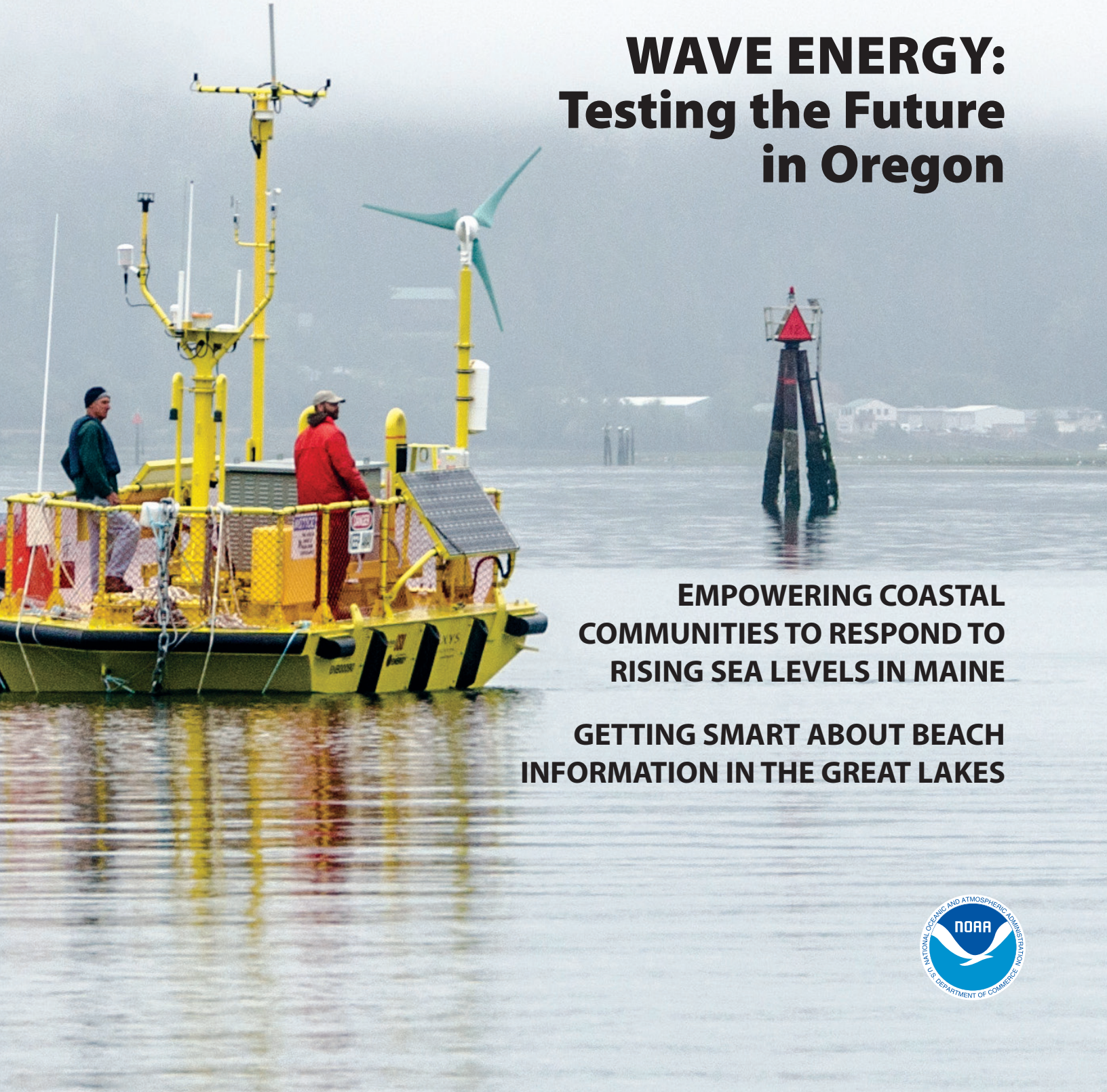
COASTAL SERVICES

VOLUME 15, ISSUE 5 • NOVEMBER/DECEMBER 2012

LINKING PEOPLE, INFORMATION, AND TECHNOLOGY



WAVE ENERGY: Testing the Future in Oregon

EMPOWERING COASTAL COMMUNITIES TO RESPOND TO RISING SEA LEVELS IN MAINE

GETTING SMART ABOUT BEACH INFORMATION IN THE GREAT LAKES

TABLE OF CONTENTS

Volume 15 | Issue 5 | November/December | 2012

LINKING PEOPLE, INFORMATION, AND TECHNOLOGY

National Oceanic and Atmospheric Administration

Back issues of *Coastal Services* can be viewed at *www.csc.noaa.gov/magazine*

To subscribe to *Coastal Services*, go to *www.csc.noaa.gov/magazine/subscribe.html*

To suggest content for *Coastal Services*, contact Hanna Goss at (828) 246-0958 or *Hanna.Goss@noaa.gov*

For information about the NOAA Coastal Services Center:

Phone: (843) 740-1200
Internet: *www.csc.noaa.gov*
Twitter: *@coastalservice*
Facebook: *www.facebook.com/NOAACoastalServices*

Coastal Services is produced bimonthly as a trade journal for coastal resource managers. Editorial content is unofficial and not authority for action. Views and opinions expressed may not reflect those of the Department of Commerce or NOAA. The mission of the NOAA Coastal Services Center is to support the environmental, social, and economic well being of the coast by linking people, information, and technology.

