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Tennessee Climate Office Monthly Report

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12-1-2020

### 2020 December - Tennessee Monthly Climate Report

Tennessee Climate Office, East Tennessee State University

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# December 2020 Tennessee State Climate Summary

Tennessee Climate Office \* East Tennessee State University

Prepared by William Tollefson and Dr. Andrew Joyner

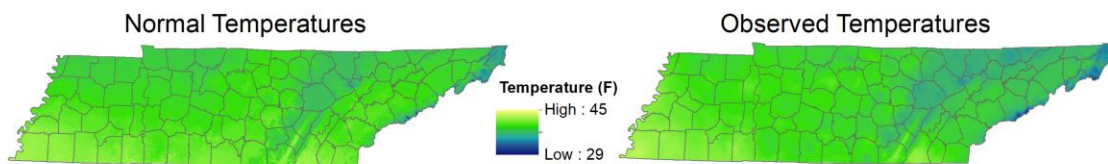
With contributions by Climate Data Representatives at University of Memphis, University of Tennessee-Martin, Vanderbilt University, University of Tennessee-Knoxville, and University of Tennessee-Institute of Agriculture

## Monthly Temperature Summary:

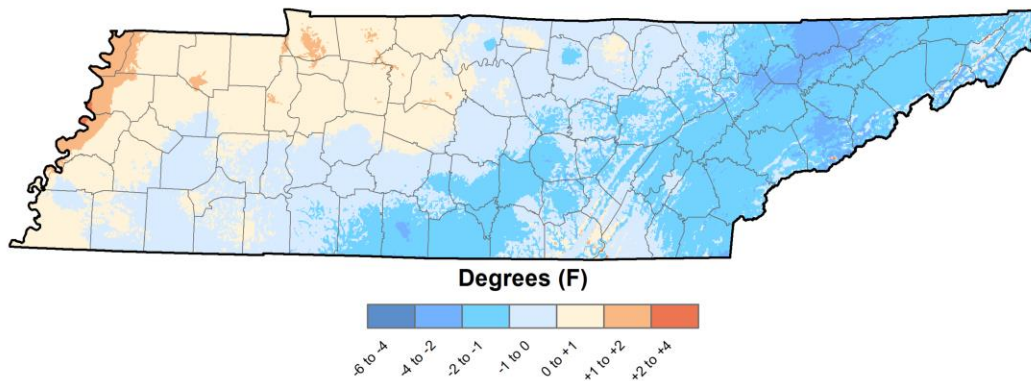
Mean Temperatures for December 2020 averaged close to normal across the state (mostly within 1°F of normal December temperatures, with some exceptions). The northwest portion of the state recorded slightly warmer than normal conditions, while southern Middle Tennessee, and East Tennessee recorded below normal temperatures. Despite the average temperatures of the month, there was a large range in observed conditions. Temperatures across the state ranged from 76°F at Ames Plantation on December 11<sup>th</sup> to -6°F at Mount LeConte on December 26<sup>th</sup>! A strong cold front swept through the state December 24-25<sup>th</sup>, ushering in the coldest air of the season. Temperatures dipped into the teens and low 20's, with single digits recorded from Dec 25-28<sup>th</sup> at several stations, even dropping to 0°F at Pickett State Park and -6°F at Mt. LeConte in the Great Smoky Mountains. The cold temperatures were combined with high winds, and wind-chill warnings were issued for many higher elevation counties in East TN.



## December 2020 Mean Temperature



Departure From Normal Temperatures



Stations with the highest mean temperature

Station Name	Station Type	Mean Temperature (F)
MEMPHIS INTERNATIONAL AP	WBAN	44.3
SHILOH NMP TENNESSEE	RAWS	44
CHATTANOOGA AP	WBAN	43.7
WOODBURY 1 WNW	COOP	42.3
LEWISBURG TOWER TENNESSEE	RAWS	42.2

Map Data From: PRISM Climate Group, Oregon State University, 1981-2010 Normals Used, Station Data retrieved from SC ACIS2

Stations with the lowest mean temperature

Station Name	Station Type	Mean Temperature (F)
MT LECONTE	COOP	26.2
NEWFOUND GAP	COOP	31.5
TAZEWELL	COOP	33.3
ROAN MOUNTAIN 3SW	COOP	34.5
CROSSVILLE EXP STN	COOP	34.9

### Monthly Precipitation Summary:

Overall, December was a dry month across Tennessee, with most areas recording below normal precipitation. Parts of East Tennessee recorded above normal precipitation, and heavy rains at the end of the month helped to produce a band of normal to slightly above normal precipitation along a line from Memphis to Clarksville and from Nashville to the northeast towards Pickett County. The dry conditions earlier in the month produced large expansions of D0 (Abnormally Dry) and some D1 (Moderate Drought) expansion in the western half of the state in the US Drought Monitor. There were two large snow events this month, with snowfall reported over much of the state on December 1st, producing minor accumulations on the Cumberland Plateau and in East Tennessee with higher totals in the mountains. A second snow event occurred overnight on Christmas Eve and through Christmas Day. With snowfall reported in most areas from Nashville eastward, and accumulations on the Cumberland Plateau and in East Tennessee. Even valley locations in East Tennessee recorded moderate accumulations around four to six inches, with even higher totals in the mountains.

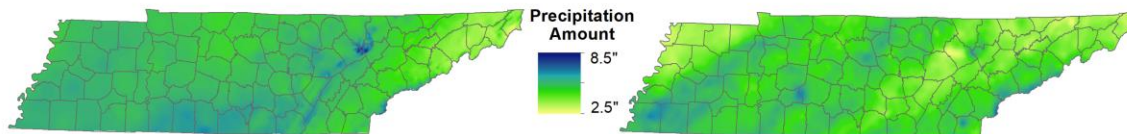


## December 2020 Precipitation

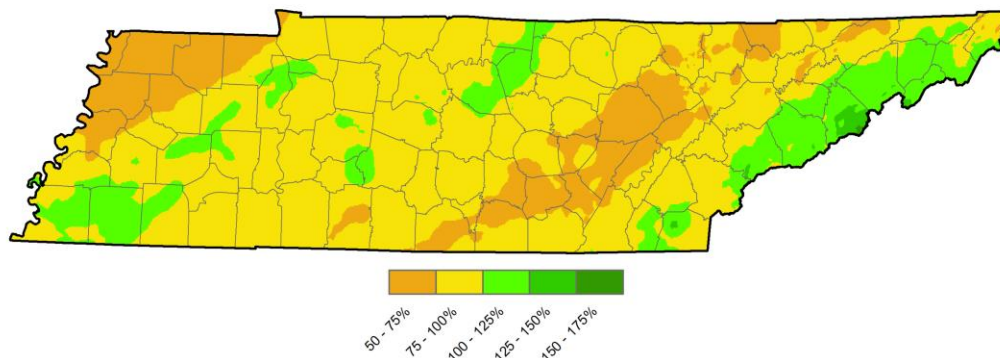


Normal Precipitation

Observed Precipitation



Percent Normal Precipitation



Stations with the most precipitation

Station Name	Station Type	Total Precipitation (in)
MT LECONTE	COOP	7.45
BENTON 2.3 ESE	CoCoRaHS	7.44
NEWFOUND GAP	COOP	6.93
MEMPHIS INTERNATIONAL AP	WBAN	6.39
BROWNSVILLE	COOP	6.22

Map Data From: PRISM Climate Group, Oregon State University, 1981-2010 Normals Used  
Station Data retrieved from SC ACIS2

