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Southern Climate Monitor

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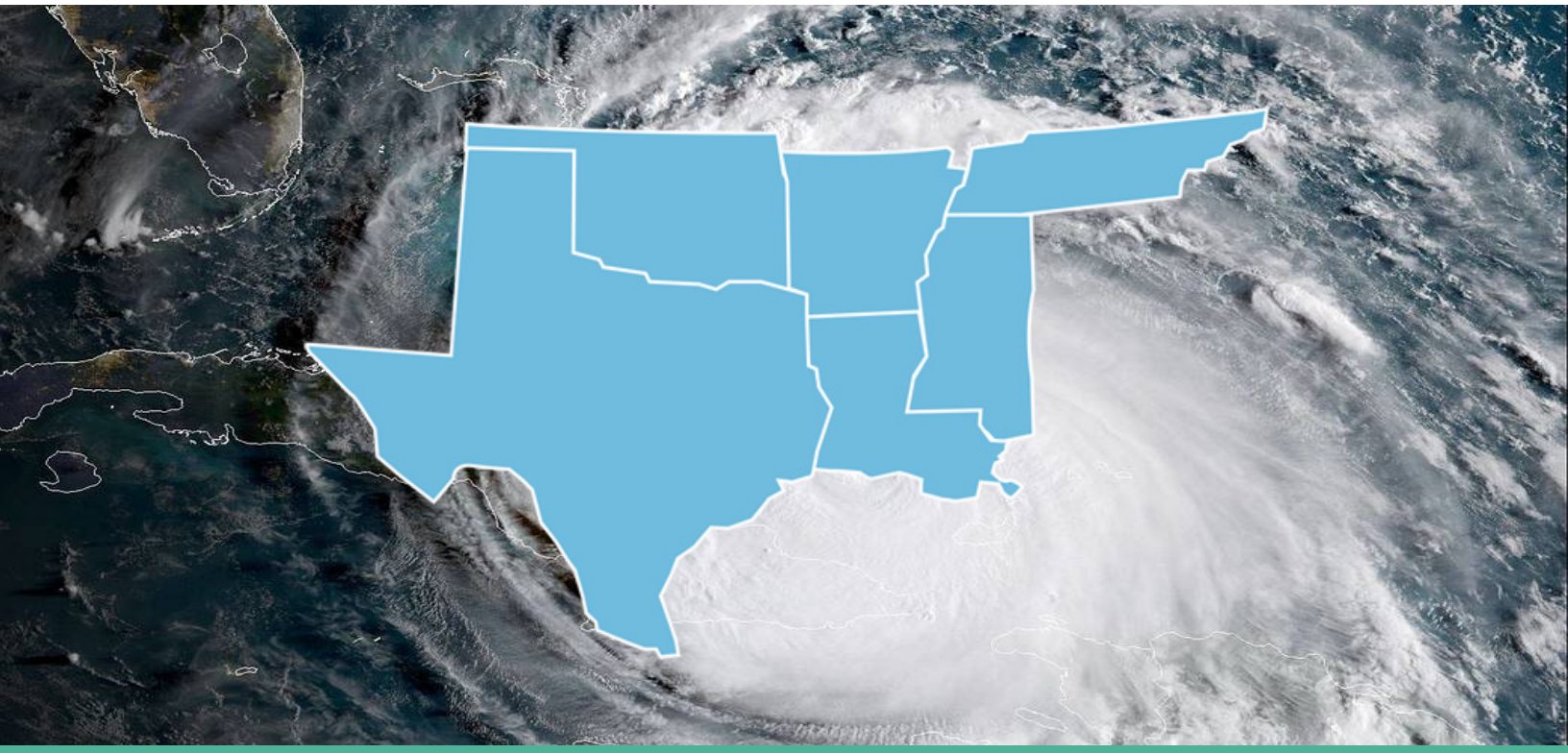


In This Issue:

The Southern Climate Monitor is available at
www.srcc.lsu.edu & www.southernclimate.org

The Increasing Variability of Precipitation in the Southern Great Plains

Paul X. Flanagan and Jeffrey B. Basara, University of Oklahoma

The Great Plains of the United States is a region heavily utilized for agriculture, including crops and grazing. As such, water resources are vitally important to the economy and ecosystem of the region. While irrigation practices are applied across the Plains region, the amount of water received from precipitation remains the most important contributor to water supply for agriculture.

The Southern Great Plains is the southern expanse of the Great Plains, spans the region from Southern Texas through Kansas, and is located in a transition zone between the dry southwest and the wet southeast (Figure 1). Because of the nature of the transition zone, the amount of precipitation that is received at any location within the Southern Great Plains can change drastically from year to year. In other words, the region has large seasonal to interannual precipitation variability. This natural phenomenon whereby there are shifts between the opposite ends of the precipitation spectrum is the main reason for the two different water extremes in the Southern Great Plains: droughts and pluvials. Drought is represented by drier than average conditions which can be extremely detrimental to the ecosystem and economy of the region. Pluvials, on the other hand, are represented by greater than average rainfall over the region. This may appear to be beneficial in many aspects but may also be associated with an increased number of flooding events and changes in landscape and environment through enhanced erosion. One aspect is certain, precipitation variability on a seasonal to annual to interannual scales affects the daily lives of everyone in the Southern Great Plains through impacts to local environment, ecosystem, economy, transportation patterns, food availability and water resources.

