

# Southern Climate Monitor

June 2013 | Volume 3, Issue 6



"Summer"  
By Katy Strnad



# SCIPP

Southern Climate Impacts Planning Program  
A NOAA RISA Team

## *In This Issue:*

**Page 2 - 4: Spotlight on Student Research: Ice Storms and Global Atmospheric Circulation**

**Page 5: Drought Summary**

**Page 6: Southern U.S. Temperature Summary for June**

**Page 7: Southern U.S. Precipitation Summary for June**

**Page 8: Climate Perspective and Station Summaries Across the South**

**Page 9: Summer Season Forecast**



# LSU



The Southern Climate Monitor is available at [www.srcc.lsu.edu](http://www.srcc.lsu.edu) & [www.southernclimate.org](http://www.southernclimate.org)

# A Climatology of Ice Storm Frequency Across the Contiguous United States and its Association with Changes in the Global Atmospheric Circulation

Carly Kovacic, SCIPP Graduate Student

Winter weather has had a detrimental impact on both lives and property across the Contiguous United States for many years. As a result, numerous studies have been conducted on winter weather events to better understand the dynamical aspects of storm development, as well as the associated hazards, in an effort to improve short-term forecast ability. However, many of these studies have focused solely on snowstorms, blizzards, or case studies of one particularly severe winter weather event. It must be addressed that mixed precipitation events and ice storms are also of great hazard during the winter months. According to Chagnon (2003), total losses resulting from ice storms between 1949 and 2000 have totaled \$16.3 billion. Yet, many previous studies still have not fully focused on the climatology or impacts of ice storms across the entire United States. Therefore, the goal of this research has been to develop a preliminary climatology of ice

storms over several decades across the Contiguous United States and then investigate the meteorological sources behind the resulting distribution of ice. Of special concern is how ice storm frequency is associated with large-scale atmospheric changes in the El Nino/Southern Oscillation (ENSO), Arctic Oscillation (AO), and North Atlantic Oscillation (NAO), as well as changes in global air circulation.

Prior to about 1978, La Nina events were associated with negative global temperature anomalies, while El Nino events were associated with positive global temperature anomalies (Figure 1). Beginning in the 1980s, La Nina events became associated with positive global temperature anomalies, and El Nino events became associated with much higher positive global temperature anomalies. In an effort to capture a potential shift in ice storm frequency resulting from these changes, ice storms were documented during the winter seasons (December, January, and February) between 1966 and 1977 and between 1998 and 2011, which correspond to periods before and after the temperature anomaly change, respectively.

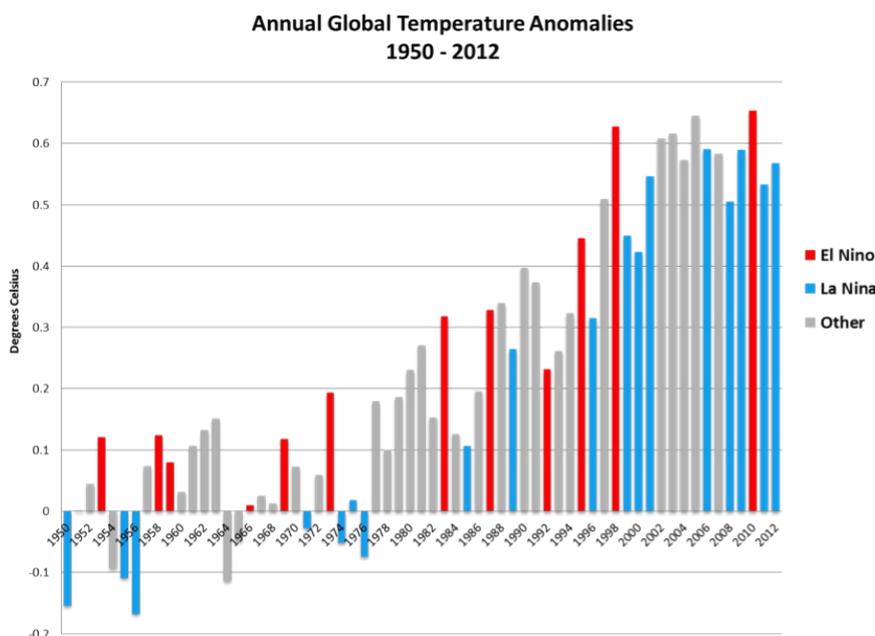


Figure 1. A bar graph showing annual global temperature anomalies between 1950-2012 in degrees Celsius. El Nino events are shown in red, La Nina events are shown in blue, and Neutral events are shown in grey. La Nina events shifted from negative anomalies to positive anomalies between 1977 and 1985, and El Nino events became more positive after about 1983. This graph was provided by NCDC.

