. Digital Coast Site Provides \$100 Million in Lidar Data. Available at <https://coast.noaa.gov/states/stories/digital-coast-site-provides-100-million-in-lidar-data.html>

about our Nation's coastal areas and help identify needs as they evolve over time. Some of those partners are testifying at this hearing today.

While NOAA developed and maintains the Digital Coast, hundreds of organizations, including private companies, universities, and federal, state, and local agencies, have contributed content. The Digital Coast Partnership has worked with NOAA to identify critical data and information needs and share resources among over 100,000 members. These partners and other content contributors use the Digital Coast as a catalyst and resource for bringing diverse organizations together to work toward common coastal management goals. The large membership of the partnership organizations increases the awareness, use, leverage, and extension of Digital Coast products and services. The partner network amplifies best practices and success stories, which fosters new management ideas, attracts more public interest, and leads to better decision-making on coastal issues.

Return on Investment

The Digital Coast has a high return on investment. Current benefits exceed costs by a margin of three to one, with net benefits of \$25 million between 2007–2013.³ Continued operation of the Digital Coast over the next 15 years is expected to yield a net benefit of \$117 million, equating to a return on investment of 411 percent.⁴ This return on investment is a good deal for the taxpayers and provides the growing base of stakeholders easy access to data and tools worth millions of dollars.⁵

Since 2010, the number of coastal communities using Digital Coast resources has consistently surpassed our increasing targets. The number of communities in coastal states accessing information resources in the first quarter of Fiscal Year 2017 is 6,093, an increase of 286 percent since tracking started in 2010. This means that one out of every three coastal communities in the United States have accessed Digital Coast resources. Three out of four users say their projects could not have been accomplished without the resources found on the Digital Coast.⁶

By providing easy access to a wide range of relevant resources, the Digital Coast helps users do their jobs more efficiently and spend less time and money finding, obtaining, and using the data and products that they need. Having this information in one easily accessible location also helps eliminate duplication of effort by government agencies.

The Digital Coast reduces costs for businesses and the public to gain access to data and information, while sustaining between 890 and 1,530 high-technology jobs in the private sector.⁷ NOAA works with private sector firms to acquire nationally consistent data products, leverages costs with other partners, and then integrates them into the Digital Coast framework to address multiple user needs. When NOAA and partners purchase geospatial data from private firms across multiple jurisdictions, each partner saves money. The Digital Coast also facilitates data consistency and standards, as data are collected to the same specifications by the Federal government, ensuring a seamless database across state boundaries.

Planning for the Future

NOAA recognizes that partnership is key to Digital Coast's continued effectiveness. NOAA is committed to supporting and enhancing the Digital Coast Partnership to ensure it represents our key customers and user base. As a result, NOAA will strengthen our partnerships with the private and public sectors at both the national and local level. We will increase availability of our core trusted, accurate, and high quality coastal data sets. We will continue to provide decision-support tools and training to understand complex coastal issues and enable better decision-making. We will also expand interagency collaborations through the partnership to fill information and expertise gaps. Finally, we will enhance the core Digital Coast platform to improve this effective gateway to actionable resources. These priorities are outlined in the Digital Coast's strategic plan covering 2016–2021.

Conclusion

Once again, I appreciate the opportunity to testify today. I support the Committee's effort to highlight how the Digital Coast helps grow our economy and reduces costs while supporting our societal needs for a safe, secure, and healthy environ-

³National Oceanic and Atmospheric Administration. (2015). *Projected Benefits and Costs of the Digital Coast*. Available at <https://coast.noaa.gov/data/digitalcoast/pdf/benefits-costs.pdf>

⁴*Id.*

⁵*Id.*

⁶ MAPPS. *Digital Coast Overview*. Available at: https://c.ymcdn.com/sites/www.mapps.org/resource/resmgr/federal_issues_digital_coast/digital_coast_overview_ppt.pdf

⁷National Oceanic and Atmospheric Administration. (2015). *Projected Benefits and Costs of the Digital Coast*. Available at <https://coast.noaa.gov/data/digitalcoast/pdf/benefits-costs.pdf>

ment. Much has been accomplished in 11 years to enable more informed decisions, but we are only just getting started. There are additional needs to address, partnerships to enhance, and efficiencies to be gained. We are excited to accomplish even more in the next decade. I welcome any questions you may have regarding the Digital Coast and NOAA's foundational role in the program. Thank you.

The CHAIRMAN. Great. Thank you, Ms. LeBoeuf.
Mr. Barnes, you are recognized for five minutes.

STATEMENT OF PAUL BARNES, GEOGRAPHIC INFORMATION SERVICES DIRECTOR, HARRISON COUNTY, MISSISSIPPI; ON BEHALF OF THE NATIONAL ASSOCIATION OF COUNTIES

Mr. BARNES. Chairman Sullivan, Ranking Member Baldwin, and distinguished members of the Subcommittee.

I am honored to testify today on NOAA's Digital Coast.

My name is Paul Barnes and I am the GIS Director for Harrison County, Mississippi. Today, I am representing the National Association of Counties. NACo represents all of the Nation's 3,069 counties, including over 400 coastal counties.

Harrison County, with a population of just over 200,000 is located along the southern Mississippi coast and is best known for gaming, shipbuilding, pharmaceuticals, fisheries, and tourism. Because of our location, we face an increased threat of major hurricanes and devastating flooding and storm surge.

Having gone through Hurricane Katrina in 2005, I am well aware of the challenges that local communities face to prepare, respond, and recover from disasters. That is why my county, and others like mine, are using Digital Coast to strengthen resiliency at the local level.

Let me explain a few reasons why Digital Coast is important to coastal counties.

First, Digital Coast is integral to counties' ability to protect both public safety and natural resources. Following a disaster, we are first on the scene and play a key role in coordinating response and working to mitigate damage before and after.

In my county, we can predict storm surge ahead of time. This allows us to create and implement critical emergency plans for mass evacuation events. Because of Digital Coast, we can more easily determine whether our residents should shelter in place, evacuate in zones, or undertake a full scale evacuation. This helps to prevent tragedies, like Hurricane Rita, where people spent over two days on clogged roads and 73 people died.

We also use Digital Coast wetlands and flood exposure data to justify appropriate building codes in flood zones.

Additionally, since counties are major owners of public infrastructure—roads, bridges, hospitals, and other facilities—Digital Coast helps us keep this infrastructure safe.

Take, for example, Miami-Dade County, Florida, which is home to 2.6 million residents. The County uses Digital Coast data and projection tools to conduct stress tests on the public infrastructure to determine vulnerability. This allows them to prioritize which facilities are the most important to get up and running after a disaster.

Finally, we use Digital Coast and other GIS tools to educate the public about disaster risks. My department relies heavily on Digital

Coast to provide a visual understanding of where wetlands are located in the County. This allows us to discuss building code requirements before construction begins. This also helps residents and businesses to make educated decisions before they buy the property, and allows the County to limit development in those flood-prone areas.

Second, Digital Coast can help citizens, businesses, and communities save money. The value of a one-stop shop for Digital Coast tools is immeasurable. Data collection can be very time consuming, expensive, and located across numerous Federal, State, and local agencies. Many local governments have neither the resources nor the staff to collect it.

For example, in Harrison County, we lack the ability to collect elevation data. If we tried to collect the data ourselves, it would easily cost our County taxpayers tens of thousands, if not hundreds of thousands of dollars.

Additionally, Digital Coast offers free online and classroom training to educate decisionmakers and the public about tools and strategies to address community hazards and risks.

Moreover, Digital Coast can decrease flood insurance costs. Federally-backed flood insurance can be expensive for residents and businesses. Thanks to using Digital Coast resources, my County lowered flood insurance premiums by 20 percent for our residents.

Third, and finally, NOAA's Digital Coast program can be strengthened if we work together. It is clear that Digital Coast has changed lives and we are taking proactive steps to protect our communities from future risks. That platform gives us resources that we would not be able to collect easily elsewhere.

We thank the Senate for passing the Digital Coast Act by unanimous consent last year. We especially thank Senators Baldwin and Sullivan for championing the bill. We support your continued efforts to swiftly enact legislation to codify NOAA's Digital Coast program into law and this will ensure that communities like mine are protected and supported for years to come.

We look forward to partnering with Congress to move and strengthen the program.

I am happy to take any questions.

[The prepared statement of Mr. Barnes follows:]

PREPARED STATEMENT OF PAUL BARNES, GEOGRAPHIC INFORMATION SERVICES DIRECTOR, HARRISON COUNTY, MISSISSIPPI ON BEHALF OF THE NATIONAL ASSOCIATION OF COUNTIES

Chairman Sullivan, Ranking Member Baldwin and distinguished members of the subcommittee, thank you thank you for the opportunity to testify on "A Decade of the Digital Coast Partnership Program: Successes and Opportunities."

My name is Paul Barnes and I currently serve as the Geographic Information Services (GIS) Director for Harrison County, Mississippi. I also serve as the Planning Section Chief in the county's Emergency Operations Center Command in the event of a state emergency declaration. Prior to my current position, I was the Director of GIS for the Southern Mississippi Planning and Development District for ten years. Today, I am representing the National Association of Counties (NACo), who participates as a Digital Coast Partner.

The Digital Coast Partnership is a diverse group of members. NACo, along with the American Planning Association, Association of State Floodplain Managers, Coastal States Organization, National Estuarine Research Reserve Association, National States Geographic Information Council, The Nature Conservancy and the Urban Land Institute work with the National Oceanic Atmospheric Administration

(NOAA) on the Digital Coast platform. Through Digital Coast, NOAA has created an innovative public-private partnership to determine the tools, data and training that counties need to protect communities from future risks. Using the Partnership, NACo educates and trains county officials on Digital Coast, collaborates with the partners on coastal issues and strengthens resiliency at the local level.

About NACo

Founded in 1935, NACo is the only national organization that represents county governments in the United States and brings together county officials to advocate with a collective voice on national policy, exchange ideas, build new leadership skills, pursue transformational county solutions, enrich the public's understanding of county government and exercise exemplary leadership in public service.

About America's Counties

Counties are highly diverse, not only in my state of Mississippi, but across the nation, and vary immensely in natural resources, social and political systems, cultural, economic and structural circumstances, public health and environmental responsibilities. Counties range in area from 26 square miles (Arlington County, Virginia) to 87,860 square miles (North Slope Borough, Alaska). The population of counties varies from Loving County, Texas, with just under 100 residents to Los Angeles County, California, which is home to close to ten million people. Of the Nation's 3,069 counties, approximately 70 percent are considered "rural," with populations less than 50,000, and 50 percent of these have populations below 25,000. At the same time, there are more than 120 major urban counties, which collectively provide essential services to more than 130 million people every day.

Many of the responsibilities of counties are mandated by both the states and Federal government. While county responsibilities differ widely, most states give their counties significant authorities. These authorities include construction and maintenance of roads, bridges and critical infrastructure, assessment of property taxes, record keeping, running elections, and overseeing jails, court systems and public hospitals. Counties are also responsible for child welfare, consumer protection, economic development, employment/workforce training, emergency management, land use planning, zoning and environmental protection.

These responsibilities become even more crucial for the 452 coastal and Great Lakes shoreline counties who account for 40 percent of the Nation's population, and face increased risks due to hurricanes, earthquakes, tsunamis, droughts and other natural disasters. Additionally, since coastal counties economies are often built on a foundation of marine construction and transportation, ship and boat building, tourism and recreation and offshore mineral extraction, counties directly benefit from Digital Coast data, tools and resources to protect this infrastructure.

About Harrison County, Mississippi

While Harrison County is considered "suburban" with a population of just over 200,000 residents, we have a very diverse mix of urban, suburban and rural components. Located on the south-central Mississippi coast, we are the second most populated county in the state, and we encompass 976 square miles (574 square land miles/402 square water miles). Unlike other counties, we have two county seats, located in Biloxi and Gulfport, two of our five incorporated cities. Approximately 151,000 of our residents live in one of these cities, but if Harrison County were a city, we would be the third largest in Mississippi, with 50,000 residents living in the unincorporated area of the county.

Like other coastal counties, our economy is heavily dependent on shipbuilding, fisheries and tourism. In fact, we are home to the longest man-made beach in the U.S., stretching 26-miles from Biloxi to Henderson Point. According to NOAA's Digital Coast Ocean Jobs Snapshot, tourism and recreation account for 79 percent of the jobs in the county and ocean jobs account for 11,034 employees, \$242 million in wages and \$453 million in goods and services (2013). We also have pharmaceuticals, gaming and two military bases; the Naval Construction Battalion Center and Keesler Air Force Base in the county.

Because we are on the Mississippi Gulf Coast, we face an increased risk of hurricanes and flooding. In 2005, after Hurricane Katrina ripped through our county, we had significant loss of life and tremendous property damage. Most structures sustained some type of damage—almost 25 percent—one in four structures—were greatly impacted. 7,500 properties were moderately damaged, and over 15,000 properties were substantially damaged or destroyed. The approximate cost to replace and/or repair just county-owned infrastructure after Hurricane Katrina was roughly \$126 million. In the aftermath of disasters such as these, it is our job to protect our residents and businesses before, during and after disasters. Digital Coast is key to this effort.

Digital Coast is beneficial for coastal and Great Lakes counties of all sizes.

The topic of this hearing is of great importance to my county and many other coastal counties across the United States who are tasked with protecting the environment, ensuring public health and strengthening the economic vitality of our communities.

Having gone through Hurricane Katrina in 2005, I am well aware of the challenges that local communities face to prepare, respond and recover from disasters. It takes time. That is why my county and others like mine are using NOAA's Digital Coast Initiative to strengthen resiliency at the local level.

Today, I would like to highlight a few reasons why Digital Coast is so valuable to coastal communities, and potential opportunities for the program moving forward:

1. *Digital Coast is integral to counties' ability to protect both public safety and natural resources.*
2. *Not only is Digital Coast a valuable tool for local governments, it can also help citizens, businesses and communities save money.*
3. *NOAA's Digital Coast program can be strengthened if we work together.*

Digital Coast is integral to counties' ability to protect both public safety and natural resources.