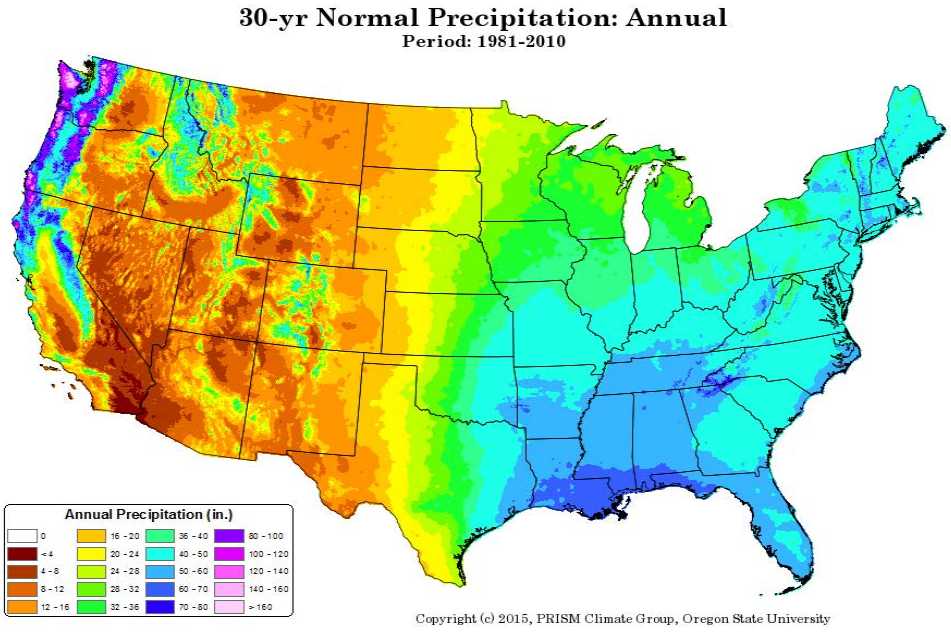


Figure 1: Climatology (1981-2010) of Annual Precipitation Amount across the United States of America from PRISM precipitation observations (Image taken from http://www.prism.oregonstate.edu/normals/).

Recent analyses have examined the overall variability of the climate system in the Southern Great Plains using historical observations along with studies focused on the frequency and intensity of both drought and pluvial events. The results have shown that precipitation variability within the Southern Great Plains is increasing (Weaver et al. 2016; Fig. 2). Thus, it is becoming more likely that the region will see wetter than average years and drier than average years

compared to what was previously occurring. In addition, the transition between extreme events including drought and pluvial periods have been accelerating. In other words, one type of precipitation extreme followed by another in the next year, is becoming more common in the region (Fig. 3).

So, how does this impact the Southern Great Plains? For starters, incurring rapid changes in the precipitation regime could impact total water resources, water quality, agriculture, industry, and wildfires. For the latter, wetter than average years yield large increases in plant biomass across the region as the ecosystem flourishes throughout the year. However, when the region experiences drought, this increased biomass dries causing an increase in the amount of fuel available to wildfires, which could be devastating. For water resources, drought conditions severely decrease the water needed for competing natural and human systems. A practical example is shown regarding a large pond in central Oklahoma during late 2014 which dried significantly following a period of extended drought (Figure 4a). However, excessive rainfall during May 2015 (over 24 inches in some locations) associated with pluvial conditions rapidly recharged the pond beyond normal capacity (Figure 4b). However, close inspection of the water quality shows significant sedimentation due to erosion from the heavy rainfall.

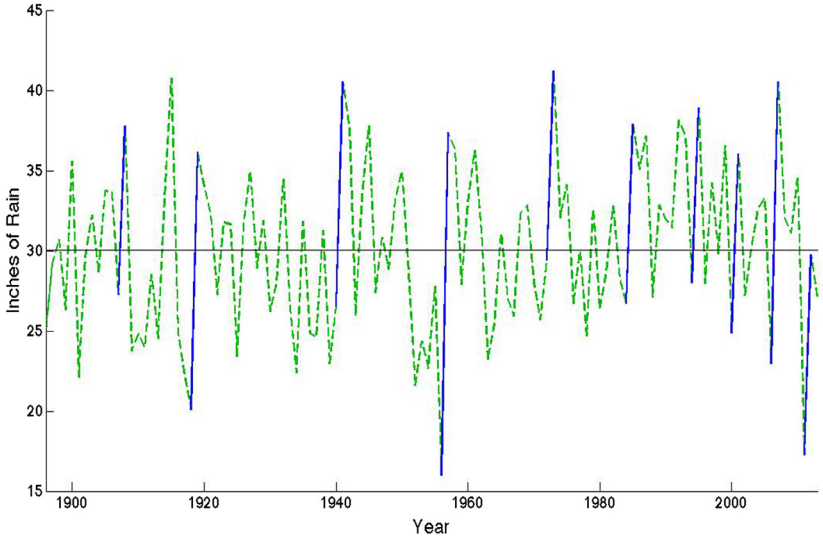


Figure 3. Annual rainfall for the SGP (green line) in inches of rain per year. The solid blue lines represent one standard deviation or above dipoles in precipitation from year to year. Image taken from *Christian et al. 2015.*