Stations with the least precipitation

Station Name	Station Type	Total Precipitation (in)
CLARKSBURG 5.6 E	CoCoRaHS	1.46
ATOKA 3.2 ESE	CoCoRaHS	1.75
MORRISTOWN WFO	COOP	2.11
HENRY 4.5 N	CoCoRaHS	2.45
GREENFIELD 0.3 SW	CoCoRaHS	2.46

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

Station data for airports across the state using WBAN weather stations:

Station Name	Temperatures (°F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	%Norm
<b>Memphis</b>	53.5	35.0	44.3	<b>+0.7</b>	73	12/10	21	12/25	6.39	<b>+0.65</b>	<b>111%</b>
<b>Jackson</b>	51.5	29.0	40.3	<b>-0.5</b>	72	12/10	17	12/25	4.87	<b>-0.48</b>	<b>91%</b>
<b>Clarksville</b>	50.4	29.2	39.8	<b>+1.1</b>	72	12/10	15	12/25	4.12	<b>-0.91</b>	<b>82%</b>
<b>Nashville</b>	52.6	30.8	41.7	<b>+1.3</b>	71	12/10	17	12/26	3.40	<b>-0.84</b>	<b>80%</b>
<b>Chattanooga</b>	54.2	33.3	43.7	<b>+1.1</b>	67	12/11	19	12/26	4.46	<b>-0.44</b>	<b>91%</b>
<b>Crossville</b>	47.0	28.5	37.7	<b>-0.8</b>	63	12/10	8	12/26	3.49	<b>-1.46</b>	<b>71%</b>
<b>Knoxville</b>	49.7	30.0	39.9	<b>-0.9</b>	66	12/12	11	12/26	3.74	<b>-0.76</b>	<b>83%</b>
<b>Bristol</b>	47.8	27.0	37.4	<b>-0.4</b>	67	12/12	6	12/26	3.52	<b>+0.15</b>	<b>104%</b>

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
AMES PLANTATION	COOP	76	11
JACKSON EXP STA	COOP	75	11
WOODBURY 1 WNW	COOP	75	12
GERMANTOWN 4SE	COOP	75	11
CLARKSVILLE WWTP	COOP	74	9
SHILOH NMP TENNESSEE	RAWS	74	10
BOLIVAR WATER WORKS	COOP	73	11
SHELBYVILLE WATER DEPT	COOP	73	31
CLARKSVILLE NO.2	COOP	73	11
JACKSON 4 NE	COOP	73	11
DECATURVILLE	COOP	73	11
MEMPHIS INTERNATIONAL AP	WBAN	73	10
MEMPHIS WFO	WBAN	73	11

*Seven stations tied for the seventh highest maximum temperature (73°F).*

**Coldest Stations (lowest minimum temperature)**

Station Name	Station Type	Lowest Temperature (F)	Date
MT LECONTE	COOP	-6	26
PICKETT STATE PARK	COOP	0	26
TAZEWELL	COOP	1	26
NEWFOUND GAP	COOP	1	26
ROAN MOUNTAIN 3SW	COOP	3	27
GREENEVILLE EXP STA	COOP	4	26
MAYNARDVILLE	COOP	6	26
CHEROKEE TENNESSEE	RAWS	6	26
COKER CREEK TENNESSEE	RAWS	6	26
CROSSVILLE 7 NW	WBAN	6	26
BRISTOL AP	WBAN	6	26

*Five stations tied for the seventh coldest temperature (6°F).*

**Warmest Stations (highest mean temperatures)**

Station Name	Station Type	Mean Temperature (F)
MEMPHIS INTERNATIONAL AP	WBAN	44.3
SHILOH NMP TENNESSEE	RAWS	44
CHATTANOOGA AP	WBAN	43.7
WOODBURY 1 WNW	COOP	42.3
LEWISBURG TOWER TENNESSEE	RAWS	42.2
GERMANTOWN 4SE	COOP	42.1
MEMPHIS WFO	WBAN	42.1
CAMDEN TOWER TENNESSEE	RAWS	42
AMES PLANTATION	COOP	41.9
SHELBYVILLE WATER DEPT	COOP	41.9
BURNS TENNESSEE	RAWS	41.9

*Three stations tied for the ninth warmest temperature (41.9°F).*

**Cooltest Stations (lowest mean temperatures)**

Station Name	Station Type	Mean Temperature (F)
MT LECONTE	COOP	26.2
NEWFOUND GAP	COOP	31.5
TAZEWELL	COOP	33.3
ROAN MOUNTAIN 3SW	COOP	34.5
CROSSVILLE EXP STN	COOP	34.9
NORRIS	COOP	35.5
ONEIDA	COOP	35.6
CROSSVILLE 7 NW	WBAN	35.8
ROGERSVILLE 1 NE	COOP	35.9
MAYNARDVILLE	COOP	35.9

**Wettest Stations (highest precipitation totals):**

Station Name	Station Type	Total Precipitation (in)
MT LECONTE	COOP	7.45
BENTON 2.3 ESE	CoCoRaHS	7.44
NEWFOUND GAP	COOP	6.93
MEMPHIS INTERNATIONAL AP	WBAN	6.39
BROWNSVILLE	COOP	6.22
SHELBYVILLE WATER DEPT	COOP	6.01
AMES PLANTATION	COOP	6
JACKSON 4 NE	COOP	5.99
JACKSON EXP STA	COOP	5.95
PETROS 0.2E	CoCoRaHS	5.8
HAMPSHIRE 2.7 SW	CoCoRaHS	5.8
MURFREESBORO 5 N	COOP	5.8

*Three stations tied for the tenth highest precipitation total (5.8").*

**Driest Stations (lowest precipitation totals):**

Station Name	Station Type	Total Precipitation (in)
CLARKSBURG 5.6 E	CoCoRaHS	1.46
ATOKA 3.2 ESE	CoCoRaHS	1.75
MORRISTOWN WFO	COOP	2.11
HENRY 4.5 N	CoCoRaHS	2.45
GREENFIELD 0.3 SW	CoCoRaHS	2.46
LENOIR CITY	COOP	2.64
MADISONVILLE 1.2 NNE	CoCoRaHS	2.67
DICKSON 6.7 SSW	CoCoRaHS	2.79
TEN MILE 2.2 NW	CoCoRaHS	2.79
FAIRVIEW 1.3 WNW	CoCoRaHS	2.8
DECATUR 7NE	COOP	2.8