FROM THE DIRECTOR

One of the first public wave energy testing facilities in the U.S. began operation off Oregon's coast this summer. It's a reminder for coastal resource managers of the need to prepare as much as possible for the emerging ocean energy industry.

In the cover story of this edition of *Coastal Services*, we look at the role coastal managers had in permitting the testing facility and how the state is planning for this new ocean use.

Managers interested in planning for the wave energy industry should check out MarineCadastre.gov, an integrated marine information system that provides ocean data, offshore planning tools, and technical support to the offshore renewable energy community.

Developed by the NOAA Coastal Services Center and the Department of the Interior's Bureau of Ocean Energy Management, MarineCadastre.gov has three primary focus areas: Web map viewers and ocean planning tools; a spatial data registry; and technical support and regional capacity building.

Also in this edition of *Coastal Services*, readers will find articles on how local and state coastal managers in Maine are working to create a regional adaptation strategy to respond to rising sea levels and become more resilient to coastal storms, and how managers in North Carolina developed the first-ever digital map of the state's 12,000-mile estuarine shoreline.

Readers will also discover how beachgoers in the Great Lakes can now check for water quality advisories and weather and water conditions with the click of a smartphone button.

Another great place for coastal resource management professionals to learn about new geospatial data, tools, technology, and information is at Coastal GeoTools 2013. Make your plans now to attend this cutting-edge conference being held March 25 to 28, 2013, in Myrtle Beach, South Carolina. For more information, go to *http://geotools.csc.noaa.gov*.

