

North Carolina Drought Management Advisory Council

Annual Activities Report - 2011

Oct. 1, 2010 to Sept. 30, 2011
North Carolina Division of Water Resources
Department of Environment and Natural Resources

Contents

Executive Summary-----3

Drought Overview 2010-2011

 Climate Summary-----3

 Streamflow and Ground Water-----4

 Agriculture-----5

 Forest Resources-----6

Drought Response

 Council Meetings-----6

 Press Releases and Public Information-----6

 Drought Classification and Drought Response Actions-----7

 Outreach and Educational Activities-----8

 DMAC Web Site-----8

Improving Coordination and Drought Depiction

 Water Resources Information -----10

 River Basin Drought Management Plans-----10

 Drought Indicator Wells -----10

U.S. Seasonal Drought Outlook-----11

Illustrations

Figure 1. Climate Summary for the October 2010 – July 2011-----4

Figure 2. Percentage of stream gages with 7-day average flows less than normal-----4

Figure 3. Drought Status for North Carolina-----7

Figure 4. Water Conservation for Public Water Supplies-----9

Figure 5. Drought Indicator Wells-----11

Figure 6. U.S. Seasonal Drought Outlook-----11

Executive Summary

This is the seventh annual report of the North Carolina Drought Management Advisory Council on the implementation of North Carolina General Statute 143-355.1 (Session Law 2003-387, Section 2), which created the council in 2003. The General Assembly amended the statute in 2004, adding a new section requiring an annual report (Session Law 2004-195, Section 2.5). 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.

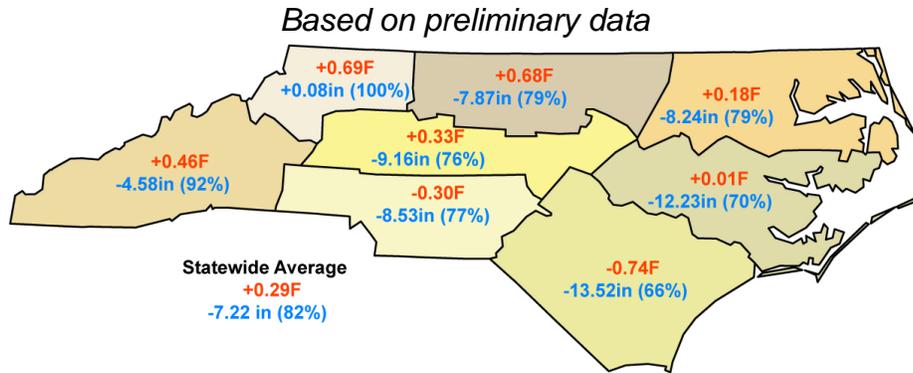
The 2011 report includes a climate summary, streamflow and groundwater conditions, as well as agricultural and forestry impacts. The report outlines the council's drought response efforts, including meetings of the council, efforts to disseminate public information, drought classifications, outreach and educational efforts and an overview of the council's website. Finally, the annual report outlines ways to improve coordination regarding the drought depiction in North Carolina through water resources information, river basin management plans and drought indicator wells. A map from the U.S. Drought Monitor of the projected drought outlook through November of this year can be found at the end of this report (Figure 6).

Drought Overview 2011

Climate Summary

Climate patterns between January 2011 and July 2011 included extremes in temperatures and precipitation, which is typical in North Carolina. The winter of 2011 was generally cold, but the La Nina event in the tropical Pacific Ocean contributed to below-normal precipitation statewide. Throughout the spring and summer, conditions in western North Carolina were generally normal while eastern North Carolina experienced very dry conditions. Moreover, extreme heat adversely affected crops and water resources during the summer of 2011. May through July of 2011 ranked as the driest and warmest on record in parts of southeastern North Carolina. Summaries of precipitation and climate departure from normal for the period of October 2010 through July 2011 are below. The percentages in the figure below are the percentage of the normal rainfall received for that area for the period covered.

