

September 2023 Tennessee State Climate Summary

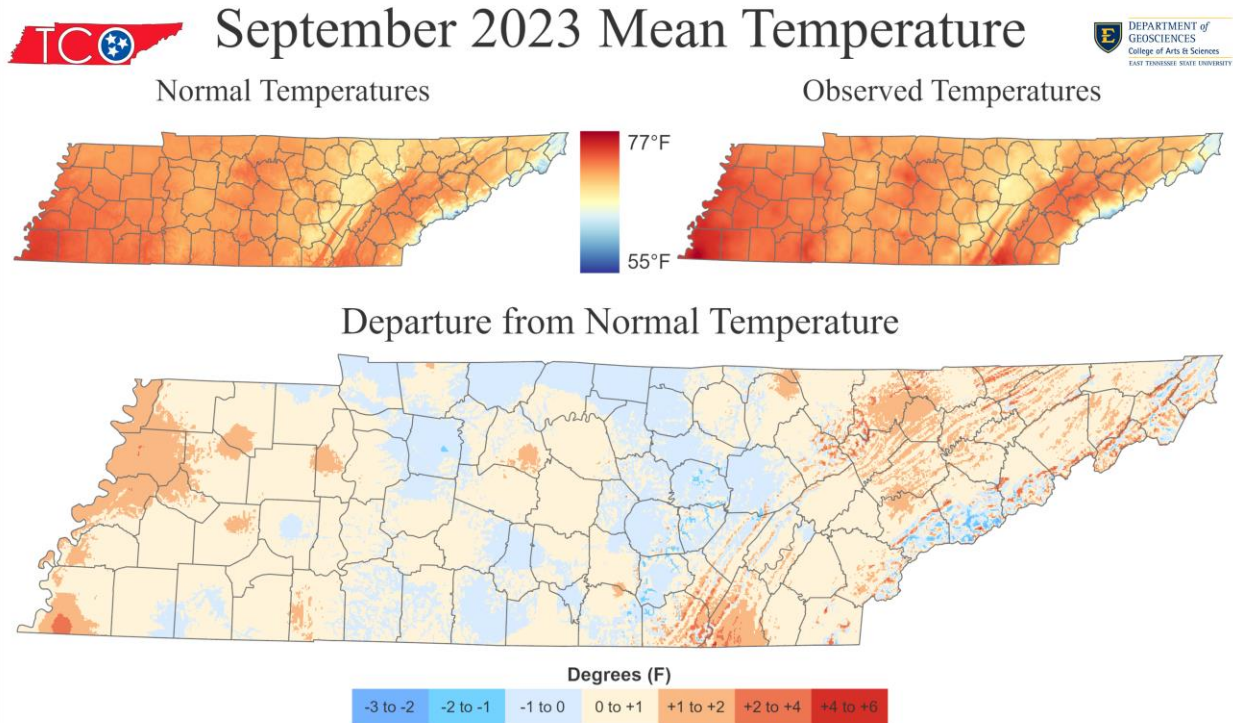
Tennessee Climate Office * East Tennessee State University

Prepared by William Tollefson and Dr. Andrew Joyner

With contributions by [Climate Data Representatives](#) across the state

Monthly Temperature Summary:

Mean temperatures for the month of September 2023 averaged close to normal (plus or minus 1°F) for most areas of Tennessee, however warmer than normal conditions were more common in West and East Tennessee, while close to normal or slightly cooler conditions were mostly observed in Middle Tennessee and the Cumberland Plateau. Despite the near average temperature for the month as a whole, there were several temperature swings throughout the month, observed temperatures ranged from 35°F on September 19th at Mt. LeConte to 97°F at the Memphis Airport on the 4th and Memphis Weather Forecast Office on the 5th. The first and fourth weeks of September were warmer than normal for most areas of the state, and the third week of the month was cooler than normal for the whole state. The second week of September was split, with cooler than normal conditions in the western half of the state and warmer than normal conditions in the eastern half of the state. There were relatively few temperature records set this month, with no broken high or low temperature records; however, there were 3 broken daily records for warmest low temperatures, and one broken daily record for coolest high temperature set this month.



Stations with the highest mean temperature

Station Name	Station Type	Mean Temperature (F)
MEMPHIS INTERNATIONAL AP	WBAN	77.7
CHATTANOOGA AP	WBAN	75.3
SHILOH NMP TENNESSEE	RAWS	75
MEMPHIS WFO	WBAN	75
NASHVILLE INTL AP	WBAN	74.6

Map Data from PRISM Climate Group, Oregon State University, 1991-2020 Climate Normals Used. Station Data Retrieved From xmACIS2.

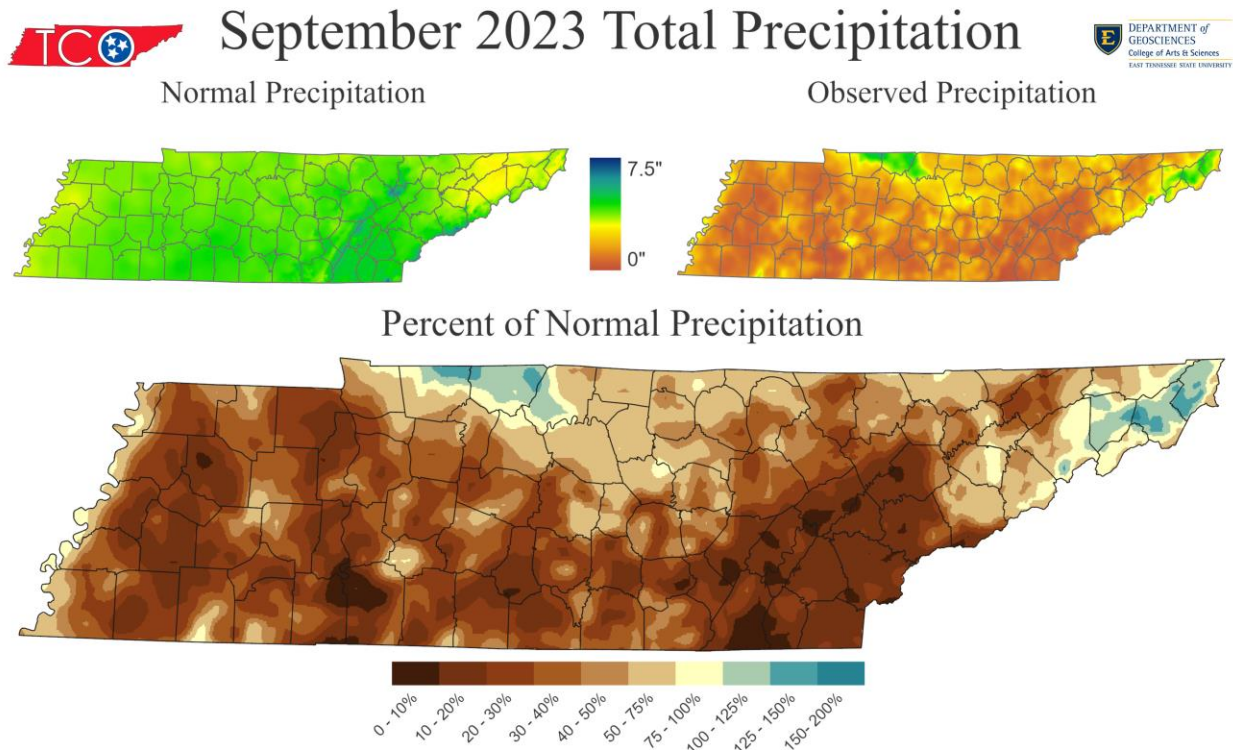
Stations with the lowest mean temperature

Station Name	Station Type	Mean Temperature (F)
MT LECONTE	COOP	53.4
NEWFOUND GAP	COOP	61.3
ROAN MOUNTAIN 3SW	COOP	62.8
MOUNTAIN CITY 2	COOP	65.4
CROSSVILLE 7 NW	WBAN	65.7

Monthly Precipitation Summary:

September 2023 brought much drier than normal conditions to the state, with the exception of a few small pockets of above normal precipitation in northern Middle Tennessee and in the northeastern corner of the state. Southern portions of the state were the driest, with several areas of the southern Tennessee Valley (from Chattanooga up to Knoxville) recording less than 10% of their normal September rainfall! The Chattanooga airport recorded only 0.13” of rainfall for the month, which was only 3% of their normal for September. While it was very dry across the state, fall is usually the driest time of year for the state and even with only 0.13” of rainfall, this was just the 5th driest September for Chattanooga (which has a 145-year weather history).

