

# CAROLINAS CLIMATE CONNECTION

Carolinas Integrated Sciences & Assessments, a NOAA RISA Team  
Integrating Climate Science and Decision Making in the Carolinas



Photo Source:  
Amanda Farris



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# UPCOMING EVENTS

November 13-15  
New Orleans, LA

**Southeast CASC Regional  
Science Symposium**

November 19-20  
Wilmington, NC

**North Carolina  
Coastal Conference**

F E R D O U Z  
C O C H R A N

CISA Featured Researcher



Ferdouz Cochran is CISA's new Climate-Health Integration and Outreach Associate. She supports efforts to integrate climate science and environmental public health and engages diverse stakeholders and decision-makers throughout the Carolinas. She works to maintain and further develop climate-health tools, including the Hazardous Extremes Risk Assessment (HERA) tool which provides information about the likelihood of weather events and related impacts, and the Wet Bulb Globe Temperature (WBGT) tool for heat health.

Ferdouz received her PhD in Geography from the University of Kansas, where she was an NSF IGERT Fellow in the Climate Change, Humans, and Nature in the Global Environment program. Since 2016, she has enjoyed living and working in the Triangle of North Carolina, a hub for research, health, and technology advancements.

# EXTREME HEAT AND PRE-TERM BIRTHS

By Stafford Mullin



Photo Source: Liz Fly

The negative health impacts of extreme temperatures on pregnant women is becoming a growing concern in a warming world. Despite these health threats, the relationship between prenatal health and extreme heat has been a neglected area of academic study in the Southeast region of the United States. Luckily, CISA researchers at UNC Chapel Hill have been conducting extensive research on the subject to fill in the knowledge gaps on this critical issue. Their article, recently published in the *International Journal of Biometeorology*, shares results of research to understand the health impacts of heat exposure on pregnant women during the notoriously warm months of May through September.

The study focused on births between 2011-2015 across the state of North Carolina. During this period, 29,854 of the 600,927 births were constituted as preterm, or occurred before 37 weeks of pregnancy. Since North Carolina is a geographically diverse state, regions within the state can significantly vary in temperature. Due to these temperature variations, the outcomes of the study were analyzed by the corresponding region in which the births occurred, those regions being Mountains, Piedmont, and Coastal Plain.

The results of the study indicated a greater likelihood of preterm births at increasingly greater temperatures when taking temperature minimums, maximums, means, and heat index variables into account. High overnight temperatures had the most impact on preterm births. Results varied across the different regions of the state. These findings are also significant in the context of increasing nighttime temperatures in the Southeast, where the number of nights with temperatures about 75 degrees F have doubled on average compared to the first half of the 20th century (Source: [Fourth National Climate Assessment](#)). Thanks to our intrepid researchers at UNC for their research contributions that draw attention to important climate health vulnerabilities in the Southeast.

Access the full article at: <https://link.springer.com/article/10.1007/s00484-019-01773-3>