*Two stations tied for the tenth lowest precipitation total (2.8").*

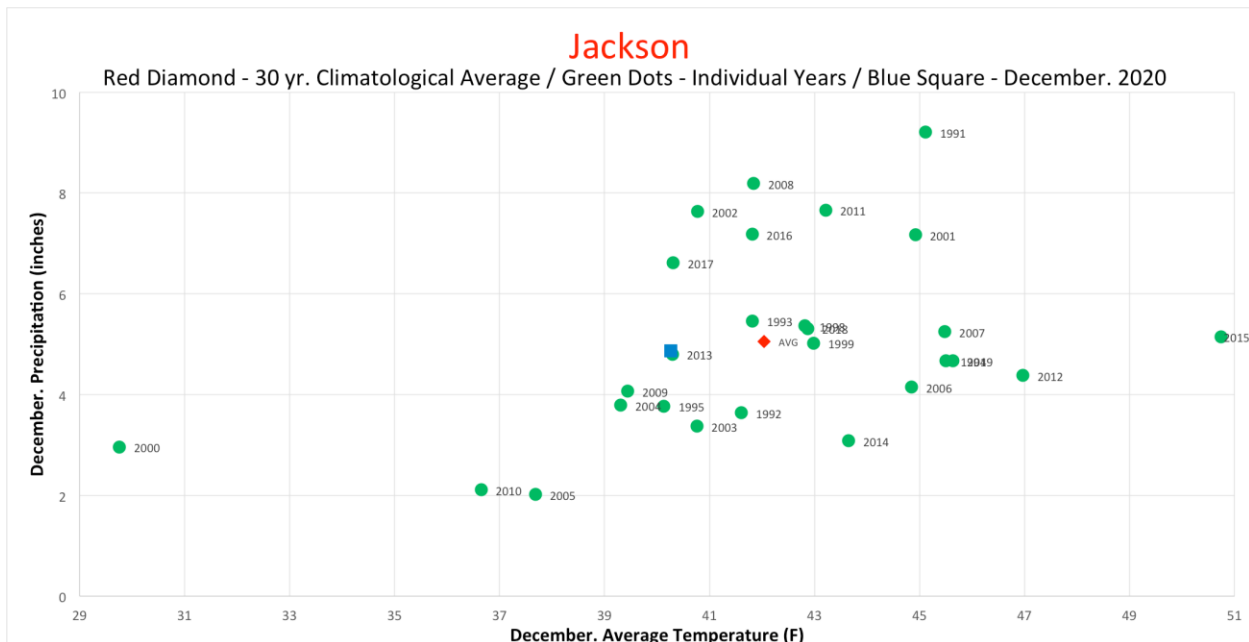
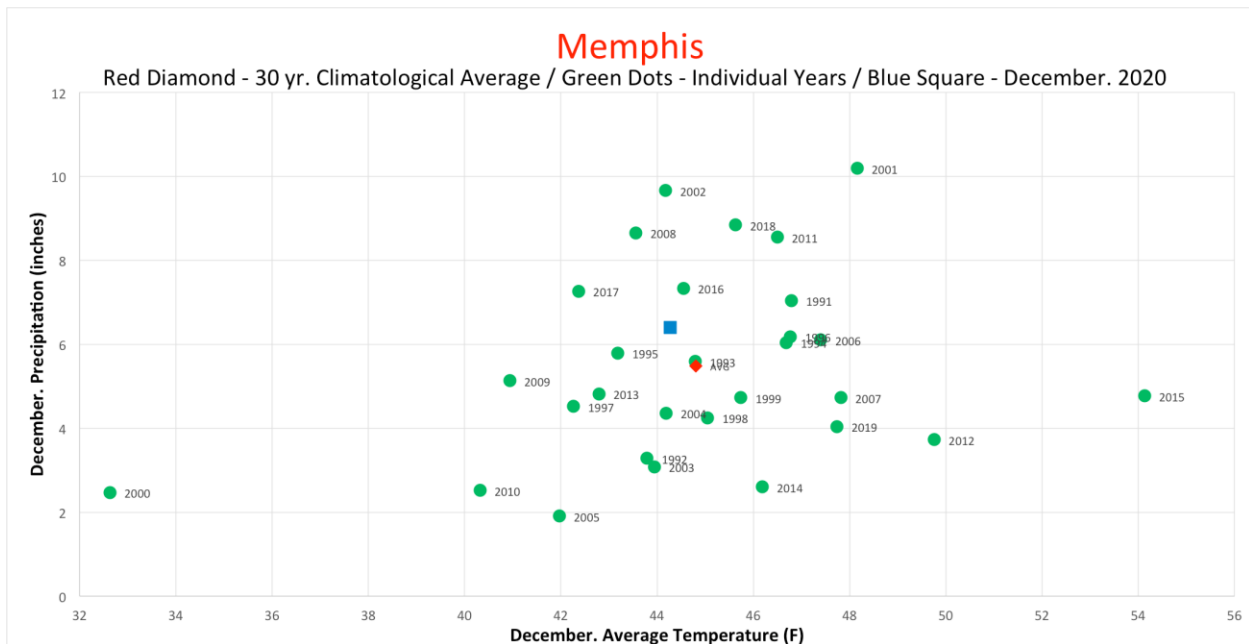
**Snowiest Stations (highest snowfall accumulations):**

Station Name	Station Type	Total Snowfall (in)
MT LECONTE	COOP	30.2
ROAN MOUNTAIN 3SW	COOP	14
GREENEVILLE 1.6 W	CoCoRaHS	8.9
GREENEVILLE EXP STA	COOP	8.5
GREENEVILLE 10.1 S	CoCoRaHS	8
KNOXVILLE 5.5 W	CoCoRaHS	7.9
NEWFOUND GAP	COOP	7.6
KYLES FORD 1.0 N	CoCoRaHS	7.3
MARYVILLE 4.1 SSW	CoCoRaHS	7
GREENEVILLE 3.0 S	CoCoRaHS	6.8

*An additional 171 stations reported measurable snowfall during the month, and an additional 51 stations reported a trace amount of snow (less than 1/10<sup>th</sup> inch). 117 stations reported no snow during December.*

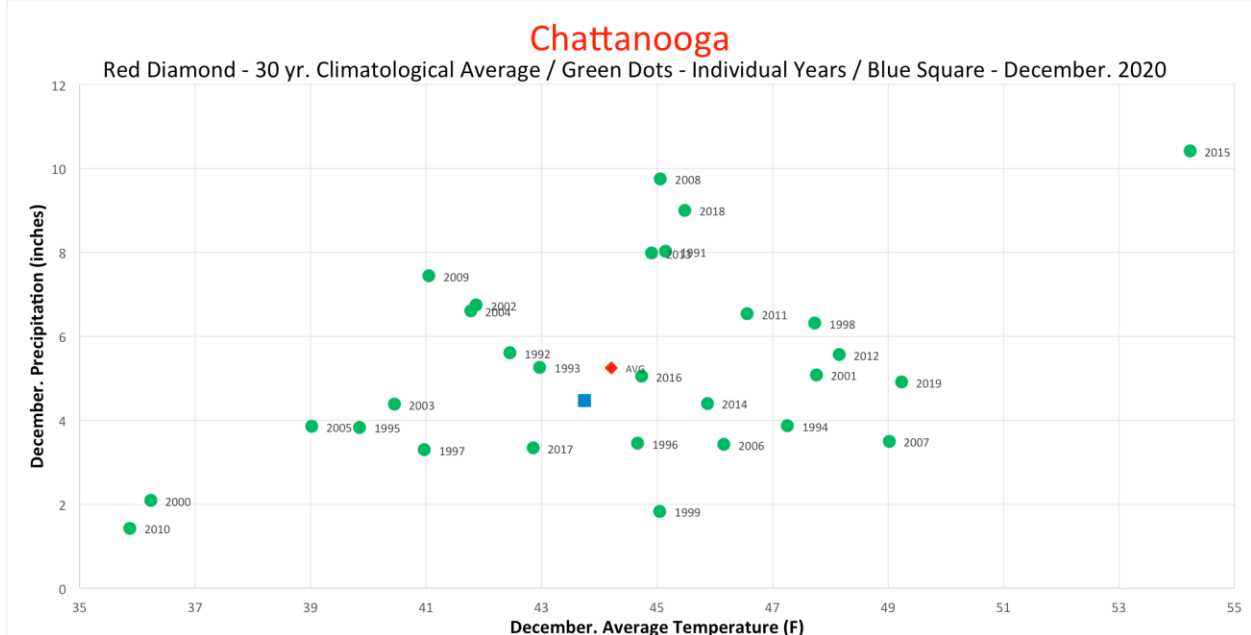
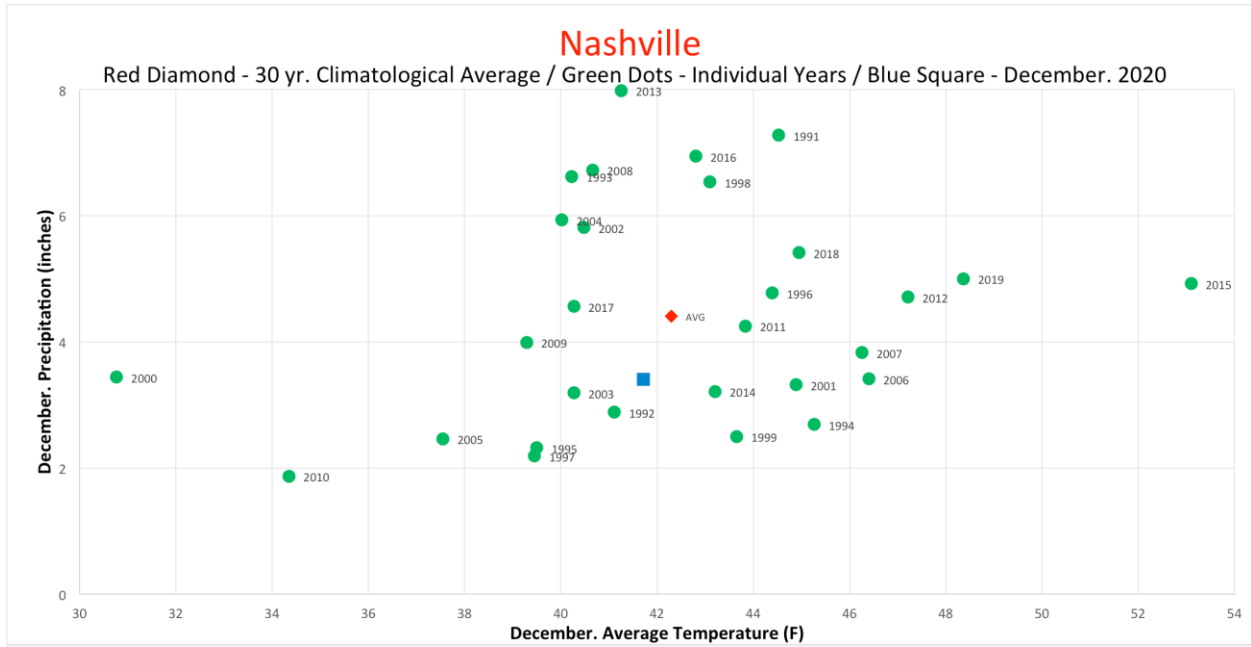
### The Month in Comparison:

Comparing the average temperature and total precipitation for December 2020, to the data for the previous thirty Decembers, we can see that most locations were close to normal for both measures. All locations had temperatures that were slightly below the average value for the last thirty years. However, compared to the 1981-2010 climate normals used in the previous Station Data section, Memphis, Nashville, and Chattanooga were a little above those normal temperatures (0.7-1.3 degrees warmer). A similar situation occurred with the precipitation data for the Bristol/Tri-Cities airport where the observed precipitation was slightly above the 1981-2010 normal, but slightly below the average precipitation total for the last 30 years. This is the last year the official NOAA/NCEI climate normal will be used, and NOAA will be releasing the 1991-2020 climate normal values later this year.

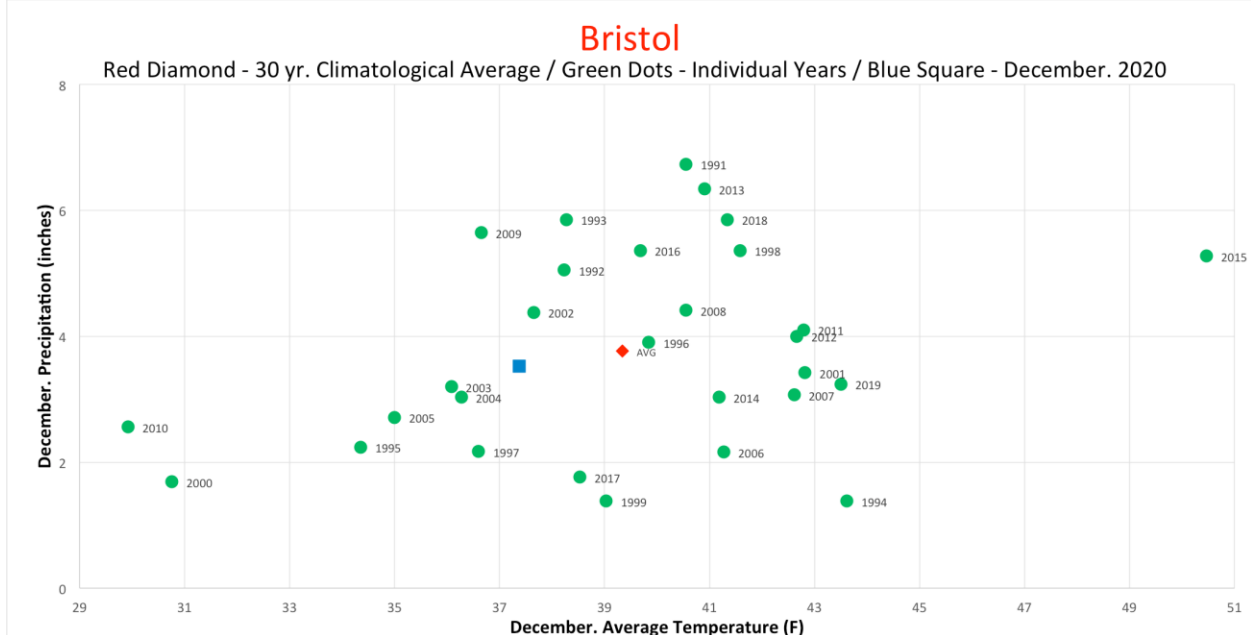
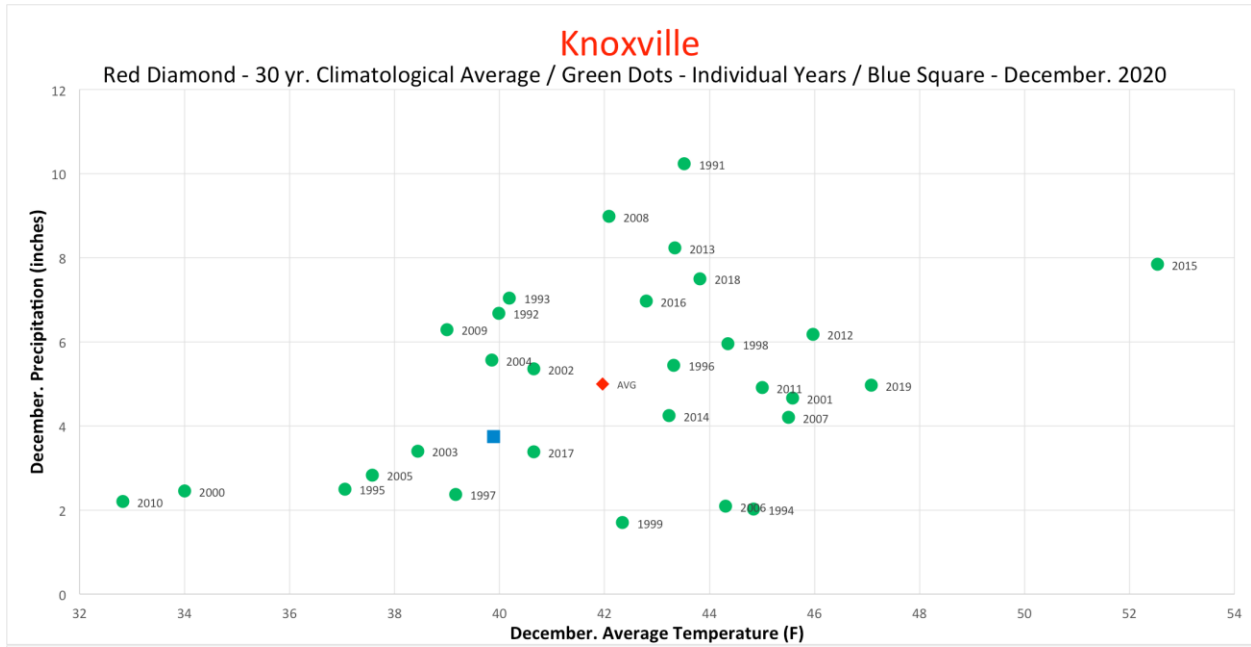