For the areas that did record above normal rainfall it mostly came in heavy thunderstorm events, in the first and fourth weeks of the month for northern Middle Tennessee and in the second week of the month for northeast Tennessee. Most areas of Robertson County recorded 2-4 inches of rain on the 28th-29th, which was the majority of their rainfall for the month. There were 8 daily records for highest daily rainfall set this month, 3 at stations with over a 100-year history. Elizabethton, in Carter County, with a weather history of 128-years set two daily rainfall records this month, with 1.24” on September 8th and 1.1” on September 18th.



Stations with the most precipitation

Station Name	Station Type	Total Precipitation (in)
GREENEVILLE 10.1 S	CoCoRaHS	5.05
CLARKSVILLE 4.9 NW	CoCoRaHS	4.83
SPRINGFIELD EXPERIMENT STATION	COOP	4.8
WHITE HOUSE	COOP	4.74
SPRINGFIELD 1.9 WSW	CoCoRaHS	4.62

Map Data from PRISM Climate Group, Oregon State University, 1991-2020 Climate Normals Used. Station Data Retrieved From xmACIS2

Stations with the least precipitation

Station Name	Station Type	Total Precipitation (in)
DAYTON 2SE	COOP	0.06
CHATTANOOGA AP	WBAN	0.13
GRUETLI-LAAGER 1.3 E	CoCoRaHS	0.14
KNOXVILLE 5.5 W	CoCoRaHS	0.16
CHATTANOOGA 5.1 ENE	CoCoRaHS	0.18

Station Data and Top Tenn. (warmest/wettest, coldest/driest stations of the month):

Station data for airports across the state using WBAN weather stations, compared to 1991-2020 30-year climate normals for departure from mean temperature and total precipitation:

Station Name	Temperatures (°F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	%Norm
Memphis	87.8	67.6	77.7	+1.7	97	9/4	60	9/18	1.63	-1.40	54%
Jackson	85.9	58.9	72.4	+0.7	93	9/5	49	9/19	1.00	-2.58	28%
Clarksville	77.6	61.3	73.0	+2.4	92	9/5	61	9/24	3.94	+0.47	114%
Nashville	85.7	63.4	74.6	+1.5	94	9/4	53	9/24	2.44	-1.36	64%
Chattanooga	86.1	64.5	75.3	+1.4	93	9/4	54	9/24	0.13	-4.10	3%
Crossville	77.6	56.8	67.3	+0.3	84	9/4	47	9/24	1.17	-2.97	28%
Knoxville	84.6	62.0	73.3	+1.5	91	9/4	53	9/19	0.42	-3.07	12%
Bristol	82.8	58.2	70.5	+1.9	91	9/5	49	9/23	0.83	-2.01	29%

Departures and %Norm Key: **Warmer than Normal**, **Cooler than Normal**; **Wetter than Normal**, **Drier than Normal**

Hottest Stations (highest maximum temperature)

Station Name	Station Type	Highest Temperature (F)	Date
MEMPHIS INTERNATIONAL AP	WBAN	97	4
MEMPHIS WFO	WBAN	97	5
LEWISBURG EXP STA	COOP	96	6
SHILOH NMP TENNESSEE	RAWS	96	5
SPRINGFIELD EXPERIMENT STATION	COOP	95	28
TENNESSEE RIDGE	COOP	95	4
COLUMBIA 3 WNW	COOP	94	4
JACKSON EXP STA	COOP	94	5
MURFREESBORO 5 N	COOP	94	5
OLD HICKORY WFO	COOP	94	5
OLD HICKORY DAM	COOP	94	27
LEBANON 7 N	COOP	94	5
NASHVILLE BERRY FIELD	COOP	94	5
GLADEVILLE	COOP	94	5
DYERSBURG MUNICIPAL AIRPORT	WBAN	94	4
NASHVILLE INTL AP	WBAN	94	4

Ten stations tied for the 7th hottest temperature (94°F)

Coldest Stations (lowest minimum temperature)

Station Name	Station Type	Lowest Temperature (F)	Date
MT LECONTE	COOP	35	19
PICKETT STATE PARK	COOP	39	2
ROAN MOUNTAIN 3SW	COOP	43	20
PORTLAND SEWAGE PLANT	COOP	44	15
COALMONT	COOP	44	25
NEWFOUND GAP	COOP	45	19
BLEDSON SF TENNESSEE	RAWS	45	24
CHEROKEE TENNESSEE	RAWS	45	19
CROSSVILLE AREA OFFICE TENNESS	RAWS	45	24
MURFREESBORO 5 N	COOP	46	24
CROSSVILLE EXP STN	COOP	46	24
HUNTINGDON WATER PLANT	COOP	46	19
MOUNTAIN CITY 2	COOP	46	19
FALL CREEK FALLS SP	COOP	46	25
CROSSVILLE 7 NW	WBAN	46	24
SHELBY BOTTOMS NATURE CENTER	COOP	46	24

Seven stations tied for the 10th coldest temperature (46°F)

Warmest Stations (highest mean temperatures)

Station Name	Station Type	Mean Temperature (F)
MEMPHIS INTERNATIONAL AP	WBAN	77.7
CHATTANOOGA AP	WBAN	75.3
SHILOH NMP TENNESSEE	RAWS	75
MEMPHIS WFO	WBAN	75
NASHVILLE INTL AP	WBAN	74.6
DYERSBURG MUNICIPAL AIRPORT	WBAN	74.5
SAVANNAH 6 SW	COOP	73.9
NASHVILLE BERRY FIELD	COOP	73.9
CAMDEN TOWER TENNESSEE	RAWS	73.7
LEWISBURG TOWER TENNESSEE	RAWS	73.7

Cooltest Stations (lowest mean temperatures)

Station Name	Station Type	Mean Temperature (F)
MT LECONTE	COOP	53.4
NEWFOUND GAP	COOP	61.3
ROAN MOUNTAIN 3SW	COOP	62.8
MOUNTAIN CITY 2	COOP	65.4
CROSSVILLE 7 NW	WBAN	65.7
TOWNSEND 5S	COOP	66
CHEROKEE TENNESSEE	RAWS	66.1
COALMONT	COOP	66.2
GATLINBURG 2 SW	COOP	66.5
FALL CREEK FALLS SP	COOP	66.9

Wettest Stations (highest precipitation totals):

Station Name	Station Type	Total Precipitation (in)
GREENEVILLE 10.1 S	CoCoRaHS	5.05
CLARKSVILLE 4.9 NW	CoCoRaHS	4.83
SPRINGFIELD EXPERIMENT STATION	COOP	4.8
WHITE HOUSE	COOP	4.74
SPRINGFIELD 1.9 WSW	CoCoRaHS	4.62
HENDERSONVILLE 4.7 N	CoCoRaHS	4.55
GREENEVILLE EXP STA	COOP	4.23
GREENBRIER 3.6 E	CoCoRaHS	4.11
JONESBOROUGH 2.7 SSW	CoCoRaHS	4.03
CEDAR HILL 2.6 N	CoCoRaHS	3.94
MORRISTOWN WFO	COOP	3.94
CLARKSVILLE OUTLAW AP	WBAN	3.94

