# COASTAL SERVICES

Volume 14, Issue 2 • March/April 2011

Linking People, Information, and Technology

## CRITICAL FACILITIES AT RISK:
### Preparing Coastal Communities for Future Floods

### Using Social Science in North Carolina to Document a Sense of Place

### Creating a Framework to Adapt to Climate Change in Oregon

# From the Director

When local land use decisions get made on a sunny day, it's easy to forget the risk from natural hazards, such as floods. But, as coastal resource managers in Mississippi and Louisiana learned during Hurricane Katrina, it is critical to ensure the safety of facilities that will be essential to a community's resilience and sustainability before, during, and in the days and weeks after a flood.

The flood risk to critical facilities across the country is such a concern that the Association of State Floodplain Managers (ASFPM) has issued a white paper on the topic. In the cover story of this edition of *Coastal Services*, we look at the problem, the ASFPM's recommendations, and the role coastal managers have in helping coastal communities reduce the risk and increase the resilience of critical facilities.

One of the best places to find the right tools, data, and partnerships for addressing flooding and other natural hazards, as well as the myriad of other issues that coastal managers face, is Coastal GeoTools '11.

Being held March 21 to 24 in Myrtle Beach, South Carolina, Coastal GeoTools '11 provides coastal managers with the opportunity not only to explore existing and emerging technology, but to discover new partnerships, engage consensus-building tools, and enhance the sharing of geospatial data.

For the first time, this year's conference is offering communication-related professional development opportunities. Communications 101 offerings will help attendees learn how to develop outreach plans, improve speaking skills, and communicate using social media.

Focused on the Digital Coast, an exciting technological gateway that provides access to a plethora of geospatial data, tools, and technical training, this stimulating and inspiring conference also offers coastal managers the opportunity to share their technical knowledge and experiences, and learn about available training, data, and technology resources.

The combined energy and ideas generated during Coastal GeoTools '11 will leave participants with the necessary resources, contacts, and communication skills to create the right solutions for their coastal communities.

To follow the GeoTools conference on Twitter, or for more information on the conference, go to *http://geotools.csc.noaa.gov/*.

I hope to see you there! ❖

Margaret A. Davidson

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.

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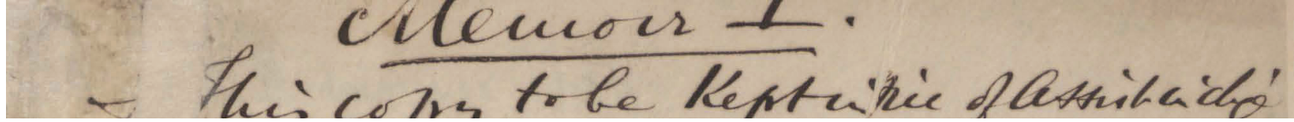
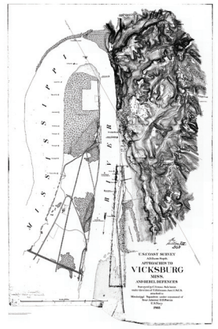



# NEWS and NOTES

## Charting the Nation's Coast during the Civil War




In honor of the 150th anniversary of the Civil War, a collection of maps, charts, and reports prepared by the U.S. Coast Survey, one of NOAA's predecessor organizations, from 1861 to 1864 is now available from the Internet. The special collection, Charting a More Perfect Union, contains over 400 documents.

Modern hydrographers are constantly surveying the ever-changing U.S. seafloor, which allows NOAA's Office of Coast Survey to produce thousands of nautical charts. Before the Civil War, however, huge swaths of the young nation's coast had not been surveyed, but the initial knowledge that was available about water depths, tides and currents, and shore topography provided a valuable advantage for Union strategy.

In 1807, President Thomas Jefferson established the Survey of the Coast to produce the nautical charts necessary for maritime safety, defense, and the establishment of national boundaries. By 1860, the U.S. Coast Survey was the government's leading scientific agency.

Lincoln's first actions after the April 1861 attack on Fort Sumter included his "Proclamation of Blockade," which kept vessels from rebel ports. The goal was to strangle the South's economy, meaning the unprepared Union navy had to navigate thousands of miles of uncharted coastline. Coast Survey Superintendent Alexander Bache, recognizing that naval navigators lacked domestic nautical charts, quickly set up additional lithographic presses, tripling distribution in the first year of the war.