December 2020 Tennessee State Climate Summary



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### Drought Monitor:

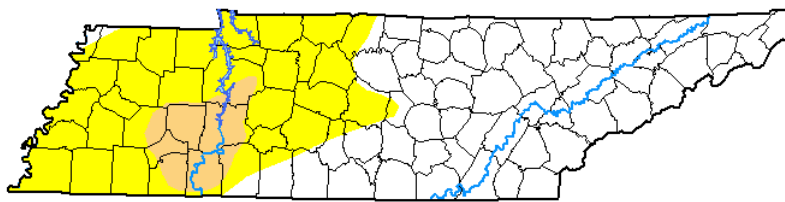
The D0 and D1 (Abnormally Dry and Moderate Drought) conditions that formed in November expanded in the western half of the state in December. There were small areas of improvement on the eastern end of the D0 area in Middle Tennessee. As of the last US Drought Monitor in December, 7.61% of the state was experiencing Moderate Drought and 37.3% of the state was experiencing Abnormally Dry conditions. Widespread heavy precipitation at the end of December and beginning of January may produce improvements in drought conditions in January 2021.

Author:

Adam Hartman  
NOAA/NWS/NCEP/CPC

## U.S. Drought Monitor Tennessee

**December 29, 2020**  
(Released Thursday, Dec. 31, 2020)  
Valid 7 a.m. EST



Intensity:

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

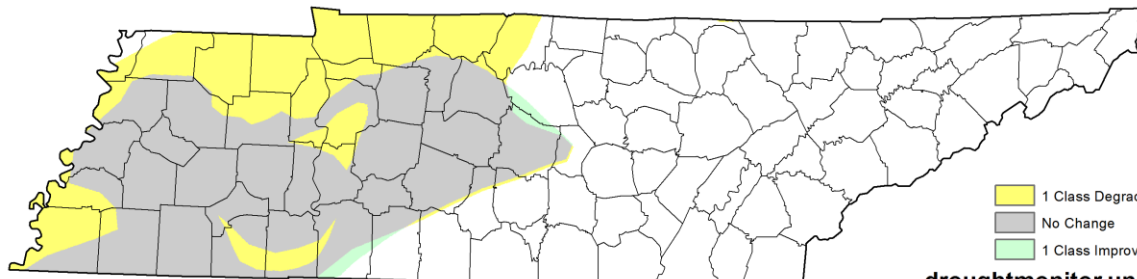
[droughtmonitor.unl.edu](http://droughtmonitor.unl.edu)



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>

December 29, 2020  
compared to  
December 1, 2020

### U.S. Drought Monitor Class Change - Tennessee 1 Month



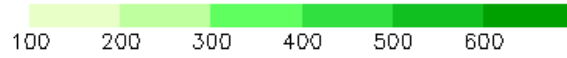
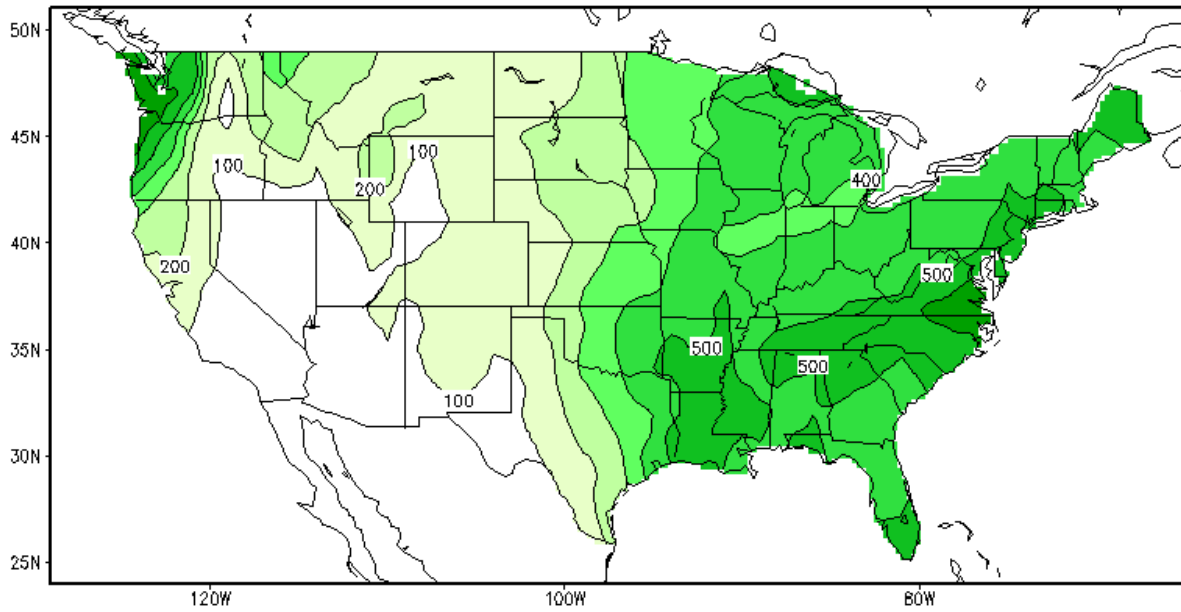
- 1 Class Degradation
- No Change
- 1 Class Improvement

[droughtmonitor.unl.edu](http://droughtmonitor.unl.edu)

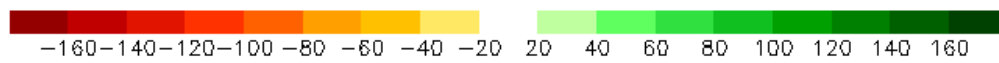
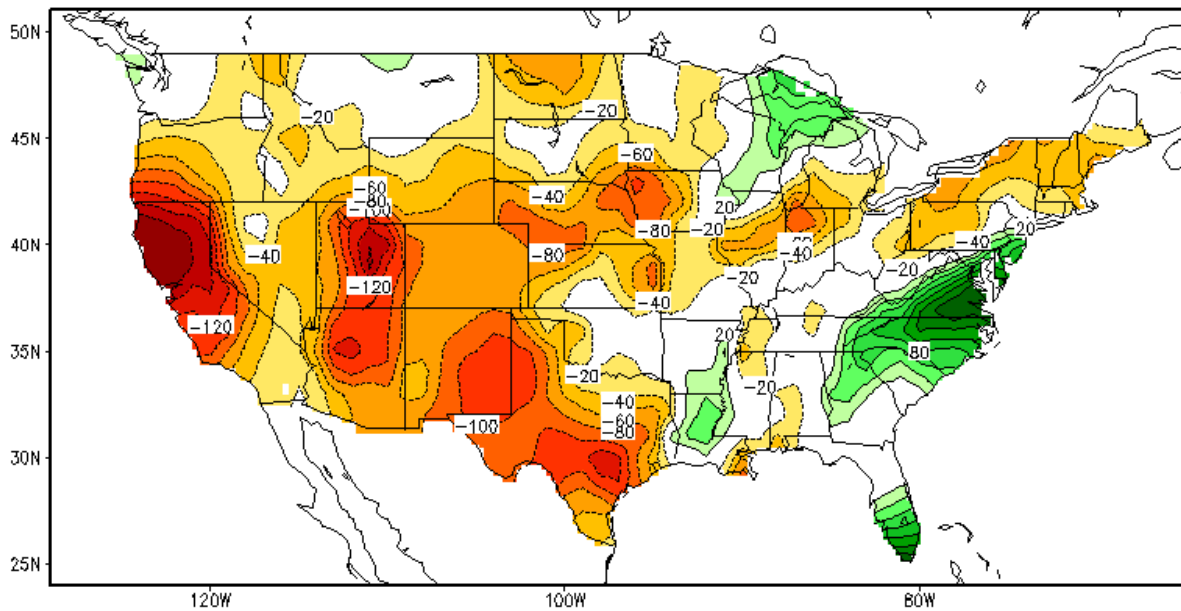
### Soil Moisture:

Soil moisture for the month ranged from 400 to 500mm, with most of West Tennessee and northern portions of Middle Tennessee reporting below normal soil moisture conditions, while most of East Tennessee had slightly above normal soil moisture. Dry conditions, except at the end of the month, led to reductions of 80-90mm in soil moisture levels over the month.