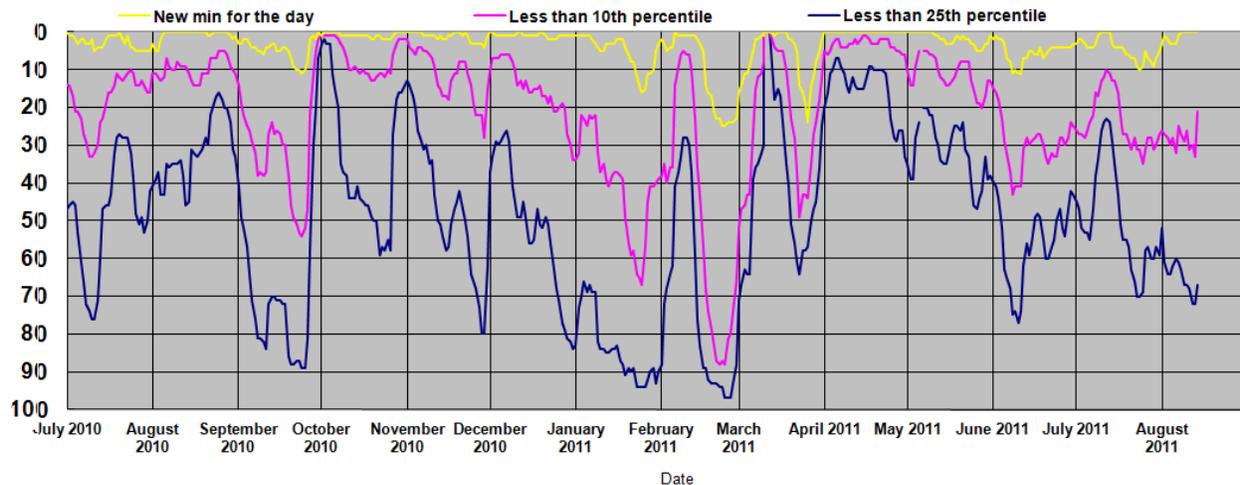
**Figure. 1 Temperature and Precipitation by Climate Division
Departure from Normal for October 2010 – July 2011**



Streamflow and Groundwater Conditions

Streamflow conditions at the U.S. Geological Survey’s (USGS) streamgages during the past 12 months were predominantly in the below-normal ranges for much of North Carolina. But wide temporal swings in conditions were observed from time to time during the period for different parts of the state. This pattern is reflected in the graph shown below, which indicates the percentage of USGS streamgages in North Carolina with 7-day flows in the less than 25th, 10th, and 1st percentile (a new daily minimum record), respectively (Figure 2).

Figure. 2 Percentage of stream-gages with 7-day average flow less than normal



In the late summer and early fall of 2010, streamflow conditions were a mix of normal and below-normal conditions across central and eastern North Carolina. To see conditions, go to <http://waterwatch.usgs.gov/new/index.php?id=wwmaps>. Streamflows substantially improved for a brief period in late September and early October in response to some significant rainfall events, with totals exceeding 10 inches the last week of September across a large area of the Coastal Plain. During the mid-fall and through the winter, streamflow conditions declined back towards the below-normal ranges. This pattern was attributed to the La Nina sea surface temperatures pattern in the Pacific Ocean. During the winter, La Nina periods have historically been characterized by below-normal precipitation across North Carolina, which results in below-normal streamflow conditions. Because the winter period is a critical recharge period for the hydrologic system, the occurrence of below-normal conditions raises serious concerns for the hydrologic system in the subsequent summer months.

By late January, more than 90 percent of sites in North Carolina had percentiles for 7-day average flows below the 25th percentile. In February, 80 percent of sites across the state had percentiles for 7-day average flows below the 10th percentile (Figure 2). Conditions improved temporarily across the state during mid-March following some late winter rainfalls. However, since April 2011, streamflows were on a general declining pattern into the below-normal ranges, particularly for streams in central and eastern North Carolina. Streamflow conditions at a number of USGS sites in the eastern part of the state have been below the 10th percentile ranges. In western North Carolina, streamflow conditions were relatively normal until August 2011, when widespread below-normal conditions became more predominant.

From July 1, 2011 through August 15, 2011, provisional new record minimum daily discharges for the period of record were set at 14 stream gage sites in North Carolina. Ten of these 14 sites were in the eastern half of the state from the Chowan to the Cape Fear River basins. During the same period, provisional new record minimum monthly average flows were set at 20 sites with 19 of these locations in the eastern half of the state.

