

Carolinas Climate Connection

Carolinas Integrated Sciences & Assessments, a NOAA RISA Team

Integrating Climate Science and Decision Making in the Carolinas

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Mayor Billy Keyserling to give Keynote at Southeast and Caribbean Climate Community of Practice Workshop

A native Beaufortonian, Billy Keyserling has served as an elected official at both the local and state level. Mayor Keyserling is committed to addressing the threats climate change poses to his hometown of Beaufort, SC. As a founding member of the Beaufort and Port Royal Sea Level Rise Task Force, he is working with other citizens to identify the most vulnerable areas in their communities and potential adaptation strategies to address current and future impacts of storm surge and sea level rise. Mayor Keyserling notes that his goal is to be "shovel ready and at the front of the line when federal infrastructure grants are available for rising sea level resilience."

Don't miss this dynamic speaker as he shares his vision for creating a more resilient coast. Other workshop sessions will include

- » Assessing Vulnerability - What does it really mean?
- » Case Studies from Local Communities: Responding to Extreme Events in Both the Short and Long-Term
- » Using the Community Rating System to Support Climate Adaptation

April 13-15, 2016, Tybee Island, GA

Visit the workshop website for a copy of the full agenda

[Register here](#)

Submit Your Presentation Ideas

The 2016 Carolinas Climate Resilience Conference will be held September 12-14 at the Hilton University Place in Charlotte, NC. The 2014 event brought together nearly 200 practitioners, researchers, and staff from local, state, and federal agencies to share information about climate-related tools, resources, experiences, and activities in the Carolinas. The conference was designed with a very interactive format geared towards networking and exchange. The 2016 event will build upon these elements to provide an even more engaging event. Sign up for the conference e-mail list to stay informed about requests for speakers and presentations, registration, and travel information. The call for presentation and session ideas is currently open. Learn more about guidelines and access submission forms here. Contact [Amanda Brennan](#) with any questions. Learn more about the conference on page 3.



Upcoming Events

[Local Solutions: Eastern Regional Climate Change Preparedness Conference](#)

April 4-6, 2016
Baltimore, MD

[Building Adaptive Capacity in the Southeast & Caribbean through a Climate Community of Practice](#)

April 13-15, 2016
Tybee Island, GA

[Carolinas Climate Resilience Conference](#)

September 12-14, 2016
Charlotte, NC

[SC Water Resources Conference](#)

October 12-13, 2016
Columbia, SC

Abstracts due April 15

[National Adaptation Forum](#)

May 9-11, 2017
St. Paul, MN

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UNIVERSITY OF
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Getting to Know Your RISA

Featured Researcher: Kirsten Lackstrom

Kirsten joined CISA as the program's first, full-time program manager and research associate in 2010. She coordinated CISA's contribution to the third National Climate Assessment which assessed adaptive capacity and use of climate information in decision making in the Carolinas. She has also worked on several projects to support the development of a National Integrated Drought Information (NIDIS) Drought Early Warning System (DEWS) focused on the ecosystems in the coastal Carolinas. Kirsten, with Amanda Brenan, recently completed the NIDIS Carolinas Progress Report (see p. 5). In 2015 Kirsten completed her Ph.D. in geography from the University of South Carolina. Her dissertation research examined the processes of institutional change and drought adaptation in the management of water resources in North and South Carolina.

Kirsten enjoys outdoor activities and spending time with her family and their Alaskan husky, Tetlin.

Left: Kirsten eagerly awaits an ABBA cover band at a Chicago street festival in 2014.

"Understanding the 2015 Charleston Floods", a Charleston Resilience Network Symposium

By: Sumi Selvaraj

The Charleston Resilience Network (CRN) was established in 2015 as a volunteer-based effort to bring together public and private sector stakeholders in the Charleston, SC, metropolitan area with an interest in the resilience of the region to episodic natural disasters and chronic coastal hazards. As part of its mission statement, the Charleston Resilience Network aims to "foster a unified strategy and provide a forum to share science-based information, educate stakeholders, and enhance long-term planning that results in resilience."

A Symposium to Discuss Climate Resilience

On February 23, 2016, the Charleston Resilience Network, in partnership with the National Academy of Sciences, organized a symposium titled "Understanding the 2015 Charleston Floods." Objectives of the symposium were to assess the Charleston region's resilience through the lens of the major flooding in October 2015; to allow for information sharing and lessons learned across sectors; and discuss practices, partnerships, and opportunities for increased resilience to future flooding events.