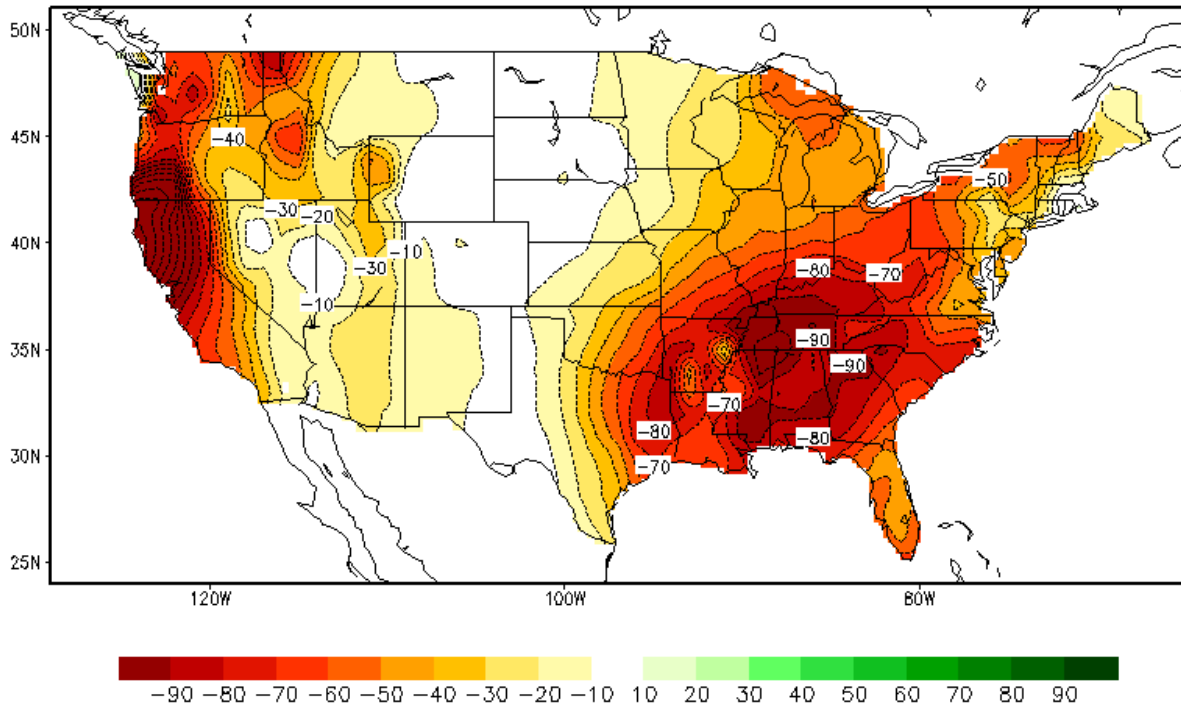
### Calculated Soil Moisture (mm) DEC, 2020



### Calculated Soil Moisture Anomaly (mm) DEC, 2020



### Calculated Soil Moisture Anomaly Change DEC 31, 2020 from NOV.30



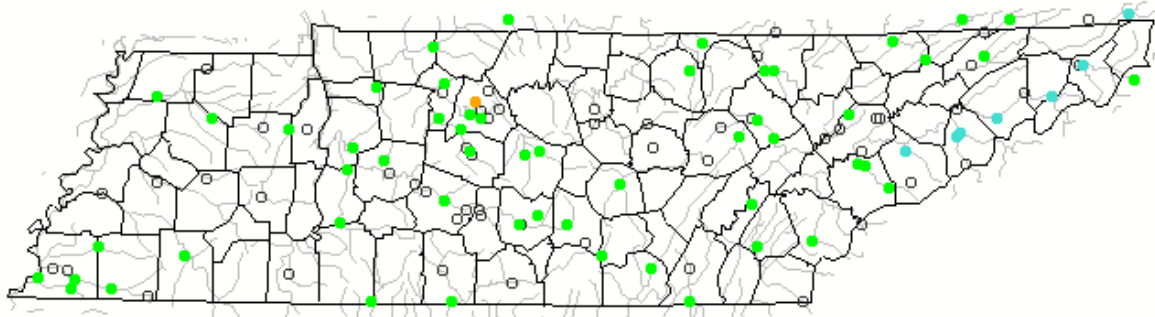
**Streamflow:**

Averaged over the month, most stream gauges reported streamflow in the normal range. With above normal precipitation and a cooler than normal month, some gauges in northeast Tennessee, recorded above normal streamflow for December.

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

Tennessee ▼ or Water-Resources Regions ▼

December 2020



Search USGS streamgauge 🔍

Choose a data retrieval option and select a location on the map

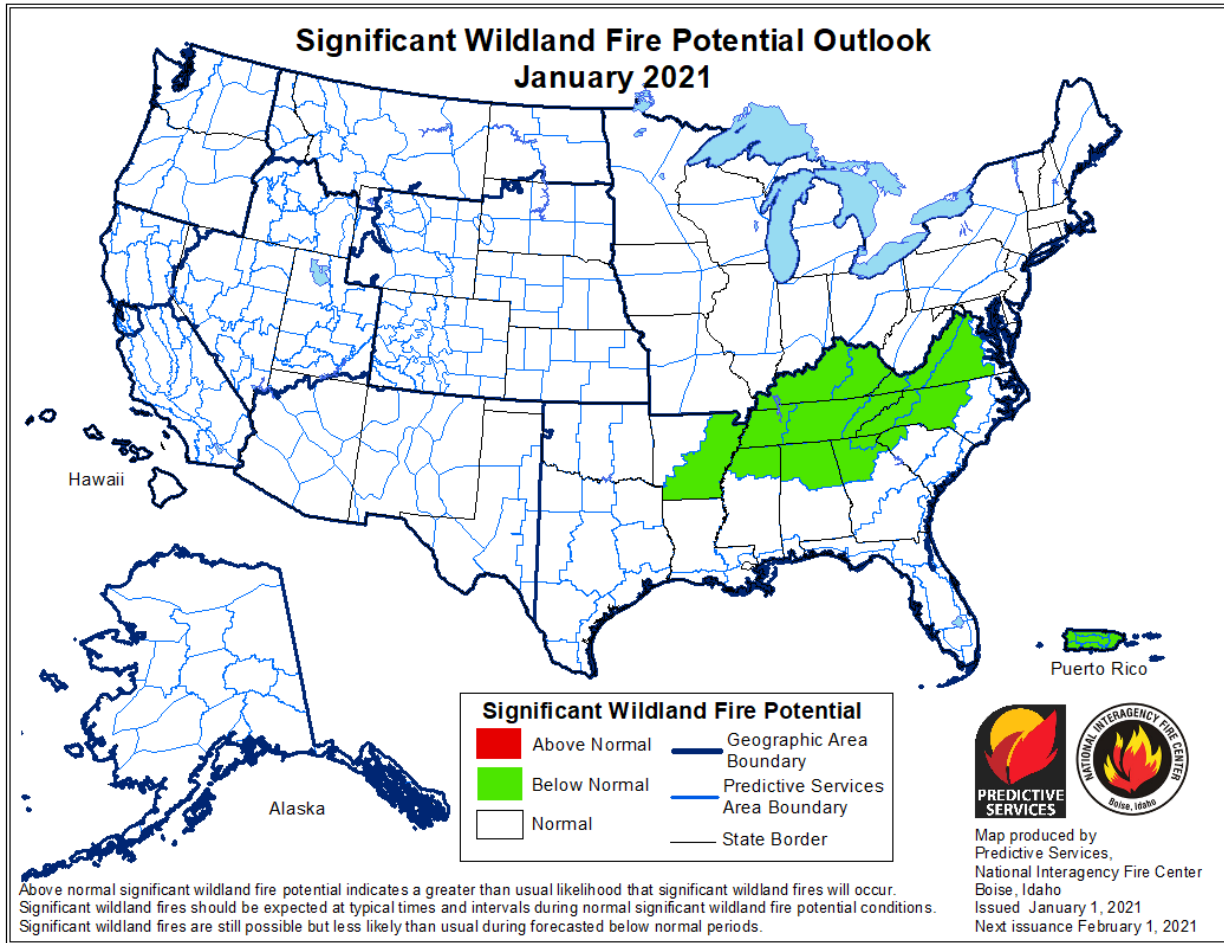
- List of all stations  Single station  Nearest stations  Peak flow