Just as important as providing charting information for Union troops was the decision to withhold information from others. As Bache pointed out, "it has been judged expedient during the past year to suspend usual foreign distribution" of charting reports. Because Coast Survey could not easily ascertain the loyalties of private citizens, chart distribution was severely restricted, "the cases of applicants who were not well known having been referred to the representative of the congressional district from which the application had been mailed."

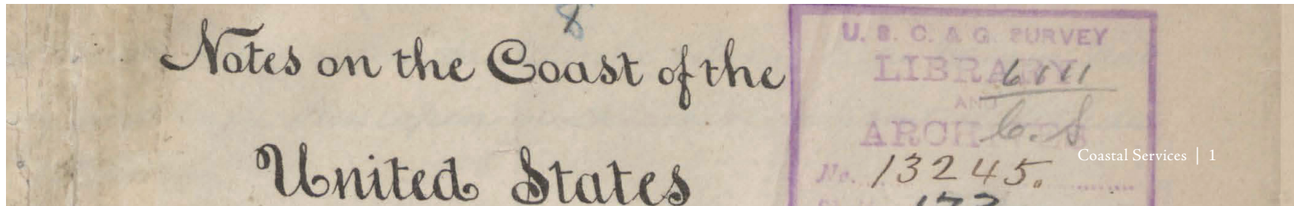
In other words, keep nautical charts out of Southern hands.

Acquiring nautical data became difficult, starting with rebels seizing tidal gauges in Louisiana, and worse. Bache sent men to work with blockading squadrons and armies in the field. One topographer was with the siege at Vicksburg in 1863:

*"Yesterday, I was three miles beyond our pickets and within 600 yds of the enemy's batteries. I did not stop work till the cannon balls plowed up the ground within 20 feet of us. One of my men had his hat blown off by the wind of a ball and one struck the levee just under my plane table. I reckon about all of the inhabitants of Vicksburg were out after me…"*

The topographer eventually died of illness contracted at Vicksburg, but he completed his chart "Approaches to Vicksburg." ❖

*To view NOAA's Charting a More Perfect Union website, go to www.nauticalcharts.noaa.gov/history/CivilWar/.*



# Using Social Science in North Carolina to Document a Sense of Place

*"We have got to talk about how to create the communities that we want. We haven't done that. This may be a very good opportunity to start some of those conversations and realize that we have to be part of the plan to make it happen—and it is going to take our time and efforts to do that. That is probably the first and biggest step that we need to take: take responsibility."*

*Lillie Chadwick Miller from the documentary, Voices of Down East*

*An aerial photo of Cape Lookout on the Core Banks, which are the barrier islands that flank Down East Carteret County.*

With residents divided over development that was changing the character of the rural fishing communities of Down East Carteret County along the shore of North Carolina, researchers funded by Sea Grant used social science methods to take a comprehensive snapshot of the views of residents and landowners. A documentary film was a key component of the project, which is helping the community determine how best to accommodate growth while protecting resources critical to local ecosystems, economies, and quality of life.

"Many coastal resource managers don't know what to do with qualitative data and social science data," says Lisa Campbell, Rachel Carson Associate Professor of Marine Affairs and Policy at Duke University and the lead researcher. "The documentary is a vehicle to translate qualitative research to policy makers, and to the community and public."

## Contentious Issues

Based at Duke's marine lab in Beaufort, North Carolina, Campbell began reading about contentious public meetings regarding development in neighboring parts of the county.

"Before the nation's economic downturn, new building in the area was booming," she says. "This area has historically been made up of fishing villages with small houses and lots of waterfront access, with folks pursuing traditional livelihoods."

Campbell says many residents were upset because land was being bought for development, and the resulting construction of larger homes and subdivisions was changing the community's character, the resulting runoff was impacting the environment, and waterfront access was shrinking. Others saw development as bringing economic opportunity and job growth.

"Each side," she says, "was talking about land use changes and what should be done, but there were no data to support any of the claims."

