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 **September** YEAR **2015**
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 **October 1, 2015**

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.

With the exception of a few isolated locations, the HSA saw above normal temperatures and below normal rainfall during September 2015. Normal rainfall for September ranges from 4.2 inches in Okmulgee County to 5.4 inches in Delaware County. In the Ozark region of northwest Arkansas, rainfall averages 4.5 inches for the month. Many locations recorded over 60" of rain during Water Year 2015. This report, past E-5 reports, and monthly hydrology and climatology summaries can be found at http://www.srh.noaa.gov/tsa/?n=hydro-monthly-summary.

Monthly Summary

Using the radar-derived estimated observed precipitation from the RFCs (Fig. 1a), rainfall totals for September 2015 ranged from around 1" to around 8". Most of the HSA received 1.5"-3" of rain this September. This corresponds to 25%-75% of the normal September rain across the majority of eastern OK and northwest AR (Fig. 1b). The exceptions were in northern Creek Co., southern McIntosh, southern Pittsburg, and southern Latimer Counties, where localized heavy rain yielded 110% to near 250% of the normal September rainfall.

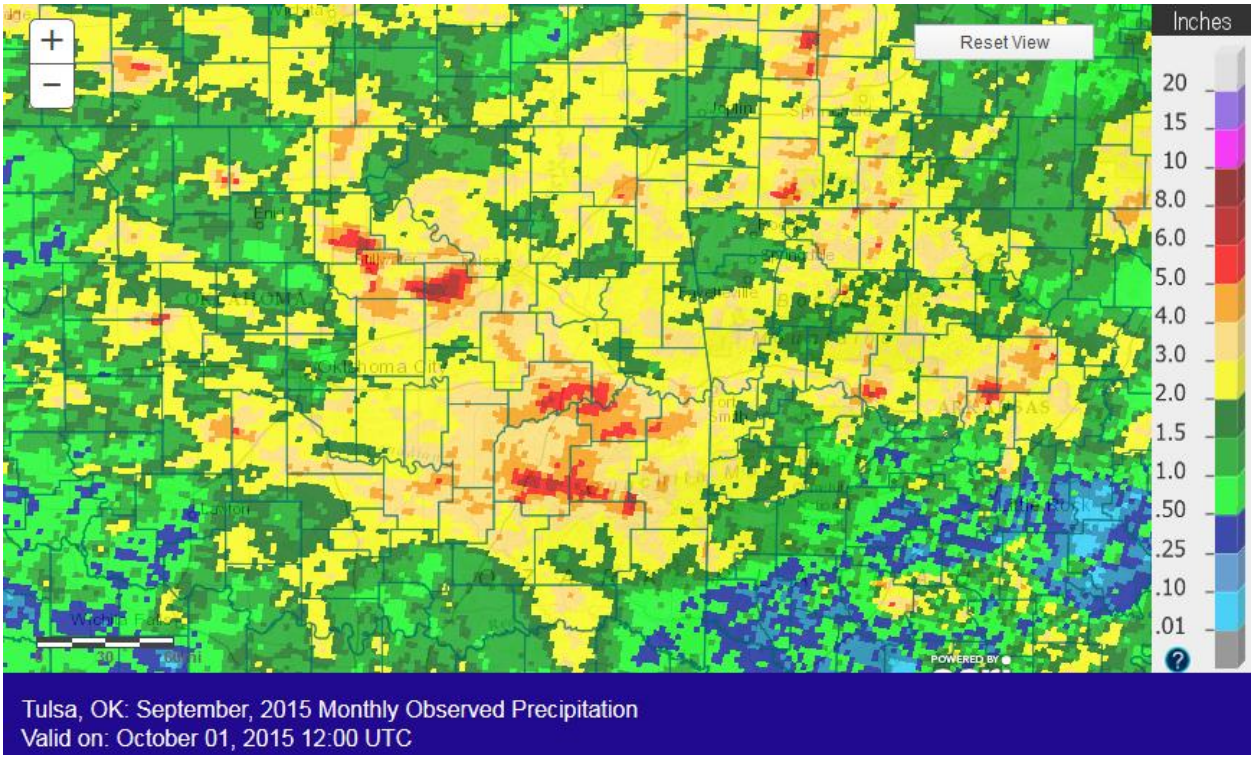


Fig. 1a. Estimated Observed Rainfall for September 2015

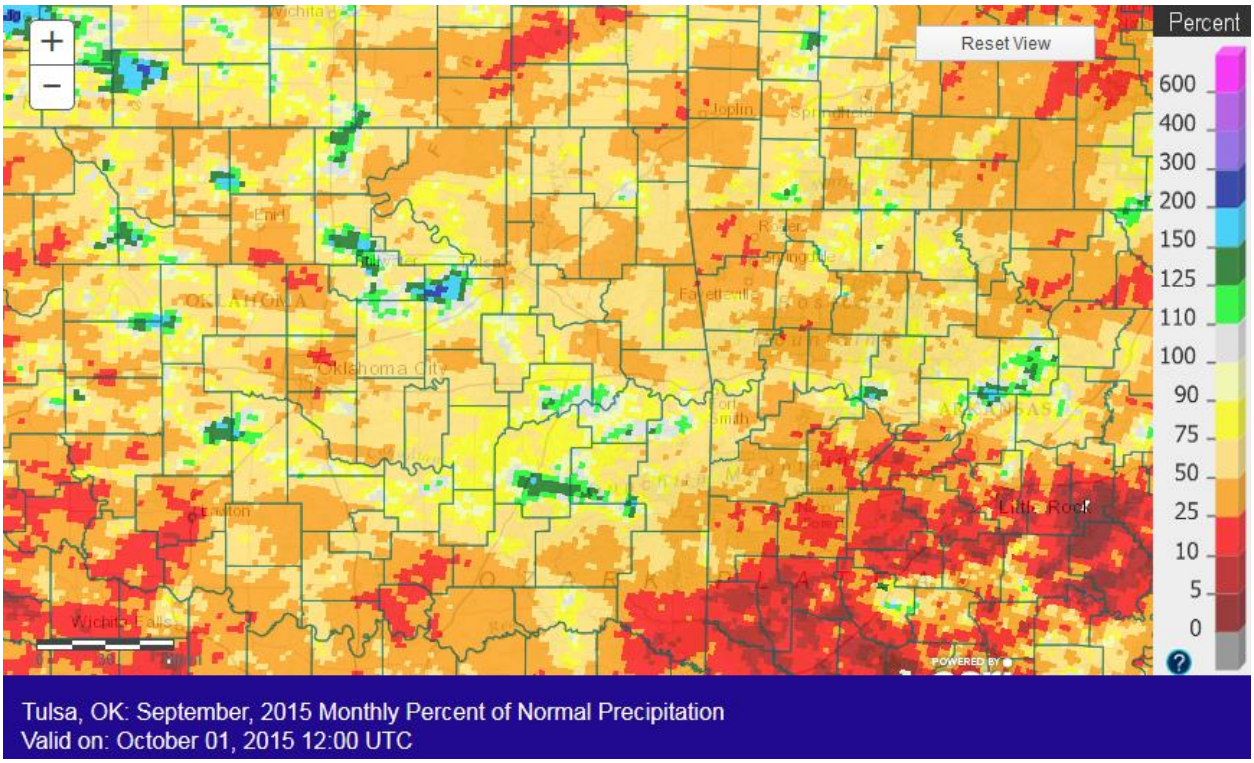


Fig. 1b. Estimated % of Normal Rainfall for September 2015

In Tulsa, OK, September 2015 ranked as the 21st warmest September (76.4°F, tied 2013; since records began in 1905) and the 58th driest September (2.93"; since records began in 1888). Fort Smith, AR had the 29th warmest September (76.7°F; since records began in 1882) and the 55th driest September (2.57"; since records began in 1882). Fayetteville, AR had the 26th warmest (70.4°F, tied 1953) and the 13th driest (1.75") September since records began in 1949.

