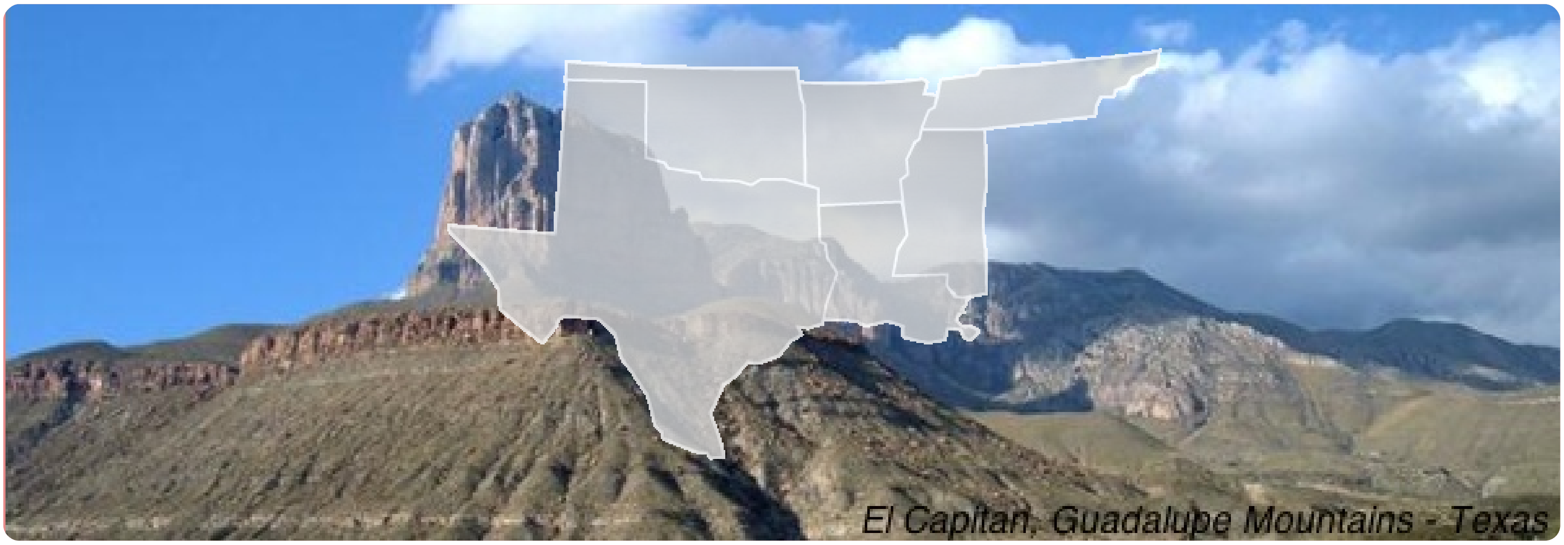

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Possible Causes of the Disappearing Southern Hackberry (Sugarberry) Trees in Louisiana

Laura Becker, Louisiana State University

Residents of southern Louisiana have noted that the hackberry has been disappearing from southern parishes. Two species of hackberries (Genus *Celtis* L.) are commonly found in Louisiana. The dwarf hackberry (*Celtis tenuifolia* Nutt.) is generally found in 16 northern Louisiana parishes (Natural Resources Conservation Service 2012). The hackberry (*Celtis laevigata* Willd.) also known as sugarberry, southern hackberry, and sugar hackberry is found throughout the southeast U.S. including most of Louisiana (Kennedy 1990).

The southern hackberry (sugarberry) is a fast growing medium-sized tree that grows to about 80 feet tall, 3 feet in diameter and lives under 150 years (Kennedy 1990; Houck and Anderson 2009). The sugarberry grows in semi-humid and semi-arid climates with most of the range of the sugarberry in humid climates (Kennedy 1990). It reproduces by seeds or cuttings and the blooming period is early spring with an abundance of fruit emerging during the summer (Houck and Anderson 2009). Despite the hardiness of the sugarberry tree, Louisianans are noticing a decreasing population. A brief overview of the common reasons for decreasing plant populations is explored to help determine a probable cause of sugarberry tree mortality.

Image of the Sugarberry tree. Courtesy Auburn University Horticulture Department (2012).