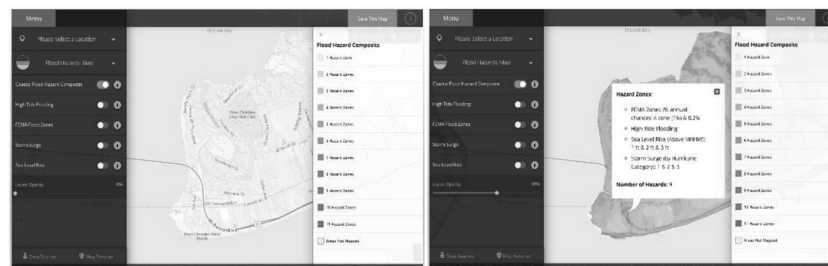
In recent years, we have seen a spate of incredible and catastrophic disasters across the country, and it is only getting worse. According to NOAA, 2017 was one of the worst years on record for natural disasters. Hurricanes Harvey, Irma and Maria alone cost \$265 billion. These storm events directly impacted coastal counties who are responsible for public safety, protection of natural resources and strengthening local economies.

First, counties play an indispensable role in addressing public health and safety issues. When a hurricane hits, flooding occurs or a tsunami threatens, residents, businesses and visitors call us for help when they are wondering whether they should evacuate, are looking for the nearest shelter, need to be rescued or aren't sure what to do. This was demonstrated over and over in 2017 with Hurricanes Harvey, Irma and Maria, as well as the massive wildfires across our western states. Digital Coast can help us plan well in advance of disasters to protect life, property and the unique heritage of our communities.

While state statutes and organizational structures vary, local emergency management responsibilities are most commonly vested in county governments. Following a disaster, local emergency managers are often first on the scene and play a key role in coordinating emergency management efforts and working to mitigate damage before and after disasters.

That's why we use Digital Coast data and tools to develop effective evacuation routes in my county. In 2017, before Hurricane Nate hit, we determined which areas would be potentially impacted by storm surge. Additionally, by using Digital Coast, we are able to effectively identify instances where residents should shelter in place, evacuate in zones or undertake a full-scale evacuation. This helps to prevent an evacuation disaster such as the one during Hurricane Rita where people spent over two days on clogged Texas roads and over 73 people died.

We also use Digital Coast wetlands and flood exposure data to justify new building codes in special flood areas. For example, the *picture below* on the left shows the Henderson Point area in Harrison County without flooding. However, the *picture on the right* shows the area with a flood hazard composite layer using potentials for flooding and storm surge. This visualization allowed the county to justify an additional two-foot elevation requirement above base flood elevation for new structures in this area.



Other counties are using Digital Coast to develop flood visualization tools for residents and businesses. Calcasieu Parish, in southwestern Louisiana, utilized Digital Coast to develop an urban flash flood forecasting and early warning system in the Contraband Bayou Watershed. With a population of nearly 200,000 residents spread across 1,094 square miles, the parish created a visual interactive storyboard. This real-time data allows the parish officials, residents and businesses to see which parts of the watershed may be impacted by a storm event, allowing the parish to efficiently coordinate and prioritize emergency response efforts within the region. It is the first of its scale and caliber in the entire state of Louisiana.

In addition to assessing flood risk, Digital Coast has proven effective in evaluating fire hazard risk in Southern California. With the combination of weather, topography, native vegetation and the notorious Santa Ana winds, Southern California is highly susceptible to wildfires. Although wildfires are inevitable in this region, Digital Coast is helping county officials identify high-risk areas. By using Digital Coast's Coastal Change Analysis Program (CCap), researchers were able to scrutinize 26 years of data to identify wildfire risk areas and their proximity to urban developments. As the project continues, communities and researchers will be able to anticipate future wildfire risk, based on changing development patterns.

Second, as counties are major owners of public infrastructure—45 percent of our Nation's public road miles and nearly 40 percent of bridges, a third of the Nation's transit systems and airports, 78 percent of public transportation, 976 hospitals and 91 percent of all local jails—we use Digital Coast to keep this infrastructure safe. Annually, counties spend \$122 billion on building public infrastructure and repairing and operating public works, \$22 billion on sewage and solid waste management and almost \$83 billion on community health and public hospitals. To protect these investments, we must develop risk assessment, emergency management and mitigation plans for a variety of natural and manmade disasters to protect this infrastructure. In Harrison County, to protect the 1,880 miles (39.9 percent) of county-owned and maintained road miles and 108 of the 298 bridges in the county, we use Digital Coast and other GIS data for bridge and road management and maintenance efforts, corridor and ecosystem preservation to name a few.

For our large urban counties who own a lot of public safety and purpose infrastructure, Digital Coast is even more important. Miami-Dade County, home to 2.6 million Floridians, owns and maintains five county airports, almost half of the county's road miles, 225 bridges, thousands of miles of pipes, pump stations and water and wastewater treatment plants, marinas, parks, nursing homes and a public hospital. Due to its geographic location along the southeastern Florida coast, the county uses Digital Coast data and projection tools to conduct "stress tests" on their facilities to determine vulnerability to sea level rise and storm surge events. Using resulting data, the county priorities which public safety facilities are the most important to get up and running after a disaster. Furthermore, Miami-Dade County collaborates with NOAA to offer Digital Coast trainings to public employees to understand these challenges at the county level.

Another example hails from Virginia. The state is working with local communities to address the vulnerability of transportation infrastructure on the Eastern Shore from sea level rise and flooding events. Using data sets from the Digital Coast Sea Level Rise and Coastal Flooding Impacts Viewer, the state determined that 33 miles of roads in the region are vulnerable to a one-foot sea level increase in the next several decades and nearly a quarter of roads would be impacted by a six-foot rise by 2090.

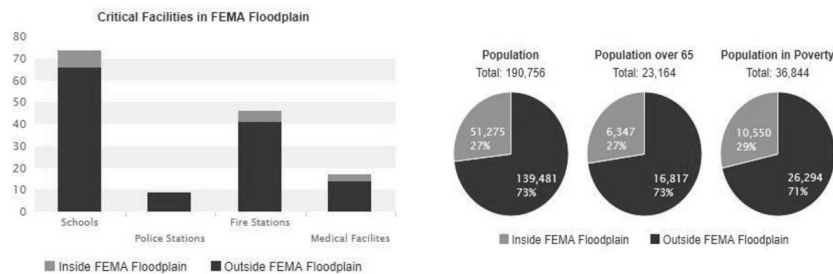
Third, counties are responsible for preservation of natural resources, while protecting the public. We use Digital Coast information to set ordinances, rules and regulations on water quality, flood protection, acquiring damaged homes or businesses and relocating structures, set building codes, adopt land use setbacks, environmental restoration projects and returning property to open space, wetlands or recreational use and other programs.

Throughout Mississippi, the Gulf region and nationwide, our counties are actively assessing how to use natural infrastructure and open space to buffer from storm events. In Harrison County, data provided through Digital Coast combined with our locally collected information helps to identify potential areas to acquire for open space conservation and/or natural infrastructure. In Jackson County, on the eastern Mississippi coast, the county has a living shoreline plan, which was just updated using Digital Coastal. Parks, open spaces, wetlands, beaches and shorelines absorb stormwater, improve water quality and offer habitat for wildlife as natural infrastructure to protect communities from flooding.

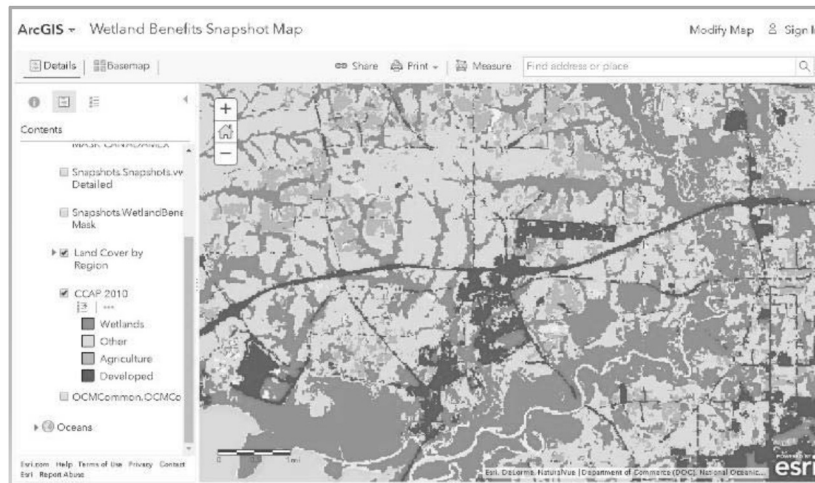
Other counties are also utilizing GIS to meet water quality standards. Within the Chesapeake Bay watershed, Prince George's County, MD. uses GIS-based tools to clean up polluted waterways. Located alongside the eastern portion of Washington,

D.C., Prince George's is facing tighter stormwater requirements in the Chesapeake Bay. To keep the waterways clean, the county has launched an online GIS tool that allows residents to quickly report trash and litter locations.

Furthermore, we utilize *Digital Coast* and other GIS tools to educate the public about disaster risks. While Digital Coast has a multitude of useful tools to make our work easier, my department largely relies on the Digital Coast Flood Exposure County Snapshot and its corresponding Wetlands Benefits Snapshot. These snapshots give a visual understanding of where wetlands are located in the county. Using the Flood Exposure County Snapshot, residents, businesses and the public sector immediately see that 27 percent of our residents and 11 percent of our critical infrastructure (hospitals, roads, schools and shelters) are located within a FEMA floodplain (shown below).



Through the Wetland Benefits Snapshot map, we can quickly display wetland areas in the county, as shown on the picture on the right, to educate residents and businesses about allowable development on a property. As a result, county code and zoning offices can discuss needed requirements with property owners and buyers before building can commence, such as wetlands surveys and elevation certificates. This allows residents and businesses to make educated decisions BEFORE they buy a property and allows the county to limit development in these hazardous flood prone areas.



Not only is Digital Coast a valuable tool for local governments, it can also help citizens, businesses and communities save money. The value of the one-stop-shop for Digital Coast tools is immeasurable. Data collection can be very time-consuming and expensive and many local governments neither have the resources or the staff to collect it. This comprehensive data collection does not necessarily exist elsewhere.

For example, in Harrison County, we lack the ability to collect elevation data. Instead, we rely heavily on Digital Coast data. This allows us to predict areas that may be inundated by flash flood and storm surges.

If we tried to collect the data ourselves, it would easily cost our Harrison County tax-payers tens of thousands, if not hundreds of thousands of dollars. This would quickly drain available county resources for other vital emergency management programs.

Additionally, Digital Coast offers free online and classroom trainings to educate practitioners and the public about tools and strategies to address risk. These offerings include a wide range of courses, such as ways to use green infrastructure for coastal risk, building risk communications skills, how to plan and facilitate collaborative meetings and how to utilize Digital Coast tools to amend land use codes for natural infrastructure.

Training such as these are not only valuable for my county, but many communities across the U.S., especially those who have limited staff and resources to attend these classes. Moreover, the no-cost trainings increase awareness of risk, mitigation challenges and bring together diverse communities, disciplines of jurisdiction, federal, state and local agencies and organizations together. This results in a more collaborative effort.

Finally, Digital Coast allows for better analysis of risk, which can lead to decreased flood insurance costs. Under the Federal Emergency Management Agency's (FEMA) National Flood Insurance Program (NFIP), which provides federally-backed insurance for residents and businesses in flood zones, participating counties must adopt and enforce sound floodplain management practices to reduce future flood damage.

By using Digital Coast, my county can undertake targeted pre-disaster mitigation investments to reduce the risk of flooding events. For example, we use Digital Coast C-CAP land cover and wetlands data to add additional layers to our GIS maps which allows us to better analyze vulnerable areas. As a result, the county has increased the community's FEMA's Community Rating System (CRS) score, which has decreased risk and lowered NFIP premium insurance rates by twenty percent for our residents in special flood hazard zones.

NOAA's Digital Coast program can be strengthened if we work together.

There is no doubt that the NOAA Digital Coast Initiative has changed lives. Through the data, tools and trainings, counties and other local governments are taking proactive steps to protect their communities from future risks.

But, we need Congress's help to ensure that the program remains in place and continues to grow. NOAA's Digital Coast gives counties and other stakeholders necessary resources that they would not be able to collect easily elsewhere. However, the program faces constant risk of disbandment unless Congress acts.

We are encouraged by the "*Digital Coast Act*" (S. 110/H.R. 4062) introduced in both the House Senate. We thank the sponsors for your support and championing these bills.

We are especially encouraged by the Senate's decision to pass S. 110 by unanimous consent last year and support your continued efforts to swiftly enact legislation to codify NOAA's Digital Coast program into law. This will ensure that communities like mine are protected and supported for years to come.

We thank you again for your efforts and we look forward to working with Congress, NOAA and the Digital Coast Partnership to move and strengthen the program in the years ahead.

In conclusion

Chairman Sullivan and Ranking Member Baldwin, the bottom line is that Digital Coast gives communities the data and tools they need to better protect their residents, while providing a cost-effective service for federal, state and local governments and their citizens. Through Digital Coast we can not only protect and transform communities, but we can also lay the groundwork for a new and better future. Digital Coast is an extraordinary partnership that works.

Thank you again for the opportunity to testify today on behalf of America's 3,069 counties. I would welcome the opportunity to work more closely with you to strengthen and improve our coastal planning efforts. I would be happy to address any questions.

Attachments:

- Ocean Jobs County Snapshot: Harrison County, Mississippi
- Flood Exposure Snapshot: Harrison County, Mississippi
- Wetlands Benefits Snapshot: Harrison County, Mississippi

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Coastal County Snapshots - NOAA Office for Coastal Management

COASTAL COUNTY SNAPSHOTS
coast.noaa.gov/snapshots/

Ocean Jobs Snapshot

Harrison County, Mississippi

Ocean Jobs = A Healthy Economy

In 2013, ocean-related businesses provided 13.3% of the total jobs in Harrison County. This represents a 56% increase in ocean jobs since 2005. Nationwide, ocean jobs represent double the number of jobs supported by agriculture.