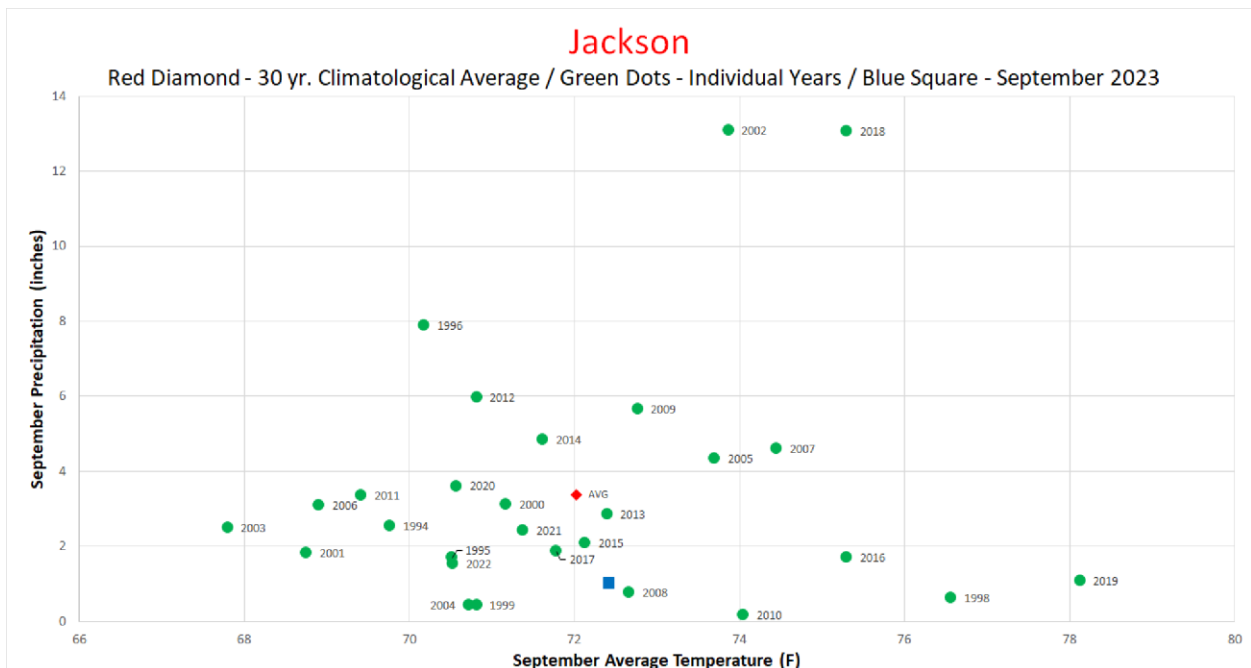
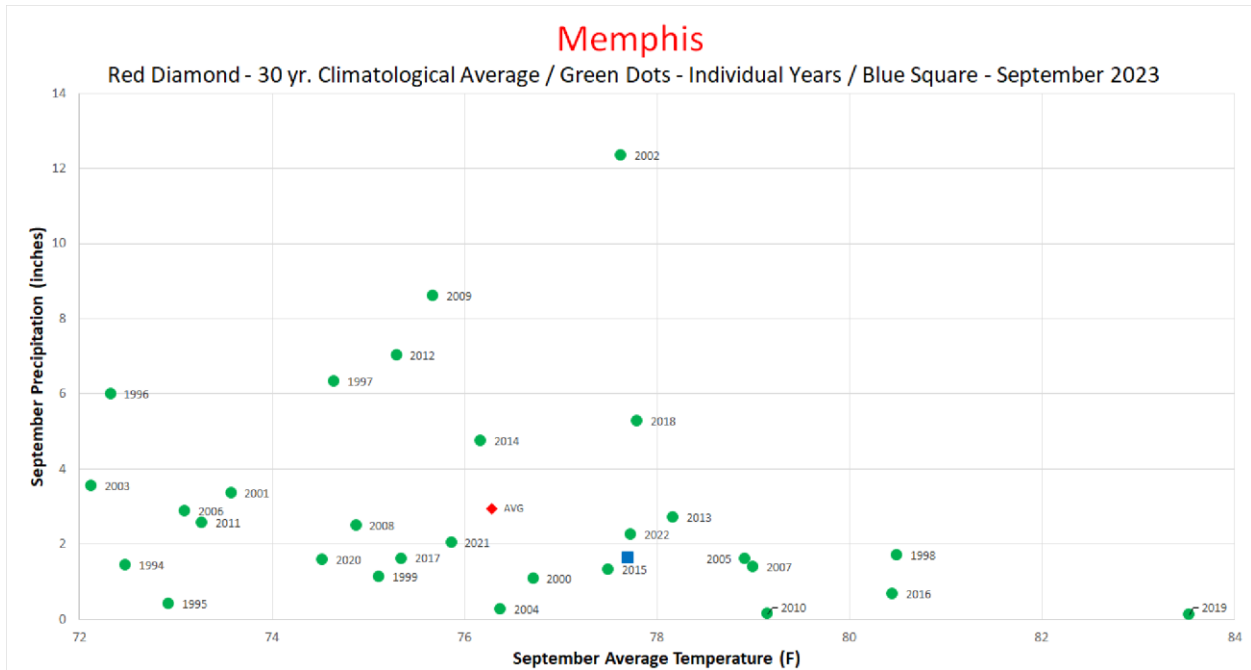
Three stations tied for the 10th wettest station (3.94")

Driest Stations (lowest precipitation totals):

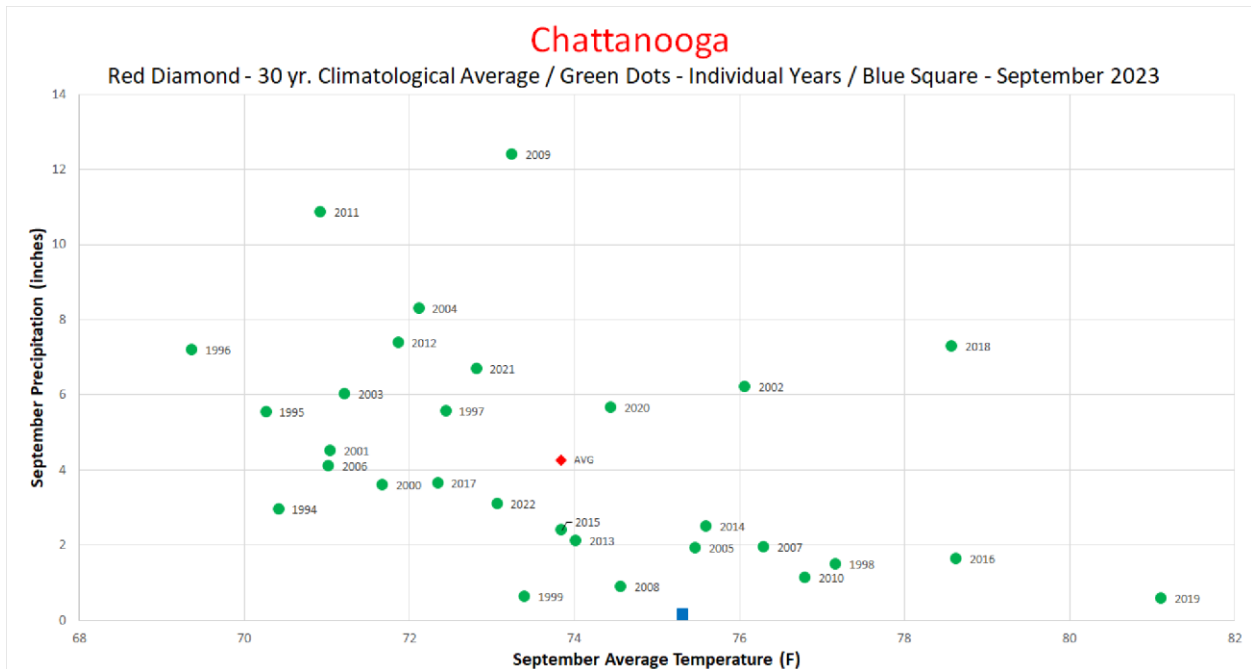
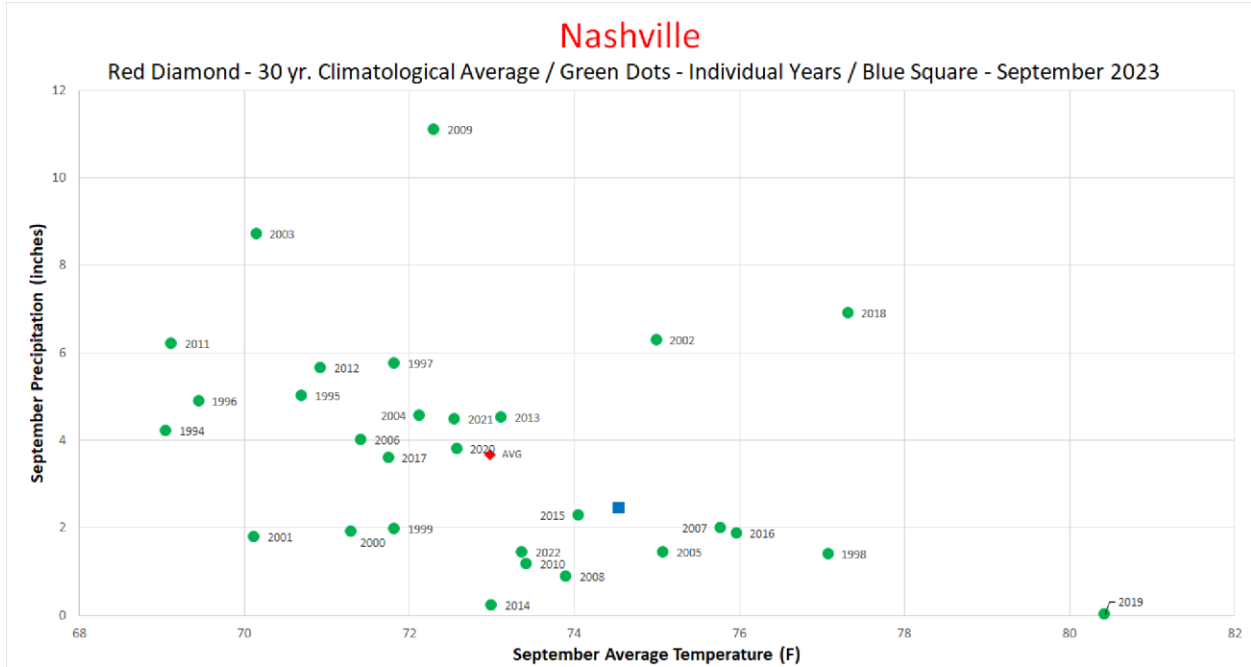
Station Name	Station Type	Total Precipitation (in)
DAYTON 2SE	COOP	0.06
CHATTANOOGA AP	WBAN	0.13
GRUETLI-LAAGER 1.3 E	CoCoRaHS	0.14
KNOXVILLE 5.5 W	CoCoRaHS	0.16
CHATTANOOGA 5.1 ENE	CoCoRaHS	0.18
OOLTEWAH 6.7 NNE	CoCoRaHS	0.2
PIKEVILLE	COOP	0.22
COALMONT	COOP	0.23
MARYVILLE 4.9 S	CoCoRaHS	0.25
MARYVILLE 6.7 SW	CoCoRaHS	0.25