Some of the larger precipitation reports (in inches) for September 2015 included:

Drumright 0.6SW, OK (coco)	8.07	Oilton, OK (meso)	7.49	Eufaula 4.6 ENE, OK (coco)	5.97
Eufaula, OK (meso)	5.89	Talihina, OK (meso)	5.40	Stigler, OK (meso)	5.03
Vinita 8.6 ESE, OK (coco)	5.02	Bunch 0.8N, OK (coco)	4.78	Kingston 2S, AR (coop)	4.33

Some of the lowest precipitation reports (in inches) for September 2015 included:

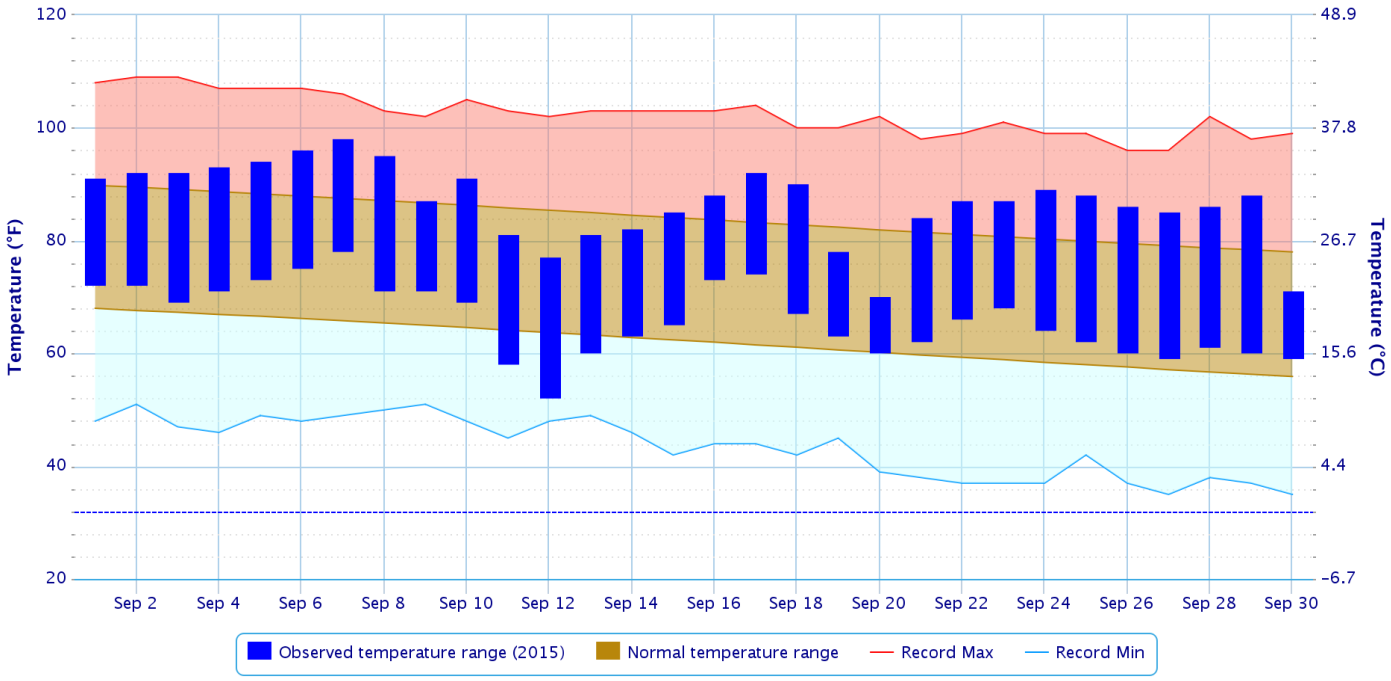
Muskogee, OK (ASOS)	0.81	Hula 5.3WSW, OK (coco)	1.13	Decatur 2.6ESE, AR (coco)	1.31
Foraker, OK (meso)	1.39	NW AR Regl. Airport (ASOS)	1.44	Burbank, OK (meso)	1.47
Cloudy, OK (meso)	1.49	Bartlesville, OK (ASOS)	1.53	Vian 5.3ENE, OK (coco)	1.55

According to statistics from the Oklahoma Climatological Survey (OCS) Mesonet:

Rank since 1921	Sept. 2015	Last 60 Days (Aug 2 – Sep 30)	Last 90 Days (Jul 3 – Sep 30)	Last 120 Days (Jun 3 – Sep 30)	Last 180 Days (Apr 4 – Sep 30)	Year-to-Date (Jan 1 – Sep 30)	Water Year 2015 (Oct 1, 2014 – Sep 30, 2015)
Northeast OK	23rd driest	47th wettest	24th wettest	25th wettest	**8th wettest**	12th wettest	16th wettest
East Central OK	35th driest	42nd driest	**8th wettest**	**5th wettest**	**1st wettest**	**2nd wettest**	**2nd wettest**
Southeast OK	31st driest	19th driest	14th driest	17th driest	**8th wettest**	**9th wettest**	16th wettest
Statewide	20th driest	24th driest	33rd wettest	24th wettest	**1st wettest**	**3rd wettest**	**5th wettest**

Daily Temperature Data – Tulsa Area, OK (ThreadEx)

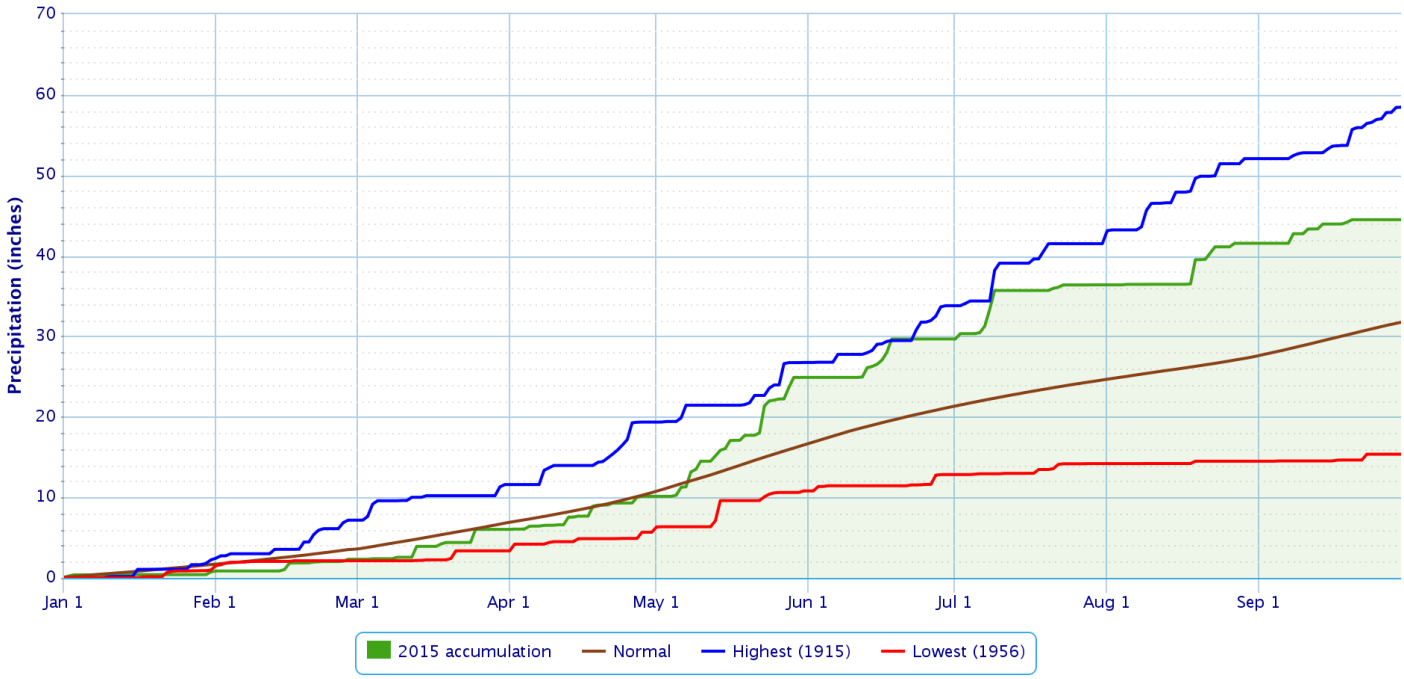
Period of Record – 1905-01-06 to 2015-09-30. Normals period: 1981-2010. Click and drag to zoom chart.



