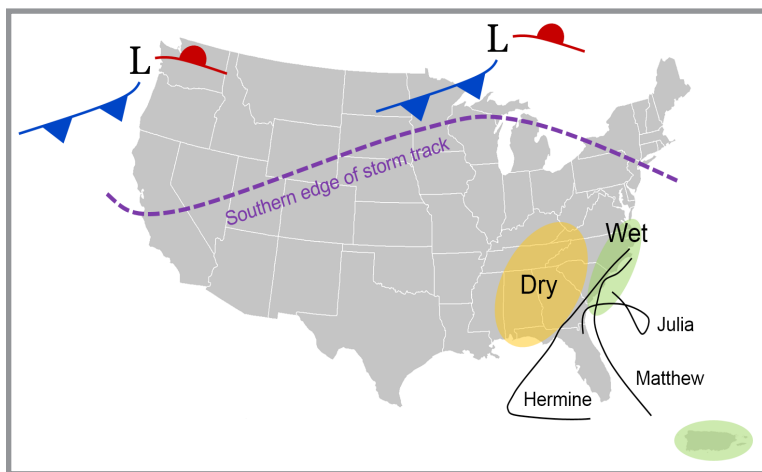


### Regional Weather Pattern and Highlights for Autumn 2016



From September through November 2016, a large upper-level ridge extended across much of the country, shifting the storm track (i.e., jet stream) farther to the north than normal. This shift resulted in a **persistency of unseasonably warm and dry weather** across much of the Southeast. However, three tropical cyclones moved along the Atlantic coast, resulting in **extraordinary rainfall totals** across the eastern Carolinas and southeastern Virginia. Much of Puerto Rico received **well-above-normal** precipitation amounts during autumn, particularly in November.

### Highlights for the Southeast

Mean temperatures were **well above average** across much of the region (including Puerto Rico and the U.S. Virgin Islands), primarily due to an **exceptional persistence of daytime warmth**.

A **pronounced west-to-east gradient** in precipitation totals ranging from extreme dryness to extreme wetness was observed across the region. At least **23** long-term (i.e., period of record equaling or exceeding 50 years) stations in Alabama, Georgia, and the Carolinas observed their driest or second driest autumn on record. In contrast, Florence, SC observed its wettest autumn on record with **23.52** inches of precipitation, while Norfolk, VA observed its second wettest autumn on record with **23.95** inches of precipitation.

A multi-day severe weather outbreak occurred on November 29th and 30th, with **28** confirmed tornadoes causing **3** fatalities and **15** injuries.

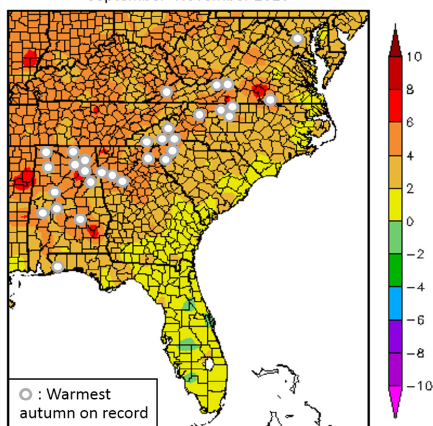
Three tropical cyclones affected coastal portions of the region, including [Hurricane Hermine](#) in early September, [Tropical Storm Julia](#) in mid-September, and [Hurricane Matthew](#) in early October. As Hurricane Matthew passed by, **six** long-term stations in the Carolinas observed their wettest day for any month on record, including Florence, SC, with **11.74** inches on October 8th, and Tarboro, NC, with **9.50** inches on October 9th.

Drought conditions continued to **intensify and expand in coverage** across much of the interior Southeast. Despite some beneficial rainfall in late November, extreme-to-exceptional (D3–D4) drought covered about **97%** of Alabama, **62%** of Georgia, **21%** of South Carolina, and **13%** of North Carolina by the end of the month.

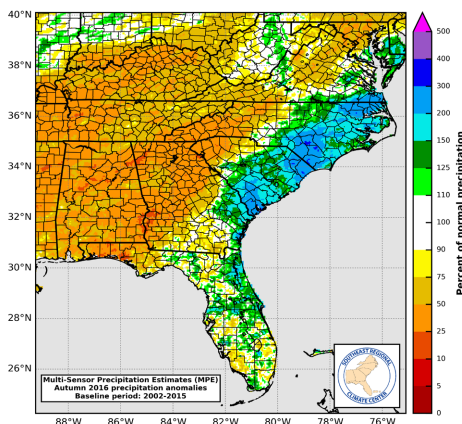
### Regional Climate Overview for Autumn 2016

