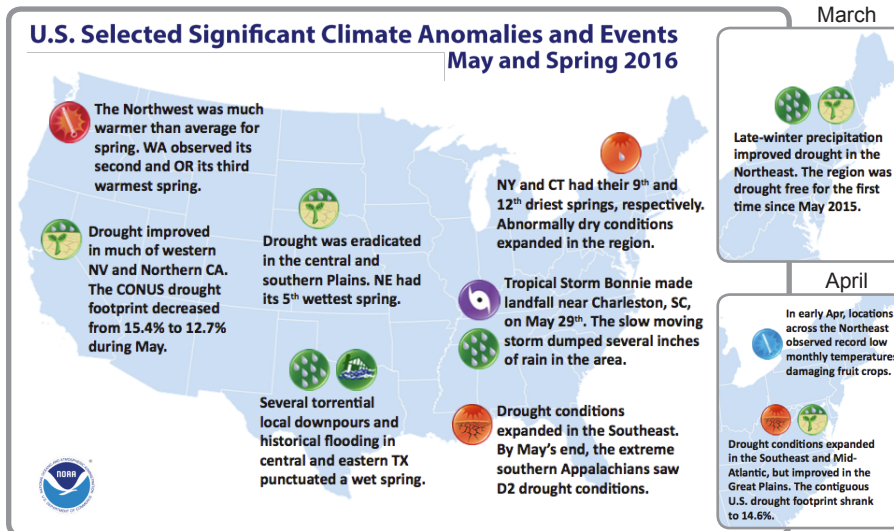


## National - Significant Events for March–May 2016



## Highlights for the East

Five tornadoes touched down in Ohio on March 14, which was above average for the month. The region saw below-average tornado activity in April and May. The median tornado frequency (2000–2015) for Virginia and the Carolinas during spring is 16, but this year there was only one in North Carolina on May 5. During spring, there were 12 large hail (2+ in.) reports in those three states, which is double the median. A 2.75 in. hailstone fell in Montgomery County, MD, on May 2, which was the county's largest since 1950.

More than 600 daily high temperature records were set or tied in the region during March. However, Arctic air moved into the region in early April. See the Impacts section for more information.

Several sites set records due to excessive precipitation, or lack thereof.

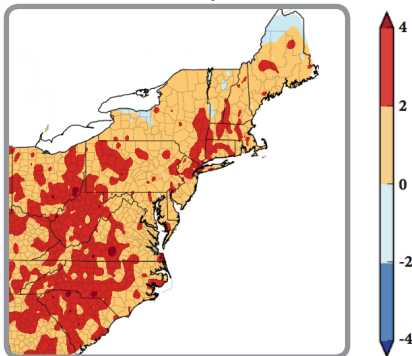
- Washington National, DC: 15 consecutive days with measurable precipitation (April 27–May 11)
- Syracuse, NY: wettest May day (2.42 in. on May 29)
- Cape Hatteras, NC, and Richmond, VA: all-time wettest May (12.67 in. and 9.79 in., respectively)
- Williamsport, PA, and Kennedy Airport, NY: driest March–May (4.91 in. and 6.34 in., respectively)
- Caribou, ME: largest late-season snowfall (4.5 in. on May 16)
- Binghamton, NY: least snowy October–May (32 in.)

The contiguous U.S. average temperature for spring was 53.7°F, 2.8°F above the 20th century average. The U.S. had its fourth warmest March on record with an average temperature of 47.5°F, 6.0°F above average. April's average temperature of 53.2°F was 2.2°F above average, making it the 18th warmest on record. The average temperature for May was 60.3°F, 0.1°F above average. The spring U.S. precipitation total was 9.03 inches, 1.09 inches above the 20th century average. March precipitation was 2.89 inches, 0.38 inches above average, while April precipitation was 2.95 inches, 0.43 inches above average. The U.S. precipitation total in May was 3.04 inches, 0.13 inches above average.

## Regional - Climate Overview for March–May 2016

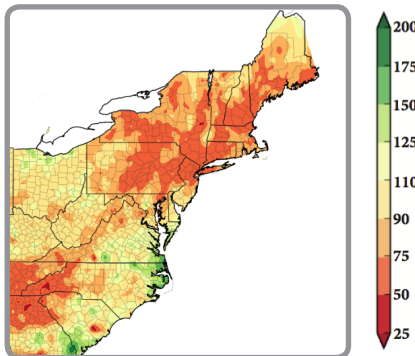
### Temperature and Precipitation Anomalies

Departure from Normal Temperature (°F)  
March 1–May 31, 2016



The Eastern Region had its sixth warmest March on record at 5.9°F above normal. All 16 states saw above-normal temperatures, with 13 ranking this March among their top 10 warmest. April was 0.8°F colder than normal, with 12 states seeing below-normal temperatures. The 16 states were split between colder than normal and warmer than normal in May. The region wrapped up the month at exactly normal. It was the 14th warmest spring on record at 1.7°F above normal. All states were warmer than normal, with 14 ranking this spring among their top 20 warmest.