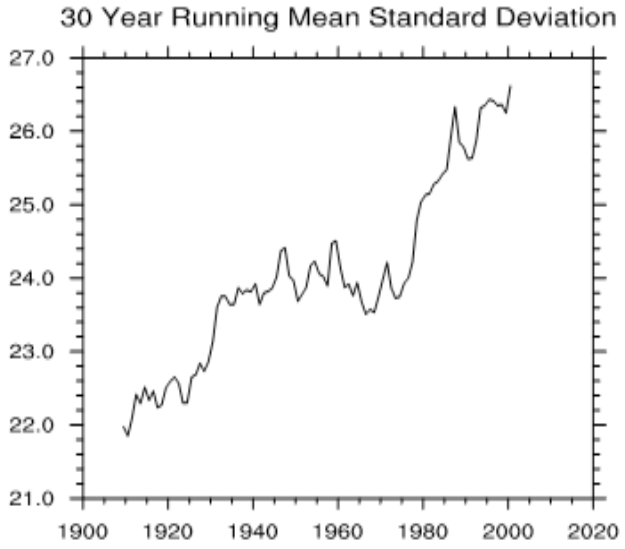


Figure 2. 30 year running standard deviation of annual precipitation in the Southern Great Plains from PRISM precipitation observations. Units are in mm/month. Value is calculated by averaging the standard deviation of the previous 15 years along with the current and next 14 years for each value.

Another aspect of the precipitation variability is not only how much falls, but when it falls. This is of critical importance to agricultural producers as there is an offset between the climatological period of greatest precipitation in the southern Great Plains (May-June) and the peak temperatures (July-August). An additional study by Flanagan et al. (2017) noted that not only are the total magnitudes of precipitation becoming more variable, the period in between the peak in precipitation and temperature is also becoming more variable. Thus, the critical timing related to crops, precipitation, and temperature is becoming more variable, and as such, more difficult to adequately plan for.

All in all, the recent research demonstrates that we are seeing a shift in the precipitation regime across the Southern Great Plains as precipitation variability increases. A key question is whether this increased variability is beneficial to the region. In some years more abundant precipitation may occur during the warm season leading to potential positive benefits to agriculture and total water storage along with potential negative impacts from flooding and erosion. Conversely, the increased variability may lead to more frequent and more intense drought periods with large negative consequences across all natural and socioeconomic sectors. From a planning standpoint, this places an additional burden on those dependent on precipitation. Further, one aspect is certain: the overall nature of the climate system in the Southern Great Plains has been dynamic and with increasing precipitation variability these dynamic trends will continue into the foreseeable future.

References:

Christian J, K. Christian, J. B. Basara, 2015: Drought and pluvial dipole events within the great plains of the United States. J. Appl. Meteorol. Climatol., 54, 1886–1898, doi: http://dx.doi.org/10.1175/JAMC-D-15-0002.1.

Flanagan, P. X., J. B. Basara, and X. Xiao, 2017: Long-term analysis of the asynchronicity between temperature and precipitation maxima in the United States Great Plains. Int. J. Climatol. doi:10.1002/joc.4966.

Weaver S, S. Baxter, K. Harnos, 2016: Regional Changes in the Interannual Variability of Warm Season Precipitation. J. Climate., 29, 5157–5173 doi:10.1175/JCLI-D-14-00803.1.

Figure 4. A large pond in Washington, OK in (a, above) October 2014 and (b, below) in May 2015.

Drought Update

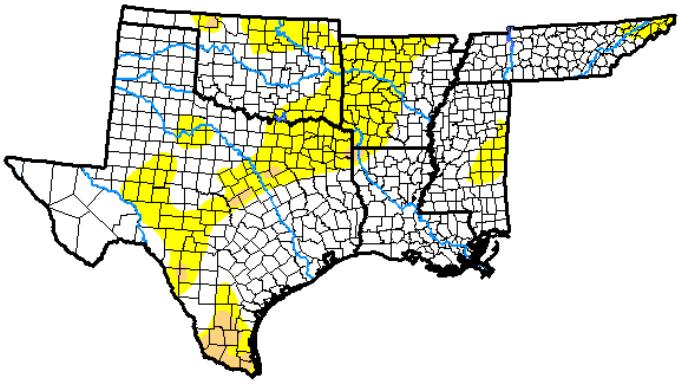
Kyle Brehe and Rudy Bartels,
Southern Regional Climate Center

Over the month of September 2017, drought conditions worsened to moderate classification in parts of southern and central Texas. Abnormally dry conditions expanded throughout parts of the SRCC region during September and now include: eastern Tennessee, western and central Arkansas, eastern Mississippi, northern and eastern Oklahoma, and northeastern, central, and southern Texas.

The Texas, Mississippi, and Louisiana state climatologists discussed drier conditions throughout their states. They state it is possible for abnormally dry to moderate drought conditions to expand throughout their states if the dry conditions persist and no tropical weather impacts the area during the month of October.

Wind seemed to be the major meteorological hazard in September with over 100 wind events reported throughout the southern region, most of which were in Texas. There were a few minor reports of hail early in the month throughout parts of Texas and Oklahoma. There were no tornado reports during the month of September for the southern region.

On September 23, 2017, there was a microburst reported in Covington, Mississippi, which caused a roof to be peeled off of a post office.



