

September 2023 Central NC Climate Summary

By Phillip Badgett and James Danco

Fall finally arrives.

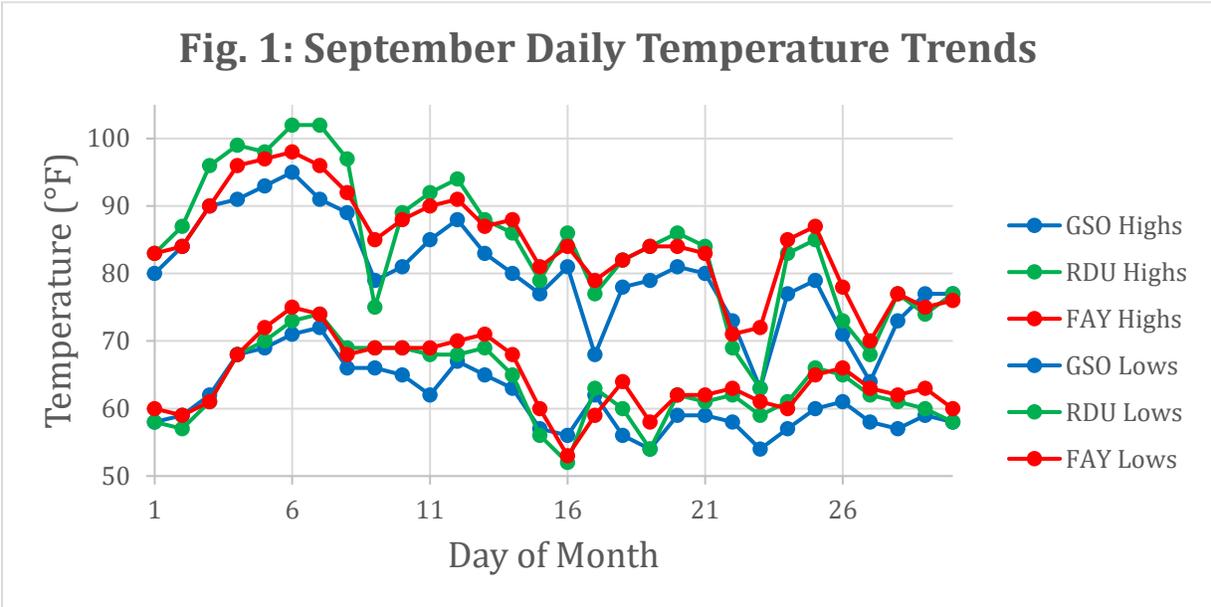
Sweltering heat continued through the first week of September, but the heat finally gave way to cooler temperatures during the latter half of the month thanks to more frontal passages and cooler high pressure systems. According to preliminary data from NCEI, the statewide temperature averaged 71.0°F, which ranked as the 50th-warmest September in the 129 years of official records. Most areas finished the month with an average temperature that was within a degree of normal, as the heat in the first half of the month was mostly offset by the cool latter half. The monthly average temperatures and their departures from normal at the three climate sites are depicted in Table 1. Greensboro finished the month barely cooler than normal while Fayetteville was barely warmer than normal. Raleigh was 1.3°F warmer than normal.