Powered by ACIS

Accumulated Precipitation – Tulsa Area, OK (ThreadEx)

Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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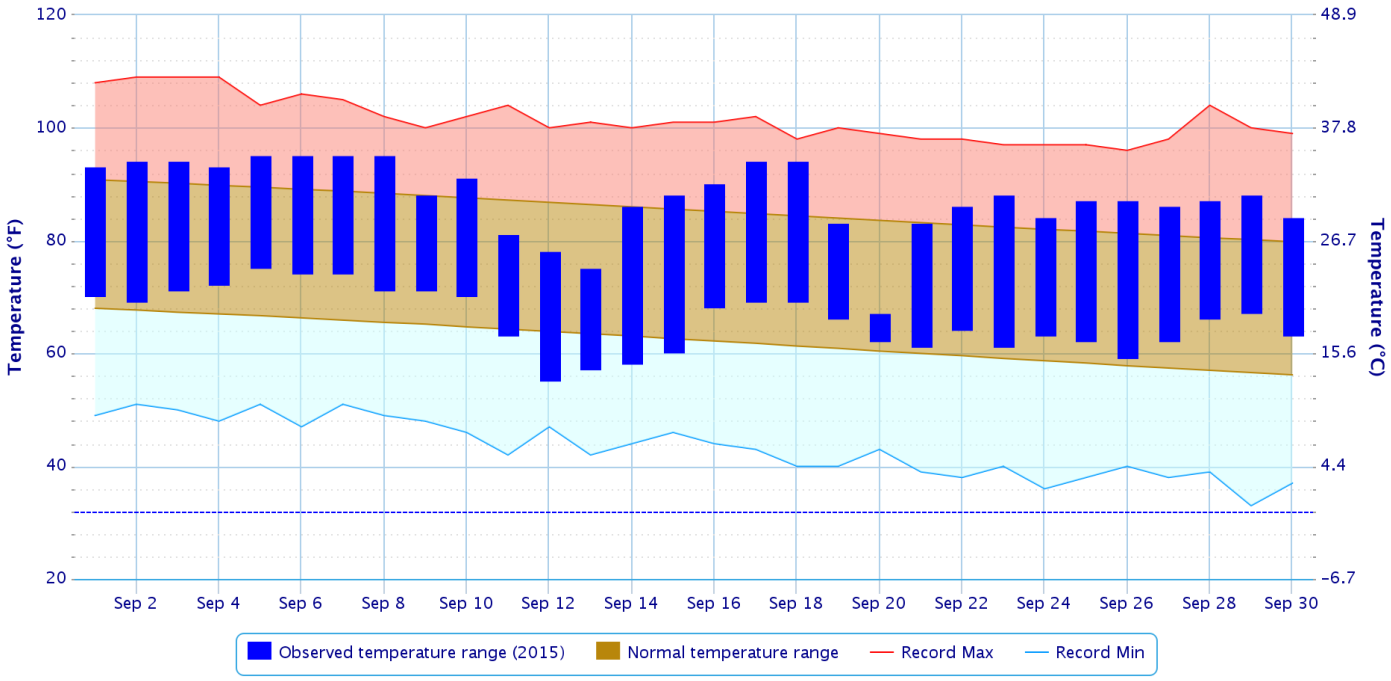
Daily Temperature Data – Fort Smith Area, AR (ThreadEx)

Period of Record – 1882-06-01 to 2015-09-30. Normals period: 1981-2010. Click and drag to zoom chart.



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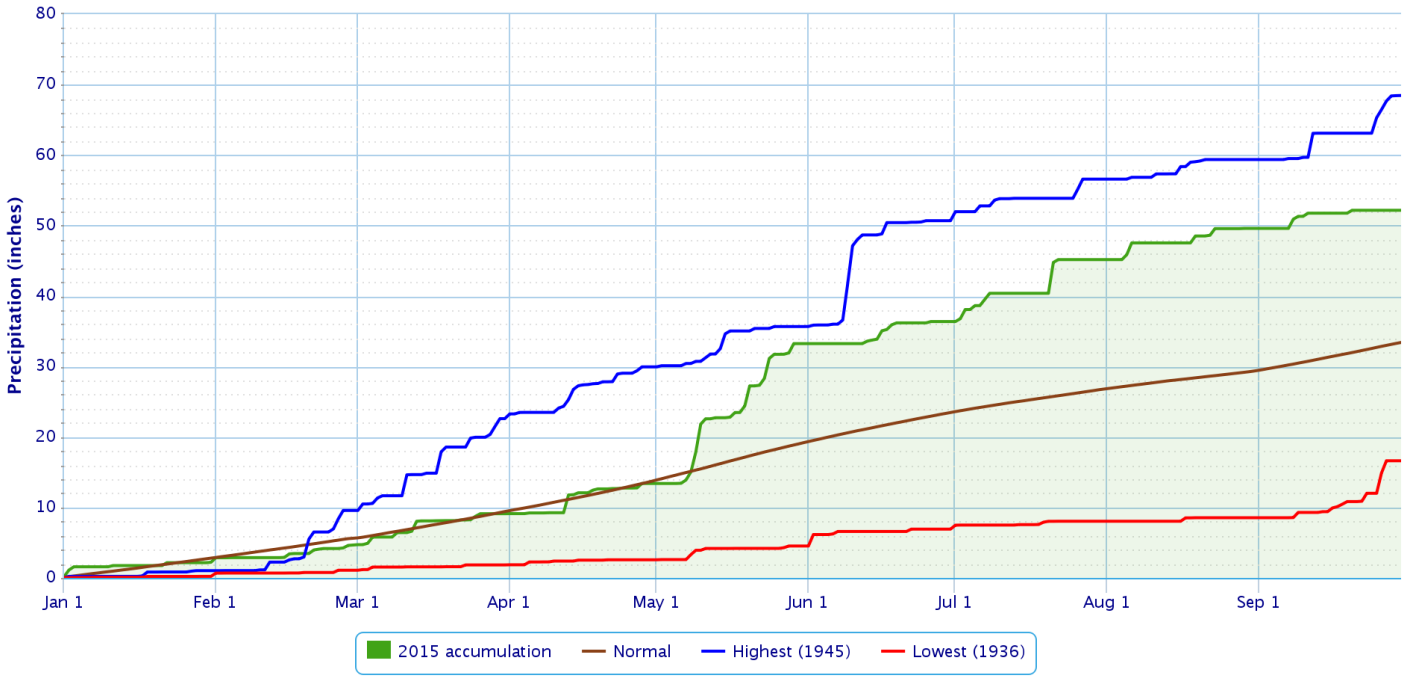
Accumulated Precipitation – Fort Smith Area, AR (ThreadEx)

Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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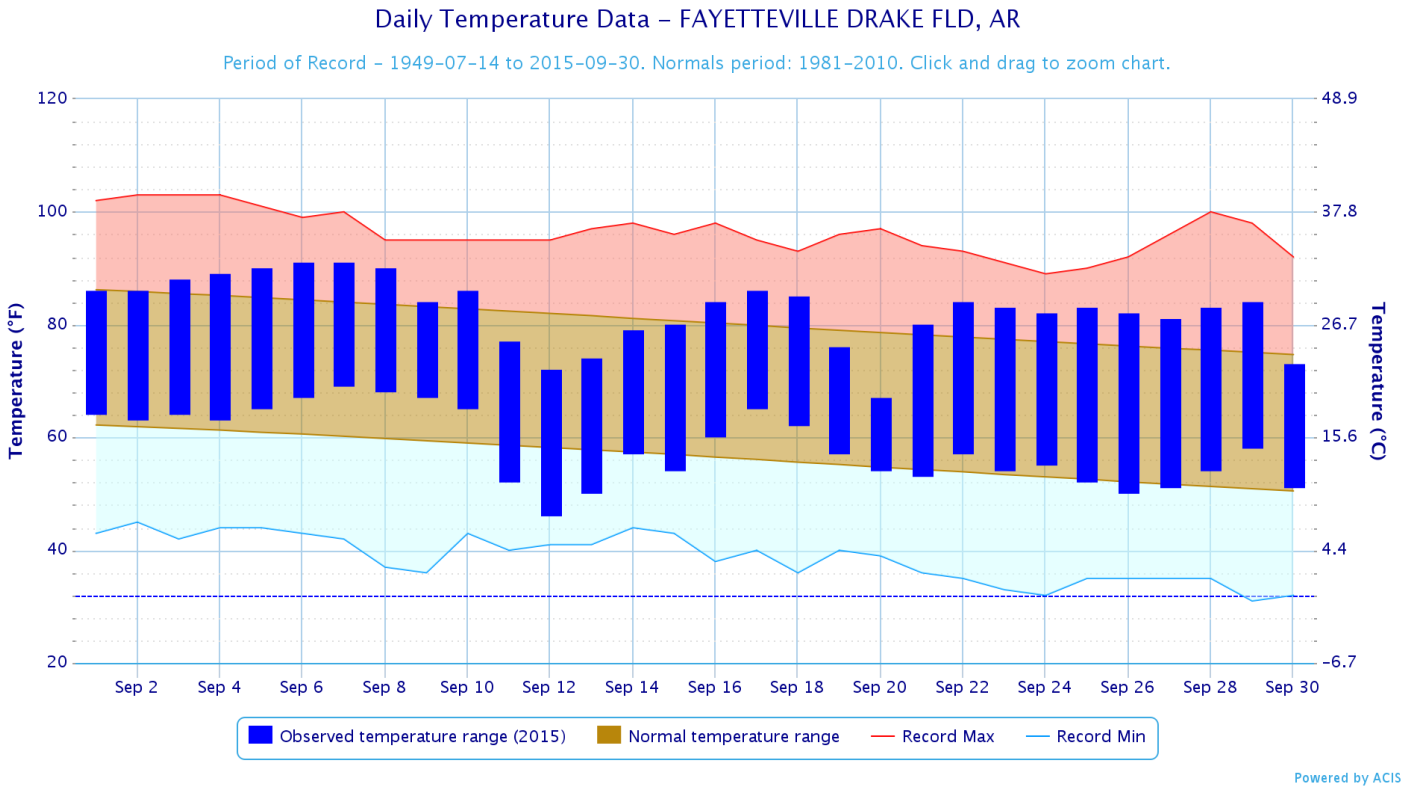
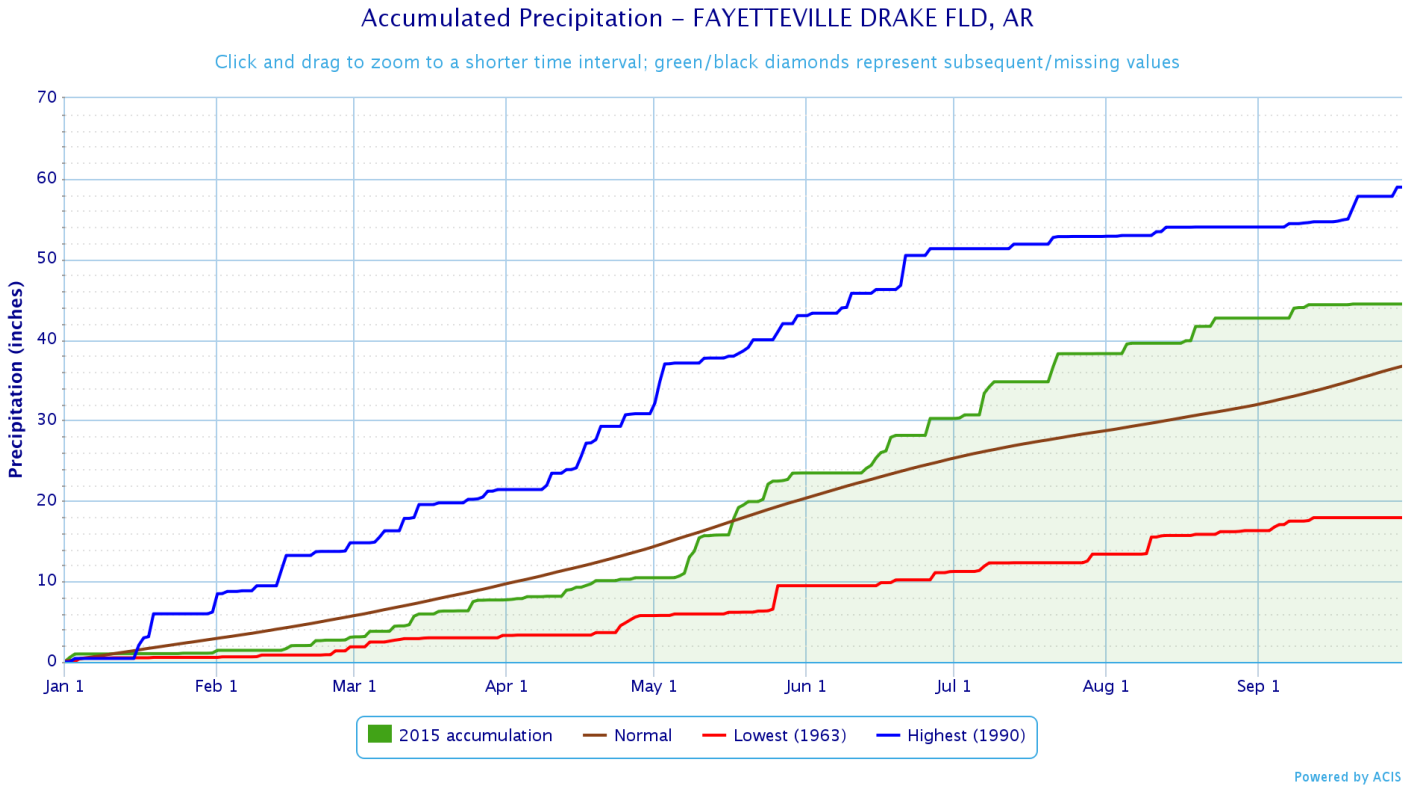




Drought

According to the U.S. Drought Monitor (USDM) from September 29, 2015 (Figs 2a, 2b), Severe (D2) drought remained across Choctaw and southern Pushmataha Counties in southeast OK. Moderate (D1) drought was occurring over most of Pushmataha County. Abnormally dry (D0), but not in drought, conditions were located across far northern Pushmataha Co. and the southern portion Le Flore Co. in southeast OK, and the southeast half of Sebastian Co. in west central AR.