I look forward to seeing you there! ❖

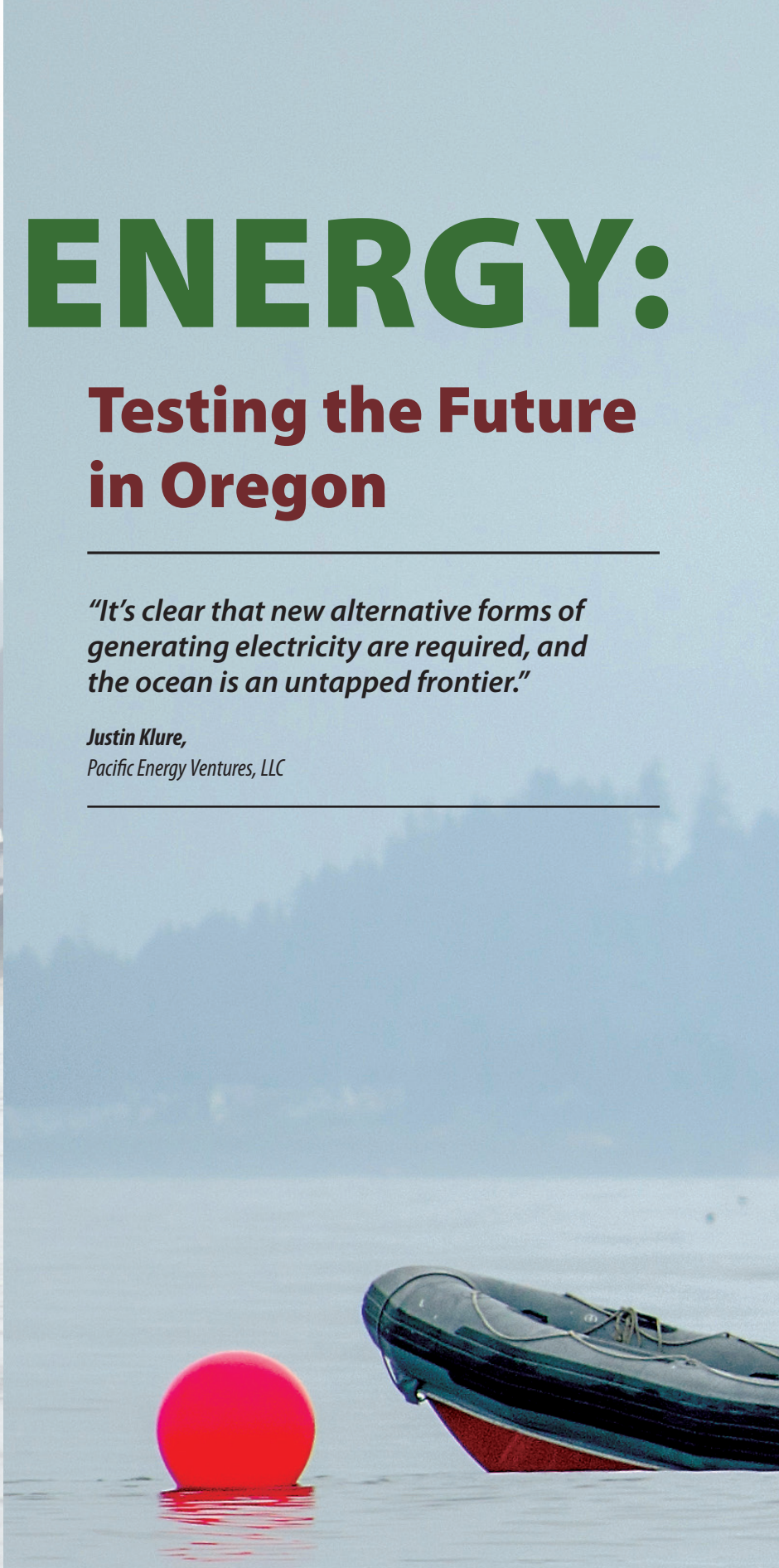
Jeff Payne, Acting Director

WAVE ENERGY:

Testing the Future in Oregon

"It's clear that new alternative forms of generating electricity are required, and the ocean is an untapped frontier."

Justin Klure,
Pacific Energy Ventures, LLC



The deployment of the Ocean Sentinel, which will measure the output of wave energy devices.

These and cover photo of the Ocean Sentinel by Pat Kight and courtesy of Oregon Sea Grant

In August, one of the first public wave energy testing facilities in the U.S. began operation in the ocean waters off Oregon's coast. This mobile system will be used by companies and academic researchers to test new wave energy technology, measure and understand the wave resources, and study potential environmental issues.

It's also a reminder for coastal resource managers across the country of the need to prepare as much as possible for the emerging ocean energy industry.

"There's no doubt that energy exists in the ocean," says Justin Klure, a managing partner with Pacific Energy Ventures, LLC. "I don't know if it will be commercially viable 5, 10, or 20 years from now, but when you look at the trends regarding energy consumption, it's clear that new alternative forms of generating electricity are required, and the ocean is an untapped frontier."

He adds, "The potential of a significant renewable resource is what keeps everyone in the industry engaged and excited. How to do it in a way that protects the ecosystem and current uses is really the challenge."

Many hope that the Ocean Sentinel—and other such testing facilities—will help shed light on some of the questions that wave energy poses.

The Oregon Coastal Management Program and Oregon Sea Grant Program, along with many other state and federal regulatory agencies, played an important role in permitting the testing facility while working to minimize environmental impacts and conflicts with other coastal uses, such as fishing and navigation.

The state is mapping out its regulatory process for marine renewable energy in a new chapter being developed for the *Territorial Sea Plan*, Oregon's ocean planning document.

OCEAN ENERGY

Potentially, there are many ways to tap the ocean for energy, including wind, tides, currents, salinity, and even its thermal features. While the Atlantic Coast is ideal for the development of the offshore wind industry, waves may be the most promising source of ocean energy for the Pacific Northwest.

Wave power devices extract energy directly from surface waves or from pressure fluctuations below the surface. Waves off the coasts of California, Oregon, Washington, Alaska, and Hawaii have been identified as good sites for the development of wave energy.

Researchers believe that, as wave technology improves, less ideal wave environments might become more accessible as energy sources and that wave energy facilities could be sited further offshore.

GREAT UNKNOWN

While pilot projects around the world have reported little to no environmental impacts, the greatest unknown about wave energy is how a large commercial facility will affect the ocean environment.

Potential environmental impacts include withdrawal of wave energy from the ecological system, interactions with marine life such as migrating gray whales, atmospheric and oceanic emissions, noise, bottom impacts from anchors, and visual appearances. Environmental impacts from cable landings are a concern, as are electrical and magnetic energy imparted into seawater. A wave energy facility could pose a threat to navigation.

Wave energy facilities could also have environmental benefits, such as acting as artificial reefs.

TESTING, TESTING

With funding from the U.S. Department of Energy, the $1.5 million Ocean Sentinel was deployed off the coast of Oregon the week of August 22 by the Northwest National Marine Renewable Energy Center (NNMREC), a collaborative center with Oregon State University and the University of Washington as partners.

The bright yellow Ocean Sentinel structure is a standard National Operational Model Archive and Distribution System (NOMADS) and NOAA buoy platform that is shaped like a boat. Equipped with an array of measuring instruments, the Ocean Sentinel floats on the water's surface and is set up in a one-square-mile test site two miles northwest of Yaquina Head off the Oregon Coast.

Wave energy devices are hooked up to the mobile test facility's instrument panel, which can measure the amplitude of waves, energy output, ocean currents, and the speed of the wind. Data on environmental factors, such as variations in acoustics, electromagnetic fields, differences in marine life, sediment, and more, are also being collected. Real-time data are transmitted back to land through Wi-Fi and cellular connections.