Coincidentally, Campbell had also met University of North Carolina graduate students Carla Norwood and Gabriel Cumming, who had developed a method they had used in the mountains of North Carolina that involved collecting interview and mapping data, producing a documentary, and then presenting the documentary and information back to the community through a series of meetings.

"As researchers, we saw an opportunity to provide the community with data and information that could help them determine for themselves how to accommodate development," Campbell says. "We would also be replicating methodologies and testing to see if they were transferable to other locations."

> ***"The documentary is a vehicle to translate qualitative research to policy makers, and to the community and public."***
>
> ***Lisa Campbell, Duke University***

## Gaining Perspective

In 2008, North Carolina Sea Grant funding allowed Campbell to gather a team that included Norwood and Cumming to begin the "Change in Coastal Communities: Perspectives from Down East" study to gauge public opinion on the pace of development in the region, trends in land ownership, and attitudes concerning the area's natural and cultural resources.

Phase one of the project was collecting survey data, says Cumming, who is now a postdoctoral associate at the Nicholas School of the Environment at Duke University.

During the summer of 2008 and spring of 2009, opinion surveys were administered to a random sample of 20 percent of the region's population, including full-time residents, part-time residents, and nonresident property owners.

The response rate was high, Cumming says, with 51 percent of those who received survey questionnaires returning them.

## Building Trust

Over the spring and summer of 2009, the research team conducted phase two of the project, which included videotaping interviews with 70 Down East stakeholders who offered a wide range of perspectives. Those interviews were then used to create a 30-minute documentary film.

"The interviews were analyzed, coded, and the data categorized to tell the story as it was told to us by the participants," Cumming says. "The documentary makes it clear that we're taking the community's input seriously. It builds trust, and in my experience you can't do too much trust building."

"One of the important indicators of the documentary's success to me," says Campbell, "is that the community felt that the issues were presented fairly."

## Information Sharing

Phase three of the project was a series of public meetings where the survey results and the documentary film were presented to local stakeholders.

Small-group discussions following the video presentations gave participants an opportunity to share their own visions for the area, Campbell says.

Participants' visions from the meetings were then compiled and ranked. At a follow-up meeting, participants identified priority issues from the ranked vision list and discussed how those issues could be tackled.

The resulting project information has been used by the Core Sound Waterfowl Museum and Heritage Center to leverage additional funding from the Z. Smith Reynolds Foundation and the North Carolina Rural Center for a regional economic development and resource management initiative.

## Meaningful Dialogue

Having proved that the social science methods work with diverse communities, the researchers say coastal resource managers could collaborate with researchers to do similar projects.

"This methodology should be used in situations when the management agency has an interest in better understanding what stakeholders views are on an issue," Cumming says. "It's not suited to a situation where managers have already developed a policy that they are trying to implement."

He adds, "This methodology is capable of fostering a civil, inclusive dialogue in situations where that hasn't been the norm. It fosters real, meaningful dialogue where new insights and ideas can emerge for everyone involved." ❖

*For more information about the Down East project or to view the Voices of Down East documentary, go to www.ml.duke.edu/coastalcommunities/. You may also contact Lisa Campbell at (252) 504-7628 or lcampbe@duke.edu, or Gabriel Cumming at (919) 681-8163 or gbc@duke.edu.*



Photo by Matthew Bowers and courtesy of Duke University

# Critical Facilities at Risk:

## Preparing Coastal Communities for Future Floods

When Hurricane Katrina struck the Gulf coast in August 2005, the storm surge flooded Mississippi's Hancock County Emergency Operations Center with waist-deep water. Those manning the center had to create a human chain to evacuate.

In the flooding after Katrina, 35 residents at St. Rita's Nursing Home in New Orleans died while trying to evacuate.

Many critical facilities in both Mississippi and Louisiana were either destroyed during the storm or were unusable afterwards because of flood damage or a lack of supplies and resources, such as power, potable water, food, and sanitation. In some cases, transportation infrastructure was so damaged that critical facilities could not be reached.