Hardiness Zones

The lowest average winter temperature is used to determine hardiness zones with the zones in ten degree intervals and then separated into 5 degrees with an a or b designation (Gill et al. 2012). In Louisiana, the zones range from 8a to 9b (Gill et al. 2012). Sugarberry trees are found in hardiness zones 5a through 10b which allows it to grow throughout Louisiana. Across Louisiana, the hardiness zones have shifted showing a 5 degree warming. Gill et al. (2012) noted that the 1980s were extremely cold causing the 1990 zones to shift south. The 2012 hardiness zone map resembles the maps before the 1990 (Gill et al. 2012).

Disease and Bugs

Pests and diseases are generally not detrimental to the sugarberry (Houck and Anderson 2009). It has been noted that the hackberry butterfly (*Asterocampa celtis*) has been responsible for defoliating sugarberry trees in the southern U.S. but no tree deaths were caused from the butterfly (Kennedy 1990). Common diseases found on the sugarberry are trunk rot, leaf spots, witches broom (Gilman and Watson 2011). Trunk rot is more in common in injured mature trees (Gilman and Watson 2011). Witches broom is commonly thought to be caused by an interaction between mites and a powdery mildew which does not harm the sugarberry tree but makes the tree unappealing (Barataria-Terrebonne National Estuary Program 2012). Fungi can cause leaf spots which is more prevalent in periods of high moisture (Gilman and Watson 2011).

Saltwater Intrusion

Sugarberry trees are moderately salt-tolerant and drought tolerance is moderate to high once the tree has matured but prefers moist and sunny locations (Gilman and Watson 2011). Sugarberry roots can handle saltwater flooding but not constant saltwater (Barataria-Terrebonne National Estuary Program 2012). Due to large groundwater withdrawals, saltwater intrusion has been evident throughout Louisiana's aquifers (Wold 2012). Louisiana coastline is rapidly disappearing due to natural and human processes. A natural cause of saltwater intrusion includes tropical cyclones that have the potential to bring large amounts of saltwater inland caused by the storm surge that may have lasting impacts. Steyer et al. (2007) listed consequences of constant exposure to saltwater on coastal plants as diebacks and limited recovery, shift to more salt tolerant species, a decrease in biomass production and germination rates. Saltwater intrusion and saltwater combined with the recent droughts may negatively impact the sugarberry population in southern Louisiana.

Seed Dispersal

Wildlife and domestic animals including small mammals and waterfowl among many other mammals and birds eat fruit produced from sugarberry trees and help disperse seeds (Kennedy 1990). Mockingbirds and robins along with other songbirds not only eat the fruit but use the tree for nesting (Barataria-Terrebonne National Estuary Program 2012). Changing habitats along the Lower Mississippi from forests to agricultural lands negatively effects the birds that help disperse tree seeds (Twedt and Wilson 2007). Limited forest restoration has been largely occurring in poorly-drained Lower Mississippi Valley areas which limits species that rely on well-drained soil such as the sugarberry (Twedt and Wilson 2007). The forest restoration has not replaced a large portion of the forest originally converted to agriculture (Twedt and Wilson 2007). Possible bird migration pattern disruptions or changing habitats that include the sugarberry both would have an impact on sugarberry population in Louisiana.

Conclusion

Some of the possible causes of the disappearing sugarberry trees are examined. Due to the wide range of climate types the sugarberry thrives in, the changes in the hardiness zones are unlikely to account for the sugarberry death in southern Louisiana. The pest and disease are not strong probable cause of the changes seen by southern Louisiana residents in sugarberry population. Saltwater intrusion and/or changes in wildlife patterns are most likely the causes affecting the decrease population of the sugarberry. Other causes that could be reviewed are strong wind events such as hurricanes and drought severity. The issue of the sugarberry changes in southern Louisiana should be examined further.

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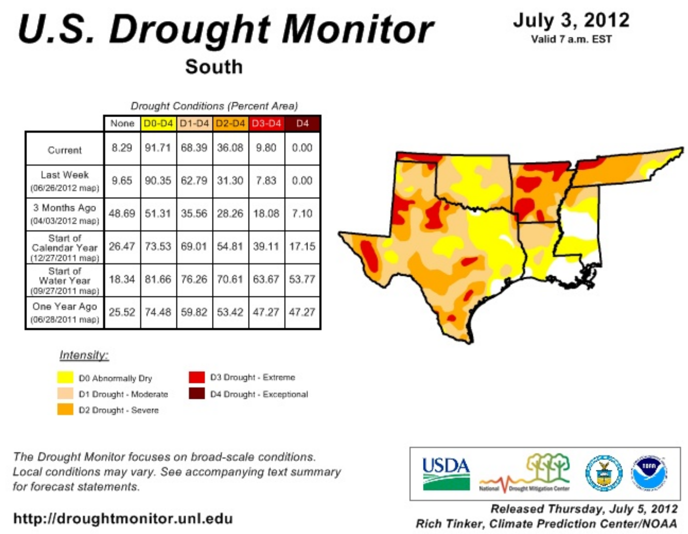
Drought Conditions and Severe Weather