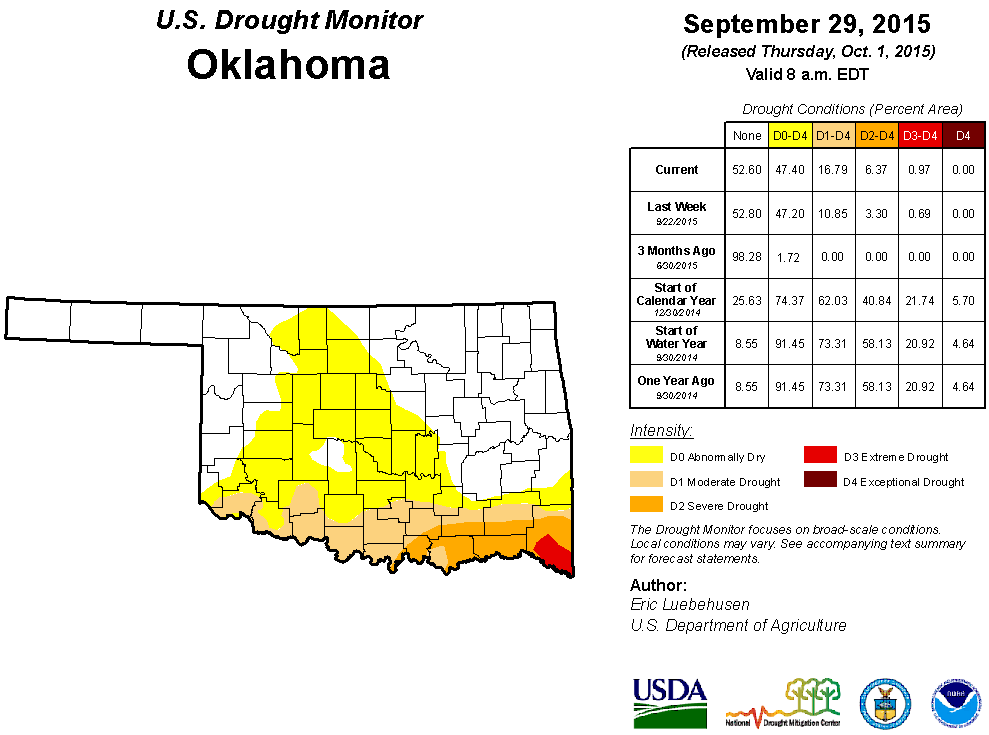


Fig. 2a. Drought Monitor for Oklahoma

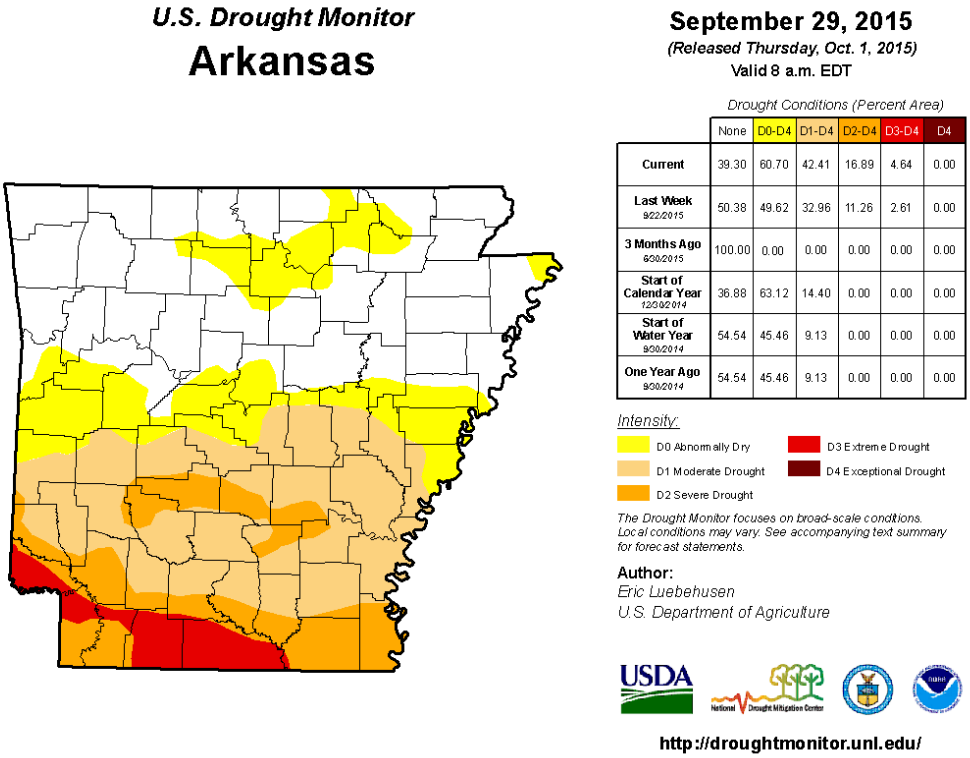
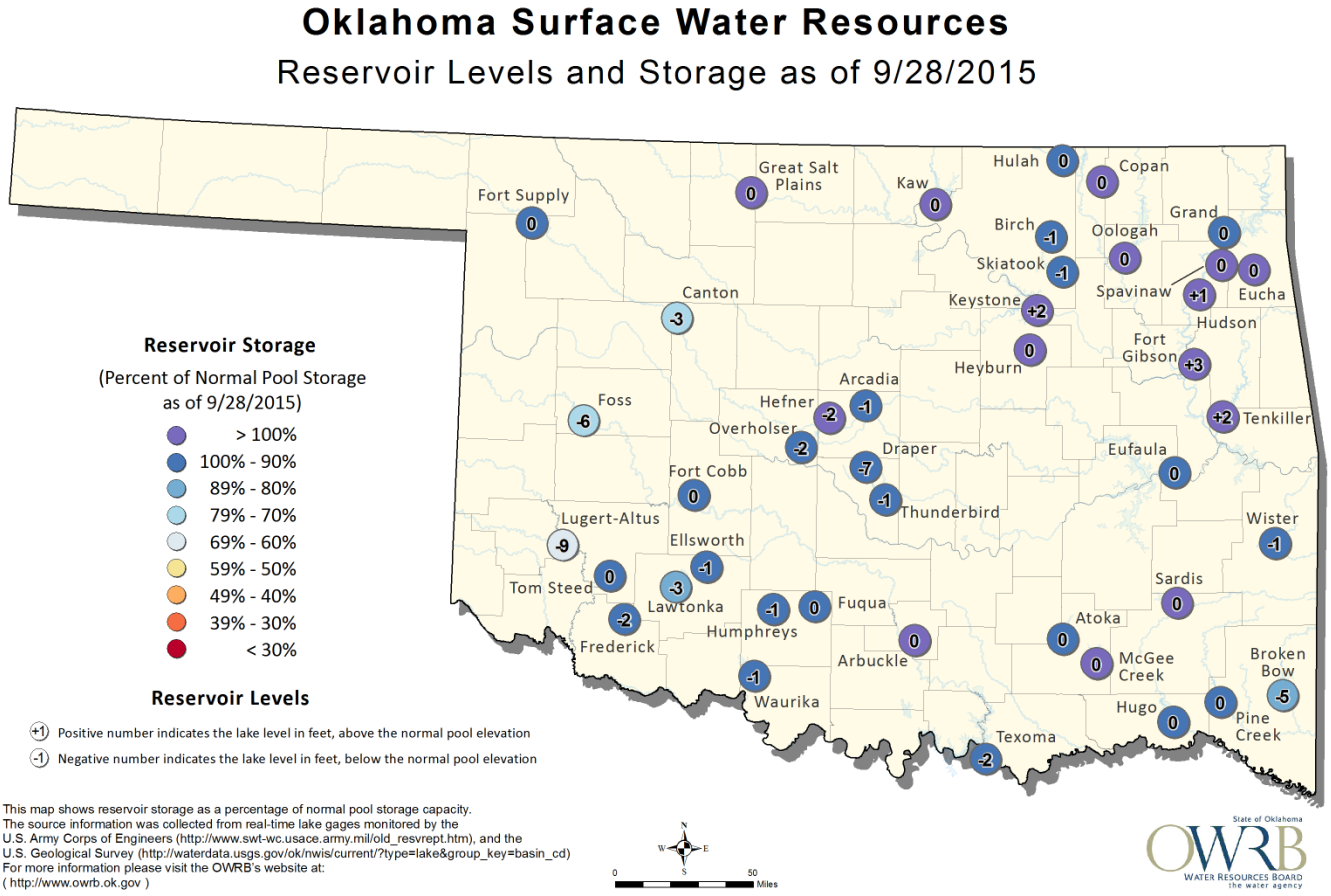


Fig. 2b. Drought Monitor for Arkansas

Reservoirs

According to the USACE, most of the major reservoirs in the HSA were operating within ±5% of the top of their conservation pools as of 9/30/2015. The exceptions were Beaver Lake, which was operating at 42% of its flood control pool and Ft. Gibson at 7%. A couple of lakes had fallen below 5% of their conservation pool: Hulah Lake 93% and Wister Lake 93%.



Water Year 2015 (Oct 1, 2014 – Sep 30, 2015)

Using the radar-derived estimated observed precipitation from the RFCs (Fig. 3a), rainfall totals for Water Year 2015 ranged from around 40” to 80” across all of eastern OK and northwest AR, expect for Osage and Pawnee Counties where totals were 30”-50”. The highest rainfall of around 70” occurred primarily in east central OK. According the OCS, Water Year 2015 was the 2nd wettest on record (since 1921) for east central OK, with 66.57” (20.43” above normal; record 69.78” in 1944-45). These high rainfall totals equate to 110%-200% of the normal Water Year rain across the majority of eastern OK and northwest AR (Fig. 3b). The exceptions were in Osage, Pawnee, Choctaw, Pushmataha, and Mayes Counties, where rainfall ranged from near normal to 25% below normal for the water year.

In Tulsa, OK, Water Year 2014-15 ranked as the 42nd warmest Water Year (61.0°F, tied 1952-53, 1945-46, 1936-37; since records began in 1906-07) and the 10th wettest Water Year (53.37”; since records began in 1893-94). Fort Smith, AR had the 53rd warmest Water Year (61.8°F, tied 1994-95, 1986-87, 1945-46, 1944-45; since records began in 1882-83) and the 3rd wettest Water Year (63.96”; since records began in 1882-83). The wettest Water Year on record in Fort Smith is 79.11” in 1944-45, followed by 64.94” in 2007-08. Fayetteville, AR had the 17th coldest (56.7°F, tied 1996-97, 1993-94, 1976-77) and the 10th wettest (56.81”) Water Year since records began in 1949-50.