Total Winter Ice Storms 1966-1977

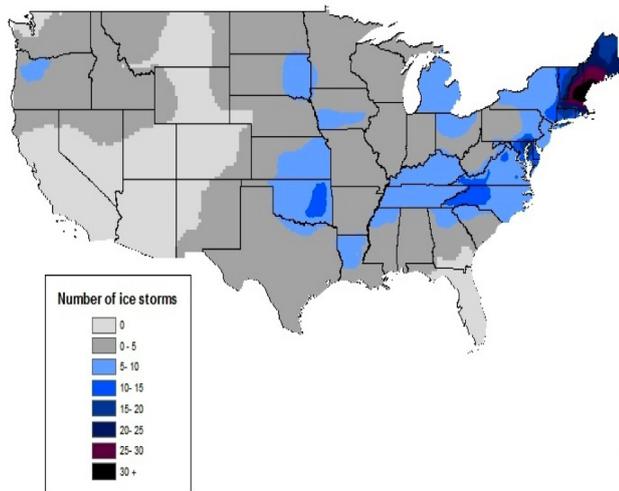


Figure 2. The total number of ice storms documented during the winter months between 1966 and 1977. The highest frequency was recorded over New England and parts of the Appalachian Mountains, with the lowest frequency across Florida and the Southwest.

The term “ice storm” in this study was defined as a freezing precipitation event that has led to hazardous travel conditions, power outages, and/or fatalities, regardless of the amount of ice accumulation or presence of other precipitation types. All ice storm events were documented using the National Climatic Data Center’s (NCDC) Storm Data database, which began recording weather events in 1959. Ice storms for every county in the Contiguous United States were documented and then plotted separately for each period of study. Shown in Figure 2 is the total number of ice storms across the United States during the winter months between 1966 and 1977. The highest frequency of ice storms (over 30 storms) was found to occur in eastern and northern New England, particularly in Massachusetts, New Hampshire, and Maine. The lowest frequency was found across the Florida peninsula and Southwest United States. Between the winter months of 1998 and 2011, the highest frequency of ice storms was located in western and southern New England, particularly across

Total Winter Ice Storms 1998-2011

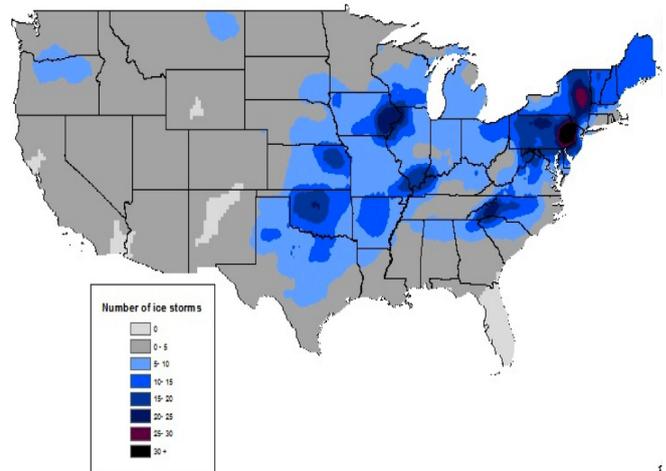


Figure 3. The total number of ice storms documented during the winter months between 1998 and 2011. The highest frequency was found to have shifted west and south into parts of southern New England. More ice storms were also documented in parts of the Appalachian Mountains and across the Midwest and Southern Plains. The lowest frequency was found across the Gulf States and west of the Rocky Mountains.