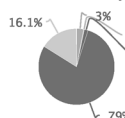
Harrison County ocean jobs account for

11,034
employees\$243m
in wages
in 2013\$453m
in goods & services

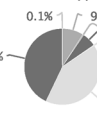
Ocean Jobs by Sector

Comparing Harrison County's ocean sectors to the state and nation shows how local concerns may or may not coincide with state and national priorities.

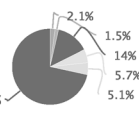
Harrison County



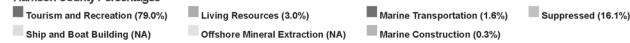
Mississippi



Nation



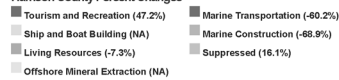
Harrison County Percentages



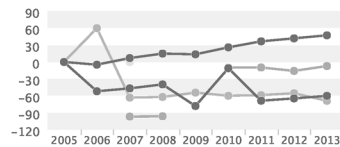
Job Trends

When making coastal management decisions, it is important to understand how the six sectors have changed over time.

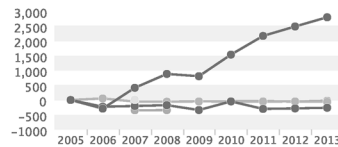
Harrison County Percent Changes



Percent Change in Jobs



Number of Jobs Gained or Lost



County and National Wages

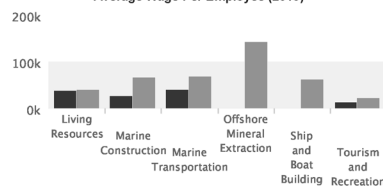
Higher local wages can be attractive to employees but a deterrent to new or expanding businesses. Managers should consider cost of living rates when making this comparison.

Impact of Part-time Workers

Average tourism wages can be smaller due to the high percentage of part-time workers, but total tourism wages are often among the highest because of the large number of people employed.

■ County ■ National

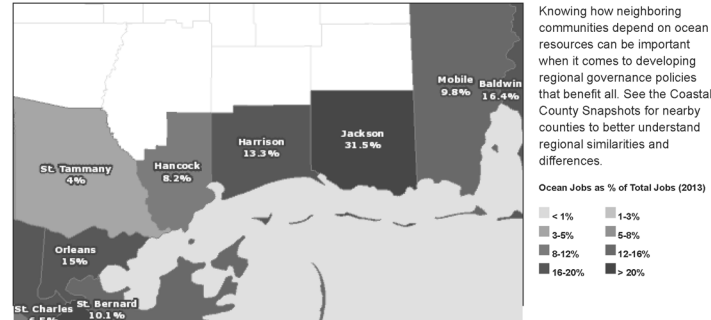
Average Wage Per Employee (2013)



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Coastal County Snapshots - NOAA Office for Coastal Management

Understanding Neighbors Makes a Region Stronger



Digging Deeper

This snapshot provides a good starting point, but there are aspects of the economy that are not captured in this analysis. Information to help fill these gaps is listed below.

[Frequently Asked Questions \(https://coast.noaa.gov/snapshots/faq/ocean-jobs.pdf\)](https://coast.noaa.gov/snapshots/faq/ocean-jobs.pdf)

Key Economic Sectors

Economic statistics that focus on employment, like those used in this snapshot, miss the contributions of the self-employed. However, the self-employed are an important part of some sectors, like commercial fishing. NOAA compiles a wide range of [data on commercial fishing \(http://www.st.nmfs.noaa.gov/commercial-fisheries/index\)](http://www.st.nmfs.noaa.gov/commercial-fisheries/index) that more fully illustrates this sector's economic importance.

Values Outside the Market

Because many of the natural features that make the coast attractive can be enjoyed at no cost, their value is not evident in the "market" data (jobs, wages, etc.). However, independent studies have estimated these "nonmarket" values (aesthetics, health, safety, etc.).

- [National Ocean Economics Program \(http://www.oceanecconomics.org/nonmarket/\)](http://www.oceanecconomics.org/nonmarket/)

Combining Data to Make Decisions

Combining information on market and nonmarket values to inform coastal management can be complicated. Below are a few resources that will assist in this task.

- [General overview in laymen's terms \(http://www.ecosystemvaluation.org\)](http://www.ecosystemvaluation.org)
- [Developing and using information on nonmarket values \(http://nepis.epa.gov/Adobe/PDF/P100ERJY.pdf\)](http://nepis.epa.gov/Adobe/PDF/P100ERJY.pdf)
- [Assessing tradeoffs \(https://coast.noaa.gov/digitalcoast/tools/invest.html\)](https://coast.noaa.gov/digitalcoast/tools/invest.html)

Additional Coastal Economic Resources

- [NOAA Fisheries Social Indicators \(http://www.st.nmfs.noaa.gov/humandimensions/social-indicators/index\)](http://www.st.nmfs.noaa.gov/humandimensions/social-indicators/index)
- [Marine Ecosystem Services Partnership \(http://www.marineecosystems-services.org/\)](http://www.marineecosystems-services.org/)
- [Introduction to Economics for Coastal Managers \(https://coast.noaa.gov/digitalcoast/training/economics.html\)](https://coast.noaa.gov/digitalcoast/training/economics.html)

Data Source for This Snapshot

Economics: National Ocean Watch (ENOW) (<https://coast.noaa.gov/dataregistry/search/collection/info/enow>). This data set provides ocean- and Great Lakes-related establishments, employment, and wages computed using the Bureau of Labor Statistics' Quarterly Census of Employment and Wages, and gross domestic product (GDP) data derived from state GDP statistics from the Bureau of Economic Analysis.

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Coastal County Snapshots - NOAA Office for Coastal Management

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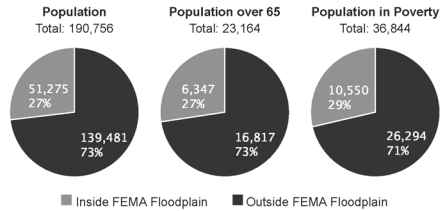
Flood Exposure Snapshot

Harrison County, Mississippi

People + Floodplains = Not Good
High-Risk Populations + Floodplains = Even Worse

The more homes and people located in a floodplain, the greater the potential for harm from flooding. Impacts are likely to be even greater when additional risk factors (age, income, capabilities) are involved, since people at greatest flood risk may have difficulty evacuating or taking action to reduce potential damage.

Based on [2009-2013 American Community Survey 5-year Summary File data](#).

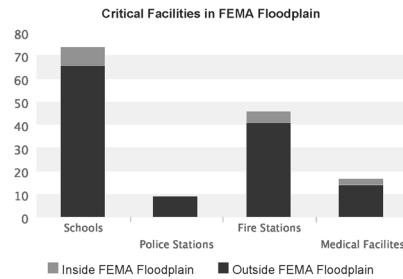


Community Infrastructure + Floodplains = Bad News

11% of critical facilities in Harrison County, Mississippi, are within the floodplain.

Hospitals, Roads, Schools, Shelters. These facilities play a central role in disaster response and recovery. Understanding which facilities are exposed, and the degree of that exposure, can help reduce or eliminate service interruptions and costly redevelopment. Incorporating this information into development planning helps communities get back on their feet faster.

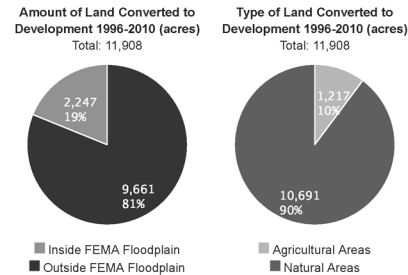
Based on [USGS Structures Database](#).



Increasing Development in Floodplains = More People in Harm's Way
Loss of Natural Buffers = Less Protection

A county with more natural areas (wetlands, forests, etc.) and less development within floodplains typically has lower exposure to flooding. A county that monitors land cover changes within the floodplain will detect important trends that indicate whether flood exposure is increasing or decreasing. Armed with this information, local leaders can take steps to improve their safety and resilience.

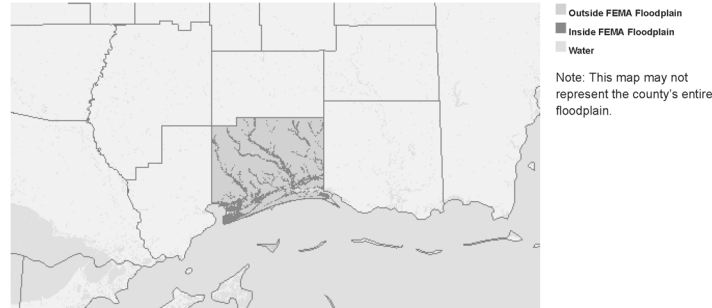
Based on [NOAA Land Cover Data](#).



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Coastal County Snapshots - NOAA Office for Coastal Management

Harrison County Floodplain



Next Steps

Through adaptation planning, all communities can be better prepared to face coastal hazards. While each community is different, there are some basic steps that all communities can follow to become more resilient.

1. **Know your risks** – If your county has a hazard mitigation plan, get a copy of it from your county emergency management office or the [Federal Emergency Management Agency \(FEMA\)](https://www.fema.gov/hazard-mitigation-plan-status). Having county information about potential hazards, vulnerabilities, and priority hazard mitigation projects is important. Use the [Coastal Flood Exposure Mapper](https://coast.noaa.gov/digitalcoast/tools/flood-exposure.html) to create maps showing exposure to coastal flood hazards in your community. The [Using Flood Exposure Maps](https://coast.noaa.gov/digitalcoast/training/flood-exposure.html) webinar can help you get started.
 2. **Develop a team** – To see the issues and opportunities from as many perspectives as possible, engaging a diverse group of stakeholders is always a good idea. The [County Snapshots](https://coast.noaa.gov/snapshots) are used to help people visualize the issues.
 3. **Know what resources are available** – Federal and state agencies have funds available for risk reduction activities. See the funding opportunities listed below to learn more. There are also data and tools available to help people visualize the issues and solutions. For information on creating inundation maps for your community, visit the Visualization section of the [Coastal Inundation Toolkit](https://coast.noaa.gov/applyit/inundation/visualize.html).
- Funding Sources**
- [FEMA](https://www.fema.gov/hazard-mitigation-grant-program)
 - [NOAA Coastal Management Program](https://coast.noaa.gov/funding/)
4. **Discover what others are doing** – See how other communities are addressing these issues. Visit the discover section of the [Coastal Inundation Toolkit](https://coast.noaa.gov/applyit/inundation/discover.html). You may also contribute a story about your community efforts.

Additional information and resources can be found within the Digital Coast's [Coastal Inundation Toolkit](https://coast.noaa.gov/applyit/inundation/understand.html).

[Frequently Asked Questions](https://coast.noaa.gov/snapshots/faq/flood-exposure.pdf)

Data Sources for This Snapshot

- [Flood Zones](https://msc.fema.gov/portal/) – Based on FEMA 1% annual chance flood zones
- [Critical Facilities](http://nationalmap.gov/structures.html) – USGS Structures Database
- [Demographic Data](https://coast.noaa.gov/digitalcoast/data/acs/) – NOAA
- [Land Cover Data](https://coast.noaa.gov/dataregistry/search/collection/info/ccapregional/) – NOAA

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Coastal County Snapshots - NOAA Office for Coastal Management

COASTAL COUNTY SNAPSHOTS
coast.noaa.gov/snapshots/

Wetland Benefits Snapshot

Harrison County, Mississippi

Protecting Wetlands = Coastal Communities That Are Safer, Cleaner, and More Economically Productive

Healthy wetlands provide more than just a pretty view. Wetlands are a pivotal part of the natural system, supplying tremendous benefits for coastal communities. Even small acreages can provide some level of benefit. The location, health, and size of individual wetlands also play a role. This snapshot demonstrates three key benefits of wetlands in Harrison County.

31%

116,068 acres

of Harrison County's land area is wetland.

Based on [2010 NOAA land cover](#).**More Economically Productive: Wetlands Support Fishing Economies**

Coastal wetlands provide habitat for many aquatic species that contribute to local food supplies and fishing-related industries.

In addition to providing a base for commercial fishing jobs and revenue, wetlands also support recreational and charter fishing. These economic benefits extend beyond county boundaries.

Based on [2013 ENOW](#) and [2013 ENOW for Self-Employed Workers](#).

Commercial Fishing	County	State
Jobs	700	3,611
Output from businesses	\$35.9 million	\$398.6 million
Revenue from self-employed	\$32.2 million	\$60.2 million

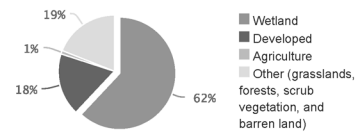
Safer: Wetlands Reduce Flood Impacts

20% (73,841 acres) of Harrison County's land area is in the floodplain.

Wetlands located in coastal and riverine floodplains can protect people and their property, community infrastructure, and agricultural investments from floods. Wetlands act as natural sponges, holding floodwaters and lowering flood heights.

Based on [Best available as of 2015 FEMA Flood Zones \(100-year\)](#); [2010 NOAA land cover](#).

Harrison County's Floodplain



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Coastal County Snapshots - NOAA Office for Coastal Management

Cleaner: Wetlands Improve Water Quality

Runoff associated with concrete, asphalt, rooftops, and other impervious surfaces is a leading cause of water pollution.

Wetlands near developed and agricultural areas trap pollutants and excess nutrients in surface runoff, keeping water bodies cleaner. This natural filtering helps prevent water use restrictions, such as beach and shellfish closures, and reduces the need for costly treatment systems.

Based on [2010 NOAA land cover](#).

■ Wetland
 ■ Developed
 ■ Agriculture
 ■ Other (grasslands, forests, scrub vegetation, and barren land)

**Next Steps**

Understanding how wetlands benefit a coastal community can provide strong incentives for wetland protection. The following suggestions and resources provide guidance in moving forward with these efforts.