Luigi Romolo, Southern Regional Climate Center

With all six states receiving less than normal precipitation in June, drought conditions throughout the Southern Region have deteriorated. Much of Tennessee is now experiencing a severe (D2) drought. In Arkansas, conditions have worsened from moderate to severe drought, with pockets of extreme drought in all areas of the state. Central Texas has also been downgraded from no drought and moderate (D1) drought to moderate (D1) and severe drought (D2). In Louisiana, northern parishes are now experiencing moderate (D1) drought as well. This is also the case for eastern Tennessee and much of central and eastern Oklahoma.



Above: Drought Conditions in the Southern Region. Map is valid for July 3, 2012. Image is courtesy of the National Drought Mitigation Center.

Texas farmers harvested their summer crops in early June, and they generally received a better yield than expected, even in West Texas where rain was scarce. Livestock was reported to be in fair condition as well, according to the Texas AgriLife Extension Service. Ranchers noted healthy grasslands provided food for cattle while the spring rains refilled stock tanks. However, the looming hot and dry summer conditions have begun to worry farmers and ranchers. (Information provided by the Texas State Climate Office)

In Texas, severe storms caused extensive damage across Texas during June. Towns in the Lower Rio Grande valley endured minor floods after strong storms dumped over 2.5 inches (63.50 mm) of rain in an hour. In the greater Houston area, there were several reports of tornados and supercells with lightning and strong winds. Those alone caused minimal damage, but accompanying hailstorms managed to cause several million dollars of damage in Houston. In the Dallas-Ft. Worth Metroplex, small but severe supercells produced baseball-sized hail over north Dallas during rush hour. After the damage had been assessed, officials estimated the cost of damages to be over $1.5 billion. Across much of the state, severe storms tormented cities during the first half of June. (Information provided by the Texas State Climate Office)

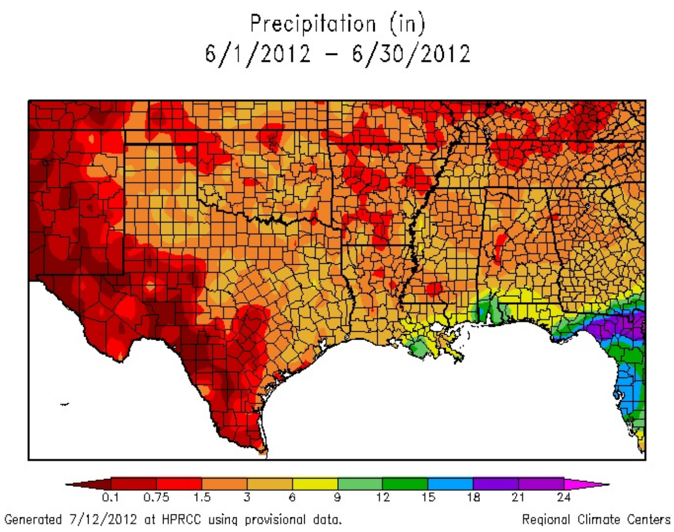
In Texas, extreme heat claimed its first life in the last week of June as temperatures climbed above 100 degrees F (37.78 degrees C); the middle-aged man died of a severe heat stroke. The high temperatures also caused numerous problems with roads and pipes across the state. (Information provided by the Texas State Climate Office)

