2008 - Spring Drought Outlook

March 2008 Assessment from NOAA's National Weather Service Office in Raleigh
Issued March 20, 2008

There have been several significant rainfall events over central North Carolina thus far during the month of March. Most of the area received near (>75%) normal rainfall, with some areas logging more than 110 percent of normal. The heaviest rain could hardly have fallen in a more fortuitous location, being concentrated over the upper reaches of the Cape Fear, Neuse, and Tar Rivers (Figure 1).

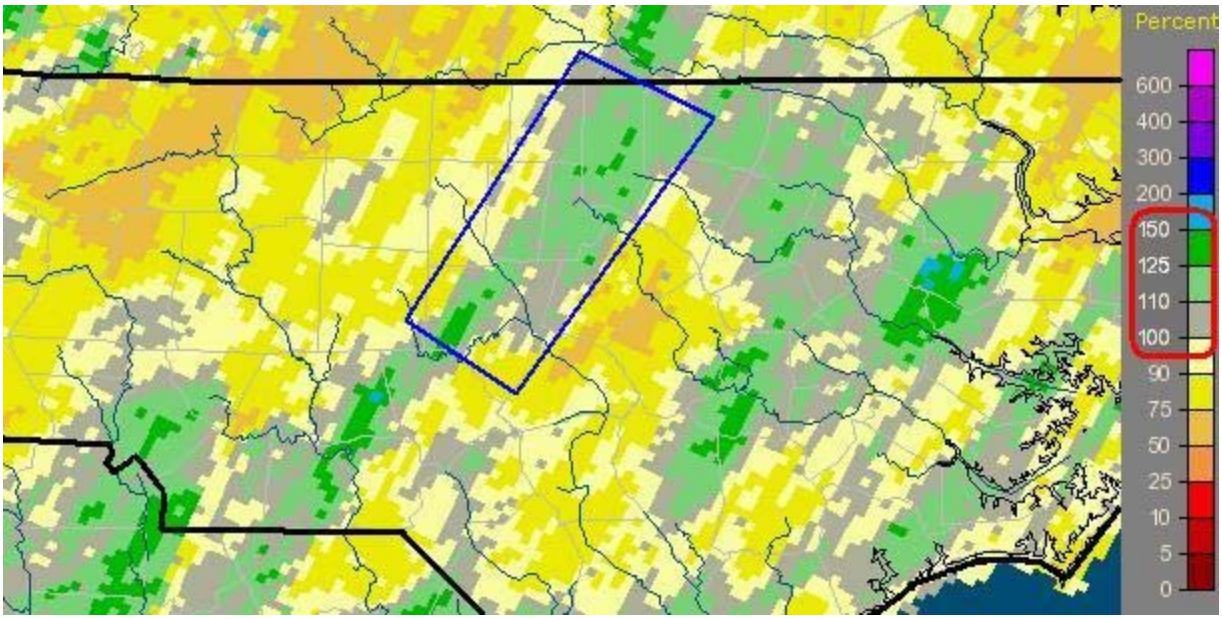


Figure 1: Feb 20 – Mar 20, 2008 - percent of normal rainfall. Courtesy of the National Weather Service.

There is still a long term rainfall deficit (Figure 2), but our latest rains were extremely beneficial, having eased some of the more serious drought impacts. In response, the U.S. Drought Monitor has removed all D4 (Exceptional) drought classification from the state (Figure 3).