Integrate wetland protection priorities into community planning – Encouraging wetland protection and development in appropriate places makes communities more resilient. Resources are available to help communities incorporate wetland protection considerations into existing planning efforts.

- [Introducing Green Infrastructure for Coastal Resilience training](https://coast.noaa.gov/digitalcoast/training/green.html) (<https://coast.noaa.gov/digitalcoast/training/green.html>)
- [Coastal Flood Exposure Mapper](https://coast.noaa.gov/digitalcoast/tools/flood-exposure.html) (<https://coast.noaa.gov/digitalcoast/tools/flood-exposure.html>)
- [Using Flood Exposure Maps webinar](https://coast.noaa.gov/digitalcoast/training/flood-exposure.html) (<https://coast.noaa.gov/digitalcoast/training/flood-exposure.html>)

Prioritize wetlands for protection – Additional factors can influence wetland protection priorities. Consult local experts regarding wetland size, location, and quality; fish and wildlife considerations; regulatory requirements; and tourism, recreation, and other benefits. Resources are available to help communities with the selection and prioritization process, including

- [C-CAP land cover data](https://coast.noaa.gov/dataregistry/search/collection/info/ccapregional) (<https://coast.noaa.gov/dataregistry/search/collection/info/ccapregional>) and [online atlas](https://coast.noaa.gov/digitalcoast/tools/lca.html) (<https://coast.noaa.gov/digitalcoast/tools/lca.html>)
- [National Wetlands Inventory data](http://www.fws.gov/wetlands/) (<http://www.fws.gov/wetlands/>)
- [Habitat Priority Planner tool](https://coast.noaa.gov/digitalcoast/tools/hpp.html) (<https://coast.noaa.gov/digitalcoast/tools/hpp.html>)
- [Green Infrastructure Mapping Guide](https://coast.noaa.gov/digitalcoast/training/gi-mapping.html) (<https://coast.noaa.gov/digitalcoast/training/gi-mapping.html>)

Discover additional helpful resources – More tools, data, and information, including funding sources, are highlighted on the [frequently asked questions page](https://coast.noaa.gov/snapshots/faq/wetland-benefits.pdf) (<https://coast.noaa.gov/snapshots/faq/wetland-benefits.pdf>)

Data Sources for This Snapshot

- [Land Cover Data](https://coast.noaa.gov/dataregistry/search/collection/info/ccapregional) (<https://coast.noaa.gov/dataregistry/search/collection/info/ccapregional>) – NOAA Coastal Change Analysis Program
- [Flood Zones](http://msc.fema.gov/portal) (<http://msc.fema.gov/portal>) – Federal Emergency Management Agency 1% Annual Chance Flood Zones
- [Economics Data](https://coast.noaa.gov/dataregistry/search/collection/info/enow) (<https://coast.noaa.gov/dataregistry/search/collection/info/enow>) – NOAA Economics: National Ocean Watch
- [Self-Employed Workers](https://coast.noaa.gov/dataregistry/search/collection/info/enow-neg) (<https://coast.noaa.gov/dataregistry/search/collection/info/enow-neg>) – NOAA Economics: National Ocean Watch for Self-Employed Workers

The CHAIRMAN. Thank you, very much, Mr. Barnes.
Mr. Millar, you are next.

**STATEMENT OF DAVID MILLAR,
GOVERNMENT ACCOUNTS DIRECTOR, AMERICAS FOR FUGRO**

Mr. MILLAR. Chairman Sullivan, Ranking Member Baldwin, and members of the Committee.

Thank you for this opportunity to appear before you to provide an industry perspective on the past 10 years of the Digital Coast Partnership Program.

My name is David Millar and I am the Government Accounts Director, Americas for Fugro based in Frederick, Maryland. My background includes 30 years of marine navigation, hydrographic survey, and ocean and coastal mapping experience.

As Government Accounts Director for the Americas, I serve as Fugro's key account manager for the United States Government, other national governments within the Americas region, the United Nations, the World Bank, and other multilateral development banks.

Fugro is the world's leading, independent provider of geo intelligence and asset integrity solutions for large construction, infrastructure, and natural resource projects. Our United States and Americas regional headquarters is located in Houston, Texas and we employ approximately 1,100 employees across 30 offices in 10 states.

Working predominantly in the energy and infrastructure markets, we serve both public and private sector clients on land and at sea. Fugro has been active in all U.S. coastal states, including Alaska and those on the Great Lakes, for more than three decades supporting resource development initiatives, coastal infrastructure development, and providing survey and mapping support to Federal, State, and local governments.

Fugro works with NOAA's Office of Coast Survey, the National Geodetic Survey, the Office for Coastal Management, the Army Corps of Engineers, the USGS, FEMA, the Bureau of Reclamation, and the U.S. Navy.

Elevation data, land cover, and imagery acquired under these contracts are, or could be, incorporated into the Digital Coast. This combined experience and expertise has positioned Fugro as a strong participant in the Digital Coast Partnership Program.

Data, tools, and training are critically important to managing coastal resources and NOAA's Digital Coast provides the coastal management community with all of these in one convenient portal.

With more than 39 percent of the U.S. population living near the coasts, the need for this type of integrated data is growing among local, State, and Federal emergency response and resource development managers.

With what seems like increased flooding frequency comes increased risk to life and property. Houston alone has experienced three 500-year floods in the past three years. And even as the city continues to recover, it is trying to plan for the next flooding event.

Coastal and emergency managers throughout the country are under increased pressure to plan for, mitigate, and manage these

events. The Digital Coast can be an invaluable resource in this process.

Fugro has been the contributor of source data to the Digital Coast since before its inception 10 years ago. Highlights include:

Providing land cover and land cover change information from Landsat to support C-CAP for inclusion into the Digital Coast;

Surveying the entire West Coast of the United States between 2009 and 2011 for the Corps of Engineers in support of their National Coastal Mapping Program; and,

Topographic LIDAR, bathymetric LIDAR, aerial photography, and hyperspectral imagery were acquired, processed, delivered, and are now part of the Digital Coast.

Earlier this year, Fugro acquired topographic LIDAR data of the greater Houston-Galveston area under contract for the Texas Water Development Board, the Texas Natural Resources Information System, and the USGS. These data will become part of the Digital Coast, and given the devastating flooding from Hurricane Harvey last August will serve as an invaluable resource to the local coastal and emergency management community.

Even Fugro uses the Digital Coast to support siting and desktop studies that help our clients assess the feasibility of infrastructure development projects in the coastal zone.

Based on our experience with the Digital Coast, I have a few recommendations for the Committee's consideration.

Firstly, increase the marketing and promotion of the Digital Coast. While I believe the Digital Coast is well known to those in government, I do not think that is the case within academia and the private sector.

For example, a Google search of "available coastal bathymetry data in the USA," does not present the Digital Coast within the first five pages of results.

Incorporate or reference coastal sonar and bathymetric LIDAR from NOAA NCEI. All of the bathymetry data acquired and maintained by NOAA's Office of Coast Survey are stored at, and are served by, NOAA NCEI. It is suggested that the coastal data be visible or accessible from the Digital Coast.

Third, develop a link between the U.S. Federal Mapping coordination site and the Digital Coast. The prior was developed by the Integrated Working Group on Ocean and Coastal Mapping and shows the mapping requirements and plans of Federal and State agencies around the country. It would be useful if the Digital Coast could also show these plans.

And last, continue the Federal Government's commitment to data collection. The Digital Coast would not exist without coastal data. Having a combination of current and historical data allows coastal managers to not only assess the current situation, but also monitor change. Both are critical to maximize the utility of data served by the Digital Coast.

Once again, I would like to thank the Committee for allowing me to provide this statement for the record and give testimony.

I would be happy to answer any questions from the Committee on the Digital Coast program.

Thank you.

[The prepared statement of Mr. Millar follows:]

PREPARED STATEMENT OF DAVID MILLAR, GOVERNMENT ACCOUNTS DIRECTOR,
AMERICAS FOR FUGRO

Chairman Sullivan, Ranking Member Baldwin, and members of the Committee, thank you for this opportunity to appear before you to provide an industry perspective on the past ten years of the Digital Coast Partnership Program. My name is David Millar and I am the Government Accounts Director—Americas for Fugro, based in Frederick, Maryland. Data, tools and training are critically important to managing coastal resources and NOAA's Digital Coast provides the coastal management community with all of these in one convenient portal.

My background includes 30 years of Marine Navigation & Positioning, Hydrographic Survey, Ocean and Coastal Mapping experience. As Government Accounts Director—Americas, I serve as Fugro's key account manager for the United States government, other national governments within the Americas Region, the United Nations, the World Bank and other Multilateral Development Banks. In this capacity, I am the interface between Fugro's government customers and all of Fugro's marine site characterization and asset integrity service offerings, across both the Land and Marine Divisions.

Prior to this, I served as the President of Fugro Pelagos, Inc., a Fugro company specializing in Hydrographic Survey and Ocean & Coastal Mapping. There I was responsible for managing a company with approximately 80 staff and an annual budget of approximately \$20M. During that period, I oversaw the delivery of Hydrographic Survey and Coastal Zone Mapping Services to NOAA, the United States Army Corps of Engineers, as well as similar government agencies in other nations. I am also on the Board of Directors of The Maritime Alliance, the GEBCO Guiding Committee, as well as the Establishment Board of Seabed 2030.

Fugro is the world's leading, independent provider of geo-intelligence and asset integrity solutions for large construction, infrastructure and natural resource project. We provide the technical data and information required to design, construct and maintain structures and infrastructure in a safe, reliable and efficient manner. Our United States and Americas regional headquarters are located in Houston, Texas and we employ approximately 1,100 employees across 30 offices in 10 states in the United States. Working predominantly in the energy and infrastructure markets, we serve both public and private sector clients on land and at sea.

Fugro has been active in all U.S. Coastal States, including Alaska and those on the Great Lakes, for more than three decades, supporting resource development initiatives, coastal infrastructure development and maintenance activities in addition to providing survey and mapping support to federal, state and local governments.

Fugro also holds multi-year contracts with NOAA Office of Coast Survey (OCS), NOAA National Geodetic Survey (NGS), NOAA Office for Coastal Management (OCM), United States Army Corps of Engineers (USACE), United States Geological Survey (USGS), the Federal Emergency Management Agency (FEMA), United States Bureau of Reclamation (BOR) and the United States Navy. Elevation data acquired under all of these contracts is or could be incorporated into the Digital Coast.

The following sections highlight specific Fugro experience with Federal agencies that relate to or support the Digital Coast Program:

NOAA—Office of Coast Survey

Fugro has been providing Hydrographic Survey Services to NOAA's Office of Coast Survey since 1997, providing critical support in addressing the Nation's charting backlog. This support has been in the form of executing hydrographic surveys utilizing vessel-based sonar and aircraft-based bathymetric lidar. Over the years, much of this work has been performed in Alaska, though most recently, the company has been tasked to work in Maine and the Gulf of Mexico.

NOAA—National Geodetic Survey Coastal Mapping Program

Fugro has been supporting the NOAA National Geodetic Survey Coastal Mapping Program since 2014. This program uses stereo photogrammetry with tide-coordinated aerial photography and/or bathy-topo lidar along the coast to provide the Nation with an accurate, consistent, up-to-date national shoreline, which serves as the critical baseline for demarcating the United States' marine territorial limits, including its Exclusive Economic Zone and for the geographic reference needed to support coastal zone management.

NOAA—Office of Coastal Management

Since 2005 Fugro has been providing Geospatial Services to NOAA's Office of Coastal Management. One of the services provided under this contract is the production of land cover and land cover change information, which is used by NOAA's

Coastal Change Analysis Program (C-CAP). C-CAP provides nationally standardized, raster-based inventories of land cover for the coastal areas of the United States.

USACE—National Coastal Mapping Program

Fugro has been supporting the USACE's National Coastal Mapping Program since its inception in 2005, providing integrated topographic lidar, bathymetric lidar, aerial imagery and hyperspectral data along coastal areas of the contiguous United States and Hawaii. These data support the USACE's regional sediment management, construction, operations, and regulatory functions in the coastal zone

USGS—Geospatial Services

Fugro has been supporting the United States Geological Survey (USGS) via their Geospatial Product and Service Contract and its predecessor contract since 2008. Under this contract, the company has been supporting The National Map and many other federal, state and local projects through the provision of photogrammetric mapping, orthophotography, IFSAR and lidar.

FEMA—Risk Map

Fugro has been supporting the Federal Emergency Management Agency's (FEMA's) Risk Mapping, Assessment and Planning (Risk MAP) program since 2010. Risk MAP provides data and solutions that increase public awareness and reduces risk to life and property through a combination of flood hazard mapping, risk assessment tools and hazard mitigation planning. Fugro provides geospatial content, including, topographic data, bathymetric data, ortho imagery and oblique imagery

Digital Coast Partnership Program

This combined experience and expertise has positioned Fugro as a strong participant in the Digital Coast Partnership Program. With more than 39 percent of the U.S. population living near the coast, projected to reach 134 million by 2020, the need and appreciation for this type of integrated data is growing among local, state, and Federal emergency response and resource development managers. Fugro plays an important role supporting the Digital Coast by providing high quality geospatial data in formats readily accessible to Federal partners, including NOAA.

Through the contracts and programs summarized above, Fugro provides a variety of source data to the Digital Coast Program. These source data include elevation, land cover and imagery. The coastal data acquired under some, but not all, of these contracts are incorporated into the Digital Coast. Other data sources and content, such as hazards and climate, economic, benthic, fish, birds, corals, demographic, Federal geo-regulations, jurisdictions and boundaries, marine habitat, marine mammals and turtles, ocean uses and planning areas, physical and oceanographic and weather are provided by NOAA and many other contributors. All content is vetted by NOAA before being served and combined on-line with tools and training. The Digital Coast portal includes visualization tools, predictive tools and tools that make data easier to find and use. Training courses are also available online or at the user's location. Content is critical, however, and Digital Coast would not exist if it were not for current and historical data. For Fugro, acquiring and processing content that feeds into the Digital Coast via our numerous Federal government contracts results in approximately one-hundred well-paying jobs across the country.

