

NWS FORM E-5 (11-88) (PRES. by NWS Instruction 10-924)	U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL WEATHER SERVICE	HYDROLOGIC SERVICE AREA (HSA) Tulsa, Oklahoma (TSA)
	MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS	REPORT FOR: MONTH August YEAR 2010
TO: Hydrometeorological Information Center, W/OH2 NOAA / National Weather Service 1325 East West Highway, Room 7230 Silver Spring, MD 20910-3283	SIGNATURE Steven F. Piltz (Meteorologist-in-Charge)	DATE September 3, 2010

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 HSA during the month above.

A lack of rainfall and hot temperatures during August 2010 led to a 'flash drought,' with abnormally dry to moderate drought conditions across a large portion of eastern OK and northwest AR by the end of the month. 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 2010 ranged from around 7" to less than 0.10" across the HSA. Most of the region along and southeast of I-44 suffered from a lack of rainfall this August, with the hardest hit area stretching from near McAlester, through Gore, to Eureka Springs. In fact, a large portion of Washington County AR received less than 0.10" of rain this month (5% or less of normal August rainfall), and the observation site at Fayetteville Drake Field Airport (FYV) only recorded 0.02" of rain for the entire month! The corridor receiving the least amount of rain ended the month with 25% or less of normal August rainfall. Overall, locations along and southeast of I-44 received 75% or less of the normal August precipitation. Northwest of I-44, rainfall totaled 2" to 7", corresponding to 100% to 200% of the normal August rain for this area (Fig. 1b).

In Tulsa, OK, August 2010 ranked as the 15th warmest August (85.5°F, since records began in 1905) and was the 27th driest August (1.19", since records began in 1888). Fort Smith, AR was the 3rd warmest August (87.4°F) and was the 56th driest August (2.27") since records began in 1882. The Fort Smith August temperature was 5.9°F above normal, while Tulsa's August temperature was 3.3°F above normal. In addition, Fort Smith had 18 days with high temperatures ≥100°F this August, which ties with 1980 as the 6th greatest number of days on record. McAlester, OK had 17 days this August with high temperatures ≥100°F, which was also the 6th greatest number of days on record.

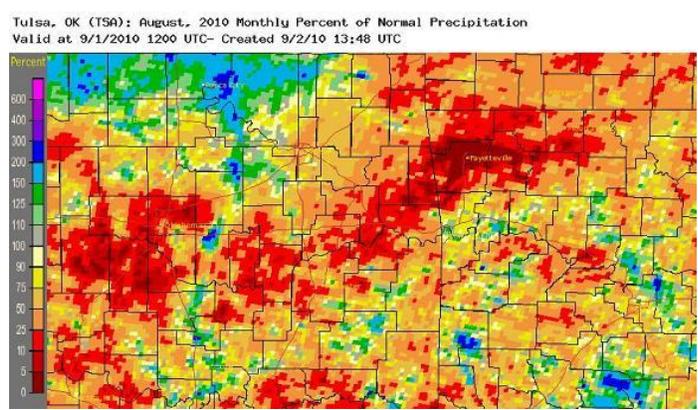
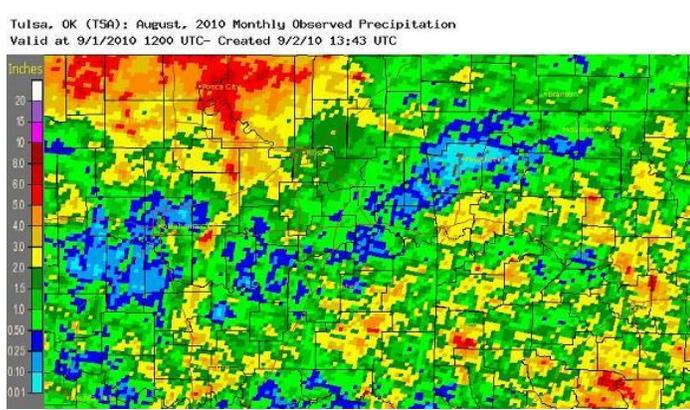


Fig. 1a. Estimated Observed Precip. for August 2010 1b. Estimated % of Normal Precip. for August 2010