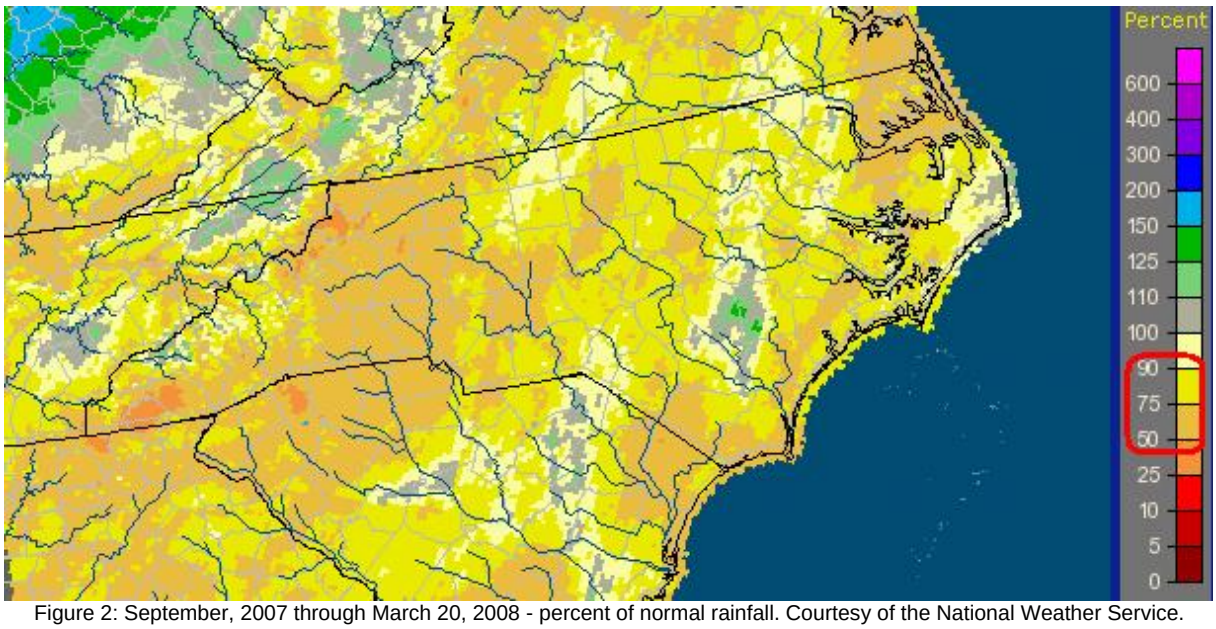


Figure 2: September, 2007 through March 20, 2008 - percent of normal rainfall. Courtesy of the National Weather Service.

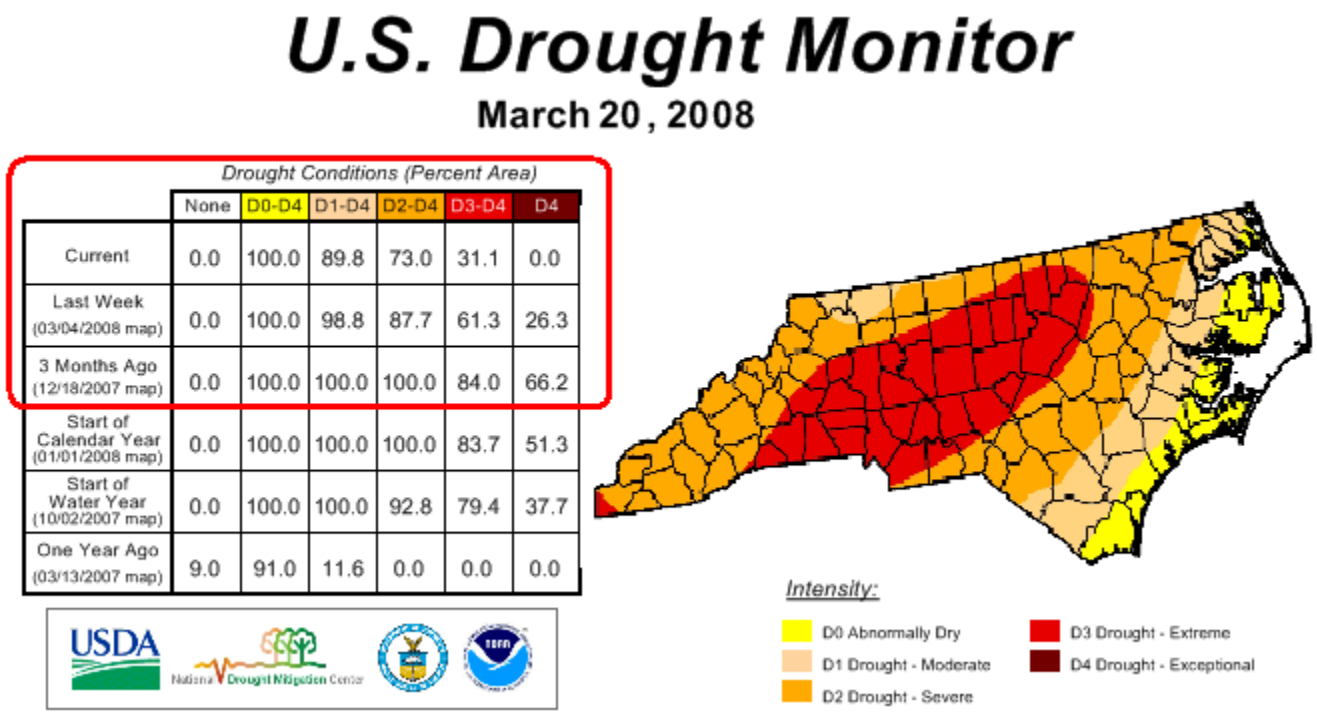


Figure 3: North Carolina Drought Monitor, 3/20/2008. Image courtesy of http://www.ncdrought.org

Water supply reservoirs had been of primary concern, as levels had fallen to very low levels through the Fall and early Winter. Lake Michie, which is the primary water supply reservoir for Durham, had fallen to about 15 feet below normal (only about a month's water supply) in mid January, and has now completely refilled. Falls Lake, which is the primary water supply for Raleigh, had fallen to its lowest level ever on Christmas day, 2007, and the water supply was still only about 30 percent of normal (~ 100 days' supply) in late February, 2008 (Figure 4).

