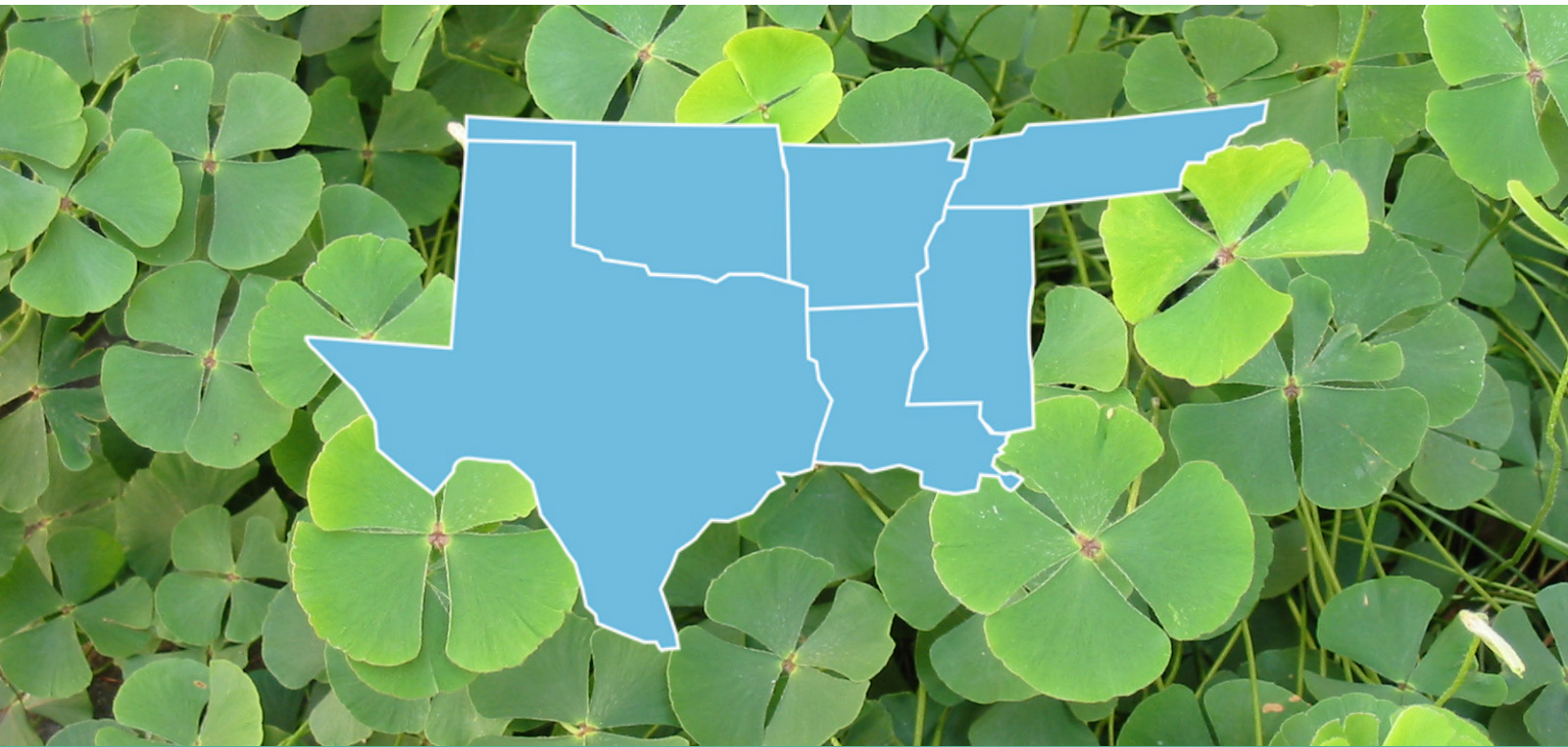




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Are Weather Extremes Increasing in the Southern Plains?

Victor Murphy, NWS Southern Region Climate Services Program Manager

The Southern Plains (Texas, Oklahoma, Louisiana, and Arkansas) has had its share of extreme weather events in the last 10 years. We have experienced both record heat and drought (2011/2012) and record rainfall and floods (2015/2016). These feast to famine extremes have not been experienced since the 1950s. One could ask, “have weather extremes increased in the Southern Plains?”

Drought and Heat Waves

In 2012, Texas, Oklahoma, and Arkansas all experienced their warmest calendar year on record, dating back to 1895. In fact, Texas broke its all-time record for the warmest year on record in 2011, only to shatter it again in 2012. Basically a 1 in 100 year event in 2011 followed by another such 1 in 100 year event in 2012.

Texas, Oklahoma, and Louisiana all experienced their hottest summers on record in 2011. The average summertime temperature of 86.8F in Oklahoma was 6.9F warmer than average (Figure 1). The 86.8F average summertime temperature that was recorded in Oklahoma and Texas in the summer of 2011 is still the warmest summer ever recorded in any state since in the US since 1895.