The symposium brought together diverse stakeholders from the City of Charleston and the region who discussed actions they took to prepare for potential flood damage and impacts, lessons learned from the event, and best practices and opportunities to build resilience to future flood events. One key theme was the important role of risk communication across and between sectors, stakeholders, and the public in increasing regional resilience to flooding. Many stakeholders also shared how lessons learned from Hurricane Hugo and existing local knowledge about flooding that occurs during heavy rainstorms and high tide flooding helped them be better prepared for the October flood event. For example, many of the flood mitigation projects in the region such as drainage improvements and strong partnerships among public entities helped reduce flood damage and improve local response during and after the flood. Moving forward, some of the challenges for Charleston will be considering future regional growth with changing frequency of floods and how to identify and prioritize needs to build long-term resilience to flood hazards.

Moving Forward: CRN Receives NOAA Coastal Resilience Grant

A \$510,319 Regional Coastal Resilience Grant from NOAA's National Ocean Service has been awarded to the SC Sea Grant Consortium on behalf of the Charleston Resilience Network. The grant will be used to "support the development of more robust and localized flooding models that can be used to plan infrastructure improvements in the Charleston region," according to Rick DeVoe, Executive Director of SC Sea Grant and program manager of the award. The mapping will focus down to the individual parcel level to examine the ability of the fast-growing, low-lying community to absorb flood impacts and build resilience. Capitalizing on the diverse capabilities of CRN members and partners, the project will help to effectively leverage this collaborative effort as it seeks to inform effective infrastructure and land use planning, as well as water management practices that minimize risks from chronic and episodic flooding events.

Learn More

If you are interested in staying up to date with the efforts of the Charleston Resilience Network and learning more about this group, be sure to check their website for more information and future updates: www.charlestonresilience.net.



Flooded streets on Folly Beach, October 2, 2015.

Photo source: SC DHEC/MyCoast

More Flood Information Resources:

- » FEMA Flood Map Service Center
- » NOAA Tides and Currents
- » NWS Charleston Forecast Office
- » Weather Underground Coastal Storm Surge Models
- » Photos of Coastal Flooding

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Join a network of adaptation practitioners for the 2016 Carolinas Climate Resilience Conference

By: Chandler Green

For two days in April 2014, 196 attendees from a variety of sectors across the Carolinas convened in Charlotte, NC, for the same purpose: to enhance climate resilience. CISA, along with a steering committee of partners, launched the 2014 Carolinas Climate Resilience Conference to support decision makers engaged in climate resilience efforts throughout the two state region. Post conference surveys indicated that the 2014 conference was a success - 98% of surveyed attendees indicated they would attend a 2nd event. As challenges in fostering climate resilience within the Carolina community continue to emerge CISA is committed to supporting stakeholders. We will host the 2016 Carolinas Climate Resilience Conference this **September 12-14** at the Hilton Charlotte University Place. The 2016 conference will build upon the success of the inaugural event, with incorporated feedback from 2014 attendees that will make the second conference even better than the first.



"(the 2014) Conference was very helpful, from a government perspective, at gleaning the state of knowledge and future needs related to climate adaptation and resilience of constituents..."

New components of this year's event will include a modified schedule to begin the full conference on Monday, September 12 at 1:00 p.m., a full day of conference sessions on Tuesday, and a ½ day on Wednesday, September 14 with the closing plenary wrapping over lunch.

Pre-conference workshops will also be integrated into this year's schedule. These workshops will be held from 9:00 to 11:30 a.m. on Monday, before the start of the full conference at 1:00 p.m. Topics will include:

- » A climate fundamentals training session
- » Inclusive climate adaptation and resilience building
- » Climate communications in the Carolinas

Pre-conference workshops to provide participant training opportunities

We are pleased to announce that *Susan Joy Hassol* will help to lead the climate communications workshop. Susan is the Director of *Climate Communication*, a non-profit project that specializes in climate change communication and outreach to support scientists, journalists, and other in communicating about climate. Susan will also help to facilitate the closing plenary to share successful communication strategies with the full conference audience.

These pre-conference workshops will be limited to the first 25 registrants. Sign up will be available through the online conference registration site, to be opened in early April.

