

<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>	
<b>MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS</b>		REPORT FOR:	
		MONTH <b>January</b>	YEAR <b>2017</b>
TO: Hydrometeorological Information Center, W/OH2 NOAA / National Weather Service 1325 East West Highway, Room 7230 Silver Spring, MD 20910-3283		SIGNATURE <b>Steven F. Piltz</b> (Meteorologist-in-Charge)	
		DATE <b>February 2, 2017</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)

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

January 2017 was a 3°-5° above normal across eastern OK and northwest AR, despite a few arctic outbreaks of cold air, some snow, and an ice storm. Rainfall was above normal northwest of I-44 and below normal southeast of I-44. Normal precipitation for January ranges from 1.2 inches in Pawnee County to 2.2 inches in Haskell County. In the Ozark region of northwest Arkansas, precipitation averages 2.2 inches for the month. This report, past E-5 reports, and monthly hydrology and climatology summaries can be found at <http://www.weather.gov/tsa/hydro-monthly-summary>.

### Monthly Summary

Using the radar-derived estimated observed precipitation from the RFCs (Fig. 1a), rainfall totals for January 2017 ranged from 1.25" to near 5", with the minimum occurring in the lower Arkansas River basin area. This corresponds to near 300% to near 50% of the normal January rainfall from north central OK to southeast OK and west central AR (Fig. 1b). The rainfall pattern this month was wet to dry from northwest to southeast across eastern OK and northwest AR, which is flipped from what is normally observed.