Table 1: Monthly Temperature Statistics

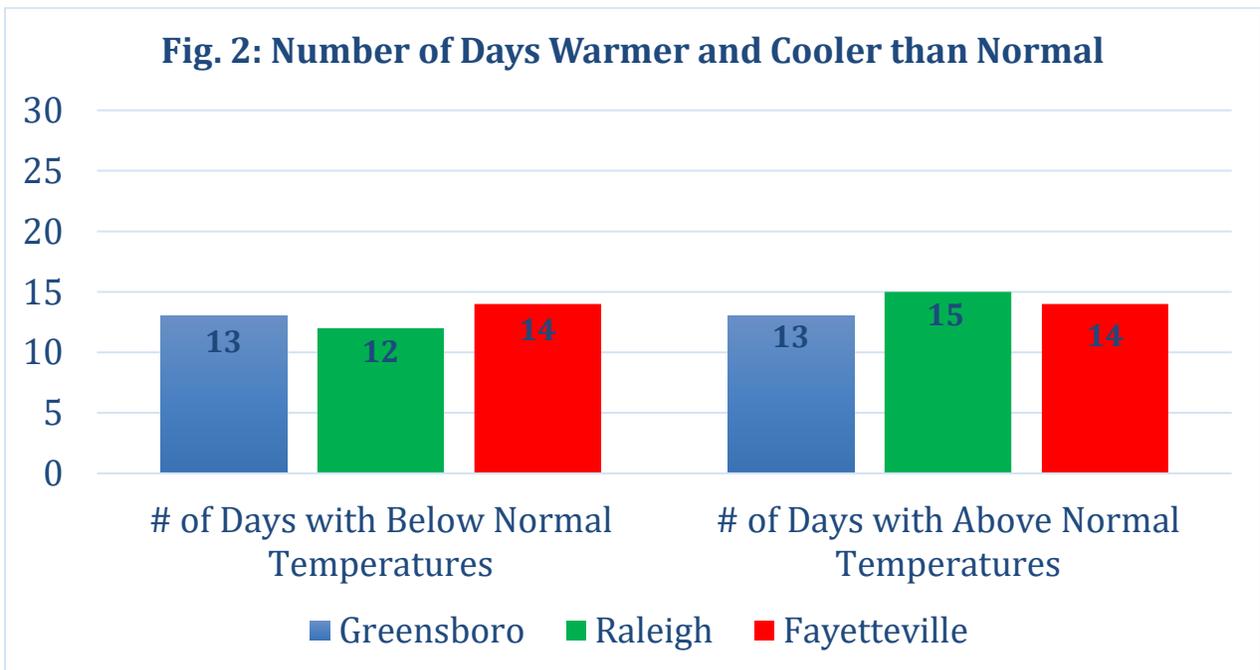
Site	Avg High Temp (°F)	Avg Low Temp (°F)	Avg Temp (°F)	Departure From Normal (°F)	Maximum Temperature (°F)	Minimum temperature (°F)
Greensboro (GSO)	80.2	61.3	70.8	-0.2	95 on 9/6	54 on 9/19 and 9/23
Raleigh-Durham (RDU)	84.5	63.3	73.9	+1.3	102 on 9/6 and 9/7	52 on 9/16
Fayetteville (FAY)	84.4	64.5	74.5	+0.3	98 on 9/6	53 on 9/16

The time series of daily temperature for the month at Greensboro, Raleigh, and Fayetteville can be found in Figure 1. Frequent highs in the 80's and 90's in the first half of the month turned into largely 60's and 70's by the end. The hottest days occurred during the first week, particularly on the 6th when all three climate sites reached their hottest temperatures for the month. Greensboro hit 95°F, while Raleigh hit 102°F and Fayetteville tied a daily record at 98°F. According to the NC state climate office, Roxboro (normally a cool spot) even reached 97°F, which was its hottest day since October 2019. Raleigh also reached 102°F on the 7th and 98°F on the 5th, both breaking daily records. The 6th and 7th were also the second hottest days ever recorded in Raleigh during September, only after September 6, 1954. And it was the first September that had multiple days at or above 100°F in Raleigh. A cold front then brought a brief break from the heat before we had one last taste of summer, with highs reaching back into the upper-80s to lower-90s on the 12th. The

total September tally of 90+°F days reached 8 at Fayetteville, 8 at Raleigh, and 5 at Greensboro. According to the NC climate office, the end of summer weather and arrival of autumn weather arrived right on time based on climatology. Greensboro’s last day reaching at least 90°F was September 7 while the average last such day is September 10. Raleigh’s last 90+°F day was on the 12th, which is exactly its average final such day. Meanwhile Siler City had its first low below 50°F just one day earlier than its average so far this century, reaching 46°F on the 16th.