In many ways, Fugro's site characterization and asset integrity services mirror many of the areas prioritized in Digital Coast. The Digital Coast provides an enabling platform that facilitates use and application. It starts with data, turns it into information and facilitates action through discovery, download, mapping, analysis, learning and sharing. Within Fugro, we acquire data of the earth and its assets, we manage and analyze the data and we provide advice covering a wide spectrum of geo-engineering and asset integrity disciplines to our customers. As with the Digital Coast, this process allows our clients to make informed decisions and facilitate/de-risk complex and technically demanding projects. The nature of the projects is different, but the process is similar and the experiences gained through work in the Digital Coast Partnership Program are valuable to the private sector.

Highlights

Fugro has been a contributor to the Digital Coast Program since its inception ten years ago and even data that we acquired before this date have been incorporated into the Digital Coast. Several examples follow:

- Fugro, through its support to the Joint Airborne LIDAR Bathymetric Technical Center of Expertise (JALBTCX), acquired topographic lidar, bathymetric lidar, aerial photography and hyperspectral imagery along the Gulf Coast for the

USACE immediately after Hurricane Katrina, which was subsequently incorporated into and is now served by the Digital Coast.

- Under our Geospatial Services contract with NOAA’s Office of Coastal Management, Fugro provides land cover and land cover change information from Landsat imagery to support C–CAP. All of our C–CAP data are incorporated into the Digital Coast and is updated on a 5-year cycle. In 2015, our C–CAP work was in the Great Lakes. In 2016, it was in Washington, Wisconsin, Pennsylvania, Ohio, Illinois, Indiana, New York, New Hampshire, Maine, Michigan, Rhode Island, Connecticut, North Carolina and South Carolina. In 2017, we worked in Georgia, Alabama, Mississippi and California.
- Between 2009 and 2011, we surveyed the entire west coast of the United States from the Mexico border in the south to the Canadian border in the north. This work was executed under our contract with USACE and was in support of the Corp’s National Coastal Mapping Program. Topographic lidar, bathymetric lidar, aerial photography and hyperspectral imagery were acquired, processed, delivered and are now served by the Digital Coast.
- Most recently, Fugro has been contracted by the Texas Natural Resources Information System and the USGS to acquire high-resolution topographic lidar data of the Greater Houston-Galveston area. This work was executed using four aircraft earlier this year. Given that this area was devastated by flooding from Hurricane Harvey last August, the dataset will undoubtedly serve as an invaluable resource to the local coastal and emergency management community.

The frequency of coastal flooding seems to be increasing and with this comes increased risk of life and property. In the case of Houston, that city has experienced three 500-year floods in the past three years. As a result, coastal and emergency managers are under increased pressure to plan for, mitigate and manage these events. The Digital Coast can be an invaluable resource in this process.

The private sector also uses the Digital Coast and in Louisiana where Fugro is contracted directly by the State of Louisiana’s Coastal Protection and Restoration Authority (CPRA), as well as indirectly by CPRA’s engineering contractors, we see data served by the Digital Coast used to monitor barrier island restoration projects on a regional scale, as well as to calibrate hydrologic models on a project level.

Even Fugro uses the Digital Coast to support some of our other activities. Data from the Digital Coast is often used to support siting and desk top studies that help our clients assess the feasibility of infrastructure development projects in the coastal zone. Data can also be used to aid in the planning and estimating of future mapping projects, where the availability of Digital Coast data can often reduce the price to our clients on new data collections. Data from the Digital Coast can also be used for change detection purposes, such that rates of change can be developed and they can also be used for QC purposes to validate the results of new surveys in some cases.

Recommendations

1. Increase the marketing and promotion of the Digital Coast Partnership Program—While I believe the Digital Coast is well known to those in federal, state and local governments, I am not sure it is so well known in academia and the private sector. As an example, a Google search of “available coastal bathymetry data in the USA” does not present the Digital Coast within the first five pages of results.
2. Incorporate coastal sonar and bathymetric lidar data from NOAA NCEI—All of the bathymetry data acquired and maintained by NOAA’s Office of Coast Survey are stored at and served by NOAA NCEI. It is suggested that data that are coastal in nature (*i.e.*, data that are adjacent to the coast) should be visible or accessible from the Digital Coast.
3. Develop a link between the U.S. Federal Mapping Coordination Seasketch site and the Digital Coast—The prior has been developed by the Integrated Working Group on Ocean and Coastal Mapping (IWG–OCM) and shows the mapping requirements and plans of Federal and state agencies around the country. It was developed to improve coordination and eliminate redundant mapping efforts, which it has done quite successfully. It would be useful if the Digital Coast could also show these plans as a layer, however.
4. Continue the Federal government commitment for data collection—As mentioned earlier, the Digital Coast would not exist without coastal data. Having a combination of current as well as historical data allows coastal managers to not only assess the current situation, but also allow them to monitor change. Both are critical to maximize the utility of data served by the Digital Coast.

Conclusion

Once again I would like to thank the Committee for allowing me to provide this statement for the record and to give testimony. I would be happy to answer any questions from the Committee on the Digital Coast Partnership Program.

The CHAIRMAN. Thank you, Mr. Millar.
Mr. Fettes.

STATEMENT OF TYSON FETTES, REGISTER OF DEEDS, RACINE COUNTY, WISCONSIN

Mr. FETTES. Thank you, Chairman Sullivan and Ranking Member Baldwin.

I am very honored and excited to be here today. Thank you for having me.

I wanted to take my time to tell you about a story of a situation that we were really just thrust into in my county, in Racine County, with some historic flooding that we had at the Fox River in my hometown of Burlington.

I was, ironically enough, out at a conference, an Esri user group conference, in San Diego. There were about 20,000 people at this conference, and I woke up in the morning to about 50 text messages because of the flooding that we had overnight. Senator Baldwin, I am sure you were privy to all of those messages also.

Our flood stage rose very, very quickly and really put a lot of our community underwater very quickly.

So while I was out at this conference, it was ironically a great place to be because I was able to connect up with some of the folks at Esri and I utilized their disaster relief program.

They helped set up a damage assessment application for us, so we were able to very quickly, from San Diego, get information into the hands of the folks in the EOC to help get them mapping information and sea flood level information through NOAA. This information was extremely useful to the folks back in the EOC.

What I think is really interesting about this story is that I am certainly no GIS expert. I am the County Register of Deeds. I happen to oversee the GIS department in our county. So we were thrust into finding information very, very quickly and because of the tools at our disposal, it made it very easy to integrate into a dashboard—NOAA data, flood level data—right into our dashboard in the Emergency Operation Center.

Once we created the damage assessment application on a smart phone, I was able to fly back and we started having our damage assessment teams go out, actually in golf carts, through the community checking on homes.

So in real time in the Emergency Operation Center, we were able to see over 1,000 responses from our teams instantly tied spatially to a map with photos of the damage in the basement. We were using FEMA codes so major, minor, affected damage. We were able to instantly see that information along with the current flood level information through the coastal program. It was really an amazing three, four days of a whirlwind being pushed into this.

To your testimony, Mr. Millar, I thought it was a really interesting point of marketing this. I was not necessarily aware of all of these tools at our disposal and now, certainly, our county is, and

we are looking forward to using more with the damage to our coast in Lake Michigan.

Racine County borders Lake Michigan. And Senator Baldwin, as you are aware, you have been out and toured some of the erosion problems that we have had. The LIDAR data that is available to us will really be helpful to us to continue to manage the erosion along the coast of Lake Michigan.

So with that, I want to thank you for having me today. I am very honored to be here and this information is really beneficial to us at the county level.

Thank you.

[The prepared statement of Mr. Fettes follows:]

PREPARED STATEMENT OF TYSON FETTES, REGISTER OF DEEDS,
RACINE COUNTY, WISCONSIN

On July 12, 2017, Racine County was hit by record flooding, with the Fox River in Burlington cresting 3ft higher than in recorded history (the river is usually at 4ft; flood stage is 11ft). Power went out at 4,478 properties and a state of emergency was declared.

When the flooding happened, I was attending a major international conference for geographic information systems users in San Diego, CA, held by Esri (Environmental Systems Research Institute), a Digital Coast contributing partner and the organization that supplies GIS/mapping technology for almost all government agencies. I attended the conference in my capacity as Register of Deeds, along with our Real Property Lister. We had received an award at the conference in 2016, and were invited back to give a presentation on the award-winning project in 2017.

As the flooding was hitting Racine County, I discussed it with Esri's Director of Global Sales & Business Development (now Director of Strategic Alliances), Chris Cappelli, who connected me with Esri's Disaster Response Team. That team worked with us while we were at the conference, at no cost, to develop and deploy a damage assessment application based on GIS technology that would allow us to start to spatially record, monitor and update damage assessment and clean-up in real time using smart phones or tablets. The application was designed to be used by field crews to submit information in the form of responses to a set of standardized questions, attaching photos, and categorizing damage according to FEMA classifications—affected, minor, major, or destroyed. Information received via self-reporting by the public was also incorporated, including updates and photographs of damage submitted via social media. All of this information, as well as sandbag and water resource areas, was laid out on a map, making it easy exactly what was happening at any given time.

Flood level data aggregated and made available through NOAA's Digital Coast Program was integrated into the application, and the map automatically updated this information as it changed over time.

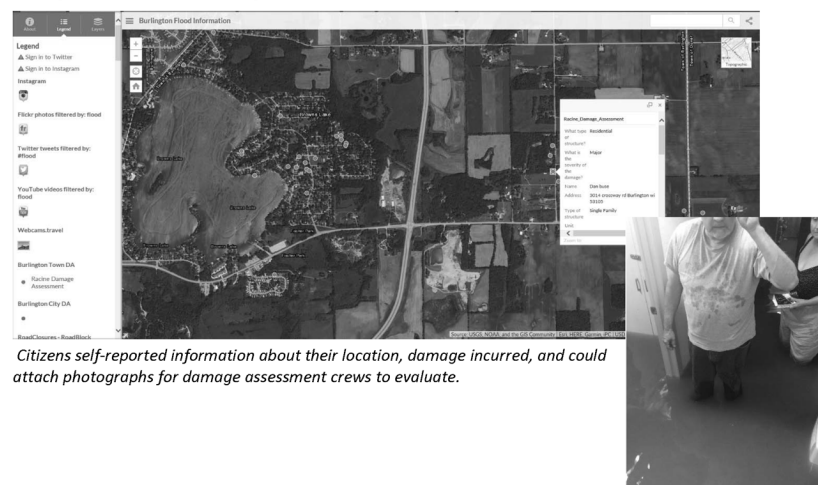
When I returned to Racine County from California, I worked with the Emergency Operations Center (EOC) and the Fire Chief to ensure the adoption of the app rather than relying on paper-based recording of damage information. The application provided an easy way of keeping information organized despite coming from many different sources in different formats and large volumes, all within a very short period of time. This also contributed significantly to our ability to submit the information required by FEMA and the State of WI extremely efficiently with a negligible amount of additional work, since it was collected and organized on the front end in the manner that FEMA and the State required it.

In all, 900 damage assessments were conducted across the City of Burlington and the Town of Burlington in Racine County using the application. Together, the application and the integration of Digital Coast flood level data were extremely powerful tools that made it possible to deliver a confident and effective disaster response effort for the citizens of Racine County.

City of Burlington Damage Assessment Application:

Information about locations and levels of damage could be viewed spatially, with full data available by clicking on a point on the map.

Burlington Flood Information Map



Survey Questions

The following questions were used when entering damage assessment data using the app, ensuring that assessment used standardized categories that could easily be submitted to FEMA and the State of Wisconsin.

Figure 1 displays four screenshots of the Burlington City Damage Assessment mobile application interface, showing various input fields and options for data collection:

- Survey123 for ArcGIS - Burlington City Damage Assessment**: The first screenshot shows the initial form with fields for "What type of property?" (dropdown menu), "Type of structure" (dropdown menu), "What is the severity of the damage?" (dropdown menu), "Name" (text input), "Owner or Renter" (radio buttons), and "Estimated amount of damage" (dropdown menu).
- Survey123 for ArcGIS - Burlington City Damage Assessment**: The second screenshot shows the "Address" section with fields for "Address" (text input), "Phone Number" (text input), "Email Address" (text input), and "Are they insured?" (radio buttons).
- Survey123 for ArcGIS - Burlington City Damage Assessment**: The third screenshot shows the "Location" section with a map view and a "Press to capture location using a map" button.
- Survey123 for ArcGIS - Burlington City Damage Assessment**: The fourth screenshot shows the "Any additional remarks?" section with a text input field and a "When was this assessment created?" dropdown menu.

The CHAIRMAN. Great. Thank you very much, Mr. Fettes.

Mr. Millar, you have a video. Is that ready?

Mr. MILLAR. Yes, I have it.

The CHAIRMAN. I was going to give you a little extra time, if it is not too long.

Mr. MILLAR. Two one-minute videos.

The CHAIRMAN. Two, one-minute videos. OK. Why don't you go for it? Are they ready to roll?

Mr. MILLAR. Yes.

The CHAIRMAN. OK.

Mr. MILLAR. So this, actually, is from the Apostle Islands. It is an animation flythrough of Sand Island and York Island of the Apostle Islands National Lakeshore in Lake Michigan, and it combines multiple datasets. We have integrated that here for this presentation. [video is shown]

It is the Corps of Engineers' topographic LIDAR data from 2007; the Corps of Engineers' bathymetric LIDAR data from 2007; NOAA Office of Coast Survey single beam sonar data from 1983; and then the NOAA Nautical Chart 14973 of the Apostle Islands.

And through this flythrough, you can see the various layers of these data types that have been fused together to basically create a seamless model across the land, the land-water interface, and then the water below the water surface. That is critically important for modeling, and simulation, and projection purposes by the coastal resource managers. [video is shown]

Here on that last, you can see a wreck symbol. There is the Wreck of the Sevona, 1890. That was the vessel on the left and then, obviously, the submerged wreck on the right.

