

# Carolinas Climate Connection

Carolinas Integrated Sciences & Assessments

Integrating Climate Science and Resource Management in the Carolinas

## Carolinas Climate Resilience Conference

In April, CISA hosted the first [Carolinas Climate Resilience Conference](#). Nearly 200 attendees spent 2 full days sharing and learning from one another about actions to address climate variability and change in the Carolinas. Pages 2 and 3 provide a brief overview of the event. For a full recap, check out the [final conference report](#). Speaker presentations are available on the [website](#).

<i>Stakeholders, Practitioners, and Researchers Talk Climate in the Carolinas</i>	2
<i>Columbia, SC Meteorologist Educates Viewers on Climate Change</i>	2
<i>Communicating about Climate: Closing Plenary Highlights</i>	3

## Third National Climate Assessment Released

In May, the [US Global Change Research Program](#) released the [Third US National Climate Assessment](#). This document contains a wealth of information about current climate changes and associated impacts we are already beginning to see, what we can expect in the coming years, and response strategies.

<i>Third US National Climate Assessment Released in Interactive Format</i>	4
<i>Climate Change Impacts in the Carolinas: Findings from the Southeast and Caribbean Chapter</i>	4-5
<i>NCA Hurricane Projections</i>	5

## CISA News

*CISA welcomes Liz Fly as the new coastal climate extension specialist* 6

CISA's annual report will be available at the end of June. Here we feature two projects from the report.

<i>Engaging Local Stakeholders in Climate-Resilient Planning in the Coastal Carolinas</i>	6
<i>Climate Change Impacts on Water Infrastructure: Vulnerability to Sea Level Rise and Coastal Storm Surges</i>	7

CISA team members at the Carolinas Climate Resilience Conference. Left to right: Kirsten Lackstrom, Peng Gao, Katie Sayre, Kirstin Dow, Janae Davis, Chip Konrad, Amanda Brennan, Dan Tufford, Greg Carbone, Jess Whitehead, Ben Haywood, Liz Fly and Kim Rodgers. Not pictured: Aashka Patel.



## Upcoming Events

[SC Water Resources Conference](#)  
Columbia, SC  
October 15-16, 2014  
Poster abstract deadline:  
August 25th

## Coastal Communities - We Want to Hear From You!

The Southeast & Caribbean Climate Community of Practice (CoP) is starting a conversation to learn more about climate adaptation and resilience tools to support planning and decision making in coastal communities.

CoP members hope to hear from local community representatives about climate-related needs or concerns. We would also like to hear from information providers about available tools. The information we gain from knowledgeable stakeholders will be used to develop a webinar or series of webinars to discuss identified needs and showcase tools to help support local decision making.

Log on to [StormSmart Coasts](#) to join the conversation.



USC Department of Geography  
Callcott Building  
709 Bull Street  
Columbia, SC 29208  
(803) 777-6875  
cisa@sc.edu  
www.cisa.sc.edu



# Carolinas Climate Connection

Carolinas Integrated Sciences & Assessments

## Stakeholders, Practitioners, and Researchers Talk Climate in the Carolinas

CISA hosted the [Carolinas Climate Resilience Conference](#) April 28 and 29 in Charlotte, NC. Nearly 200 participants attended the event to discuss climate-related issues and ongoing activities in the Carolinas. Speakers from a variety of professions and academic disciplines across the Carolinas imparted valuable insights and information on fostering resilience in communities facing climate change impacts. Highlights included a keynote address by Kathy Jacobs, the director of the [Third National Climate Assessment](#), presentations by over 100 participants, lunchtime viewings of the [National Park Service Climate Change Response YouTube video series](#), and a special closing plenary which showcased different ways to effectively communicate about climate variability and change.

Interactive plenary and concurrent sessions, a networking reception, and plenty of discussion time in the halls allowed participants to engage with one another to make connections and identify opportunities for future collaboration. In the words of one attendee, “At the conference I met wonderful people who share similar interests in climate adaptation, and I learned state of the

art methods to enhance climate resilience. As a result of the conference I will promote climate resilience in my region in a more comprehensive way.”