New York, Pennsylvania, and New Jersey (Figure 3). The lowest frequency was found again across the Florida peninsula and west of the Rocky Mountains. The recent westward and southward shift in ice storm frequency across New England is rather significant and shown in Figure 4 is the difference in the number of ice storms that occurred in New England during the 1966-1977 period and the 1998-2011 period. Also of interest is the recent increase in ice storm frequency across the Midwest and Southern Plains. It has been hypothesized that the westward and southward shift in ice storm frequency across New England is of meteorological significance, while the increase in ice storms across the Midwest and Southern Plains is thought to be related to improvements in ice storm reporting. To investigate this, the next step of this study is to find potential changes in the sea surface temperatures across the coastal waters of New England and the North Atlantic Ocean, which may be associated with changes in surface air

temperatures and storm tracks within this region. Any changes in the location and temperature of the Gulf Stream over the past few decades will also be monitored for similar reasons. Potential changes in stratospheric air masses will also be looked at; in particular, the location of the polar vortex and its documented break downs. Changes in surface air temperature over land will also be investigated, with the depth of low level cold air and the thickness of the warm nose above of main concern. These results will then be compared to documented changes in teleconnections (ENSO, AO, and NAO). To verify the reasoning behind the nonmeteorological sources, population change and various methods of reporting and documenting ice storms will also be investigated.

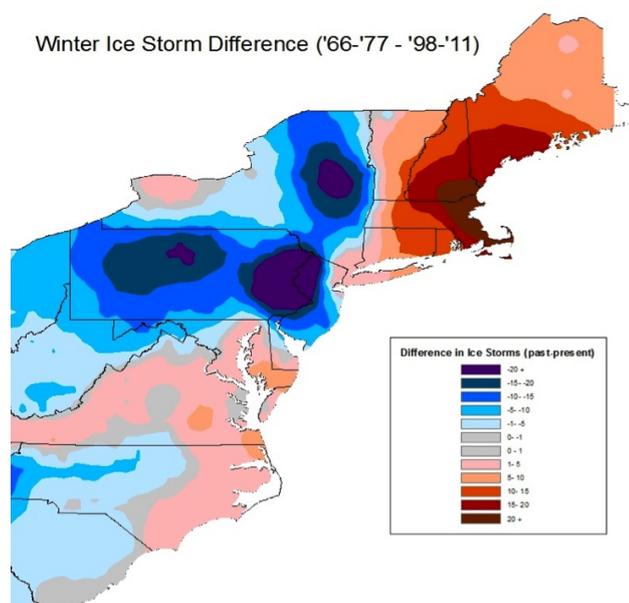
Together, these results will hopefully provide insight into potential changes in global atmospheric circulation, which will help in understanding the role that teleconnections have in ice storm frequency across the United States. The knowledge provided by this will then aid in improvements to both long-term and short-term weather forecasting, ultimately protecting lives and property during future freezing precipitation events.

## References:

Changnon, S. A., 2003: Characteristics of Ice Storms in the United States. *J. Appl. Meteor.*, 42, 630-639.

ENSO global temperature anomaly bar graph (Figure 2) was provided by NCDC: <http://www.ncdc.noaa.gov/>

For questions, contact Carly Kovacik at [cekovaci@ou.edu](mailto:cekovaci@ou.edu).



**Figure 4.** The difference in the number of ice storms across New England between the winter months of 1966-1977 and 1998-2011. Hot colors (i.e., reds) represent a higher number of ice storms between 1966-1977 and cooler colors (i.e., blues) represent a higher number of ice storms between 1998-2011.

## More to Learn:

-<http://www.caps.ou.edu/reu/reu10/papers/Kovacik.pdf>

-[https://support.rms.com/publications/1998\\_Ice\\_Storm\\_Retrospective.pdf](https://support.rms.com/publications/1998_Ice_Storm_Retrospective.pdf)

-<http://journals.ametsoc.org/doi/pdf/10.1175/1520-0477%281999%29080%3C1399%3ATEOTEN%3E2.0.CO%3B2>

# Drought Update

*Luigi Romolo  
Southern Regional Climate Center*

Drought conditions have remained fairly steady over the month of June. Severe to extreme drought continue to plague much of Texas and Oklahoma. Some improvement has been observed in the central portions of Oklahoma, while Louisiana, Arkansas, Mississippi, and Tennessee remain drought-free.