This next animation is actually from Alaska. It is Kachemak Bay; Bear Cove in Kachemak Bay, Alaska. [video is shown]

This particular dataset combines NOAA NGS LIDAR data from 2008; that is bathymetric and topographic LIDAR data. It contains NOAA Office of Coast Survey multibeam data from 2008. It contains NOAA's Integrated Office of Ocean and Coastal Management, natural color imagery from the Digital Coast and IOCM, Integrated Ocean and Coastal Mapping infrared imagery from the Digital Coast as well. Then this is super laid on NOAA Chart 16645.

Again, you can see the integration of the various datasets here. Just for illustrative purposes, but you get a sense of the 3-D model. Hopefully that can be used for the simulation and forecasts and interpretive reasons.

Thank you.

The CHAIRMAN. Great, thank you. Thank you very much for that video.

I am going to start by asking some questions here, but thank you very much for the testimony. It was very useful and I appreciate when you have recommendations, like you did, Mr. Millar. Those were, I think, pretty good recommendations. We will take a look at that.

I want to start by asking Ms. LeBoeuf, what is NOAA doing to prioritize updating the nautical charts in the Arctic? Let me just give you an anecdote.

A couple of years ago, I met some NOAA officials who were doing nautical mapping updating in Dutch Harbor. As you probably

know, Ms. LeBoeuf, that is the biggest fishing port in the country, out in the Aleutian Island chain. Yet, even within Dutch Harbor, a lot of the charts were not very updated. That is a place that has enormously busy vessel traffic.

Can you give me a sense of that? And then what are some strategies to fill Alaska's coastal data gaps? Can the Digital Coast leverage partnerships and resources to help do that?

So those are three questions for you.

Ms. LEBOEUF. Thank you, Senator Sullivan.

Alaska does present a considerable challenge, given its size and its coastline extent.

We have developed a national charting plan that looks out over the next 5 years of hydrographic survey priorities. In particular to Alaska, we also have an Arctic nautical charting plan that is a longer term plan. It is a 10 to 15 year outlook at Alaska and the Arctic region needs.

We have identified the need for 11 priority charts, which is approximately half of the overall priorities that we are looking at across our hydrographic survey needs.

And so, we are plotting a course forward, working very closely with the private sector, as well as our coastal partners. We are increasing opportunities for Digital Coast to be linked there with the State of Alaska.

For example, the Digital Coast has a fellowship program and Alaska has just been awarded its first fellow to begin in September. That person will be dedicated to creating tighter connections between what Alaska needs across bathymetric as well as flood, risk, and other data needs with the Digital Coast. And so, we are very much looking forward to that opportunity.

The CHAIRMAN. Great, thank you.

Would you agree with me, we have a lack of data in many parts of the state, and yet particularly the increased traffic in some of the regions poses some risks? Would you agree with that?

Ms. LEBOEUF. I would, sir. Yes.

The CHAIRMAN. Let me ask Mr. Millar. You are familiar with some of the important economic activities derived from coastal activities, not just in Alaska, but in Mississippi, in Wisconsin.

How should the capabilities you have be highlighted best to be able to be used in my state, or in Wisconsin, or other coastal communities? You mentioned a number of recommendations, but do you have a sense of how to highlight some of the capabilities that you, and your competitors, provide?

Mr. MILLAR. Thank you, Chairman Sullivan, for the question.

I would say Fugro, and our colleagues in the private sector mapping industry, are really looking at this from a data provision standpoint. So there are many platforms, sensors, and solutions are available to acquire and deliver these data to the Digital Coast.

Once in the Digital Coast, then that data can serve many, many different applications and purposes, for economic development, for coastal protection, for coastal restoration, for fisheries, fisheries management, fisheries protection, even in the private sector.

Our customers, as I mentioned, often have coastal infrastructure. So ports and harbor construction or expansion, LNG or other marine terminals, this data if it were available everywhere, could be

used by our customers to facilitate and help them plan, and site, and permit those projects.

The CHAIRMAN. Thank you very much.

Senator Baldwin.

Senator BALDWIN. Thank you.

As we have heard from all of our witnesses, Digital Coast provides quality products and services while reducing cost and potential duplications. We have heard from the local government, we have heard from the private sector, and the Federal Government. They are singing the same tune. It is not often we get that experience here.

To Mr. Fettes and Mr. Barnes, you both testified about how your counties, which are thousands of miles apart, certainly hundreds of miles apart—one on a freshwater coast, one on a decidedly saltier coast—with different threats. Racine is vulnerable to riverine flooding; the Mississippi coast vulnerable to hurricanes and storm surge.

You have used the Digital Coast platform. While communities like yours are the reason the program was started, Digital Coast is at risk because it is not authorized. It is not congressionally authorized.

So if NOAA changed course and the Digital Coast was no longer maintained with current accurate data, what would that mean for your work? What implications would it have for real people in your communities?

Mr. BARNES. Thank you, Ranking Member Baldwin, for that question. That really, I think as long as I have been in this profession, has been a critical issue, updated information.

Every year it seems as if it does get better and we get more complete coverage. But we also know that the frequency of these updates are also very expensive.

Regarding Digital Coast, which is an incredible resource, it pulls in information from so many different agencies and organizations, and trying to keep that up to date is difficult at best. But when you are relying on multiple resources that are responsible for their own updating, I think that really is the big challenge.

And so, looking at it from the perspective of just one program like Digital Coast, I think maybe the real challenge is trying to help all agencies and organizations get more current on their information.

Mr. FETTES. I think adding onto that, open data is key in sharing data.

Senator Baldwin to your comments about the Federal Government, county government, local government working together, this information, for our office, we are a healthy sized county in the State of Wisconsin, but we are a very lean staff. So it is important for our team to be as efficient as possible.

So for us to be able to tie-in to live and accurate open data is critical for us to be able to make decisions at the local government level. So we want to thank you for making that data available for us.

Senator BALDWIN. Ms. LeBoeuf, I know how much of an impact the Great Lakes make in terms of generating economic activity. It is quite something.

I have one figure here that the Great Lakes alone generated nearly \$5 trillion in economic activity, or about 30 percent of combined U.S. and Canadian economic output.

As Mr. Millar showed in his video, the private sector has continued to invest in the development of new technologies that result in better quality data being collected for coastal management including the Great Lakes.

So how does NOAA's Digital Coast program support these private sector investments in new technologies and employment opportunities?

And then, Mr. Millar, if you have any perspectives that you want to share after Ms. LeBoeuf, please add that in.

Ms. LEBOEUF. Thank you, Senator Baldwin.

We rely heavily on the private sector to provide the data that goes into Digital Coast. But we have a relationship with them that is so tightly coupled to the needs of the coastal managers.

We provide, as you said, both efficient and effective in working with these companies that provide the data. We let them know what the coastal managers need. They can hone right in on that. They can develop their technologies. They can be innovative in a way that is responsive, real time, to the priority of coastal communities when that data is received by NOAA.

This Digital Coast effort spends about \$5 million a year on acquiring data from the private sector, and as I said in my testimony, supporting about 1,500 high tech jobs. We receive that data and then we are able to put it into complex visualization tools that we know, through the partnerships and our conversations with the coastal managers, they are going to be able to readily use.

So it is a very nice relationship. The private sector can go directly to the kinds of data that we know will be needed. Then we provide that data. And that feedback loop is absolutely transformative. And so, we very much appreciate their contributions and their continued investments.

Senator BALDWIN. Thank you.

Mr. Millar, by the way, I will add I was up in the Apostle Islands last week in our north coast, Lake Superior.

Yes, go ahead.

Mr. MILLAR. Senator, thank you for the question.

I would reinforce and restate, I guess, that the collaboration between NOAA and the private sector is very strong. There are forums through conferences and meetings, seminars, workshops where NOAA and the private sector can come together and share information on what is new, what is emerging.

There is the Joint Hydrographic Center for Ocean and Coastal Mapping at the University of New Hampshire. We are their industrial partner, and once a year we come together with NOAA, again, in that forum to share research, innovation, development, and ideas. All of that ultimately makes it into the Government's specifications when this work is solicited and tendered.

So the bar continuously gets raised through this process.

Thank you.

The CHAIRMAN. Great. Thank you.

Senator WICKER.

**STATEMENT OF HON. ROGER F. WICKER,
U.S. SENATOR FROM MISSISSIPPI**

Senator WICKER. Thank you very much, Mr. Chairman.

Mr. Barnes, thank you for your service to Harrison County and congratulations also on being chosen to testify today on behalf of the National Association of Counties.

You mentioned in your written testimony, the flood exposure County Snapshot and the Wetlands Benefits Snapshot.

How does Digital Coast help us save taxpayer money in that regard? How does it contribute to economic development in that regard? Why do we hear so much about disparities in terms of these maps from state to state?

Mr. BARNES. Thank you, Senator Wicker for your warm welcome and for this question.

Digital Coast has such a great collection of tools that at any level of technological advancement, I think communities have been able to use them.

The economic impact of using something like Digital Coast for planning, to strategize for disaster preparedness and response is really critical. Now, there may not be an economic development obvious component when you look at it from the front side, but the big economic impact has to do with resilience.

So if we plan properly, we are able to ensure that we do not build infrastructure, or public facilities, or even residential structures in areas that are vulnerable for flood risk and storm surge.

So by building outside of those vulnerable areas, we are ensuring that we recover more quickly in the event of a disaster. And I believe that we all fully appreciate that it is not "if" a disaster will occur; it is "when". Something will happen in the future. We do not know when it will, but it will happen.

The real economic development issue is being able to recover quickly, provide services, be able to generate revenue again so that we can fulfill that tax base and continue to develop and recover.

I think the disparities are real important to note. In my County, for instance, we have pretty good resources. We are fairly advanced technologically. We have a very good progressive thinking board. Some of our more rural areas, and our smaller cities, they do not have those financial and personnel resources.

When you take Digital Coast as a whole program, the training, the education, the tools, the online visualization resources, those things are readily available for people who do not create their own maps locally.

Just in addition to that, we are capable of pulling in services. We do not have to just download data. We can use services within our own local maps. I think that is the real value of Digital Coast. From the have-not to the have-all, it helps everyone.

Senator WICKER. Thank you very much.

Ms. LeBoeuf, with regard to data on storm surge risk, I understand my staff provided you with a copy of the 2018 CoreLogic Storm Surge Report.

Did you get a copy of that?

Ms. LEBOEUF. Yes, sir.

Senator WICKER. Have you had a chance to look at it and give us your opinion about the value of that?

Ms. LEBOEUF. I have scanned it sir, yes.

Senator WICKER. All right. Well, could you comment on that?

Ms. LEBOEUF. Well, what I will say in relation to the Digital Coast is that the data we provide that are used by companies like CoreLogic are able to provide information to the insurance industry, the building industry, and others about the risks associated with building in flood and in storm surge prone areas.

And so, it is heartening to see those kinds of reports out there because I think a better educated development and insurance industry will make strategic and good choices.

Senator WICKER. Very good.

Mr. Chairman, I am going to ask that this Report be included in the record.

The CHAIRMAN. Without objection.

[The information referred to follows:]



The 2018 CoreLogic Storm Surge Report

The Impact Of Storm Surge Along America's Longest Coastline

DATA SUMMARY



Executive Summary

The weather has a significant effect on both residential and commercial properties as well as how insurance coverage is assessed. This impact is vast and leaves a lasting impression on the insurance industry and the economics of regions affected by severe weather, including the number of homes damaged and the cost to rebuild. For that reason, it is important to analyze meteorological, geographic and oceanic data to understand what areas may be at risk.

CoreLogic® has published its 2018 CoreLogic Storm Surge Report, an annual evaluation of the number and associated reconstruction cost value (RCV) of single-family residential homes in the U.S. that are vulnerable to storm surge from the Gulf of Mexico and Atlantic basins. This year's report shows that more than 6.9 million homes along the Atlantic and Gulf Coasts are at potential risk of damage from hurricane storm surge inundation with a total reconstruction cost value (RCV) of more than \$1.6 trillion (Table 1).

Regionally, the Atlantic Coast has more than 3.9 million homes at risk of storm surge with an RCV of more than \$1 trillion (Table 2), an increase of around \$30 billion compared to 2017. The Gulf Coast has more than 3 million homes at risk with over \$609 billion in potential exposure to total destruction damage, with over \$16 billion increase compared to 2017. Areas with less coastal exposure but with lower elevations that extend inland tend to have more total homes at risk because the surge water can travel farther inland. Additionally, due to market conditions and previous storm surge damage, construction costs can increase despite having a lower number of at-risk homes compared to other states or Core-Based Statistical Areas (CBSAs).

Addendum

The 2018 CoreLogic Storm Surge Report and the following addendum provides the following data and analysis for the 19 states which border the Gulf and Atlantic Coasts. It does not include Pacific basin storms due to the relatively low impact of these weather events on properties along the coasts of Hawaii, California, Oregon and Washington.

1. The number of homes at risk of storm surge flooding. By state and Core-Based Statistical Area (CBSA). There are 19 states and 86 CBSAs evaluated.
2. The reconstruction cost value (RCV) for at-risk homes. RCV figures represent the cost to completely rebuild a property in case of damage – including labor and materials by geographic location – assuming the worst-case scenario at 100-percent destruction.
3. The probabilistic loss analysis of the storm surge from Hurricanes Harvey and Irma.
4. A pre-season forecast for 2018.

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The 2018 CoreLogic Storm Surge Report - May 2018

Table 1 – Total Number of Homes at Risk Nationally and Estimated Reconstruction Cost Value

Note: The numbers on Tables 1 and 2 are cumulative, increasing in value from extreme to low. This is based on the explanation that Category 5 storms are low risk because they are least likely to occur, but will cause more storm surge flooding inland than higher-risk, lower Category storms.