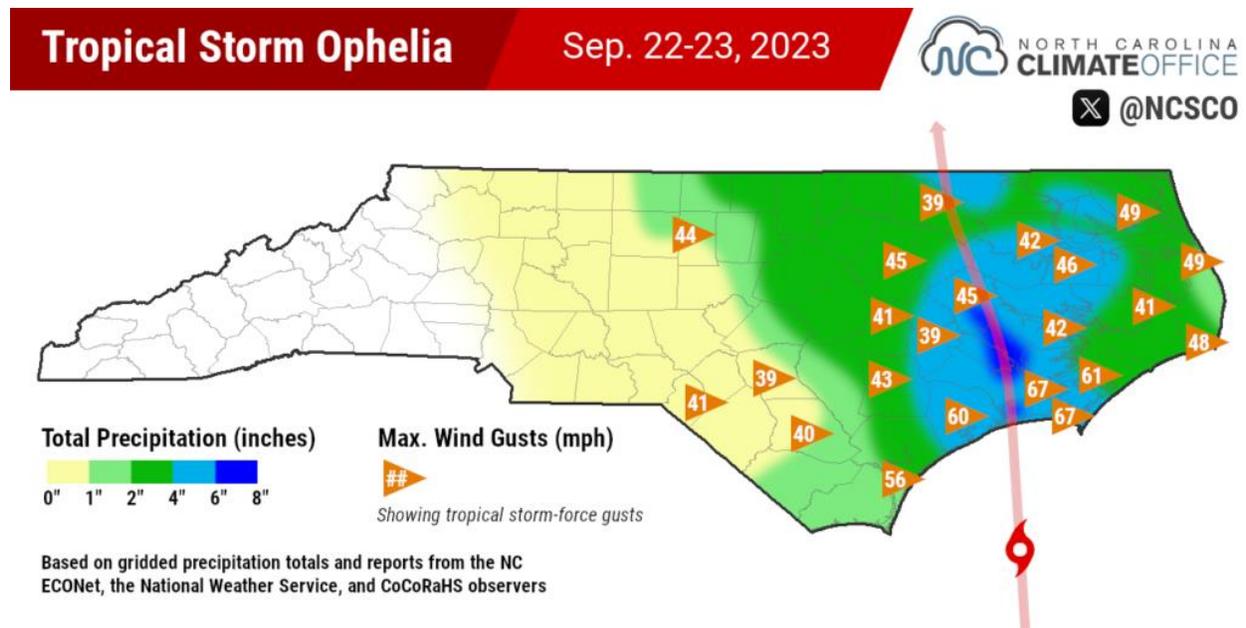
As seen in Figure 2, the number of days warmer and cooler than normal during the month was exactly the same at Greensboro and Fayetteville, and it was close at Raleigh.



The system of the month was Tropical Storm Ophelia, which initially developed as an area of low pressure along a stalled front off the Florida coast. It made landfall with 70 mph winds along the NC coast at Emerald Isle in the early morning hours of September 23. The storm then tracked north through eastern NC and southeastern VA. Ophelia was the first named storm to hit the NC coast since Hurricane Isaias in August 2020. There were remnant tropical systems that moved across NC in the previous 3 years, just none to strike the coast directly. These remnant systems included: Fred in 2021, Ian and Nicole in 2022, and Idalia last month.

Rain associated with Ophelia spread over NE Piedmont and Coastal Plain, which received as much as 2-4 inches. However, rainfall did not extend as far west as the western Piedmont and Foothills, leaving quite a gradient over central NC. Raleigh received 2.81 inches, including 2.38 inches on the 23rd which was a daily rainfall record. However, only 0.73 inches fell in Burlington and little to none fell over the Piedmont Triad Region. The Sandhills also largely missed out. Fayetteville only received 0.60 inches. Unfortunately, some of the heaviest rain fell where it wasn't necessarily needed as southeastern areas had already been wet over the previous month. After Ophelia's rain, the ECONet station in Clinton received 9.83 inches over the previous 30 days. According to the NC Climate Office, this was the wettest stretch at this time of year since 2018 when it had 18.42 inches, mostly from Hurricane Florence. Winds across central NC were gusty but stayed below 50 mph. The highest gusts were 46 mph in Louisburg, 45 mph in Rocky Mount, and 44 mph in Greensboro and Burlington. A map of the precipitation totals and highest recorded wind gusts from Ophelia across NC from the state climate office is shown in Figure 3.