Corresponding with this increase in extreme heat, the number of

extreme cold waves has reached the lowest levels on record (since 1895).¹ This has been marked by an increasing trend in persistently high nighttime temperatures. From 1898 to 2015, every cold season at Dallas/Ft. Worth (DFW) saw a minimum temperature of at least 25F. In 2016, the coldest minimum temperature was 27F (Figure 2).

The number of record low monthly temperatures has declined to the lowest levels since 1911, while the number of record high monthly temperatures has increased to the highest level since the 1930s.²

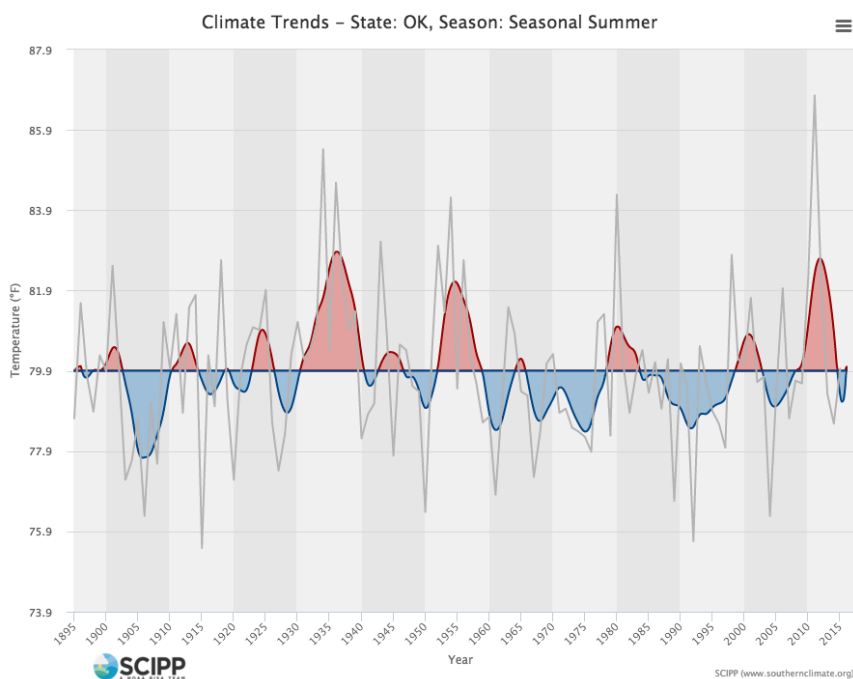


Figure 1. With an average statewide summer temperature of 86.8F in 2011, Oklahoma had its warmest summer on record dating back to 1895. This was 6.9F warmer than the 20th Century average. Thin gray lines indicate yearly temperatures. Blue (below normal), and red (above normal), areas show the 5 year rolling average.

Use navigation tools above and below chart to change displayed range

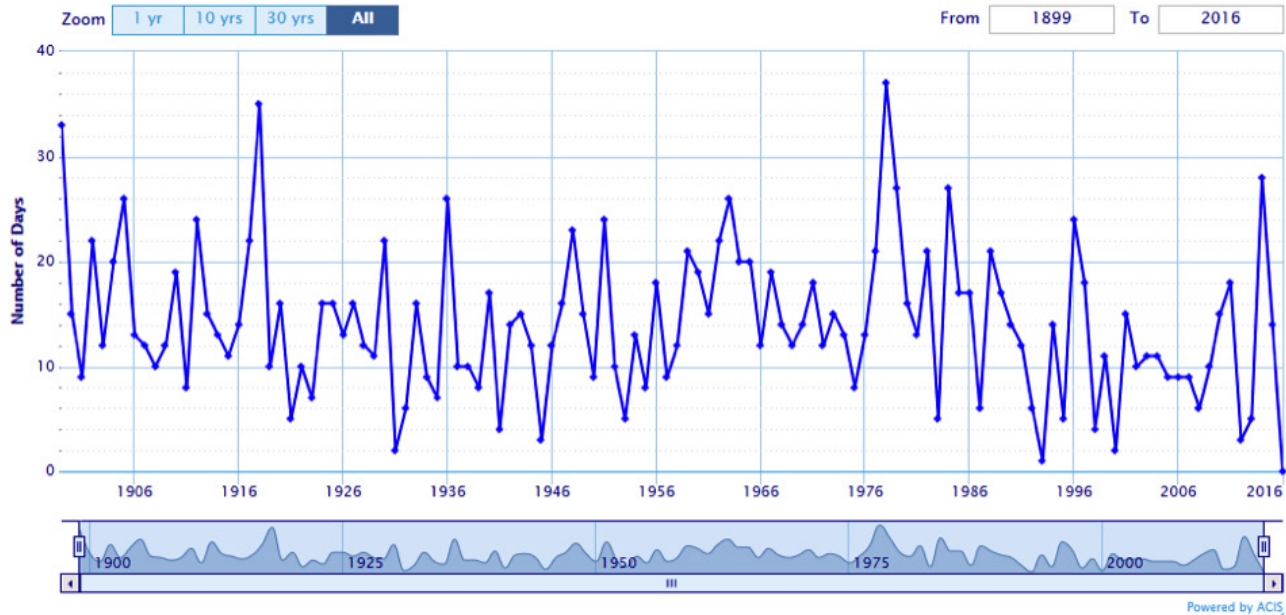


Figure 2. Graph showing the number of days where minimum temperatures were below 27F at Dallas/Ft. Worth, TX (DFW) during the cold season.