Storm Surge Risk Level (Storm Category)	Total Homes Potentially Affected	Total Estimated RCV (U.S. Dollars)
Extreme (Category 1-5 storm)	806,735	\$191,170,832,774
Very High (Category 2-5 storm)	2,509,236	\$608,263,801,243
High (Category 3-5 storm)	4,557,089	\$1,088,338,913,877
Moderate (Category 4-5 storm)	6,050,936	\$1,442,435,751,572
Low (Category 5 storm)	6,942,499	\$1,620,652,870,673

Source: CoreLogic 2018

There are more than 6.9 million homes at risk for hurricane storm surge damage on the Atlantic and Gulf Coasts (Table 1). These 6.9 million homes have a total reconstruction cost value (RCV) of more than \$1.6 trillion (Table 1). Reconstruction cost estimates increased 6.6 percent from 2017 due to higher regional construction, equipment and labor costs.

Homes are categorized by five risk levels: Low (homes affected only by a Category 5 storm), Moderate (homes affected by Category 4 and 5 storms), High (homes affected by Category 3, 4 and 5 storms), Very High (homes affected by Category 2, 3, 4 and 5 storms), Extreme (homes affected by Category 1-5 storms).

Table 2 – Residential Property Exposure by Coastal Region

Regional Risk	Atlantic Coast Homes	Atlantic Coast RCV (U.S. Dollars)	Gulf Coast Homes	Gulf Coast RCV (U.S. Dollars)
Extreme	456,688	\$122,684,450,321	350,047	\$68,486,382,453
Very High	1,438,100	\$398,084,569,726	1,071,136	\$210,179,231,517
High	2,506,545	\$672,405,046,607	2,050,544	\$415,933,867,270
Moderate	3,460,837	\$916,771,265,997	2,590,099	\$525,664,485,575
Low	3,924,023	\$1,011,558,178,641	3,018,476	\$609,094,692,032

Source: CoreLogic 2018

The Atlantic Coast has more than 3.9 million homes at risk of storm surge with an RCV of more than \$1 trillion (Table 2), an increase of around \$30 billion compared to 2017. The Gulf Coast has more than 3 million homes at risk with over \$609 billion in potential exposure to total destruction damage (Table 2), with more than a \$16 billion increase compared to 2017.

Table 3 – At Risk Home Totals by State

Note: The numbers on Tables 3 and 4 are cumulative, increasing in value from extreme to low. This is based on the explanation that Category 5 storms are low risk because they are least likely to occur, but will cause more storm surge flooding inland than higher-risk, lower Category storms.

Rank	State	Extreme	Very High	High	Moderate	Low*
1	Florida	351,093	1,064,674	1,752,603	2,292,791	2,774,175
2	Louisiana	72,256	207,442	624,521	747,111	817,480
3	Texas	39,109	117,558	253,947	384,944	543,847
4	New Jersey	95,659	278,539	382,065	471,353	N/A
5	New York	75,238	224,558	347,236	462,390	N/A
6	Virginia	26,960	94,378	246,824	366,478	409,129
7	South Carolina	35,934	126,997	209,026	294,239	347,030
8	North Carolina	32,282	95,286	160,831	210,233	259,718
9	Massachusetts	11,048	46,558	102,189	157,898	N/A
10	Georgia	8,887	50,409	105,735	141,518	152,559
11	Maryland	17,824	60,553	99,056	125,417	N/A
12	Mississippi	9,261	30,353	60,620	90,010	101,720
13	Pennsylvania	932	20,815	56,830	83,808	N/A
14	Connecticut	7,167	28,497	46,618	67,207	N/A
15	Alabama	6,379	17,306	32,331	44,744	57,973
16	Delaware	8,901	24,649	40,048	56,418	N/A
17	Rhode Island	1,876	8,153	17,312	26,484	N/A
18	Maine	5,445	7,960	11,851	18,150	N/A
19	New Hampshire	284	4,551	7,446	9,753	N/A

Source: CoreLogic 2018

*The low risk category refers to Category 5 hurricanes, which are not common along the northeastern Atlantic Coast. States in that region are designated as N/A for this category due to the extremely low probability of a Category 5 storm affecting these areas.

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Table 4 – Reconstruction Cost Value of At Risk Homes by State

Rank	State	Extreme	Very High	High	Moderate	Low*
1	Florida	\$68,993,319,371	\$214,615,495,959	\$353,434,047,211	\$458,546,265,943	\$552,417,823,248
2	New York	\$29,069,437,198	\$92,192,934,548	\$142,653,686,948	\$190,523,945,573	N/A
3	Louisiana	\$15,058,006,592	\$44,361,573,373	\$141,431,122,080	\$169,398,148,734	\$186,089,070,917
4	New Jersey	\$27,210,934,630	\$83,140,546,592	\$116,378,523,825	\$146,074,429,226	N/A
5	Texas	\$6,544,802,706	\$20,281,149,088	\$46,590,193,249	\$73,689,714,628	\$103,257,560,067
6	Virginia	\$6,889,209,422	\$23,532,519,915	\$57,147,551,590	\$84,231,366,445	\$95,057,016,309
7	South Carolina	\$10,365,743,962	\$33,689,536,077	\$52,352,428,765	\$70,363,340,488	\$80,775,388,252
8	North Carolina	\$6,502,998,590	\$19,557,292,731	\$33,348,232,464	\$43,887,698,767	\$54,356,018,315
9	Massachusetts	\$2,980,187,240	\$13,363,727,998	\$29,309,257,327	\$46,442,774,460	N/A
10	Georgia	\$2,740,063,841	\$13,213,068,236	\$24,703,010,004	\$31,744,968,374	\$33,763,709,156
11	Maryland	\$4,349,256,919	\$14,483,853,619	\$23,474,382,707	\$29,806,926,424	N/A
12	Connecticut	\$2,559,481,204	\$9,608,686,921	\$15,452,737,215	\$22,111,853,493	N/A
13	Mississippi	\$1,977,375,919	\$6,157,332,097	\$11,913,778,331	\$17,373,187,675	\$19,557,738,154
14	Pennsylvania	\$216,076,484	\$4,664,438,284	\$13,120,822,659	\$19,444,951,459	N/A
15	Delaware	\$2,635,651,997	\$7,021,080,076	\$11,463,739,373	\$16,078,182,995	N/A
16	Alabama	\$1,203,825,492	\$3,124,223,041	\$5,789,839,450	\$7,962,250,197	\$10,139,735,934
17	Rhode Island	\$528,745,488	\$2,408,462,659	\$5,093,849,517	\$7,809,201,093	N/A
18	Maine	\$1,281,230,692	\$1,914,444,383	\$2,960,376,784	\$4,634,377,599	N/A
19	New Hampshire	\$64,485,027	\$933,435,646	\$1,721,334,378	\$2,312,167,999	N/A

Source: CoreLogic 2018

*The low risk category refers to Category 5 hurricanes, which are not common along the northeastern Atlantic Coast. States in that region are designated as N/A for this category due to the extremely low probability of a Category 5 storm affecting these areas.

At the state level, Florida has the most coastal exposure and has the most susceptibility to storm surge flooding of the 19 states analyzed, with more than 2.7 million at-risk homes across the five risk categories (Table 3). Louisiana ranks second with over 817,000 at-risk homes, Texas ranks third with more than 543,000 at-risk homes, and New Jersey ranks fourth with over 471,000 at-risk homes. Since the number of homes at risk strongly correlates with the accompanying RCV, Florida also has the highest RCV at over \$552 billion (Table 4). Notably, New York ranks second in RCV with over \$190 billion, despite its fifth-place ranking in number of homes at risk, due to the density of the residential population near the coast and high construction costs in this state. Louisiana and New Jersey are also near the top of the list for RCV, with Louisiana totaling more than \$186 billion and New Jersey totaling over \$146 billion. Texas sits in fifth place for RCV, at more than \$103 billion.

Table 5 – Top 15 Metropolitan Areas for Storm Surge Risk

Rank	Metropolitan Area	Total Homes at Risk of Storm Surge	Total Estimated RCV
1	Miami, FL	788,679	\$156,109,638,962
2	New York, NY	726,048	\$277,316,495,768
3	Tampa, FL	459,082	\$79,154,913,706
4	New Orleans, LA	395,975	\$95,278,109,445
5	Virginia Beach, VA	389,938	\$90,904,781,082
6	Fort Myers, FL	318,950	\$63,465,095,946
7	Houston, TX	284,622	\$57,652,653,916
8	Bradenton, FL	254,535	\$49,231,359,219
9	Naples, FL	186,100	\$39,684,021,652
10	Jacksonville, FL	171,332	\$38,495,385,153
11	Philadelphia, PA	165,300	\$41,317,614,113
12	Charleston, SC	149,900	\$37,938,251,071
13	Myrtle Beach, SC	128,155	\$22,792,717,625
14	Boston, MA	126,263	\$34,937,253,340
15	Beaumont, TX	121,379	\$21,026,736,810
	Total	4,666,258	1,105,305,027,808

Source: CoreLogic 2018

Due to the concentration of residences in and around large metro areas, 15 CBSAs account for 67.2 percent of the 6.9 million total at-risk homes and 68.2 percent of the total \$1.6 trillion RCV (Table 5). This reinforces the idea that the location of future storms will be integral to understanding the potential for catastrophic damage. A low-intensity storm in a densely populated, residential urban area can do significantly more damage than a higher-intensity hurricane along a sparsely inhabited coastline. The Miami metro area, which includes Fort Lauderdale and West Palm Beach, has the most homes at risk, totaling over 788,000 with an RCV of more than \$156 billion. By comparison, the New York metro area has slightly fewer homes at risk at just over 726,000, but a significantly higher RCV totaling more than \$277 billion, a 5 percent increase compared to 2017.

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Table 6 – Storm Surge Damage from Hurricane Harvey

Texas Counties	Dollar contribution from Total Storm Surge Damage in Texas	Percent contribution from Total Storm Surge Damage in Texas
Galveston	\$197.8 million	31%
Harris	\$139.1 million	22%
Aransas	\$136.6 million	22%
Nueces	\$125.4 million	20%

Source: CoreLogic 2018

Table 7 – Storm Surge Damage from Hurricane Irma

Florida Counties	Dollar contribution from Total Storm Surge Damage in Florida	Percent contribution from Total Storm Surge Damage in Florida
Saint Johns	\$444.3 million	14%
Miami-Dade	\$331.5 million	10%
Broward	\$287.3 million	9%
Brevard	\$256.5 million	8%
Collier	\$243.1 million	8%

Source: CoreLogic 2018

CoreLogic created event footprints for wind, storm surge and inland flooding for Hurricane Harvey and Hurricane Irma in the CoreLogic probabilistic risk modeling platform, RQE® (Risk Quantification and Engineering). The total flood damage for Hurricane Harvey, including both inland and storm surge flooding, was between \$40 billion and \$59 billion – inclusive of both uninsured and insured residential and commercial properties. Hurricane Irma's overall flood damage for both residential and commercial properties was estimated to be between \$29 billion and \$46 billion.

Table 8 – Total Number of Hurricanes in Texas from 1900 to Present

SSHWS Category	1	2	3	4	5	Total
Number of Storms	19	7	7	5	0	38

Source: CoreLogic 2018

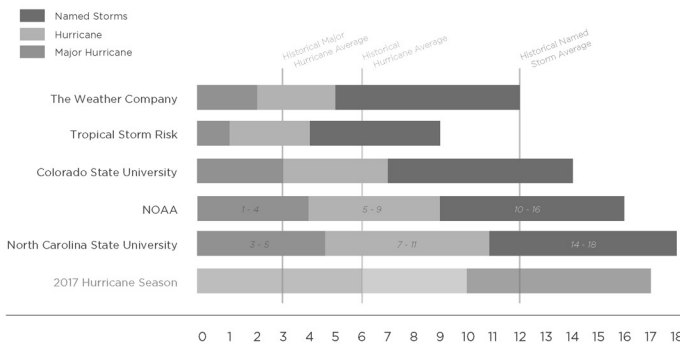
Table 9 – Total Number of Hurricanes in Florida from 1900 to Present

SSHWS Category	1	2	3	4	5	Total
Number of Storms	24	16	16	11	2	69

Source: CoreLogic 2018

Table 10 – 2018 Hurricane Season Outlook

2018 Predicted Number of Storms



Source: CoreLogic 2018
*Last updated May 30

Early forecasts for the 2018 Atlantic basin hurricane season are mixed, with The Weather Company forecast indicating slightly lower than average activity and the National Oceanic and Atmospheric Administration (NOAA) forecast indicating a near- or above-normal season.

Understanding The Data

The risk of storm surge flooding is not uniform along the coasts or limited only to states with a reputation for more frequent hurricane activity such as Florida or Louisiana. Every state with a coastline that borders the Gulf or the Atlantic has at least one area of extreme storm surge risk. As the 2018 analysis shows, the total number of homes and the related RCV has increased over the past year.

No matter the total number of hurricanes predicted, it is important to consider a strong hurricane that occurs in a less densely populated area – or even a small storm that tracks through a densely populated area – could generate catastrophic storm surge. When evaluating potential damage, the number of storms that occur is not as significant as the intensity and track of where they occur. For example, areas with less coastal exposure but with lower elevations that extend inland tend to have more total homes at risk because the surge water can travel farther inland. Additionally, due to market conditions and previous storm surge damage, construction costs can increase despite having a lower number of at-risk homes compared to other states or Core-Based Statistical Areas (CBSAs).

Probabilistic modeling of hurricane perils provides risk managers with greater insight as to what could happen in a season, so they can better plan and manage their businesses.

Methodology

The analysis in the 2018 CoreLogic Storm Surge Report encompasses single-family residential structures less than four stories, including mobile homes, duplexes, manufactured homes and cabins (among other non-traditional home types). This is not an indication that there will be no damage to residential units greater than four stories, as there may be associated wind or debris damage. However, including all high-rise residential units in the analysis would inaccurately skew the actual number of houses at risk, as elevated structures are not as susceptible to damage from surge waters.