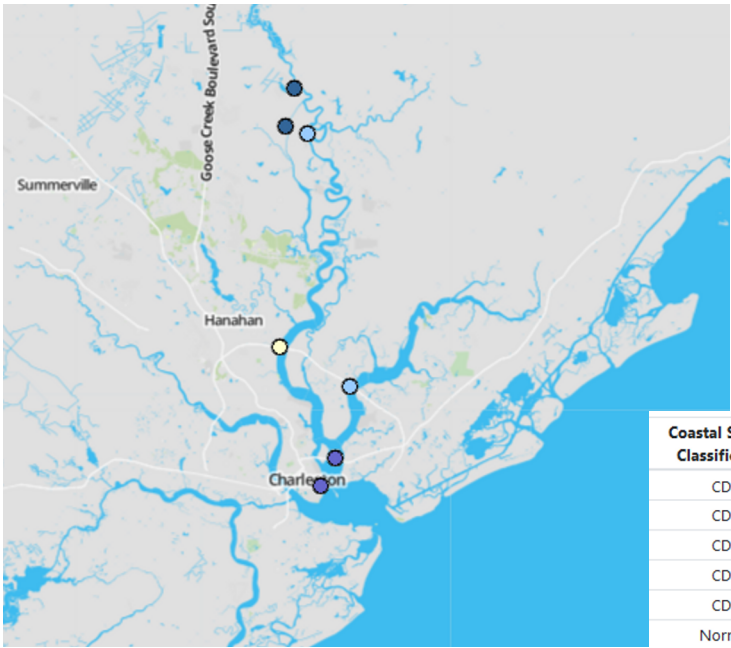
# COASTAL SALINITY INDEX WEBSITE

By Elijah Charette

The Coastal Salinity Index (CSI) was developed to monitor surface water conditions in coastal areas. The freshwater-saltwater interface in surface waters along the coast can be highly variable, moving further inland or seaward depending on the amount of freshwater flowing downstream and effecting ecological, municipal, and industrial uses. However, traditional drought surveys do not accurately predict salinity levels in these areas.

The Coastal Salinity Index measures how much current salinity conditions differ from typical salinity conditions. Negative values indicate increasingly saline conditions and positive values indicate increasingly freshwater conditions. The CSI website, launched in September, displays real-time salinity levels at seventeen USGS recording stations located in areas of varying degrees of freshwater-saltwater mixing on the coasts of North Carolina, South Carolina, and Georgia (see map below). The data used on the site come from the USGS National Water Information System (NWIS) database. The CSI uses the same classification scheme as the [US Drought Monitor](#) for high saline, or drought conditions. The CSI tool does not calculate daily or hourly changes in conditions. Its primary use is to track monthly, seasonal, or interannual changes in salinity that can have long-term effects on coastal ecosystems.

The CSI and newly available resources, such as the website, were developed by the US Geological Survey (USGS) and CISA, through funding from the National Integrated Drought Information System (NIDIS), USGS, and the NOAA Climate Program Office



Access the [CSI Website](#) here, and find the [CSI user guide](#) under the Resources tab on the website

Sample of CSI website map showing salinity gauge station location, color coded to indicate their salinity level based on the CSI classification.

Coastal Salinity Classification	Description	Threshold Values	Icon	Cumulative Percentage
CD4	Exceptional salinity conditions	-2.00 or less		2
CD3	Extreme salinity conditions	-1.99 to -1.60		5
CD2	Severe salinity conditions	-1.59 to -1.30		10
CD1	Moderate salinity conditions	-1.29 to -0.80		20
CD0	Abnormal salinity conditions	-0.79 to -0.50		30
Normal	Normal salinity conditions	-0.49 to 0.50		70
CW0	Abnormal freshwater conditions	0.51 to 0.80		80
CW1	Moderate freshwater conditions	0.81 to 1.30		90
CW2	Severe freshwater conditions	1.31 to 1.60		95
CW3	Extreme freshwater conditions	1.61 to 2.00		98
CW4	Exceptional freshwater conditions	2.01 or more		100
Not Available	Missing Data			

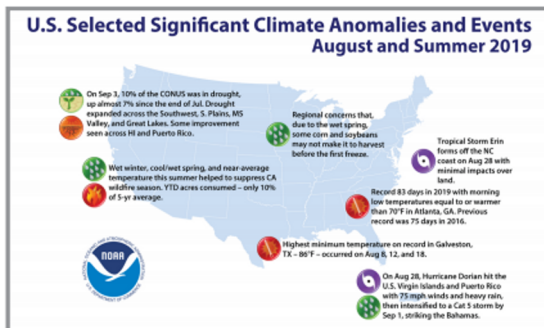
# SOUTHEAST QUARTERLY CLIMATE IMPACTS & OUTLOOK

The Southeast Regional Climate Center has just released the Quarterly Climate Impacts and Outlooks for Summer 2019. This two-pager provides an overview of information regarding weather and climate trends from this past summer, as well as projected outlooks for the fall. Looking ahead at the upcoming season, NOAA predicts warmer than average temperatures across the Southeast region. Also, outlooks suggest an increased likelihood of an above average normal hurricane season, largely due to subsiding El Nino conditions. Access the full document [here](#) to learn more.