Environmental reporter Bruce Henderson covered the event. His article was posted in the Tuesday, April 29, 2014 edition of the *Charlotte Observer* and leads with “As politicians debate the existence and causes of climate change, some Carolinas communities are preparing to live with it” highlighting the emphasis at the conference on planning and activities currently underway in the Carolinas to address climate variability and change. Read the [full article](#).

Participant feedback on the evaluation survey was largely positive with 98% of respondents indicating that they would attend a 2<sup>nd</sup> conference. Read more about the event and results of the participant evaluation survey in the conference [final report](#). Presentations and posters are posted on the [conference website](#).

The next Carolinas Climate Resilience Conference will take place in 2016. We look forward to seeing you all there!

## Columbia, SC Meteorologist Educates Viewers on Climate Change

WLTX 19 Columbia Chief Meteorologist Jim Gandy partnered with the [Center for Climate Change Communication](#) at George Mason University and [Climate Central](#) to develop the [Climate Matters](#) segments broadcast on WLTX 19 Columbia. These segments are intended to educate viewers on the causes and implications of climate change. Findings from the field study to analyze changes in viewers’ understanding of climate change over the course of a year are described in the article, “[Climate Change Education through TV Weathercasts: Results of a Field Experiment](#),” published in the April 2014 edition of the Bulletin of the American Meteorological Society (BAMS). Gandy has received national recognition for the program including receipt of the [2013 Award for Excellence in Science Reporting by a Broadcast Meteorologist](#) and recognition by NOAA on the [climate.gov](#) website. Gandy was also invited for a [one-on-one interview with President Obama](#) on May 6th as part of the rollout for the Third National Climate Assessment.



Participants discuss climate adaptation options at the Integrating Climate Change into Sustainability Planning session.



Jim Gandy (WLTX 19) poses questions to climatologists Chip Konrad (Southeast Regional Climate Center) and Hope Mizzell (SC State Climate Office) during the ‘What’s Up with Strange Weather?’ session

# Carolinas Climate Connection

Carolinas Integrated Sciences & Assessments

## CCRC Closing Plenary Highlights

### *Climate Communications in the Carolinas*

During the closing plenary, Jessica Whitehead (North Carolina Sea Grant), Kelly Spratt (Georgia Sea Grant), Tim Watkins (National Park Service Climate Change Response Program), David Shelley (Congaree National Park) and Jim Gandy (WLTX19, Columbia SC) shared different ways they use to communicate climate change information to the various audiences with whom they engage.

Jess Whitehead provided a novel interpretation of the children's book, *Whose Mouse Are You?*<sup>\*</sup>, a book of 141 words in which a young mouse takes on and solves big problems. Her presentation elaborated on her work helping coastal stakeholders discuss climate change. She recommends tailoring climate information for target audiences and communicating it in short and simple formats. Whitehead also urged audience members to acknowledge fear, to respect differing interpretations of vulnerability, and to empower others by helping them take action in their communities.

As Government Outreach Coordinator for Georgia Sea Grant and a former elected official, Kelly Spratt shared key lessons on how to spur local decision makers to action. She urged agencies to understand the political climate and talk to decision-makers at local, state and federal levels to encourage action at larger scales. She also emphasized that agencies can play a role in educating decision makers as they take steps to respond to climate change.

Tim Watkins, Science Education Coordinator for the National Park Service's Climate Change Response Program, presented a thoughtful discussion about the complexities involved in preserving treasured places such as our national parks and monuments such as Ellis Island, hit by Hurricane Sandy, or Fort Sumter, facing sea level rise here on the Carolina Coast. The threats that climate change poses to the places we adore invoke perplexing questions to society about what is important, what should be prioritized and what could be done to mitigate or adapt. Watkins explained that while such questions are not easily answered, they reveal the multitude of choices and the immense agency we possess to adapt and improve conditions. Therefore, the places we love are hopeful places and reflect the power of human ingenuity and resilience.