Fig. 3: Rainfall Totals and Maximum Wind Gusts from Ophelia



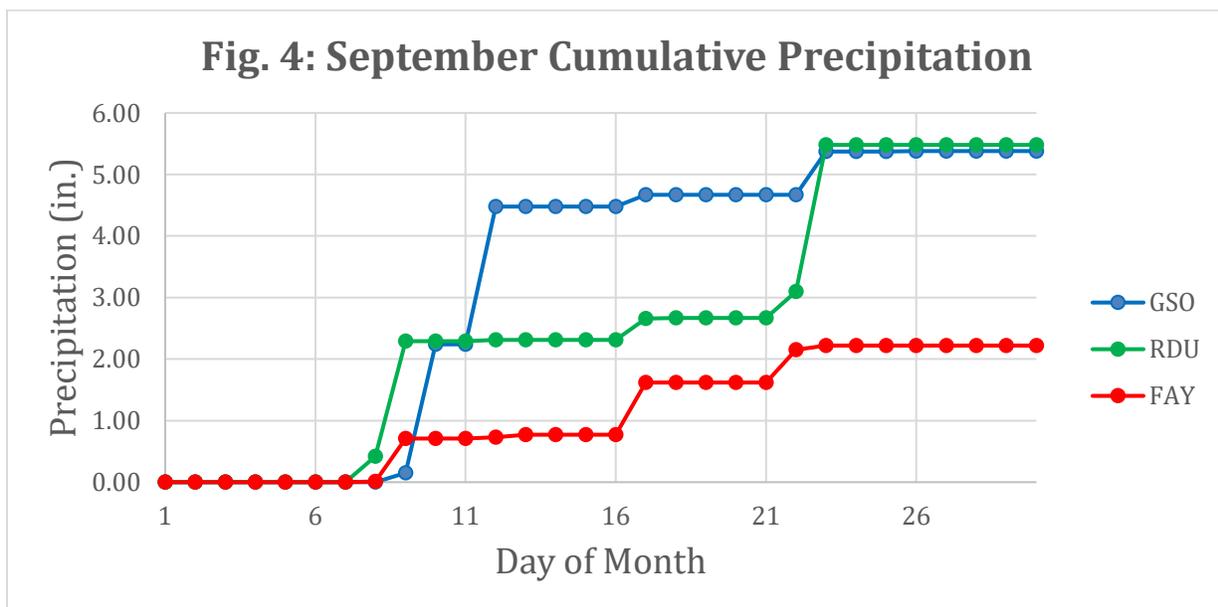
September 2023 was dry in the western part of the state and wet in parts of the east, partly due to Ophelia. According to preliminary data from NCEI, the NC statewide average rainfall was 3.56 inches. This made it the 52nd-driest September in the past 129 years. Central NC was the battleground between much drier weather over the mountains and wet conditions down east along

the coast. By month's end, much of the NE Piedmont and Coastal Plain tallied near to slightly above normal rainfall, while dry conditions prevailed in much of the Sandhills and western Piedmont. From the NC climate office, Roanoke Rapids was 2.75 inches wetter than normal and had its 10th-wettest September in the last 52 years. The final rainfall tallies for September 2023 from the three main central NC climate reporting sites depicted dryness at Fayetteville, which had less than half of its normal precipitation and its driest September since 2013. However, conditions were slightly wetter than normal at Greensboro and Raleigh (Table 2).

Table 2: Monthly Precipitation Statistics

Site	Total precipitation (in.)	Departure from Normal (in.)	Max Daily Precipitation (in.)
Greensboro (GSO)	5.38	+0.79	2.24 on 9/12
Raleigh-Durham (RDU)	5.48	+0.33	2.38 on 9/23
Fayetteville (FAY)	2.22	-2.65	0.85 on 9/17