In Texas, heat caused problems late in the month. Several cities saw their greatest June maximum temperatures ever and dozens of other rural regions saw the same. This had a remarkable effect on reservoirs in East Texas, causing several water planning regions, from Dallas/Fort Worth to Houston and Nacogdoches, to see thousands of acre-feet in surface water loss in days. Statewide reservoir storage dropped by over a percent for the first time in months, falling below end of month levels for May and April.

*Drought Conditions (Percent Area)*

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	39.80	60.20	49.62	39.59	20.00	7.32
Last Week (06/25/2013 map)	44.32	55.68	48.03	35.49	18.71	6.85
3 Months Ago (04/02/2013 map)	28.19	71.81	60.23	43.79	23.69	7.28
Start of Calendar Year (01/01/2013 map)	21.18	78.82	63.69	50.50	32.80	10.98
Start of Water Year (09/25/2012 map)	24.13	75.87	66.61	51.50	29.86	9.11
One Year Ago (06/26/2012 map)	9.65	90.35	62.79	31.30	7.83	0.00

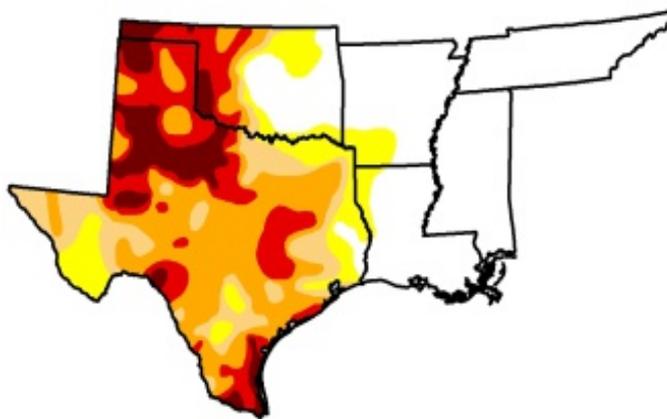
**Intensity:**

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

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompany text summary for forecast statements. <http://droughtmonitor.unl.edu>

Though much of the state saw less than normal precipitation, the area around Eagle Pass experienced a deluge of rainfall and far greater than normal precipitation all within two days.

On June 17, the Panhandle and Big Country saw supercell thunderstorms crossing over Lubbock and Abilene, dropping up to baseball sized hail around Lubbock International Airport and bringing hurricane force winds to Abilene, causing 21,500 to lose power (Information provided by the Texas State Climate Office). On June 14, 2013, a tornado caused some roof damage in Uvalde County, Texas. Fortunately, no injuries or fatalities were reported. Other than a few other touchdowns, it was a relatively quiet month for tornadoes in the Southern Region.



Released Wednesday, July 3, 2013

Matthew Rosencrans, NOAA/NWS/Climate Prediction Center

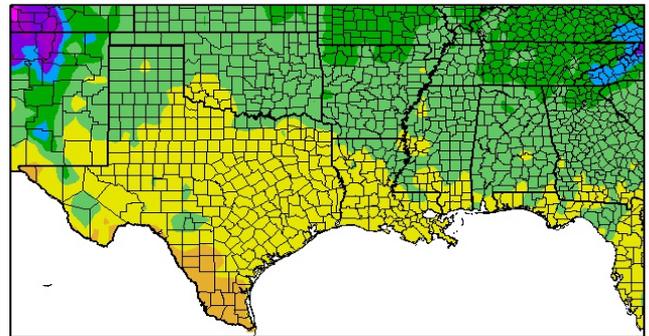
Above: Drought Conditions in the Southern Region. Map is valid for July 2, 2013. Image is courtesy of National Drought Mitigation Center.

# Temperature Summary

*Luigi Romolo*  
 Southern Regional Climate Center

For the Southern Region, the month of June proved to be a slightly warmer than normal month across the board. Temperatures across the six states generally averaged between 0 to 4 degrees F (0 to 2.22 degrees C) above normal, with the highest anomalies occurring in northwestern Texas and western Oklahoma. The state average temperatures for the month are as follows: Arkansas with 77.00 degrees F (25.00 degrees C), Louisiana with 80.50 degrees F (26.94 degrees C), Mississippi with 78.70 degrees F (25.94 degrees C), Oklahoma with 78.10 degrees F (25.61 degrees C), Tennessee with 74.50 degrees F (23.61 degrees C), and Texas with 81.70 degrees F (27.61 degrees C). For Texas, it was the seventeenth warmest June on record (1895-2013). All other state rankings fell within the middle two quartiles.