A review of daily record high/low minimum temperatures and daily high/low maximum temperatures at DFW since 2005 reveals that record high minimum temperatures (126) are nearly 10 times more apt to occur than record low minimum temperatures (13). Record high maximum temperatures (61) are about 2 times more likely to occur than record low maximum temperatures (28). Weather records for Dallas/Ft. Worth (DFW) extend back to 1898. Prior to 2010, the warmest minimum daily temperature was 85F set in 1939. This record was tied or exceeded 10 times in 2011.

Precipitation Extremes

The feast to famine extremes have also manifested themselves in regard to rainfall events.

On the heels of the 2011 drought, both Texas and Oklahoma established yearly statewide average precipitation records in 2015. Arkansas established theirs in 2009. Thus, in the last 7

years, Arkansas, Texas, and Oklahoma have all established yearly records for average statewide temperature and precipitation, with data going back to 1895.

Looking more closely at these extremes for Texas and Oklahoma allows us to see the magnitude of these records. In the case of Oklahoma, average statewide precipitation for 2015 was 53.72", or nearly 20" more than the statewide average of 33.77". This shattered the existing 120 year record (47.88" in 1957) by more than 10% (Figure 3).

In Texas, the 2015 average statewide precipitation was 41.23", or about 50% greater than the statewide average of 27.14". This comes on the heels of 2011, which was the 2nd driest year on record for the state, with average precipitation of 14.7". So, in the space of 5 years, Texas saw its 2nd driest year and record wettest year on record. The difference between the two, 26.53", was nearly the equivalent of a full year of precipitation.

Assessing Temperature and Precipitation Extremes

Is there an objective way to assess these extremes and compare them?

The NOAA National Center for Environmental Information (NCEI) has calculated a Climate Extremes Index (CEI) for the United States. It is an arithmetic average of extremes in high and low maximum and minimum temperatures, severe drought, heavy precipitation in 1 day, and consecutive days with or without precipitation. Based on this, NCEI has also calculated the CEI by regions. The RCEI for the south consists of Kansas, Oklahoma, Texas, Arkansas, Louisiana, and Mississippi (Figure 4).

Summary

Based on the statewide temperature and precipitation extremes highlighted above, as well as the more objective Climate Extremes Index, the amount of weather extremes in the Southern Plains this Century are indeed on the increase. Policy makers, officials, and the public must take reasonable actions to mitigate the impacts and ensure that our infrastructure has the resiliency to adapt to this.

References

1. National Climate Assessment, 2014: <http://nca2014.globalchange.gov/report/our-changing-climate/extreme-weather>
2. Ibid
3. Gleason, et al, 2008: A Revised US Climate Extremes Index: <https://www.ncdc.noaa.gov/extremes/cei/introduction>

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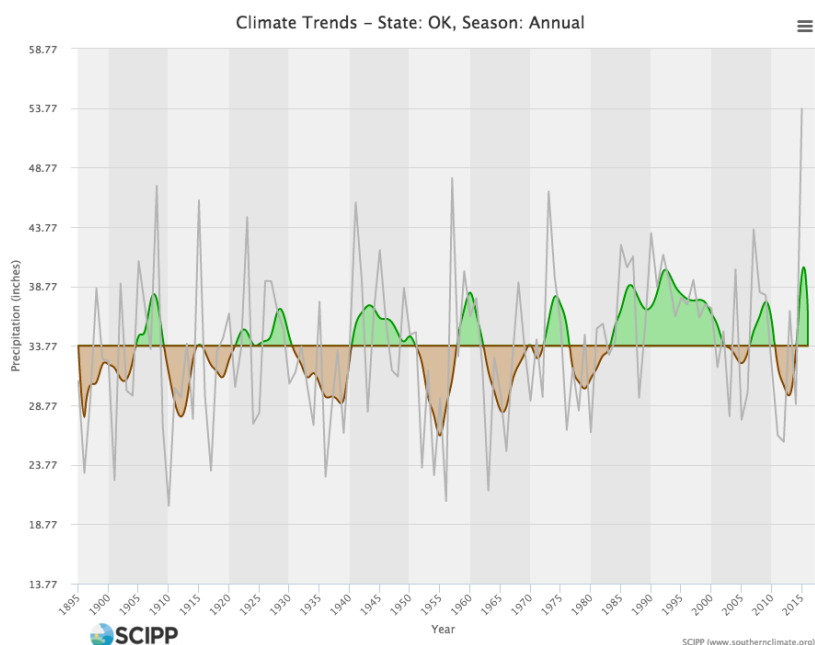


Figure 3. Average statewide precipitation for Oklahoma from 1895 to 2015. Thin gray lines are yearly totals. Green (surplus) and brown (deficit) are the 5 year rolling average compared to normal.