Groundwater conditions during the past 12 months at 17 USGS observation wells in North Carolina have been characterized by water levels generally depicted in the normal ranges in the western half of the state and were mostly below normal in the eastern half of the state. A link displaying these conditions can be found on the N.C. Climate Response Network website at <http://groundwaterwatch.usgs.gov/StateMapsNet.asp?ncd=crn&sc=37>.

Agriculture

The 2010-11 growing season has been challenging for farmers. Planting of small grains, wheat, barley and oats started in late September to early October. North Carolina experienced wet conditions in March. The rain provided needed moisture for plants and crops and improved small grain condition. However, in April, North Carolina saw cold and wet conditions, which slightly delayed corn planting. Then, on April 16, devastating tornadoes swept across central and eastern North Carolina, causing damage to property and crops. The end of May saw extremely dry conditions in the northern and central coastal regions, as there was not enough moisture to plant soybeans and peanuts in many areas and corn began to show some signs of stress. June was a particularly hot and dry month for North Carolina farmers, as soil moisture began to rapidly deplete. There are four categories of soil moisture levels. From worst to best they are very poor, short, adequate and surplus. Soil moisture levels are a factor when determining drought severity. As of June 25, statewide soil moisture was rated at 24 percent very poor, 38 percent short, 34 percent adequate and 4 percent surplus. There were seven weeks from May 22 to July 3 where North Carolina saw above normal temperatures and below normal precipitation.

On July 31, the lack of rainfall and hot temperatures prompted the N.C. Drought Management Advisory Council to designate extreme drought in 11 counties, severe drought in 21 counties, moderate drought in 21 other counties and abnormally dry conditions in 16 counties. Conditions have improved since that time, mostly due to the rainfall received from Hurricane Irene. On September 20, severe drought was present in three western counties, moderate drought in 35 central counties and abnormally dry conditions in 16 counties in the state.

Forest Resources

From October 2010 through August 2011, drought conditions adversely impacted forest resources statewide, primarily in the Coastal Plain and Piedmont. There were approximately 5,000 fires that burned more than 60,000 acres - more than twice the average area burned per year in North Carolina. Fires threatened more than 7,400 homes and other structures during this time period. Thanks to the efforts of ground and aerial firefighting resources, only 12 homes were lost to wildfires.

Pine mortality associated with Ips engraver beetles continues to be prevalent in areas of the Piedmont and Coastal Plain experiencing drought. Hardwood decline and mortality are also being observed statewide due to drought conditions, with greater impacts in areas with shallow soils and drought-intolerant tree species.

Drought Response

Council Meetings

The Drought Management Advisory Council (DMAC) is required by law to meet at least once each calendar year to identify representatives who will maintain appropriate agency readiness and participation. The chairman of the council called for the annual meeting to be conducted on March 24. Attendance included 40 representatives and associates of the DMAC and the news media. A second meeting was held on July 21 in Williamston, in the eastern part of the state, where the drought was having its greatest impact. The main purpose of the July 21 meeting was to provide an opportunity for agricultural representatives to share information about how rainfall deficits were impacting agriculture in eastern counties and statewide.

Members of the council also discussed drought assessments, seasonal forecasts, the impact of drought on streamflow and ground water levels, lake and reservoir levels, agriculture, forestry, public water systems and special reports about drought preparedness and response.

Press Releases and Public Information

Since Oct. 1 2010, four press releases were issued and several interviews with news media were conducted on drought conditions and advisories.

Drought conditions in North Carolina are updated weekly. A technical drought advisory team, a sub-group of the N.C. Drought Management Advisory Council, participates each Tuesday in a webinar conference call to gather and feed information to the U.S. Drought Monitor author about local drought conditions in North Carolina. The team consists of experts on climate, weather, geology, water supply, forestry and agriculture. The members report each week on the impact of rainfall on streams, groundwater, reservoirs, wildfire activity and crops. Based on the team's discussion, the council makes a recommendation to the U.S. Drought Monitor about how the state's drought map should look for that week. The U.S. Drought Monitor uses the state's recommendation when it releases the final drought map each Thursday. Thursday's map reflects conditions from 8 a.m. on Tuesday of the previous week to 8 a.m. on Tuesday of that week. To

see or download a copy of the current drought map, go to the state’s official drought website at www.ncdrought.org.