The Month in Comparison:

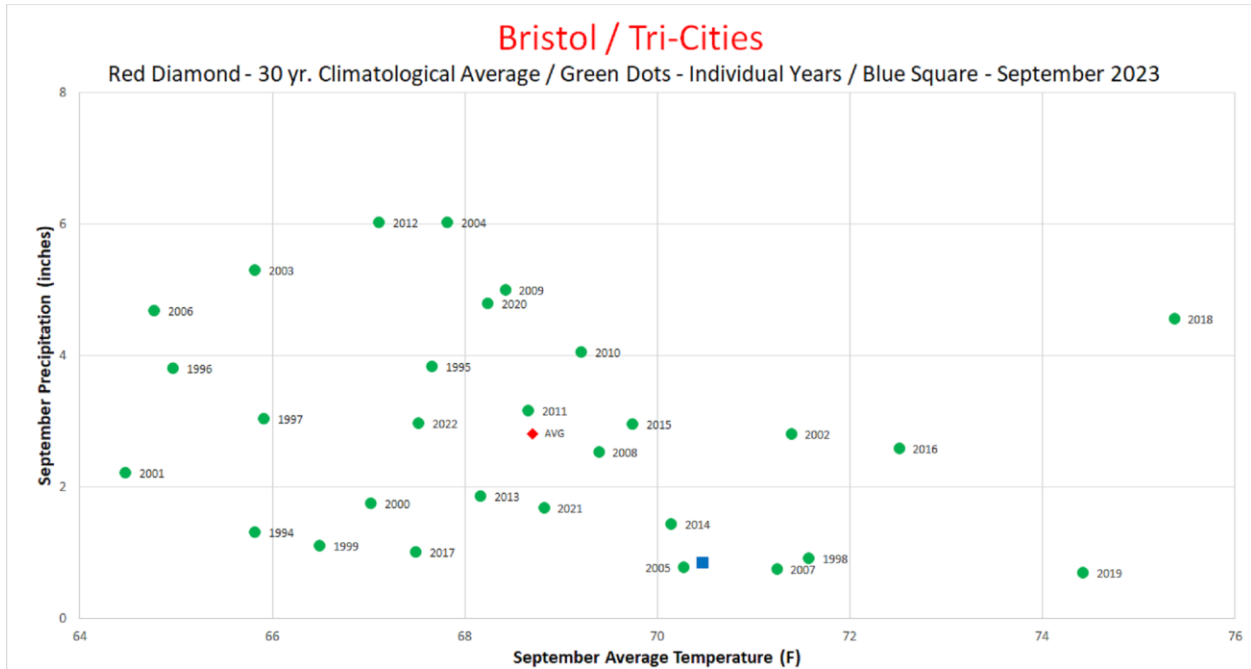
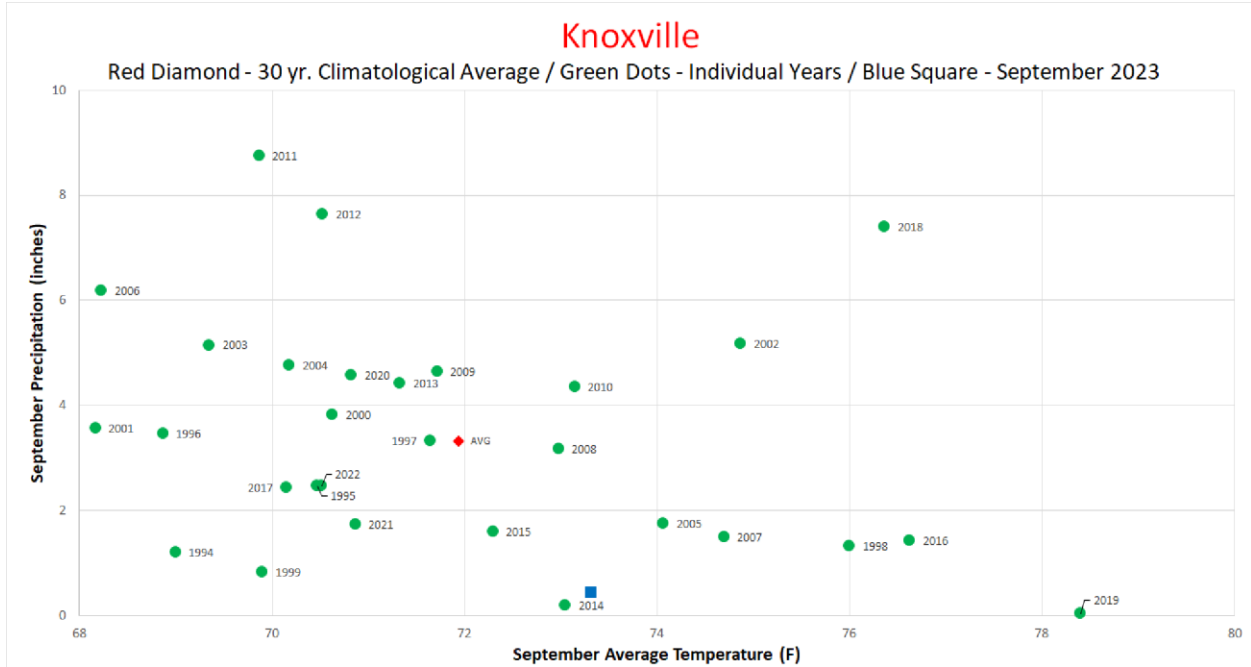
Comparing the average temperature and total precipitation for September 2023 to the conditions of September over the past 30 years at selected automated weather stations located at airports across the state, September 2023 was warmer and drier than average at all six airport weather stations. The average temperature of this month was not a major outlier at any station. For total monthly precipitation, 2023 was the driest September of the past 30 years for Chattanooga, 3rd driest for Knoxville, and 4th driest for Bristol/Tri-Cities. Looking at the longer-term weather record for those three cities, it was the 3rd driest September in the 145-year weather history for Chattanooga, 5th driest for the 76-year weather history for the Tri-Cities, and tied for 5th driest in the 153-year weather history for Knoxville.



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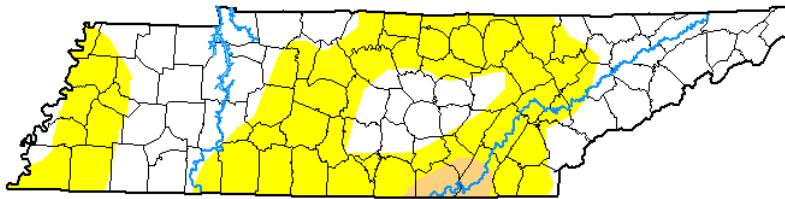


Drought Monitor:

Tennessee started out clear of drought and almost entirely free of Abnormally Dry (D0) conditions on the US Drought Monitor for August 29, with only a tiny portion of southwestern Shelby County included in D0. By the end of September (September 26 Drought Monitor) 2.31% of the state was shown with Moderate Drought (D1) in the Chattanooga area, and an additional 49.47% of the state was shown with Abnormally Dry (D0) conditions. The D0 areas were in West Tennessee, Middle Tennessee, the northern Cumberland Plateau, and in East Tennessee in the southern half of the Tennessee Valley.

