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 **February** YEAR **2016**
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 **March 3, 2016**

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.

It was a warm and dry February 2016 for most of eastern Oklahoma and northwest Arkansas. Despite a dry first two months of 2016, a very wet December resulted in above normal temperatures and precipitation for Winter 2015-16. Normal precipitation across the Hydrologic Service Area (HSA) in February ranges from 1.8 inches in Osage County to 3.2 inches in Choctaw County. In the Ozark region of northwest Arkansas, the normal monthly precipitation is 2.9 inches. 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 February 2016 ranged from 0.25" to around 4". Most of the HSA received 0.50"-2" of rain this month. This corresponds to only 10%-50% of the normal February rain north of Hwy 412 in northeast OK and northwest AR (Fig. 1b). South of Hwy 412, most of the region received 25%-90% of the normal February rain. A few isolated locations, primarily in Okfuskee, Okmulgee, Creek, Latimer, and Le Flore Counties, ended the month with above normal rainfall, receiving 110% to near 200% of the normal February rain.

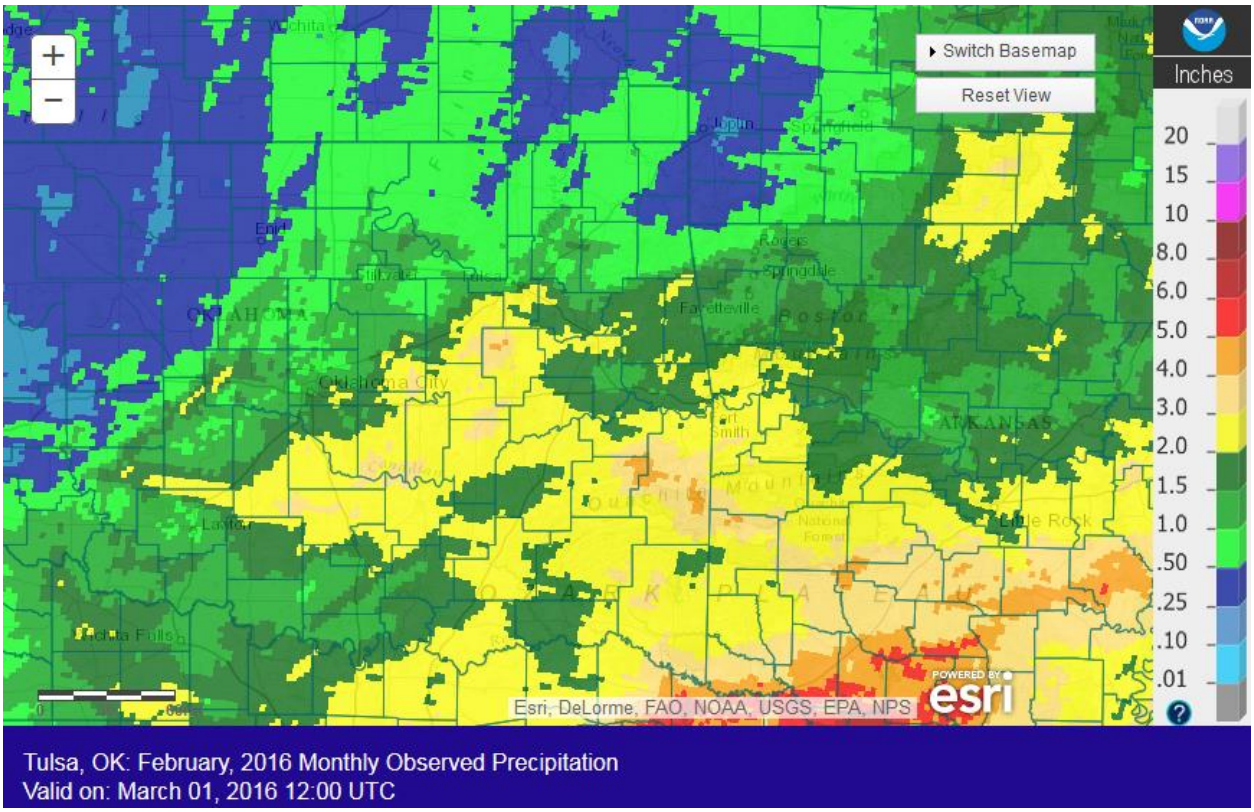


Fig. 1a. Estimated Observed Rainfall for February 2016

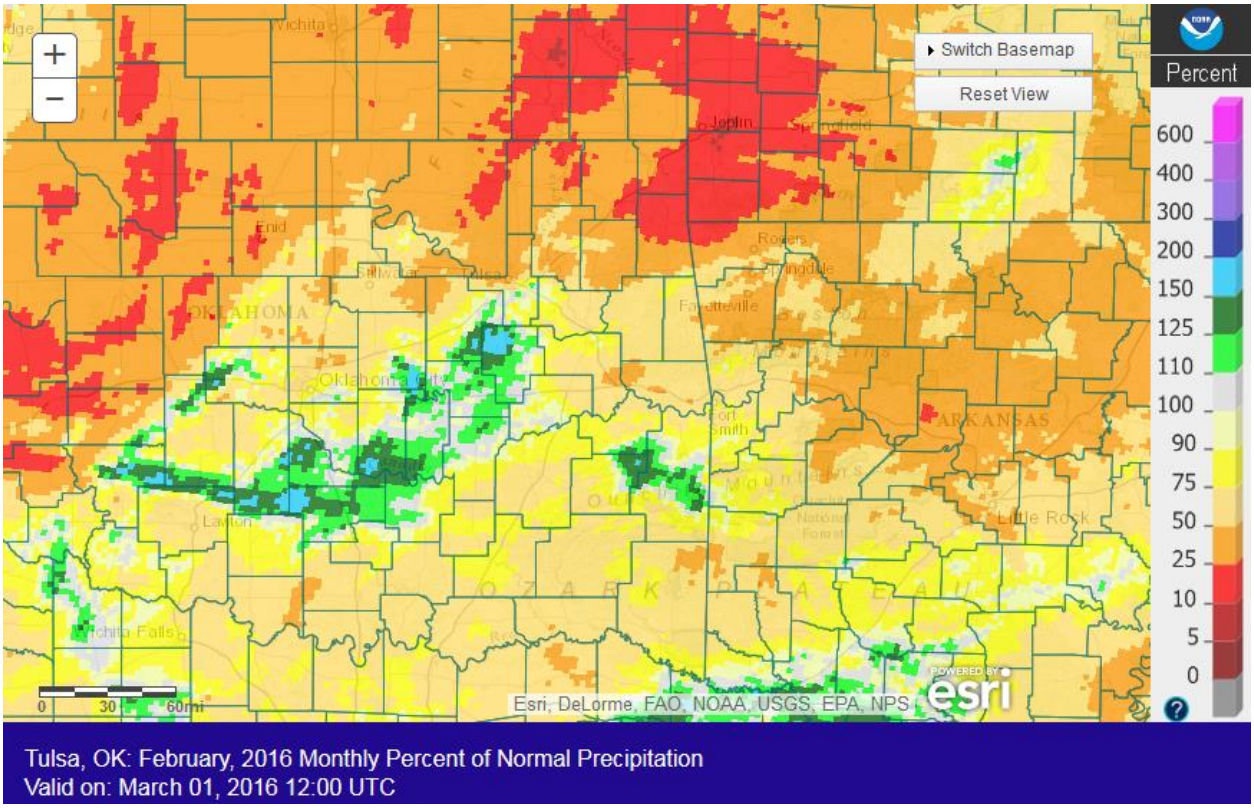


Fig. 1b. Estimated % of Normal Rainfall for February 2016

In Tulsa, OK, February 2016 ranked as the 8th warmest February (48.7°F; since records began in 1905) and the 19th driest February (0.59"; since records began in 1888). Fort Smith, AR had the 18th warmest February (48.1°F, tied 1890; since records began in 1883) and the 51st driest February (1.76"; since records began in 1883). Fayetteville, AR had the 18th warmest (42.6°F, tied 1995, 1984) and the 2nd driest (0.64") February since records began in 1950.

Some of the larger precipitation reports (in inches) for February 2016 included:

Okemah, OK (meso)	2.48	Hectorville, OK (meso)	2.40	Fanshawe, OK (coop)	2.36
Bristow, OK (meso)	2.25	Talihina, OK (meso)	2.20	Wister, OK (meso)	2.20
Cloudy, OK (meso)	2.08	Antlers, OK (meso)	2.03	Bengal, OK (meso)	1.89

Some of the lowest precipitation reports (in inches) for February 2016 included:

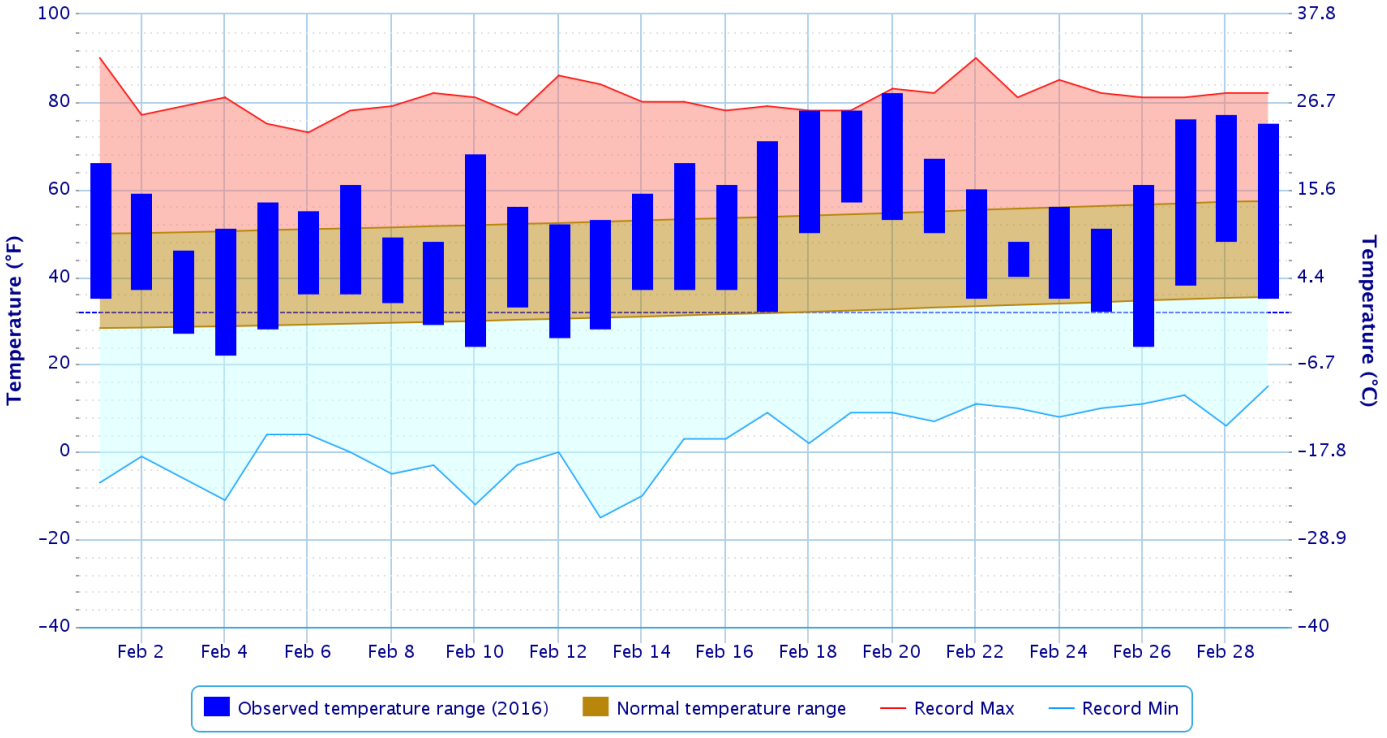
Vinita, OK (coco)	0.12	Jay, OK (meso)	0.26	Upper Spavinaw Port, OK (coop)	0.39
Decatur 2.6ESE, AR (coco)	0.44	Springdale 6.4WSW, AR (GHCN)	0.44	Kingston 2S, AR (coop)	0.46
Northwest AR Regl. Airpt (ASOS)	0.50	Miami, OK (meso)	0.51	Bartlesville, OK (ASOS)	0.51
Bella Vista 2.0E, AR (coco)	0.51				