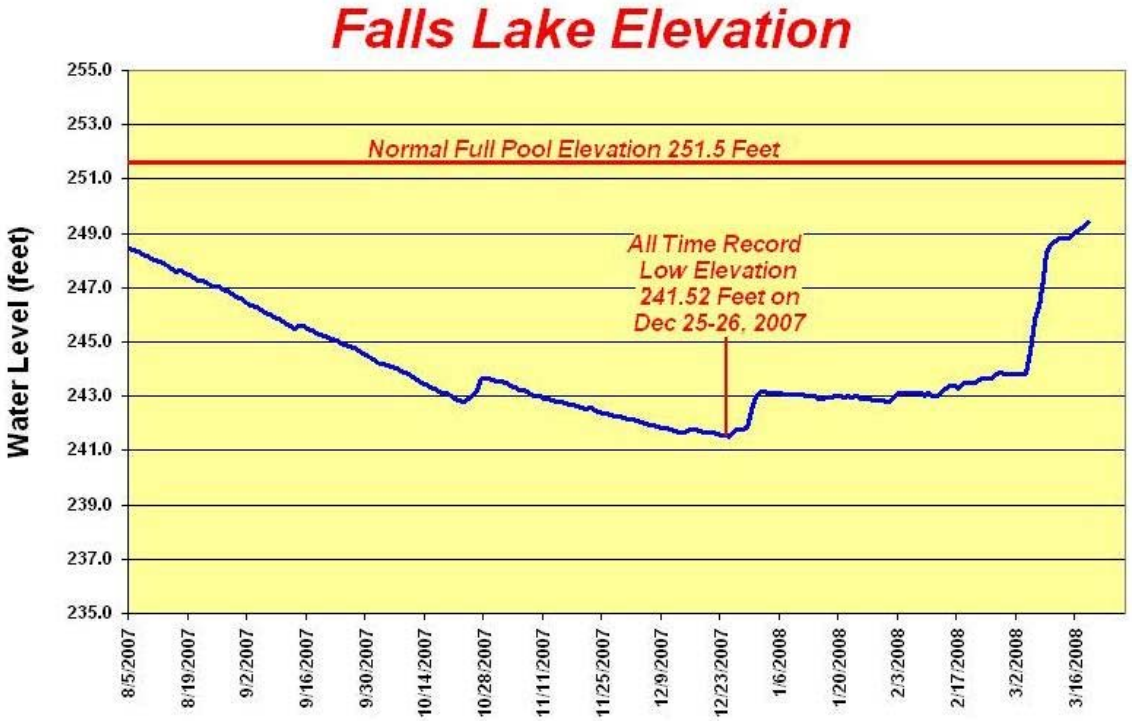
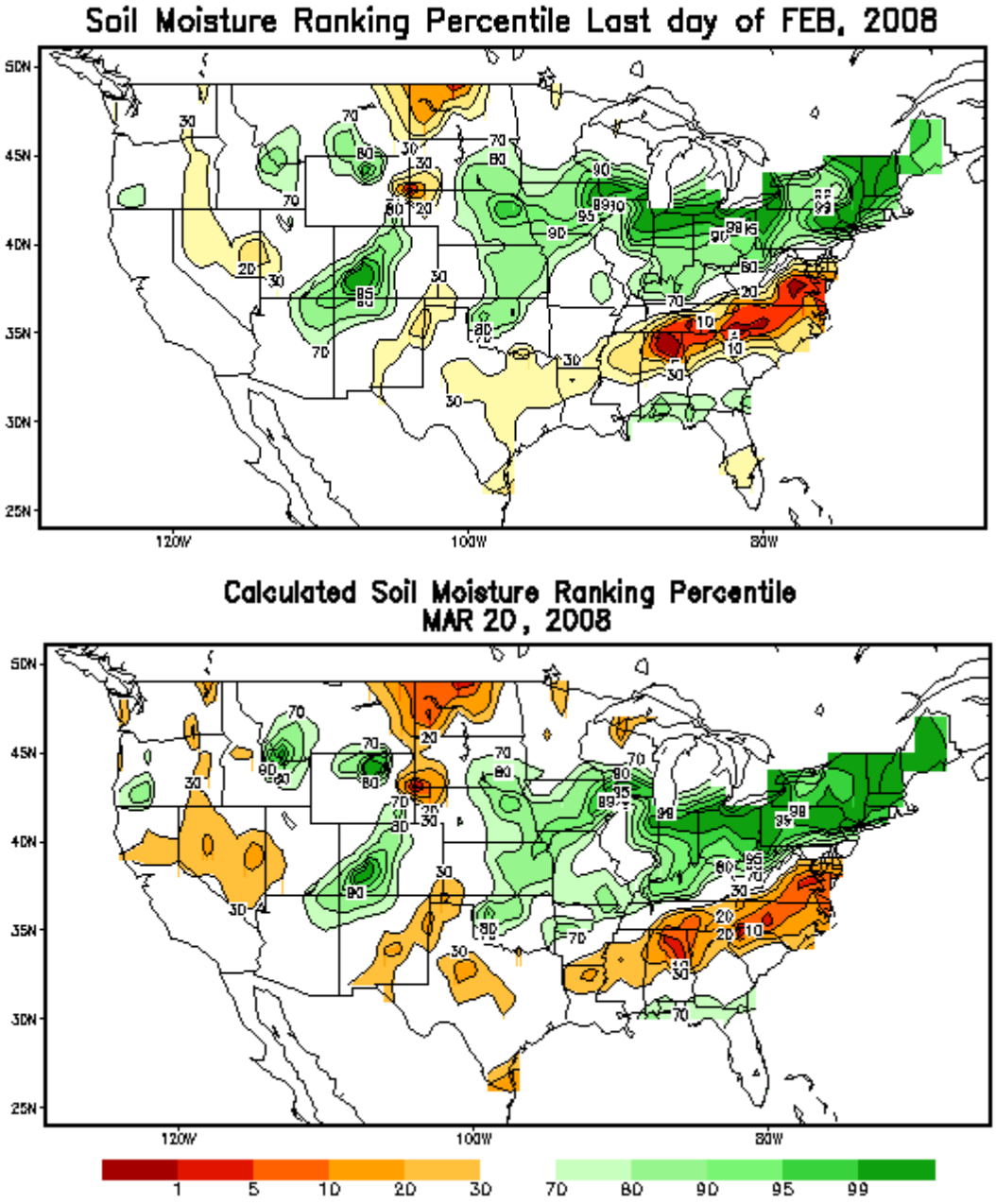