Presentation and session ideas due April 8

The focus of discussion at the 2014 conference encompassed a variety of topics pertinent to climate resilience. Topics covered at the 2016 event will be equally as inclusive as the inaugural event, seeking to provide climate-related information to a wide range of regional stakeholders representing government, private sector, academia, and non-profit organizations. Major themes of concurrent sessions will include climate data and information, public health impacts of climate, resilient communities and infrastructure design, sea level rise, coastal climate, climate communications, and water and natural resources management.

"As an academic researcher, the conference provided me a very valuable picture of the specific climate related actions that are in place at the local/state level."

A primary goal of this conference is to facilitate networking among the diverse set of attendees, encouraging conversations that help participants think outside of silos. Therefore, opportunities for interaction and collaboration are interwoven into every aspect of the conference. In addition to a wide variety of topics, conference sessions also seek to engage participants through interactive presentation formats. Conference sessions will not follow a typical "listen only" format; we want audiences to be just as involved as the presenters to boost idea sharing among attendees. Our interactive presentation formats, such as "Connecting the Dots (Ask the Audience)" and "Illustrated Presentations," will enhance networking and collaboration. All presenters are encouraged to approach their presentations as an open dialogue with audience members to spark participation and idea sharing. The conference's collaborative settings helped foster new interactions among attendees as 98% of 2014 surveyed respondents indicated they met new people or made new connections with other stakeholders in the region engaged in their area of work and with similar interests.

"I think some of the best results of any conference come from the connections made with attendees. In this regard, this conference format was more proactive in facilitating discussion and interaction than any I've been to."

Conducting work to increase climate resilience in the Carolinas?

We want to hear from you!

[Access guidelines and submission forms here](#)

The 2016 CCRC Goes Carbon Neutral

Shift Equity, a company dedicated to expanding clean energy capacity, will help the 2016 Carolinas Climate Resilience Conference "walk the talk" of sustainability through its *Carbon Advantage Program*. This program allows organizations to offset the carbon they produce while directly supporting clean energy production. To offset electricity use at the 2016 conference, the Carbon Advantage Program purchased Renewable Energy Credits (RECs) based on estimated energy use from overnight accommodations and food preparation. These credits go directly to buying solar energy from local system owners, increasing the competitiveness of clean energy. The Carbon Advantage Program will also offset carbon emissions from the event by estimating negative costs to society and the environment. Together, the total costs of RECs and Carbon Offsets have been combined into a comprehensive *Carbon Neutral Sponsorship* available for the 2016 conference. Carbon Neutral Sponsors will receive all the benefits of a traditional sponsorship package with the added benefit of pioneering a new form of environmental stewardship. Contact *Amanda Brennan* if your organization is interested in this opportunity.

Connecting weather and climate with public health impacts in North Carolina

By: Jenna Hartley

To complete her Master's thesis, CISA graduate research assistant Jenna Hartley conducted a study to uncover spatial and temporal patterns of diarrheal disease across the state of North Carolina and to determine if those patterns are related to socioeconomic, demographic, and/or meteorological factors.

Incidence of gastrointestinal illness in North Carolina was determined using Emergency Department (ED) visit data from NC DETECT (North Carolina Disease Event Tracking and Epidemiologic Collection Tool), North Carolina's statewide syndromic surveillance system. Emergency departments throughout the state submit codes for each patient when they are released to denote their diagnosis. Based on the case definition from previous literature, Jenna used codes for intestinal infectious diseases, gastroenteritis, and diarrhea to define gastrointestinal illness for the purposes of this study.

Age- and gender-specific estimates of the North Carolina population by both ZIP code and county were obtained from the 2010 US Census Bureau-based population estimates. Those estimates were then used as denominators in the calculation of gastrointestinal illness ED visits per 100,000 person years. The researchers also assessed whether other measures of demographic and socioeconomic characteristics factored into the incidence of illness, including the following elements: percentage of the population living in poverty, average number of people per household, urban vs. rural counties, drinking water source, and the type, level, and percentage of health insurance coverage. Maps of all demographic variables were produced as a way to investigate regional and local trends in gastrointestinal illness.

Meteorological data was obtained through a feature within NC DETECT called the Climate-Health Toolbox, which was designed and produced by the Southeast Regional Climate Center (SERCC). For this study, cumulative totals for precipitation for the 3 days prior to each ED visit and 10 days prior to each ED visit were selected. Using the 3-day and the 10-day lag periods, the population of emergency room visits was then split into two samples based on the amount of precipitation. Precipitation values that were unreasonably high were excluded, and the remaining values were binned into two groups: 1) Heavy: Greater than 2" of rain and 2) Light: Less than 2" of rain.