**U.S. Drought Monitor
Tennessee**

September 26, 2023
(Released Thursday, Sep. 28, 2023)
Valid 8 a.m. EDT



Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

Author:

Richard Heim
NCEI/NOAA

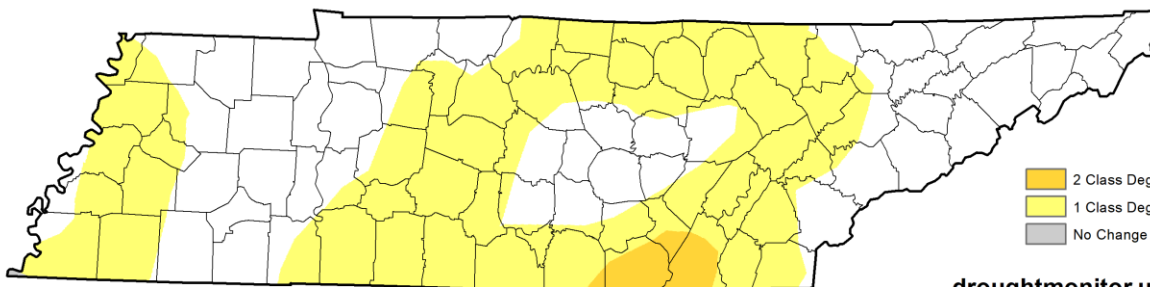
droughtmonitor.unl.edu



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

September 26, 2023
compared to
August 29, 2023

**U.S. Drought Monitor Class Change - Tennessee
4 Week**



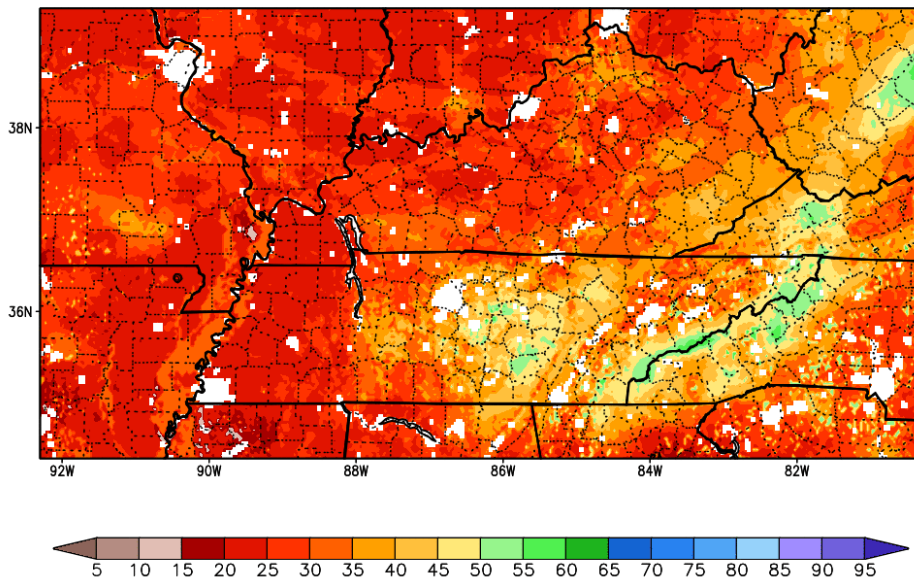
- 2 Class Degradation
- 1 Class Degradation
- No Change

droughtmonitor.unl.edu

Soil Moisture:

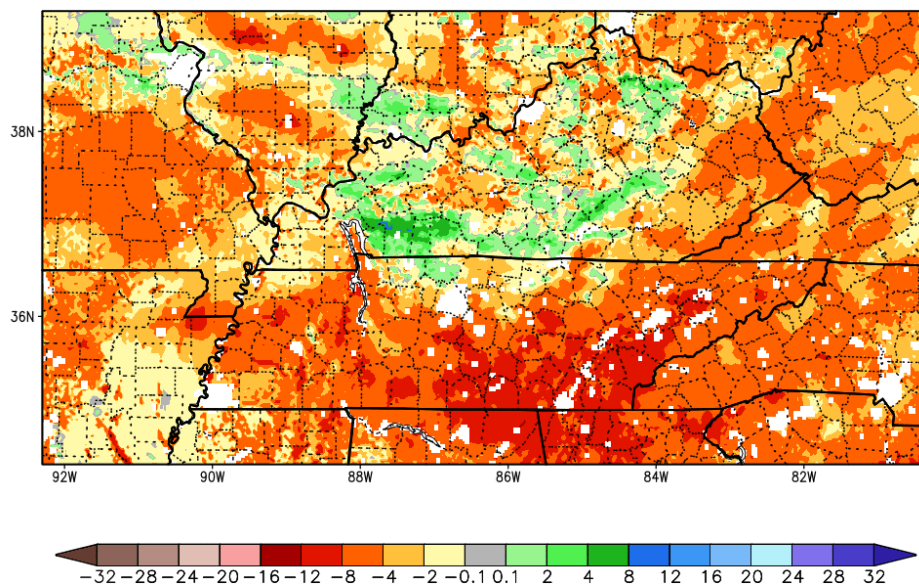
Maps from the NASA SPoRT-Land Information System shows that most of Tennessee has below average soil moisture, with West Tennessee in the 20-25% of normal available water range. This was a drop for almost all areas of the state from the previous month, with southeastern portions of the state showing the strongest decrease, in the 8-12% range. The USDA Crop Weather Report for the week ending October 1 rated topsoil moisture as 11% very short, 43% short, 45% adequate and 1% surplus, while subsoil moisture was rated 8% very short, 36% short, 55% adequate, and 1% surplus.

Column-Integrated Relative Soil Moisture (available water; %) valid 00z 30 Sep 2023
 Precipitation in previous hour (1,2,5,10,15,20,25 mm contours)



****NOTE****
****Experimental****

1-Month Difference in Column Relative Soil Moisture (%) valid 12z 30 Sep 2023



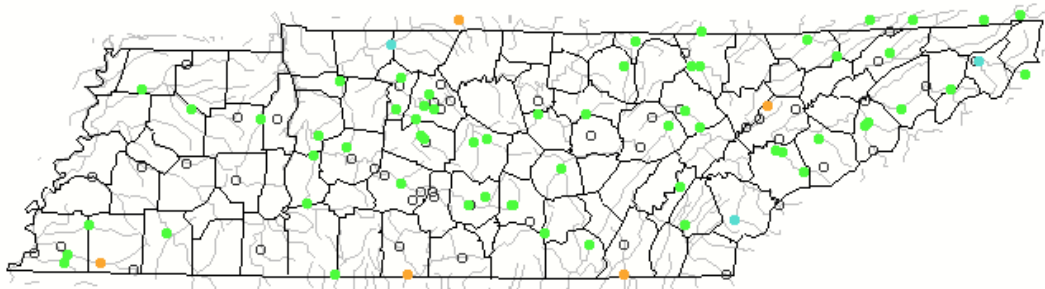
****NOTE****
****Experimental****

Streamflow:

Averaged for the month most stream gauges reported streamflow in the normal percentile range (25th - 75th), but a few streams in the southern half of the state averaged to below normal for the month. However, as the month progressed more streams started to show daily streamflow levels that were in the below normal ranges (less than 25th percentile for this time of year).