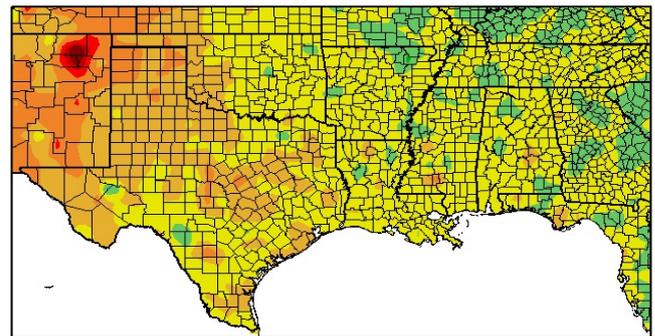
Temperature (F)  
 6/1/2013 - 6/30/2013



Generated 7/5/2013 at HPRCC using provisional data. Regional Climate Centers

**Average Temperature for June 2013 across the South.**

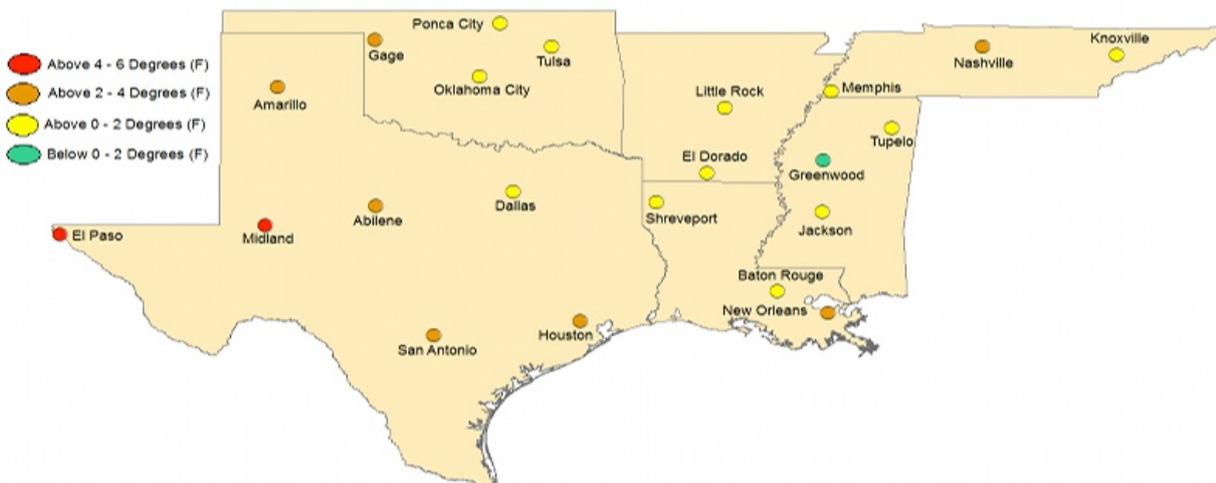
Departure from Normal Temperature (F)  
 6/1/2013 - 6/30/2013



Generated 7/5/2013 at HPRCC using provisional data. Regional Climate Centers

**Average Temperature Departures from 1971-2000 for June 2013 across the South.**

## June Temperature Departure from Normal



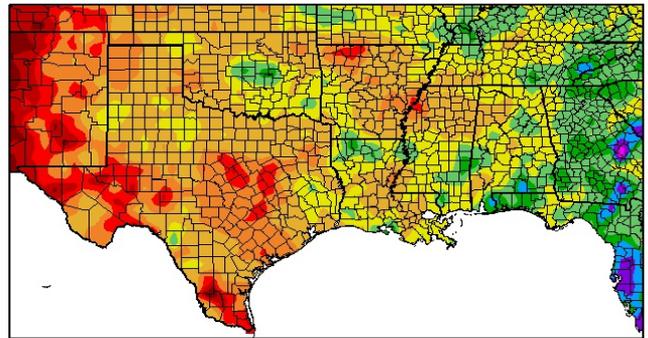
June Temperature Departure from Normal from 1971-2000 for SCIPP Regional Cities