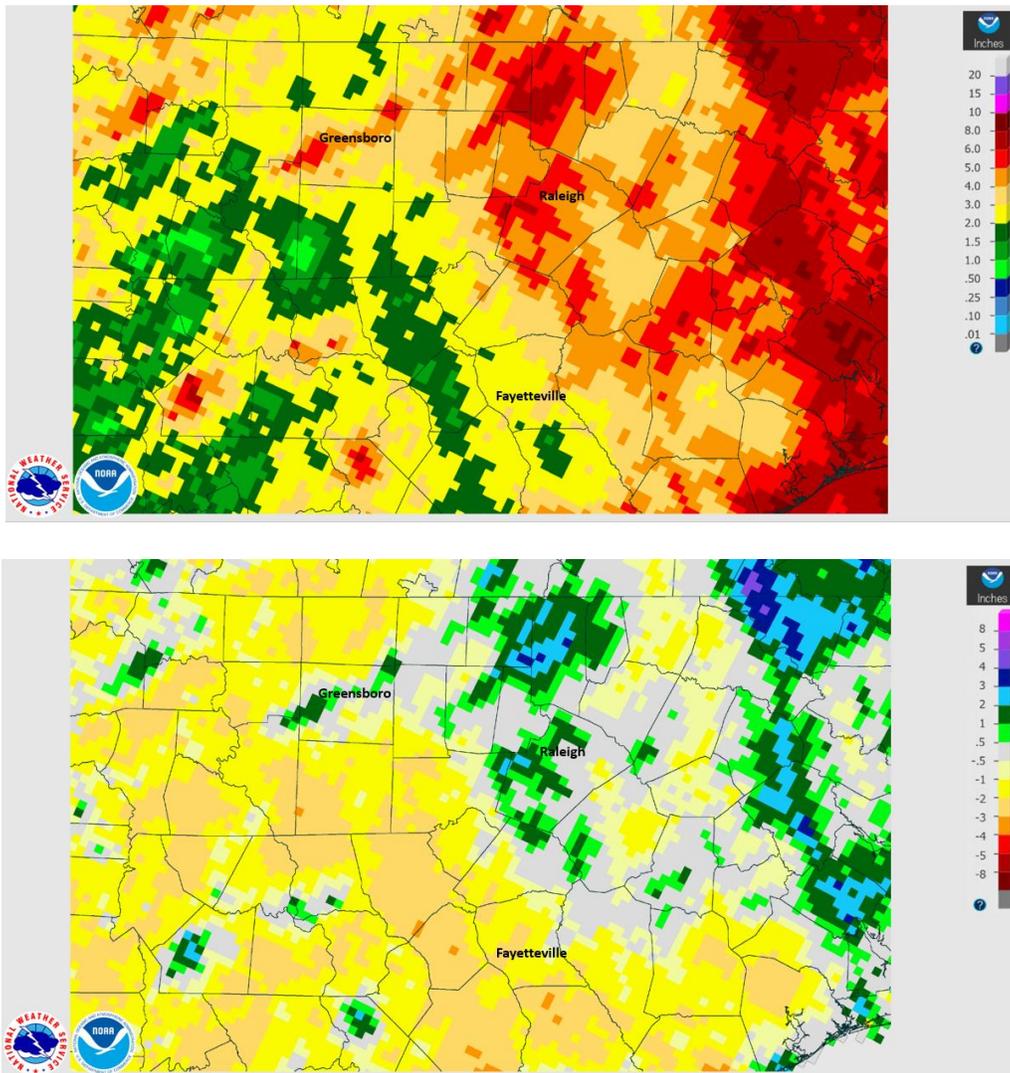
The cumulative precipitation for September at the three climate sites is shown in Figure 4. There were essentially two wet periods. One was from the 8th through the 12th associated with a slow-moving front, particularly at Greensboro where 2.09 inches fell on the 10th and 2.24 inches fell on the 12th, both daily rainfall records. Raleigh had 2.29 inches on the 8th-9th, including a storm on the 8th that produced a 76 mph wind gust at the airport. This was one of the strongest wind gusts ever recorded at Raleigh and the strongest since January 11, 2014. The other wet period was the 22nd-23rd associated with Ophelia. Outside of that, the month was quite dry.



Some of the cooperative station rainfall reports from around central NC from September 2023 included: Sparta 3.75 inches (-1.38), Lexington 1.40 inches (-2.87), Winston-Salem 2.19 inches (-1.67), Burlington 4.03 inches (-0.37), Mount Airy 3.74 inches (-0.50), Danbury 2.85 inches (-2.13), Yanceyville 4.83 inches (-0.25), Eden 2.68 inches (-2.02), Henderson 6.23 inches (+1.45), Carthage 2.56 inches (-3.01), Cary 4.65 inches (-0.92), Raleigh (NCSU) 5.19 inches (-0.53), Louisburg 3.53 inches (-1.38), Apex 5.19 inches (-0.08), Chapel Hill 3.61 inches (-1.81), Jackson Springs 2.40 inches (-2.89), Laurinburg 2.55 inches (-2.93), Rocky Mount 3.29 inches (-1.62), Tarboro 5.08 inches (-1.14), and Clinton 4.23 inches (-2.33).

As displayed by the radar-estimated precipitation and the radar-estimated precipitation departure from normal in Figure 5, the final monthly totals were near to slightly above normal for much of the NE Piedmont and Coastal Plain. Meanwhile over much of the western Piedmont and Sandhills, only 1-3 inches fell, which was 1-3 inches below normal.

