



Storm Courier

Charleston, SC

Weather Forecast Office

Fall 2013

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Another Quiet Hurricane Season for the Lowcountry and Coastal Empire

by Robert Bright — Tropical Program Leader

The 2013 Atlantic hurricane season officially ended on November 30. Despite warm ocean temperatures, it was not as active as NOAA predicted earlier this year with just 13 named storms (12 tropical storms and 1 sub-tropical storm), only 2 of which became hurricanes. Furthermore, many of these storms were relatively short-lived and none became major hurricanes (Category 3-5). It has now been 8 years since a major hurricane made landfall in the U.S. Although the number of tropical storms match the seasonal average (from 1981 to 2010), the number of hurricanes is well below the

average of 6 and only one storm, Tropical Storm Andrea, hit the U.S.

It looked like it may be a pretty busy hurricane season earlier this summer as 4 tropical storms had developed by August 1. The first storm, Andrea, was the only one of these to affect south-east South Carolina and southeast Georgia. The storm brought gusty winds but the main impact was heavy rainfall with widespread amounts of 3-5 inches with some locations picking up near 7 inches.

Some of the reasons for the lack of storms include the

absence of La Nina development (which typically is more favorable for tropical cyclone development due to lessened atmospheric wind shear), large areas of stable, sinking air throughout the Atlantic basin, and plenty of dry, dusty air coming off the African coast.

For more on the 2013 Atlantic hurricane season as well as hurricane history and safety information, check out the [National Hurricane Center's website](#). For a history of tropical storms and hurricanes which have affected the local area, check out our [local tropical cyclone history page](#).

Did You Know?

by Ron Morales— Warning Coordination Meteorologist



You may be familiar with some of our products and services such as forecasts for the public, marine, and aviation communities, or warnings for severe thunderstorms, tornadoes and flash floods. However, you may not realize that we also regularly provide weather briefings to some of our key partners including emergency management, TV media, law enforcement, and other state and local authorities. With that said, you might now wonder, when and for what situations do we provide these briefings? Our highest priority is to provide briefings for our decision making customers whenever we expect impacts

from widespread hazardous weather across our region, including: damaging thunderstorm winds, large hail, tornadoes, flooding/flash flooding, tropical systems or winter storms. In addition, every Monday and Friday, we host live video briefings designed to highlight any expected high impact weather related events for the coming work week and weekend. There is a crucial difference between providing forecast products or warnings and briefings. When we give a briefing, our forecasters are able to share their latest thoughts and levels of confidence concerning high impact weather events directly with our customers. Therefore, we move from simply providing information and data, to interpreting that information into something that allows someone, such

as an emergency manager, to make an informed decision. This type of information sharing and briefing is called "Decision Support", and it helps promote our mission of protection of life and property, and move toward a more [Weather Ready Nation](#).

If you are interested in seeing an example of one of our weekly briefings posted on the web, please click the icon below.



Have You Found Us on Social Media Yet?

by John Quagliariello — Social Media Program Leader

For NWS Charleston, SC, social media has become an increasingly important component of communicating hazardous weather information to a wide range of people. While getting potentially life-saving information out to as many people as possible is perhaps the greatest benefit of social media, our interaction with the people we serve in southeast South Carolina and southeast Georgia is very rewarding.

NWS Charleston, SC entered the world of social media when we started our Twitter account in June 2011. Since that time, our followers have grown to over 3,500 as we

have actively engaged with the public, media, and other government agencies. Twitter is perhaps the best way for us to share time-sensitive, critical weather information leading up to and during hazardous weather events when lives and property are in danger.

The start of our Facebook page in February 2012 opened new opportunities for interaction, and our page has seen followers increase to around 2,500. Facebook has become an invaluable tool for posting about upcoming hazardous weather events, looking back at previous weather events, sharing climate, outreach and other educational information, and keeping everyone updated on the latest goings on at the NWS.

In August 2013, we launched our YouTube channel with two videos highlighting our office, including an overview of what we do at the NWS and a look at warning operations. Our YouTube channel will be used in the future to post informational videos about NWS products and services and significant weather events.