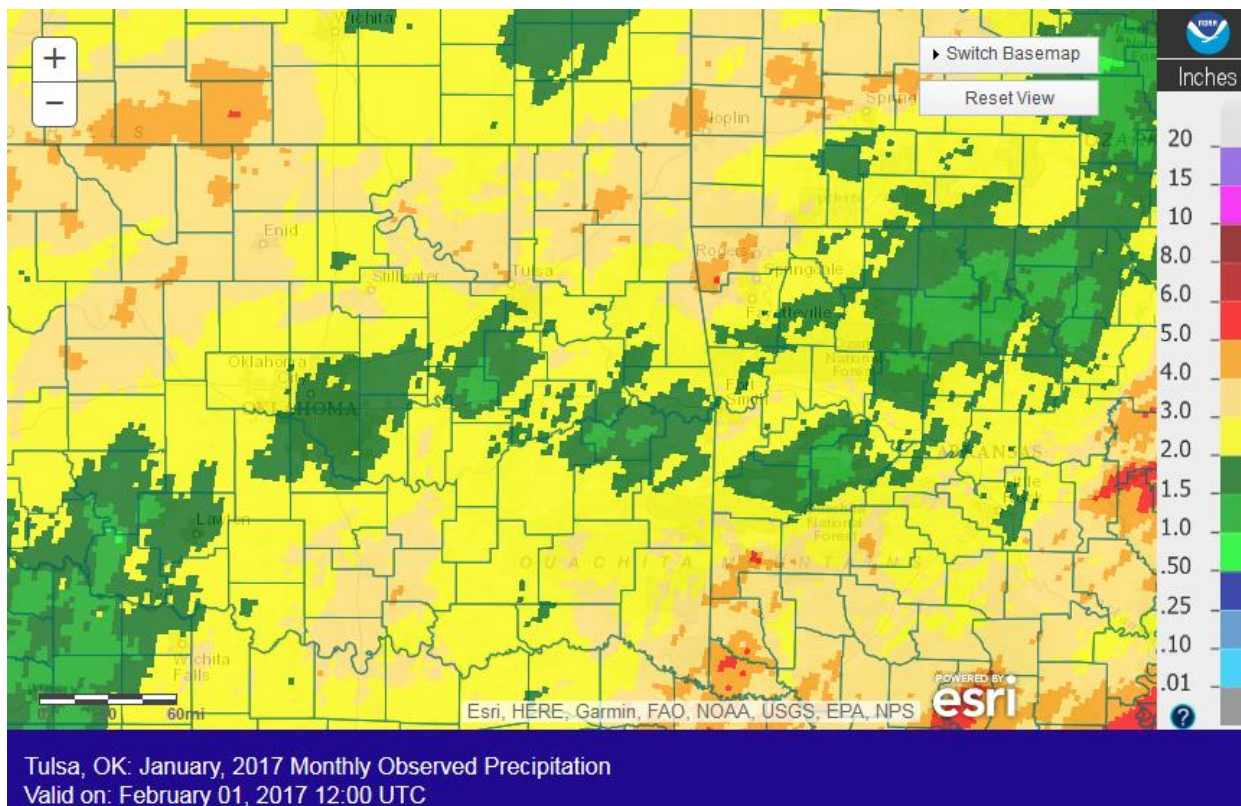


Fig. 1a. Estimated Observed Rainfall for January 2017

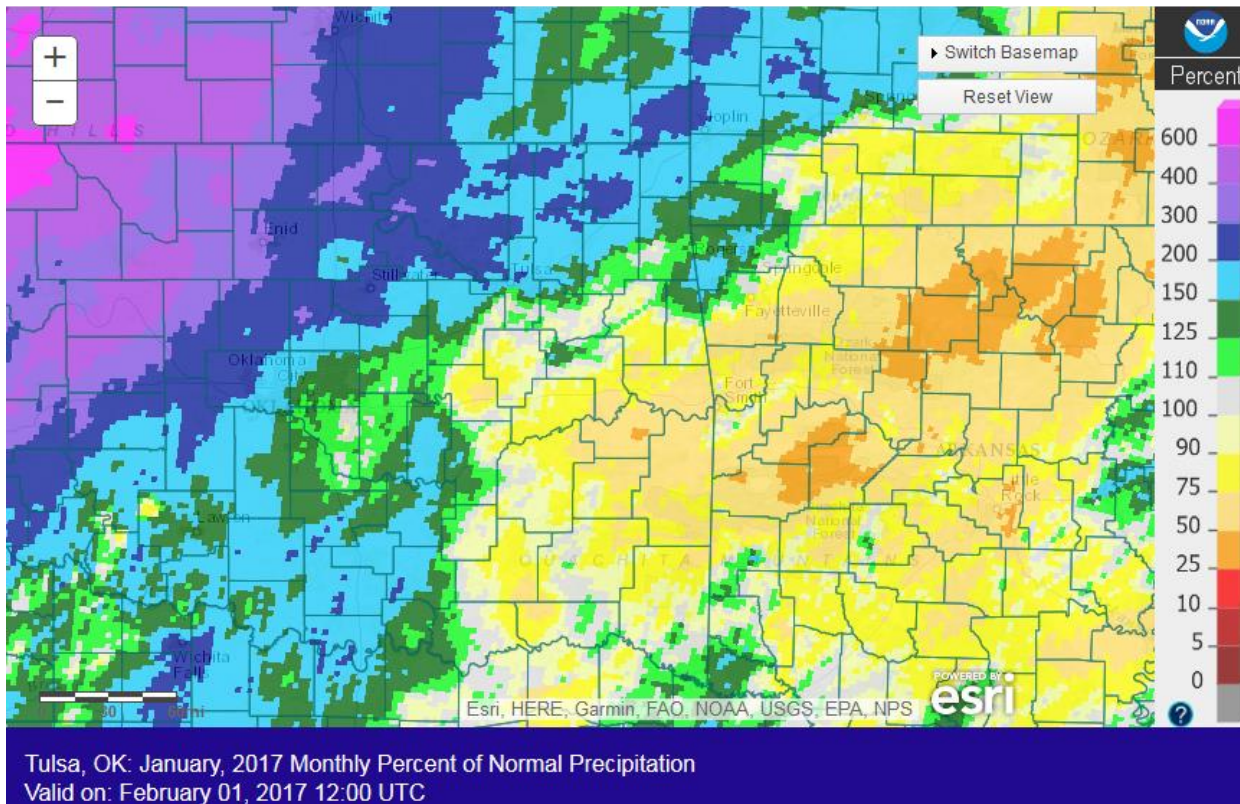


Fig. 1b. Estimated % of Normal Rainfall for January 2017

In Tulsa, OK, January 2017 ranked as the 15<sup>th</sup> warmest January (42.1°F; since records began in 1905), the 12<sup>th</sup> wettest January (3.42"; since records began in 1888), and the 30<sup>th</sup> least snowy (0.2", tied 1919, 1936; since records began in 1900). Fort Smith, AR had the 15<sup>th</sup> warmest January (44.7°F; since records began in 1883), the 62<sup>nd</sup> wettest January (2.34"; since records began in 1883), and the 42<sup>nd</sup> snowiest January (2.0", tied 1996, 1945, 1936, 1888; since records began in 1884). Fayetteville, AR had the 10<sup>th</sup> warmest (40.3°F), the 30<sup>th</sup> wettest (2.39"), and the 29<sup>th</sup> least snowy (0.5", tied 1994, 1972) January since records began in 1950.

