

<b>NWS FORM E-5</b> (11-88) (PRES. by NWS Instruction 10-924)	<b>U.S. DEPARTMENT OF COMMERCE</b> NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL WEATHER SERVICE	HYDROLOGIC SERVICE AREA (HSA) <b>Tulsa, Oklahoma (TSA)</b>
		REPORT FOR: MONTH                      YEAR <b>August</b> <b>2011</b>
<b>MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS</b>		SIGNATURE <b>Steven F. Piltz</b> (Meteorologist-in-Charge)
TO: Hydrometeorological Information Center, W/OH2 NOAA / National Weather Service 1325 East West Highway, Room 7230 Silver Spring, MD 20910-3283		DATE <b>September 1, 2011</b>

*When no flooding occurs, include miscellaneous river conditions, such as significant rises, record low stages, ice conditions, snow cover, droughts, and hydrologic products issued (NWS Instruction 10-924)*

**X** An "X" in the box indicates no flood stages were reached in this Hydrologic Service Area (HSA) during the month above.

August 2011 began with all-time record breaking heat and dry conditions for much of the first week, as strong upper level ridging dominated the weather pattern; however, while temperatures continued to be above normal on most days, the remainder of the month featured increased precipitation and overall cooler weather. August is climatologically the second driest non-winter month for the Tulsa HSA. Normal rainfall for August ranges from 2.6 inches in McIntosh County to 3.8 inches in Ottawa County. In the Ozark region of northwest Arkansas, rainfall averages 3.7 inches for the month.

**Monthly Summary**

Using the radar-derived estimated observed precipitation from the RFCs (Fig. 1a), rainfall totals for August 2011 ranged from less than 0.25" to isolated areas of at least 10". A large portion of eastern Oklahoma and northwest Arkansas received greater than normal precipitation during the month, with parts of southeast Oklahoma seeing significantly less than normal rainfall for August. Most of eastern Oklahoma and northwest Arkansas to the northeast of a Bristow to Clayton, Oklahoma, line received 100% to 200% of the normal August rainfall, though there were some areas that received as little as 25% to 50% of normal in this region (Fig. 1b). Across the remainder of southeast Oklahoma, less than 25% of normal August rainfall was received, with some areas of Choctaw County seeing less than 5%.

Tulsa, OK (TSA): August, 2011 Monthly Observed Precipitation  
 Valid at 9/1/2011 1200 UTC- Created 9/1/11 19:45 UTC

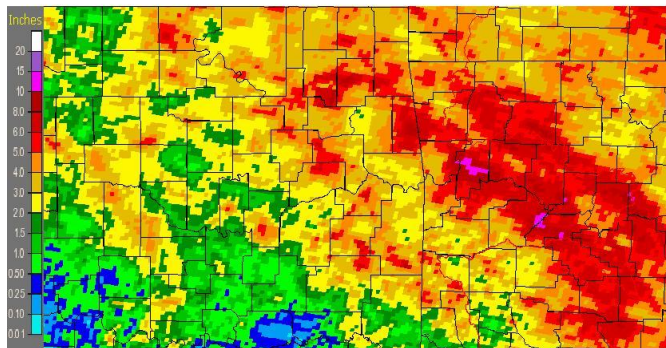


Fig. 1a. Estimated Observed Rainfall for August 2011

Tulsa, OK (TSA): August, 2011 Monthly Percent of Normal Precipitation  
 Valid at 9/1/2011 1200 UTC- Created 9/1/11 17:49 UTC