David Shelley of Congaree National Park summarized the major aspects of climate change through a performance of [The Climate Change Song](#), a folk tune co-written by David Shelley and Chris Houston. The song provides a broad overview of climate change that resonates with everyone from students and adults. It defines and explains the science behind climate change, notes its effects, and shares steps we can take to reduce impacts. David's

performance offered an innovative way to communicate climate change to audiences of all walks of life.

Finally, Jim Gandy answered questions about the challenges associated with communicating climate change information to the public. Currently, Gandy hosts "[Climate Matters](#)" on WLTX news in Columbia, South Carolina. Climate Matters is a 30-40 second segment broadcast during regular weathercasts which discusses the causes and implications of climate change. Gandy noted that he has encountered a few skeptics. But he received less negative feedback regarding the Climate Matters segment for which most responses have been positive and encouraging.

Through creative and engaging presentations plenary speakers provided an extensive summary of best practices for communicating climate change information to communities. The insights and suggestions they offered are useful for businesses, non-profits and agencies working to respond to and communicate information about climate change. View slides and content from each of their presentations on the [conference website](#).



David Shelley performs "The Climate Change Song" on his dulcimer during the closing plenary

<sup>\*</sup>Kraus, Robert. *Whose Mouse Are You?* New York, NY: Macmillan, 1969.

# Carolinas Climate Connection

Carolinas Integrated Sciences & Assessments

## Third US National Climate Assessment Released in Interactive Format

Released on May 6, 2014 by the [US Global Change Research Program](#) (USGCRP), the [Third U.S. National Climate Assessment](#) (NCA) is the most comprehensive, authoritative scientific report generated about documented climate impacts in the United States and further changes we can expect to see throughout this century. The report includes [43 chapters](#) organized by sectors, regions and response strategies, [284 figures](#), [161 findings](#), [19 tables](#), and [3,395 references](#).\*

The USGCRP worked to make the online report as interactive as possible through their newly redeveloped website. Available on a mobile-compatible site, the electronic version of the NCA allows every piece of the report to be shared including graphics, key messages, regional highlights, and full chapters. Each graphic is downloadable as a JPEG file and all findings are fully traceable and supported by metadata through the [Global Change Information System](#) (GCIS). Each report chapter also includes 'Traceable Accounts' as supplemental material to support chapter key findings.

\*<http://data.globalchange.gov/report/nca3>

Many other efforts by a variety of individuals and organizations have been made to share report findings in creative ways to increase accessibility for all audiences.

- [Gary Braasch](#) compiled a series of photos from his [Climate Change Image Library](#) to illustrate key findings.
- [The Story Group](#) developed a Vimeo channel which personifies the scientific information found in the report through interviews with citizens and NCA authors. The channel contains two video series, one which illustrates climate change impacts on [everyday lives and livelihoods](#) around the country. The second series is [narrated by NCA chapter authors](#) and illustrates some of the most important messages from the report.
- A variety of additional resources is available through [NCAnet Partners website](#).

News about the NCA and other activities by the federal government to address climate change can be found on the [USGCRP website](#).