> *"Money spent now will pay huge dividends later."*
>
> *Al Goodman, Mississippi Emergency Management Agency*

With the lessons of Hurricane Katrina still fresh, Larry Buss, a retired senior advisor and national expert with the U.S. Army Corps of Engineers in the areas of flood risk management and nonstructural flood risk reduction, says coastal resource managers have a role in working with coastal communities to reduce flood risk and increase the resilience of critical facilities, such as hospitals, fire departments, utilities, evacuation shelters, and schools.

"Critical facilities are those that are essential to a community's resiliency and sustainability" before, during, and in the days and weeks after a flood, Buss says. "Stated simply, critical facilities should never be flooded, and critical actions should never be conducted in floodplains."

The flood risk to critical facilities across the country is such a concern that the Association of State Floodplain Managers (ASFPM) has issued a white paper outlining the problems and providing eight recommendations for federal, state, and local governments.

"I would encourage everyone to do their part to ensure their communities are more resilient," says Al Goodman, state floodplain manager for Mississippi. "Katrina's unprecedented storm surge damaged or destroyed critical facilities all along our 80 miles of coastline. When a local official states that all he has left is a shovel and a flashlight, it's hard to coordinate and respond."

### Increasing Risk and Damage

"We began talking about critical facilities in the 1980s. These aren't new concepts," says Chad Berginnis, associate director of the ASFPM, a professional nonprofit organization dedicated to reducing flood losses and protecting floodplain functions and resources. "But in many cases, critical facilities are not recognized in association with their potential hazard risk."

This is particularly a concern, says Buss, the lead author of the ASFPM white paper, because both flood risk and flood damage are increasing in the U.S., "despite many decades and billions of dollars spent trying to control floods, then to reduce flood damage, and now to reduce flood risk."

Flood damage is increasing, they say, because construction is continuing to occur in high flood-risk areas and is often done without adequate mitigation for the existing flood hazard, much less future risks. Another issue is that when critical facilities are flooded, a community's desire to rebuild quickly often usurps either the need to move the facility to higher ground or rebuild it to better withstand future flooding.

### Deciding Factors

While flood damage is mostly thought about in economic terms, loss of life and human suffering, as well as loss of natural and beneficial floodplain functions, are important factors that coastal communities should take into account before deciding where future critical facilities should be sited, and before determining if current facilities should be relocated out of a floodplain or retrofitted to withstand a future flood.

Economically, the cost of a flood damaging a home versus a critical facility, such as a wastewater treatment plant, is often drastically different, Berginnis says. "A minor flood in a wastewater treatment facility could ruin hundreds of thousands of dollars worth of very specialized equipment that many communities could ill afford to purchase in the first place."

While there is financial assistance available to communities if a flood is declared a federal disaster, Berginnis notes that after smaller floods, the cost of recovery comes out of community coffers.

"I believe the fundamental problem in this country and why flood damages are increasing is that many land use decision makers think dealing with flood damages is not a local responsibility and should be pushed up to the federal level," Buss says. "Those decision makers say, 'Why change how we make land use decisions if federal dollars will just roll in and help with response and recovery?'"

He adds, "Communities generally look at local economics first and often don't look at loss of life and human suffering, which can occur when critical facilities are flooded and can no longer fulfill their function in response and recovery. This means that it takes longer for a community to get back to pre-flood levels of functionality."

The natural and beneficial functions of floodplains must also be part of a community's plan to achieve flood resilience and long-term sustainability, Buss says.

### Needed Changes

While the ASFPM white paper calls for broad-scale changes by all levels of government to reduce the flood risk to critical facilities, there are areas where coastal resource managers could play a role.

One area of critical need, Buss says, is educating communities on the connection between land use decisions and flood risk responsibility and cost.

"The issue is that most communities—most people in general—ignore the presence of critical facilities in a floodplain," Buss says. "They don't realize what the critical facilities are during times of flood, and the importance of those facilities to the resilience of their community during a flood, and their ability to recover quickly after a flood."

Coastal managers also can help communities incorporate resilience concepts into longer-range planning efforts, such as hazard mitigation plans, coastal management plans, and local comprehensive plans, Berginnis says.