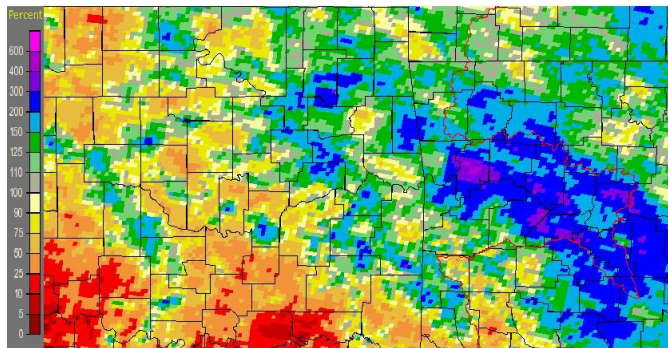


Fig. 1b. Estimated % of Normal Rainfall for August 2011

In Tulsa, OK, August 2011 ranked as the 5<sup>th</sup> warmest August (87.6°F; since records began in 1905) and the 14<sup>th</sup> wettest August (5.76", tied with 1937) since records began in 1888. On August 3<sup>rd</sup>, Tulsa's high of 113°F came within 2 degrees of tying the all-time record maximum temperature of 115°F, set on August 10<sup>th</sup>, 1936. Fort Smith, AR, was the 2<sup>nd</sup> warmest August (88.2°F) and the 33<sup>rd</sup> wettest August (4.13") since records began in 1882. Fort Smith set its all-time record maximum temperature (115°F) on August 3<sup>rd</sup>, breaking the old record of 113°F first set on August 10<sup>th</sup>, 1936, and tied on August 2<sup>nd</sup>, 2011. On August 9<sup>th</sup>, Fort Smith ended its record streak of consecutive days with temperatures ≥100°F. The new record of 35 consecutive days more than

doubles the previous record of 17 days that ended on July 26<sup>th</sup>, 1934.

Some of the larger precipitation reports (in inches) for August 2011 included:

Mountainburg, AR (coop)	6.70	Inola, OK (meso)	6.55	Claremore, OK (coop)	6.18
Westville, OK (meso)	6.14	Tulsa, OK (ASOS)	5.76	Vinita, OK (coop)	4.45
Oktaha, OK (coop)	4.25	Fort Smith, AR (ASOS)	4.13	Greenwood, AR (coop)	3.94

According to the [U.S. Drought Monitor](#) (USDM) from August 30, 2011, exceptional drought (D4) conditions expanded into eastern Oklahoma, encompassing most of Pawnee, Creek, Okfuskee, Choctaw, and far southwest Pushmataha counties. Extreme drought (D3) conditions were found across southern portions of Osage, western Tulsa, Okmulgee, western McIntosh, Pittsburg, Pushmataha, LeFlore, Latimer, western Sequoyah, western Cherokee, northeast Muskogee, and eastern Wagoner counties. Severe drought (D2) conditions stretched across northern and eastern parts of Osage, eastern Tulsa, Washington, eastern Okmulgee, eastern McIntosh, western and southern Muskogee, Haskell, eastern Sequoyah, eastern Cherokee, Adair, Ottawa, Mayes, Rogers, southwestern Nowata, and northeastern Craig counties. Moderate drought (D1) conditions were found across most of Nowata, Craig, and Delaware counties, as well as northeastern Rogers, northeastern Mayes, and northeastern Adair counties. Severe drought (D2) conditions also spread into parts of northwest Arkansas, including western Sebastian, western Crawford, far southwestern Washington, and Carroll counties, with moderate drought (D1) conditions across the rest of northwest Arkansas (see Figs. 2 & 3).