The bright yellow Ocean Sentinel structure is a buoy platform equipped with an array of measuring instruments.

Photos by Pat Kight and courtesy of Oregon Sea Grant

The first device to be tested was the Wet-NZ, developed by private industry and the government of New Zealand.

"The Ocean Sentinel provides an alternative to needing to bring cable all the way back to shore," notes Kaety Hildenbrand, marine fisheries extension faculty member for Oregon State University and Oregon Sea Grant Extension.

Site selection for an estimated $25 million "grid-connected" testing facility for larger wave energy devices is currently underway off Oregon's coast.

RELATIONSHIP BUILDING

One of the important roles for Oregon coastal resource managers in addressing the Ocean Sentinel and the state's marine spatial planning efforts for ocean energy has been working to ensure open communication among industry, researchers, fishermen, state and federal agencies, and many other stakeholders.

"Sea Grant has helped us with all of our community outreach and has been indispensable in helping us develop relationships," notes Belinda Batten, director of the NNMREC.

She adds, "Most developers don't think about how important that is. You've got to talk to the local communities and fishermen. This is their coast and their ocean."

Hildenbrand and other Sea Grant staff members have helped with outreach by facilitating many town hall meetings, conferences, and discussions with community leaders, as well as helping to create siting plans and engage with the National Environmental Policy Act (NEPA) process to look at potential environmental impacts.

KEEPING IT CONSISTENT

The Coastal Zone Management Act's federal consistency clause has also been key, says Juna Hickner, coastal state–federal relations coordinator for the Oregon Coastal Management Program.

"The project needed to go through the U.S. Army Corps of Engineers to get a permit," Hickner explains, "and any time there's a federal permit, it has to be approved as consistent with our networked coastal management program."

Hickner coordinated various state agency reviews of the permit, worked with networked state agencies to make sure their concerns were addressed through the federal permitting process, and issued the final statement on behalf of the state that the project is consistent with Oregon's coastal management program.

NEW CHAPTER

In 1995, Oregon approved its *Territorial Sea Plan*, a robust institutional framework for ocean resource management. The plan established policies and procedures, coordinated state agencies, and provided a strategy for protecting rocky shores, the state's most significant marine habitat.

"Through the planning process," says Paul Klarin, marine affairs coordinator for the Oregon Coastal Management Program, "we incorporated NNMREC into the *Territorial Sea Plan*, recognizing their Newport ocean-test facility as a special-use site devoted to renewable energy testing. Basically we gave them the space to operate in and some simple standards to apply to any devices that they deploy there."

The state is in the process of developing a new chapter for the *Territorial Sea Plan* to prepare for larger wave-energy testing sites and the potential for commercial proposals. The new chapter will include a spatial-mapping component with 200 data layers, a resource inventory, and review and regulatory standards.

"We're lucky to have the *Territorial Sea Plan* already in place," notes Patty Snow, program manager for the Oregon Coastal Management Program. "It gives us a framework to look at this new use of the territorial sea, work with our partner agencies to look at the effects, and fulfill the requirements to conserve marine resources and ecological function."

"The inherent challenge," Batten notes, "is that these projects have never been done before. Even though the technology is going to change over time—maybe significantly—we can begin now to frame how we will analyze the potential effects, and that's critical."

She adds, "I would encourage managers to get out in front of this issue. Be engaged early." ❖

For more information on the Ocean Sentinel, contact Belinda Batten at (541) 737-9492 or Belinda.Batten@oregonstate.edu, or Justin Klure at (503) 475-2999 or jklure@peventuresllc.com. For more information on the Territorial Sea Plan, contact Patty Snow at (503) 373-0050, ext. 281, or patty.snow@state.or.us, Juna Hickner at (971) 239-9460 or juna.hickner@state.or.us, or Paul Klarin at (503) 373-0050, ext. 249, or paul.klarin@state.or.us. For more information on Oregon Sea Grant's role, contact Kaety Hildenbrand at (541) 574-6534, ext. 27, or Kaety.Hildenbrand@oregonstate.edu.

Empowering Coastal Communities to Respond to Rising Sea Levels in Maine

"We realized that the best way to proceed was not the traditional regulatory approach."

Peter Slovinsky,
Maine Geological Survey

One of the participating communities has approved a new floodplain ordinance that requires structures to be elevated three feet above the base flood elevation.

Photo courtesy of Maine Geological Survey

On April 16, 2007, an intense storm, combined with high tides, generated waves of up to 30 feet along the Maine coast. The pounding waves and storm surge caused flooding and severe erosion in areas south of Portland.

It also provided an opportunity.

"It really helped people visualize on the ground what the potential future impacts of sea level rise could be if we don't do anything," says Peter Slovinsky, a marine geologist with the Maine Geological Survey. "Instead of needing a visualization tool, nature provided a visualization for us."