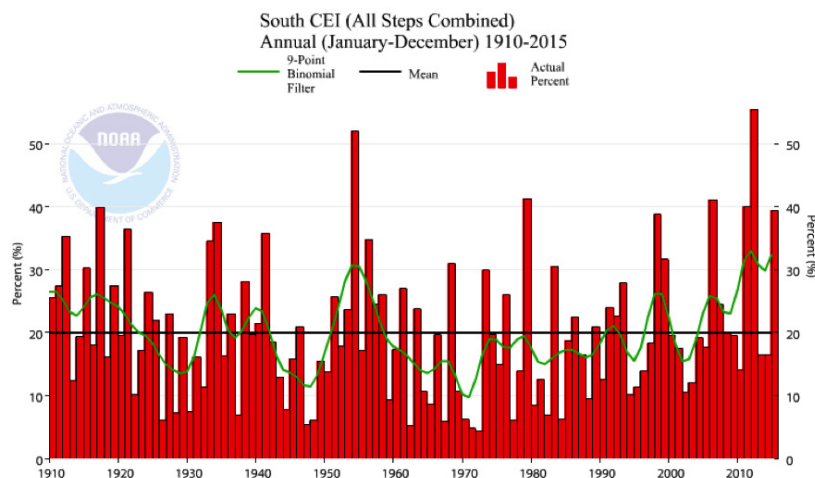


Figure 4. Regional Climate Extremes Index for the Southern United States.

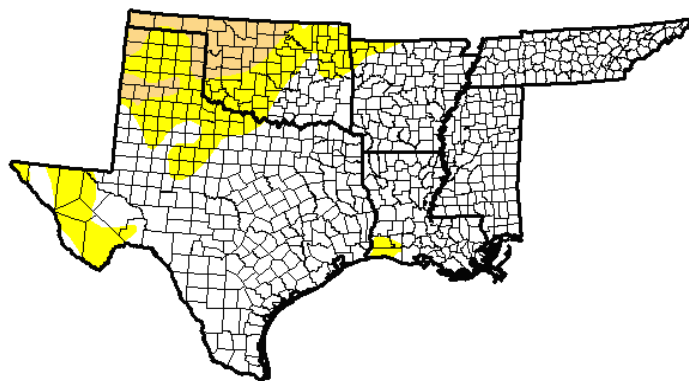
Drought Update

Luigi Romolo,
Southern Regional Climate Center

Because of excessive heat and lack of rainfall in the northwestern portions of the Southern Region during March, the National Drought Mitigation Center has declared some moderate drought conditions in the western counties of Oklahoma and in the northern Texas panhandle.

The primary story for severe weather in the month of March for the Southern Region was a heavy rainfall event that occurred between March 8-12, 2016. Many portions of eastern Texas, Louisiana, Arkansas, and Mississippi saw rainfall totals over 18 inches (457.2 mm), and in the case of northeastern Louisiana, over 22 inches (558.8 mm) of rainfall. Concerns

about the weather on March 10 prompted officials to close down schools, universities and government offices across the southern parishes of Louisiana. In the case of the latter, government offices in forty parishes were closed through Friday, March 11. The heavy rainfalls also produced high stage levels over many of the rivers in the southern portions of the state, causing road closures, and more flooding events. The Sabine River, which borders Louisiana and Texas, reached record levels following this event. The Sabine crested at 33.24 feet (10.13 m) around March 15. Evacuations were ordered in Deweyville, Texas, and in Newton County, over four hundred homes were flooded by the racing river. According to the Associated Press, over twenty counties in Texas were under a state of disaster declaration.



Released Thursday, April 7, 2016

Richard Tinker, CPC/NOAA/NWS/NCEP

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	76.06	23.94	6.16	0.00	0.00	0.00
Last Week 3/29/2016	77.17	22.83	4.14	0.00	0.00	0.00
3 Months Ago 1/5/2016	99.14	0.86	0.00	0.00	0.00	0.00
Start of Calendar Year 12/29/2015	97.72	2.28	0.00	0.00	0.00	0.00
Start of Water Year 9/29/2015	36.88	63.12	37.43	18.31	5.72	0.00
One Year Ago 4/7/2015	57.24	42.76	29.46	19.85	13.10	3.50



Intensity:

	D0 Abnormally Dry		D3 Extreme Drought
	D1 Moderate Drought		D4 Exceptional Drought
	D2 Severe Drought		

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Above: Drought conditions in the Southern Region. Map is valid for April 5, 2016. Image is courtesy of National Drought Mitigation Center.