We hope you'll join in the conversation with us on social media and keep informed of the latest weather information by following our office on:



Twitter: <https://twitter.com/NWSCharlestonSC>
 Facebook: <https://www.facebook.com/US.NationalWeatherService.CharlestonSC.gov>
 YouTube: <https://www.youtube.com/user/NWSCharleston/>

New Addition to Our Website: "Today in Weather History"

by Pete Mohlin — Senior Forecaster

Many of us probably remember that on September 21 and 22 in 1989, Hurricane Hugo slammed into the coast near Charleston as a Category 4 hurricane. Others will have a recollection of the big snowstorm on February 12, 2010. Or the terrible ice storm with freezing rain all the way to the coast on January 10, 2011.

But do you know what significant event happened locally on September 29, 1959? Or how about May 11, 2008? What about December 23, 1989?

Now you can find out about these and other significant weather events that occurred on each day of the year in southern South Carolina and southeast Georgia. Just go to our new [Today in Weather History](#) page. The link will open automatically to today's date, but you can click on the calendar for any date of the year to get unusual weather that occurred on that date.

By the way, the significant weather events that we alluded to above were:

- *Cat 3 Hurricane Gracie on September 29, 1959
- *The Mother's Day Tornado outbreak with an EF-4 in McIntosh County, Georgia on May 11, 2008
- *6 inches of snow fell in Charleston with 3.2 inches of snow in Savannah on December 23, 1989

If there is an event that you know of that is missing from our yearly listing, please send us an email at chs.skywarn@noaa.gov.

January	February	March	April
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November 8, 1957
 It was a bitterly cold start to the day across the area, with early morning temperatures down into the lower and middle 20s inland. A few spots even started off in the upper teens. These unseasonably cold values were some 20 to 25 degrees below climatological norms.

Winter Weather—Here?

by Steve Rowley—Winter Weather Program Leader



During most winters, snow, sleet, freezing rain and extreme cold bypass southeast South Carolina and southeast Georgia. Many of us enjoy the benefits of sunshine and mild temperatures common to this part of the country during the winter months, and these attributes lure many folks from colder climates to visit or relocate to this part of the country.

Given our latitude and proximity to the Atlantic Ocean, cold air and moisture – the necessary ingredients for any winter storm – rarely arrive at the same time in our neighborhood. However, on rare occasions when cold air has caught up with moisture – or vice versa – snow and ice have accumulated on our roads, cars, trees and power lines. During the modern era, significant snow storms have occurred in February 1973, December 1989 – only 3 months after Hurricane Hugo pummeled the region – and most recently in February 2010. In January 2011, a morning ice storm closed roads and damaged trees and power lines across parts of the area.

Infrequently, very cold air sweeps into our region. On January 21, 1985, airport temperatures bottomed out at +3°F in Savannah and +6°F in Charleston – the coldest temperatures ever recorded at these locations and far colder than the normal lows in the upper 30s for that date. In February 1899, a historic, frigid arctic air mass plunged into the southeastern United States.

Prior to the holiday season is a great time of year to plan ahead for the potential impacts of winter storms and extreme cold as most of our winter weather occurs in January and February. Preparation is the key to mitigating the impact of infrequent but dangerous winter events. For more details regarding winter weather preparation, check out these web sites: www.FEMA.gov and www.redcross.org



Winter weather provides unique forecast challenges for meteorologists, and the uncommon nature of these events intensifies the level of forecast difficulty. At the National Weather Service office in Charleston, forecasters participate in specialized annual winter weather training to prepare for the upcoming season. When necessary, our staff will address the impacts of winter storms within Hazardous Weather Outlooks, Winter Storm Watches, Winter Storm Warnings and Winter Weather Advisories. Warnings signify a threat to life and property; Advisories imply significant inconvenience.

During winter storms, we depend on a constant flow of information regarding precipitation type and intensity, snow and ice accumulation and other events such as trees and power lines damaged by the weight of snow and ice. We encourage you to become a CoCoRaHS observer; this is a great method to pass along snow and ice accumulation reports to the



National Weather Service. CoCoRaHS also has excellent [guidance for measuring snow and ice](#) that is available to the public. You can also report precipitation type through the [mPING project](#) - a new way to collect weather information from the public through smart phones or mobile device.

Don't forget you can always send us your reports via phone, **888-383-2024**, e-mail, chs.skywarn@noaa.gov or Twitter **@NWSCharlestonSC**.