# Precipitation Summary

*Luigi Romolo*  
*Southern Regional Climate Center*

June was generally a drier than normal month for the Southern Region, with the exception of central Mississippi, northern Louisiana, and eastern Tennessee. The driest area of the region occurred in central Texas where a bulk of the stations reported less than half the expected values for the month. This was also the case in northwestern Arkansas and for some parishes in southeastern Louisiana. Eastern Tennessee was on the wet end of the spectrum, reporting between one hundred and fifty to two hundred percent of normal. The state average precipitation totals are as follows: Arkansas with 3.23 inches (82.04 mm), Louisiana with 4.65 inches (118.11 mm), Mississippi with 4.27 inches (108.46 mm), Oklahoma with 4.06 inches (103.12 mm), Tennessee with 5.68 inches (144.27 mm), and Texas with 2.39 inches (60.71 mm). For Tennessee it was the eighteenth wettest June on record (1895-2013). The state rankings for all other states fell within the two middle quartiles.

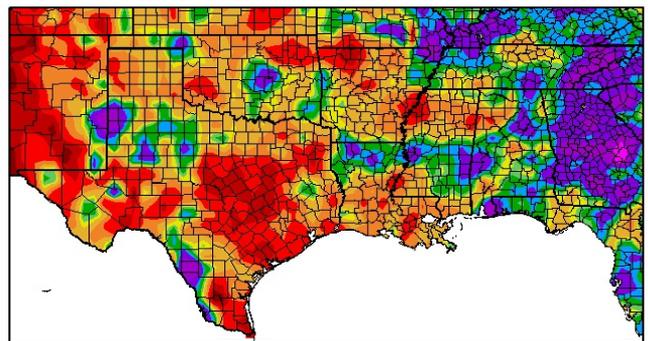
Precipitation (in)  
 6/1/2013 – 6/30/2013



Generated 7/5/2013 at HPRCC using provisional data. Regional Climate Centers

**Total precipitation values for June 2013 across the South.**

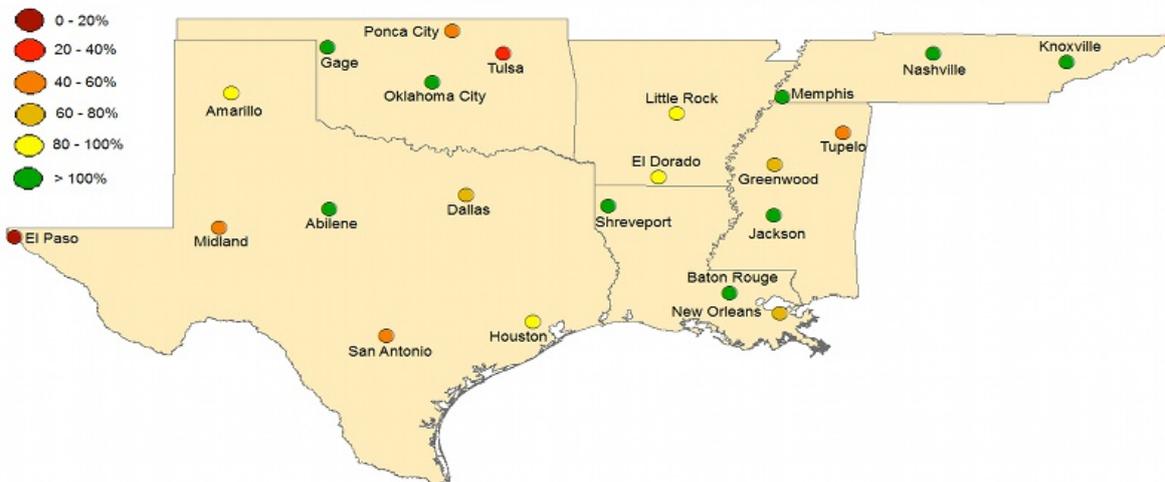
Percent of Normal Precipitation (%)  
 6/1/2013 – 6/30/2013