With the impacts from the Patriot's Day storm fresh in people's minds, town and city managers from four coastal communities, the Maine Geological Survey, and the Southern Maine Regional Planning Commission began working to create a regional adaptation strategy to respond to rising sea levels and become more resilient to coastal storms.

With financial support from the Maine State Planning Office and Coastal Program, the Saco Bay Sea Level Adaptation Working Group (SLAWG) has improved hazards mapping in the region, and one community has approved a new floodplain ordinance that requires structures to be elevated three feet above the base flood elevation—more than the one-foot minimum standard.

Other coastal communities in the state—and around the country—are taking note of the group's success.

MIMICKING IMPACTS

The opportunity from the Patriot's Day storm came when simulations run by the Maine Geological Survey projected that the state's highest annual tide with two feet of sea level rise would mimic the storm's high water mark.

"It's been easy to say, 'Remember that storm? If sea level rise goes up two feet, we'll have that several times a year in good weather, even without a storm,'" says Jonathan (J.T.) Lockman, planning director for the Southern Maine Regional Planning Commission. "That's been a very compelling way to get people to the table."

It was so compelling that in 2008, managers from the Saco Bay communities of Saco, Scarborough, Old Orchard Beach, and Biddeford agreed to discuss the idea of creating a group that looked at sea level rise and storm surge impacts from both the municipal and regional perspectives.

Lockman says Saco Bay is "unique and perfect" for undertaking such an endeavor because it's home to the largest expanse of contiguous beaches

and coastal wetlands within the state. It also has one of the state's worst erosion problems in Saco, and one of its worst flooding problems at Old Orchard Beach.

In addition, the four communities were already proactive in hazards issues and have a history of working together.

SLAWG START

SLAWG grew out of a pilot project that the Maine Geological Survey conducted using lidar data to simulate the potential vulnerability from sea level rise of the built and natural environments in the community of Drakes Island Beach in Wells, Slovinsky says.

"We realized that the best way to proceed was not the traditional regulatory approach where the state works up data, comes up with a regulation, and imposes it on the local communities," he says. "The work we did in Wells led to the idea of really focusing on municipal engagement and letting the local community run the show, while teaming with state and regional partners who can provide technical work and planning capabilities."

Lockman adds, "Unless you engage city or town managers and council members—the officials that are really in charge of the purse strings for long-range capital planning projects like roads, flood control, and drainage—then you'll never really see a difference."

FINDING AGREEMENT

With funding from the Maine Coastal Program to get SLAWG started, the four participating communities signed an agreement to proceed with conducting a vulnerability assessment for sea level rise and storm surge, says Lockman.

A steering committee was created, which included two appointed members from each community. The committee then developed a detailed plan to create and implement SLAWG.

"One of the other unique things about this approach was that we actually had to have commitments from the municipalities for them to partake," says Slovinsky. "They had to be willing to dedicate staff time, provide a small cash match, and work on ways to accommodate for sea level rise as a result."

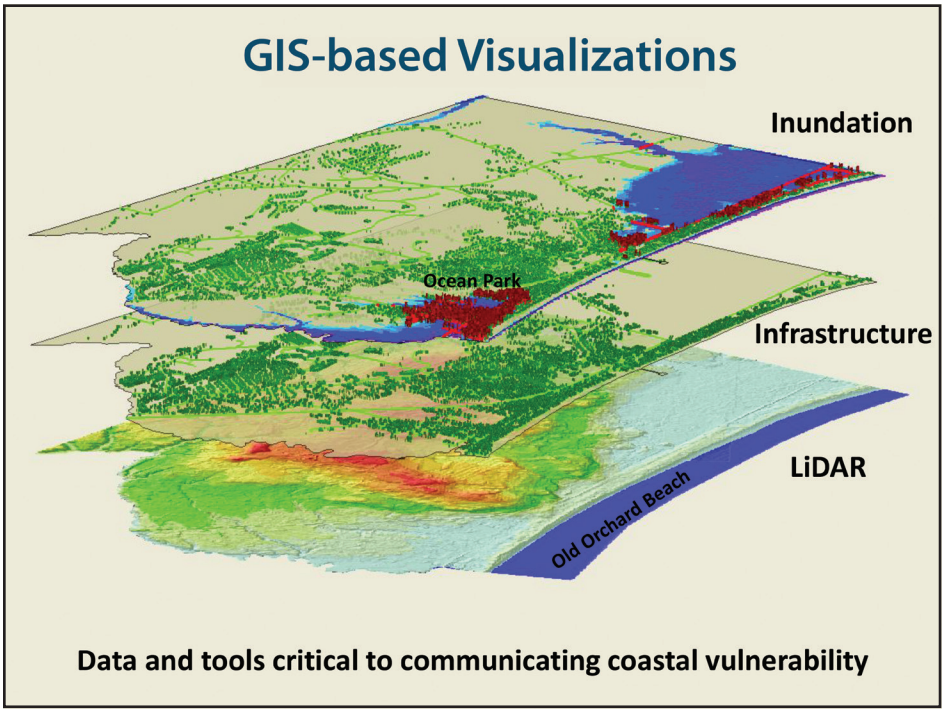
He adds, "Just to get those agreements to be able to move forward took nine months."