Percent of Normal Precipitation (%)  
March 1–May 31, 2016

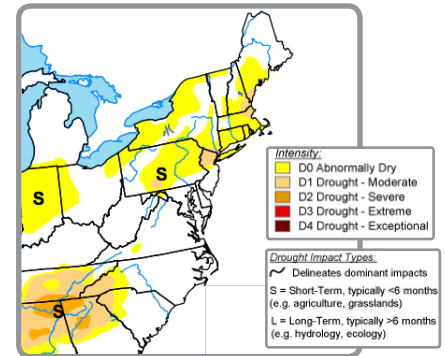


The Eastern Region saw 71% of normal precipitation in March, its 11th driest, and 75% of normal precipitation in April. Nine states ranked this March and three states ranked this April among their top 20 driest. During much of May, the main storm track was parked over the Mid-Atlantic, bringing persistent precipitation and cool temperatures. For more information, see the Impacts section. The region saw 108% of normal May precipitation, with the six southernmost states ranking this May among their top 20 wettest. Spring precipitation was 86% of normal, with three states having a top 20 driest spring.

Normals based on 1981–2010

### Drought in the East

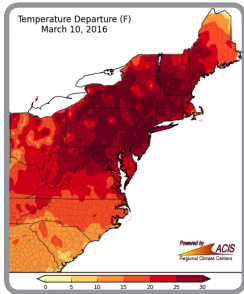
U.S. Drought Monitor  
June 16, 2016



With below-normal precipitation in March and April, abnormal dryness expanded in the Northeast and was introduced in Virginia and the Carolinas. Moderate drought was also introduced in some areas. The dry conditions contributed to several wildfires, including two in eastern North Carolina that led to an air quality alert and two that caused train delays in the New York City metro area. Also, a fire in Shenandoah National Park, VA, burned over 10,000 acres, making it one of the largest fires in the park's history. Frequent precipitation from late April to mid-May eased dryness in parts of the Mid-Atlantic, but dry conditions lingered elsewhere.

# Regional - Impacts and Updates for March–May 2016

## Spring Conditions



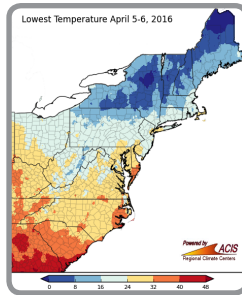
High temperatures on March 9 (reported on March 10) were 25–40°F above normal across much of the Northeast.

Spring transitioned from summer-like in March to winter-like in early April. On March 9, 14 major Northeast climate sites had their warmest day so early in the season. Greenville–Spartanburg, SC, had its greatest number of 70°F March days, while Wilmington, NC, had its greatest number of 80°F March days. The warmth caused plants to bud earlier than usual.

In early April, lows fell below freezing from Maine to the Carolinas. On the 5th, Concord, NH, had its all-time coldest April temperature and Ithaca, NY, had a below zero April temperature for the first time. The cold spell **significantly damaged** some

grain and fruit crops, with some stone fruits a near total loss.

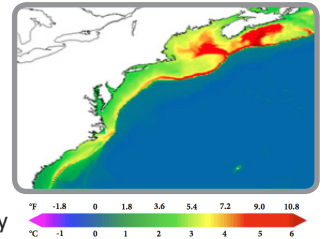
In parts of the Mid-Atlantic and Ohio, wet and cool conditions in May slowed crop growth and delayed field work, such as hay harvest and soybean and corn planting. The conditions contributed to **fruit rot in strawberries** and diseases in other crops. Hailstorms in early May also damaged some crops. Conversely, farmers in New York and New England had to irrigate some crops due to dry conditions.



From April 5 to 6, low temperatures were 32°F or below in much of the region.

## Ocean Warmth Projections

Coarse-scale global climate models have a warm bias in sea surface temperature in the Northwest Atlantic, especially within the Northeast U.S. Continental Shelf (Cape Hatteras, NC, to the Gulf of Maine), due to inaccurate positioning of the Gulf Stream. Also, these climate models cannot take into account the fine-scale submarine topography of the Shelf, such as its deep canyons and banks, which impacts the regional circulation. A study by [Saba et al. \(2016\)](#) found that a high-resolution global climate model from NOAA was more accurate at resolving these regional dynamics. The carbon dioxide doubling response from this model shows that bottom ocean temperature in the Shelf, particularly in the Gulf of Maine, warms at a rate nearly 2–3 times as fast as the coarser models. This enhanced warming is accompanied by an increase in salinity due to a change in water mass distribution that is related to a retreat of the Labrador Current and a northerly shift of the Gulf Stream, which is related to a weakening of the Atlantic Meridional Overturning Circulation.



