

Department of Environmental Quality
North Carolina Division of Water Resources

North Carolina Drought Management Advisory Council Annual Report
July 1, 2015 through June 30, 2016

Introduction

This is the 12th annual report of the North Carolina Drought Management Advisory Council required by North Carolina General Statute 143-355.1. In accordance with statutory requirements, the council submits the report to the Secretary of the N.C. Department of Environment and Natural Resources, the Governor of North Carolina and the N.C. Environmental Review Commission by Oct. 1 of every year.

Drought Overview 2015/2016

Climate Summary

The period from July 1, 2015 to June 30, 2016 saw above normal precipitation and temperatures across the state, with many stations experiencing one of their top 5 wettest and warmest years for the period, as seen in the figure below of precipitation rankings. Most of the above-normal precipitation occurred during the fall and winter, while summer 2015 and spring 2016 both experienced below-normal precipitation in the western part of the state with a mix of above-below- and normal precipitation throughout the rest of the state.



Precipitation rankings for the period July 1, 2015 - June 30, 2016. Source: Southeast Regional Climate Perspectives tool found at: www.sercc.com/perspectives

Summer 2015 was warm and dry for most of the state, and saw drought expand and intensify over the mountains and piedmont. At the end of the summer, a significant rain event impacted the Carolinas, bringing at least four inches of rain to most parts of the state, and some places along the coast saw over 12 inches. This event brought an abrupt end to the drought.

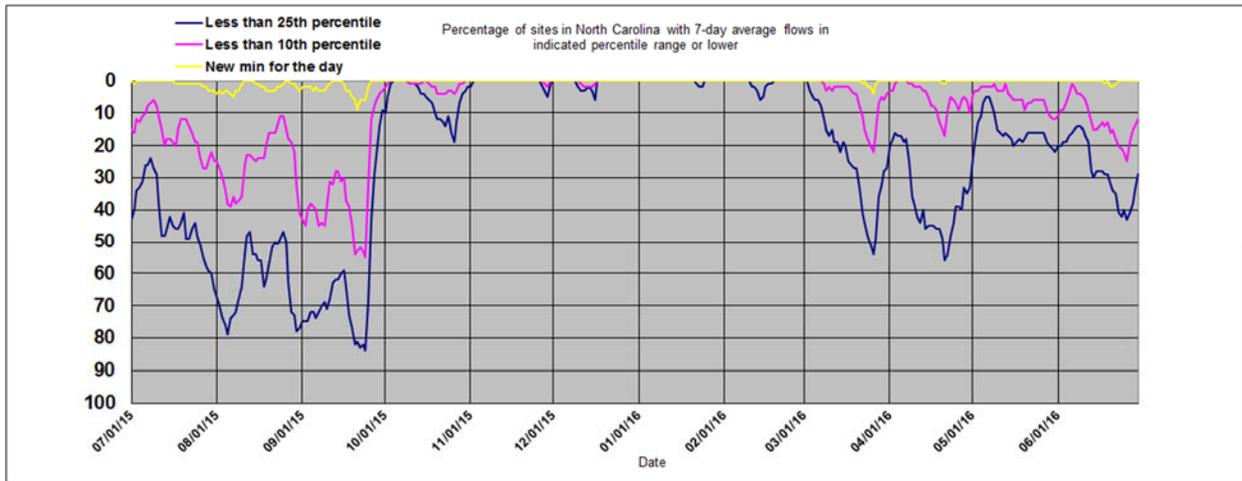
An enhanced subtropical jet stream, largely a result of the strong El Nino, steered storm systems across the Southeast throughout the fall and winter. December was the warmest and wettest on record for the state, while January saw slightly below normal precipitation and February saw slightly above. While the state saw ample precipitation for the winter, above normal temperatures meant below-normal snowfall.