By passing along timely reports, you can help your National Weather Service deliver the best possible service during winter storms and cold weather outbreaks. In the meantime, enjoy our benign winter season, but always be prepared for brief bouts of snow, ice and cold weather.

Enhanced weather.gov/chs Nearing Completion

by Jonathan Lamb — Web Team Member

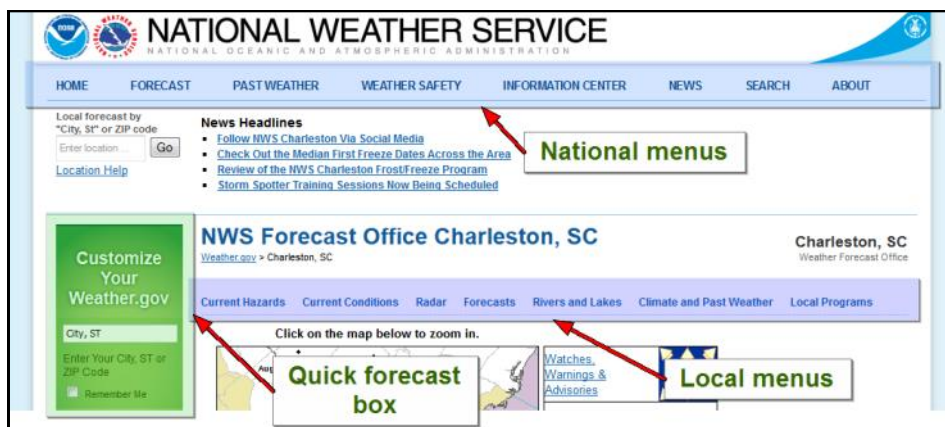
We want to thank you for your patience as we have gradually upgraded our website. The new weather.gov/chs page should be fully-functional so we recommend everyone update bookmarks and use it exclusively (the old website was erh.noaa.gov/chs). The new page is hosted on much faster, redundant servers that are designed to handle the heavy traffic during active weather patterns. It also ushers in a new standardized page layout that will eventually match all NWS websites. We maintain some control over local content and have the ability to swap out quick buttons and add some of our own pages, but other information will be standardized across the entire country.

The NWS faces a daunting task with regard to website layout and design. Unlike most other organizations, we serve a tremendously diverse array of customers with very different information needs. The challenge is keeping the page simple and uncluttered for those seeking a

quick forecast while also providing easy access to the detailed, technical information desired by other users. Our new design keeps the main page simple but allows one to “drill down” to much more detailed information via drop-down menus. The top row of menus are standardized across all NWS pages and link to more broad information. Just above the warning map is a row of local menus that link to information specific to southern SC and southeast GA. Of particular note in the Current Hazards menu is our [Briefing Page](#). Here we have links

to a lot of popular information to help you get up to speed about any upcoming high-impact weather events. If you haven’t already done so, please take a moment to peruse our new site to become familiar with where things are located.

If you ever have any questions about our site, notice missing information or broken links, or want to see something added, we welcome your feedback! Contact us at chs.webmaster@noaa.gov



NWS Charleston Participates in National Week of Service

by Emily Timte — Meteorologist



Staff members volunteering at the local food bank.

Every year in the fall, the National Weather Service holds the National Week of Community Service. During this week, offices around the country make an effort to reach out to help those who are in need in our communities. All of these events occur outside of our normal working hours.

Our office participated in two events this year. The first event was the annual Beach Sweep/River Sweep organized by the SC Sea Grant and SC Department of Natural Resources. Four of our staff members along with dozens of other volunteers helped collect 75 bags of trash weighing over 280 pounds from the beaches and pathways at Sullivan’s Island, SC. NWS Charleston employees also volunteered at the local food bank where we helped sort and process about 20 boxes of food to be sent to families in need. It was very rewarding to give back to the local community!

Check out the [2013 Week of Service](#) page to see what other NWS offices did as well as an event summary.

Science and Technology Highlights in 2013 at NWS Charleston

by Frank Alsheimer — Science and Operations Officer

Several advancements in both research and technology were made to improve our service in 2013. Here are some of the highlights.