Released Thursday, September 28, 2017
Brad Rippey, U.S. Department of Agriculture

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	72.17	27.83	2.38	0.02	0.00	0.00
Last Week *09-19-2017*	80.04	19.96	1.92	0.18	0.00	0.00
3 Months Ago *06-27-2017*	78.01	21.99	4.65	0.31	0.00	0.00
Start of Calendar Year *01-03-2017*	53.95	46.05	27.69	11.09	1.11	0.00
Start of Water Year *09-27-2016*	76.89	23.11	6.74	1.89	0.28	0.11
One Year Ago *09-27-2016*	76.89	23.11	6.74	1.89	0.28	0.11

Intensity:

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

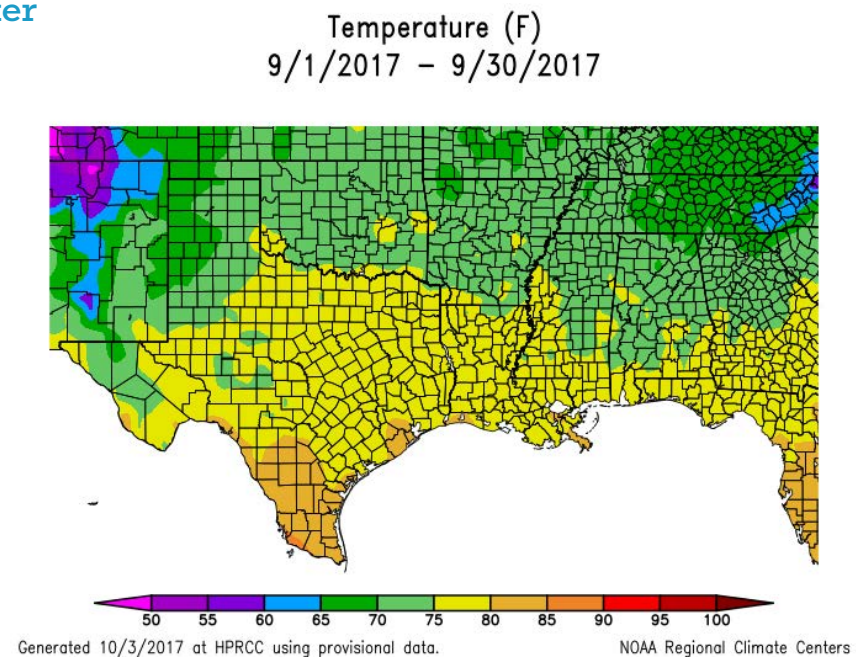
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Above: Drought Conditions in the Southern Region. Map is valid for September 26, 2017. Image is courtesy of the National Drought Mitigation Center.

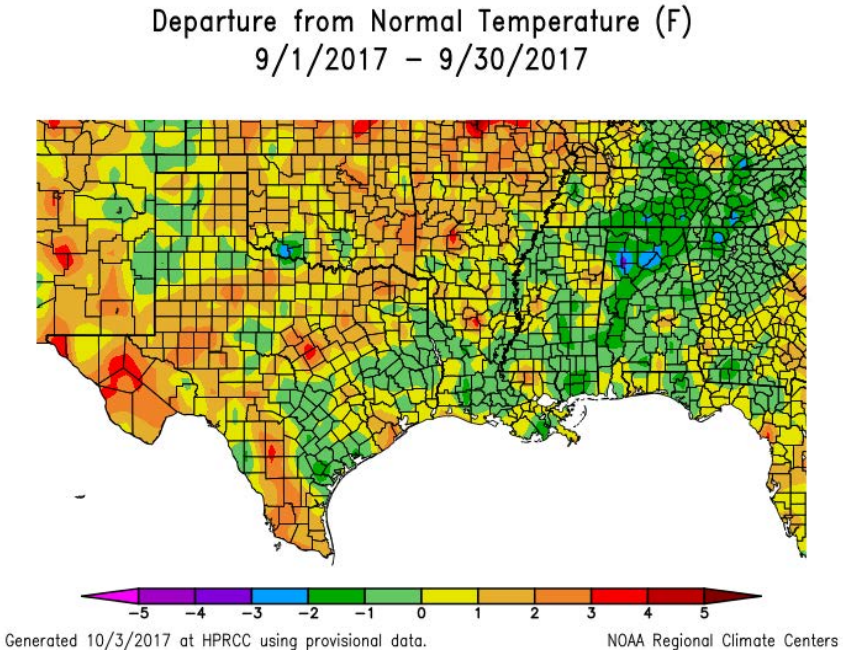
Temperature Summary

Kyle Brehe and Rudy Bartels,
Southern Regional Climate Center

September temperatures varied throughout the region. There were areas of 1 to 2 degrees F (0.667 to 1.111 degrees C) below normal in central and eastern Tennessee, southern Mississippi, and parts of southern Louisiana. There was a small area in southern Tennessee that experienced 2 to 3 degrees F (1.111 to 1.667 degrees C) below normal temperatures. Most of Oklahoma, Arkansas, northern Louisiana, northern Mississippi, western Tennessee and northern, central, and western Texas experienced 1– 2 degrees F (0.667 to 1.111 degrees C) above normal temperatures. There were clusters of 3 - 4 degrees F (1.667 and 2.222 degrees C) above normal temperatures in central Arkansas, northern Louisiana and western and central Texas. The statewide monthly average temperatures were as follows: Arkansas -- 73.10 degrees F (22.83 degrees C), Louisiana -- 77.00 degrees F (25.00 degrees C), Mississippi -- 74.50 degrees F (23.61 degrees C), Oklahoma -- 73.20 degrees F (22.89 degrees C), Tennessee -- 69.20 degrees F (20.67 degrees C), and Texas -- 76.60 degrees F (24.78 degrees C). The statewide temperature rankings for September are as follows: Arkansas (fifty-eighth warmest), Louisiana (fifty-third coldest), Mississippi (fifty-fourth coldest), Oklahoma (fifty-ninth coldest), Tennessee (forty-sixth coldest), and Texas (forty-third warmest). All state rankings are based on the period spanning 1895-2017.