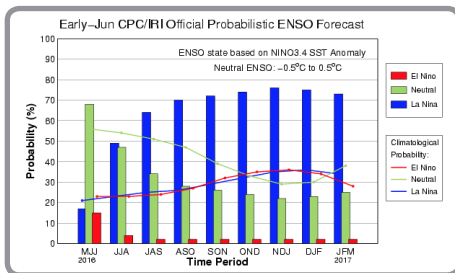
NOAA high-resolution global climate model projection of bottom ocean temperature change under an atmospheric carbon dioxide doubling experiment.

## Draft Climate Action Plan

NOAA Fisheries released a [draft climate science action plan](#) for the Northeast U.S. Continental Shelf Ecosystem and [is seeking comments through July 29](#). The draft plan outlines a strategy and specific actions for increasing understanding of, preparing for, and responding to climate change effects on the region's species and the people that depend on them.

## Regional - Outlook for Summer 2016

### La Niña



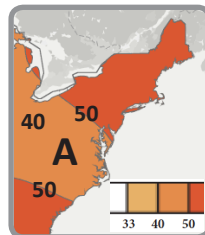
As of early June, El Niño dissipated and ENSO-neutral conditions were present in the equatorial Pacific Ocean. Most models predict La Niña conditions will develop during summer, with a **75% chance of La Niña** during fall and winter. Currently, forecasters are expecting a weak or borderline moderate La Niña.

### Atlantic Hurricane Season

NOAA's [2016 Atlantic hurricane outlook](#) indicates a near-normal season is most likely. There's a 70% chance of 10–16 named storms. Of the named storms, 4–8 could become hurricanes, with 1–4 of those becoming major hurricanes. Two factors influencing this year's outlook are the [Atlantic Multi-Decadal Oscillation \(AMO\)](#) and [La Niña](#). This season is expected to be more active than the past three, which were below normal. The Atlantic hurricane season runs from June 1 through November 30, with a peak from mid-August to late October. There have already been three named storms: Hurricane Alex in January, Tropical Storm Bonnie in late May, and Tropical Storm Colin in early June.

### Precipitation and Temperature

Valid for July–September 2016



A: Above-normal  
#: Probability of above-normal

The Climate Prediction Center is forecasting an increased chance of above-normal temperatures for the entire Eastern Region (map above). The greatest chances are in southern South Carolina and much of the Northeast. Equal chances of below-, near, or above-normal precipitation were forecast for the entire region.

### Drought

Valid for June 16–September 30, 2016



■ Drought persists  
■ Drought remains but improves  
■ Drought removal likely  
■ Drought development likely

The [U.S. Drought Outlook](#) indicates dry conditions are favored to persist in far western portions of the Carolinas. With increased chances of precipitation over the next two weeks and favorable precipitation climatology that tends to limit prolonged and widespread droughts, dry conditions are expected to ease in the Northeast.

## Eastern Region Partners

- National Oceanic and Atmospheric Administration  
[www.noaa.gov](http://www.noaa.gov)
- National Centers for Environmental Information  
[www.ncei.noaa.gov](http://www.ncei.noaa.gov)
- National Weather Service, Eastern Region  
[www.weather.gov](http://www.weather.gov)
- NOAA Fisheries Science Centers and Regional Offices, Atlantic  
[www.nmfs.noaa.gov](http://www.nmfs.noaa.gov)
- Office for Coastal Management  
[www.oceanservice.noaa.gov](http://www.oceanservice.noaa.gov)
- NOAA Research, Climate Program Office and Geophysical Fluid Dynamics Lab  
[www.research.noaa.gov](http://www.research.noaa.gov)
- NOAA National Sea Grant Office  
[www.seagrant.noaa.gov](http://www.seagrant.noaa.gov)
- NOAA's North Atlantic, South Atlantic, and Great Lakes Regional Collaboration Teams  
[www.regions.noaa.gov](http://www.regions.noaa.gov)
- Climate Prediction Center  
[www.cpc.noaa.gov](http://www.cpc.noaa.gov)
- National Operational Hydrologic Remote Sensing Center  
[www.nohrsc.noaa.gov](http://www.nohrsc.noaa.gov)
- Northeast Regional Climate Center  
[www.nrcc.cornell.edu](http://www.nrcc.cornell.edu)
- Southeast Regional Climate Center  
[www.sercc.com](http://www.sercc.com)
- National Integrated Drought Information System  
[www.drought.gov](http://www.drought.gov)
- Carolinas Integrated Sciences and Assessments  
[www.cisa.sc.edu](http://www.cisa.sc.edu)
- Consortium on Climate Risk in the Urban Northeast  
[www.ccrun.org](http://www.ccrun.org)
- Cooperative Institute for North Atlantic Research  
[www.cinar.org](http://www.cinar.org)
- Eastern Region State Climatologists  
[www.stateclimate.org](http://www.stateclimate.org)