Coastal management data and information on coastal processes, including sea level rise and other climate change impacts, can also augment state and local floodplain maps to improve decision-making, Berginnis says. "Particularly in coastal areas, flood maps that only

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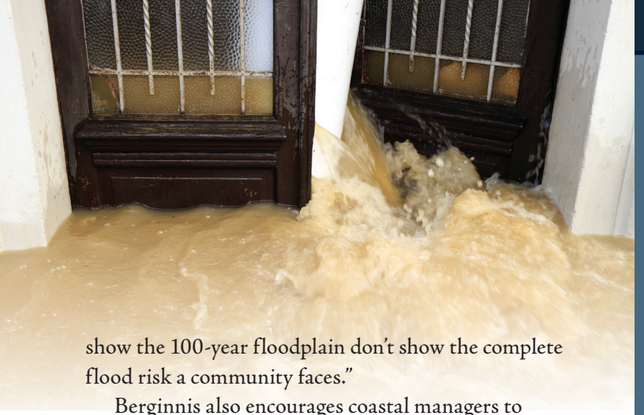

show the 100-year floodplain don't show the complete flood risk a community faces."

Berginnis also encourages coastal managers to reach out to state floodplain and emergency managers to share information, participate on state hazard mitigation teams, and encourage other interagency collaboration.

Mississippi's Goodman urges coastal managers to "do as many proactive things as you can to mitigate storm surge or flooding conditions. Money spent now will pay huge dividends later."

### Severe Awakening

Buss says he hopes the ASFPM white paper will result in a "rapid and severe awakening in regard to the need for higher levels of flood risk reduction and floodplain management for critical facilities."

"We need to do whatever we can to give flood risk a high priority in land use decisions," Buss says.

"In my professional experience," Berginnis says, "I have worked several flood disasters, and time and time again critical facilities get damaged, needlessly so. This paper does capture the different issues and the broad range of actions that can be implemented at the federal, state, or local level."

He adds, "This is personally an issue that is very near and dear to my heart. Any way we can lessen flood impacts on communities, that's important. Hopefully, this paper will help highlight those issues." ❖

*To view the Association of State Floodplain Managers' "Critical Facilities and Flood Risk" white paper, point your browser to www.floods.org/ace-files/documentlibrary/ASFPM_Critical_Facilties_and_Flood_Risk_Nov_2010.pdf. For more information, contact Chad Berginnis at (608) 274-0123 or cberginnis@floods.org, or Larry Buss at (402) 995-2300 or l-bbuss@iowatelecom.net. For information on how Mississippi addressed critical facilities after Hurricane Katrina, contact Al Goodman at (601) 933-6884 or agoodman@mema.ms.gov.*

## Recommendations

Here is a summary of the eight recommendations the Association of State Floodplain Managers (ASFPM) has for reducing the flood risk to critical facilities, with an emphasis on the role of coastal managers. For the complete list, go to *www.floods.org/ace-files/documentlibrary/ASFPM_Critical_Facilties_and_Flood_Risk_Nov_2010.pdf.*

**Reconnect land use decisions and flood risk responsibility and cost.** Funding and financing construction or repair of facilities should be based on land use decisions that incorporate resilience and long-term sustainability. Communication and education for communities on the importance of flood risk and appropriate land use decisions is a critical need.

**Ensure that communities are aware of their critical facilities.** Community hazard mitigation plans should inventory and assess susceptibility of critical facilities and identify potential mitigation actions.

**Shift flood risk management thinking from "short term" to "long term"** by not externalizing costs of poor land-siting decisions and requiring long-term planning.

**Issue an updated federal executive order (EO) on floodplain management to replace the 34-year-old EO 11988.** The nation should be moving to a "no, or minimal flood risk" environment by incorporating the concept of "no flood risk" into every land use decision.

**Provide accurate floodplain information for communities.** Incorporating information that reflects future conditions must be a high priority within communities and within agencies at the state and federal levels.

**Adopt or update state executive orders on floodplain management dealing with critical facilities** to ensure that state facilities are operable to at least the 500-year flood level.

**Shift the understanding of who pays for "at-risk" development in order to support good community decision-making**, and fully implement the concepts of "No Adverse Impact."

**Incorporate higher minimum standards for critical facilities** to reflect their importance to the community and future conditions.



# Tracking Septic Systems in Indiana

When officials have to close a beach because of high *E. coli* bacteria counts, the problem can sometimes be tracked to malfunctioning septic systems. Without local data on how a system was designed, permitted, installed, operated, and maintained, it can be challenging to identify where a problem may be coming from.