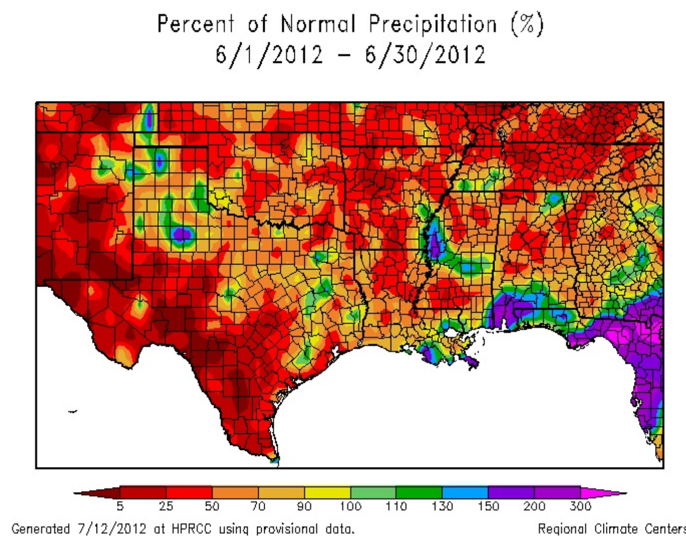
Three people were reported killed from a tornado in Crosby County, Texas. The twister touched down on June 4, 2012. It was reported to be of EF-2 strength. Storms on June 11, 2012 resulted in dozens of hail reports which spanned from Northern Arkansas and Northern Tennessee, to eastern Texas and as far south as southern Mississippi.

PRECIPITATION SUMMARY

Luigi Romolo, Southern Regional Climate Center

With a few small exceptions, June was a relatively dry month with much of the region receiving less than average precipitation totals. The driest area of the region proved to be southern and south eastern Texas, where a majority of stations received only 0 to 25 percent of normal precipitation. This was also the case for much of central Tennessee, western Arkansas, north central Louisiana, and south central Mississippi. Average precipitation totals for all states were below the 1895-2012 average. For Tennessee, it was their sixth driest June on record (1895-2012). The average precipitation total for Tennessee was a mere 1.91 inches (48.51 mm). Arkansas received 2.02 inches (51.31 mm) of precipitation for the month, which was their seventeenth driest June on record (1895-2012). Other state precipitation totals include: Louisiana with 4.50 inches (114.30 mm), Mississippi with 3.25 inches (82.55 mm), Oklahoma with 2.75 inches (69.85 mm), and Texas with 2.00 inches (50.80 mm).



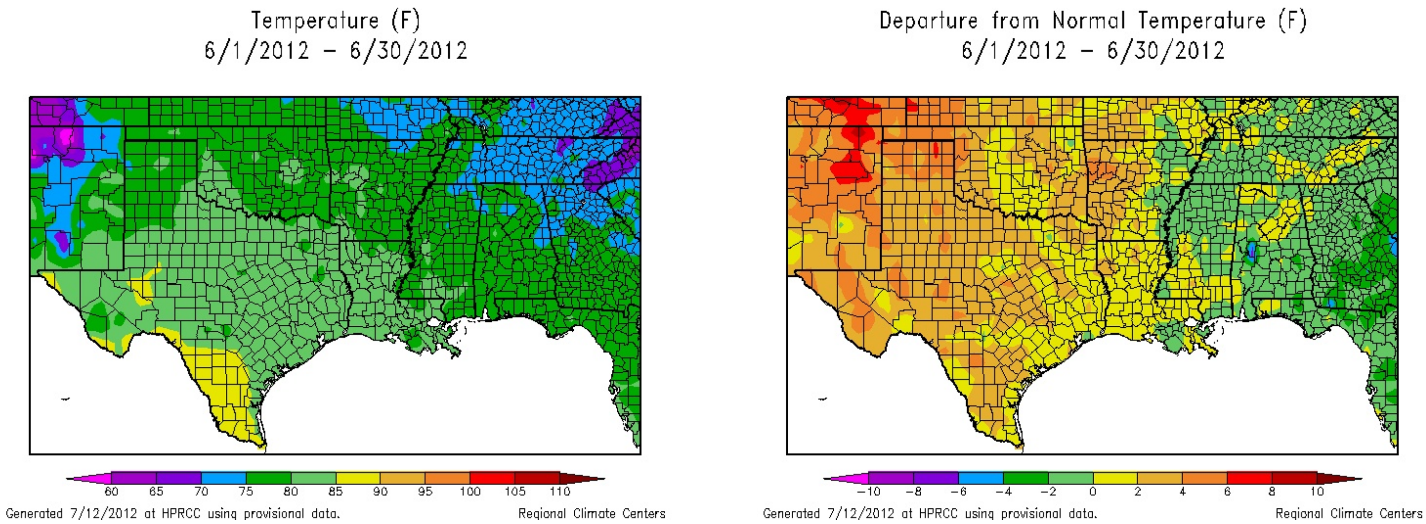


Total precipitation values (left) and the percent of 1971-2000 normal precipitation totals (right) for June 2012.