Spring 2016 saw a mixed bag of temperatures and precipitation, beginning with a warm and dry March, the 4th warmest and 7th driest on record, and ending with a cool and wet May. Seasonal temperatures returned with the start of summer in June, but also brought a return of dryness over western NC. Eastern NC received ample rainfall from the remnants of two early-season tropical systems -- Tropical Storm Bonnie and Tropical Storm Colin -- forestalling any concerns of dryness over this region.

Streamflow and Groundwater

During the annual period (July 1, 2015, through June 30, 2016), streamflow conditions at U.S. Geological Survey (USGS) continuous-record streamgages were in the below-normal ranges across much of the western half of North Carolina during summer 2015, with an expansion of below-normal conditions eastward across the State during the early fall season. However, the occurrence of heavy rainfall in early October quickly raised streamflow conditions into the above-normal and much-above normal ranges across the State. With overall weather patterns during the late fall and winter seasons affected by the El Nino Southern Oscillation, streamflow conditions across the state were sustained in the normal and above-normal conditions. In March, however, a quick and brief onset of dry conditions led to a return of below-normal conditions at some of the USGS streamgages in western and central North Carolina until early May when above-normal rainfalls returned across parts of the state, again improving streamflow conditions. By latter June, below-normal streamflows were beginning to re-occur, particularly across the southern and central Blue Ridge streams.

The graph shown below indicates the percentage of USGS streamgages in North Carolina with 7-day flows less than the 25th, 10th, and 1st percentiles (or record-low for the calendar date) during the annual period.



Below-normal streamflow conditions expanded during the summer and early fall seasons with percentages of USGS streamgages across North Carolina with 7-day average streamflow percentiles below the 25th and 10th percentiles reaching 84 and 55 percent, respectively, in latter September. These percentages are higher than the maximum values (72 and 40 percent, respectively) observed during the previous annual period. From November through February, percentages for both indices were consistently less than 5 percent, with values at 0 percent on many days during the this period. With a return of dry conditions during the early spring, the percentages of streamgages with below-normal 7-day percentiles rose to about 55 and 20 percent, respectively, during March and April. Following a return of wet conditions in May, below-normal 7-day conditions in the western part of the state resulted in percentages during latter June for these two indices reaching about 40 and 25 percent, respectively.

Examination of provisional daily discharges indicates no new period of record minimum daily mean discharges or minimum monthly average streamflows were set at the USGS streamgages across North Carolina during July 1, 2015 through July 31, 2016. However, new record monthly minimum 7-day average streamflows were set at Cape Fear River at Lillington in Harnett County during March 2016 and at Reedy Fork near Gibsonville in Guilford County during July 2016. However, as a result of the above-normal rainfalls during the course of the period, new monthly maximum records for average streamflow, 7-day discharges, daily discharges set at 60, 49, and 32 streamgages across North Carolina during the period.

Groundwater levels at 15 USGS observation wells within the N.C. Climate Response Network varied widely during July 1, 2015, through June 30, 2016, reflective of the individual well characteristics (e.g. well depth) and the rainfall patterns that occurred during the period. Overall, hydrograph inspections for most of the wells indicate water levels were generally in the normal and above-normal ranges throughout most of the annual period. But below-normal water levels were noted during the period, particularly during parts of March and April when dry conditions resulted in water-level declines in some of the Coastal Plain wells. Below-normal water levels

were also observed during March and April as well as near the end of the annual period in the three shallower Blue Ridge wells (Marble well in Cherokee County, Champion well in Haywood Count, and Pisgah Forest well in Transylvania County).

Inspection of provisional water level records indicate new record minimum monthly water levels were observed at 4 of the 15 wells during the annual period from July 1, 2014 through July 31, 2015. These wells include the Marble well in Cherokee County (March through May, July 2016), Grantham well in Wayne County (March 2016), Comfort Research Station well in Jones County (April 2016), and the Hoke well in Washington County (April 2016). As a result of the above-normal rainfalls during the course of the period, new record maximum monthly water levels were observed 11 of the 15 wells across the state, with multiple new monthly records at many of the wells. Included in this group is the deep well (58 feet) at Blantyre in Transylvania County where new monthly maximum water levels were observed in March 2016. Also among this group is the Marston well in Scotland County (39 feet deep) where new monthly maximum water levels were set November 2015 through March 2016.