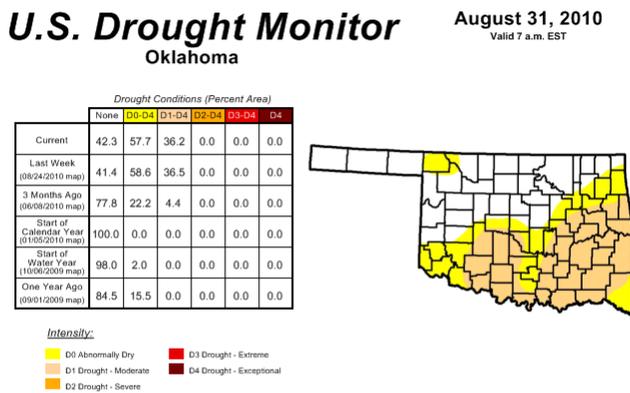
Some of the larger precipitation reports (in inches) for August 2010 included:

Burbank, OK (meso)	6.33	Foraker, OK (meso)	5.87	Bartlesville, OK (ASOS)	5.49
Pawnee, OK (meso)	5.49	Ralston, OK (coop)	5.45	Burbank, OK (coop)	4.26
Copan, OK (meso)	3.91	Vinita, OK (meso)	3.80	Nowata, OK (meso)	3.44

Some of the smallest precipitation reports (in inches) for August 2010 included:

Fayetteville, AR (ASOS)	0.02	Cookson, OK (meso)	0.11	Stigler, OK (meso)	0.11
Antlers, OK (coop)	0.12	Westville, OK (meso)	0.13	Wilburton, OK (meso)	0.17
Berryville, AR (coop)	0.18	St. Paul, AR (coop)	0.30	Oktaha, OK (coop)	0.34

According to the [U.S. Drought Monitor](#) (USDM) from August 31, 2010, abnormally dry conditions (D0) and moderate drought (D1) existed across eastern OK and northwest AR southeast of I-44 (see Figs. 2 and 3). Northwest of I-44, drought conditions did not exist.



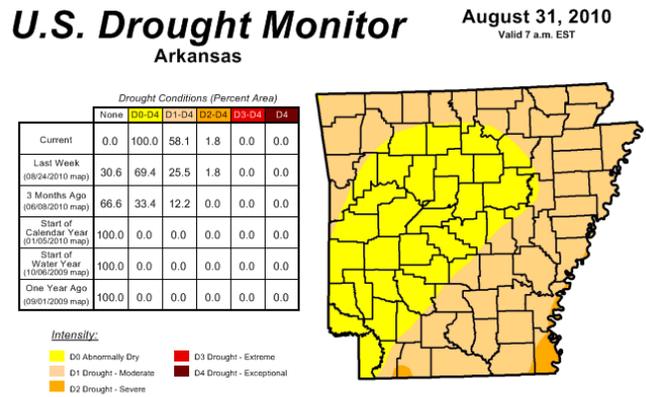
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements

<http://drought.unl.edu/dm>



Released Thursday, September 2, 2010
Author: Brad Rippey, U.S. Department of Agriculture

Fig. 2. Drought Monitor for Oklahoma



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

<http://drought.unl.edu/dm>



Released Thursday, September 2, 2010
Author: Brad Rippey, U.S. Department of Agriculture

Fig. 3. Drought Monitor for Arkansas

Many of the major reservoirs in the Tulsa HSA reported $\pm 5\%$ of their full conservation pools as of September 1, 2010. Corresponding to the recent rainfall deficits, several reservoirs were experiencing deficits within the conservation pool, especially in the Lower Arkansas and Lower Red River basins. Conservation pool deficits: Hugo Lake 41%, Ft. Gibson Lake 75%, Heyburn Lake 79%, Wister Lake 88%, Eufaula Lake 89%, and Birch Lake 92%.