Dual-Polarization Upgrade Improves Precipitation Estimation

Installed in late 2012, the dual-polarization upgrade to the WSR-88D Doppler Weather Radar got its first full year of use during 2013, and it didn't take long for the upgrade to pay off. The new technology allows meteorologists to see hydrometeors (raindrops, snowflakes, hail, graupel, etc.) in three dimensions rather than just two, giving an idea of the full shape and size of hydrometeors. Algorithms built into the radar can utilize this information to more accurately determine the amount of rainfall precipitating from a cloud, and hence at the ground. This increase in information led to increases in lead time for several flood events in the Charleston and Savannah areas this summer.

New Local Models

During 2013, two new local models were introduced into operations. The first was a high-resolution mesoscale model called the WRF-ARW. This model runs at 4km resolution 4 times a day, providing output every hour for 36 hours. This kind of spatial and temporal resolution allows our forecasters to get a detailed look at meteorological phenomena important to our local weather, such as lake and sea breeze boundaries that play a role in determining the timing of thunderstorms in the summer. It also allows improved wind forecasts for both land and marine areas. This model complements the WRF-NMM model that we have run locally for several years, but runs a more sophisticated scheme.

The second new local model was an upgraded wave forecast model known as the Nearshore Wave Prediction System (NWPS). This model allows us to put our forecast winds directly into the calculations for determining wave height, giving us a more accurate model solution. This is especially true in times of strong offshore winds where traditional models struggle to create high enough seas to be accurate.

Experimental Satellite Products

The Charleston NWS office is an active participant in the GOES-R proving ground, which looks at experimental products designed to become operational when the GOES-R series of satellites are launched into orbit ([here's more details](#) on the satellite and its instruments). These experimental products include simulated satellite imagery from high resolution models, cloud top cooling algorithms (which can help determine which cumulus clouds are growing fast enough to become thunderstorms and produce dangerous lightning), and probabilistic aircraft landing hazard information. Forecasters are urged to look at these products during both routine and hazardous forecast conditions, and then make comments on their strengths and weaknesses through several different methods (including mentioning them in area forecast discussions, posting case studies of successes and failures on product developer's blogs, and presenting research using the products at national conferences).

2013 National Weather Association Annual Meeting

The Charleston, SC metro area was host to the annual [National Weather Association \(NWA\)](#) meeting from October 12-17. This marks the first time the annual meeting was held in SC in the nearly 40 year history of the NWA. Despite the unfortunate timing of the government shutdown which prevented most federal employees from attending, over 400 people from broadcast meteorology, private sector meteorology, academia (including students), and emergency management participated. Topics ranged from Hurricane Sandy and the recent Oklahoma tornadoes to panel discussions on societal impacts of weather and the risks and benefits of storm chasing. The growing area of social media and communications was discussed, and many innovations in cutting edge technology and research in the field of meteorology were presented. Many students who are pursuing degrees in meteorology were mentored by several early-career and veteran meteorologists covering a wide range of employment prospects. Several top meteorologists in the field, including Mike Bettes and Bryan Norcross from the Weather Channel, and Bill Read, retired director of the National Hurricane Center, gave presentations during the week.



A few of our staff members got to meet with our friends from the Weather Channel, Jim Cantore and Mike Lowry.

Changes to Hydrology Products and Services

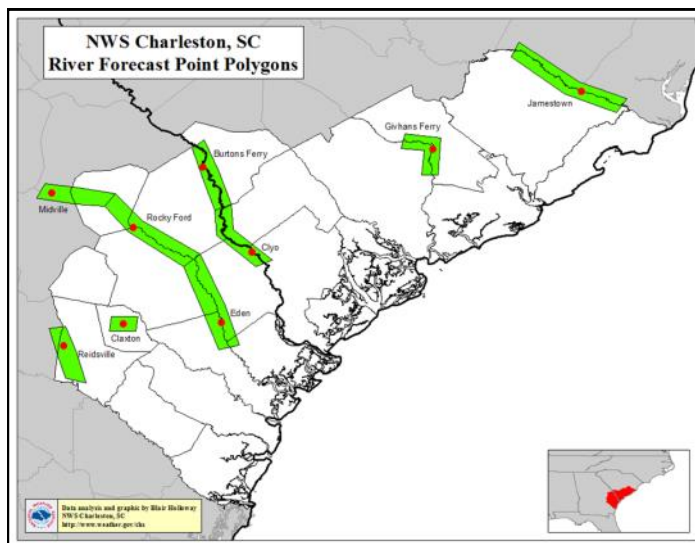
by Blair Holloway — Hydrology Program Leader

Recently, a couple of significant changes were made to the hydrology program at NWS Charleston. These include a transition to polygon-based river flood warnings and an adjustment to the flood stages at the Eden, GA river forecast point.