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

Rank since 1921	Last 30 Days (Jan 30 – Feb 28	Year-to-Date (Jan 1 – Feb 28)	Winter-to-Date (Dec 1 – Feb 29)	Last 120 Days (Nov 2 – Feb 29)	Water Year-to-Date (Oct 1 – Feb 29)	Cool Growing Season (Sep 1 – Feb 29)	Last 365 Days (Mar 2, 2015-Feb 29, 2016)
Northeast OK	11th driest	12th driest	1st wettest	1st wettest	2nd wettest	3rd wettest	1st wettest
East Central OK	22nd driest	12th driest	1st wettest	1st wettest	1st wettest	2nd wettest	1st wettest
Southeast OK	27th driest	11th driest	2nd wettest	1st wettest	1st wettest	1st wettest	1st wettest
Statewide	24th driest	16th driest	3rd wettest	1st wettest	2nd wettest	4th wettest	1st wettest

Daily Temperature Data – Tulsa Area, OK (ThreadEx)

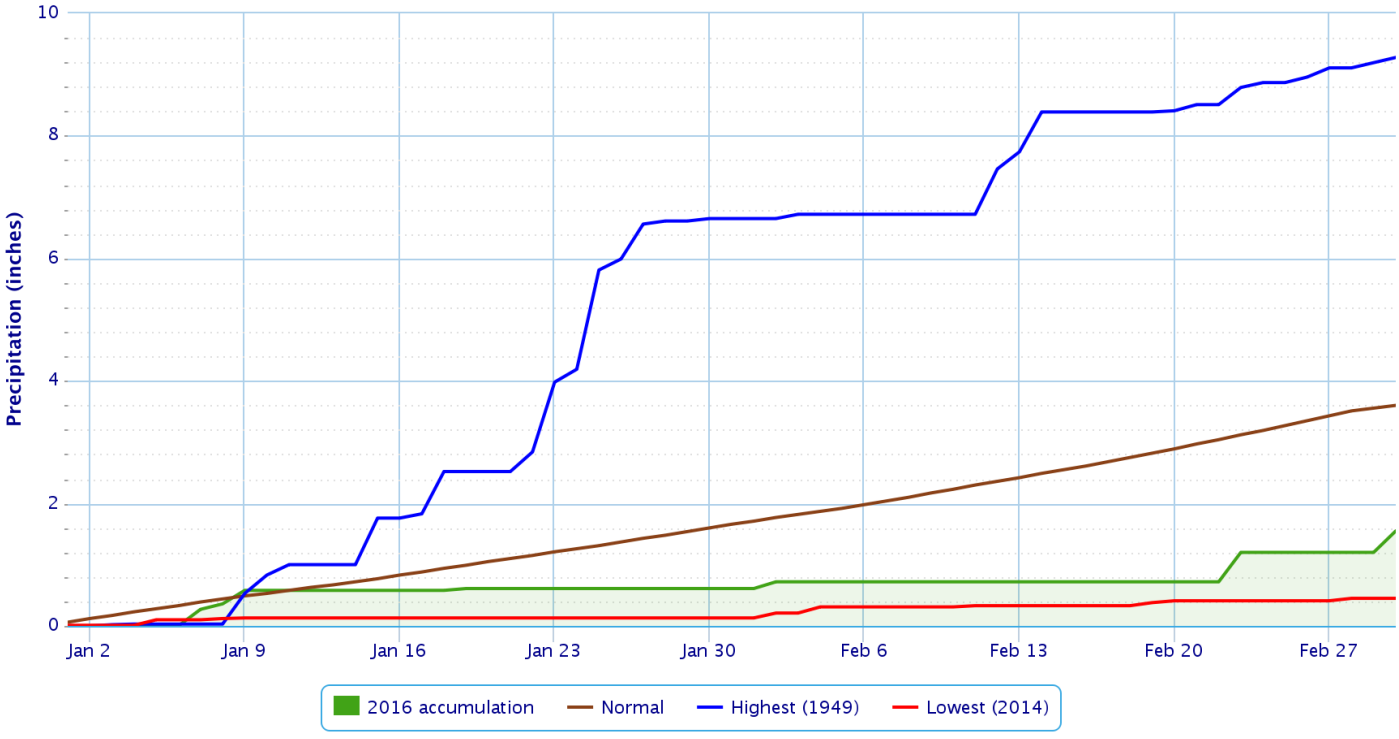
Period of Record – 1905-01-06 to 2016-03-03. Normals period: 1981-2010. Click and drag to zoom chart.



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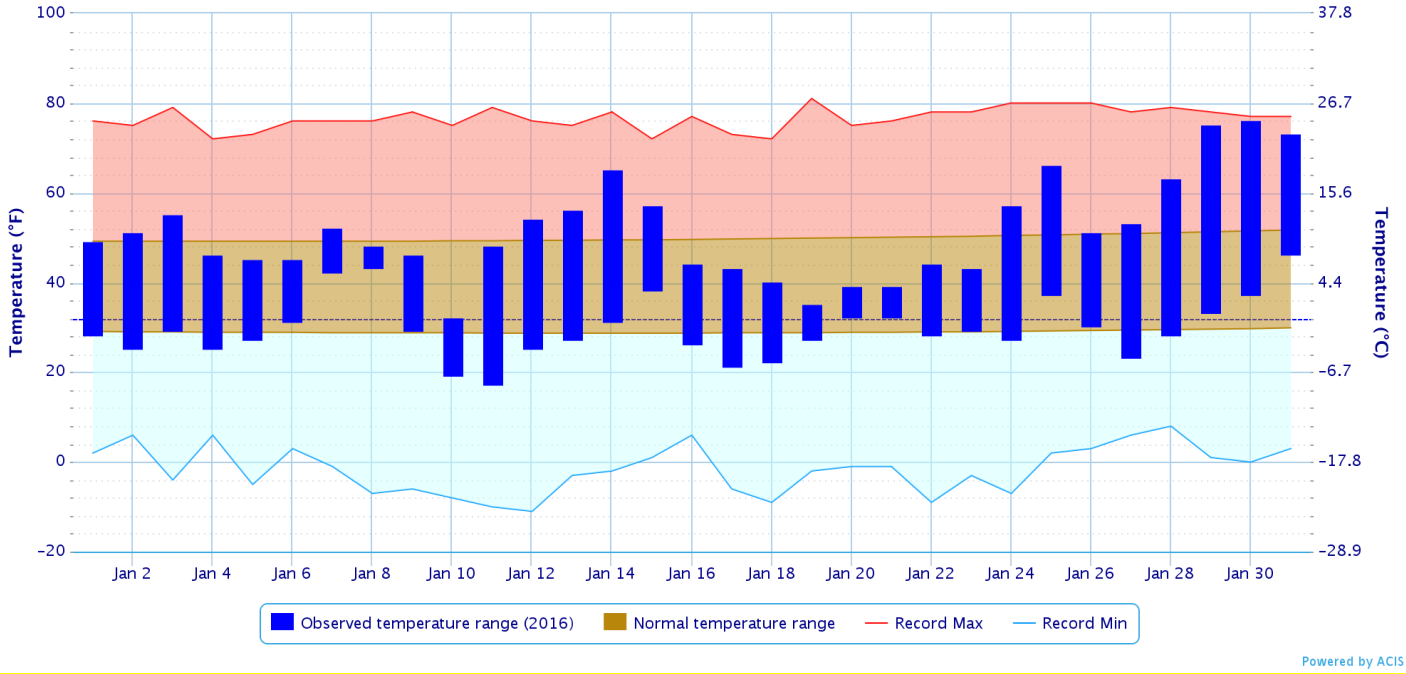
Daily Temperature Data – Fort Smith Area, AR (ThreadEx)

Period of Record – 1882-06-01 to 2016-01-31. Normals period: 1981-2010. Click and drag to zoom chart.



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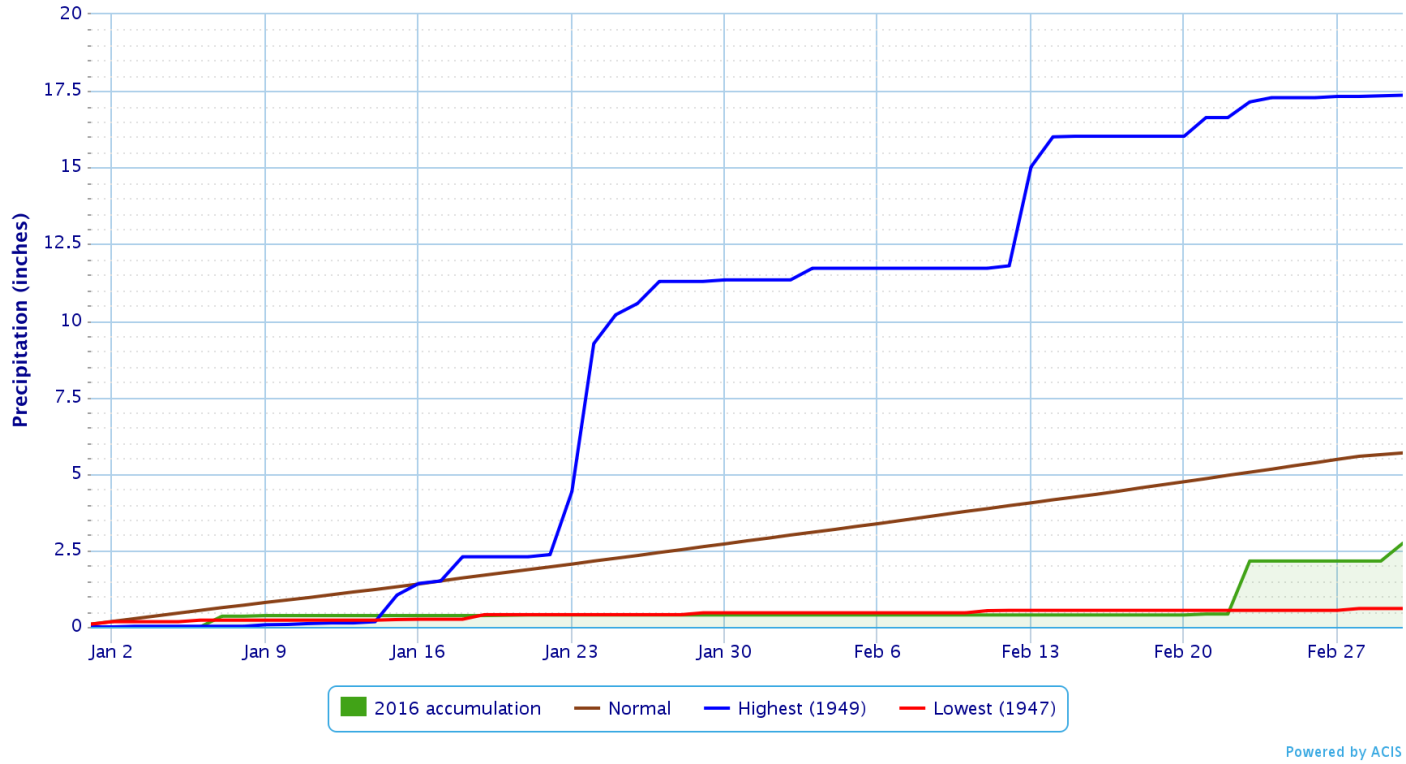
Accumulated Precipitation – Fort Smith Area, AR (ThreadEx)