Southern Climate Monitor

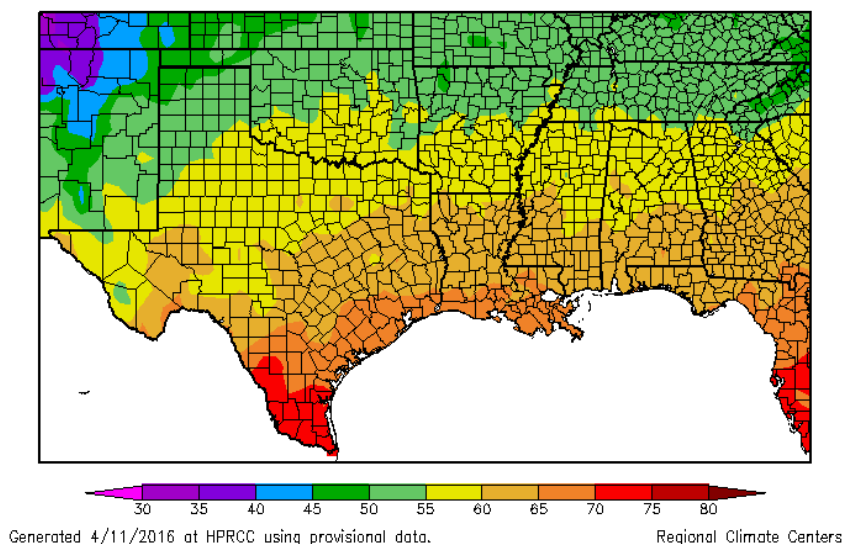
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Temperature Summary

Luigi Romolo,
Southern Regional Climate Center

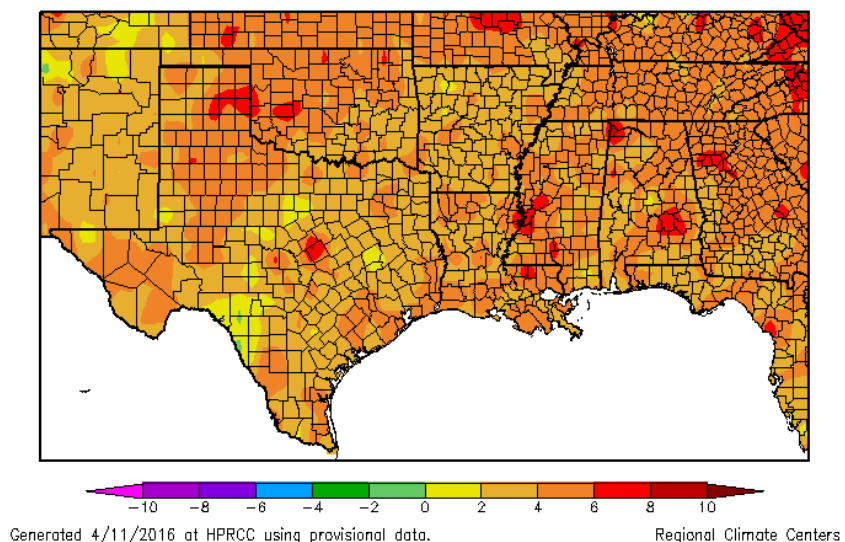
As was the case in February, March average temperatures in the Southern Region were consistently above normal for all six states. Temperature anomalies were generally 3-6 degrees F (1.67-3.33 degrees C) above normal across the entire region. All six states averaged well above normal for the month. The statewide monthly average temperatures were as follows: Arkansas reporting 55.40 degrees F (13.00 degrees C), Louisiana reporting 63.60 degrees F (17.56 degrees C), Mississippi reporting 60.30 (15.72 degrees C), Oklahoma reporting 54.80 degrees F (12.67 degrees C), Tennessee reporting 53.90 degrees F (12.17 degrees C), and Texas reporting 61.30 degrees F (16.28 degrees C). All state rankings fell on the warmer side of normal. For Louisiana, it was the thirteenth warmest March on record. Mississippi, Tennessee, and Texas all recorded their fourteenth warmest March on record. For Oklahoma, it was their eleventh warmest March, while Arkansas experienced its twenty-first warmest March on record. All state rankings are based on the period spanning 1895-2016.