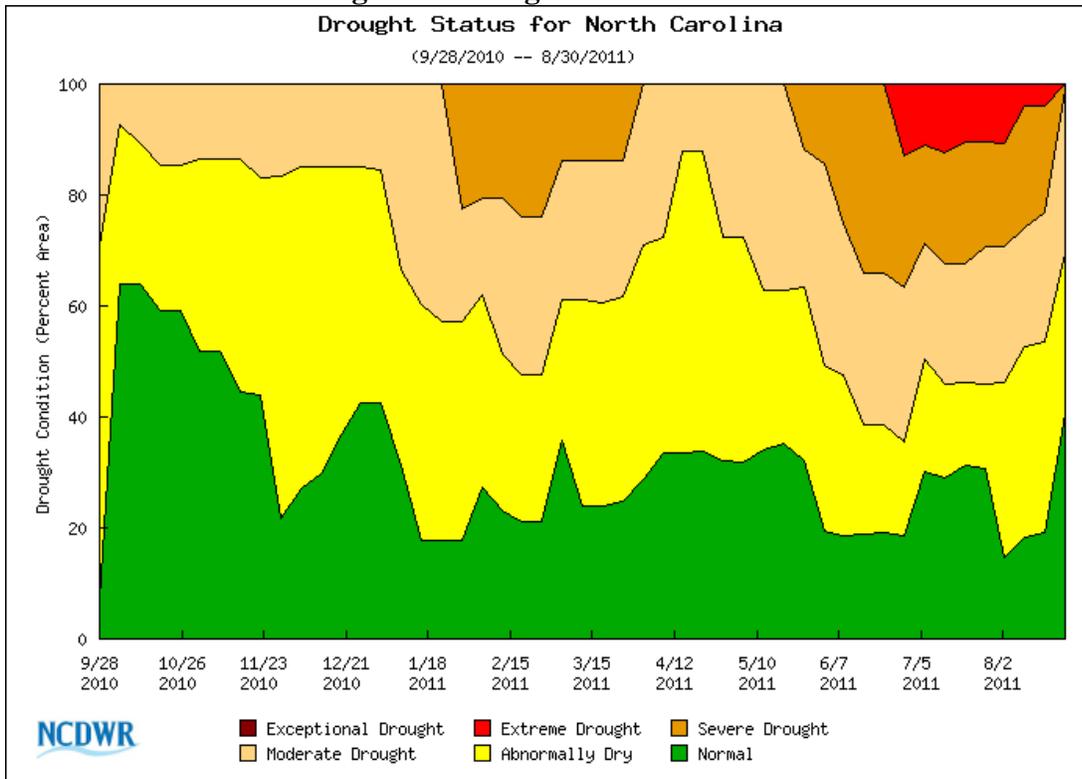
There are weekly conference calls to coordinate releases from reservoirs and hydroelectric power generation to conserve as much water as possible and balance upstream and downstream needs. The U.S. Army Corps of Engineers and the utility companies, owners of the biggest reservoirs, work together on this effort.

Drought Classifications and Drought Response Actions

Drought conditions statewide in North Carolina from Sept. 28, 2010 to Aug. 2, 2011 are displayed in Figure 3. As of the Aug. 23, 2011, the hot temperatures and a lack of rainfall prompted the N.C. Drought Management Advisory Council to recommend extreme drought conditions in four counties, severe drought conditions in 21 counties, moderate drought in another 23 counties and abnormally dry conditions in 38 counties. On August 23, 2011:

- 24 water systems were in an extreme drought
- 129 water systems were in a severe drought
- 112 water systems were in a moderate drought
- 193 water systems were abnormally dry.

Figure 3. Drought Status for North Carolina



Outreach and Educational Activities

- The department is developing a Water Efficiency Education and Outreach Program Toolkit for local governments. The toolkit will include a step-by-step approach to implement and maintain a water efficiency education and outreach program, case studies, sample policies, posters, brochures and fact sheets.
- Department staff members continue to make available a wide range of educational and water conservation materials for educators, children and adults at www.savewaternc.org.