Map of monthly streamflow compared to historical streamflow for the month of the year (Tennessee)

September 2023



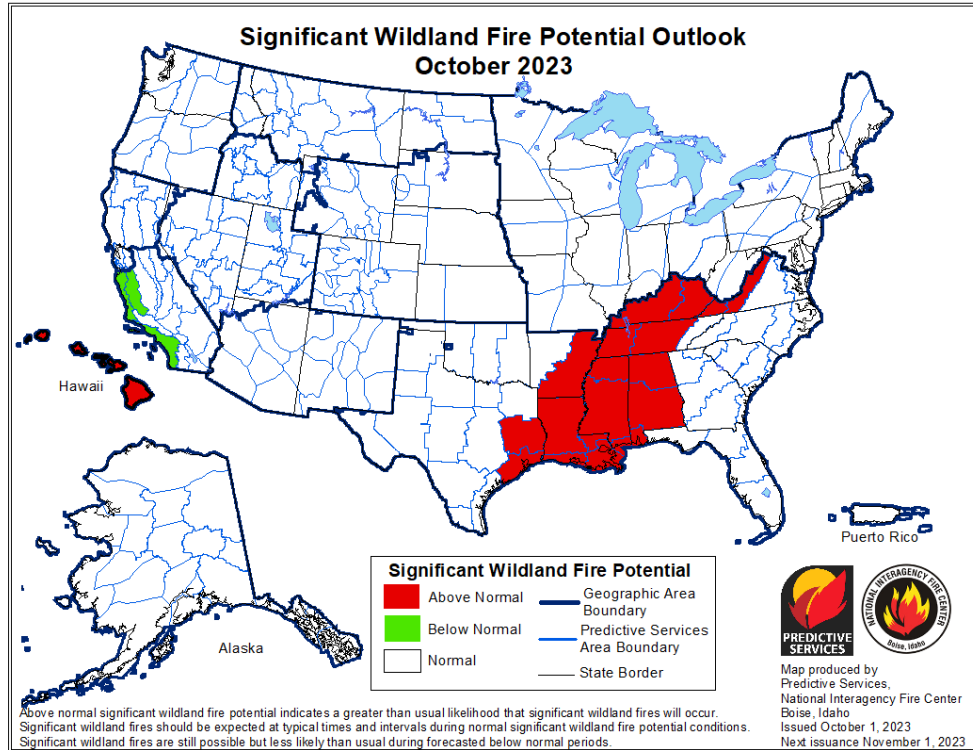
Explanation - Percentile classes							
●	●	●	●	●	●	○	
Low	<10 Much below normal	10-24 Below normal	25-75 Normal	76-90 Above normal	>90 Much above normal	High	Not-ranked

Miscellaneous:

Crop Conditions from USDA: Crop conditions remained mostly strong through the month of September, with the majority of Corn, Cotton, and Soybeans in good or excellent condition. Dry weather allowed for field work, and harvesting for Corn began in earnest this month with 58% of the crop harvested by October 1. The cotton and soybean harvests also began towards the end of the month. Corn, cotton, and early planted soybeans were doing well, but later planted soybeans could use some rainfall to finish the season strong. Pastures were still mostly in good condition, but the dry weather is of concern, as livestock producers hope for rain to replenish pasture soils and get a bit more forage growth before winter sets in.

CROP PROGRESS					CONDITION					
Item	This Week	Last Week	2022	5 Year Avg.	Item	Very Poor	Poor	Fair	Good	Excellent
	Percent					Percent				
Corn – Mature	96	91	95	96	Cotton	6	7	18	54	15
Corn – Harvested	58	46	61	62	Corn	1	6	18	56	19
Cotton – Bolls Opening	77	65	67	75	Soybeans	2	5	17	59	17
Cotton – Harvested	5	3	5	9	Pasture	3	9	37	47	4
Soybeans – Dropping Leaves	73	62	72	67						
Soybeans – Harvested	29	17	20	20						
Tobacco – Cut	84	75	85	90						
Winter Wheat – Planted	9	4	11	11						
Winter Wheat – Emerged	1	0	5	5						

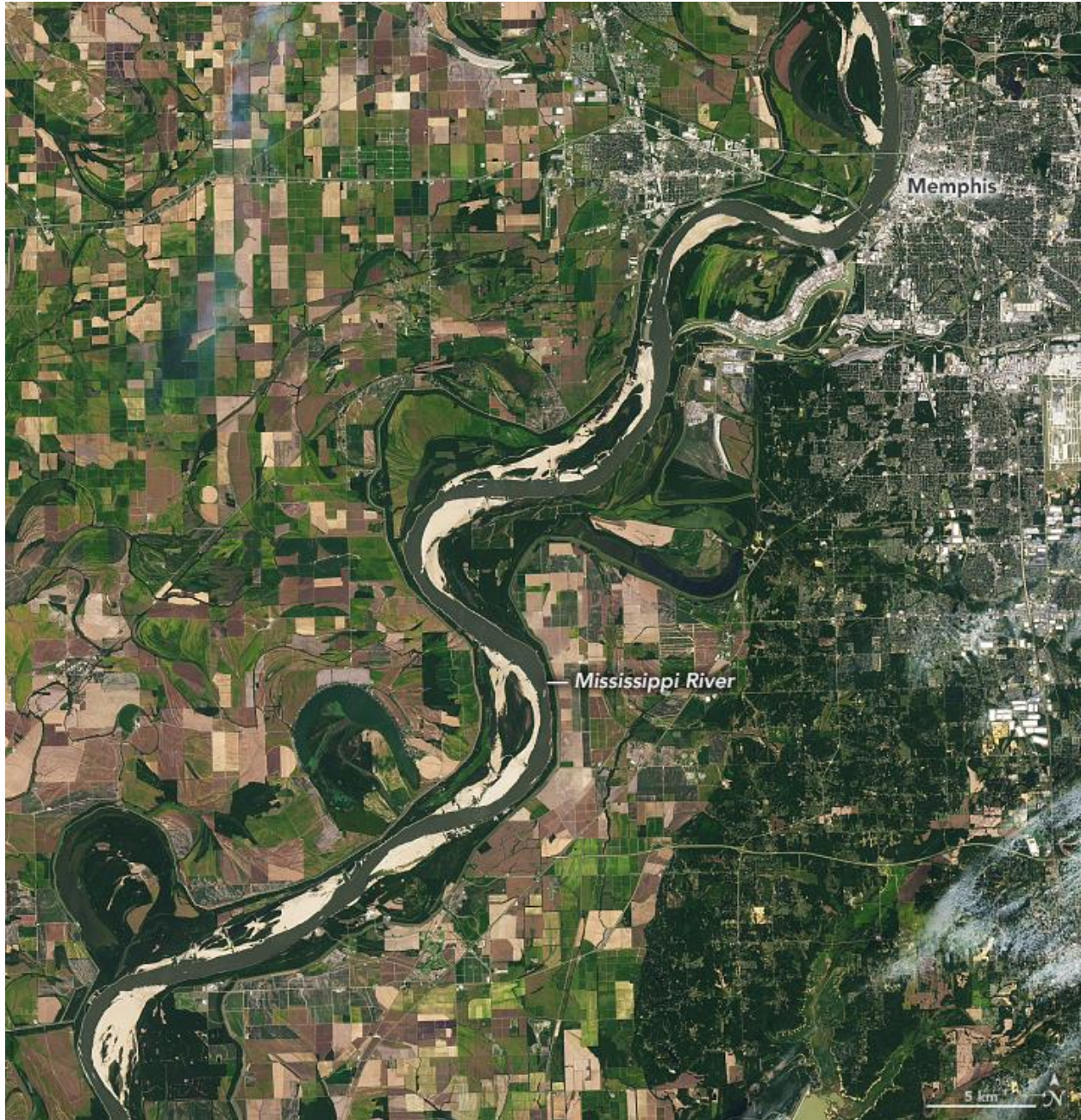
Fire Danger: The National Interagency Fire Center significant wildland fire outlook for October shows that most of Tennessee (including West TN, Middle TN, and the Cumberland Plateau) will have an above normal potential for significant wildland fires. While most of East Tennessee is shown with normal potential for significant wildland fires, drying conditions outside of the far northeast corner of the state could increase the likelihood of wildland fires as we head into October, which is typically the driest month of the year for this portion of the state.



Story of the Month:

The story of September 2023 was the emerging flash drought impacting the state. After mostly wetter than normal summer months, rains simply cut off for most areas of the state in September, with some areas recording less than 10% of their normal monthly rainfall. In addition to the dry weather, most areas of the state had warmer than normal conditions for the month, except for a cool spell in the third week of September. The hot sunny days increased evapotranspiration and led to rapid dry down in plants and near-surface soil moisture. Over the course of the month the state went from being free of drought, and with only 0.04% of the state’s area in Abnormally Dry (D0) conditions on the US Drought Monitor on September 5th to 79.10% of the state being shown in Abnormally Dry (D0) or Moderate Drought (D1) on the US Drought monitor for October 3.

In addition to the dry conditions in Tennessee, persistent summer drought in the Midwest led to new preliminary record low water level on the Mississippi River at several USGS stream gauges. The stream gauges set preliminary record lows at Tiptonville (TN) and Caruthersville (MO) on September 12, and Memphis (TN) on September 14. This is the second year in a row that a record low water level has been set on the Mississippi River stream gauge at Memphis. Satellite imagery of the river shows extensive sandbanks exposed, and river traffic was restricted due to low water levels. The water levels in the river at Memphis were only about 1-foot above the lower operational limit for any river traffic. There was a slight rise in water levels at the end of September, with the river at Memphis being up to -10ft for the start of October, but it is forecast to lower again to near record low levels later this month.