In Indiana, coastal resource managers partnered with state health officials to develop a Web-based tool to track septic systems at the local level.

The iTOSS (Indiana's network for Tracking of Onsite Sewage Systems) tool creates a centralized database that county health officials can use to document septic system information, such as location, soil and system type, permit, and permit violations.

State and county permit staffs can link permit violations and complaint data to a specific parcel, as well as attach site images and other supporting documentation. The tool can be used to develop and implement water quality improvement projects throughout the watershed.

"The on-site disposal system section of 6217 is one that a lot of coastal states struggle to meet," says program manager for the Lake Michigan Coastal Program Mike Molnar. Section 6217 of the Coastal Zone Management Act calls upon states and tribes with federally approved coastal zone management programs to develop and implement coastal nonpoint pollution control programs.

"I think this tracking tool could be used by other coastal states as a template. It's definitely a model that could be used by others," Molnar says.

> *"It's definitely a model that could be used by others."*
>
> *Mike Molnar, Lake Michigan Coastal Program*

### System Failure

On-site sewage disposal systems are a contributing source of nonpoint pollution in many coastal areas, including Indiana's Lake Michigan watershed. While septic systems do effectively treat contaminants, such as nutrients and pathogens, systems can fail for reasons that include poor soil conditions and inadequate maintenance.

"Prior to iTOSS, there was no single state database to track those systems, and the majority of county health departments used paper records," Molnar explains.

In 2007, the Indiana State Department of Health convened a committee of state and county health department staff members to determine what a statewide database should look like, says Mike Mettler, director of the Environmental Public Health Division of the Indiana State Department of Health.

### Streamlined and Customized

With funding and support from the Lake Michigan Coastal Program, the state modeled its program on the U.S. Environmental Protection Agency's Wastewater Information System Tool, streamlining and customizing the input screens and altering the flow of data to more accurately reflect county record-keeping.

"The majority of the system is handled by local health departments, and they don't work for us," Mettler notes. As a result, the state tested the database with several counties before releasing it and is providing training and outreach for county staff members.

"It's not a *Field of Dreams* kind of thing where if you build it, they will come," Molnar says. "We have found some counties don't have computers or GPS units, and we have provided additional grant funding to build that capacity internally. It's important to commit the resources to make sure it works in the end."

*Continued on Page 9*

# Creating a Framework to Adapt to Climate Change in Oregon


Research shows that the impacts of climate change are already being seen in Oregon. A Climate Change Adaptation Framework was recently released that lays out the state's climate-related risks and the resulting actions that are needed to adapt.

The Oregon Coastal Management Program helped lead a collaborative process with state agencies and organizations to develop the framework.

"One of our conclusions is that addressing changing climate conditions isn't necessarily about doing new things. It's often about doing the things we do today differently and according to different standards," says Jeffrey Weber, coastal conservation coordinator for the Oregon Coastal Management Program.

The framework identifies expected climate-related risks and the state's ability to adapt to those risks, as well as short-term priorities. It also provides steps that will evolve into a long-term process to improve Oregon's capacity to adapt to future climate conditions.

Weber says the work to create the framework began in October 2009, when the governor asked the directors of several state agencies, research institutions, and extension services to develop a climate change adaptation plan.

Among other things, the plan was to provide a framework for state agencies to identify authorities, actions, research, and resources needed to increase Oregon's capacity to address the impacts of climate change.

"The governor asked my department to take the lead role in facilitating that process, which we did," Weber says. "The work was done by a core group of staff from about eight to ten state agencies," including the departments of health and transportation.

The first two tasks of the interagency work group, which met about 20 times, were to identify likely changes in Oregon's climate conditions and the likely consequences of those changes over the next 40 to 50 years.

The work group identified several dozen likely changes in four areas: built and developed systems, ecosystems, public health and safety, and Oregon's economy. In consultation with the Oregon Climate Change Research Institute and state agencies, the work group ultimately combined the likely changes into 11 categories.

The group's biggest challenge, Weber says, was characterizing the risks to the state's economy.