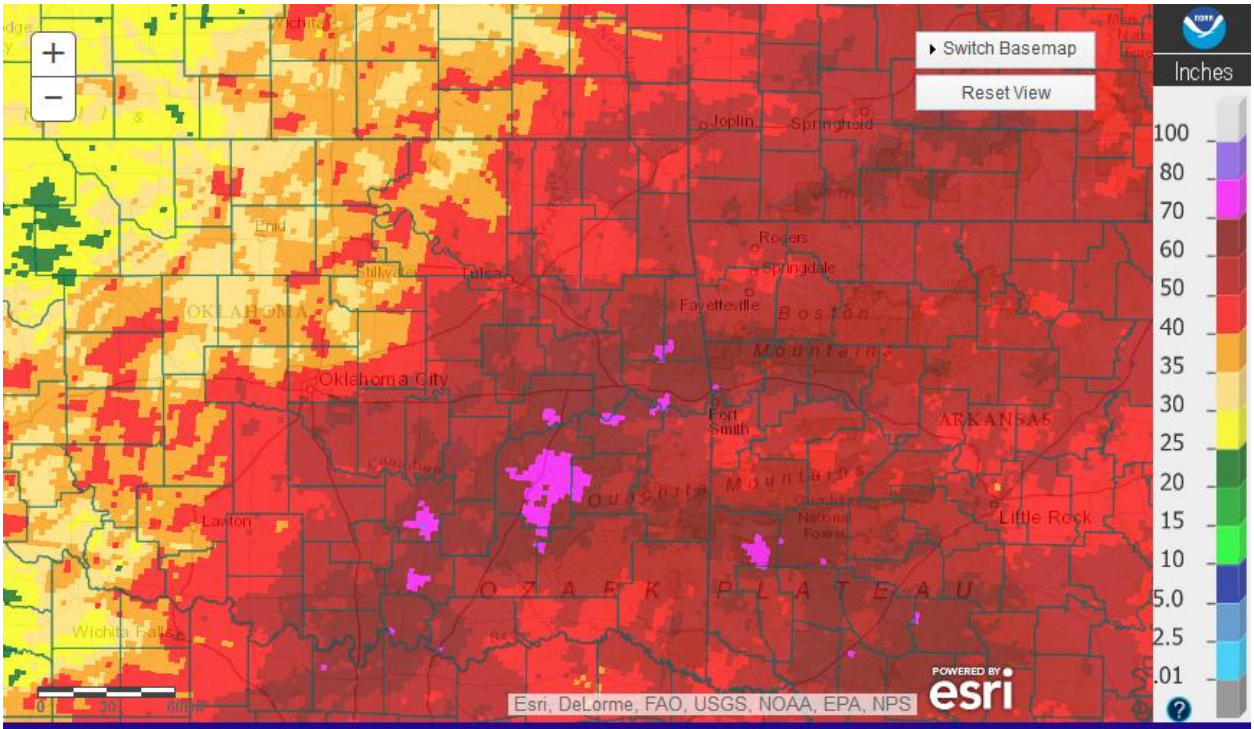


Fig. 3a. Estimated Observed Rainfall for Water Year 2015

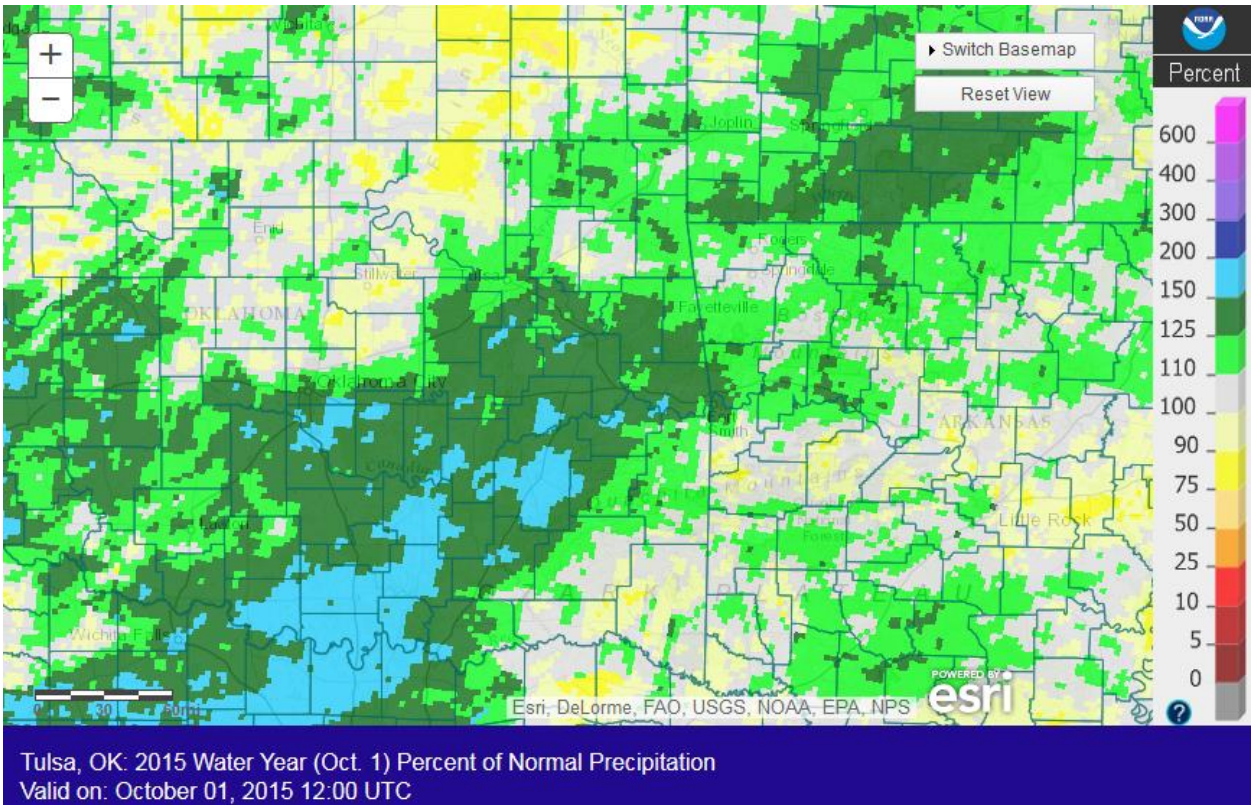


Fig. 3b. Estimated % of Normal Rainfall for Water Year 2015

Some of the larger precipitation reports (in inches) for Water Year 2015 included (no Mesonet data available):

Winfrey, AR (DCP)	71.86	Wesley 3N, AR (DCP)	70.58	Maysville, AR (DCP)	70.31
Bunch 0.8N, OK (coco)	70.28	Hartshorne 4ESE, OK (DCP)	69.68	Winslow 7NE, AR (coop)	69.54
Sallisaw 1.0SE, OK (coco)	69.16	Barber, OK (DCP)	69.07	Big Cedar, OK (DCP)	68.81
Krebs 0.3WNW, OK (coco)	68.52	Short 4S, OK (DCP)	68.34	Barling L&D 13, AR (DCP)	68.20
Vian 5.3ENE, OK (coco)	67.67	McAlester, OK (ASOS)	67.39	Whitefield, OK (DCP)	66.31
Grand Lake, OK (DCP)	65.67	Kingston 2S, AR (coop)	65.40	Hartshorne 3.9NNE, OK (coco)	64.88

Mountainburg 2NE, AR (coop)	64.88	Kerr L&D15, OK (DCP)	64.86	Van Buren, AR (DCP)	64.57
Fort Smith, AR (ASOS)	63.96	Tahlequah, OK (DCP)	62.96	Fanshawe, OK (coop)	62.92
Muskogee, OK (DCP)	62.75	Bella Vista 1.0ESE, AR (coco)	62.24	Page 5N, OK (DCP)	61.96
Red Oak, OK (DCP)	61.81	Webbers Falls L&D 16, OK (DCP)	61.38	Van Buren 2.1NNW, AR (coco)	61.26
Stigler, OK (DCP)	61.05	Ozark, AR (coop)	60.96	Wilburton 9.4N, OK (coco)	60.80
Warner, OK (DCP)	60.36	West Siloam Springs, OK (DCP)	60.03		

For reference, the 1981-2010 annual normal rainfall is: 40.97" in Tulsa, OK; 42.04" in McAlester, OK; 48.51" in Fayetteville, AR; and 45.46" in Fort Smith, AR.

Outlooks

The Climate Prediction Center (CPC) outlook for October 2015 (issued September 30, 2015) indicates a slightly enhanced chance for above median precipitation across far southeast OK, and equal chances for above, near, and below median precipitation elsewhere. The outlook also calls for an equal chance of above, near, or below normal temperatures across all of eastern OK and northwest AR. This outlook is based on both short- and extended range weather forecasts. The precipitation outlook also considers El Niño influences.

For the 3-month period October-November-December 2015, CPC is forecasting an equal chance for above, near, and below normal temperatures and an enhanced chance for above median precipitation across all of eastern OK and northwest AR (outlook issued September 17, 2015). According to CPC, weekly El Niño conditions are currently of strong strength. The ongoing El Niño is expected to peak in strength in the late autumn or early winter. There are indications that this event could peak as a very strong (sometimes referred to as a "super") El Niño, with sea surface temperature anomalies greater than +2.0°C. There is a 95% chance for El Niño to continue through the upcoming winter and it is expected to persist through spring 2016. El Niño impacts are generally most significant in the Southern Plains during the cold season. Therefore, this outlook is based primarily on both statistical and dynamical forecast tools, as well as typical impacts resulting from El Niño conditions.