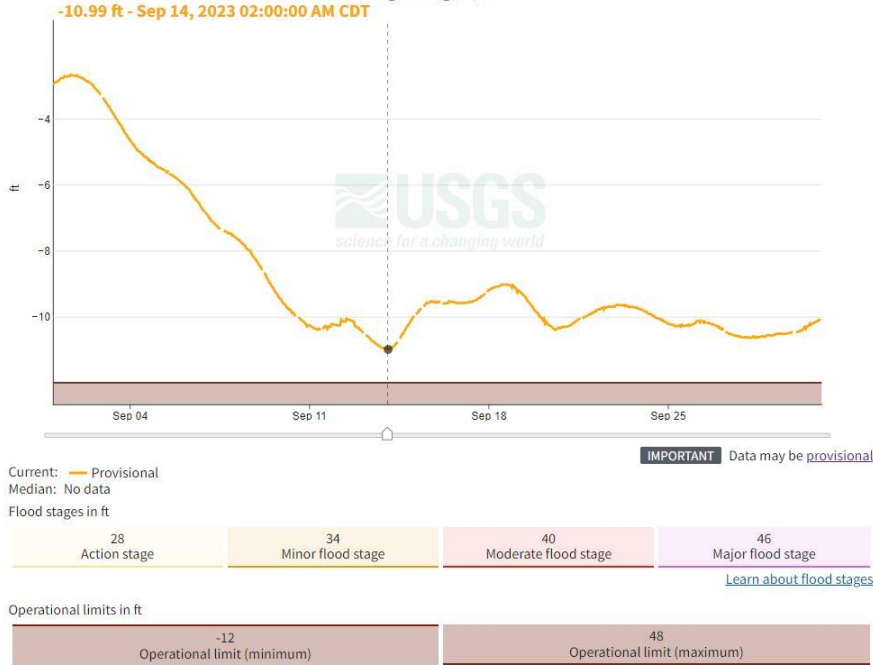


Satellite imagery of the Mississippi River from Memphis into northern Mississippi from September 16, 2023. (Image via NASA Earth Observatory: <https://earthobservatory.nasa.gov/images/151897/the-mississippi-is-mighty-parched>)

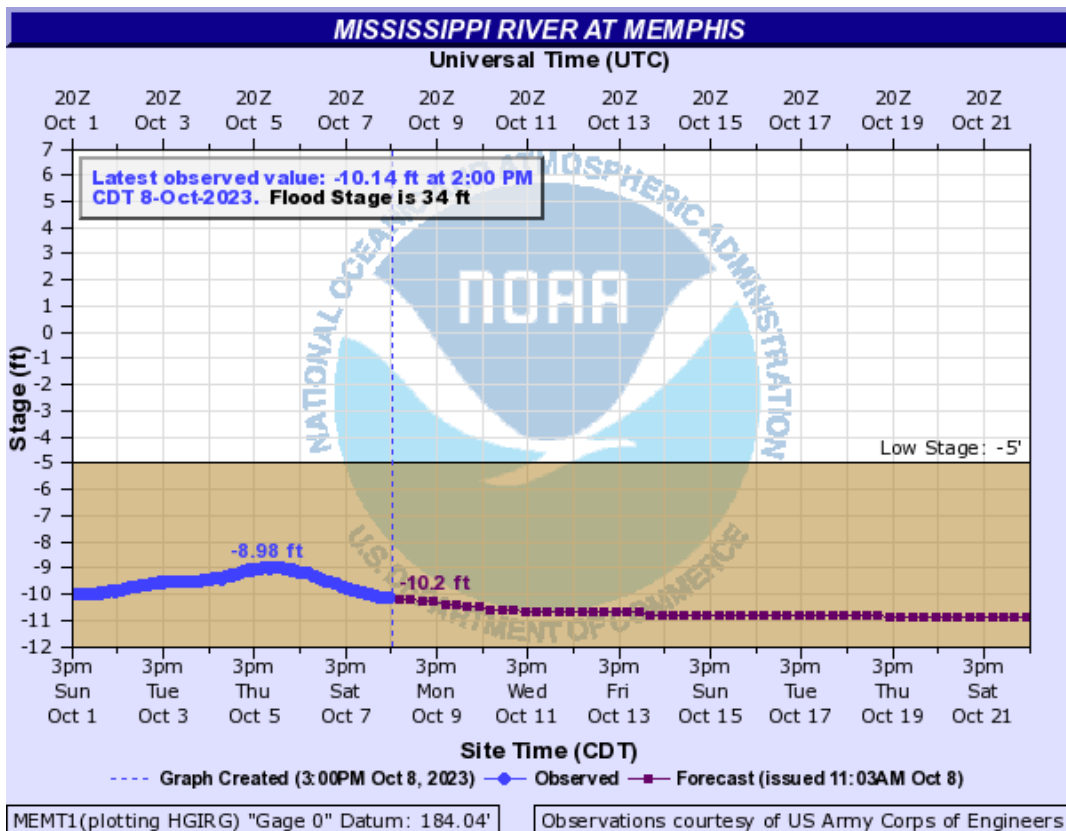
Mississippi River at Memphis, TN - 07032000

September 1, 2023 - September 30, 2023

Gage height, feet



Mississippi River at Memphis gauge height graph for the month of September 2023.



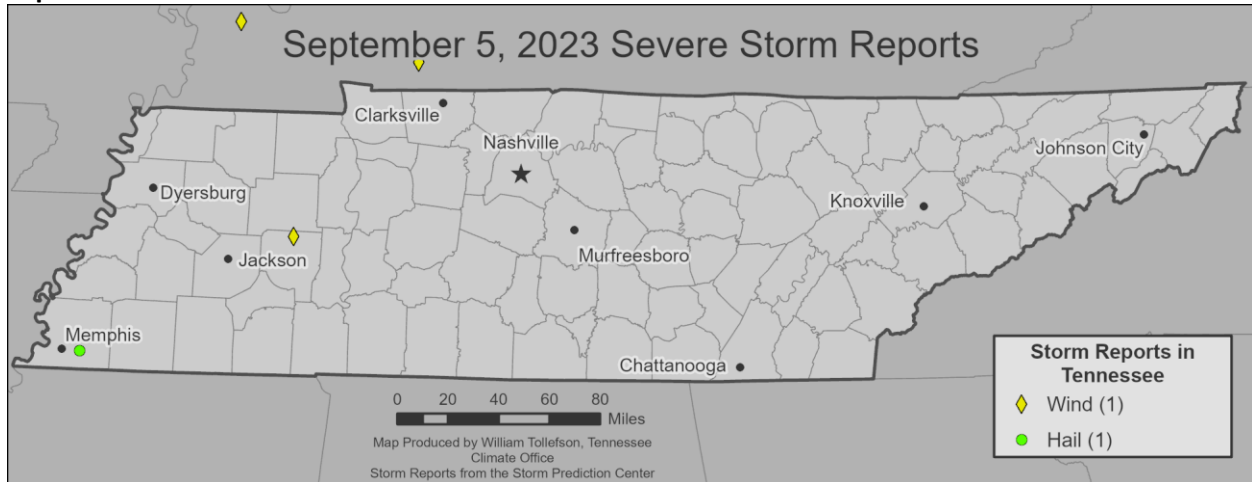
USGS forecast for the Mississippi River at Memphis for October 2023.

Storm Reports:

*Storm Reports are based on filtered NOAA Storm Prediction Center data or local NWS storm reports. Future quality control checks may change the official record of severe events, please see [spc.noaa.gov](https://www.spc.noaa.gov) for any updates.

There were 7 days with severe storm reports during September 2023, with no reported tornadoes, 13 reports of severe wind damage, and 3 reports of severe hail (with a diameter of 1" or larger).