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



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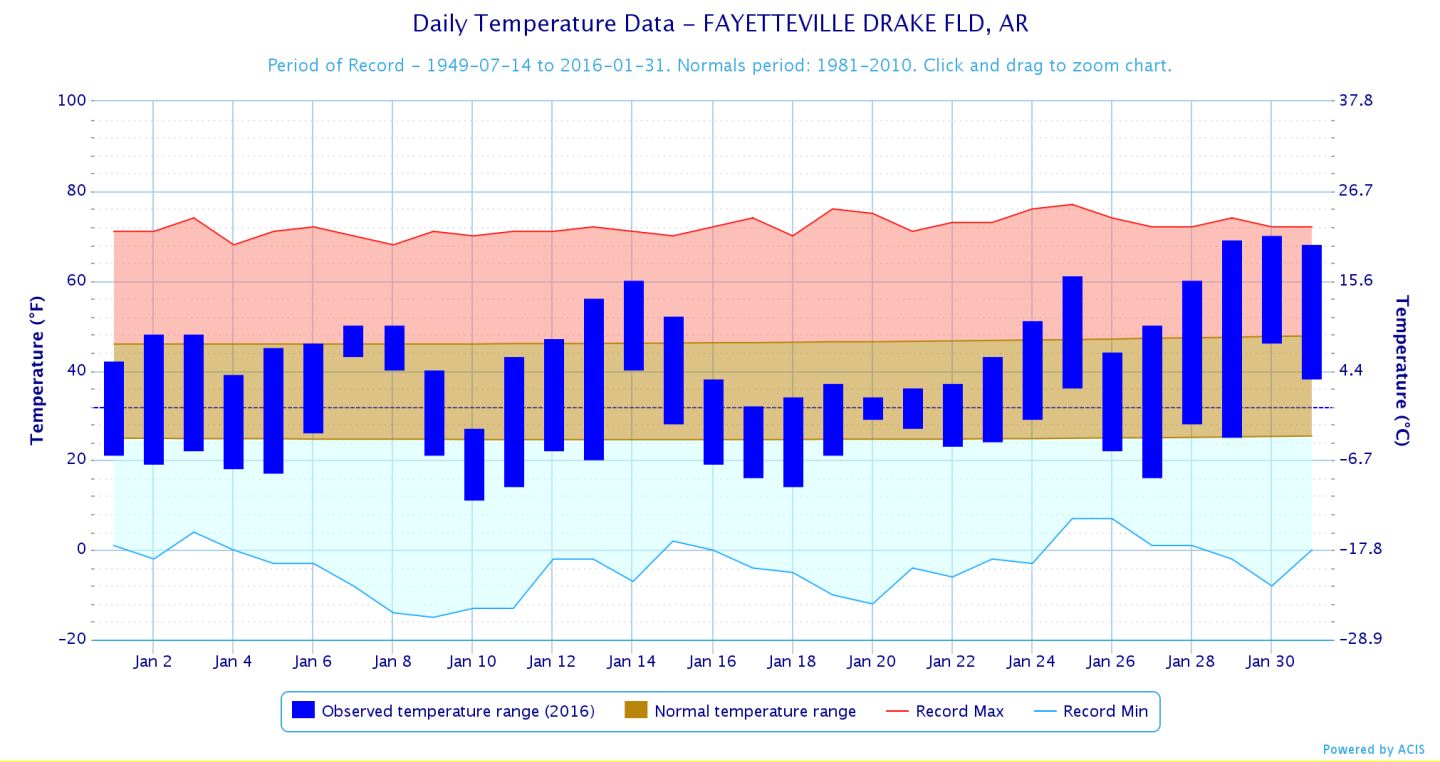
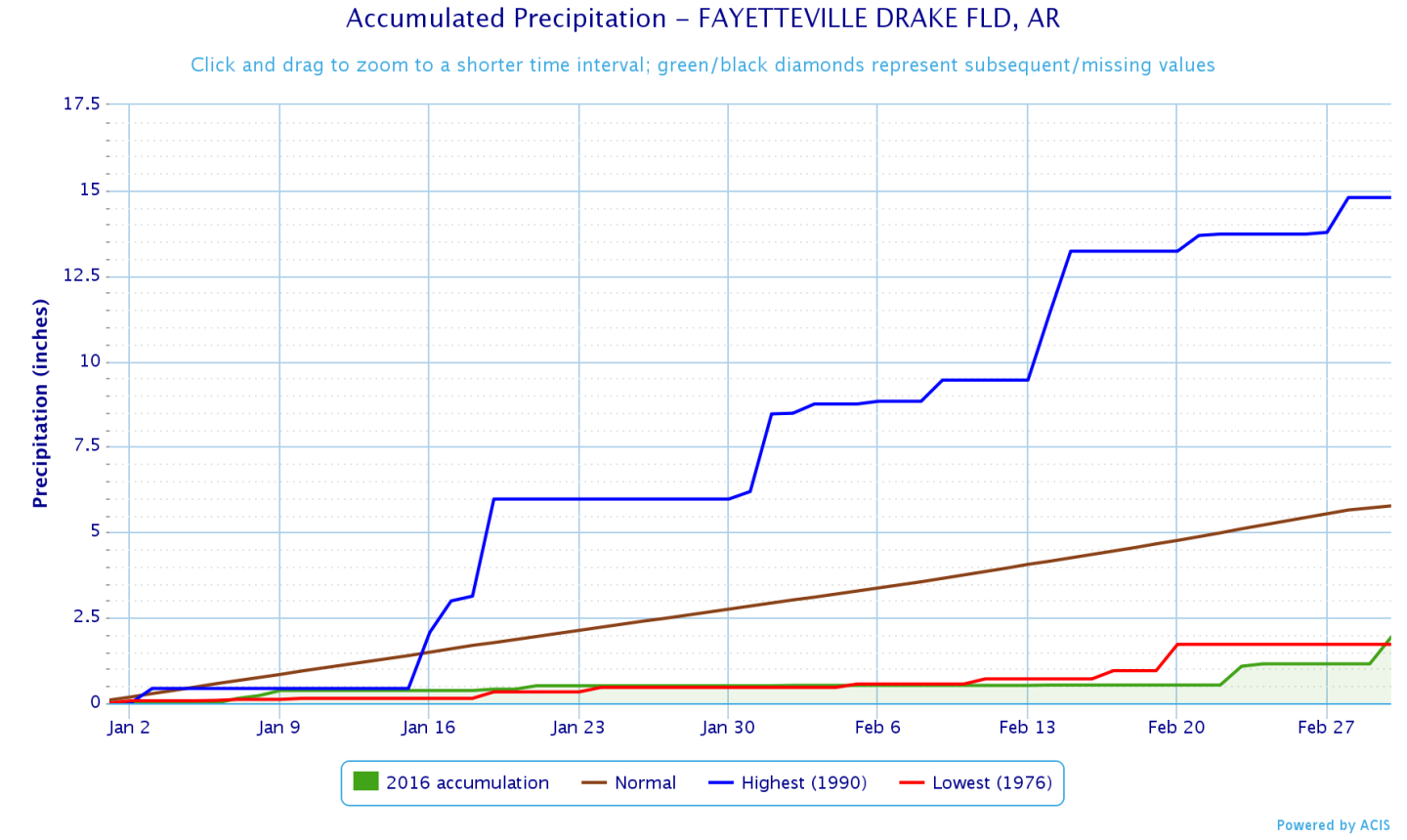


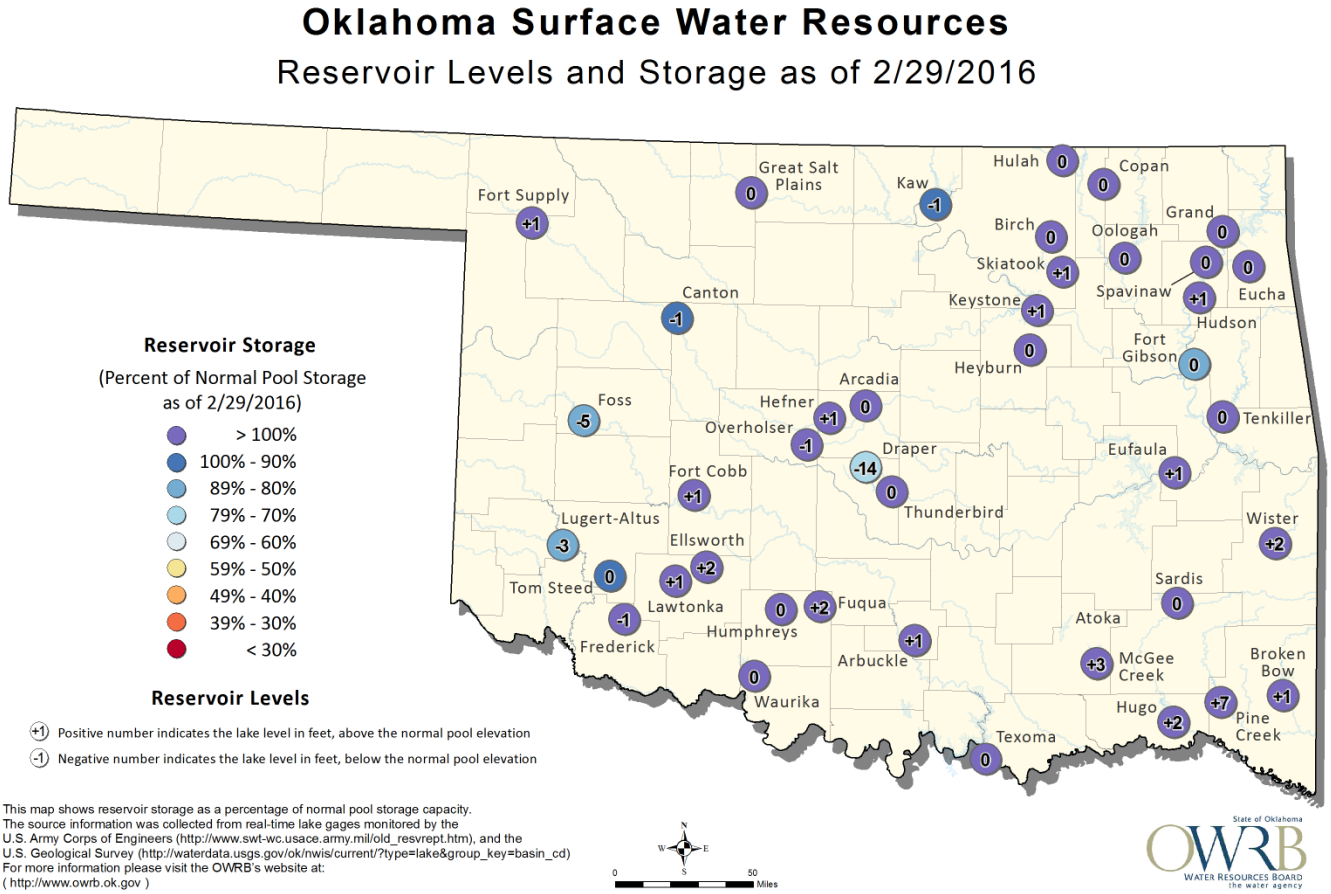


Drought

According to the U.S. Drought Monitor (USDM) from March 1, 2016, there were no drought or abnormally dry conditions present in eastern OK and northwest AR.