Figure 4: Falls Lake Elevation Sep, 2007 through Mar 20, 2008. Courtesy of National Weather Service

As of March 20, Falls Lake had risen to 249.5 feet MSL, which is only 2.0 feet below the target elevation of 251.5 feet. The water supply in Falls Lake is currently around 75%, which would last the city of Raleigh through the Fall of 2008. This estimate is based on the assumptions that we receive no rain and that water use remains constant.

The recent rain also increased soil moisture somewhat, which is necessary to maintain stream and river flows between rain events (Figures 5 and 6). Early-season agriculture will benefit from increased soil moisture as well, as soils will be more workable, as well as having sufficient moisture for newly-planted crops (Figure 7). There is still a deeper groundwater deficit, however, which is not as visible to the general populace. Easing this deficit will require at least normal rainfall for a number of months.



Figures 5 and 6: Soil moisture percentile rankings - Feb 29 and Mar 20, 2008. Courtesy of NOAA's Climate Prediction Center

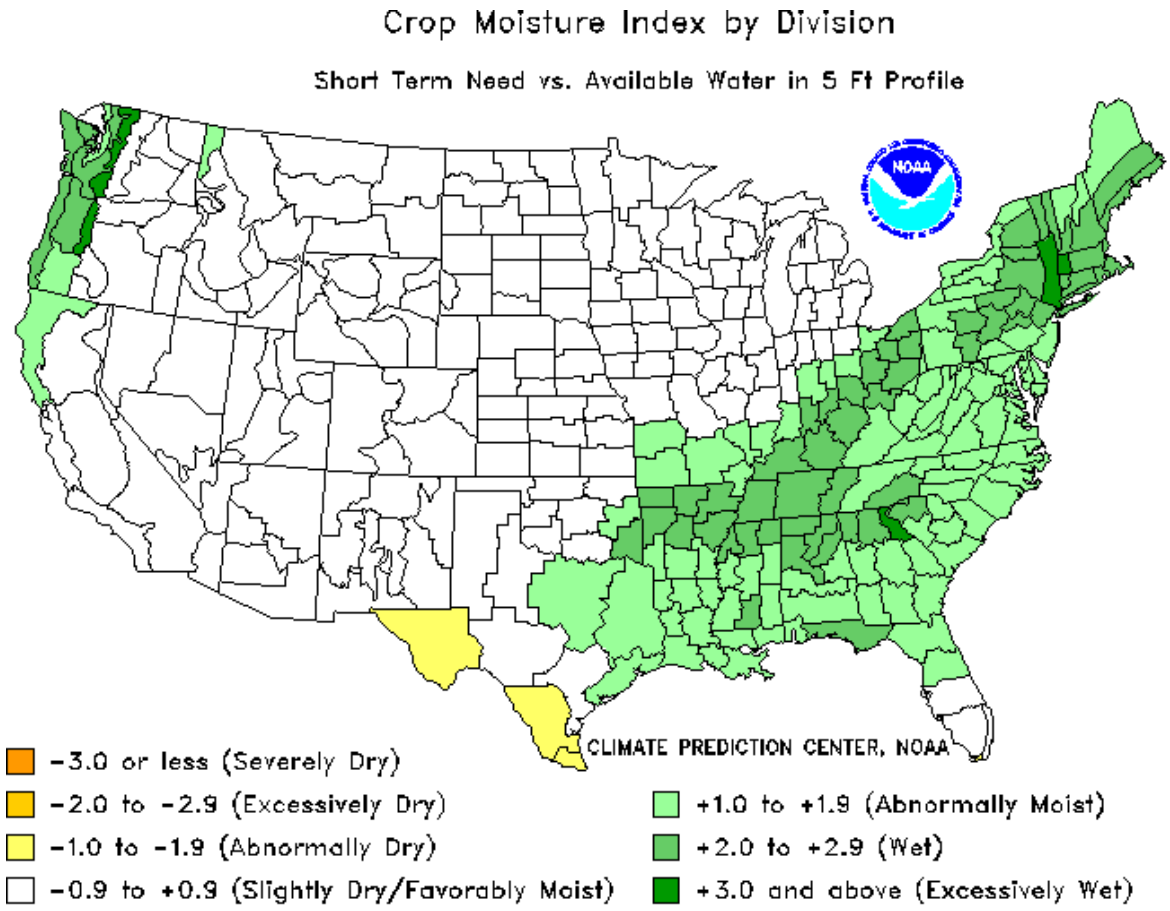


Figure 7: US Crop Moisture Index. Provided by NOAA's Climate Prediction Center

The current extreme drought classifications are largely determined by the long term rainfall deficit, and the shortage of ground water, which provides the base flow for streams and rivers. In late February, nearly all streams and rivers were flowing below 10 percent of normal. Flows