Agriculture

As of July 1, 2015, the western counties of North Carolina were experiencing abnormally dry to moderate drought conditions, while the eastern counties were receiving adequate precipitation. Statewide, wheat and small grain harvest was around 90% complete and farmers were beginning to cut hay for the second time. Corn, cotton and soybean progress appeared to be on target with projected five year averages while peanut progress lagged.

Dry conditions spread east, through the month of August, as temperatures rose above average in most areas of the state. Days suitable for fieldwork ranged between 5.9 and 6.6 days each week. Field crop progression, including peanuts, were on target. Peach harvest was at 89% by the end of the month. In the driest counties, indications were that farmers had started feeding hay to livestock, depleting their reserves.

Dry conditions continued into and throughout September. Deteriorating pasture conditions, low hay inventories, and falling creek, river and pond levels were cause for concern. Estimated yields for corn, cotton, peanuts and soybeans were considerably lower compared to August forecasts.

A period of excessive rainfall early October alleviated the drought effects suffered the previous month. The majority of the state received 11 days of steady precipitation totaling between 3 to 14 inches state wide. Crops conditions deteriorated and livestock operations were hindered due to flooding and overly wet fields and pastures. Drier conditions near mid-month allowed crop harvest to continue. By the end of the month, farmers started planting wheat and small grains.

Forecast yields on November 1st reflected stress from September and October weather events. Hardest hit were cotton, down 229 pounds per acre from the August 1 forecasted yield, and peanuts, down 400 pounds per acre. Soybean yield was down 2 bushels per acre, while corn saw a slight increase from 115 bushels to 118. Rain continued throughout the month, Days suitable for field work averaged 3.4 days per week. This is compared to an average of 5.7 days the previous year. Farmers in the piedmont and coastal regions spent the week harvesting soybeans, cotton, peanuts and sweet potatoes. In the mountains, Christmas tree harvest was underway and the last of the burley was being stripped.

December proved to be wet and warm with high temperatures averaging across the state at 9-16 degrees above normal. Rain varied from 3.87 inches in Elizabeth City to 13.46 inches in Winston Salem. Top soil moisture for the state measured at 55% Surplus and 45% adequate. Wheat and small grains suffered due to wet weather conditions. Strawberries in some counties were ahead of schedule and pastureland rebounded.

Year's end production estimates for crops were down significantly from 2014. Cotton, peanuts, corn and soybeans all had loses due to low yields and unharvested acres. Winter wheat seedings fell 140,000 acres from the year before. By the end of January some farmers were reporting soybeans still in the fields. Colder conditions brought snow to the mountains, with reports of snowfall between 6 to 18 inches.

February was cold and wet. Snow, ice and rain hindered farming activities in the mountains. Wind and ice storms affected piedmont counties disrupting power and downing limbs and trees. The cold was welcomed by blueberry and tree fruit growers, who rely on cooler temperatures to promote blossom and fruit setting. Topsoil moisture rated at 54% surplus and 46% adequate.

A dry March brought much improvement to small grains as well as pastures. Farmers spent their time preparing cropland for planting. The strawberry crop was progressing ahead of schedule, while tobacco transplants looked to be on target. 2016 prospective crop plantings reported in North Carolina indicated that farmers were going to plant more corn, peanuts and sweet potato acres and less soybean and cotton acres than the previous year.

Two cold events during the week ending April 10th caused average temperatures to fall below normal. This brought frost damage to some strawberry crops and fruit trees. Some counties reported peach loss at 100%, while others reported 30%. Farmers spent their time preparing fields, planting cabbage, potatoes, corn and transplanting tobacco. By the end of the month corn planted progress was at 84% compared to 70% the previous year and flue-cured tobacco was at 42% compared to 35% in 2015. Wheat and small grains were on target phenologically.