Temperature Summary

Luigi Romolo, Southern Regional Climate Center

For the most part, June was a relatively average month where temperatures are concerned. Both Tennessee and Mississippi experienced a slightly cooler than normal month, while Louisiana and Arkansas experienced a slightly warmer than normal month. In these four states, temperature averages for the month typically fell within 2 degrees F (1.11degrees C) of normal. This was also the case for eastern Oklahoma and Eastern Texas, which experienced a slightly warmer than normal month. In western Texas and western Oklahoma, however; temperature departures were a bit higher, ranging from 2 to 6 degrees F (1.11 to 3.33 degrees C) above normal. One state ranking worth mentioning is for Texas, which experienced its thirteenth warmest June on record (1895-2012) with an average temperature of 82.40 degrees F (28.00 degrees C). The other state averages ranking outside of the top twenty five. Their averages are: 77.80 degrees F (25.44 degrees C) for Arkansas, 80.40 degrees F (26.89 degrees C) for Louisiana, 78.00 degrees F (25.56 degrees C) for Mississippi, 78.60 degrees F (25.89 degrees C) for Oklahoma, and 73.80 degrees F (23.22 degrees C) for Tennessee.

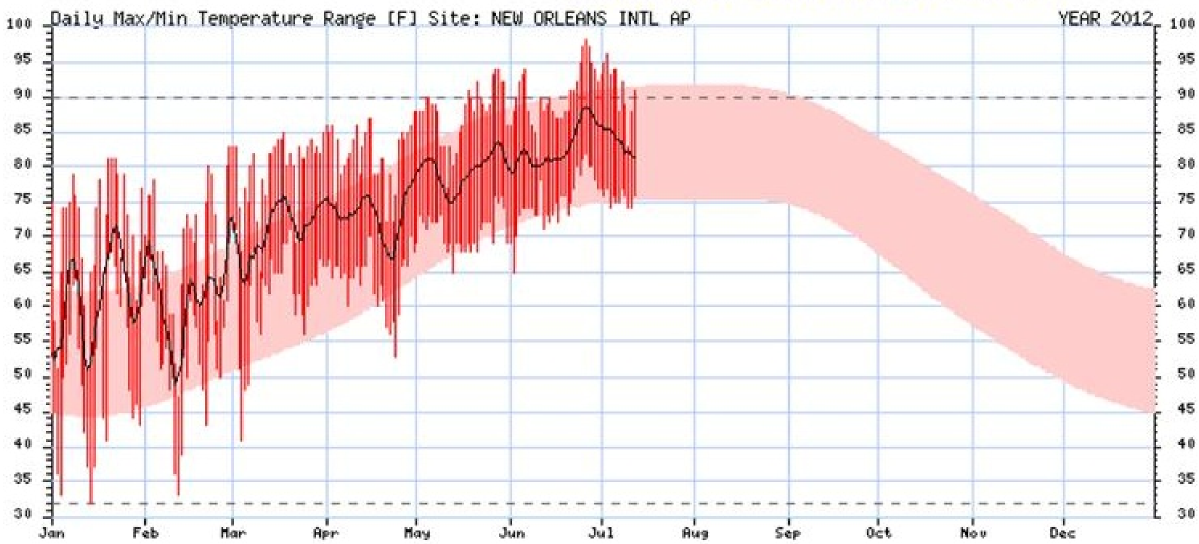


Average temperatures (left) and departures from 1971-2000 normal average temperatures (right) for June 2012, across the South.

Warmest Point of the Year is Now

Barry D. Keim, Louisiana State Climatologist

On the summer solstice, which took place this past June 20th, the northern hemisphere received the greatest amount of energy from the sun. That is because the sun is above the horizon for the longest length of time during the whole year - over 14 hours – and the sun's angle at noon climbs the highest above the horizon than on any other day of the year. So, given the highest number of hours of daylight, combined with the strongest intensity of the sun, you might think that this would be warmest day of the year, on average. However, determining the warmest period of the year is a bit more complicated than that. The warmest period of the year, climatically, occurs over the last 2 weeks of July and in to early August - a full 3-4-5 weeks after the summer solstice. The reason for this is based on what we call energy budgets. Don't cower in fear, as this really isn't that complicated. Surely, for each day following the summer solstice, the daylength decreases a little, but is still very long. In addition, the sun's angles decline slightly, but are still high on the horizon (just not as severe as on the solstice). But, from late June to mid- to late July, there is still more energy accumulating at the Louisiana surface each day, than what escapes out to space. In other words, as long as there is more incoming energy than outgoing energy over the course of a day, daily temperatures will continue to increase. At some point in mid-August, this trend turns around where more energy departs the surface than what is absorbed, and temperatures gradually decline as we move into late summer, and eventually into fall. The chart below (Figure 1) shows the daily average temperature range for the entire year, based on a 30-year average, and this is plotted along with what the actual temperatures have been over 2012 at the New Orleans Airport. Notice the high end of the "normal window" occurs from mid-July through mid-August. Furthermore, the forecast for this upcoming week is for seasonable temperatures – mornings in the mid-70s and highs in the low 90s, with the requisite chance of an afternoon thunderstorm most every day. Protect yourself from the heat, and keep umbrellas near.