have shown some improvement (Figure 8), with very low flows mainly in the Yadkin and Roanoke River basins. These surface and ground water supplies take much longer to replenish, and are typically the last drought indicators to show improvement.

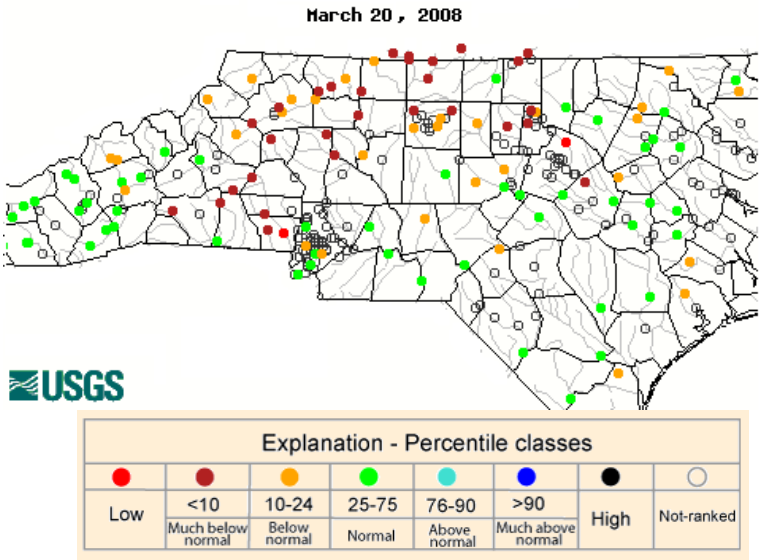


Figure 8: Stream flow at long-term stream flow gaging stations as of March 20, 2008. Graphics courtesy of the USGS.

Precipitation Outlook and La Niña

Looking ahead to remainder of this spring, a moderate La Nina is expected to persist through the spring before weakening later this summer. Past La Nina events occurring during the winter and spring months have resulted in an average rainfall deficit of 1 to 3 inches below normal rainfall for the months from of February through April. La Niña, the cold phase of the ENSO cycle, occurs when cooler than normal sea surface temperatures over the central Pacific Ocean persist for several months (Figure 9). The El Niño/ La Niña phenomena are one of the main sources of year-to-year variability in weather and climate for many areas of the United States and even the world. La Niña conditions during the later winter and spring tend to influence the atmospheric flow across the eastern North Pacific and North America. During La Niña, the southern stream of the jet stream, which typically brings moisture and enhanced storm systems into the mid Atlantic, is weakened. This can result in fewer storms and less moisture in the Carolinas (Figure 10).