Summer Summary

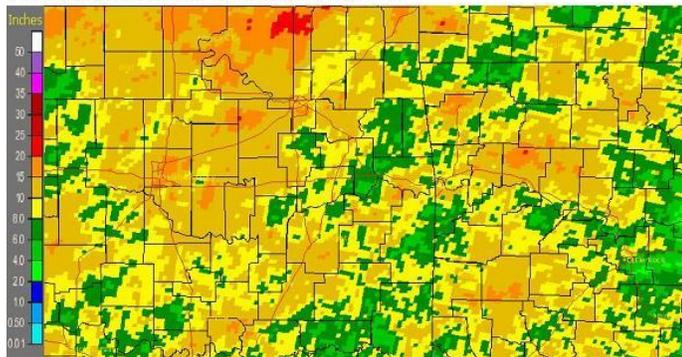
Summer 2010 ranked as one of the top hottest summers. While afternoon temperatures and heat index values were hot this summer, it was actually the overnight low temperatures that had been exceptionally warm the entire summer across the area. High pressure dominated the Southern Plains and Southeast U.S. during summer 2010, keeping a moist airmass in place over the region. The higher humidity levels kept temperatures from cooling much during the overnight hours, allowing for many consecutive days with minimum temperatures at or above 70°F. Both Tulsa, OK and Fort Smith, AR had the most consecutive days with temperatures at or above 72°F on record, and the August 2010 average minimum temperature ranked 2nd warmest on record at both locations. While a few afternoon record high temperatures were set this summer (Fort Smith 1; Fayetteville 4; McAlester 2), numerous record warm minimum temperatures were set: Tulsa set or tied 5 daily warm minimum temperatures; Fort Smith 3; Fayetteville 7; McAlester 8. (More information about the unusually warm overnight temperatures can be found at http://www.srh.noaa.gov/tsa/?n=weather-event_hotsummer2010)

Using the radar-derived estimated observed precipitation from the RFCs (Fig. 4a.), rainfall totals for the last 90 days ending September 2, 2010 ranged from around 5" to near 25" across the HSA. The highest totals occurred across Osage and Washington Counties in northeast OK, with lesser amounts across southeast and east central OK and northwest AR. Overall, locations along and west of Highway 75 received near to around 200% of normal rainfall, while elsewhere, locations received near 100% to around 50% of normal rainfall during

this period (Fig. 4b).

In Tulsa, OK, Summer 2010 ranked as the 6th warmest Summer (84.0°F, since records began in 1905) and was the 39th wettest Summer (12.93", since records began in 1888). Fort Smith, AR was the 3rd warmest Summer (85.2°F) and was the 56th wettest Summer (10.10") since records began in 1882.

Tulsa, OK (TSA): Current 90-Day Observed Precipitation
Valid at 9/2/2010 1200 UTC - Created 9/2/10 15:29 UTC



Tulsa, OK (TSA): Current 90-Day Percent of Normal Precipitation
Valid at 9/2/2010 1200 UTC - Created 9/2/10 15:34 UTC

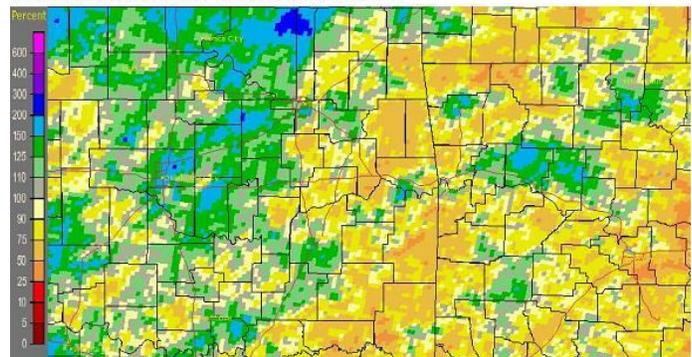


Fig. 4a. Estimated Observed Precip. for last 90 days ending 7am CDT 9/2/2010

4b. Estimated % of Normal Precip. for last 90 days ending 7am CDT 9/2/2010

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

Rank since 1921 ("Last XX days" ending August 31, 2010)	Last 30 days (Aug. 2 – 31)	Last 60 days (Jul. 3 – Aug. 31)	Year-to-Date 2010	Summer (Jun. 1 – Aug. 31)	Water Year (Oct.1, 2009 – Aug 31, 2010)	Warm Growing Season (Mar. 1 – Aug. 31)
Northeast OK	40 th wettest	19 th wettest	39 th wettest	20 th wettest	30 th wettest	42 nd wettest
East Central OK	5 th driest	30 th driest	18 th driest	29 th driest	44 th wettest	19 th driest
Southeast OK	12 th driest	33 rd driest	17 th driest	18 th driest	42 nd driest	10 th driest