Temperature (F)
3/1/2016 – 3/31/2016



Average March 2016 Temperature across the South

Departure from Normal Temperature (F)
3/1/2016 – 3/31/2016



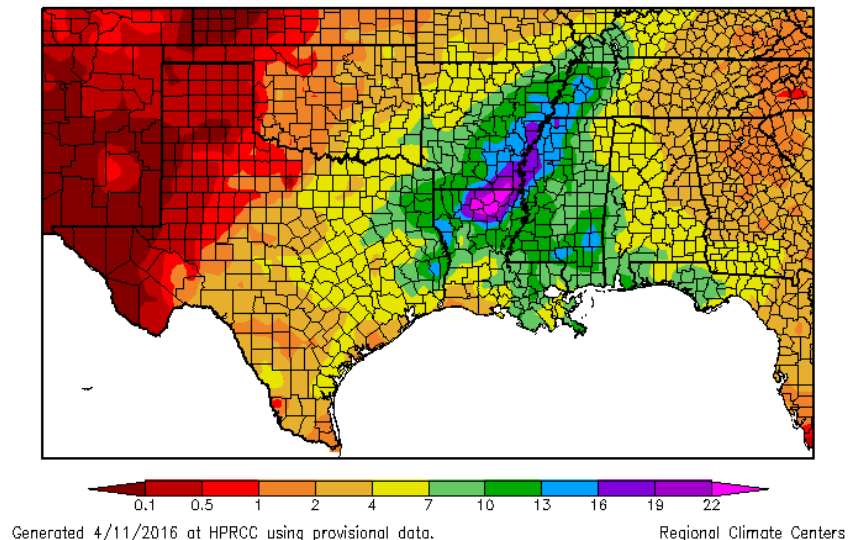
Average Temperature Departures from 1971-2000 for March 2016 across the South

Precipitation Summary

Luigi Romolo,
Southern Regional Climate Center

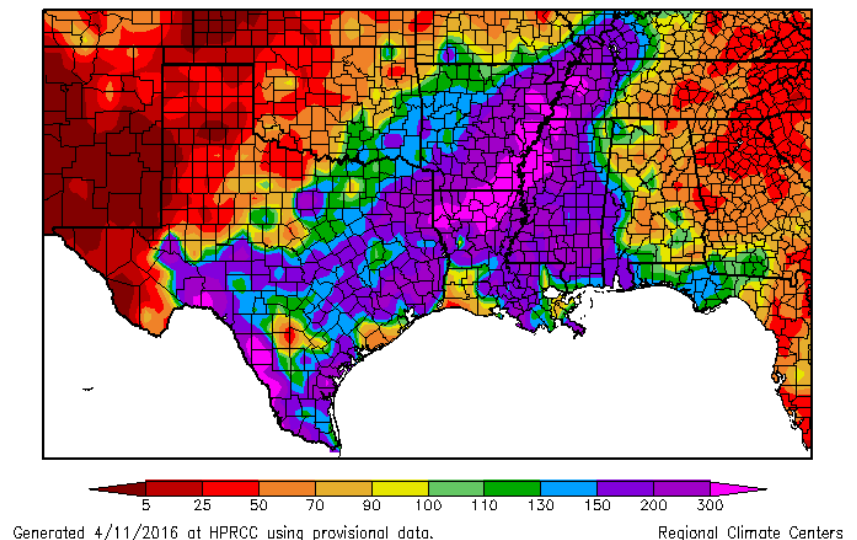
March precipitation in the Southern Region varied dramatically with the northwestern and northeastern corners of the region experiencing much drier than normal conditions, while central portions of the region experienced flooding events from heavy rainfall totals. In the central portions of the region, many stations reported between one and a half to three times the monthly total. This was mostly due to the passage of a slow moving cold front and Gulf of Mexico low pressure system. The state-wide precipitation totals for the month are as follows: Arkansas reporting 9.90 inches (251.46 mm), Louisiana reporting 10.40 inches (264.16 mm), Mississippi reporting 10.96 inches (278.38 mm), Oklahoma reporting 2.34 inches (59.44 mm), Tennessee reporting 5.19 inches (131.83 mm), and Texas reporting 2.85 inches (72.39 mm). The state precipitation rankings for the month are as follows: Arkansas (third wettest), Louisiana (second wettest), Mississippi (fourth wettest), Oklahoma (sixty-first driest), Tennessee (sixty-first wettest), and Texas (twelfth wettest). All state rankings are based on the period spanning 1895-2016.