Generated 7/5/2013 at HPRCC using provisional data. Regional Climate Centers

**Percent of 1971-2000 normal precipitation totals for June 2013 across the South.**

## June Precipitation Departure from Normal



**June Percent of 1971-2000 Normal Precipitation Totals for SCIPP Regional Cities**

## Climate Perspective

State	Temperature	Rank (1895-2011)	Precipitation	Rank (1895-2011)
Arkansas	77.00	47 <sup>th</sup> Warmest	3.23	42 <sup>nd</sup> Driest
Louisiana	80.50	35 <sup>th</sup> Warmest	4.65	55 <sup>th</sup> Wettest
Mississippi	78.70	44 <sup>th</sup> Warmest	4.27	50 <sup>th</sup> Wettest
Oklahoma	78.10	31 <sup>st</sup> Warmest	4.06	55 <sup>th</sup> Wettest
Tennessee	74.50	50 <sup>th</sup> Warmest	5.68	18 <sup>th</sup> Wettest
Texas	81.70	17 <sup>th</sup> Warmest	2.39	44 <sup>th</sup> Driest

State temperature and precipitation values and rankings for June 2013. 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 Name	Temperatures (degrees F)								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	%Norm
El Dorado, AR	88.9	68.4	78.7	0.2	98.0	6/28	59.0	6/8	4.17	-1.01	81
Little Rock, AR	89.3	69.9	79.6	1.2	101.0	6/27	59.0	6/3	3.23	-0.72	82
Baton Rouge, LA	90.7	72.3	81.5	1.8	95.0	6/14	68.0	6/2	6.47	1.14	121
New Orleans, LA	90.4	75.3	82.8	2.1	95.0	6/28+	70.0	6/2	4.39	-2.44	64
Shreveport, LA	91.1	71.6	81.3	1.4	100.0	6/28	63.0	6/8	7.75	2.70	153
Greenwood, MS	89.4	68.3	78.8	-0.7	95.0	6/27	57.0	6/8	3.04	-1.46	68
Jackson, MS	89.5	69.7	79.6	1.1	94.0	6/27	63.0	6/8	4.98	1.16	130
Tupelo, MS	88.9	68.3	78.6	1.7	97.0	6/27	61.0	6/8+	2.04	-2.78	42
Gage, OK	90.7	65.2	77.9	2.6	106.0	6/27	46.0	6/2	4.10	1.21	142
Oklahoma City, OK	88.1	68.4	78.2	1.4	99.0	6/27	56.0	6/3	4.81	0.18	104
Ponca City, OK	89.3	67.3	78.3	0.8	102.0	6/27	52.0	6/7+	2.41	-2.09	54
Tulsa, OK	89.1	69.0	79.1	1.1	100.0	6/27	52.0	6/3	1.69	-3.03	36
Knoxville, TN	84.8	66.0	75.4	1.6	92.0	6/12	59.0	6/15	9.38	5.34	232
Memphis, TN	88.9	70.6	79.8	1.0	97.0	6/27	61.0	6/8	5.47	1.17	127
Nashville, TN	87.6	66.6	77.1	2.0	96.0	6/27	56.0	6/4	4.48	0.40	110
Abilene, TX	94.1	70.4	82.2	2.4	104.0	6/28	62.0	6/7+	5.13	2.07	168
Amarillo, TX	91.2	64.3	77.8	3.5	105.0	6/27	51.0	6/2	2.80	-0.48	85
El Paso, TX	100.3	73.2	86.8	4.7	107.0	6/27	64.0	6/8	0.16	-0.71	18
Dallas, TX	92.6	72.6	82.6	1.7	103.0	6/28	62.0	6/3	2.14	-1.09	66
Houston, TX	94.7	74.0	84.3	3.0	107.0	6/29	68.0	6/8+	4.46	-0.89	83
Midland, TX	96.3	70.9	83.6	4.0	109.0	6/4	63.0	6/7+	0.85	-0.86	50
San Antonio, TX	93.3	74.4	83.9	2.4	108.0	6/29	65.0	6/8	2.02	-2.28	47

Summary of temperature and precipitation information from around the region for June 2013. 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.