In late August, river flood warnings transitioned from being county-based products to polygon-based products. Under the old method, when a river flood warning was issued for a river forecast point, the entire county (or group of counties) was included in the warning. Since river flooding only impacts a small area in the immediate vicinity of the river, this method resulted in significant over-warning. To better and more precisely highlight the area that will be impacted, polygons were created for our nine river forecast points to include the upstream and downstream extent of impacts from flooding. The transition to polygon warnings results in a reduction in warned area of around 92% with only minor changes to the warning text product.

Also, after recent surveying and collaboration with the Chatham Emergency Management Agency, adjustments were made to the flood stages for the Eden, GA river forecast point. Minor flood stage was adjusted from 9 to 11 feet, moderate from 12 to 14 feet, and major from 15

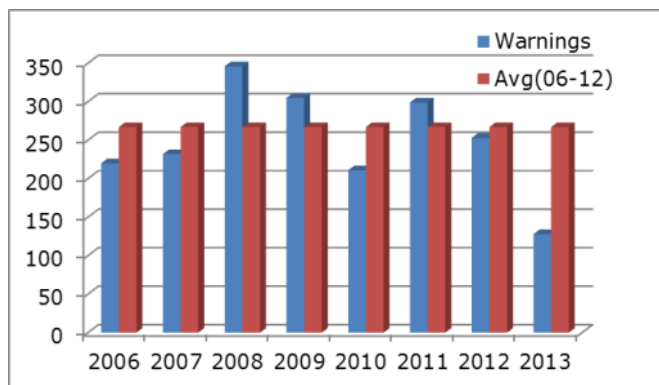
to 16 feet. The upward adjustment in these flood stages represents a more accurate portrayal of the actual impacts associated with flooding at these levels. As a result, river flood warnings for this point will now better communicate the expected impacts based on the river level forecast.



2013 Severe Weather Season: Less Active Than Recent Years

by Steve Rowley — Severe Weather Team

From January 1 to early November, your National Weather Service office in Charleston, SC issued 128 Severe Thunderstorm Warnings and received 263 reports of severe weather including large hail and damaging straight line winds. The following graph shows annual Severe Thunderstorm Warnings from 2006 through 2013.



Clearly, 2013 featured less severe weather than recent years across southeast South Carolina and southeast Georgia. An unusual and persistent trough of low pressure aloft settled over the Southeast, resulting in frequent

episodes of unusually heavy rainfall and generally cooler temperatures than recent years. This regime translated to fewer instances of damaging winds and hail but increased the occurrences of flash flooding. The more notable severe weather events of 2013 included:

- April 19: a squall line ahead of a cold front produced 38 reports of severe weather – mostly straight-line wind damage.
- June 4: NWS Storm Survey determined that 2 EF-1 tornadoes touched down in northern Dorchester County just after 3:30 pm. In addition, we received 21 severe weather reports during this active day.
- June 10: a squall line produced 38 severe weather reports – again, mostly straight-line wind damage.
- June 26: hail as large as tennis balls fell in the Shadowmoss area of West Ashley.

During the cool season, despite the absence of hot, humid conditions, extratropical storms including cold fronts and associated stronger tropospheric winds can produce significant if infrequent severe weather events. So, remain prepared for severe weather, even during the autumn and winter months.