Correlations between demographics, rainfall, and gastrointestinal illness

Results confirmed correlations with gastrointestinal illness and poverty, and indicated an increase in the average rates of emergency department admissions for gastrointestinal illness after periods of heavy rainfall (greater than 2") across the state of North Carolina. Specifically for heavy rainfall, several geographical clusters of high disease occurrence were identified at the county level; **seven counties across the state showed 300% and greater increases in average rates of disease occurrence after heavy rainfall**. These findings support the **suggestion that there is potentially a waterborne component of disease transmission in the population**, especially in the counties with the highest increases in disease rates after heavy rainfall. A better understanding of the impact that heavy rainfall has on disease incidence is an important public health step towards finding ways to prevent and mitigate the risk of disease (Drayna et al., 2010)*.

* Drayna, P., McLellan, S.L., Simpson, P., Li, S., & Gorelick, M.H. (2010). Association between Rainfall and Pediatric Emergency Department Visits for Acute Gastrointestinal Illness. Environmental Health Perspectives, 118: 10, 1439-1443.

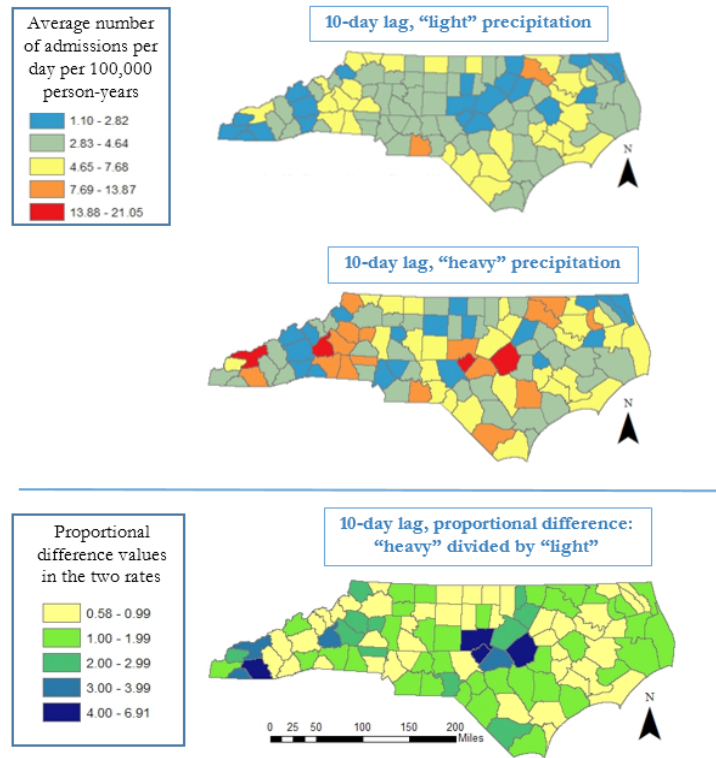
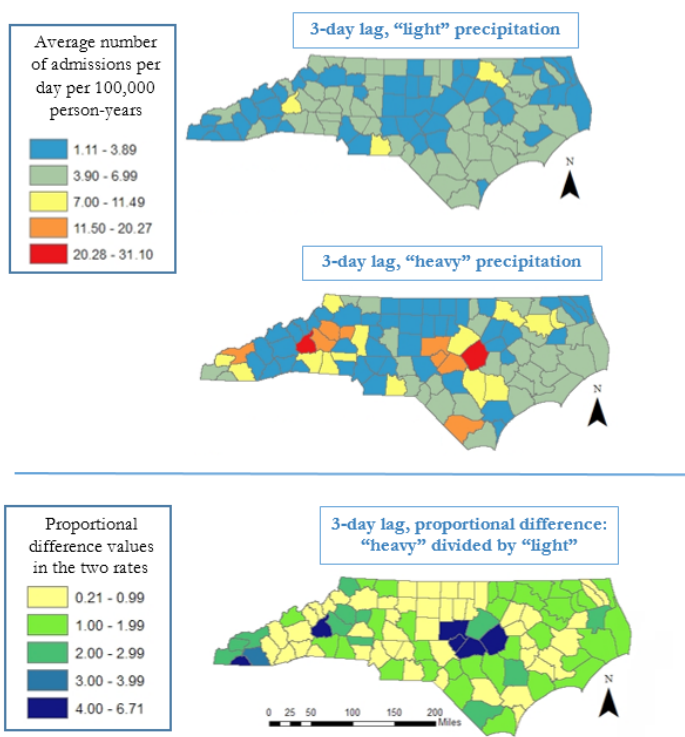


Figure 1: The rate of admissions per day per county for "light" and "heavy" precipitation over a 3-day lag period (top) and the proportional difference values in the two rates (bottom).