Reservoirs

According to the USACE, most of the major reservoirs in the HSA were operating at their conservation level or within 5% of the flood control pool as of 3/01/2016. Only a few reservoirs had higher levels: Beaver Lake 112%, Hudson Lake 108%, and Eufaula Lake 106% of their conservation pools. Ft. Gibson Lake was below the top of its conservation pool at 91%.



Winter (Dec-Jan-Feb 2015-16)

Using the radar-derived estimated observed precipitation from the RFCs (Fig. 2a), rainfall totals for Winter 2016 ranged from around 4" to near 25" from northwest to southeast across eastern OK and northwest AR. Most of the HSA received 8"-15" of rain this season. This corresponds to 110% to around 200% of the normal Winter rain across most of eastern OK and northwest AR (Fig. 2b). The western portions of Osage and Pawnee Counties received 75%-100% of the normal Winter rain. This was all primarily due to the record December rainfall. Both January and February were dry with below normal rainfall.

In Tulsa, OK, Winter 2015-16 ranked as the 3rd warmest Winter (44.4°F; since records began in 1905-06) and the 5th wettest Winter (9.80"; since records began in 1888-89). Fort Smith, AR had the 5th warmest Winter (45.9°F; since records began in 1882-83) and the 7th wettest Winter (12.96"; since records began in 1882-83). Fayetteville, AR had the 10th warmest (40.9°F, tied 1994-95) and the 7th wettest (12.10") Winter since records began in 1949-50.

Some of the larger precipitation reports (in inches) for Winter 2015-16 included:

Upper Spavinaw Port, OK (coop)	18.47	Wilburton 9.4N, OK (coco)	18.22	Decatur 2.6ESE, AR (coco)	16.60
Winslow 7NE, AR (coop)	16.57	Fanshawe, OK (coop)	15.98	Bengal, OK (coop)	15.73
Bella Vista 2.0E, AR (coco)	15.70	Mountainburg 2NE, AR (coop)	15.30	Springdale 6.4WSW, AR (GHCN)	15.16

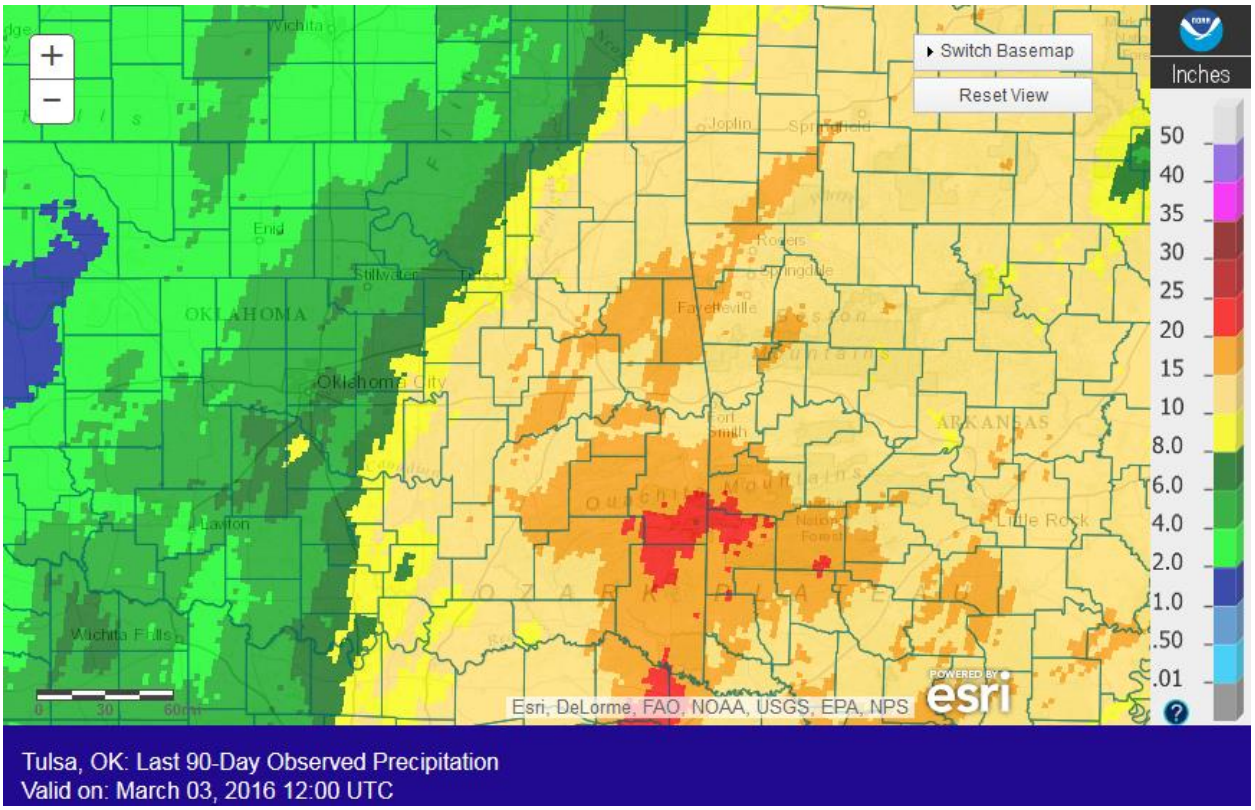


Fig. 2a. Estimated Observed Rainfall for Last 90 Days ending Mar. 3, 2016

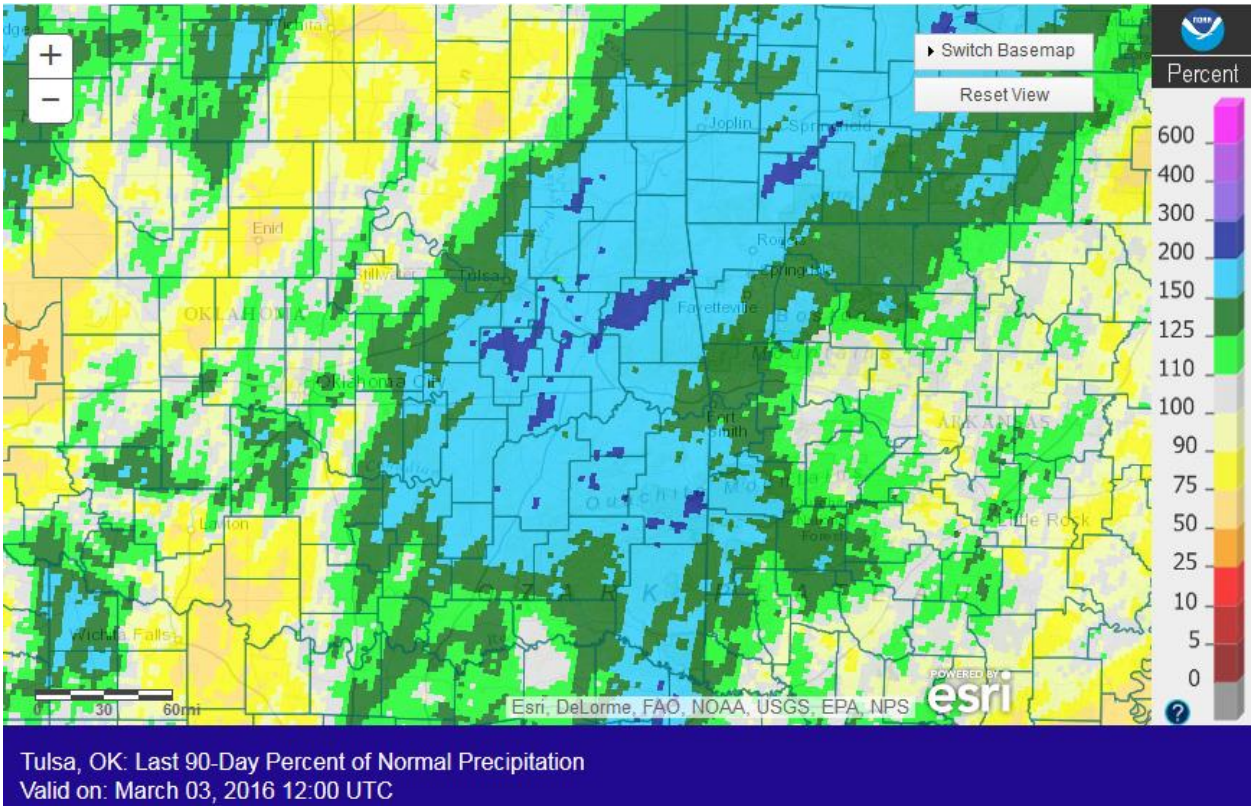
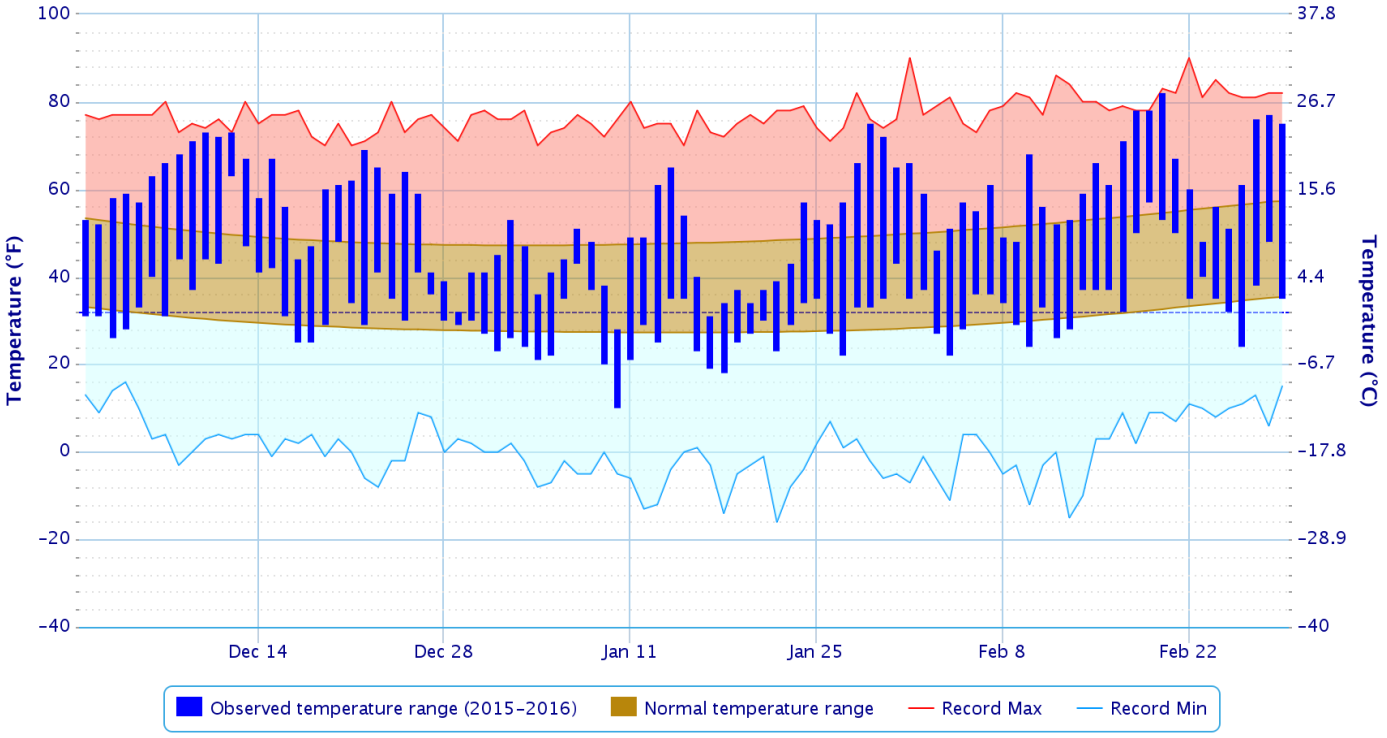