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 reports have stopped for the 2020-2021 winter season and will resume in April 2021.

**Fire Danger:** The Interagency Fire Center significant wildland fire potential outlook for January shows all of Tennessee, and most surrounding regions with lower than normal risk for fires.

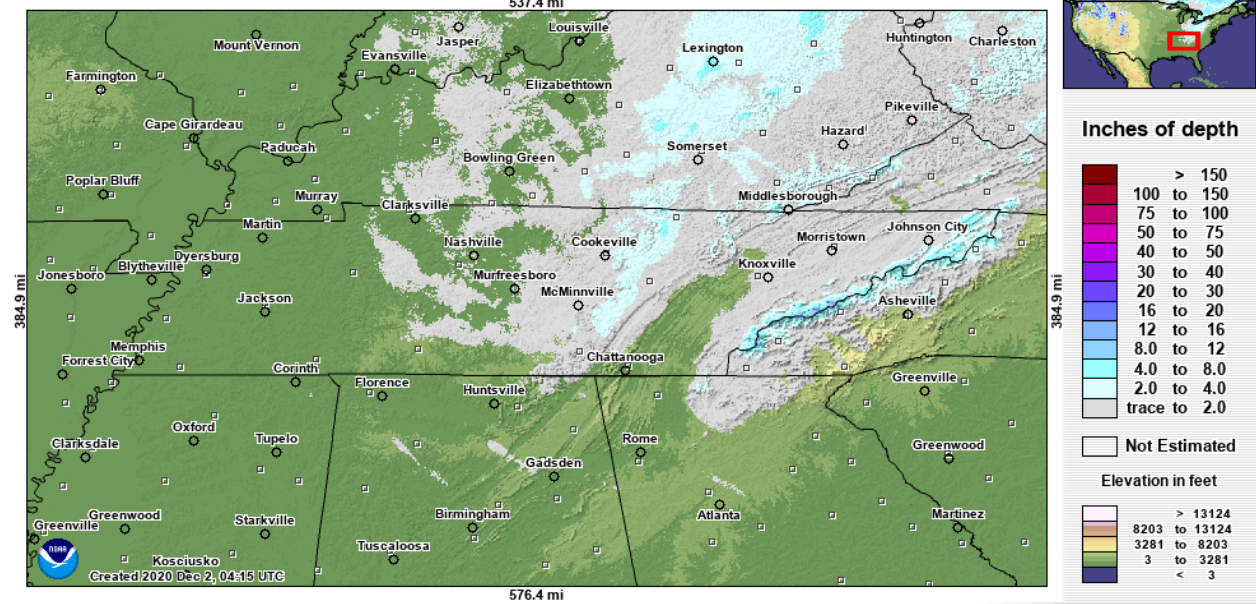


**Snow:** There were two larger snow events this month, with snowfall reported over much of the state on Dec 1st, resulting in minor accumulations on the Cumberland Plateau and in East TN (higher totals in the mountains). A second snow event occurred overnight on Christmas Eve and through Christmas Day. With snowfall reported in most areas from Nashville eastward, and accumulations on the Cumberland Plateau and in East TN. Even valley locations in East TN picked up moderate accumulations (up to 6”). Snowfall was also reported across the state on the 13<sup>th</sup> and 14<sup>th</sup>, but with only minor accumulations in the high elevations.