Precipitation (in)
3/1/2016 – 3/31/2016



March 2016 Total Precipitation across the South

Percent of Normal Precipitation (%)
3/1/2016 – 3/31/2016



Percent of 1971-2000 normal precipitation totals for March 2016 across the South

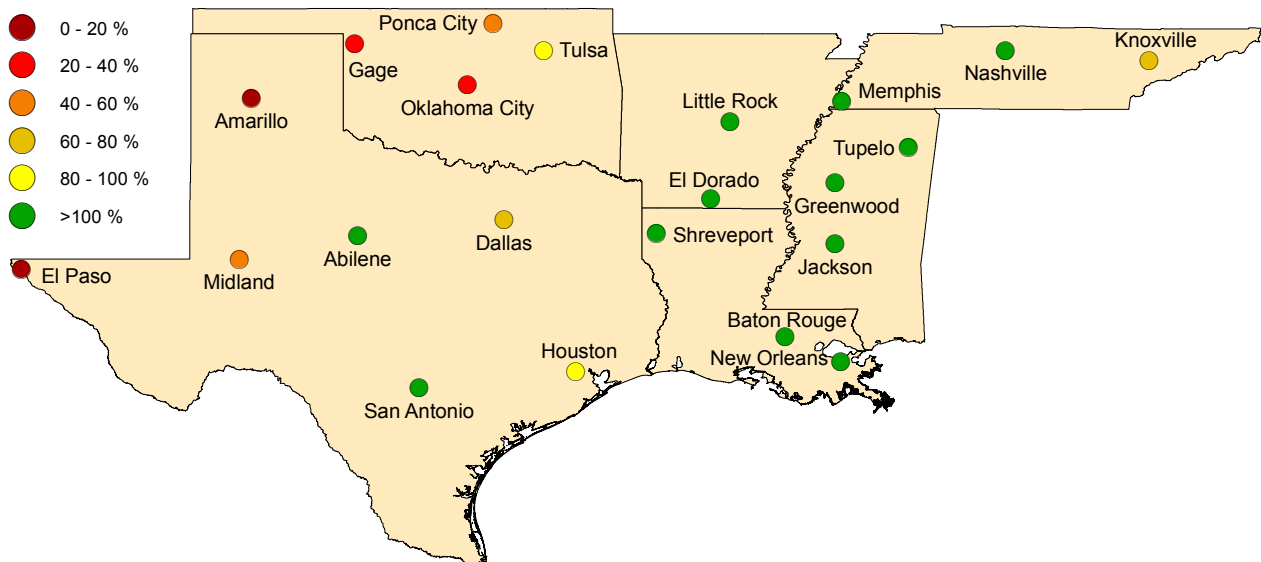
Regional Climate Perspective in Pictures

March Temperature Departure from Normal



March 2016 Temperature Departure from Normal from 1971-2000 for SCIPP Regional Cities

March Percent of Normal Precipitation



March 2016 Percent of 1971-2000 Normal Precipitation Totals for SCIPP Regional Cities

Climate Perspective

State	Temperature	Rank (1895-2011)	Precipitation	Rank (1895-2011)
Arkansas	55.40	21 st Warmest	9.90	3 rd Wettest
Louisiana	63.60	13 th Warmest	10.40	2 nd Wettest
Mississippi	60.30	14 th Warmest	10.96	4 th Wettest
Oklahoma	54.80	11 th Warmest	2.34	61 st Driest
Tennessee	53.90	14 th Warmest	5.19	61 st Wettest
Texas	61.30	14 th Warmest	2.85	12 th Wettest

State temperature and precipitation values and rankings for March 2016. Ranks are based on the National Climatic Data Center's Statewide, Regional, and National Dataset over the period 1895-2011.

Station Summaries Across the South

Station Summaries Across the South											
Station Name	Temperatures								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	%Norm
El Dorado, AR	71.0	47.2	59.1	3.3	85	03/15	28	03/21	11.72	6.97	247
Little Rock, AR	68.8	47.6	58.2	4.8	87	03/15	32	03/21	12.33	7.65	263
Baton Rouge, LA	75.5	55.8	65.7	4.2	84	03/17+	34	03/21	10.00	5.59	227
New Orleans, LA	75.8	60.3	68.1	5.5	85	03/17	44	03/22	6.36	1.81	140
Shreveport, LA	73.9	51.9	62.9	5.0	87	03/15+	31	03/21	12.83	8.69	310
Greenwood, MS	71.1	48.7	59.9	4.4	86	03/15	31	03/21	12.50	8.19	290
Jackson, MS	73.0	50.5	61.8	4.9	87	03/15	34	03/21	12.24	7.20	243
Tupelo, MS	69.8	46.7	58.3	4.3	89	03/15	32	03/02	7.89	3.07	164
Gage, OK	68.2	36.1	52.2	4.9	84	03/14	17	03/20+	0.75	-1.13	40
Oklahoma City, OK	67.9	43.1	55.5	3.3	84	03/30	27	03/20	1.02	-2.04	33
Ponca City, OK	67.9	39.0	53.4	4.6	83	03/14	24	03/19	1.42	-1.29	52
Tulsa, OK	68.4	44.6	56.5	5.2	82	03/23	31	03/28+	2.86	-0.43	87
Knoxville, TN	66.9	43.7	55.3	5.0	82	03/12	28	03/03+	2.94	-1.40	68
Memphis, TN	68.2	48.8	58.5	4.5	82	03/15	34	03/21	16.20	11.04	314
Nashville, TN	67.1	44.7	55.9	5.9	87	03/15	30	03/05	4.33	0.22	105
Abilene, TX	71.4	47.2	59.3	2.9	85	03/23	31	03/20	2.31	0.57	133
Amarillo, TX	69.1	36.7	52.9	5.0	85	03/22	18	03/20	0.27	-1.12	19
El Paso, TX	75.9	47.8	61.9	5.3	84	03/22+	38	03/10	0.01	-0.25	4
Dallas, TX	71.5	50.9	61.2	3.6	89	03/14	34	03/21	2.67	-0.80	77
Houston, TX	75.2	55.6	65.4	2.7	87	03/14	34	03/21	3.25	-0.16	95
Midland, TX	75.9	45.6	60.7	5.1	89	03/22	29	03/20	0.34	-0.26	57
San Antonio, TX	76.1	55.6	65.8	3.6	90	03/14	36	03/21	3.56	1.25	154