Figure 2: The rate of admissions per day per county for "light" and "heavy" precipitation over a 10-day lag period (top) and the proportional difference values in the two rates (bottom).

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New NIDIS Carolinas Progress Report Now Available

The Coastal Carolinas Drought Early Warning System (DEWS) is one of several National Integrated Drought Information System (NIDIS) regional DEWS programs in place across the U.S. As different parts of the country are affected by drought in different ways, DEWS provide tools, resources, management strategies, and opportunities for information exchange around salient drought issues at the regional scale. Launched in 2012, the Coastal Carolinas DEWS has focused on

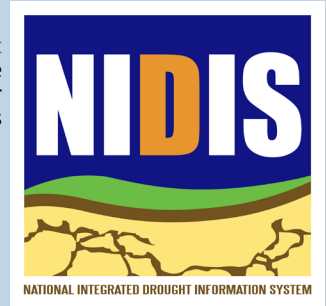
- » improving understanding of the unique vulnerabilities and impacts of drought on coastal ecosystems
- » developing tools, information, and other resources that will help managers and decision makers integrate drought and coastal resources management activities.

A new report by CISA researchers highlights progress on several projects supported by NIDIS including:

- » The development of a citizen science condition monitoring network to regularly monitor the effects of rainfall (or a lack thereof) on local environments and communities (Amanda Brennan and Kirsten Lackstrom, CISA)
- » The establishment and refinement of a Coastal Salinity Index (CSI) that uses USGS streamflow data to characterize drought conditions in coastal environments (Paul Conrads, USGS South Atlantic Water Science Center)
- » An assessment of drought indicators for monitoring and managing fire risk in the coastal zone (Ryan Boyles, State Climate Office of NC)
- » The development of tools and information that allow fisheries managers and crabbers to investigate the connections between climate variability and crab landings (Michael Childress, Clemson University)
- » Foundational steps to build an "Atlas of Hydroclimate Extremes for the Carolinas," a web-based tool that will provide baseline information about drought duration, frequency, and intensity (Greg Carbone, CISA; Chip Konrad, SERCC). More on this project below.

The Coastal Carolinas DEWS is advancing NIDIS early warning goals centered on improving and integrating public awareness, monitoring and forecasting activities, risk assessment, preparedness, and communications. Through applied research and ongoing engagement with stakeholders and decision makers, the Coastal Carolinas DEWS is building a solid foundation for, and developing new knowledge that can be applied to, a wide variety of drought early warning activities.

[Read the full report here.](#)



Depicting the Story of Drought in the Carolinas

CISA researchers are developing a visual narrative about the historical character of drought in the Carolinas with the goal of conveying it through a website designed for educational and planning purposes. Drought is a slow-moving natural hazard originating from an extended rainfall deficit ranging from seasons to years and, typically, cascading into moisture deficiencies in other parts of the hydrologic cycle (soil moisture, for example). Drought events are commonly characterized based on the **intensity** and **duration** of moisture shortage and **frequency** of occurrence using a range of metrics and statistics.

Impacts of drought can be far-reaching. The sensitivity of natural resources and communities to drought and the severity of resulting drought impacts vary with different drought characteristics. A localized understanding of drought is, therefore, essential for effective drought-related planning and response actions. This project will analyze and map the nature of drought events recorded in the past 120 years in the Carolinas, *and* connect it to local drought-related impacts and experiences through photos, videos and other narrative formats.

The range of information produced will summarize the observed drought characteristics in the region as well as allow comparisons of individual drought events with average conditions, past events, and their variability across the region. The format will include location-specific graphics and maps covering the Carolinas region. For example, the first figure (below) shows the variation and probability of seasonal precipitation totals for a single station located in Wilmington, NC.

The second figure (right), shows - for Climate Division 1 in NC - levels of dryness based on precipitation and temperature, as measured by the Palmer Drought Severity Index (PDSI). This type of information can be useful for local and regional resource management decisions, such as those for surface water permitting, regional water quality planning, and reservoir operations. Some of this information will also be presented in the form of case-studies placing individual drought events in recent memory in the historical context.