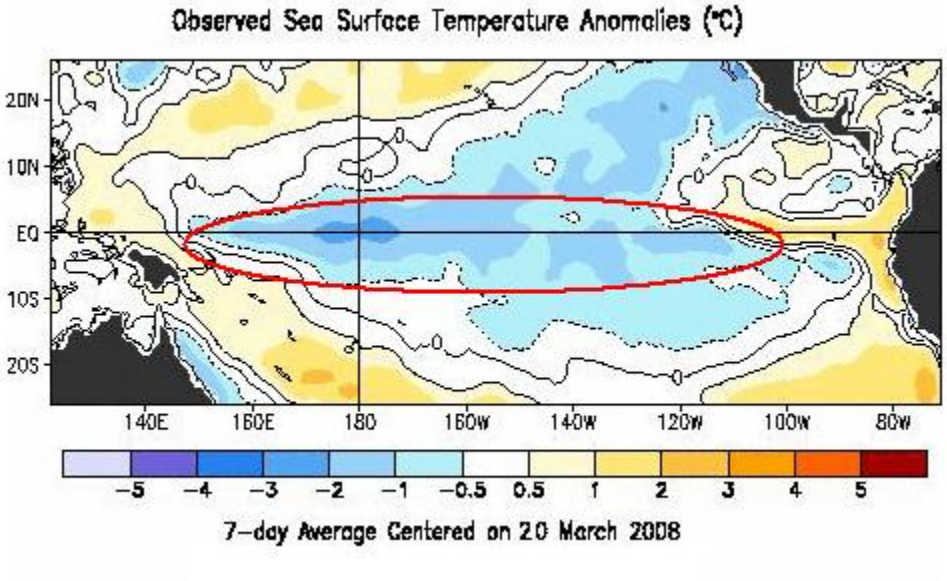


Figure 9: Sea surface temperature anomalies colder than normal across most of the equatorial Pacific Ocean. Graphic provided by NOAA's Climate Prediction Center.

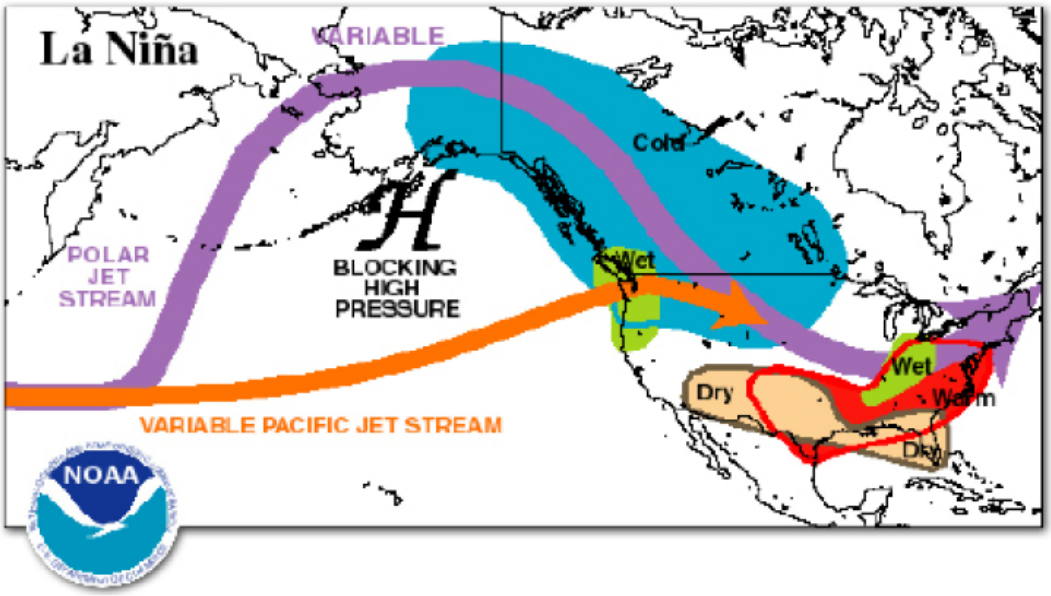
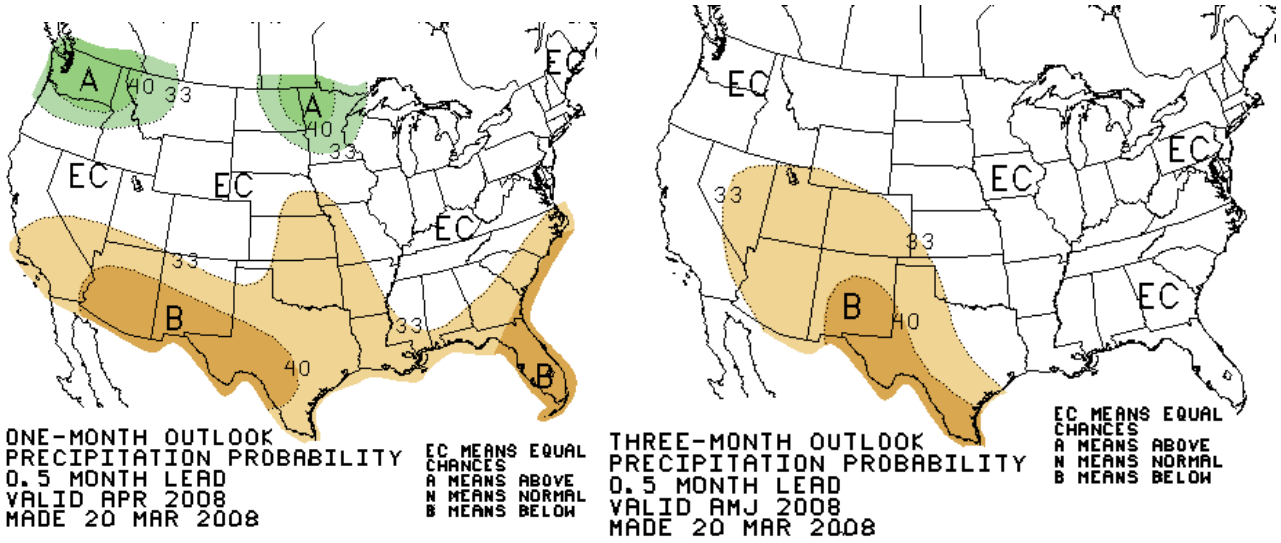