The Division of Environmental Assistance and Outreach (DEAO) provides technical assistance and training in water efficiency for the institutional and municipal sectors. Recent activities include:

- Hosting webinars on water efficiency techniques and technologies. To see the webinars, go to <http://www.savewaternc.org/waterwebinars.php>.
- Producing water efficiency videos for the new YouTube channel at <http://www.youtube.com/user/savewaternc>.
- Developing water efficiency document collections for hospitality, irrigation and cooling towers at <http://www.p2pays.org/infohouse/>.
- Providing outreach and assistance to industrial and commercial entities, including water efficiency through the Economy, Energy, and Environment (E3) program in central North Carolina.
- Working with the Public Water Supply Section in the Division of Water Resources (DWR) to establish guidance for public water systems on meeting the water conservation and efficiency consumer education program requirements for state loans and grants.
- Coordinating and managing the DENR Environmental Stewardship Initiative, a voluntary three-tiered approach for the regulated community in North Carolina that encourages and rewards superior environmental performance. Each year, members must set environmental goals and report progress towards those goals.

N.C. Drought Management Advisory Council Website

The N.C. Drought Management Advisory Council's website, www.ncdrought.org, presents the federal drought map for North Carolina each Thursday. The drought conditions depicted are valid for 8 a.m. Eastern Standard Time for the preceding Tuesday. North Carolina is fortunate because it has the N.C. Drought Management Advisory Council, which works closely with the U.S. Drought Monitor to adjust designations weekly to better reflect North Carolina's local conditions. This map is defined as the official drought map nationally and for North Carolina.

The N.C. Drought Management Advisory Council issues official drought advisories each Thursday based on the drought classifications in the official map. This information provides

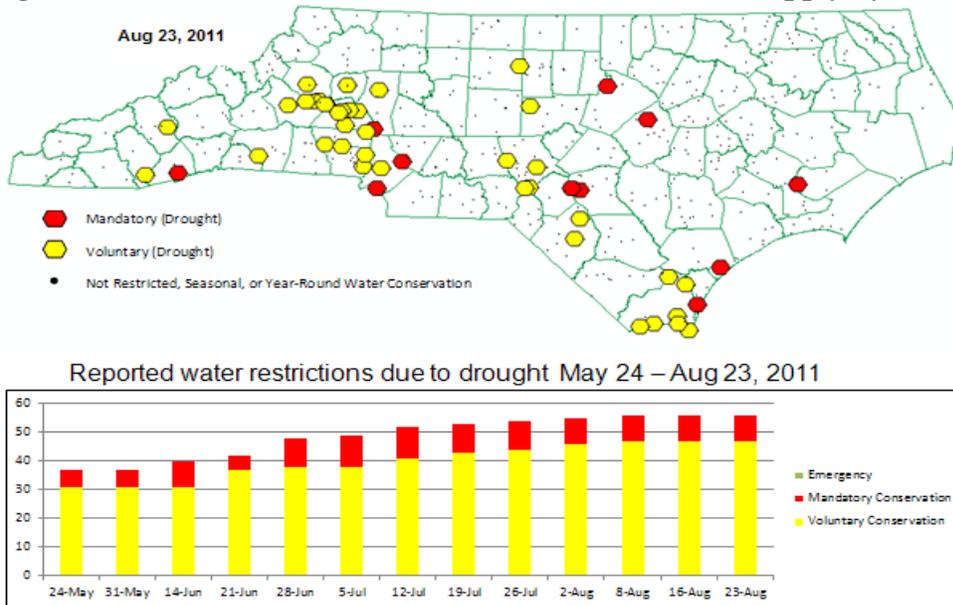
water users with a reliable basis for managing and calling for drought response actions in their regions. The list of counties under drought advisories is updated and released each week on the website to reflect local drought classifications on the U.S. Drought Monitor’s map for North Carolina.

The N.C. Drought Management Advisory Council’s website also has links to available resources for drought information, some with real-time data about current conditions, news, drought contacts, information and drought education, archives and water conservation tips.

The website includes a time lapse animation of the weekly U.S. Drought Monitor maps for North Carolina since January 2000. Viewers also can see drought classifications nationwide, statewide, county-wide, or by river basin. The drought monitor map history can be found at <http://www.ncdrought.org/archive/index.php>.