"Very little information is available on the likely economic effects of climate change," he says. "Risks to Oregon's economy that were identified were really risks to other systems restated in very general economic terms."

> *"What we need to know are the likely costs of no action versus the cost of action."*
>
> *Jeffrey Weber, Oregon Coastal Management Program*

He adds, "What we need to know are the likely costs of no action versus the cost of action."

The next step was to identify existing state programs that can respond, Weber says. Those actions were then prioritized. Since no new funding was available, the group focused on low- or no-cost actions.

The resulting framework was released November 30, 2010.

"We recognize that this is version 1.0," Weber says. "It's establishing the stage for continued collaborating and coordination. It will be necessary to continue to develop adaptation strategies and plans, particularly at the regional and local level." ❖

*To view the "Oregon Climate Change Adaptation Framework" document, point your browser to www.lcd.state.or.us/LCD/docs/ClimateChange/Framework_Final.pdf. For more information, you may contact Jeffrey Weber at (971) 673-0964 or jeff.weber@state.or.us.*



*Continued from Page 7*

## Using the System

So far 12 counties have begun using the system, which was completed in 2010, including two of the three coastal counties bordering Lake Michigan.

"The beauty of it for the counties is that they don't need to buy or maintain any software," Mettler says. "It's Internet based, so they can just log in to the system." Currently, the Oracle Web-based system is not publicly accessible.

"This database is easy for people to use, and it's easy to see the information in a comprehensive way," says Colin Highlands, nonpoint source coordinator for the Lake Michigan Coastal Program.

Highlands notes that the coastal program is planning to use iTOSS data to assist local communities with refining watershed management plans and developing local ordinances addressing on-site sewage disposal systems.

"Any county that is still using paper records would benefit from this database," Highlands says. "Paper records are an impediment for setting ordinances on the operation, on-site inspection, and maintenance of septic systems."

Two other states have already asked for a program demonstration, Mettler says.

He adds, "We've gotten a lot of positive feedback for it. It turned out better than I imagined it would. I was worried our budget wasn't big enough, but what we really needed, we got." ❖

*For more information on the iTOSS system, you may contact Mike Molnar at (317) 233-0132 or mmolnar@dnr.in.gov, Colin Highlands at (219) 921-0863 or chighlands@dnr.in.gov, or Mike Mettler at (317) 233-7183 or mmettler@isdh.in.gov.*

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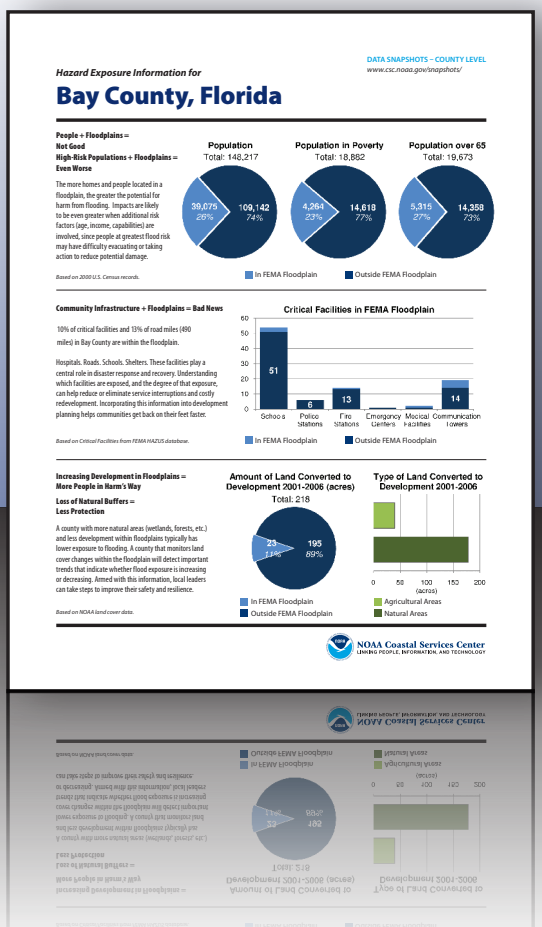


## Coastal County Snapshots

# Complex hazard data made simple.

**Coastal County Snapshots**
*www.csc.noaa.gov/snapshots/*