#### Temperature and Precipitation Anomalies

Mean Temperature: Departure from Average (°F)  
September–November 2016

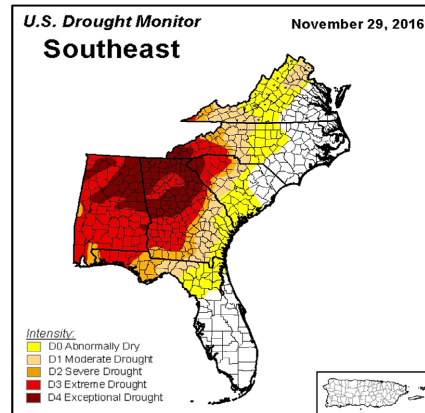


**Well-above-average** temperatures were observed across much of the Southeast region, with the greatest departures from average occurring in September and October. Mean temperature departures were generally **2°–6°F** above average across the interior portion of the region, while much of Florida and coastal portions of the region (including Puerto Rico and the U.S. Virgin Islands) were **1°–4°F** above average. At least **31** long-term stations (gray dots on the map), with one or more in every state, observed their warmest autumn mean temperature on record. **Thirty** long-term stations observed their highest count of daily maximum temperatures at or above 80°F during autumn, including Montgomery, AL (**69** days) and Macon, GA (**62** days).



A broad portion of the Southeast region was **exceptionally dry**, including much of Alabama, Georgia (except the southeastern portion), the Florida Panhandle, and the western Carolinas. These areas received only **10%–50%** of their average autumn precipitation. Asheville, NC and Birmingham, AL observed their second and third driest September–November period on record, with only **2.64** and **2.75** inches of precipitation, respectively. In contrast, **well-above-normal** precipitation occurred across the eastern Carolinas and southeastern Virginia, where seasonal precipitation totals were between **150%–300%** of normal. Autumn precipitation was well above normal across northern and western Puerto Rico, as San Juan observed its third wettest autumn on record with **28.95** inches of rainfall.

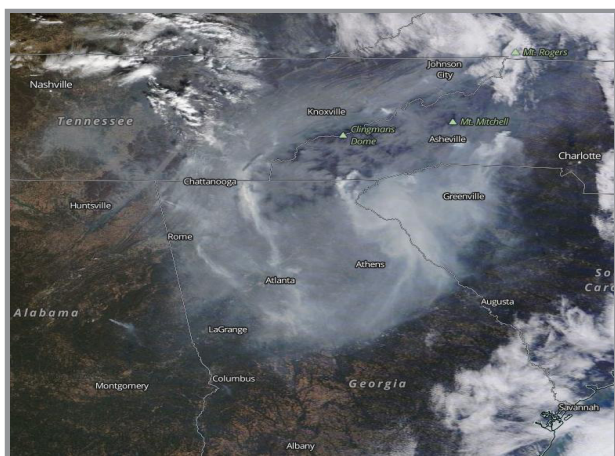
#### Drought



As of November 29th, the [U.S. Drought Monitor](#) indicated that nearly **55%** of the Southeast region was classified in moderate-to-exceptional (D1–D4) drought conditions. As autumn progressed with well-above-average temperatures and a persistent lack of rainfall, drought conditions intensified and expanded in coverage across much of the interior portion of the region. In late November, a portion of **every** state in the region was classified in extreme (D3) drought for the first time since **March 2008**. Record-breaking streaks of no rainfall were observed at numerous locations, including Tuscaloosa, AL (**71** days) and Montezuma, GA (**72** days). Eufaula Wildlife Refuge, AL, located about 75 miles southeast of Montgomery, recorded its longest streak of **91** days with no measurable precipitation. This is also the **longest streak** for any station in Alabama's historical record.

## Regional Climate Impacts for Autumn 2016

### Water Resources and Wildfires



Wildfire smoke blanketing the interior Southeast on November 14th. (Image credit: NASA Worldview)

By November, [soil moisture](#) reached **exceptionally low** levels (i.e., less than the 1st percentile) across drought-stricken parts of the region. Streamflows and lake levels declined rapidly during autumn, with about **85%** of USGS gages in [Alabama](#) and [Georgia](#) recording well-below-normal (i.e., less than the 10th percentile) streamflows in late November. Across the interior portion of the region, the very dry forest floor coupled with seasonal leaf litter provided ideal conditions for an extraordinary number of wildfires, with over **180,000** acres burned during November. [Thousands of residents](#) in western North Carolina had to evacuate from several large fires, which cost the state nearly **\$30 million** in fire suppression expenses. The wind-driven transport of wildfire smoke caused poor air quality during mid-November across a broad portion of the region, including the cities of Atlanta, GA, Asheville, NC, Charlotte, NC, and even cities farther away, such as Raleigh, NC and Charleston, SC. [Respiratory issues](#) were reported for both people and livestock in these affected areas.