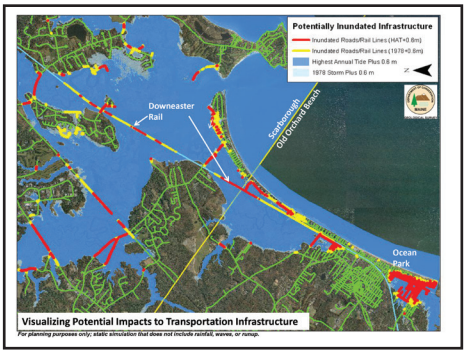
MORE ACCURATE

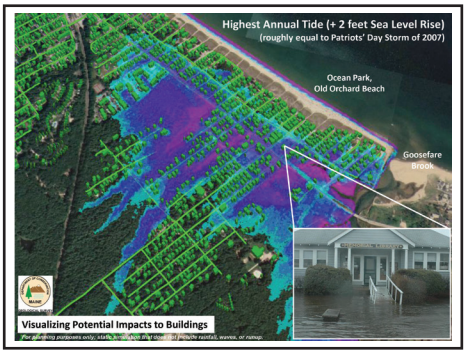
One of the benefits of SLAWG has been exposing communities to technological advances in visualization and data, such as topographic lidar data.

"Our ground-truthed lidar data showed the contour of the actual inundation

Continued on page 11







Communities are using advances in visualization and data to show potential impacts of inundation to buildings and transportation infrastructure.

Maps courtesy of Maine Geological Survey

North Carolina Map Tells the Estuarine Shoreline Story

"People want to know about the different shoreline types, such as marsh or swamp forest, how development may influence shoreline changes, and where sills, docks, and other structures are located. This map can help answer those questions."

Braxton Davis,
North Carolina Division of Coastal Management

North Carolina Estuarine Shoreline Facts

12,625	**Total Shoreline Miles**
26,612	**Total Number of All Shoreline Structures**
825	**Total Acres of All Shoreline Structures**
604	**Total "Shoreline Stabilization Structure" Miles (groins, sills, bulkheads, and other)**

The first-ever digital map of North Carolina's 12,000-mile estuarine shoreline will help coastal agencies, research institutions, and local governments identify shoreline changes and development trends. This information will be used to monitor those changes and make better-informed coastal resource management decisions.

"People want to know about the different shoreline types, such as marsh or swamp forest, how development may influence shoreline changes, and where sills, docks, and other structures are located. This map can help answer those questions," says Braxton Davis, director of the North Carolina Division of Coastal Management.

The estuarine shoreline for the 20 coastal North Carolina counties is viewable via Internet Explorer on the North Carolina Shorelines and Oceanfront Setback Map (*http://ims.ncdenr.org/Website/ncshore/viewer.htm*).

Featuring data from the best-available aerial imagery collected from 2006 through 2010, the site enables users to combine various data layers for customized and downloadable maps. GIS files can also be used in other maps and analyses.

The map provides detailed coastwide and county-level information. For instance, a sampling of searches yields answers on the average width of boat ramps, average length of groins, and total square footage of piers and docks. Facts are also provided on shoreline stabilization structures such as bulkheads and groins. This information can help coastal professionals weigh complex decisions that involve property rights, development, protecting coastal resources, and other concerns.

The North Carolina Division of Coastal Management partnered with East Carolina University to complete the map. The project partners received support through NOAA's Office of Ocean and Coastal Resource Management under the Coastal Zone Enhancement Program.

The map became available in June 2012, and the early response has been positive. "Even before it came out, we were getting data requests from local governments and academia," says Davis.

One group is using the map to analyze the condition of shoreline stabilization structures before and after 2011's Hurricane Irene. Over the coming months, the agency will be holding more outreach events in coastal communities to explain the map's usefulness.

VAST AREA, GREAT NEED

Marshes, rivers, creeks, and brackish sounds make up North Carolina's 2.2 million acres of estuarine waters, one of the largest estuarine systems in the U.S. Until recently, much information on this resource was either anecdotal or area-specific, lacking the details needed for a more accurate, "big-picture" understanding.

"People would say things like, 'North Carolina has enough bulkheads to stretch from Murphy to Maneo.'

That didn't tell us anything about what percentage of the shoreline had bulkheads, or the effect of a particular bulkhead on an area," emphasizes Mike Lopazanski, coastal and ocean policy manager for the division.

"Even permit records don't tell the whole story," notes Lopazanski, "because what is permitted is not necessarily what ends up being built. We needed solid data for our agency and also to give to the North Carolina Coastal Resources Commission so they could make informed decisions about situations on the ground."