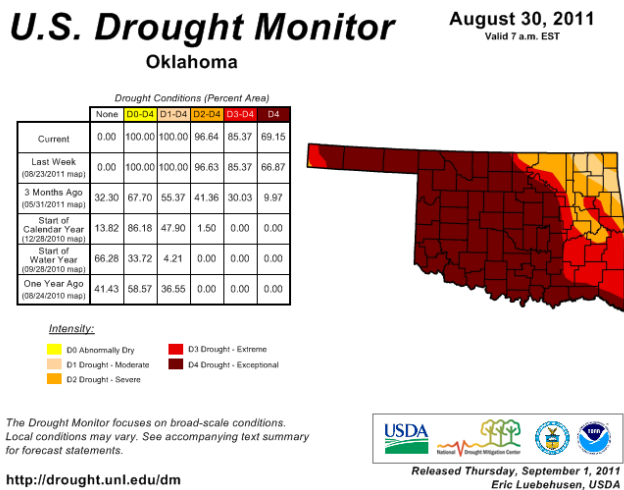


Fig. 2. Drought Monitor for Oklahoma

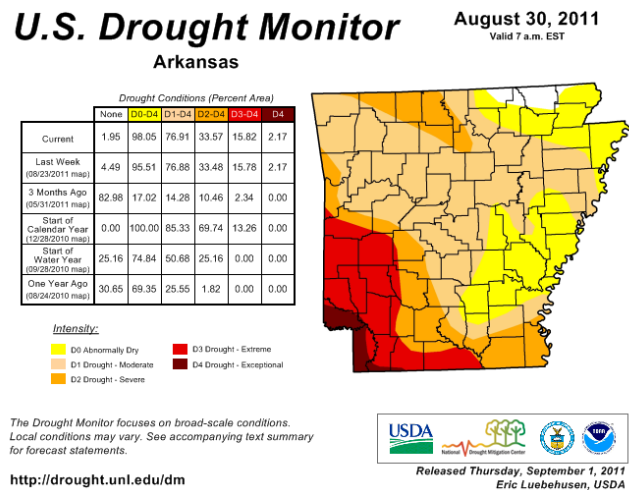


Fig. 3. Drought Monitor for Arkansas

According to statistics from the [Oklahoma Climatological Survey](#) (OCS):

Rank since 1921 ("Last XX days" ending August 31, 2011)	August 2011	Warm Growing Season (Mar 1, 2011 – Aug 31, 2011)	Last 60 days (Jul 3, 2011 – Aug 31, 2011)	Year-to-Date (Jan 1, 2011 – Aug 31, 2011)	Water Year (Oct 1, 2010 – Aug 31, 2011)	Last 365 Days (Sep 1, 2010 – Aug 31, 2011)
Northeast OK	<b>27<sup>th</sup> wettest</b>	25 <sup>th</sup> driest	30 <sup>th</sup> driest	21 <sup>st</sup> driest	11 <sup>th</sup> driest	18 <sup>th</sup> driest
East Central OK	<b>27<sup>th</sup> wettest</b>	35 <sup>th</sup> driest	2 <sup>nd</sup> driest	22 <sup>nd</sup> driest	12 <sup>th</sup> driest	28 <sup>th</sup> driest
Southeast OK	<b>34<sup>th</sup> driest</b>	17 <sup>th</sup> driest	32 <sup>nd</sup> driest	12 <sup>th</sup> driest	6 <sup>th</sup> driest	8 <sup>th</sup> driest
Statewide	<b>33<sup>rd</sup> driest</b>	<b>4<sup>th</sup> driest</b>	<b>14<sup>th</sup> driest</b>	<b>2<sup>nd</sup> driest</b>	<b>3<sup>rd</sup> driest</b>	<b>3<sup>rd</sup> driest</b>

Most of the major reservoirs in the Tulsa HSA were within  $\pm 30\%$  of conservation pool by the end of August 2011. Most reservoirs were showing deficits in their conservation pools. Beaver Lake continued to show levels in excess of its conservation pool, with 10% of flood control storage in use as of August 31. The following reservoirs were reporting conservation pool deficits as of August 31, 2011: Heyburn Lake 66%, Skiatook Lake 70%, Keystone Lake 79%, Birch Lake 72%, Eufaula Lake 80%, Tenkiller Lake 85%, Hugo Lake 86%, Sardis Lake 92%, Fort Gibson Lake 92%, Oologah Lake 93%, and Copan Lake 94%. Blue-green algae blooms

continued to be a problem at several area lakes during August, including Keystone Lake, Skiatook Lake, Fort Gibson Lake, Tenkiller Lake, and Eufaula Lake, due to the ongoing heat wave. The blooms led to the closing of beaches at several of the aforementioned lakes.