Year-over-year changes between the number of homes at risk and the RCV can be the result of several variables, including new home construction, improved public records, enhanced modeling techniques, fluctuation in labor, equipment and material costs – even a potential rise in sea level. For that reason, direct year-over-year comparisons should be warily considered. To estimate the value of property exposure of single-family residences, CoreLogic uses its RCV methodology which estimates the cost to rebuild the home in the event of a total loss and is not to be confused with property market values or new construction cost estimation. Reconstruction cost estimates more accurately reflect the actual cost of damage or destruction of residential buildings that would occur from hurricane-driven storm surge, since they include the cost of materials, equipment and labor needed to rebuild. These estimates also factor in geographical pricing differences (although actual land values are not included in the estimates). The values in this report are based on 100 percent (or "total"), destruction of the residential structure. Depending on the amount of surge water from a given storm, there may be less than 100 percent damage to the residence, which would result in a lower realized RCV.

To evaluate storm surge risk at the local level, CoreLogic uses the designation of Core-Based Statistical Areas (CBSAs), which are often referred to as metropolitan areas (>50,000 people), or micropolitan areas (<50,000 people), as defined by the U.S. Office of Management and Budget. The CBSA represents an urban center and the adjacent regions that are tied to that center socioeconomically. The specific areas identified in this report are named by primary urban center, though each may contain additional urban areas.

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The high-resolution, granular modeling for underwriting individual risk allows enhanced understanding of the risk landscape and damage potentials. CoreLogic offers high-resolution solutions with a view of hazard and vulnerability consistent with the latest science for more realistic risk differentiation. The high-resolution storm surge modeling using 10m digital elevation model (DEM) and parcel-based geocoding precision from PxPoint™ facilitate a realistic view of the risk.

Sources:

1. "Slightly above average 2018 Atlantic hurricane season predicted by CSU team", <https://source.colostate.edu/slightly-above-average-2018-atlantic-hurricane-season-predicted-by-csu-team/>
2. "2017 Atlantic Hurricane Season Forecast Calls for Less Activity Than 2016", <http://weather.com/storms/hurricane/news>
3. U.S. Census Bureau, Core Based Statistical Area definition, Office of Management and Budget, 2017.

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About CoreLogic

CoreLogic (NYSE: CLGX) is a leading global property information, analytics and data-enabled services provider. The company's combined data from public, contributory and proprietary sources includes over 4.5 billion records spanning more than 50 years, providing detailed coverage of property, mortgages and other encumbrances, consumer credit, tenancy, location, hazard risk and related performance information. The markets CoreLogic serves include real estate and mortgage finance, insurance, capital markets, and the public sector. CoreLogic delivers value to clients through unique data, analytics, workflow technology, advisory and managed services. Clients rely on CoreLogic to help identify and manage growth opportunities, improve performance and mitigate risk. Headquartered in Irvine, Calif., CoreLogic operates in North America, Western Europe and Asia Pacific. For more information, please visit corelogic.com.

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Senator WICKER. And then, quickly, back to you, Mr. Barnes. You mentioned Hurricane Rita and these people being trapped on the roads resulting in 73 deaths.

What were the differences in that tragedy and our approach in Hurricane Nate? What role might Digital Coast have had a better result there?

Mr. BARNES. Senator, thank you for that question.

I am not familiar with the planning processes in Texas, so I have a hard time speaking directly to their engagement and their processes in evacuation.

But what I can say about Hurricane Nate is that—and this started last year for our emergency operations—we have done as much as we can to get our announcements and the availability of information as public as possible. Just last year, we started televising our emergency management briefings while we were active during Nate.

So I think the public information perspective is very dynamic and, of course, it changes from event to event. But people need to be aware of where those inundation areas or where those flash flooding events can occur.

I believe that the only way to do that is to visualize these areas on the map and a dynamic working map. During Hurricane Katrina, we had nothing like that.

I believe that if we had had a map for visualization of where that storm surge for a Category 3 or 4 Storm had gone, we may have clogged our roads, but it probably would have saved some lives.

The messages for Hurricane Katrina were out there. It was very clear that these folks needed to leave, but I do not think they understand terms like, “There will be a 10 to 12 foot storm surge.” That makes no sense to anyone. They need to be able to see where this water is going to go.

If I look at a map and my house is blue, then I figure it is about time to move.

Senator WICKER. Thank you.

Mr. BARNES. Thank you.

The CHAIRMAN. Well, I want to thank the witnesses. We have a vote at 11 a.m., but I think Senator Baldwin and I have a few more questions to ask. Again, appreciate you flying in from all parts of the country.

Let me follow up a little, Mr. Barnes, on some of the questions you had with Senator Wicker, actually for you and Mr. Fettes.

How can Digital Coast partnerships and products be used to promote local and states’ capacity to increase resiliency or, as you were just talking about, provide warnings particularly for some of the communities that you are referencing that might not have a lot of resources or that do not always have the most up-to-date data? That is for both of you.

Mr. FETTES. Yes, I think that is a really great question.

Most counties all have some form of GIS system in place. I believe it starts at the county level where they can help your more progressive cities and your small rural towns who do not have the ability to create applications themselves.

But what I think is really important is—and it kind of goes to the theme of all of this—being able to see something on a map real-

ly changes how you can look at things. Even from people who are experienced decisionmakers who could maybe understand what a 10 or 12 foot storm surge means.

But when you simplify it down to, "Your parcel is blue and blue is bad," it really makes it crystal clear. And with being able to tie data and tie services into open data so there is no manual work. It is a script to make this possible. You can make all of these maps and applications public facing and put them in the places that matter.

So, for example, the county could help that rural town have an application on that rural town's website tied to live data showcasing flood damage or where we are looking at flood levels with the upcoming storm. That is how I think the county can help both your city and town and everywhere in between at the county.

So seeing things on a map, it really makes it easy to make decisions.

The CHAIRMAN. Mr. Barnes, do you have a follow up on that?

Mr. BARNES. Thank you.

I am delighted that Mr. Fettes looked at it from the map perspective. I would like to talk about the communication and cooperation perspective.

I think that as the training and the workshops provided by Digital Coast provide a forum, this environment where folks get together that normally would not. Now, I know you probably will not believe this, but there may be a bit of silo-ism between local governments.

The CHAIRMAN. We do not have any of that in the Federal Government.

[Laughter.]

Mr. BARNES. These workshops do provide that forum and we all get together and say, "We all have this same experience."

And so, what I love about that, though, is we have a lot of resources in the County to manage these difficulties and challenges. Our smaller cities, and I can think of three of them in my County, do not have the same resources.

I am able, through those training opportunities and workshops, to make those connections and communicate with the people who make those decisions in code offices in the smaller cities that would not normally reach out to us for help.

Building those relationships has probably been the greatest value to me and my County in the use of Digital Coast.

The CHAIRMAN. Great, thank you. Let me ask one final question.

Now, as Senator Baldwin mentioned, we have a wide array of witnesses here: Federal Government officials, private sector officials, state and local representation. Ms. LeBoeuf, I am going to ask you a bit of a tricky question.

Mr. Millar from his private sector vantage point provided some, what I thought, were constructive recommendations on how we could do a better job here on this program.

Do you agree with his recommendations?

Ms. LEBOEUF. I would have to look into that further. I thought they were very interesting as some of those were ones that we have not yet considered. So I would love to take those back.

The CHAIRMAN. Well, why don't we take that back for the record to have you just take another hard look, and if you have questions for Mr. Millar on exactly what he meant? If you can get back to this Committee, I think it would be useful to have your view on what he was talking about.

Ms. LEBOEUF. Absolutely.

The CHAIRMAN. Great.

Senator Baldwin.

Senator BALDWIN. Thank you.

In 2010, the Great Lakes Restoration Initiative was launched. GLRI is intended to coordinate and accelerate Federal efforts to protect and restore the largest system of fresh surface water in the world.

We want to ensure that water is safe for drinking, swimming in, and boating on. That fish are safe to catch and eat. That we control nuisance species and avoid new invasions, and that native plants and animals are thriving and protected in restored habitats.

Digital Coast is important to this Initiative. One of the Digital Coast success stories is a tool that helps planners determine where priority restoration areas are.

Just last month, the EPA published a new interactive mapping application for GLRI projects. With 16 Federal agencies working to restore the Great Lakes across seven states, and in partnership with our Canadian neighbors, having a central repository is important for measuring progress and keeping everyone, quite literally, on the same page.

Ms. LeBoeuf, I am a strong advocate, if you are not already aware, for full funding of the Great Lakes Restoration Initiative because of the work that it is doing to invest in the future of our communities and protection of our resources.

I have been very concerned with recent efforts to scale back this investment. I believe it would severely hinder the progress that we are making and leave our communities to grapple with these serious challenges on their own.

Further compounding this issue with GLRI funding, the Administration has proposed additional cuts to several coastal programs that support Digital Coast like the Coastal Zone Management Grants.

How would the proposed 90 percent cut to the Great Lakes Restoration Initiative funding, and the proposed zeroing out of the Coastal Zone Management Grants, impact NOAA's ability to help communities respond to, say, bluff collapse, coastal erosion, algae blooms, and water quality challenges?

Just a light question to end our hearing with.

Ms. LEBOEUF. Thank you, Senator Baldwin. And thank you for your appreciation of the work we are doing in the Great Lakes with the EPA and others.

As you may know, the primary budget line for that program does come to EPA, so I would be reticent to comment on EPA's Budget status.

I will say that the President's Fiscal Year 2019 budget had to address a number of competing resources and NOAA was able to continue to fund its core projects including nautical charting, which is

nearly level funded, as well as some of our other NOAA priorities such as weather forecasting and fisheries management.

So with that I will close my comment on the Fiscal Year 2019 budget. Thank you.

The CHAIRMAN. Well, I want to thank the witnesses, again. Very, very informative and enlightening testimony.

The hearing record will remain open for two weeks. During this time, Senators may submit additional questions for the record. Upon receipt, the witnesses are requested to submit their written answers to this Committee as soon as possible.

Again, I want to thank everybody for appearing today. Very informative.

This hearing is now adjourned.

[Whereupon, at 11:09 a.m., the hearing was adjourned.]

A P P E N D I X

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. ROGER F. WICKER TO NICOLE LeBOEUF

Question 1. Your written testimony states that the current return-on-investment for the Digital Coast program is 3:1 and projected to grow over the next 15 years. How could that ROI be improved further with a fully authorized program?

Answer. With a fully authorized Digital Coast program, NOAA would continue to grow partnerships, leverage resources, and encourage broader awareness of the program. Authorization would codify a high-value program used by states, local authorities, and others. NOAA expects that use generally will increase over time, leading to an improved return on investment, which is measured through the cost-savings realized by Digital Coast users. Continued investments in the Digital Coast infrastructure (*e.g.*, adding new tools) will make existing economic and other data accessible to new users and further reduce the cost to users of accessing data.

Question 2. Does the Digital Coast program include region-specific data on parameters such as construction, equipment, and labor costs, and, if not, how can the program be improved for incorporating this type of data?

Answer. The Digital Coast program does not, at this time, include region-specific data on parameters such as construction, equipment, and labor costs. However, Economics: National Ocean Watch (ENOW) is a data set on the Digital Coast that includes labor information (employment and annual wages) for six economic sectors that depend on the oceans and Great Lakes. ENOW's annual time-series data are produced by NOAA for about 400 coastal counties, 30 coastal states, eight regions, and the Nation from 2005 and onward using data from the Bureau of Labor Statistics and the Bureau of Economic Analysis. ENOW does not include region-specific data on construction and equipment costs.

Regionally-specific data on construction and labor costs are available from public and private sources. The same is true for some types of construction equipment.

Question 3. What type of interaction does NOAA have with the professional surveying community as part of the surveying, mapping, and geospatial efforts in this project?

Answer. NOAA has constant interaction with the professional surveying community through open contracts and professional association engagement. NOAA's Coastal Geospatial Services Contract has five surveying and mapping prime contractors actively supporting the data and tool development made accessible via the Digital Coast. In addition, NOAA has access to over 100 other firms as subcontractors to the prime contracts. NOAA has awarded approximately \$44 million in FY18 to these private firms for hydrographic surveying, shoreline surveying, and other data collection and analysis, in addition to tool development. NOAA also regularly attends meetings and conferences of the only professional association whose membership is comprised of private surveying and mapping firms—MAPPS (Management Association for Private Photogrammetric Surveyors).

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. JIM INHOFE TO DAVID MILLAR

While Oklahoma is located in the South Central region of the United States we hold the same concerns as many Coastal states especially in mitigating flood risk. Right now my home state of Oklahoma leads the Nation with over 2,000 upstream flood control dams that have provided \$81 million in annual estimated benefits to both businesses and residents in my state.

Oklahoma is also home to the Tulsa Port of Catoosa, the furthest inland, warm water port in the Nation. The Tulsa Port of Catoosa is connected to McClellan—Kerr Arkansas River Navigation (MKARNS) which provides inland water navigation through the Arkansas and Mississippi River. The state of Oklahoma has seen the

benefits of inland water navigation through the Port of Catoosa, however I am concerned that the levee system protecting the Port of Catoosa from the Arkansas river is at risk due to aging infrastructure and design limitations.

Fugro has a strong background working with the National Oceanic and Atmosphere Administration (NOAA), the United States Geological Survey and the United States Army Corps of Engineers to provide mapping information and other technical data to support the design and construction of projects to mitigate flooding and the impact of similar natural disasters. In your testimony, you highlight the value of the Digital Coastal Partnership program provides to local planners and emergency managers to mitigate the impact of coastal flooding from natural disasters.

Question 1. Do you believe the communities along our Nation's inland waterways would benefit from a similar public private data sharing partnership?

Answer. Failed to Respond.

Question 2. What best practices can you share regarding your experiences working with NOAA and the Digital Coastal Partnership Program that could extend to other agencies like the United States Geological Survey and the Army Corps of Engineers involved in flood control efforts and emergency response and planning efforts along our Nation's inland waterways?

Answer. Failed to Respond.