Fig. 2b. Estimated % of Normal Rainfall for Last 90 Days ending Mar. 3, 2016

Daily Temperature Data – Tulsa Area, OK (ThreadEx)

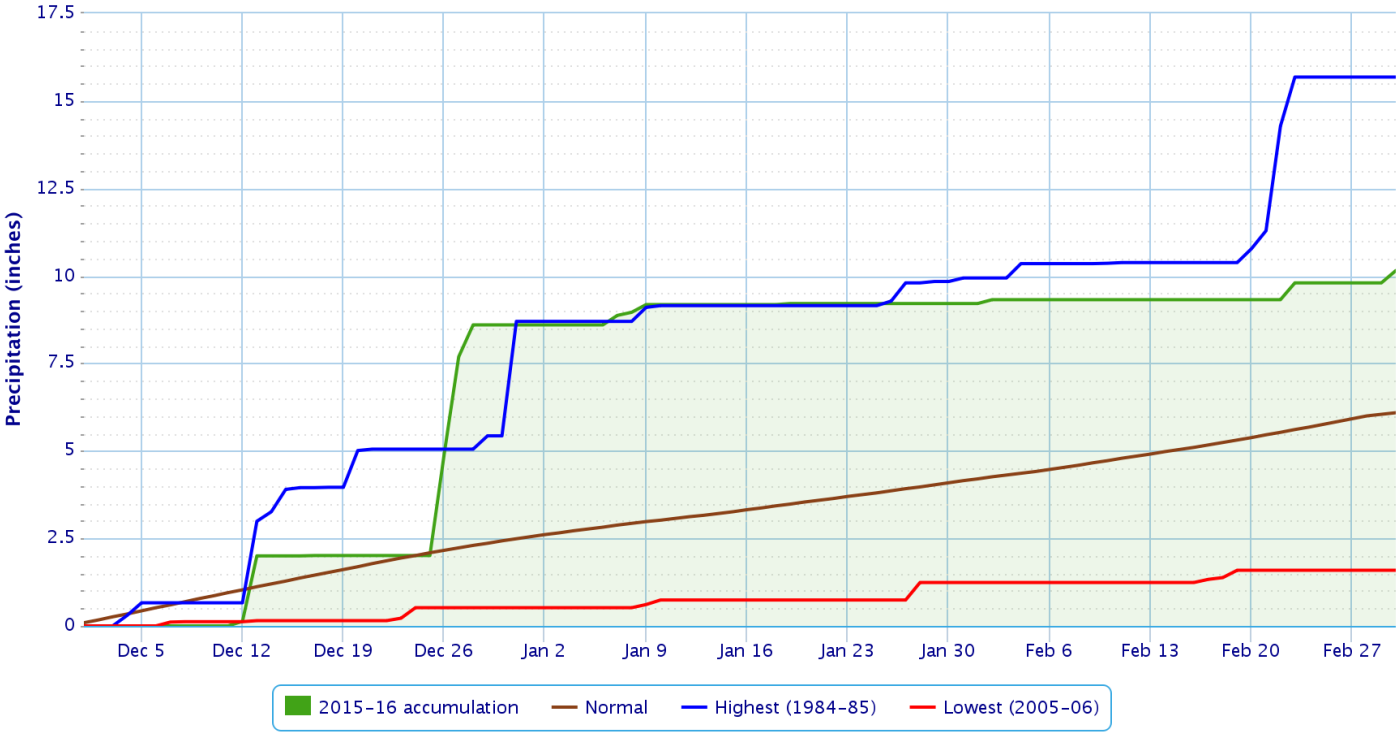
Period of Record – 1905-01-06 to 2016-03-03. Normals period: 1981-2010. Click and drag to zoom chart.



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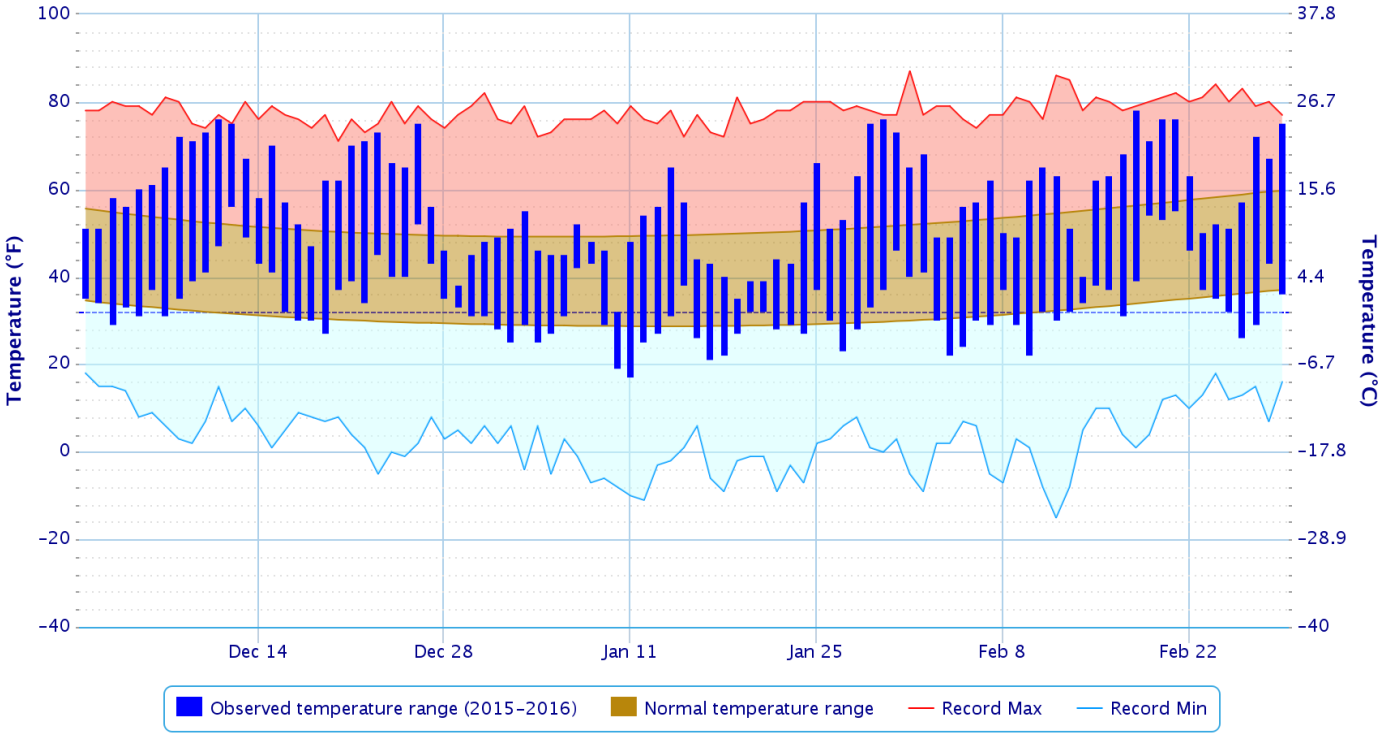
Daily Temperature Data – Fort Smith Area, AR (ThreadEx)

Period of Record – 1882-06-01 to 2016-03-03. Normals period: 1981-2010. Click and drag to zoom chart.



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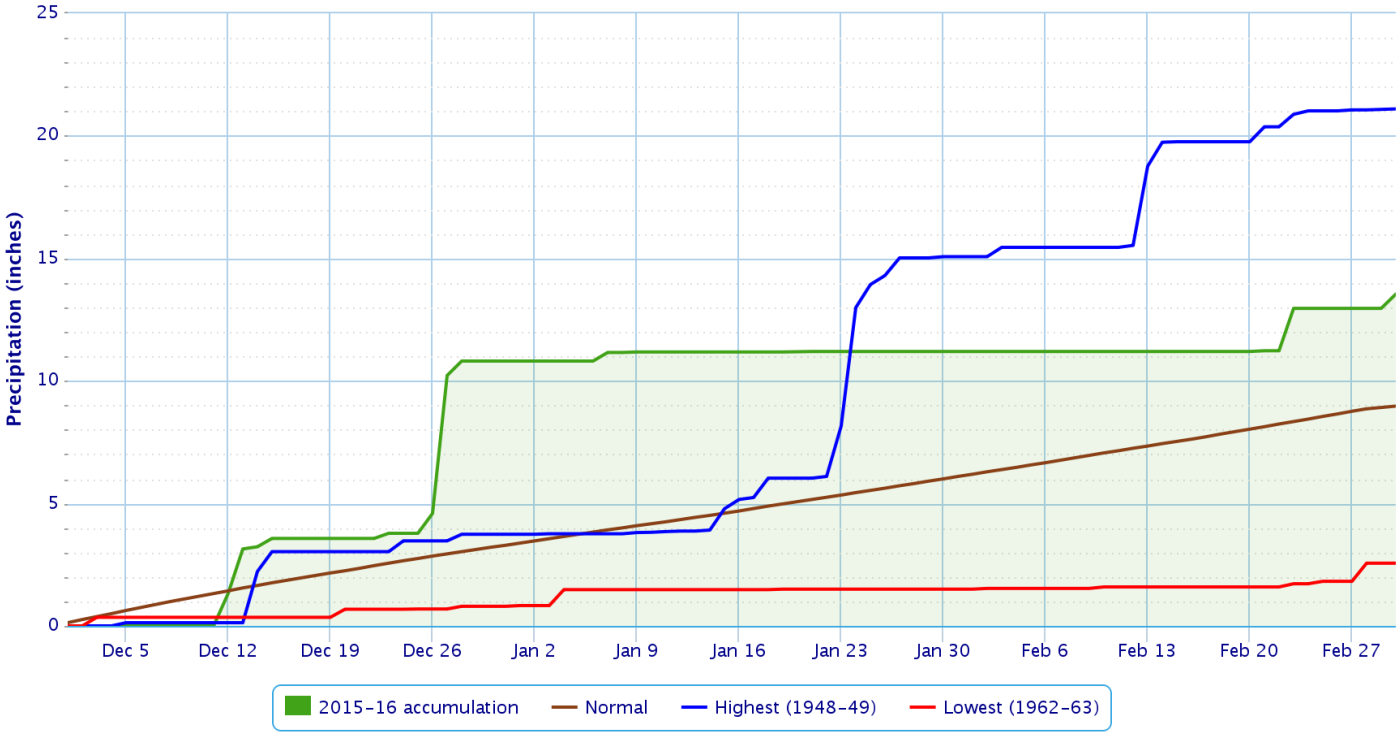
Accumulated Precipitation – Fort Smith Area, AR (ThreadEx)