September 5



Wind:

Time (UTC)	Speed (mph)	Location	County	Lat	Lon	Comments
23:06	--	1 WNW Wildersville	Henderson	35.79	-88.38	Trees down at intersection of Battleground Dr. and Wildersville Road just south of I-40. Time is radar estimated. (MEG)

Hail:

Time (UTC)	Size (in)	Location	County	Lat	Lon	Comments
22:15	1.50	3 NE Southeast Memphis	Shelby	35.1	-89.85	Caller reported large hail up to ping-pong size lasting approximately 5 minutes resulting in small dents on their car. (MEG)

September 7



Hail:

Time (UTC)	Size (in)	Location	County	Lat	Lon	Comments
20:57	1.00	4 N Shady Valley	Sullivan	36.57	-81.93	Quarter size hail and a few trees down near Shady Valley. (MRX)

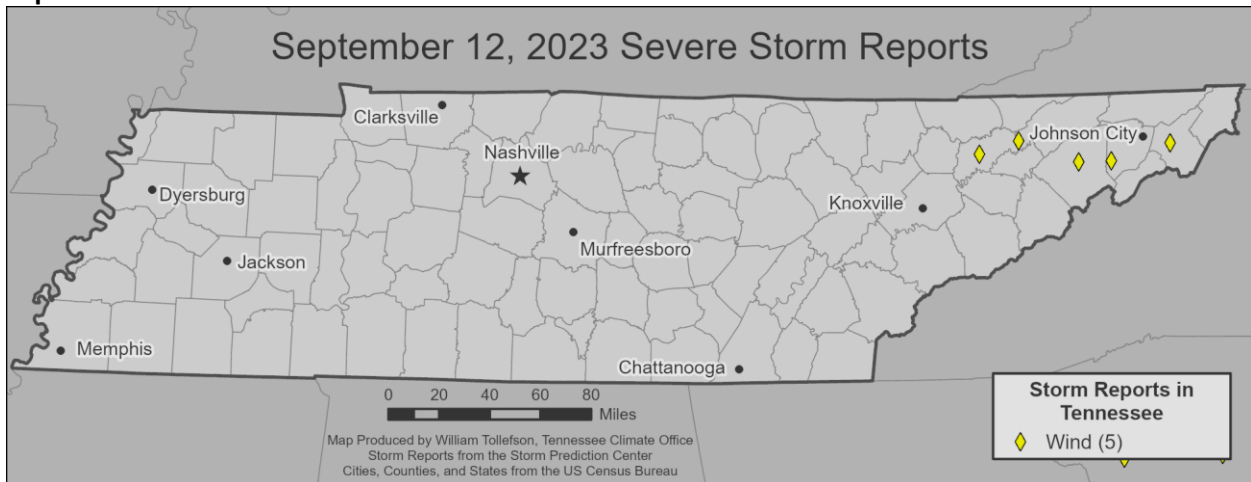
September 9



Wind:

Time (UTC)	Speed (mph)	Location	County	Lat	Lon	Comments
23:12	--	2 ENE Jacksboro	Campbell	36.35	-84.16	Trees down in the Pinecrest Community. (MRX)
0:05	--	2 SSW Arthur	Claiborne	36.52	-83.69	Few trees down near Arthur. Time estimated from radar. (MRX)

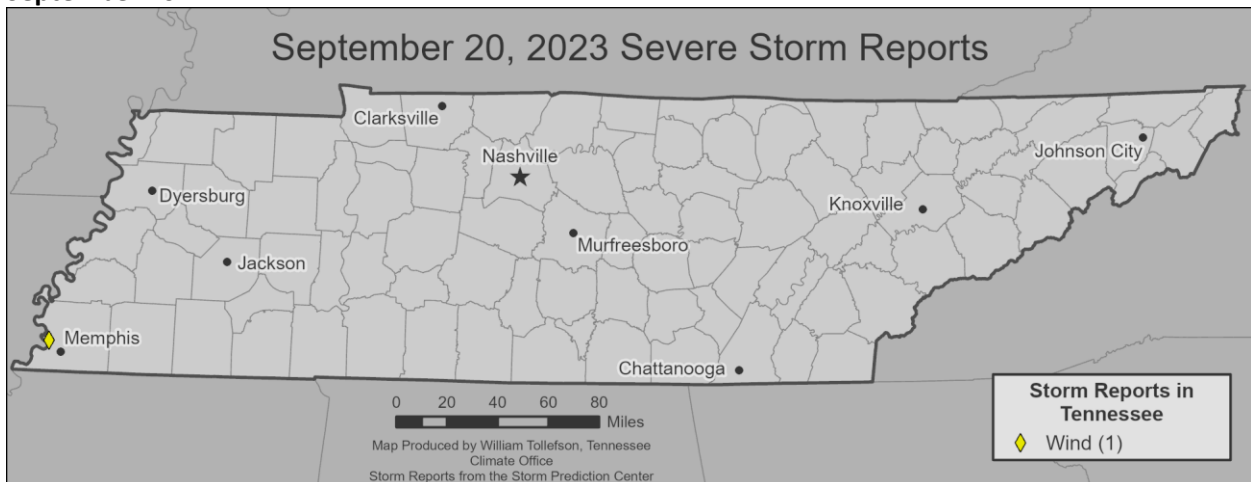
September 12



Wind:

Time (UTC)	Speed	Location	County	Lat	Lon	Comments
19:08	--	1 W Rutledge	Grainger	36.27	-83.54	Large limb down. (MRX)
19:51	--	2 W Mooresburg	Hawkins	36.34	-83.26	Several trees down. (MRX)
20:30	--	3 NNW Greeneville	Greene	36.21	-82.84	Several trees down. (MRX)
20:50	--	2 ESE Limestone	Washington	36.21	-82.61	Trees down at intersection of Old State Route 34 and Taylor Mill Road near Limestone. Time estimated from radar. (MRX)
21:45	--	1 NNW Hampton	Carter	36.3	-82.19	A few trees down. (MRX)

September 20



Wind:

Time (UTC)	Speed (mph)	Location	County	Lat	Lon	Comments
21:03	--	2 N Downtown Memphis	Shelby	35.17	-90.06	Large tree down across Island Dr near the Island Park apartment complex. (MEG)

September 27



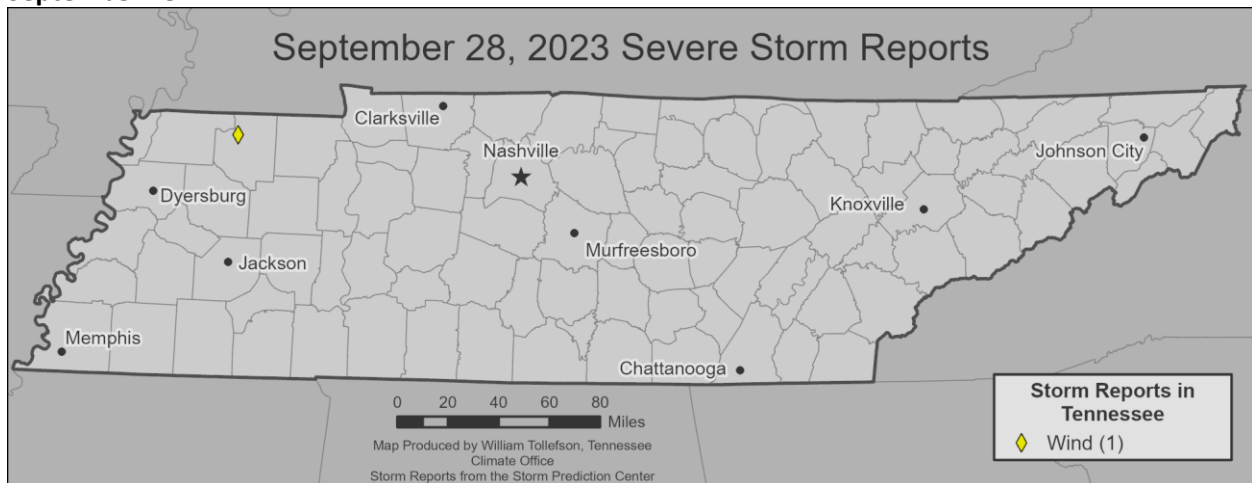
Wind

Time (UTC)	Speed (mph)	Location	County	Lat	Lon	Comments
17:55	60	Murfreesboro	Rutherford	35.85	-86.39	60 mph wind gust recorded at the Murfreesboro airport (KMBT). (OHX)
18:00	--	2 E Murfreesboro	Rutherford	35.85	-86.37	A tree and several large branches were blown down at MTSU. (OHX)

Hail

Time (UTC)	Size (in)	Location	County	Lat	Lon	Comments
17:54	1.00	5 W Murfreesboro	Rutherford	35.84	-86.48	Quarter size hail was reported via mPING. (OHX)

September 28



Wind

Time (UTC)	Speed (mph)	Location	County	Lat	Lon	Comments
22:25	--	5 ENE Martin	Weakley	36.38	-88.79	Large tree down blocking the road. No injuries reported. (MEG)

CPC Outlooks for the Next Month:

The NOAA Climate Prediction Center 1-month outlook for October shows almost all of Tennessee leaning towards above normal temperatures for the month, and all of Tennessee leaning towards below normal precipitation, with slightly higher confidence than the temperature outlook.