Average September 2017 Temperature across the South

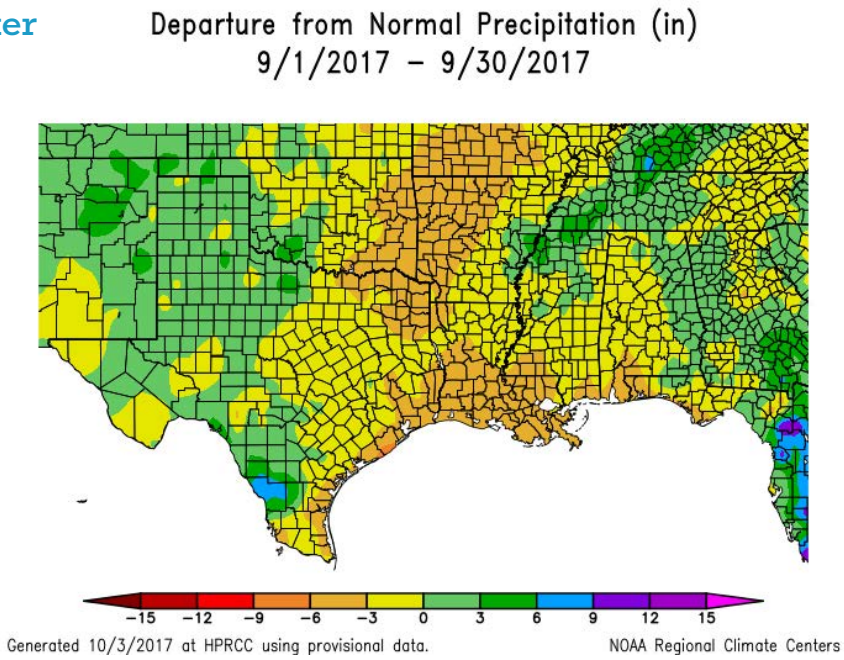


Average Temperature Departures from 1981-2010 for September 2017 across the South