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



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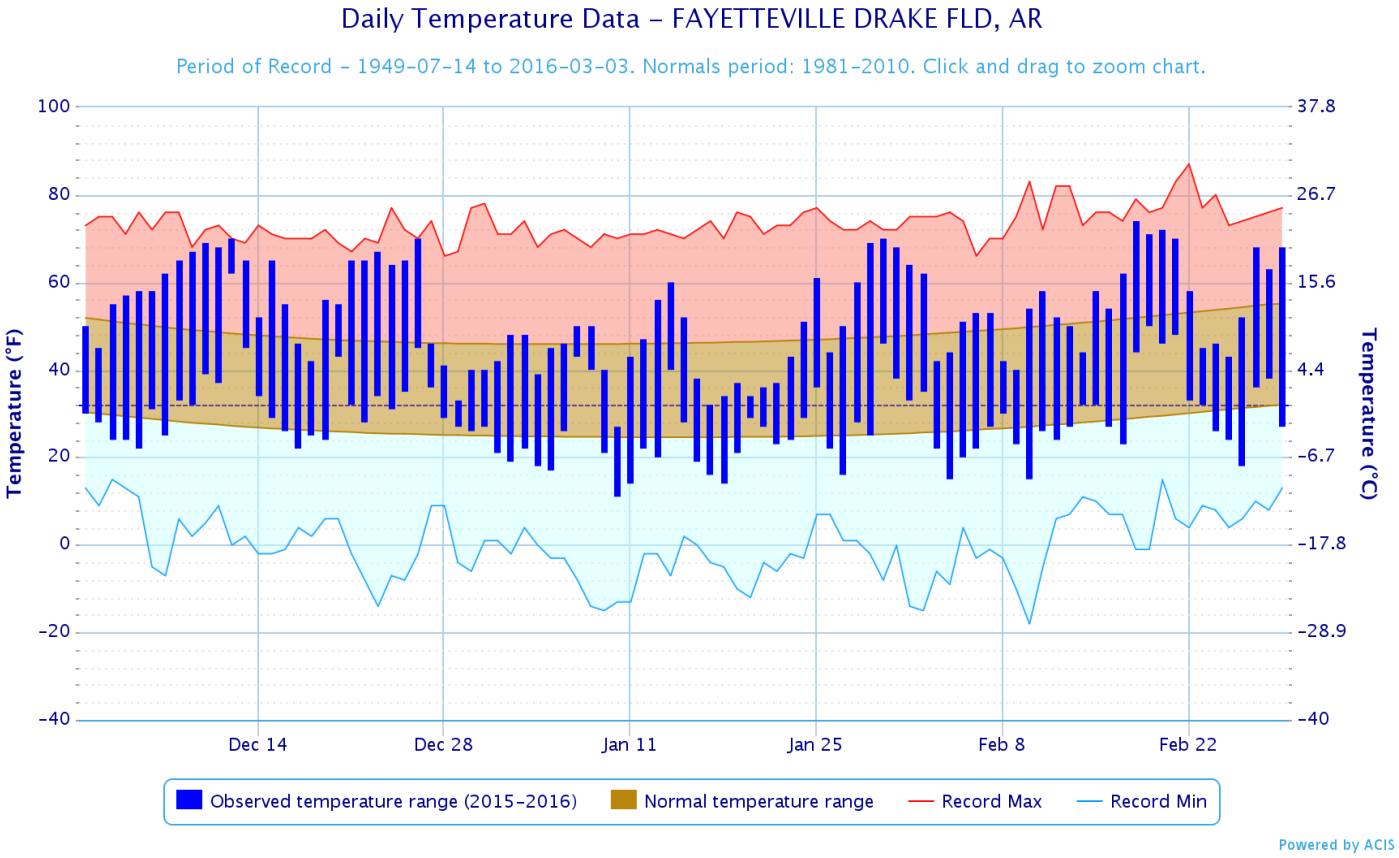

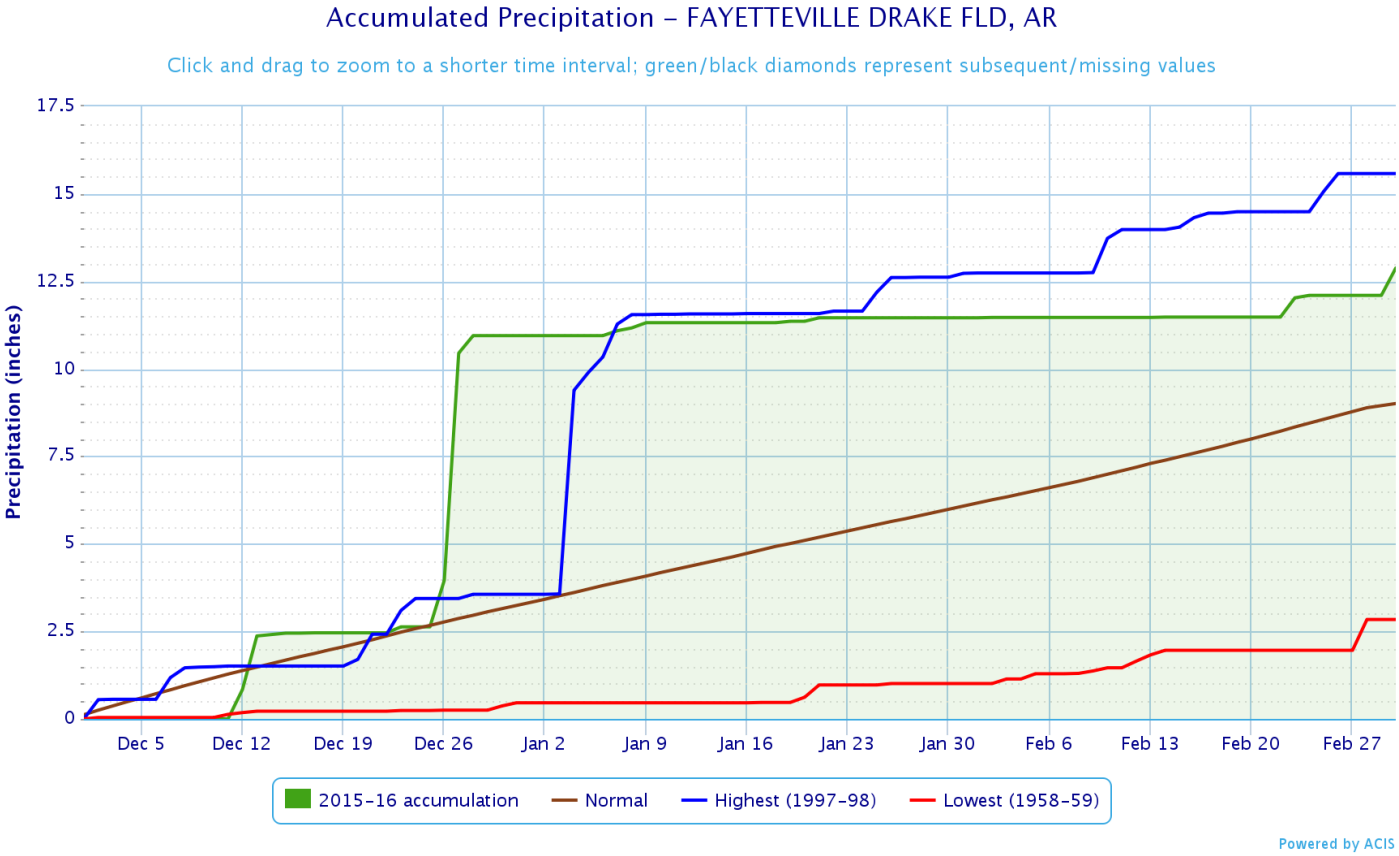

Outlooks

The Climate Prediction Center (CPC) outlook for March 2016 (issued February 29, 2016) indicates equal chances for above, near, and below normal temperatures across all of eastern OK and northwest AR. This outlook also calls for a slightly enhanced chance for above median precipitation across eastern OK and equal

chances for above, near, and below median precipitation across northwest AR. This outlook is based on both short- and extended-range weather forecasts. The ongoing, strong El Niño will be the primary driver of climate over North America in March. While El Niño is predicted to decrease during the spring, it is probable that El Niño conditions will remain strong for most of March, and this outlook reflects the impacts of El Niño.

For the 3-month period March-April-May 2016, CPC is forecasting an equal chance for above, near, and below normal temperatures and precipitation across all of eastern OK and northwest AR (outlook issued February 18, 2016). According to CPC, strong El Niño conditions persist, but the El Niño has likely peaked. The 2015-16 El Niño is one of the strongest on record. This event is likely to transition to neutral conditions during the late spring or early summer 2016. Therefore, this outlook is based primarily on both statistical and dynamical forecast tools, with a heavy reliance on typical circulation response to 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

February 1-14

A potent upper-level low lifted northeast across the central plains, while the associate surface low lifted northeast into southeast OK. A line of thunderstorms developed over western and central OK near the low and triple point during the evening of the 1st and moved east across eastern OK during the late evening through overnight hours. The storms weakened as they progressed east into northwest AR during the pre-dawn hours of the 2nd and the rain was east of the HSA near sunrise. This activity primarily affected locations along and north of I-40, and rainfall totals ranged from a few hundredths of an inch to around 1" (Fig. 3).

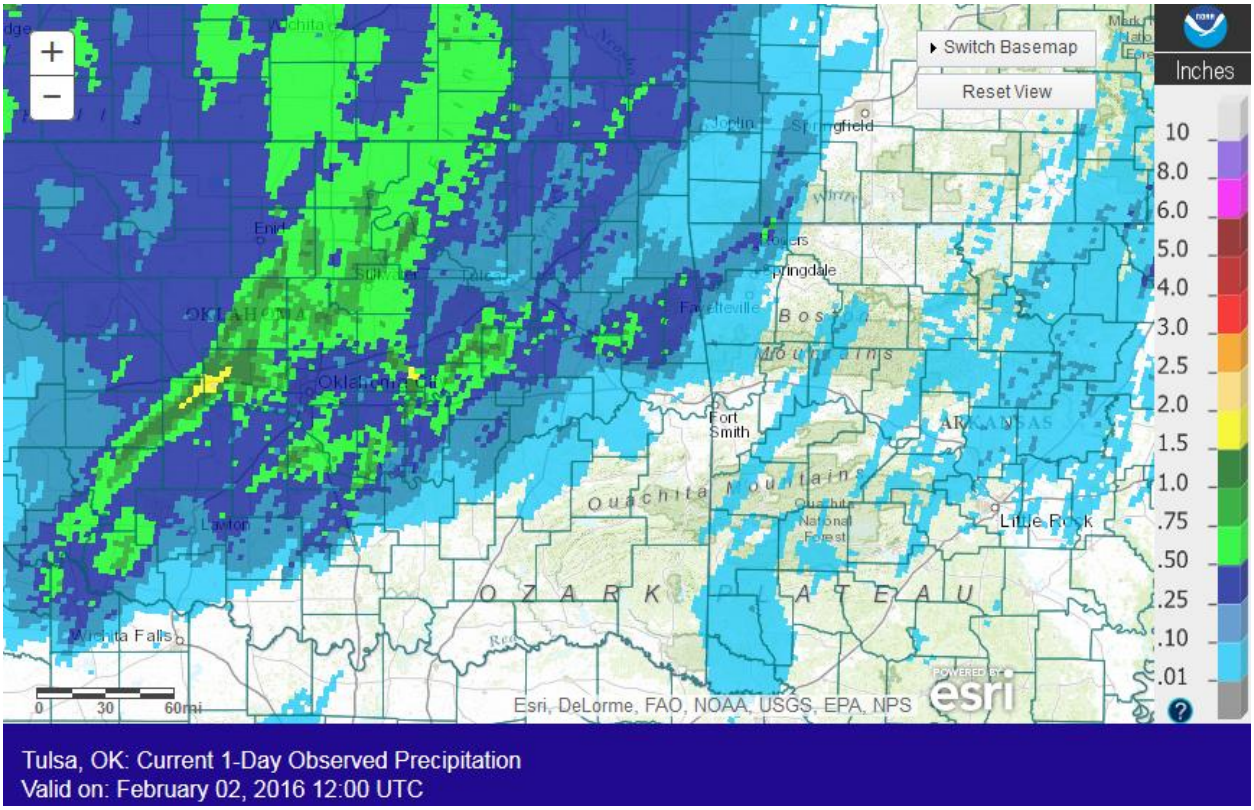

Fig. 3. 24-hour Estimated Observed Rainfall ending at 6am CST 2/02/2016.