Daily temperatures relative to normal. Pink region displays the average high and low temperature for each day, the red displays the daily minimum and maximum temperatures each day in 2012, and the black line is the daily average temperature. Graphic was produced by the Southern Regional Climate Center at Louisiana State University.

CLIMATE PERSPECTIVE

State	Temperature	Rank (1895-2011)	Precipitation	Rank (1895-2011)
Arkansas	78.80	34th Warmest	2.02	17th Driest
Louisiana	80.40	36th Warmest	4.50	60th Driest
Mississippi	78.00	47th Coldest	3.25	44th Driest
Oklahoma	78.60	26th Warmest	2.75	34th Driest
Tennessee	73.80	52nd Coldest	1.91	6th Driest
Texas	82.40	13th Warmest	2.00	31st Driest

State temperature and precipitation values and rankings for June 2012. 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	92.6	65.6	79.1	0.7	104	06/25	54	06/01	0.93	-4.25	18
Little Rock, AR	93.0	67.9	80.4	2.0	107	06/28	59	06/01	0.90	-3.05	23
Baton Rouge, LA	91.6	72.0	81.8	2.1	101	6/26+	59	06/02	5.50	0.17	103
New Orleans, LA	90.2	74.9	82.6	1.9	98	06/26	65	06/02	3.18	-3.65	47
Shreveport, LA	93.4	71.2	82.3	2.4	101	6/26+	61	06/01	5.15	0.10	102
Greenwood, MS	90.3	64.8	77.6	-1.9	101	06/27	53	06/02	1.85	-2.65	41
Jackson, MS	90.9	68.5	79.7	1.2	100	6/29+	57	06/02	5.34	1.52	140
Tupelo, MS	90.5	65.5	78.0	1.1	106	06/29	54	06/02	1.41	-3.41	29
Oklahoma City, OK	89.9	67.7	78.8	2.0	104	06/26	53	06/01	1.56	-3.07	34
Ponca City, OK	92.9	68.4	80.7	3.2	108	06/26	48	06/01	0.03	-4.47	1
Tulsa, OK	91.6	69.8	80.7	2.7	105	06/25	50	06/01	4.29	-0.43	91
Knoxville, TN	87.5	64.5	76.0	2.2	105	06/30	51	06/02	2.53	-1.51	63
Memphis, TN	90.6	69.9	80.2	1.5	103	06/29	58	06/02	1.38	-2.92	32
Nashville, TN	90.2	63.9	77.0	1.9	109	06/29	48	06/02	0.26	-3.82	6
Amarillo, TX	93.0	64.8	78.9	4.6	106	6/27+	58	06/12	1.72	-1.56	52
El Paso, TX	100.2	72.4	86.3	4.2	106	06/30	65	6/8+	0.00	-0.87	0
Dallas, TX	94.4	74.1	84.2	3.3	106	06/26	61	06/01	2.82	-0.41	87
Houston, TX	93.6	73.7	83.7	2.4	105	06/26	68	06/02	4.97	-0.38	93
San Antonio, TX	95.3	74.2	84.8	3.3	106	06/26	66	06/09	0.11	-4.19	3

Summary of temperature and precipitation information from around the region for June 2012. 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. Blue-shaded boxes represent cooler than normal temperatures; red-shaded boxes denote warmer than normal temperatures; tan shades represent drier than normal conditions; and green shades denote wetter than normal conditions.

Disclaimer: This is an experimental climate outreach and engagement product. While we make every attempt to verify this information, we do not warrant the accuracy of any of these materials. The user assumes the entire risk related to the use of these data. This publication was prepared by SRCC/SCIPP with support in part from the U.S. Department of Commerce/NOAA. The statements, findings, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the views of NOAA

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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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