### Agriculture and Livestock

Worsening drought conditions and Hurricane Matthew produced widespread agricultural and livestock impacts across the Southeast. [Dryland crops](#) across the interior portion of the region, particularly peanuts and soybeans, continued to decline in quality prior to harvest. [Pastures and hay fields](#) remained in **very poor** condition due to the persistent lack of rainfall. Livestock producers continued to sell off some cattle and feed hay from diminishing reserves. Producers in Alabama and Georgia had to haul in water by trailer for their cattle, as ponds and streams dried up. Cool season grains could not be planted for winter grazing because soil moisture levels were too low for seed germination. Flooding and high winds from Hurricane Matthew were expected to cause at least **\$1 billion** in crop losses extending from central Florida to southeastern Virginia, including sweet potatoes in eastern North Carolina and pecans in southern Georgia. Approximately **three thousand** hogs and nearly **two million** chickens and turkeys perished in the [inland flooding](#) across eastern North Carolina. About **\$13 million** in crop losses was reported in Puerto Rico due to heavy rainfall during November.

### Hurricane Matthew

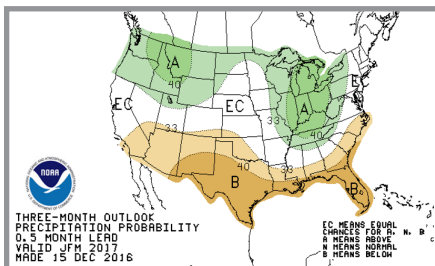
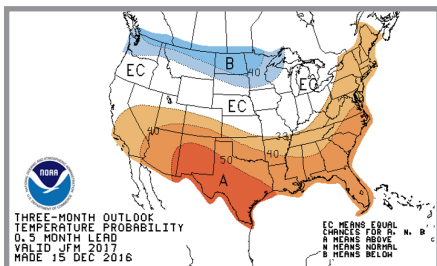
In early October, Hurricane Matthew tracked nearly parallel to the Atlantic coastline and made a brief landfall near McClellanville, SC on the 8th, as a Category 1 storm. Five states had at least one station that recorded a wind gust exceeding 85 mph, with the highest gust of **107 mph** observed at Cape Canaveral, FL. A few of the highest rainfall totals were **17.49** inches at Hunter Army Air Field near Savannah, GA and **14.87** inches at Fayetteville Regional Airport, NC. Over half (**28**) of the **51** reported fatalities caused by Matthew across the Southeast occurred in North Carolina, and most of these resulted from drowning. More than [four thousand people](#) in North Carolina were displaced from their homes due to the flooding from Matthew. An estimated **\$10 billion** in damage was caused by the storm across the Southeast.



Flooded hog farm in Duplin County, NC. (Photo credit: Rick Dove, Waterkeeper Alliance)

## Regional Climate Outlook for Winter 2016–2017

### Temperature and Precipitation



According to the latest [outlook](#) from NOAA's Climate Prediction Center (CPC), a higher probability of **warmer-than-normal** winter temperatures is forecasted for the Southeast. An increased chance of **below-normal** winter precipitation is predicted for much of the coastal portion of the region, particularly in Florida and southern Georgia. **Above-normal** winter precipitation is slightly favored across interior, drought-stricken portions of the region.

### La Niña

On November 10th, the CPC issued a [La Niña Advisory](#), which indicates that weak [La Niña](#) conditions were present within the equatorial Pacific Ocean. Cooler-than-average sea surface temperatures (i.e., at least 0.5°C below average) have been observed across the central equatorial Pacific for **three consecutive three-month periods**, with **two** more required for an official La Niña event. Based on the latest model guidance, weak La Niña conditions are [forecasted](#) to persist through winter (December–February), but a transition to ENSO-neutral conditions is expected by early spring. Climatologically, La Niña is associated with **above-average temperatures** and **below-average precipitation** across the Southeast during winter. However, other modes of climate variability (e.g., [Arctic Oscillation](#) and [North Atlantic Oscillation](#)) will also affect weather patterns across the region.

### Drought

The [U.S. Seasonal Drought Outlook](#) issued by the CPC indicates that current drought conditions over much of the Southeast are likely to **persist** through the winter months, with **improvement or total removal** expected across interior portions of the region. Additional drought development is predicted for northern Florida, southeastern Georgia, and coastal South Carolina.

### Southeast Region Partners

#### National Oceanic and Atmospheric Administration

[National Centers for Environmental Information](#)  
[National Weather Service Eastern Region](#)  
[National Weather Service Southern Region](#)  
[National Weather Service River Forecast Centers](#)  
[National Integrated Drought Information System](#)  
[Carolinas Integrated Sciences and Assessments](#)  
[National Sea Grant Office](#)  
[Southeast and Caribbean Regional Collaboration Team](#)

#### State Climatologists

#### U.S. Department of Agriculture

[Southeast Regional Climate Hub](#)

#### U.S. Department of the Interior

[Southeast Climate Science Center](#)  
[South Atlantic Landscape Conservation Cooperative](#)