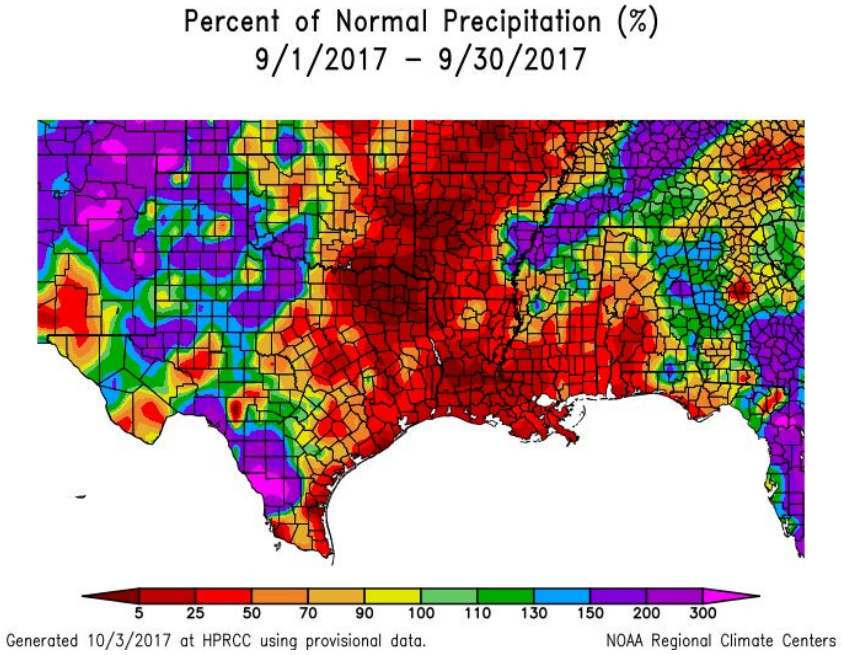
Precipitation Summary

Kyle Brehe and Rudy Bartels,
Southern Regional Climate Center

Precipitation values for the month of September varied spatially throughout the Southern Region. The central part of the region received below normal precipitation whereas parts of the western and eastern part of the region received above normal precipitation. Central Louisiana, western Arkansas, southern Mississippi, eastern Oklahoma, and northeastern and southeastern Texas received below 25 percent of normal precipitation. Most of Louisiana and Arkansas received 25 - 50 percent below normal precipitation. Parts of eastern Tennessee, central Mississippi, eastern Texas, and eastern Oklahoma received 50 - 70 percent below normal precipitation. In contrast, western Tennessee, northern Mississippi, east central Arkansas, western Oklahoma, and southwestern and northern Texas received 150 – 300 percent above normal precipitation. Overall, Tennessee, Oklahoma, Texas, and Mississippi had a large spatial gradient of precipitation. The state-wide precipitation totals for the month are as follows: Arkansas -- 1.16 inches (29.46 mm), Louisiana -- 0.87 inches (22.10 mm), Mississippi -- 2.68 inches (68.07 mm), Oklahoma -- 2.54 inches (64.52 mm), Tennessee -- 4.27 inches (108.46 mm), and Texas -- 2.62 inches (66.55 mm). The state precipitation rankings for the month are as follows: Arkansas (eighth driest), Louisiana (first driest), Mississippi (forty-sixth driest), Oklahoma (forty-seventh driest), Tennessee (thirty-fourth wettest), and Texas (fifty-sixth driest). All state rankings are based on the period spanning 1895-2017.