## Climate Change Impacts in the Carolinas: Findings from the Southeast & Caribbean Chapter

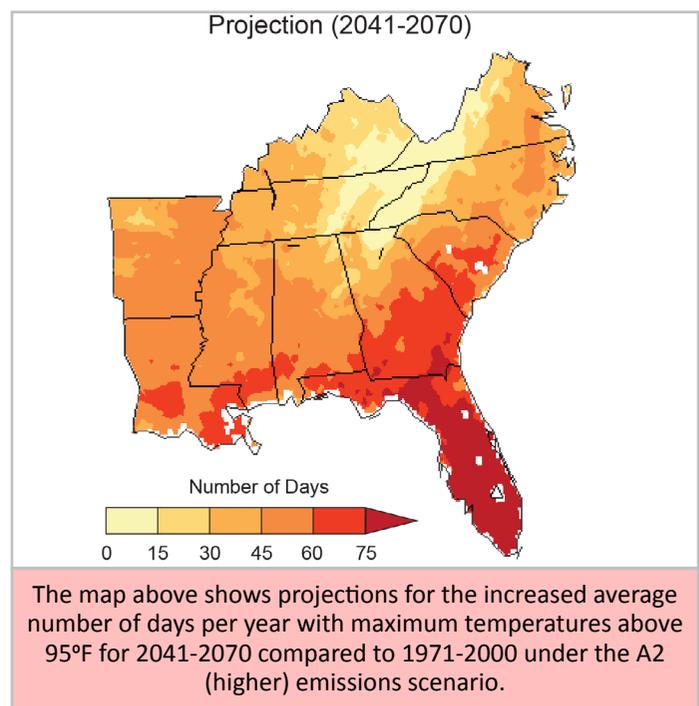
Climate change and associated impacts are not uniform. Therefore, the NCA includes regional chapters which provide information on impacts specific to the various regions throughout the US. The tables which follow include the three key findings from the [Southeast and Caribbean chapter](#) and associated impacts which resonate clearly for the Carolinas.

**Increasing temperatures and the associated increase in frequency, intensity, and duration of extreme heat events will affect public health, natural and built environments, energy, agriculture, and forestry.**

[Future climate projections for the Southeast](#) show a significant increase in the number of [hot days](#) (95 degrees F or above) and decrease in [freezing events](#).

Higher temperatures contribute to the formation of harmful air pollutants and allergens. Specifically, the report states that ground-level ozone is projected to increase in the largest urban areas of the Southeast. Find more information on public health impacts in the [Health chapter](#).

Increasing temperatures extend to ocean waters as well, which can lead to changes in distribution patterns of certain fisheries along the Carolina coastline.



# Carolinas Climate Connection

Carolinas Integrated Sciences & Assessments

## Sea level rise poses widespread and continuing threats to both natural and built environments and to the regional economy.

Global sea level rose about 8 inches in the last century and is projected to rise another 1 to 4 feet in this century. View mean sea level trends for [South Carolina stations](#) and [North Carolina stations](#).

Freshwater supplies from rivers, streams, and groundwater sources near the coast are at risk from accelerated saltwater intrusion due to higher sea levels.

The rising of sea levels will lead to damage or loss of critical infrastructure such as roads, airports, sea ports, and military facilities. It could also lead to the damage or loss of tourism infrastructure as well.

## Decreased water availability, exacerbated by population growth and land-use change, will continue to increase competition for water and affect the region's economy and unique ecosystems.

Population increases and land-use changes have reduced the amount of agricultural and forested lands faster in the Southeast than in any other region in the country.

Continued urban development and increases in irrigated agriculture will increase water demand while higher temperatures will increase evaporative losses.

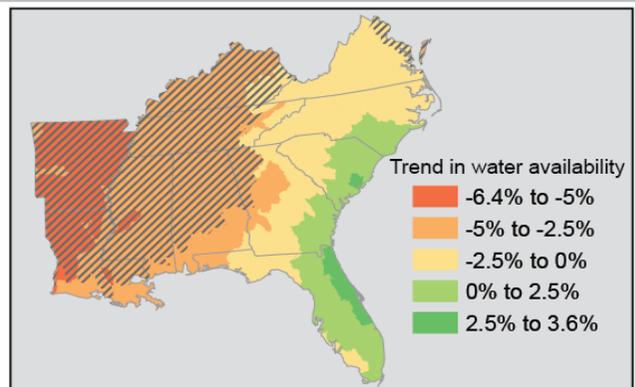
Increased demand in combination with rising sea levels will exacerbate saltwater intrusion into freshwater aquifers and threaten environmentally sensitive wetlands in coastal regions of the Carolinas.