Figure 10. La Niña's influence on jet stream provided by NOAA's Climate Prediction Center.

On a brighter note, La Nina's influence on rainfall distribution across North Carolina weakens considerably as temperatures warm heading into Spring. The precipitation outlook from NOAA's Climate Prediction Center for the spring continues to call for a continued chance of below normal precipitation for April (Figure 11a), As La Nina's influence weakens, there is no longer a strong indicator that would produce a precipitation anomaly (either surplus or deficit) from April through June (Figure 11b). Unfortunately, summer rainfall is heavily dependent on sporadic thunderstorm activity as well as occasional tropical systems such as hurricanes which can prove to be unreliable sources of needed rainfall.



Figures 11a and 11b. Precipitation Outlooks for April and from April through June. Note the weakening influence of La Nina. Courtesy of by NOAA's Climate Prediction Center

Summer Outlook

Warm summer days mean an increase in surface water loss to evaporation along with increased water demand. Daily evaporation increases significantly in May and June and remains high through June, July, August and September. Climatologically, between 3 to 4 inches of surface water is lost each month from June through October, which nearly equals the amount of rainfall across the Piedmont during the summer. This suggests the balance of water received from rainfall versus the water lost to evaporation is in delicate balance, especially in the Piedmont. Based on pan evaporation rates, the amount of surface water lost to evaporation in a given year in the Piedmont (40 to 42 inches) is only slightly less than the normal rainfall (43 to 44 inches) for the region (Figure 12). While the process of evapotransiration, which accounts for the effects of vegetation, lowers the water loss to around 70 percent of the actual direct evaporation, it is still worth noting that the balance between expected yearly rainfall and water loss to evaporation in the Piedmont is less than that for other regions of the state. On average, a rainfall deficit of 20% to 30% in a given year will likely result in a drought of some variety. As population increases in the Piedmont, further stresses on local water supplies will potentially increase the frequency of water shortages - especially during periods of prolonged dryness.