February 15-29

Very strong winds, temperatures well above normal, and large quantities of fine fuels (thanks to the wet Spring and Fall 2015) resulted in numerous large wildfires across eastern OK and northwest AR on the 18th. Several of these fires continued for several days. The Oklahoma Forestry Service estimated about 58,000 acres were burned across Oklahoma from the 18th-20th (Fig. 4). Despite a lack of recent rain, the ground remained wet from the December 2015 rains, and firefighters were warned about engines getting stuck during the fire fight.

A list of the some of the larger wildfires in the HSA:

- Pawnee Cove (Pawnee Co.) 3,320 acres (as of 2/19), approximately 5 miles east of Terlton. 50 structures destroyed.
- The Pharoah and Nuyaka (Okmulgee/Okfuskee Counties) fires began on the 18th and merged together on the 20th. As of the 22nd, it was estimated that the Pharoah-Nuyaka fire had burned 21,840 acres and was 60% contained. Multiple residences, outbuildings and a large hog farm were threatened.
- Sand Creek (Okfuskee Co.) 4,950 acres (as of 2/19), approximately 2 miles southeast of Dustin.
- Suicide Hill (Latimer Co.) 540 acres (as of 2/19), approximately 5 miles west of Bengal. Numerous structures threatened.
- Gilmore (Le Flore Co.) 300 acres (as of 2/19), approximately 6 miles east of Poteau, 1 structure lost.
- 11 fires burned a total of 206 acres, with 1 home and 5 outbuildings lost across northwest AR as of 2/19.

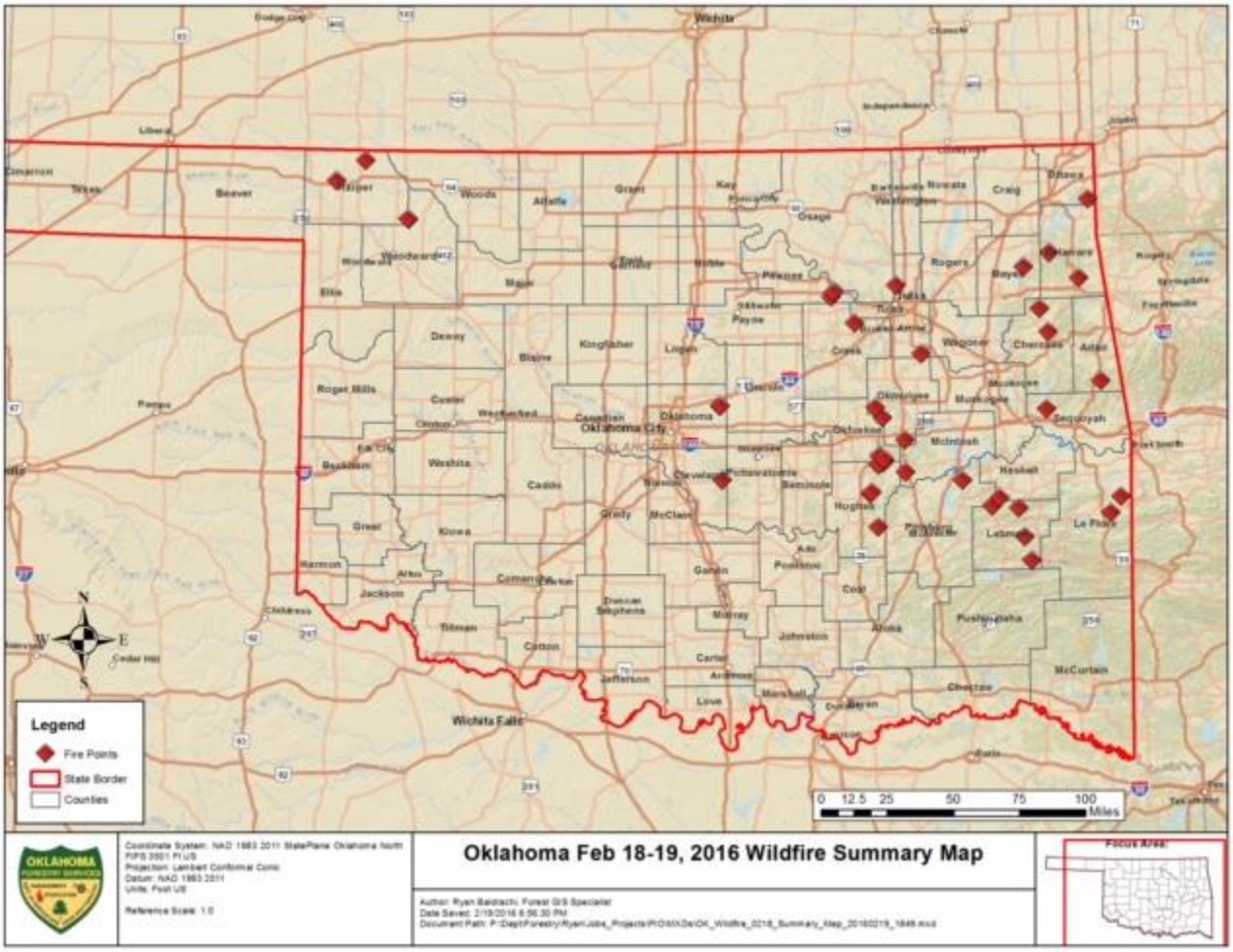

Fig. 4. Locations of wildfires in Oklahoma Feb. 18-19, 2016 from the Oklahoma Forestry Services.

Fig. 5. Wildfires were burning both east and west of Hwy 169 in Owasso, OK on 2/19/2016. Image: NewsOn6 KOTV

Showers and thunderstorms developed near a weak cold front over far southeast OK around midnight on the 22nd and moved east of the area shortly after sunrise. Rainfall totals were around 0.50" or less over far southern Pittsburg, far southern Le Flore, Pushmataha, and Choctaw Counties.

A strong storm system affected the region beginning during the evening of the 22nd and continuing until just before sunrise on the 24th as a mid-level low deepened as it moved eastward over northern TX. The HSA remained on the cool side of the system, resulting in light to moderate rain showers without any thunderstorm activity. Rainfall totals ranged from around 0.10" in northwest Osage County, to near 3" in southeast OK (Figs. 6, 7, 8). The heaviest rain affected southeast OK and west central AR, where some areas received 2"-3" of rainfall for the storm duration. As the low deepened, dynamic cooling allowed for a change over to snow southeast of a Stilwell to McAlester line. For most that saw snow, temperatures remained near to above freezing and any snow melted quickly. These areas likely received less than 0.5" of snow. However, the higher elevations of the Ouachitas in southeast Oklahoma and the Ozarks in northwest Arkansas, generally above 1,500 feet, received 1"-4" (Fig. 9). The highest snowfall measurement of 8" was from Kingston, AR (Madison Co.) at an elevation of 2,146 feet.

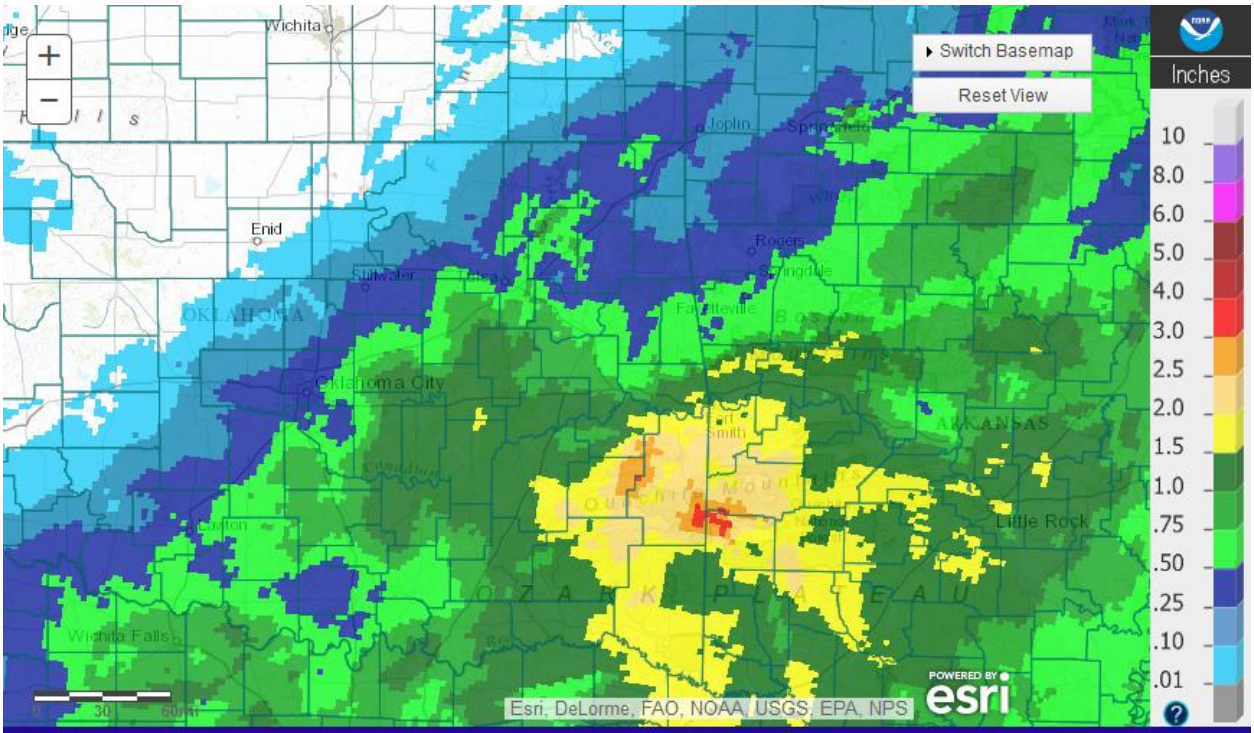

Fig. 6. 24-hour Estimated Observed Rainfall ending at 6am CST 2/24/2016.