Below: Sneak peak of Summer 2019 Highlights

## Quarterly Climate Impacts and Outlook Southeast Region September 2019

### National and Regional Weather Highlights for Summer 2019



#### Highlights for the Southeast

There were **few extremes in summer temperatures** across the region. However, extreme warmth occurred in portions of Florida with Jacksonville, Stuart, and Punta Gorda observing their **warmest summer on record**.

Precipitation varied greatly across the Southeast for the summer. From June 7-10th, **flash flooding** resulted in three fatalities in the foothills of NC. On July 8th **Reagan National Airport** observed flash flooding, resulting in more than 30 water rescues. A series of **training thunderstorms** caused flash flooding in Greensboro NC on July 31st. In contrast, Oneonta, AL observed its driest July on record.

**Strong thunderstorm winds** were reported during the summer, resulting in three fatalities and four injuries. Some of the highest wind gusts include 78 mph (35m/s) at Duck Pier in Dare, NC; 79 mph (35 m/s) in Columbia, SC; 80 mph (36 m/s) on St. Thomas Island, USVI.

**Hurricane Dorian** formed on August 24th, brushing by Puerto Rico on August 28th as a category 1 storm, and impacting St. Thomas Island, USVI with strong winds and heavy rains.

*Much-above-average **minimum temperatures** were observed across the Southeast this summer. Atlanta, GA, Jacksonville, FL and Plant City, FL all broke records for number of days with high minimum temperatures. Slow moving and training thunderstorms were observed throughout the summer, causing **flash flooding** in local areas of the region. At the end of August, **Hurricane Dorian** formed and impacted the U.S. Virgin Islands and Puerto Rico with strong winds and heavy rains. For more information, see: <https://www.ncdc.noaa.gov/sotc/>*

# NEW RESOURCES FROM THE SC STATE CLIMATE OFFICE



## NEW SC HURRICANES & TROPICAL STORMS WEBSITE

The SC State Climatology Office (SC SCO) has done a complete overhaul of the hurricane data available on their website. The [new webpage](#) displays an interactive map with tracks for all hurricanes and tropical storms that have impacted the state since record keeping began. Users can click on a track to view additional information about any storm. There is also a data table below the map, where users can search for specific storms, dates, or keywords.

Each storm also has its own webpage (linked through the Storm Details button). Here users will find an enhanced version of the storm track map showing the development of the storm through time, pressure and wind speeds, and additional information about the storm's impacts to South Carolina. Links to online interactive journals for that state's most recent storms, such as Hurricane Florence, are also available on the individual storm pages. Other features include: downloadable storm summaries and maps, accessible table views of all datasets, and infographics and summary charts in an [Executive Summary](#).

Access the site at: <http://portal.dnr.sc.gov/climate/sco/hurricanes/>

# HURRICANE HUGO 30 YEAR ANNIVERSARY INTERACTIVE JOURNAL

“Hurricane Hugo was the most devastating hurricane to affect South Carolina in the 20th century. The Category 4 hurricane made landfall near Sullivan’s Island, SC, at 11:00 p.m. on September 21, 1989. It caused 13 directly related deaths, 22 indirectly related deaths, and injured several hundred people in SC. Damage has been estimated in excess of \$7 billion, including \$2 billion in crop damages.”



Photo Source: Wes Tyler

Hurricane Hugo made landfall in South Carolina on September 21, 1989. To commemorate the 30th anniversary of the event, the SC SCO created an [interactive online journal](#) with images, videos, and impact stories from the event archives, some of which have never been released publicly before.

Viewers can follow along the track of the storm as it crosses the Atlantic and develops into a major hurricane, learning about the reconnaissance flight mission into the storm, uncertainty of where the storm would eventually make landfall, and the evacuation orders that followed. A home video during the storm shows the intense wind and rainfall that South Carolinians experienced across the state. And damage photos show the unimaginable destruction Hugo caused. Interviewees also share stories through video about how their organizations prepared for the storm, what it was like to live through it, and the enormous effort it took to recover and rebuild.

Access the online journal at:

<https://storymaps.arcgis.com/stories/28ff5b92311e4a179085f3d265cfb552>