## NCA Hurricane Projections

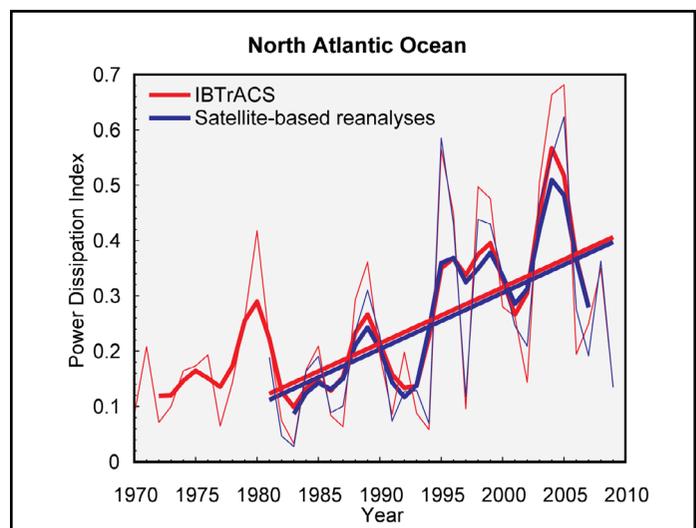
The NCA reports that hurricane intensity and associated rainfall are projected to increase in a warming climate. Recent increases in activity have been linked to increasing sea surface temperatures in the region where Atlantic hurricanes form and move through. However, the relationship between hurricane development and ocean temperatures is complex and the confidence level that human-induced warming is the primary cause of this change is low. Ensemble climate models (e.g. [CMIP5](#)) project a slight decrease in the annual number of tropical cyclones, but an increase in the number of more intense Category 4 and 5 hurricanes; although, there is significant variability in projections by individual models with some projecting increases and others projecting decreases. Models show greater agreement that the amount of precipitation caused by hurricanes will increase. Read the [full section on hurricanes](#).

The chart to the right shows recent variations of the Power Dissipation Index (PDI) in the North Atlantic Ocean. PDI is a combination of storm intensity, frequency, and duration and is calculated from historical data (IBTrACS) and reanalysis using satellite data. It provides a measure of total hurricane power over a hurricane season. There is a strong upward trend in the Atlantic PDI. NCA findings reveal that there has been a significant increase in the strength and number of Category 4 and 5 hurricanes since 1980\*.

\*<http://nca2014.globalchange.gov/report/our-changing-climate/changes-hurricanes>



The image above shows projected change in water yield for 2010-2060. Hatched areas show where a predicted negative trend in water availability associated with the range of climate scenarios is statistically significant (95% confidence).



# Carolinas Climate Connection

Carolinas Integrated Sciences & Assessments

## Featured Project

### *Engaging Local Stakeholders in Climate-Resilient Planning in the Coastal Carolinas*

Liz Fly (CISA and SC Sea Grant Consortium Coastal Climate Extension Specialist) and Jess Whitehead (NC Sea Grant Coastal Communities Hazards Adaptation Specialist) are currently working with decision makers in Beaufort County, SC, to write a plan for priority actions to update the county's planning processes and form-based codes to promote climate resilience.

In June 2013, Jess conducted 15 interviews to gauge climate-related concerns in Beaufort County. These interviews provided background information for a workshop in August 2013, where 18 attendees participated in a facilitated discussion to identify impacts of sea level rise on county planning and potential adaptation options. This workshop was conducted using the [Vulnerability and Consequences Adaptation Planning Scenarios \(VCAPS\)](#) process.

Participants discussed both stormwater and sea level rise impacts. They were much more interested in pursuing the sea level rise aspect than stormwater, likely because there has been active work on stormwater issues in Beaufort County for a long time. Sea level rise, on the other hand, has not been addressed in any organized fashion until this project.

In February 2014, participants met again to view maps of sea level rise impacts on Beaufort County and discuss a report summary of the VCAPS workshop. After the VCAPS workshops, project partners identified the need to bring in new expertise, and have been working hard to engage the real estate community as well as the military.

Participants met for a final workshop in May 2014 to discuss maps of sea level rise impacts on the county with their colleagues. Participants also ranked the adaptation actions identified in the VCAPS workshop. Fly and Whitehead will compile these into a report of recommended actions decided upon by the group, and will hold at least two public workshops in the fall of 2014 to engage a larger audience and get feedback on the recommended actions.