Davis acknowledges that efforts by several Southeast and Mid-Atlantic states to map their estuarine shorelines—and the great information that is being discovered—inspired North Carolina to spearhead its own project. "For decades Virginia and Maryland have partnered with researchers to map estuarine shorelines and produce 'shoreline situation reports,' and I've been told these are some of the most useful projects they've ever supported," he notes.

This marsh toe revetment, a type of sill, was captured in North Carolina's first-ever estuarine shoreline map.

Photo courtesy of North Carolina Division of Coastal Management

STEPS FORWARD, LESSONS LEARNED

North Carolina's mapping effort began with a pilot project in December 2006. Seeking a better understanding of stakeholders' mapping needs and expectations, the project partners held a summit in December 2007. Representatives attended from state and federal resource and regulatory agencies, academic institutions, and nongovernmental organizations.

By 2008, a working group had been formed to guide the project and establish methods for collecting the aerial imagery and processing the results. County by county, the partners and working group collected the most recent imagery available with the highest possible resolution, using color imagery because of its better visibility and contrast.

"While collecting information for the map, we found that communication was key—not only within our working group but also with other agencies, universities, and consultants," says Lopazanski. "Establishing a consistent methodology and limiting the number of shoreline categories also turned out to be important, because any more than five shoreline types made the mapping too difficult."

BUILDING MOMENTUM

A follow-up summit in spring 2013 will go over the results of the mapping project and address possible tweaks and improvements to the methods. Plans are in the works to make the map viewable in several additional browsers and to update the detailed structures inventory. Davis and Lopazanski also hope to build on the map's effectiveness by finding support for regular imagery collection and shoreline updates.

"Regular data updates and a structures inventory can tell us more about shoreline changes over time and whether some erosion-control methods work especially well, to mention just a few uses," notes Davis. "With these data sets, we can make better decisions about the most favorable areas for erosion control and the best methods to accomplish it." ❖

For more information on the North Carolina Shorelines and Oceanfront Setback Map, contact Braxton Davis at Braxton.Davis@ncdenr.gov or (252) 808-2808. You can also learn more by visiting http://ims.ncdenr.org/Website/ncshore/viewer.htm.

Getting Smart about Beach Information in the Great Lakes

"We were really focused on making it as useful and user-friendly as possible."

Christine Manninen,
Great Lakes Commission

Beachgoers in the Great Lakes can now check for water quality advisories and weather and water conditions with the click of a smartphone button. While this is the first smartphone application developed by the Great Lakes Commission, harnessing mobile technology for environmental uses will likely become coastal managers' outreach tool of choice in the future.

"It's mainly for the convenience of it," says Christine Manninen, communications director for the Great Lakes Commission and head of the Great Lakes Information Network. "If a person is heading to the beach or a tourist is searching for beaches in the area, it's easy to use their phone to find information."

She adds, "It's a great way to promote Great Lakes tourism and beaches, and protect human health when there are water quality advisories."

Released in late May, MyBeachCast provides real-time Great Lakes beach data for Android smartphones. It allows users to discover the closest local beaches and save beach locations for future reference.

"It's GPS-enabled so users can quickly locate other nearby beaches in the case of a water quality advisory at their favorite beach," Manninen says. Advisory and closure data are available from all eight Great Lakes states: Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, and Wisconsin.

MyBeachCast is also linked to the Great Lakes Observing System, which enables users to find information on weather, wave height, current conditions, and water temperatures.

Developed by the Great Lakes Commission in partnership with LimnoTech and the Great Lakes states, the app was funded by the U.S. Environmental Protection Agency-led Great Lakes Restoration Initiative.

With input from the beach management community, Manninen worked with a Web designer, programmers, and the contractor to develop the app.

They chose to create the app with an Android platform first because research showed it was the fastest growing market. If funding is available, Manninen would like to expand the app to the iPhone platform.

The most challenging part of developing the app, she says, was acquiring the necessary data from the states. "Once we worked with a couple states, we knew exactly what we needed and were able to develop a process."

Graphic courtesy of the Great Lakes Commission

They also spent a lot of time determining the app's functions and navigation. "We were really focused," Manninen says, "on making it as useful and user-friendly as possible."

She notes that the app was designed to automatically draw all its data dynamically, so there shouldn't be a lot of maintenance.

Since being released Memorial Day weekend, about 2,000 people have downloaded the app. Team members conducted surveys about the the app at 10 beaches in June and July and will use the feedback to make upgrades to MyBeachCast.

"It was a great team effort," Manninen says. "Developing an app was new to all of us, and I'm really proud of the results."

She adds, "I'm excited about doing another one. Mobile is definitely the direction we're going." ❖

For more information or to download MyBeachCast, go to http://beachcast.glin.net. You may also contact Christine Manninen at 734-971-9135, ext. 112, or manninen@glc.org.

Continued from page 7

from the Patriot's Day storm beautifully," says Slovinsky. "It really made our simulations credible."

One of the recommendations the group came up with was to use lidar data to update existing regulatory maps within the communities, significantly improving their accuracy.

Lockman notes that a lot of maps the communities had been using were U.S. Geological Survey quadrangles from the 1970s.