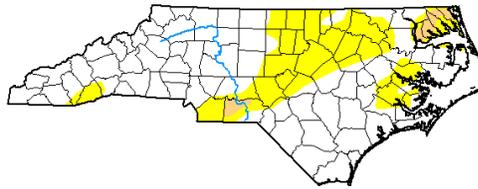
Fig. 5: Radar-Estimated Monthly Precipitation and Departure from Normal Precipitation



The US Drought Monitor maps for NC from early September and early October are shown in Figure 6. The D0 (Abnormally Dry) conditions improved through the month over the NE Piedmont and northern Coastal Plain thanks to the rainfall there. However, D0 conditions expanded across the western Piedmont and Sandhills where it was drier, and a small area of D1 (Moderate Drought) remained over the southwestern Piedmont.

Fig. 6: US Drought Monitor for NC on September 5 (top) and October 3 (bottom)

**U.S. Drought Monitor
North Carolina**



September 5, 2023
(Released Thursday, Sep. 7, 2023)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	70.60	29.40	1.97	0.00	0.00	0.00
Last Week 09-29-2023	49.94	50.06	10.60	0.00	0.00	0.00
3 Months Ago 06-06-2023	85.67	14.33	0.00	0.00	0.00	0.00
Start of Calendar Year 01-03-2023	56.06	43.94	24.97	0.00	0.00	0.00
Start of Water Year 09-27-2022	38.94	61.06	15.04	0.00	0.00	0.00
One Year Ago 09-06-2022	61.72	38.28	0.00	0.00	0.00	0.00

Intensity:
 None (white) D0 Abnormally Dry (yellow)
 D1 Moderate Drought (orange) D2 Severe Drought (red-orange)
 D3 Extreme Drought (red) D4 Exceptional Drought (dark red)

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>

Author:
Richard Tinker
CPC/NOAA/NWS/NCEP



droughtmonitor.unl.edu

**U.S. Drought Monitor
North Carolina**



October 3, 2023
(Released Thursday, Oct. 5, 2023)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	58.93	41.07	1.56	0.00	0.00	0.00
Last Week 09-26-2023	82.24	17.76	0.36	0.00	0.00	0.00
3 Months Ago 07-04-2023	92.11	7.89	0.00	0.00	0.00	0.00
Start of Calendar Year 01-03-2023	56.06	43.94	24.97	0.00	0.00	0.00
Start of Water Year 09-26-2023	82.24	17.76	0.36	0.00	0.00	0.00
One Year Ago 10-04-2022	97.55	2.45	0.00	0.00	0.00	0.00

Intensity:
 None (white) D0 Abnormally Dry (yellow)
 D1 Moderate Drought (orange) D2 Severe Drought (red-orange)
 D3 Extreme Drought (red) D4 Exceptional Drought (dark red)

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Author:
Brad Pugh
CPC/NOAA



droughtmonitor.unl.edu

Other notes:

Days with thunderstorms this month:

Greensboro: 3

Raleigh: 2

Fayetteville: 2

Days with dense fog (visibility of ¼ mile or less):

Greensboro: 1

Raleigh: 2

Fayetteville: 1

Strongest wind gusts and direction:

Greensboro: S (160 degrees) at 39 mph on September 9

Raleigh: SW (240 degrees) at 76 mph on September 8

Fayetteville: N (340 degrees) at 39 mph on September 23

Number of days with high temperatures at or above 90°F this month:

Greensboro: 5

Raleigh: 8

Fayetteville: 8

Monthly records:

Greensboro:

None.

Raleigh:

None.

Fayetteville:

None.

Daily records:

Greensboro:

A daily record high minimum temperature of 72°F was tied on September 7. This record was previously set in 2018.

A daily record rainfall of 2.09 inches was set on September 10. This broke the old record of 1.03 inches set in 2022.

A daily record rainfall of 2.24 inches was set on September 12. This broke the old record of 1.64 inches set in 1934.

Raleigh:

A daily record high temperature of 98°F was set on September 5. This broke the old record of 97°F set in 1954.

A daily record high temperature of 102°F was set on September 7. This broke the old record of 99°F set in 1954.

A daily record high minimum temperature of 74°F was tied on September 7. This record was previously set in 1910.

A daily record rainfall of 2.38 inches was set on September 23. This broke the old record of 2.03 inches set in 1906.

Fayetteville:

A daily record high temperature of 98°F was tied on September 6. This record was previously set in 1941.

A daily record high minimum temperature of 75°F was tied on September 6. This record was previously set in 2011.

A daily record high minimum temperature of 74°F was tied on September 7. This record was previously set in 1910.