The public feedback will be incorporated into the report, which will be provided to the Beaufort County Planning Department in winter of 2014 for consideration in the latest update of their Comprehensive Plan.

In addition, these results will be applicable and useful to other coastal communities. Through the assistance of NC Sea Grant and SC Sea Grant Consortium, we anticipate this process will help increase the acceptance of cost-effective community-based climate adaptation in several communities in the Carolinas who were interested in learning from the Beaufort County example but unable to commit to the requirements of this funding opportunity. Leaders of several NC and SC communities will be invited to attend the public workshops in Beaufort County.

This project is part of the [Carolinas Coastal Climate Outreach Initiative](#), a joint effort between CISA, NC Sea Grant and the SC Sea Grant Consortium to integrate climate information into coastal community planning and decision making processes.

## CISA Welcomes Liz Fly to the Team

Elizabeth (Liz) Fly, Ph.D., has joined CISA and the SC Sea Grant Consortium (SCSGC) as the new coastal climate extension specialist. Liz has a B.S. in biology from the University of Puget Sound and a Ph.D. in biological sciences from the University of South Carolina. Before coming to CISA and SCSGC, she spent a year in Washington, D.C. as a Knauss Fellow, working jointly with NOAA's Climate Program Office and the US Global Change Research Program on the Third US National Climate Assessment. Liz will be based out of the SC Sea Grant office in Charleston, SC. In her role as coastal climate extension specialist, Liz will work to educate and support coastal communities and decision makers in evaluating and preparing for the impacts of climate variability and change in coastal systems. She will assist communities in incorporating weather and climate information into local planning and decision making processes. Liz can be reached at [elizabeth.fly@scseagrant.org](mailto:elizabeth.fly@scseagrant.org) or (843) 953-2097.

Jess Whitehead previously held the position which was jointly funded between CISA, NC Sea Grant and the SC Sea Grant Consortium. Jess moved to Raleigh last fall to work solely for NC Sea Grant as their coastal communities hazards adaptation specialist. Jess can now be reached at [j\\_whitehead@ncsu.edu](mailto:j_whitehead@ncsu.edu) or (919) 515-1686. Jess and Liz will work together to build resilience in coastal communities throughout the Carolinas.



Ellen Mecray (Left, NOAA Eastern Region Climate Services Director) and Liz Fly (right) at the Carolinas Climate Resilience Conference