## **Outlooks**

The [Climate Prediction Center](#) (CPC) outlook for September 2011 (issued August 31, 2011) indicates an equal chance for below, near, or above normal temperatures across all of eastern Oklahoma and northwest Arkansas and an equal chance of below, near, or above normal precipitation. For the 3-month period Sep-Oct-Nov 2011, CPC is forecasting an enhanced chance for above average temperatures (outlook issued August 18, 2011). The 3-month outlook also shows an enhanced chance for below normal precipitation across most of eastern Oklahoma and west central Arkansas, with equal chances for above, near, and below normal precipitation across far northeastern Oklahoma and most of northwest Arkansas.

According to CPC, ENSO neutral conditions continued into August and are expected to continue into Fall 2011. Negative sea surface temperature anomalies are beginning to develop in the eastern Pacific, making a continuation of ENSO neutral conditions or the development of La Niña conditions equally likely after Fall 2011.

## **Summary of Precipitation Events**

### **August 1 – 15:**

August began with upper level ridging remaining in control of the overall weather pattern across eastern Oklahoma and northwest Arkansas. Temperatures across the region approached, and in some cases, surpassed, all-time record high temperatures on the 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup>. Isolated diurnal thunderstorms developed on the 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> across the higher terrain areas of southeast Oklahoma and northwest Arkansas, with less than a quarter of an inch of rain in any one location. Additional thunderstorms affected portions of northeast Oklahoma along the Kansas border late on the 3<sup>rd</sup> and early on the 4<sup>th</sup>, with only light amounts falling in Oklahoma.

After a largely dry day on the 5<sup>th</sup>, widespread thunderstorms developed across northeast Oklahoma and far northwest Arkansas during the afternoon and evening of the 6<sup>th</sup> ahead of a quasi-stationary front that was draped just north of the Kansas and Missouri borders. Rainfall amounts were generally in the half to inch and a half range. The thunderstorms also caused wind damage across portions of the Tulsa metro area, forcing the cancellation of an outdoor music festival. Many were left without power across the Tulsa metro for most of the next day, a situation complicated by the ongoing excessive heat. Jenks Riverside Airport measured a 63 mph gust when the storms moved through the area.

The upper level ridge weakened considerably by the 8<sup>th</sup>, which allowed the aforementioned quasi-stationary boundary to move southward and also led to increased overnight MCS activity. Thunderstorms developed across north central Oklahoma along the front during the afternoon and evening hours of the 8<sup>th</sup>, which then spread eastward into northeast Oklahoma and northwest Arkansas. All areas except far southeast Oklahoma saw rain from these storms, with maximum amounts ranging from 1 to 3 inches. The storms again produced widespread severe winds and wind damage. The Oklahoma Mesonet site near Hectorville in far southern Tulsa County measured a 66 mph gust, and a barn was heavily damaged near Haskell in northwest Muskogee County.

Multiple thunderstorm complexes affected the area beginning during the very early morning hours of the 10<sup>th</sup>, one of which moved eastward from western Oklahoma and the other which moved southward from Kansas and Nebraska. Rainfall totals ranged from 2 to 4 inches, with the highest totals along the Highway 412 corridor. Significant severe weather occurred with the initial complex, including an EF2 tornado near Locust Grove in far southeastern Mayes and far northwestern Cherokee counties. Numerous reports of significant severe wind damage were received across northeast Oklahoma and into northwest Arkansas.

Overnight and morning thunderstorms again impacted parts of the area on the 11<sup>th</sup>, resulting in an additional 1 to 2 inches of rain for parts of northeast Oklahoma and northwest Arkansas. Similar rainfall amounts were seen across southeast Oklahoma and west central Oklahoma during the daytime hours on the 11<sup>th</sup>, as the

thunderstorms pushed southward.

The morning of the 12<sup>th</sup> featured scattered thunderstorms across northeast Oklahoma, with additional development seen during the afternoon and early evening in parts of east central Oklahoma and northwest Arkansas. Daytime rainfall totals reached a half inch in some locations, and isolated reports of wind damage were received from Tahlequah in Cherokee County and near Greenwood in Sebastian County. A late evening and overnight thunderstorm complex moved through most of eastern Oklahoma and northwest Arkansas again on the 12<sup>th</sup> and early morning on the 13<sup>th</sup>. The highest rainfall totals – greater than an inch – were seen in northeast Oklahoma to the north of the I-40 corridor and east of a line from Pawhuska to Stigler. A swath of totals between 2 to 4 inches extended from just northwest of Bartlesville to near Claremore and Pryor southeastward to near Stilwell. The Bartlesville ASOS measured 2.61 inches.