Coastal Hazards Statistics

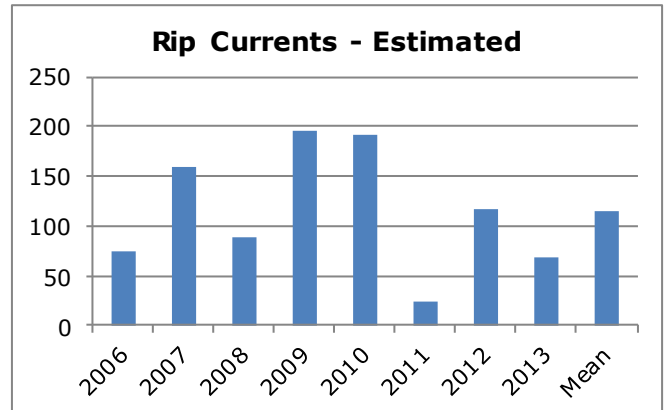
by Pete Mohlin — Marine Program Leader

Rip Currents

Although 2013 was below average with only 69 rip currents reported, a couple of these rip currents likely caused the drowning deaths of 4 people. The first occurred at Isle of Palms, SC on June 30th, and then 3 more people likely drowned due to a rip current at Hunting Island, SC on July 14th.

Rip currents can be found on many surf beaches every day. Under most tide and sea conditions, the speeds are relatively slow. However, under certain wave, tide, and beach profile conditions the speeds can quickly increase to become dangerous to anyone entering the surf.

For additional information please visit the [NWS Rip Current Safety](#) page and also the [NWS Charleston Science](#) page.

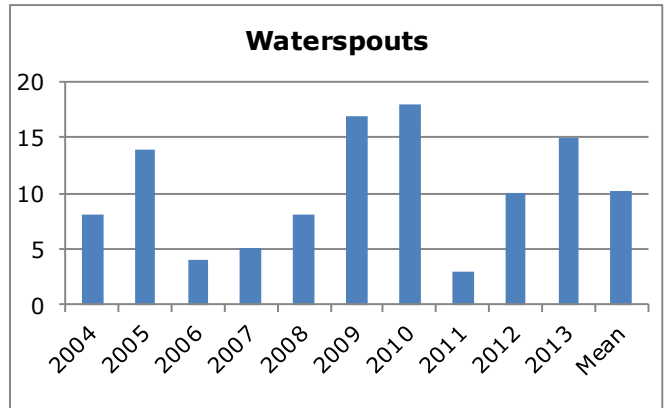


Waterspouts

There were reports of 15 waterspouts in the Charleston Forecast and Warning Area in 2013, which is 5 more than the 10-year average of 10 waterspouts. The most active period was July 11-13, when 5 waterspouts were sighted. This included one that may have skirted the coast of Hunting Island as a brief tornado.

Waterspouts are most common during the warmer months of the year, when there is a good supply of moisture, instability, light wind and lines of moderate cumulus and towering cumulus clouds.

For more information, visit the [NWS Charleston Science](#) page.



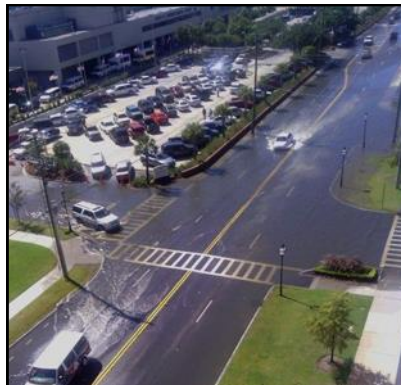
Coastal Flooding

Charleston: There were 13 times in 2013 when tide levels in Charleston Harbor were at or above 7.0 ft Mean Lower Low Water. This is the level at which shallow coastal flooding typically begins along the lower South Carolina coast. The highest level since Nov 2012 was 7.90 ft MLLW on November 15, 2012, resulting in the closure of numerous roads in and around downtown Charleston.

Savannah: Shallow coastal flooding typically begins when the tide gauge at Fort Pulaski reaches 9.2 ft MLLW, and we had 11 such occurrences in 2013. The highest level since Nov 2012 was 9.73 ft MLLW on November 15, 2012, resulting in the closure of the eastbound lane of Route 80 when approaching Tybee Island.



Rain combined with high tides to produce coastal flooding on 11/15/12. Photo from Post & Courier.



Coastal flooding near MUSC on 10/9. Photo received via Twitter.



Waterspouts off Hilton Head Island on 6/25. Photo via Twitter.