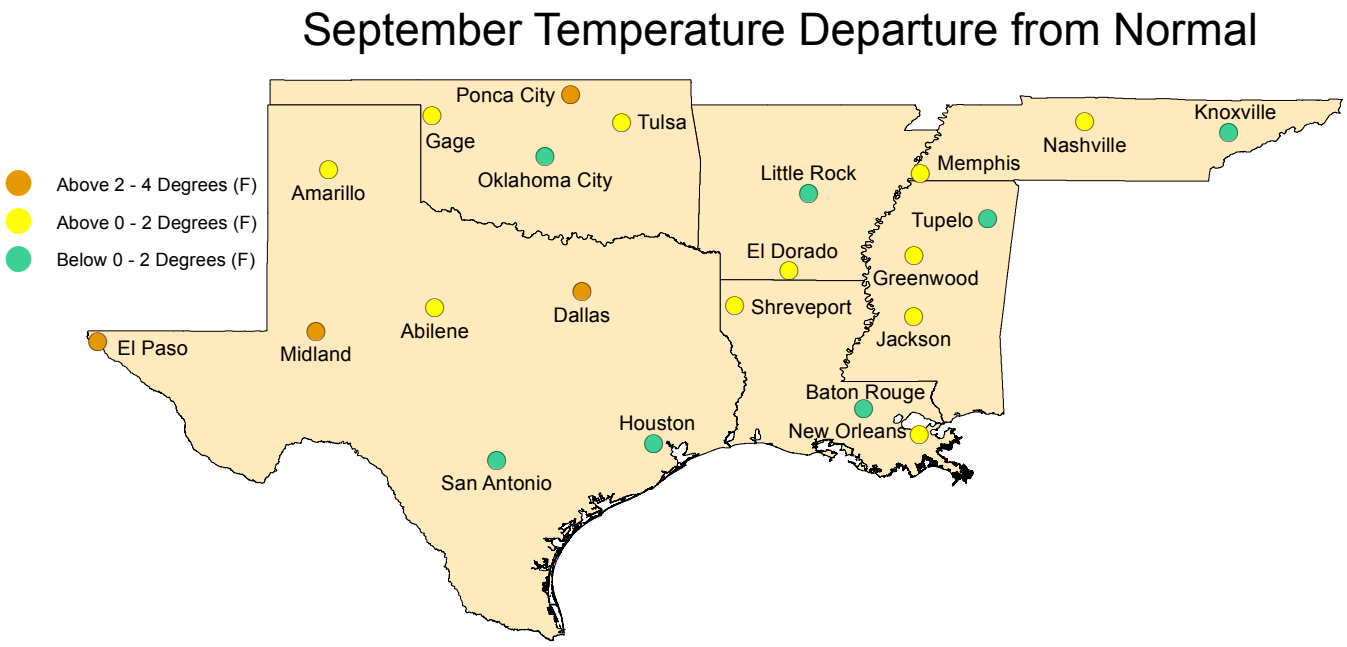


September 2017 Total Precipitation across the South

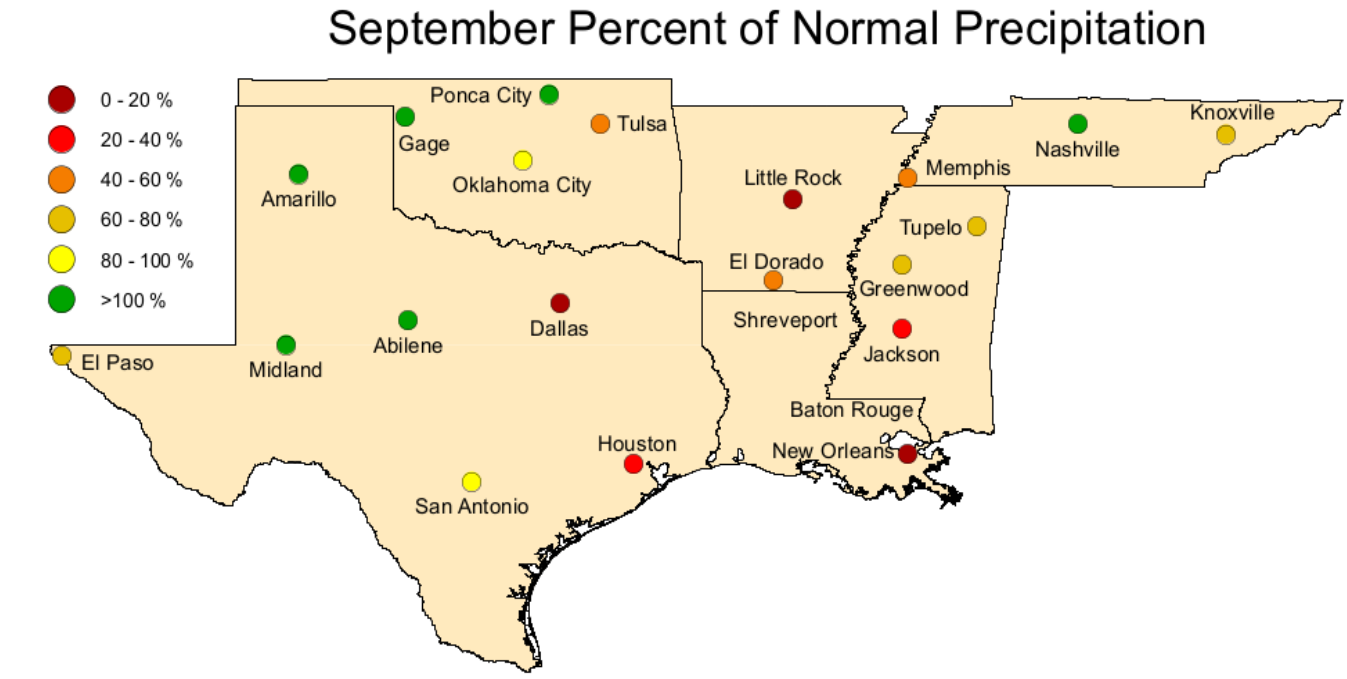


Percent of 1981-2010 normal precipitation totals for September 2017 across the South

Regional Climate Perspective in Pictures



September 2017 Temperature Departure from Normal from 1981-2010 for SCIPP Regional Cities



September 2017 Percent of 1981-2010 Normal Precipitation Totals for SCIPP Regional Cities

Climate Perspective

State	Temperature	Rank (1895-2017)	Precipitation	Rank (1895-2017)
Arkansas	73.10	58th Warmest	1.16	8th Driest
Louisiana	77.00	53rd Coldest	0.87	1st Driest
Mississippi	74.50	54th Coldest	2.68	46th Driest
Oklahoma	73.20	59th Coldest	2.54	47th Driest
Tennessee	69.20	46th Coldest	4.27	34th Wettest
Texas	76.60	43rd Warmest	2.62	56th Driest

State temperature and precipitation values and rankings for September 2017. Ranks are based on the National Climatic Data Center's Statewide, Regional, and National Dataset over the period 1895-2017.

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	86.9	63.5	75.2	0.6	93	09/23+	52	09/07	1.27	-1.84	41
Little Rock, AR	85.6	64.1	74.8	-0.1	93	09/22	53	09/07	0.45	-2.73	14
Baton Rouge, LA	89	67.4	78.2	-0.4	93	09/28+	58	09/08+	0.08	-4.46	2
New Orleans, LA	88.2	72	80.1	0.4	92	09/29+	63	09/12	0.42	-4.55	8
Shreveport, LA	88.4	66	77.2	0.3	94	09/23	54	09/07	T	-3.16	0
Greenwood, MS	87.1	62.7	74.9	0.2	95	09/22	51	09/07	2.31	-1.35	63
Jackson, MS	87.4	65.1	76.2	0.6	93	09/27	54	09/07	1.17	-1.86	39
Tupelo, MS	85.2	62.5	73.9	-0.2	93	09/21	50	09/07	2.28	-1.16	66
Gage, OK	85	59.5	72.2	1.6	99	09/04	43	09/06	2.08	0.14	107
Oklahoma City, OK	84	62.2	73.1	-0.8	94	09/19	51	09/13	3.71	-0.35	91
Ponca City, OK	86.4	62.6	74.5	2.4	97	09/04	46	09/06	3.44	0.15	105
Tulsa, OK	86.3	63.8	75	2	95	09/20+	52	09/06	1.8	-2.46	42
Knoxville, TN	80.7	59.6	70.2	-0.9	89	09/27+	50	09/08+	2.43	-0.81	75
Memphis, TN	84.8	65.9	75.3	0.1	93	09/22	55	09/07	1.61	-1.48	52
Nashville, TN	82.7	60.8	71.8	0.2	92	09/27+	50	09/08+	3.58	0.17	105
Abilene, TX	86.8	64.4	75.6	0.1	100	09/14	55	09/11	4.43	2.19	198
Amarillo, TX	81.7	57.6	69.7	0.2	94	09/21+	50	09/06	3.4	1.48	177
El Paso, TX	90.5	67.4	78.9	3.5	100	09/13	60	09/26	1.16	-0.35	77
Dallas, TX	91.1	70.1	80.6	2.6	99	09/20	60	09/12	0.47	-2.08	18
Houston, TX	89.9	69.7	79.8	0	93	09/28+	60	09/12	1.23	-2.89	30
Midland, TX	88.5	66.2	77.3	2.8	104	09/14	59	09/11	4.07	2.21	219
San Antonio, TX	89.2	69.5	79.4	-0.3	97	09/20	57	09/07	2.8	-0.23	92

Summary of temperature and precipitation information from around the region for September 2017. 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.