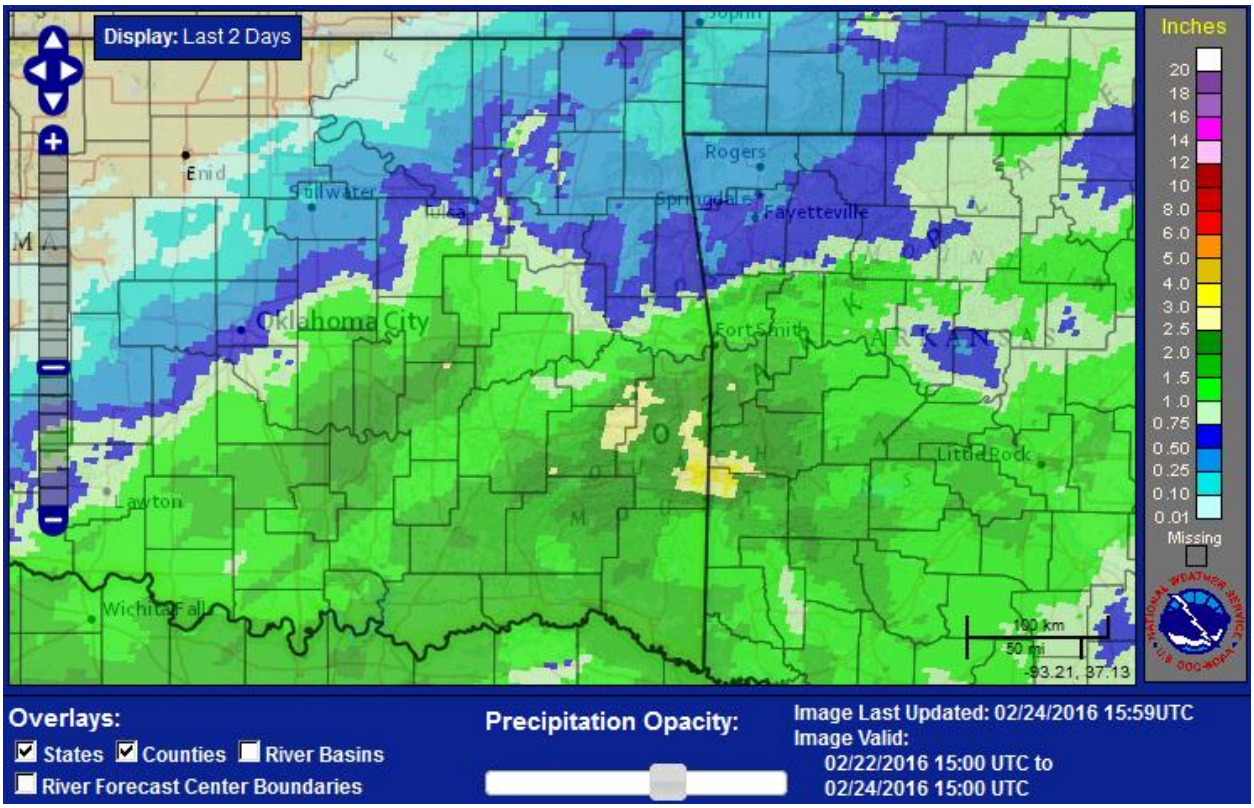

Fig. 7. 2-day Estimated Observed Rainfall ending at 9am CST 2/24/2016.

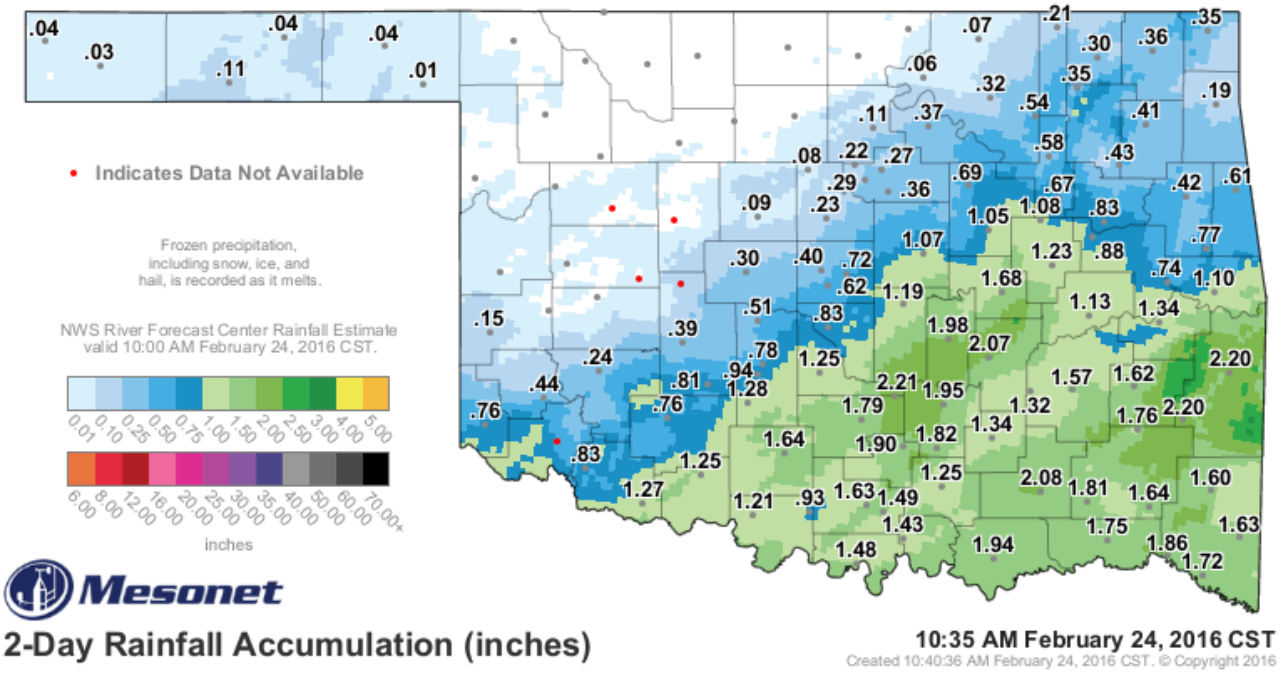

Fig. 8. 2-day Estimated Observed Rainfall (image) and OK Mesonet measurements ending at 10:35am CST 02/24/2016.

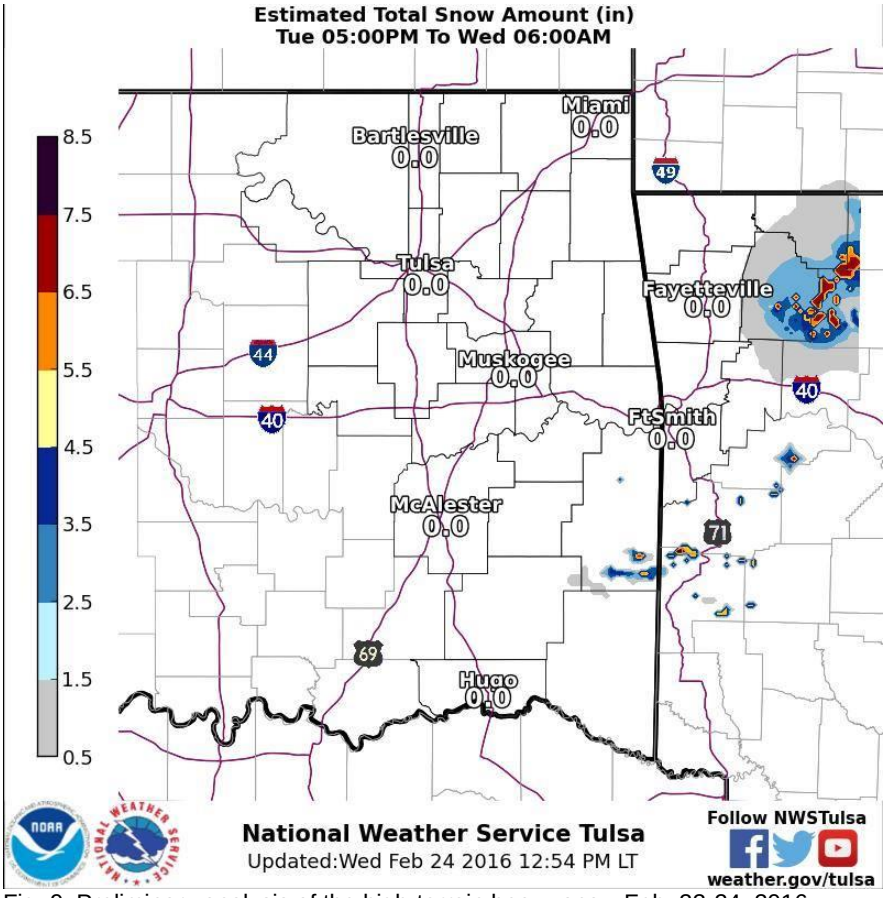

Fig. 9. Preliminary analysis of the high-terrain heavy snow Feb. 23-24, 2016.

A line of showers and thunderstorms moved into east out of central OK during the late evening of the 29th, generally affecting locations of along and south of Hwy412 in eastern OK and northwest AR. Scattered thunderstorms developed behind the initial line of storms near a cold front after 1am on March 1st, affecting much of the HSA as they tracked eastward through the overnight and early morning hours. Most of the rain had exited the area by 8am on the 1st. There were numerous reports of pea and dime-sized hail with the storms. Rainfall totals ranged from around 0.10" to around 2" (Fig. 10).

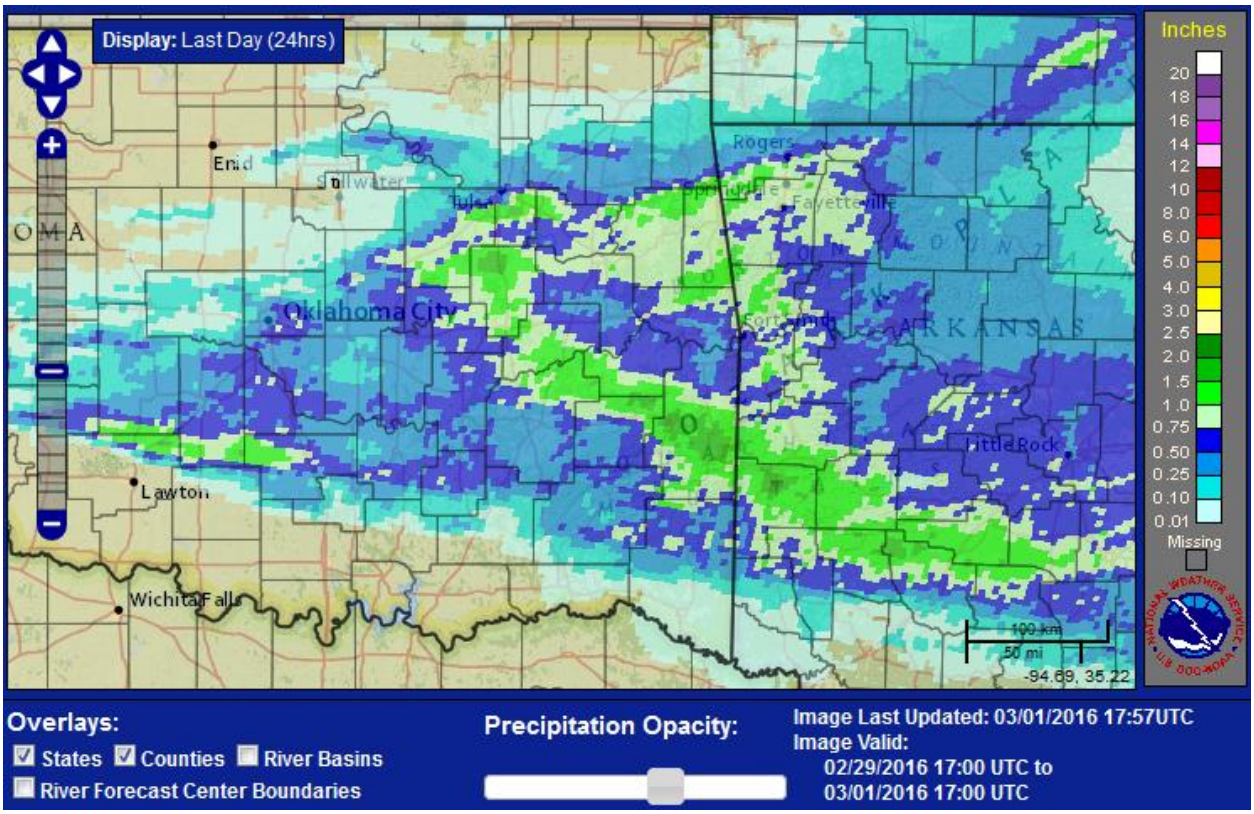

Fig. 10. 24-hour Estimated Observed Rainfall ending at 11am CST 3/01/2016.

Written by:

Nicole McGavock
Service Hydrologist
WFO Tulsa

Products issued in February 2016:

*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)
0 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)
0 Drought Information Statements (DGT)

Preliminary Hydrographs:

None