Local water conservation measures for more than 600 public water systems are tracked in real time by the DWR. Examples of these measures are illustrated in Figure 4. This online database provides a consistent way to document and track real time drought related impacts on public water supply systems. To view this information, go to http://www.ncwater.org/Drought_Monitoring/reporting/displaystate.php.

Figure 4. Water Conservation Status for Public Water Supply Systems



Improving Coordination and Drought Depiction

Water Resources Information

DWR works with the N.C. State Climate Office, the U.S. Army Corps of Engineers, the N.C. Ground Water Management Section, the U.S. Geological Survey and the Tennessee Valley Authority to improve and expand a water resources information, storage, analysis and retrieval system. This program provides an archive of historical and near real time data about hydrology, including streamflow, groundwater and reservoir data. It also provides weather and climate conditions and water use data in North Carolina. Data products are now available for public use at <http://www.ncwater.org/wrisars/index.php>. Drought products can be found by going to <http://mapserver.ncwater.org/DM/>. These products have been in a maintenance mode and continue to have the same capabilities as last year.

River Basin Drought Management Plans

As part of the relicensing of hydropower projects in the Catawba-Wataree and Yadkin-Pee Dee River basins, procedures were established for adjusting operations during periods of low-inflow into reservoirs to conserve the limited water supply. The low-inflow protocols, or LIPs, provide trigger points and procedures detailing how the projects will be operated as well as water withdrawal reduction measures and goals for other water users during periods of low-inflow into reservoirs. During the 2007 drought, the LIPs in these basins were tested and resulted in significantly improved water management when compared to similar drought periods of the past.

The DWR is working with the U.S. Army Corps of Engineers and other stakeholders to develop a drought management plan for Falls Reservoir. When completed, this drought management plan will be incorporated into the Neuse River Basin Hydrologic Model. The drought management plan for Jordan Reservoir is included in the existing Cape Fear River Basin Hydrologic Model. The Cape Fear model is being updated. Incorporation of the drought management plans into the hydrologic models should result in model results that more closely reflect the effects of drought on reservoir operations, storage capacity and downstream flows.

Drought Indicator Wells

There are a network of drought indicator wells that monitor the effects of droughts and other climate variability on groundwater levels in the aquifers, or water table (figure 5). The DWR's goal is to increase the number and geographic distribution of drought indicator wells. The division has 48 actively monitored wells in the network and a short-term goal of adding two wells to the network this fiscal year. The long-term goal is to have at least 60 monitored drought indicator wells. This will provide a much more complete assessment of possible or actual drought conditions in each of the major river basins of the state. More information about drought indicator wells can be found by going to http://www.ncwater.org/Data_and_Modeling/Ground_Water_Databases/Drought_Indicator_Wells/.

Drought Indicator Wells (Figure 5)

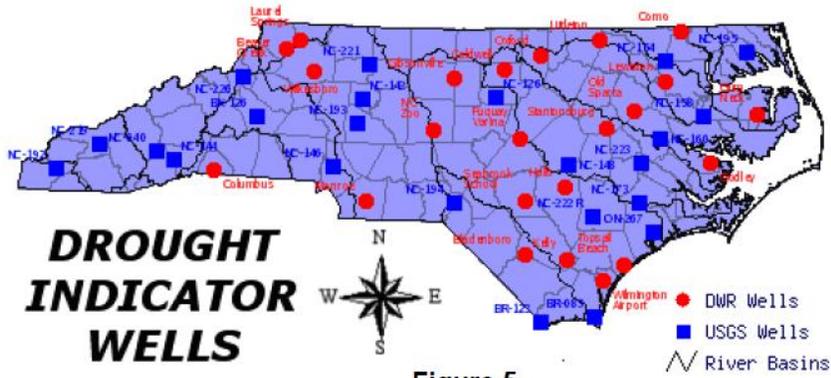


Figure 5

U.S. Seasonal Drought Outlook

The following map is a seasonal drought outlook from the U.S. Drought Monitor indicating where drought is likely to develop, persist or improve and represents the period from September through November of 2011. The map represents large scale trends, rather than short term events.

U.S. Seasonal Drought Outlook (Figure 6)