The daytime hours on the 13<sup>th</sup>, as well as the entire day on the 14<sup>th</sup>, were largely dry across eastern Oklahoma and northwest Arkansas. Above normal temperatures returned to most of the area on the 15<sup>th</sup> as the upper level ridge reasserted itself over the region. Isolated morning thunderstorms developed on the 15<sup>th</sup> primarily across northwest Arkansas, as a result of increased low level warm advection. Rainfall amounts were less than half an inch.

### **August 16 – 31:**

More widespread morning thunderstorms developed on the 16<sup>th</sup>, with areas just south of the I-44 corridor seeing rain. Amounts were generally a half inch or less, although parts of Adair County saw up to an inch. Scattered thunderstorms induced by the low level jet developed across parts of eastern Oklahoma and northwest Arkansas late on the 17<sup>th</sup> and into the early morning hours of the 18<sup>th</sup>, producing up to three-quarters of an inch of rain. Mostly hot and dry conditions prevailed from the daytime hours on the 18<sup>th</sup> through the morning hours of the 20<sup>th</sup>.

Thunderstorms developed in the triple digit heat on the afternoon of the 20<sup>th</sup> across areas south of the Highway 412 corridor. Rainfall amounts were generally an inch or less, but some of the storms produced significant wind damage from downbursts. The Fort Smith ASOS measured a 62 mph gust, and a swath of wind damage extended from Fort Smith eastward to north of Vesta and near Ozark. Additional wind damage was reported in Crawford County from a collapsing thunderstorm. Isolated thunderstorms continued into the overnight hours on the 20<sup>th</sup> and early morning of the 21<sup>st</sup>, with only small rainfall amounts noted.

On the 22<sup>nd</sup>, showers and thunderstorms developed and persisted through much of the morning across northeast Oklahoma, which kept temperatures below normal for a portion of the area. Rainfall was generally light, with totals up to a quarter of an inch. Additional thunderstorms developed across southeast Oklahoma and west central Arkansas that afternoon, as an absence of cloud cover allowed temperatures to warm into the triple digits in that region. Isolated morning thunderstorms again developed on the 23<sup>rd</sup> and 24<sup>th</sup> across most of the area, with less than a half inch of rain in most locations.

A weak cold front pushed through the area late on the 24<sup>th</sup>, which resulted in scattered afternoon thunderstorms. Wind damage was reported across parts of northeast Oklahoma, including near Lenapah in Nowata County and Mannford in Creek County. The front also brought drier air to the region in its wake. Dry conditions persisted from the 25<sup>th</sup> through the 28<sup>th</sup>.

Showers and thunderstorms developed as low level warm and moist air made a return to the region during the early morning hours of the 29<sup>th</sup>. A large portion of the area to the east of the Highway 75 corridor was affected through the morning. Rainfall amounts were generally an inch or less, but a few locations in Adair and eastern Sequoyah counties received as much as 2 inches of rain. Early morning on the 30<sup>th</sup>, more scattered showers and thunderstorms developed over eastern Oklahoma in response to a low level jet. Rainfall amounts of a half inch or less were received. The month ended on a dry note on the 31<sup>st</sup>.

Written by:

Karen Hatfield  
Forecaster  
WFO Tulsa

Products issued:

- 0 River Flood Warnings (FLW)
- 0 River Flood Statements (FLS)
- 0 River Flood Advisories (FLS) (0 Advisory FLS CON/EXT/CAN)
- 0 River Flood Watches (FFA) (0 Watch FFA CON/EXT/CAN)
- 0 River Statements (RVS)
- 0 Hydrologic Outlooks (ESF)
- 0 Drought Information Statements (DGT)