Cooler temperatures and drier conditions throughout the month of May aided in planting crops and tending livestock. Spotty showers and a significant rain event increased soil moisture levels in many areas of the state. The southwest counties were experiencing moderate drought conditions. At the coast, tropical storm Bonnie brought much needed moisture, but wet field conditions delayed plantings.

Through the month of June, dry conditions spread from the mountains eastward into the western piedmont. Corn, non-irrigated vegetable crops and pastureland in the west were showing signs of drought stress. Rain and rain storms continued to be spotty statewide. By the end of the month all plantings were complete or almost complete. Farmers had started cutting hay for the 2nd time in 2016 and small grain harvest winding down. Peach harvest had just begun.

Forest Resources

Weather impacts had limited effect on forestry operations across the state during the past year. Tree planting was delayed, especially in the coastal plain, due to higher than normal precipitation events during the winter months. Prescribed burning was also affected in the mountain region, which showed a 34% reduction in acreage burned compared to the previous year.

From July 1, 2015 to June 30, 2016, the N.C. Forest Service responded to 3,073 wildfires across the state that burned approximately 20,740 acres. The number of fires decreased slightly from the previous year, while the number of acres almost doubled. The increased acres can be attributed to several large fires in the spring of 2016 including Whipping Creek (7,800 acres under NCFS jurisdiction), Clemmons Rd. (1,600 acres), and County Line (980 acres). The number of fires was approximately 25 percent less than the 10-year average. The total number of acres burned was 12% higher than the 10-year average. The reduction in number was primarily due to wet weather. As mentioned, the increase in acres was due to a few large fires. There were 75,656 acres on state and private lands which were treated with prescribed fire during the past fiscal year, a 3.5% increase from the previous year.

For the most part, trees and forests exhibit immediate symptoms of drought stress during periods of low rainfall. While some of these symptoms subside quickly when water becomes available, it may take several years before a tree fully recovers. During these years, trees are weakened or stressed, leaving them vulnerable to secondary or opportunistic insects and diseases. Trees that were already stressed prior to the drought tend to fare worse. The prolonged drought that ended several years ago had long-term impacts on forests and trees that were already stressed from overcrowding, poor soils, and/or poor forest management. For the most part, a majority of trees seem to have either succumbed or recovered from the previous drought. NCFS field personnel have reported scattered *Ips* engraver beetle mortality in the Sandhill region over the past year, a

reduction in reports from previous years. It appears that opportunistic *Ips* engraver beetle activity is returning to pre-drought levels. In parts of western N.C. where drought is ongoing, atypical forest insect outbreaks have been reported and if the drought continues in the area, we can expect increasing issues.

Drought Conditions

During the past year in North Carolina, the worst drought conditions occurred in the month of September 2015, and the best conditions occurred during the months of October 2015 through mid-March 2016 with no drought designations. During the week ending June 30, 2016, the number of water systems that were affected by the drought conditions were as follows:

- 132 water systems were under abnormally dry conditions (D0)
- 27 water systems were under moderate drought conditions (D1)
- 16 water systems were under severe drought conditions (D2)



Council Meetings

Drought conditions in North Carolina are updated weekly through an audio-video telecom with a Technical Drought Advisory Team, which is a sub-group of the N.C. Drought Management Advisory Council. The team consists of experts on climate, weather, geology, water supply, forestry and agriculture that report each week on streams flows, groundwater levels, reservoirs levels, wildfire activity and crops. Based on this information, the team makes a recommendation to the U.S. Drought Monitor author on the state's drought conditions for that week. Those recommendations are used to draw the national drought map each Thursday. To see or download a copy of the current drought map, go to the state's official drought website at: www.ncdrought.org.

The Drought Management Advisory Council (DMAC) is required by law to meet in person at least once each calendar year. The annual council meeting was held on April 28, 2016 at 10:00

am with 37 representatives and associates of the DMAC in attendance. Items discussed at the meeting included current conditions on stream flow and ground water levels, lake and reservoir levels, agriculture, forestry and public water systems.