Summary of Precipitation Events Daily quality controlled rainfall maps can be found at: http://water.weather.gov/precip/index.php?location_type=wfo&location_name=tsa

September 1-15

Deeper moisture moved north, allowing isolated terrain-forced showers and thunderstorms to affect southeast OK and northwest AR during the afternoon and evening hours of the 4th-7th. Overall rainfall was light, with most affected locations receiving around 0.25" or less. A few localized spots got 0.50"-1.5" of rain.

A cold front moved into the HSA on the 8th, and thunderstorms increased along the boundary forming a mesoscale convective system (MCS). The MCS affected all of eastern OK and northwest AR through the evening and overnight hours, bringing heavy rain to the area. Eastern Kay and far western Osage County received less than 0.50" of rain, while the remainder of the area got 0.50" to around 4" (Fig. 4). The highest totals of 3"-4" fell over portions of Craig, Delaware, Muskogee, McIntosh, Haskell, Le Flore, Latimer, and Pittsburg Counties.

Highest rainfall reports (in inches) ending at 7am CDT 9/9/2015:

Eufaula 5W, OK	4.82	Stigler 6SSE, OK	4.49	Panama 2E, OK	4.25
Stigler 4WNW, OK	4.19	Big Cabin 5NE, OK	4.05	Talihina 4SE, OK	3.68

A cold front moved south across the HSA late on the 10th and through the early afternoon of the 11th. Showers and thunderstorms developed along the front in KS, and this complex moved south into the area during the early morning hours. Scattered showers and thunderstorms continued near and behind the front, but weakened through the late morning and early afternoon hours. Most of the rainfall affected locations along and north of I-40, though rain did fall over much of Haskell, Le Flore, and Sebastian Counties. Rainfall totals ranged from 0.10" to around 1", with a few spots getting near 1.5" (Fig. 5).

A decaying thunderstorm complex from northwest OK moved into northeast OK during the pre-dawn hours of the 14th and lingered through the early evening as the associated MCV moved east along the KS/OK state line. Rainfall totals were generally light, with most affected locations northwest of a McAlester to Siloam Springs line receiving around 0.10" or less of rain. A few locations had around 0.25" of rain, with northern Osage, northern Washington (OK), and southwestern Pawnee County getting 0.50" to around 1" of rain.

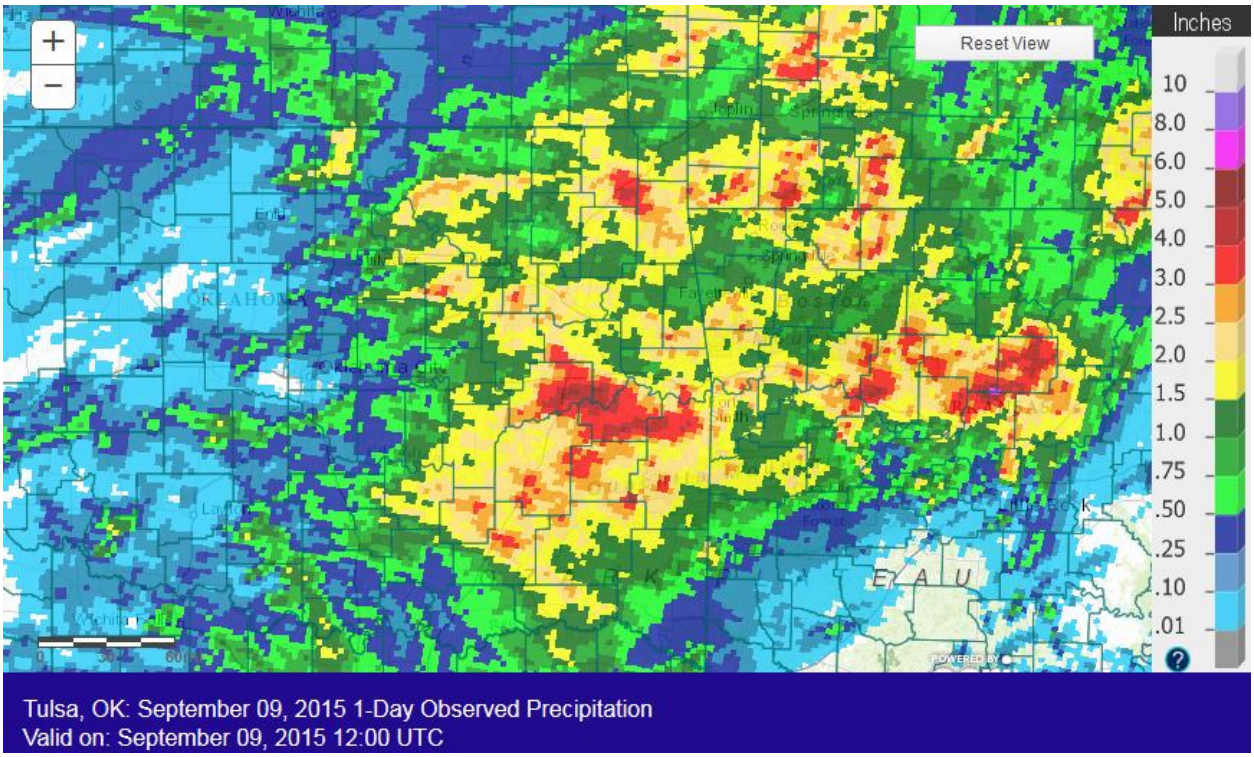


Fig. 4. 24-hr Estimated Observed Rainfall ending at 7am CDT 9/09/2015.

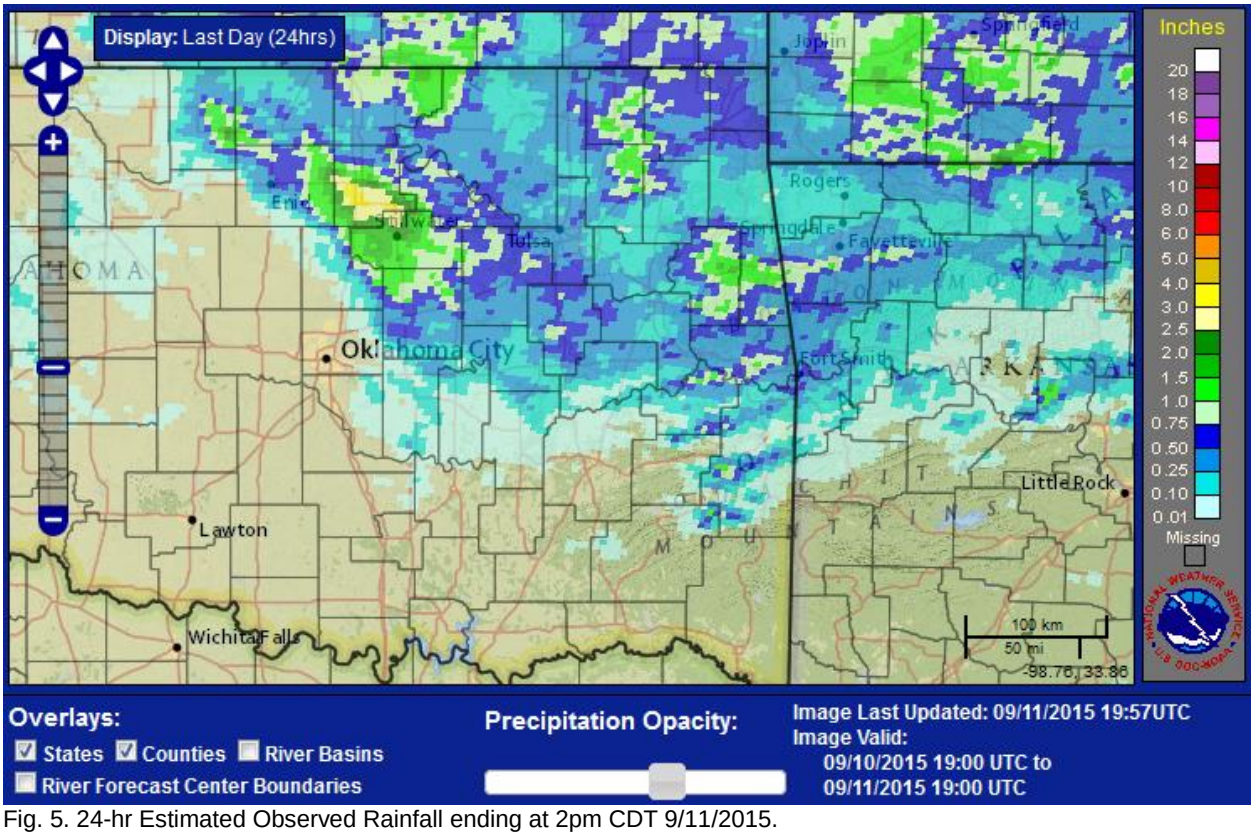


Fig. 5. 24-hr Estimated Observed Rainfall ending at 2pm CDT 9/11/2015.