2013 Climate Wrap-Up

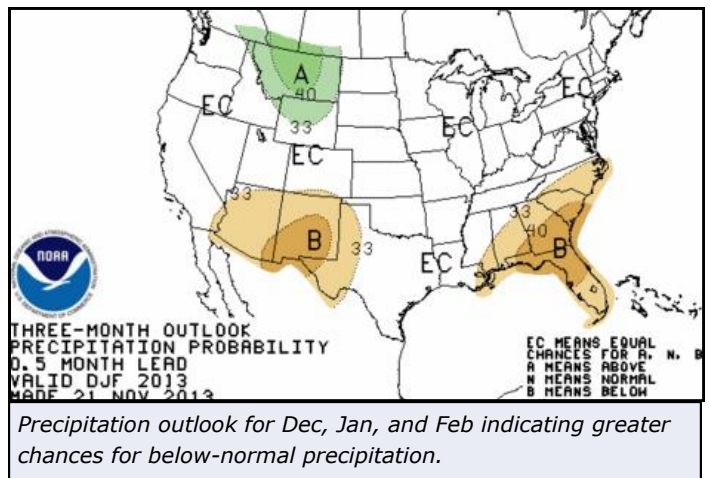
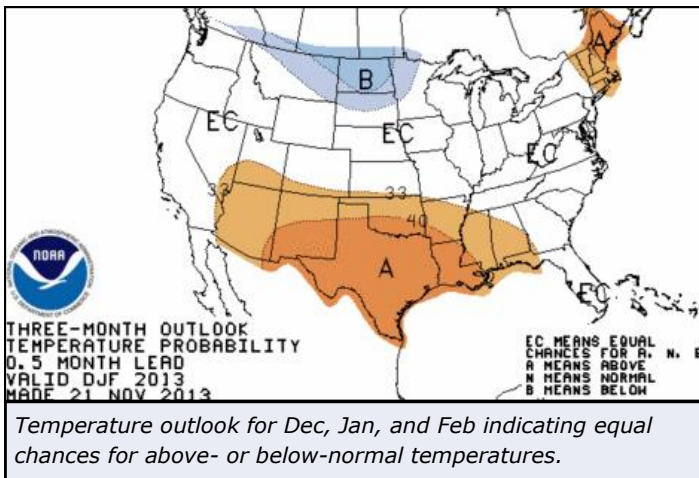
by Julie Packett — Climate Program Leader

2013 started out dry and warm across much of the Southeast, only exacerbating ongoing severe drought conditions. In January, over a dozen days had high temperatures of 70 degrees or higher at both the Charleston and Savannah International Airports. In addition to the unseasonably warm temperatures, both airports received less than an inch of rain during the month. Although no monthly temperature records were broken, the 0.35 inches of rain in Charleston, which was 3.36 inches below January’s normal monthly value, made January 2013 the driest at the Charleston Airport since records started in 1938.

Interestingly, the weather pattern took a drastic turn the very next month. A series of low pressure systems brought several record-breaking rainfall events to the Southeast. As a result, 10.47 inches of rain was measured at the Charleston Airport during February while 9.75 inches was recorded at the Savannah Airport. This surplus of rain resulted in the wettest February on record at the Charleston Airport, making it the first documented instance of a record wettest month immediately following a driest month at the airport. The unseasonably wet trend continued into the spring, and by late April, drought conditions had improved drastically across South Carolina and Georgia.

In June, the combination of typical summertime thunderstorm activity and convection associated with Tropical Storm Andrea contributed to a monthly rainfall total at Charleston Airport twofold the norm. Although this abundant rain did not break the site’s monthly rainfall record of 27.24 inches, the 13.32 inches that was recorded at the Charleston Airport still resulted in the sixth wettest June on record. The Savannah Airport also measured a substantial amount of rain during the month, but with precipitation records dating back to 1871, the June 2013 rainfall total of 8.28 inches could not crack the top ten wettest Junes for the airport.

Based on expected neutral ENSO conditions, the Climate Prediction Center’s Three-Month Outlook gives a below-median chance for precipitation through February 2014 for the Southeast. Regardless of any additional rainfall totals, 2013 rainfall accumulations as of Dec 1st have already measured above the annual normal for both the Charleston and Savannah Airports.



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National Weather Service
 Charleston Weather Forecast Office
 5777 South Aviation Avenue
 North Charleston, SC 29406
 (843) 744-0303
www.weather.gov/chs