The group also developed a new transferable model floodplain ordinance requiring three feet of freeboard, or the elevation of structures above the flood zone, instead of current state requirements of one foot. The ordinance has already been adopted by Saco, and is being considered for adoption by Scarborough.

"There's a great deal of power in saying town X did this," Lockman says.

Other coastal communities are starting to pay attention to SLAWG success, and Lockman and Slovinsky have been asked to make presentations in Ogunquit and York—and in other states. As a result, York is adding a chapter on sea level rise to its comprehensive plan, and Ogunquit is evaluating the location of a seaside sewage treatment plant.

"Everyone wants to try to do this in their community," says Lockman. "It's catching on."

One of the keys to SLAWG's success, Slovinsky says, is "the entire process has completely avoided the politics of climate change and has really empowered municipalities who are at ground zero of impacts of sea level rise."

He adds, "They need to do something regardless of what's happening at the state, federal, or international level. They're already feeling the impacts of storm events, and they're the ones that need to be working to adapt." ❖

For more information on the Saco Bay Sea Level Adaptation Working Group, you may contact Peter Slovinsky at (207) 287-7173 or Peter.A.Slovinsky@maine.gov, or Jonathan (J.T.) Lockman at jlockman@smrpc.org.

NEWS YOU CAN USE
FROM THE NOAA COASTAL SERVICES CENTER

Modeling Sea Level Rise and Marsh Changes

Keil Schmid collects data in a saltwater marsh.

A lidar data investigation that began with a muddy trek through South Carolina's saltwater marsh has important implications for coastal professionals trying to produce accurate sea level rise scenarios. The take-home message: review your lidar data and check the findings against information gathered through ground survey methods.

Brian Hadley and Keil Schmid, two remote-sensing scientists with the NOAA Coastal Services Center, began the investigation in 2009. "Like lots of other lidar specialists," Schmid says, "we initially thought that the 'scrub/shrub' land cover category would work for marsh areas in terms of the pulse energy striking and transmitting elevation information in a similar way."

However, as the two researchers cross-checked the lidar findings against information gathered through traditional survey and GPS methods, the numbers did not add up.

"We'd walk into these wide marsh areas and could see and feel that the land was mostly very flat. But when we looked at the numbers processed through lidar software, the elevation readings were jumping up and down," notes Hadley.

Marsh vegetation is often much denser, and closer to the "bare earth" surface, than is typical "scrub/shrub." As a result, the lidar pulses were hitting vegetation but were registering as "bare earth." These faulty lidar readings were off the mark by up to 9.8 inches.

"That sort of inaccuracy can cause big problems, particularly because the elevation errors go just one direction—upward," says Schmid. "Let's say you have projected one foot of sea level rise, but your data is skewed, upward of nine inches higher than the actual land elevation in a marsh. The result is that there will be flooded marsh areas you didn't expect."

"Any coastal lidar user is going to want a less biased, more accurate model," says Hadley. "For coastal marsh, that may mean wading in and getting ground control points in addition to lidar data. When you're planning for sea level rise, it's better to be safe than sorry." ❖

To learn more about the Center's lidar services, contact Keil.Schmid@noaa.gov. Additional findings of this lidar investigation were covered in a LiDAR Magazine article at www.lidarnews.com/PDF/LiDARMagazine_Fahey-ModelingSeaLevelRise_Vol2No4.pdf.

Yes, there is a Santa Claus.

And he can bring coastal management training to your staff. All you need to do is ask.

19 classes

4 delivery mechanisms

- Instructor led
- Online
- Webinars
- Publications

4 types

- Technical skills
- Effective projects
- Working with people
- Coastal issues

All of the topics important to coastal managers!

- Coastal Community Planning and Development
- Green Infrastructure for Coastal Resilience
- Managing Visitor Use
- Planning for Meaningful Evaluation
- Coastal Inundation Mapping
- And many more!

What are you waiting for? Embrace the gift of knowledge.

www.csc.noaa.gov/training

NOAA Coastal Services Center
LINKING PEOPLE, INFORMATION, AND TECHNOLOGY

NOAA Coastal Services Center
LINKING PEOPLE, INFORMATION, AND TECHNOLOGY

2234 South Hobson Avenue
Charleston, South Carolina 29405-2413
(843) 740-1200
www.csc.noaa.gov

PRST STD
Postage & Fees Paid
NOAA Coastal
Services Center
Permit No. 132

Regional Offices:
NOAA Pacific Services Center,
NOAA Gulf Coast Services Center, and
Offices in the Great Lakes, Mid-Atlantic,
Northeast, and West Coast

Gearing up for Season 18

of the NOAA Coastal Management Fellowship Program

Candidate Applications due January 25, 2013

Postgraduate students should apply to the Sea Grant office in the state where they went to college. Sea Grant programs recommend candidates by February 22.

STARTS HERE ▶ *www.csc.noaa.gov/fellowship*