September 16-30

Scattered elevated convection developed along a cold front early in the morning of the 18th. This activity moved into northeast OK by late morning. Additional thunderstorms formed along the front as it moved through the region during the afternoon through evening hours; however, far eastern OK and western AR remained dry. Scattered showers and thunderstorms continued through the early morning hours of the 19th behind the surface front/along the 850mb front and finally dissipated by early afternoon. Rainfall totals were generally from 0.10" to around 1", though much of Creek Co. received 0.75" to near 4" of rain (Fig. 6). Drumright 0.6SW, OK in Creek Co. measured 3.86".

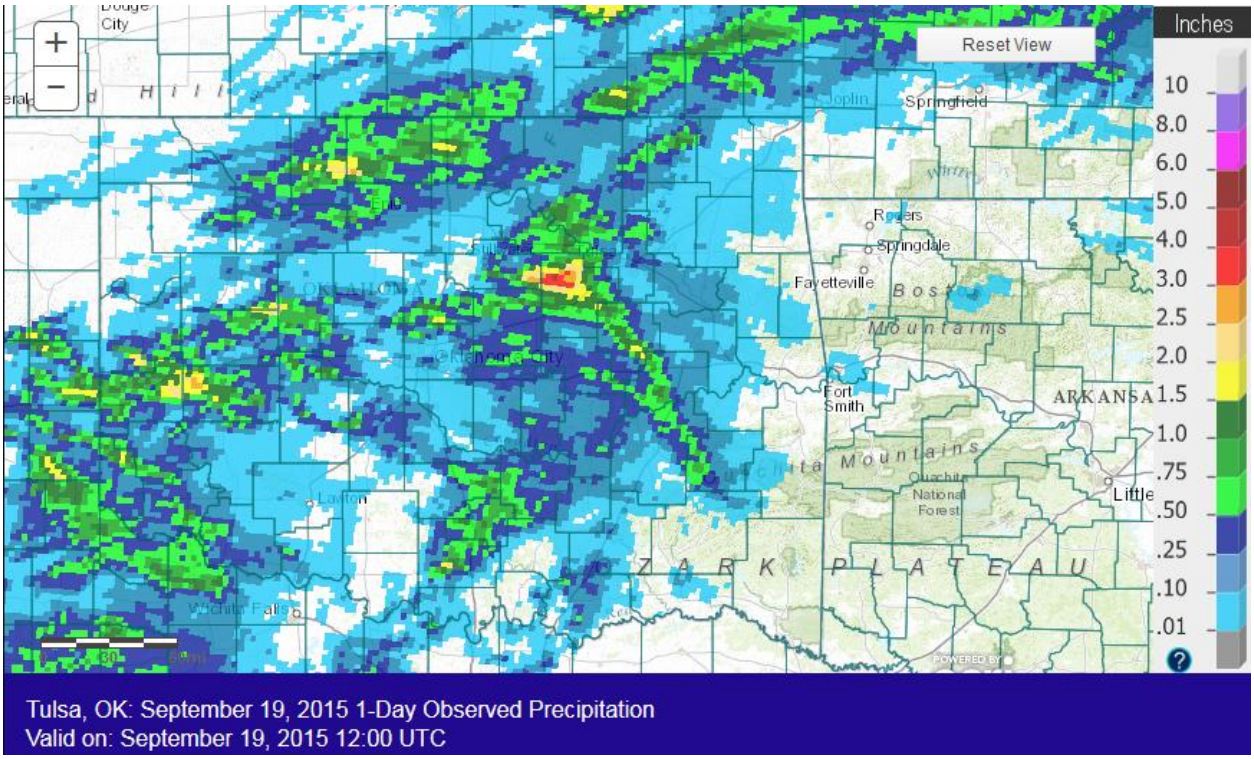


Fig. 6. 24-hr Estimated Observed Rainfall ending at 7am CDT 9/19/2015.

Thunderstorms developed over western OK during the early morning hours of the 20th, moving into northeast OK around sunrise. This activity spread eastward across most of eastern OK and northwest AR during the morning through the early afternoon. Rainfall along and south of Hwy 412 ranged from 0.10" to near 4", with the heaviest rain occurring across southern Pittsburg and southern Latimer Counties (Fig. 7).

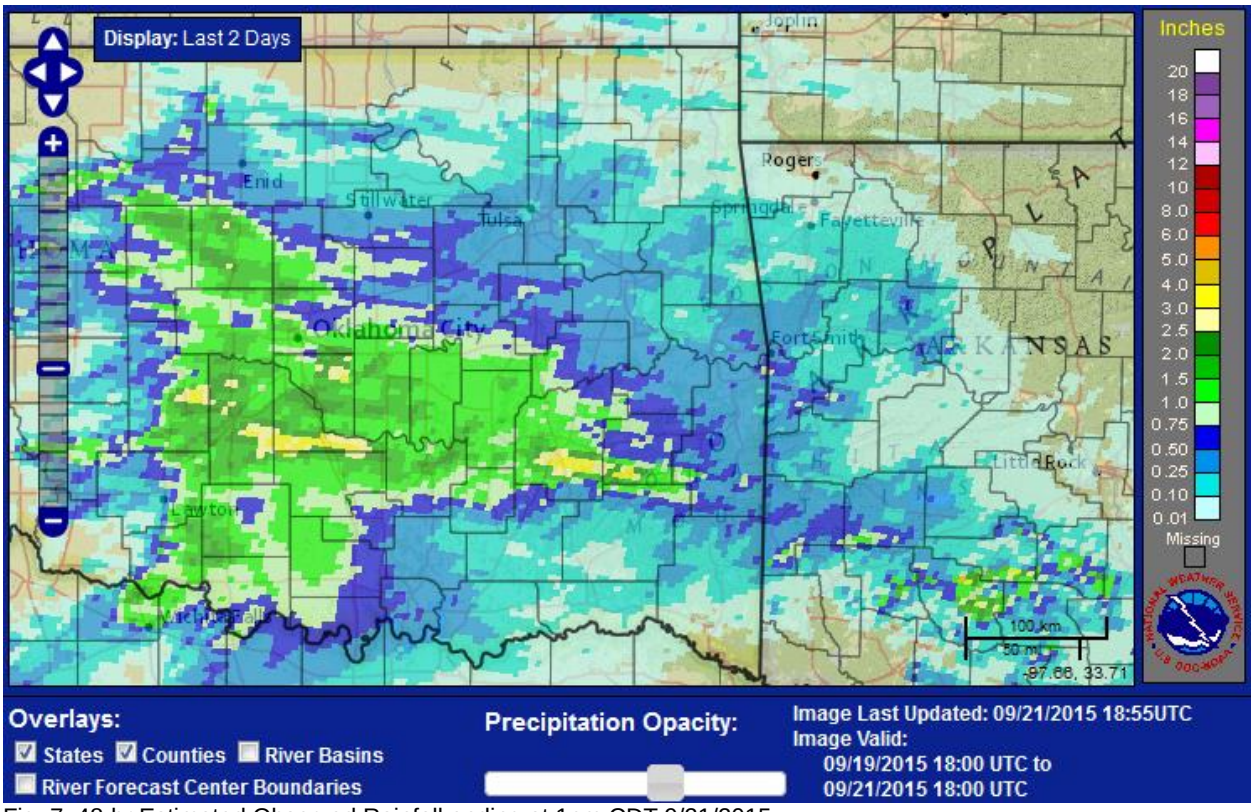


Fig. 7. 48-hr Estimated Observed Rainfall ending at 1pm CDT 9/21/2015.

Written by:

Nicole McGavock
Service Hydrologist
WFO Tulsa

Products issued in September 2015:

*MLBA4 and OZGA4 transferred to NWS Tulsa HSA February 5, 2014
*Mixed case River Flood products began July 31, 2013

0 Flash Flood Warnings (FFW)
0 Flash Flood Statements (FFS)
0 Flash/Areal Flood Watches (FFA) (0 Watch FFA CON/EXT/EXA/EXB/CAN)
7 Urban and Small Stream Advisories (FLS)
0 Areal Flood Warnings (FLW)
0 Areal Flood Statements (FLS)
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)

Preliminary Hydrographs:

None