The [Climate Prediction Center](#) (CPC) outlook for September 2010 (issued August 31, 2010) indicates a slightly enhanced chance for above average temperatures and equal chances for above, near, and below median precipitation. For the 3-month period Sep-Oct-Nov 2010, CPC is forecasting an enhanced chance for above average temperatures and equal chances for above, near, and below median precipitation (outlook issued August 19, 2010). Sea-surface temperatures in the equatorial Pacific have decreased and are now indicating La Niña conditions. The enhanced chance for above average temperatures for the 1- and 3-month outlooks are consistent with a developing La Niña. According to CPC, strong cooling in the equatorial Pacific over the last several months indicates that La Niña conditions are likely to strengthen and continue through winter 2010-11. A La Niña Advisory was issued on August 5, meaning La Niña conditions are observed and expected to continue.

Summary of August Rain Events

August 1 - 15:

High dewpoints from July continued across eastern OK and northwest AR into August. Widely scattered afternoon convection developed across far eastern OK and western AR on August 1, bringing around one inch of rain or less to the affected locations. A frontal boundary pushed south into far northern OK late on the 4th and provided a focus for showers and thunderstorm activity across Osage and Pawnee Counties. Elevated shower activity continued through the morning hours of the 5th across northeast OK and northwest AR. Rainfall totals in excess of 2 inches were estimated in western Osage Co., with lesser amounts elsewhere. The front continued to slowly move south across the HSA on the 5th, allowing additional storms to develop southeast of a McAlester, OK to Huntsville, AR line. Rainfall totals of around 2 inches or less occurred, with a few localized

higher amounts.

The cold front stalled just south of the Red River on the 6th, with scattered afternoon convection occurring across the HSA. Rainfall amounts with this activity were generally around 0.5" or less. A few showers developed during the early morning hours of the 7th, with a thunderstorm over central Craig Co. producing an estimated 6" of rain (Fig. 5). A weak upper-level disturbance moved over the region during the afternoon of the 7th, and with moist conditions and numerous outflow boundaries at the surface, more widespread showers and thunderstorms developed. Rainfall totals were around 2" or less, though higher totals of 3" to 4" occurred in western Choctaw Co. near Frogville. Light showers continued across southeast OK during the morning of the 8th within the residual moist axis. A few isolated thunderstorms developed across far northeast OK and northwest AR during the afternoon of the 8th, bringing localized heavy rain.

After a few days without any rain, isolated showers and thunderstorms developed during the heat of the afternoon on both the 11th and 12th south of I-44, bringing around 0.5" of rain or less. An outflow boundary generated from Kansas thunderstorms initiated light showers along and immediately south of I-44 during the morning of the 14th. These showers brought 0.5" or less of rainfall to portions of northeast OK and far northwest AR. As a cold front made slow progress southward in southern KS, additional showers and thunderstorms moved into far northern OK later on the 14th. Rainfall totals along and north of a Pawnee to Miami line were generally around 0.5" or less, though a few locations received closer to 1" of rain. The weak cold front/surface boundary moved through the HSA on the 15th, with scattered showers and thunderstorms developing across northeast OK. Rainfall totals were around 0.5" or less, with the exception of near the Delaware-Mayes County line where a thunderstorm produced around 2.5". Diurnal scattered convection also occurred across the higher terrain of southeast OK, where very localized and brief heavy rain occurred.

Tulsa, OK (TSA): 8/7/2010 1-Day Observed Precipitation
Valid at 8/7/2010 1200 UTC- Created 8/9/10 23:31 UTC

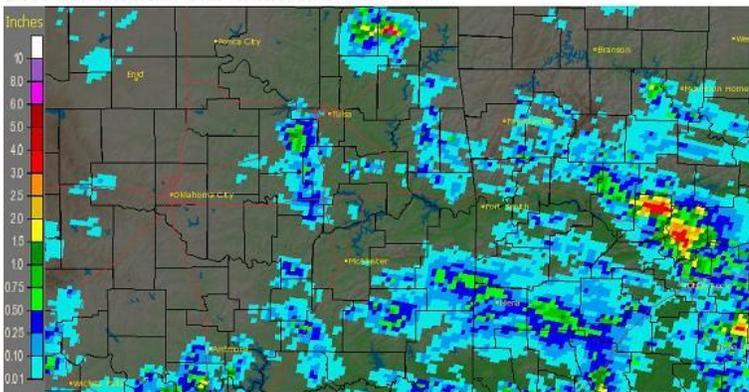


Fig. 5. Estimated rainfall ending at 7am CDT 8/07/2010

August 16 – 31:

A complex of thunderstorms moved eastward along the OK/KS state line during the night of the 16th, and began to affect northeast OK during the early morning hours of the 17th. As this activity progressed further east, it became more linear and developed further to the south. This allowed for some much needed widespread rain to fall across most of northeast OK. The storms then began to dissipate as they approached the state line, with only light rain across northwest AR and isolated afternoon thunderstorms across southeast OK. Training and slow storm movement brought the heaviest rainfall to Osage and Pawnee Counties, where rainfall rates were 1" to 1.75" per hour and upwards of 3" to 4" total rain were observed (see Figs. 6 and 7). Elsewhere, precipitation totals ranged from 0.25" to near 2".

Widely scattered afternoon showers and thunderstorms affected southeast OK and west central AR from Aug. 18-21, with rainfall totals around half an inch or less each day. A cool front then moved through the HSA on the 21st, bringing around half an inch of rainfall near the KS/OK state line during the early morning hours. Additional showers and thunderstorms redeveloped along the front during the afternoon south of I-40. While most of the affected area received less than half an inch of rain, localized areas of over 2.5" occurred.

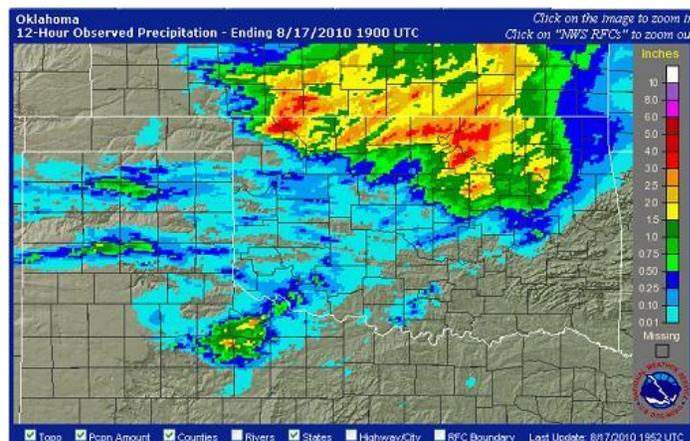
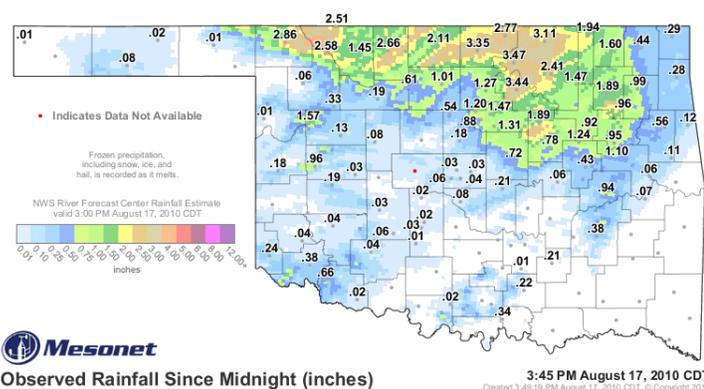


Fig. 6. Rainfall since midnight 8/17/2010 (Courtesy of OCS)

Fig. 7. 12-hr rainfall ending at 2pm CDT 8/17/2010

A stronger cold front moved through the region from late on the 23rd and through the 24th, bringing refreshingly cooler temperatures. The front also generated shower and thunderstorm activity across eastern OK, west of a Nowata to Muskogee to Hugo line. Rainfall totals from this activity were around 1" or less. Light diurnal rain showers developed during the afternoon hours on the 30th across southeast OK and west central AR. A few thunderstorms developed across west central AR, bringing 1" to 1.5" of rain. Additional showers and thunderstorms developed within a moist axis on the last day of the month, primarily affecting northeast and east central OK. The heaviest rains of 0.5" to 2.5" fell across Osage and Washington Counties in northeast OK.

Written by:
Nicole M^cGavock,
Service Hydrologist
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)
- 1 Drought Information Statements (DGT)