Summary of temperature and precipitation information from around the region for March 2016. Data provided by the Applied Climate Information System. On this chart, "depart" is the average's departure from the normal average, and "% norm" is the percentage of rainfall received compared with normal amounts of rainfall. Plus signs in the dates column denote that the extremes were reached on multiple days. Blueshaded boxes represent cooler than normal temperatures; redshaded boxes denote warmer than normal temperatures; tan shades represent drier than normal conditions; and green shades denote wetter than normal conditions.

Maya Express Produces Heavy Rains in Louisiana

Barry Keim, Louisiana State Climatologist, Louisiana State University

The Maya Express is a river of moisture that originates in the western Caribbean as well as the region near the Yucatan Peninsula, and this moisture occasionally gets caught up in the circulation patterns and gets transported north to Louisiana. This is what happened last week across the State, which led to the production of heavy rainfall across Louisiana. In essence, we had a cold front that stalled just to the east of Louisiana, and the Maya Express continuously pumped warm moist air into the State leading to the production of extremely high rainfall totals. Figure 1 shows the radar-estimated rains across Louisiana. It shows most of the northwestern quadrant of the State with over 10 inches, with significant regions over 15 and 20 inches of rainfall. There was also a sizable region across the Florida Parishes of Louisiana that exceeded 10 inches. Da Parish appears to have recorded about 2 inches in this event, whereby I recorded about 5.5 inches at my house in Baton Rouge. However, we did have some flooding problems here in the Capitol City as shown in Figure 2, but this pales in comparison to what occurred elsewhere in the

State, where we had many road closures, a bridge collapse, and even some fatalities. This just punctuates the many dangers that heavy rainfall presents. Heck, we live the wettest State in the conterminous United States and I urge everyone to make wise decisions when the

chips are down. The National Weather Service slogan is "turn around, don't drown" and these just may very be words to live by.....literally (Figure 3). If you have any questions, feel free to contact me at keim@lsu.edu.

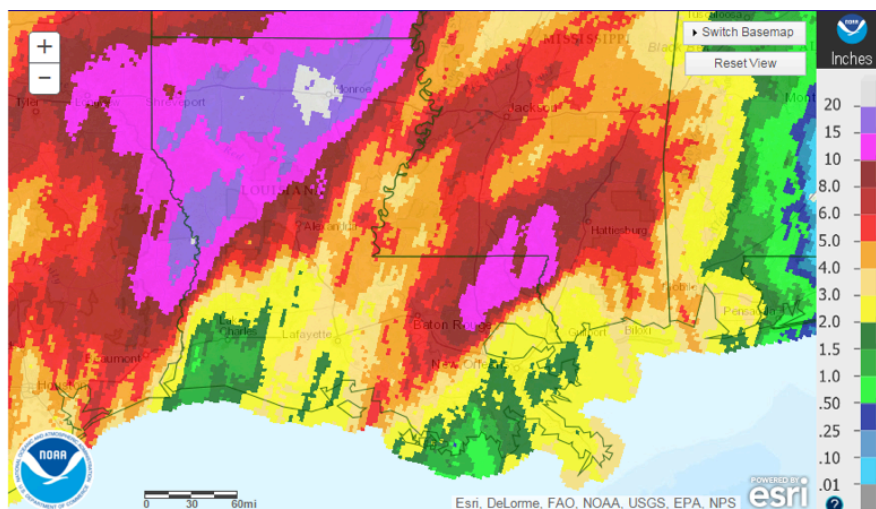


Figure 1. Last week's storm rainfall across Louisiana. Note that this map represents all rainfall from 7 a.m. on Saturday, March 5 to 7 a.m. on Saturday, March 12, 2016.



Figure 2. Flooded park in Baton Rouge. Image taken by Barry Keim on March 11, 2016.



Figure 3. Slogan from the National Weather Service.

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Contact Us

To provide feedback or suggestions to improve the content provided in the Monitor, please contact us at monitor@southernclimate.org. We look forward to hearing from you and tailoring the Monitor to better serve you. You can also find us online at www.srcc.lsu.edu & www.southernclimate.org.

For any questions pertaining to historical climate data across the states of Oklahoma, Texas, Arkansas, Louisiana, Mississippi, or Tennessee, please contact the Southern Regional Climate Center at [225-578-5021](tel:225-578-5021).

For questions or inquiries regarding research, experimental tool development, and engagement activities at the Southern Climate Impacts Planning Program, please contact us at [405-325-7809](tel:405-325-7809) or [225-578-8374](tel:225-578-8374).

Monthly Comic Relief



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