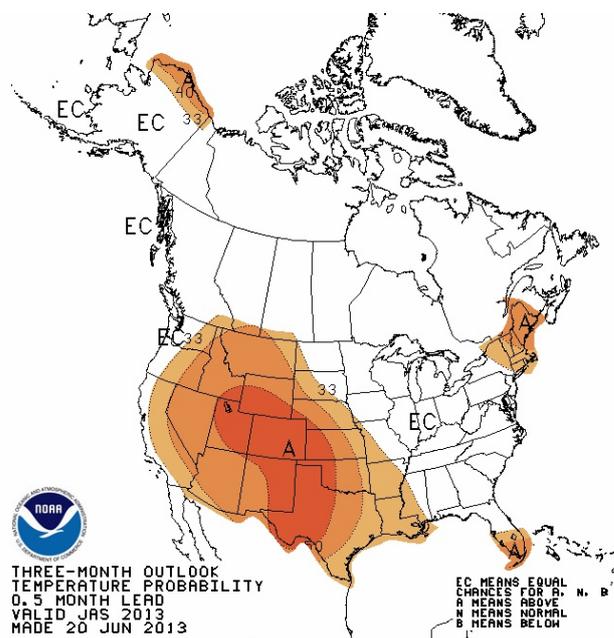
# Summer Season Forecast

*Barry Keim, Louisiana State Climatologist, Louisiana State University*

Now that summer has officially arrived, it's time to examine the summer seasonal forecast from the NOAA's Climate Prediction Center. With exception to the immediate West Coast, they are calling for most of the western half to two-thirds of the country to be warmer than normal, and this includes Louisiana. The explanation for this would be that the jet stream would get displaced farther north than normal over the west and central United States, and this would create a ridge of high pressure over the region, leading to high temperatures. Just what we need during the hottest and most humid time of the year!

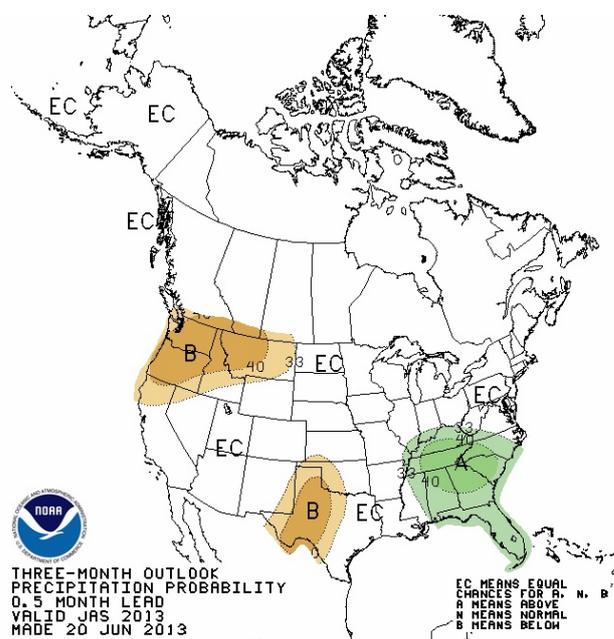
They are forecasting "EC" for rainfall, meaning equal chances. What this actually means is that there are equal chances of above normal, normal, or below normal conditions. We'll just call it "normal," for simplicity. Normal rainfall would be much welcomed, as we have been in and out of drought over the past few summer seasons.

I'll also add that if rainfall does fall short again, this will only make our summer that ever hotter than expected. Here's to hoping for some excessive cloudiness and scattered rains to take the edge off of this upcoming season. My advice.....go buy a bathing suit that meets your needs and use it often. If you have any questions, feel free to contact me at keim@lsu.edu.



**Figure 1: Summer seasonal temperature forecast from the Climate Prediction Center. Graphics found at**

[http://www.cpc.ncep.noaa.gov/products/predictions/long\\_range/seasonal.php?lead=1](http://www.cpc.ncep.noaa.gov/products/predictions/long_range/seasonal.php?lead=1)



**Figure 2: Summer seasonal precipitation forecast from the Climate Prediction Center. Graphics found at**

[http://www.cpc.ncep.noaa.gov/products/predictions/long\\_range/seasonal.php?lead=1](http://www.cpc.ncep.noaa.gov/products/predictions/long_range/seasonal.php?lead=1)

## Monthly Comic Relief



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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 225-578-502. 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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