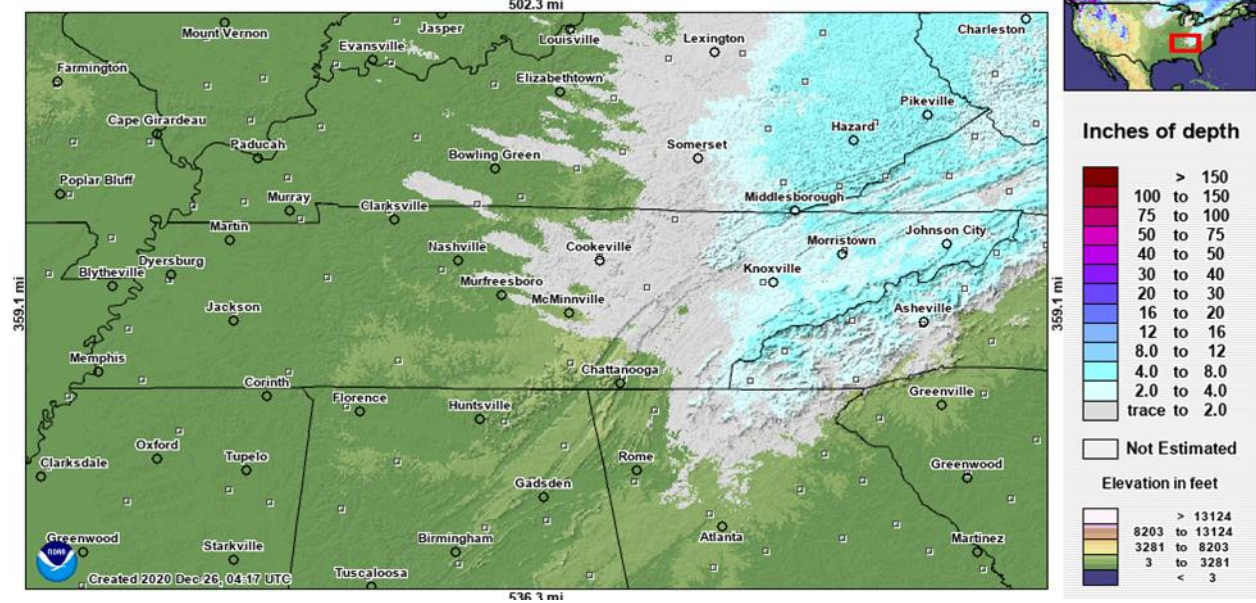


December 2020 Tennessee State Climate Summary

Modeled Snow Depth for 2020 December 1, 21:00 UTC



Modeled Snow Depth for 2020 December 25, 23:00 UTC



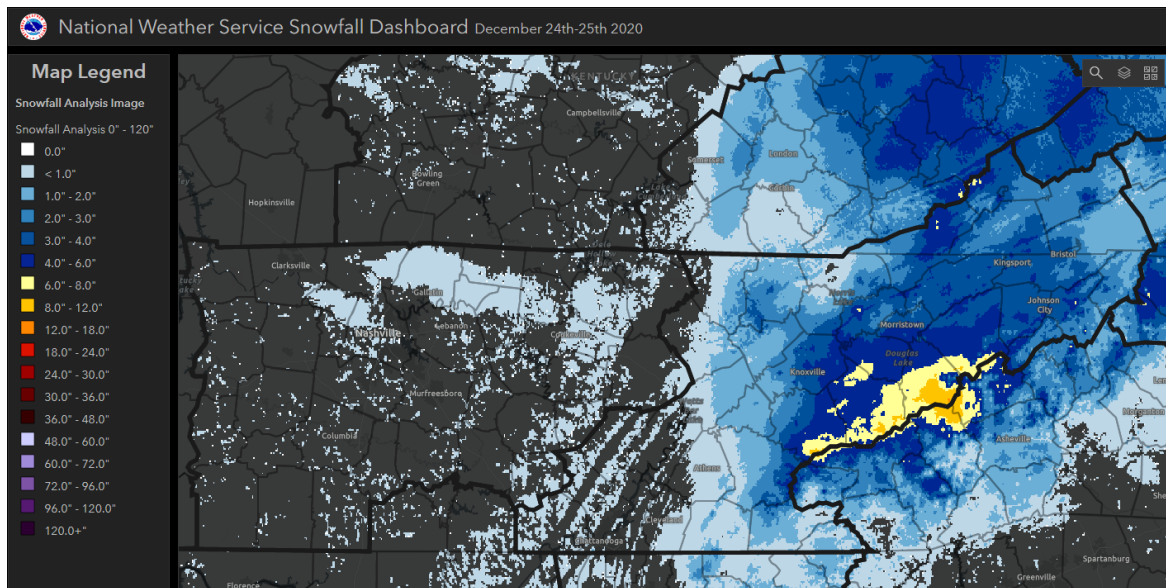


### Story of the Month:

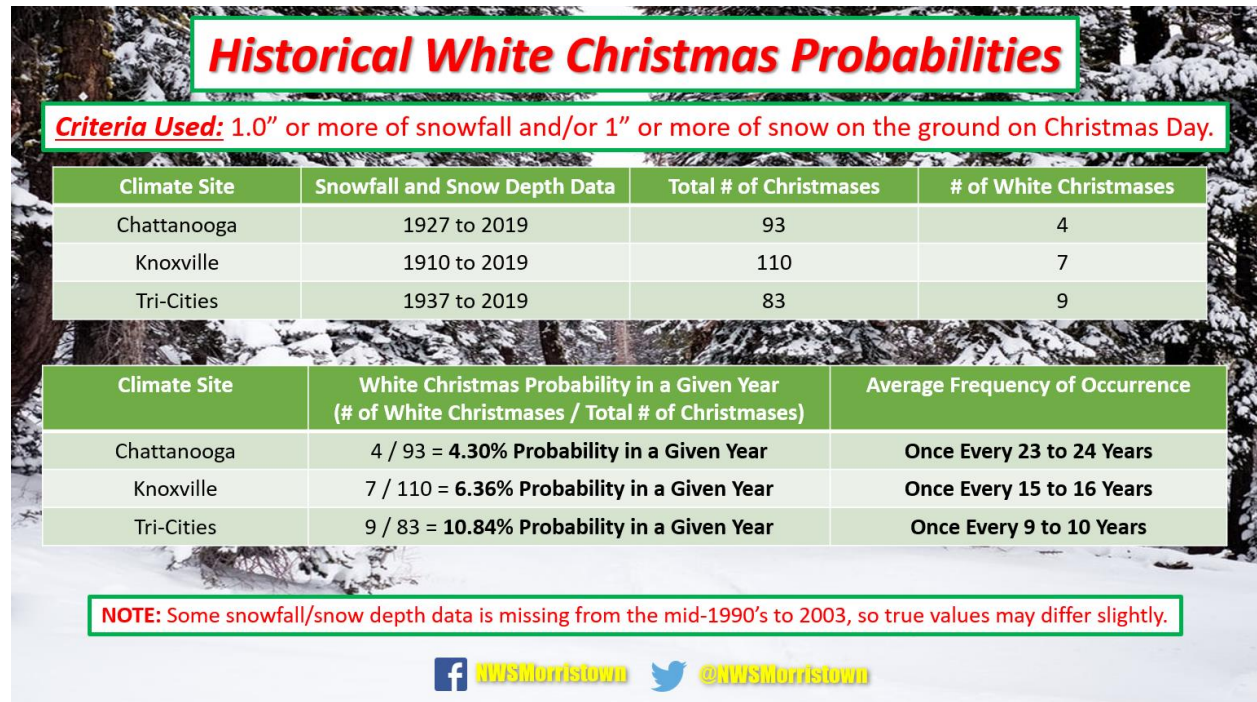
The major climate story of December 2020 was the white Christmas for East Tennessee. Measurable snowfall was recorded in most areas of east Tennessee on December 24<sup>th</sup> and 25<sup>th</sup>, with even valley locations recording upwards of 3-4” of snow. This was the first white Christmas since 2010 for both Knoxville and the Tri-Cities. This is a pretty rare occurrence in Tennessee, with the Tri-Cities airport being the climate station with the highest likelihood of a white Christmas, but even that only has about an 11% chance each year.



*Snow-covered evergreen tree in Washington County Tennessee on December 25, 2020 (Photo credit: Andrew Joyner).*



The National Weather Service Office in Morristown produced the web map showing snow totals in the region:  
<https://noaa.maps.arcgis.com/apps/opsdashboard/index.html#/4fe985838e464fb9bb980799443e01b6>



## Historical White Christmas Probabilities



**Criteria Used:** 1.0" or more of snowfall and/or 1" or more of snow on the ground on Christmas Day.

Climate Site	Snowfall and Snow Depth Data	Total # of Christmases	# of White Christmases
Chattanooga	1927 to 2019	93	4
Knoxville	1910 to 2019	110	7
Tri-Cities	1937 to 2019	83	9

Climate Site	White Christmas Probability in a Given Year (# of White Christmases / Total # of Christmases)	Average Frequency of Occurrence
Chattanooga	4 / 93 = <b>4.30% Probability in a Given Year</b>	<b>Once Every 23 to 24 Years</b>
Knoxville	7 / 110 = <b>6.36% Probability in a Given Year</b>	<b>Once Every 15 to 16 Years</b>
Tri-Cities	9 / 83 = <b>10.84% Probability in a Given Year</b>	<b>Once Every 9 to 10 Years</b>

**NOTE:** Some snowfall/snow depth data is missing from the mid-1990's to 2003, so true values may differ slightly.

 [NWSMorristown](https://www.facebook.com/NWSMorristown)
 [@NWSMorristown](https://twitter.com/NWSMorristown)

*White Christmas probabilities for the East Tennessee climate stations. Photo from NWS Morrystown Office.*

### 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](http://spc.noaa.gov) for any updates.*

There were no severe storm reports in Tennessee during December 2020, making this the second month in a row with no severe storm reports in the state.

### CPC Outlooks for the Next Month:

The NOAA Climate Prediction Center outlooks for January 2021 show all of Tennessee with above normal chances for a warmer and wetter month.