Hurricane Season Ain't Over til It's Over

Barry D. Keim- Louisiana State Climatologist, Louisiana State University

To date, this hurricane season has been a busy one. So far, we've had 13 named storms, including 7 tropical storms, and 7 hurricanes, of which 4 were a major hurricanes. However, only three of these 13 storms made landfall in the United States. Tropical Storm Cindy made landfall in southwestern Louisiana in late June, Major Hurricane Harvey made landfall along the central Texas coast on August 26, which was followed by Hurricane Irma which made landfall in South Florida on September 10th. And yes, the season is winding down and we happen to be quiet at this very moment. But Whoa Nelly....the season is NOT over, as we still need to squeak through October before casually consuming our hurricane supplies for the year.

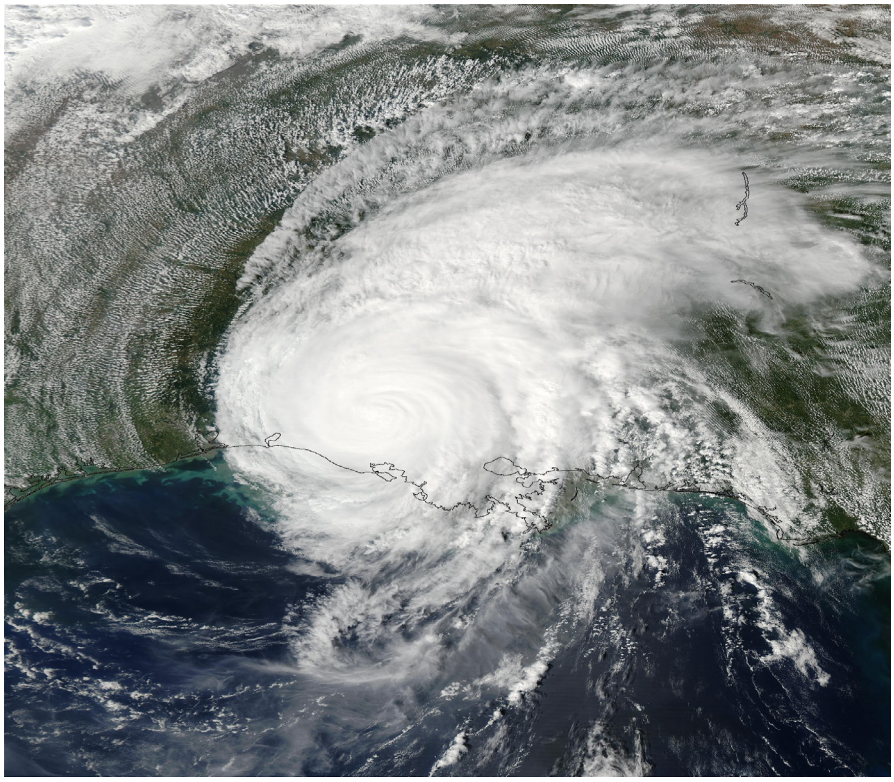


Figure 1. MODIS image of Hurricane Lili shortly after landfall in Louisiana on October 3, 2002. Image is from NASA and can be found at http://visibleearth.nasa.gov/view.php?id=62080.

Surely we're past the peak of the season, but October can still be an active month. Historically, October has brought us in Louisiana the Racer's storm of 1837, which is named after the British Naval ship Racer that was damaged by this storm down in the Caribbean. Then, there was the Chenier Caminada Hurricane of 1893, which produced a 16-foot storm surge just west of Grand Isle and drowned about 2000 people. In October 1964, Hurricane Hilda made landfall in St. Mary Parish leading to 24 deaths. Then, Hurricane Juan made multiple landfalls in Louisiana in 1985 as it did several loops along our coast. More recently, Hurricane Lili hit southwestern Louisiana in 2002 giving more of a scare than serious damage (Figure 1). Of these October hurricanes, Juan was the latest in the season - still hanging around Louisiana while trick or treaters were doing their thing at the end of the month!

On average the North Atlantic Basin (including the Gulf and Caribbean) averages 2 named storms in October. The tracking pattern of tropical storms and hurricanes takes a shift more toward the eastern Gulf in October, as well as in November, but Louisiana is still centrally located along the Gulf and still can get hit this month. If the State can hang on until mid-October, the chance of major hurricanes visiting the Bayou will get become very low, and if we can make all the way the end of the month, we can ALMOST consider ourselves home free. But, we're not there yet. We all need to hang in there just a little longer, before closing the book on this season. Although Yogi Berra was talking about sports, his famous quote is just as relevant to our hurricane season...."it ain't over til it's over!" Please contact me with any questions at keim@lsu.edu.

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Contact Us

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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.

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 or (225)578-8374.

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From Our Partners

USDA Southern Plains Climate Hub:

September 31, 2017 : Public Service Annoucements for the Promotion of Soil Health

The Southern Plains Climate Hub, in partnership with Redlands Community College and the USDA Natural Resources Conservation Service, is working on promoting soil health as a tool for both climate change mitigation and to help farmers and ranchers adapt to extreme weather events like droughts and floods. As part of this outreach effort, the Hub is developing a series of audio Public Service Announcements (PSA's) for distribution to local radio stations and online.

For more information contact Clay Pope, USDA Southern Plains Climate Hub Coordinator at 405-699-2087 or clayg-pope@gmail.com

Monthly Comic Relief