# Carolinas Climate Connection

Carolinas Integrated Sciences & Assessments

## Featured Project:

### *Climate Change Impacts on Water Infrastructure: Vulnerability to Sea Level Rise and Coastal Storm Surges*

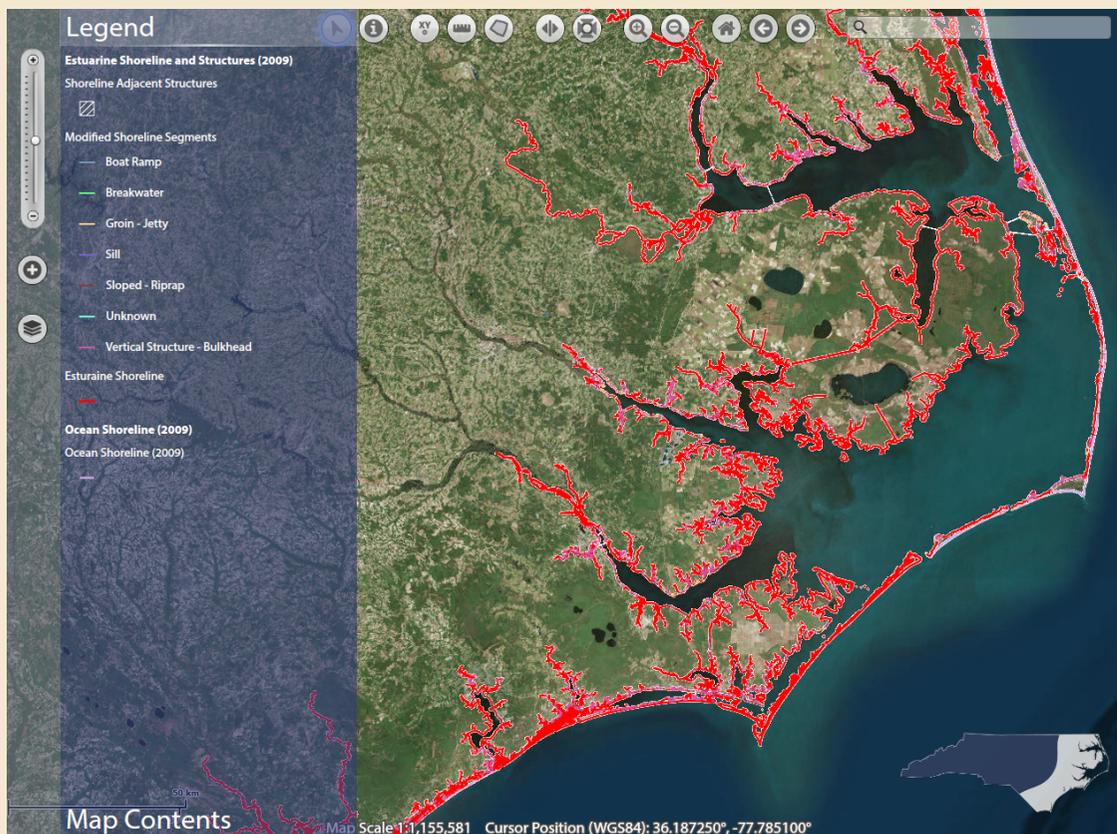
CISA collaborating investigators from the East Carolina University Department of Geography Tom Allen and Burrell Montz and Ph.D. student Zach Oyer have worked over the past year to assess the vulnerability of municipal water infrastructure to coastal hazards in North Carolina communities. The project, which built on the CISA-supported Lower Cape Fear Watershed Study, brought together GIS and water management expertise as well as experience modeling sea level rise and future climate change impacts to produce a series of detailed maps visualizing the vulnerability of water and wastewater infrastructure.

The maps and graphics developed by researchers are intended to help stakeholders better understand which coastal hazard (sea level rise, storm surge, or riverine flooding) poses the greatest risk based on planning time horizons and locations most suitable for stakeholder decision making needs. The maps and graphics were produced to be comparative across jurisdictions allowing for seamless assessment, visualization and comparison of vulnerable infrastructure.

The maps illustrate relative sea level rise heights which expose water and wastewater infrastructure to damage. Graphics also highlight the number of assets that are vulnerable. Further consultation with local officials and planners will help to draw site-specific implications of study results.

Initial feedback from stakeholders indicates that they are pleased with the standardization of the flood risk maps. Planners consulted favor the focus on infrastructure (water as well as wastewater), and they urged specificity about the individual objects which were included, such as lines and pump stations. Some further fine details (e.g., manhole covers) are desired, yet currently out of reach of the field inventory capacity for most of the coastal rural jurisdictions.

Researchers plan to package the individual municipality maps and graphics into a custom document for each planner and GIS staff with whom they engaged. Maps and graphics will be compiled into a final report shared with NC Sea Grant for communicating climate change risks. Maps will also be reformatted for publication on the [NC Coastal Atlas](#).



The [North Carolina Coastal Atlas](#) (pictured left) was designed to provide geospatial data, visualization tools, and thematic maps to coastal managers, scientists, students, and the interested public. Maps provide viewers with information on ocean and estuarine shorelines; wetland habitats and threats; flood inundation vulnerability; NC Sentinel Site Cooperative Projects; and East Carolina University coastal research projects. The atlas covers the entire coastal plain, including twenty [Coastal Management Act \(CAMA\)](#) counties, the estuaries and rivers, and adjacent marine areas.