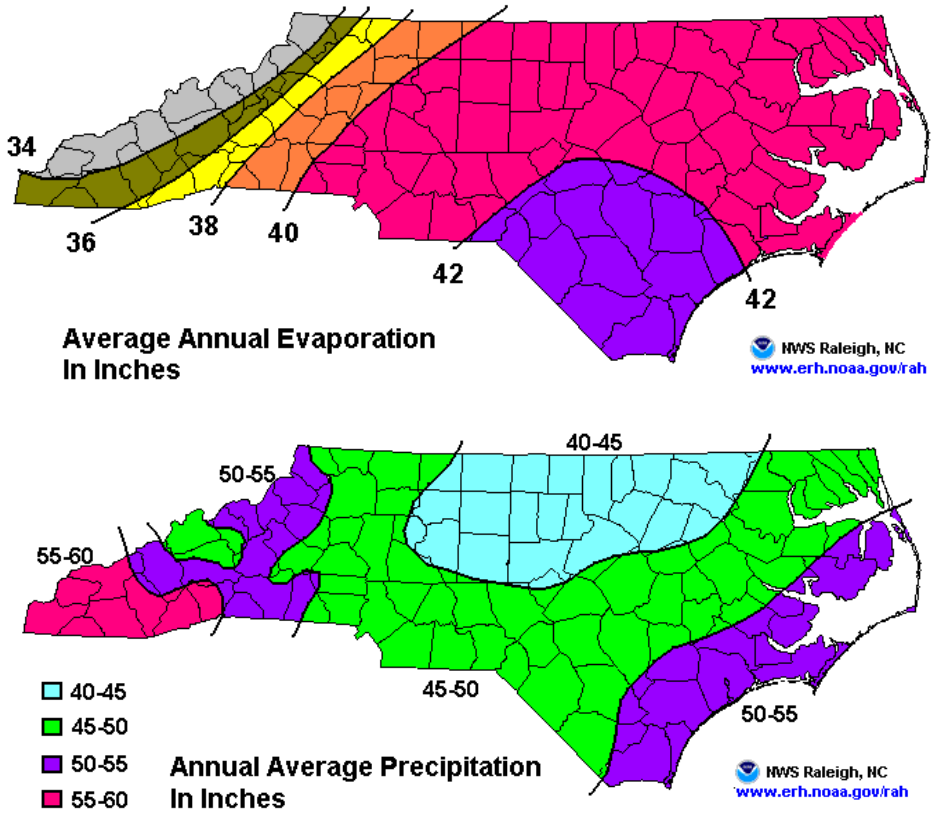


Figure 12. Annual average pan evaporation (top) and annual average rainfall (bottom). Graphic created by the Raleigh National Weather Service Office.

It is important to realize that the low base flow levels in streams and rivers are due to an underlying deeper soil moisture and groundwater deficit. Therefore, in some areas, even near normal rainfall over the next few months ***will not bring an end*** to the current drought. Drought conditions are forecast to persist, with some improvement, through the early summer months (Figure 13).

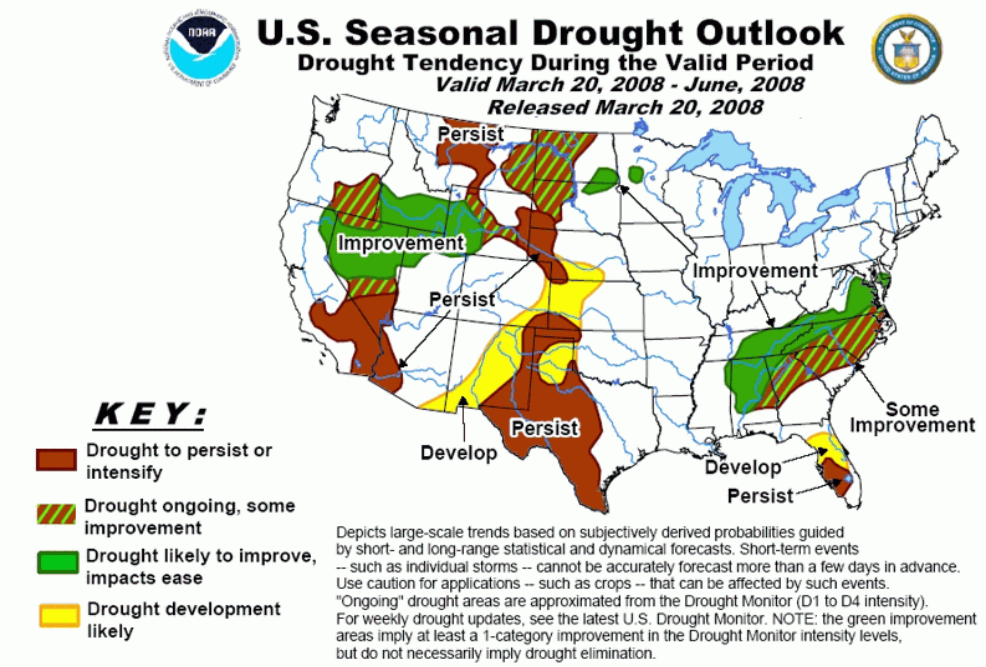


Figure 13. Drought Outlook April - June. Courtesy of by NOAA's Climate Prediction Center

Websites

National Integrated Drought Information System (NIDIS)
http://www.drought.gov

NC Drought Monitor
http://www.ncdrought.org

State Climate Office of North Carolina
http://www.nc-climate.ncsu.edu/

National Weather Service Raleigh, NC
http://www.erh.noaa.gov/rah/

Climate Prediction Center
http://www.cpc.ncep.noaa.gov

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Climate Prediction Center (CPC)
National Climatic Data Center (NCDC)