Some of the larger precipitation reports (in inches) for January 2017 included:

Westville 0.2ENE, OK (coco)	4.41	Kingston 2S, AR (coop)	4.35	Siloam Springs 1.8N, AR (coco)	4.12
Skiatook, OK (meso)	4.05	Bella Vista 2E, AR (coco)	4.04	Tulsa, OK (meso)	4.02
Jay 3.3NNE, OK (coco)	4.01	Burbank, OK (meso)	3.99	Rogers 2.1SE, AR (coco)	3.89

Some of the lowest precipitation reports (in inches) for January 2017 included:

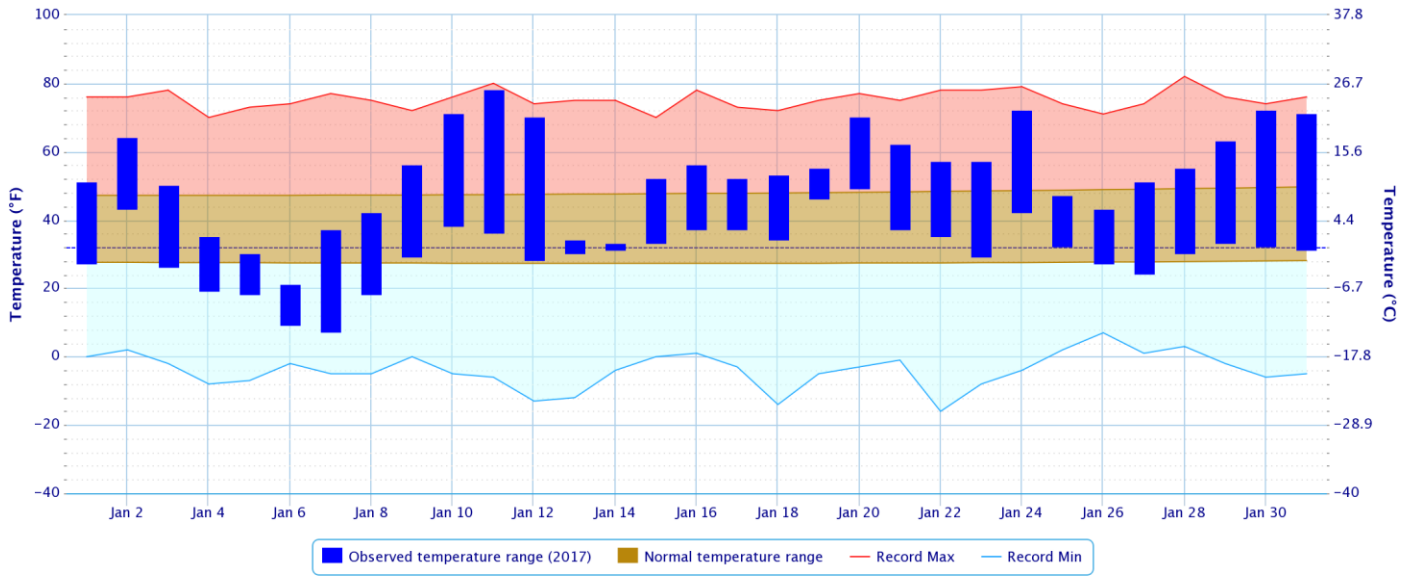
Stigler, OK (meso)	1.54	McAlester, OK (ASOS)	1.57	Sallisaw, OK (meso)	1.69
Wister, OK (meso)	1.74	Pawnee, OK (meso)	1.74	Okemah, OK (meso)	1.77
Berryville 0.8SSW, AR (coco)	1.77	Krebs 0.3WNW, OK (coco)	1.81	Okmulgee, OK (meso)	1.84

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

Rank since 1921	January 2017	Winter-to-Date (Dec 1 – Jan 31)	Last 90 Days (Nov 3 – Jan 31)	Water Year-to-Date (Oct 1 – Jan 31)	Cool Growing Season-to-date (Sep 1 – Jan 31)	Last 180 Days (Aug 5 – Jan 31)	Last 365 Days (Feb 2, 2016– Jan 31, 2017)
Northeast OK	11 <sup>th</sup> wettest	39 <sup>th</sup> wettest	33 <sup>rd</sup> driest	42 <sup>nd</sup> driest	31 <sup>st</sup> driest	32 <sup>nd</sup> driest	28 <sup>th</sup> driest
East Central OK	38 <sup>th</sup> wettest	25 <sup>th</sup> driest	<b>8<sup>th</sup> driest</b>	14 <sup>th</sup> driest	<b>9<sup>th</sup> driest</b>	<b>9<sup>th</sup> driest</b>	16 <sup>th</sup> driest
Southeast OK	46 <sup>th</sup> driest	18 <sup>th</sup> driest	24 <sup>th</sup> driest	<b>8<sup>th</sup> driest</b>	<b>7<sup>th</sup> driest</b>	21 <sup>st</sup> driest	35 <sup>th</sup> driest
Statewide	11 <sup>th</sup> wettest	43 <sup>rd</sup> wettest	36 <sup>th</sup> driest	23 <sup>rd</sup> driest	25 <sup>th</sup> driest	31 <sup>st</sup> driest	40 <sup>th</sup> driest

### Daily Temperature Data – Tulsa Area, OK (ThreadEx)

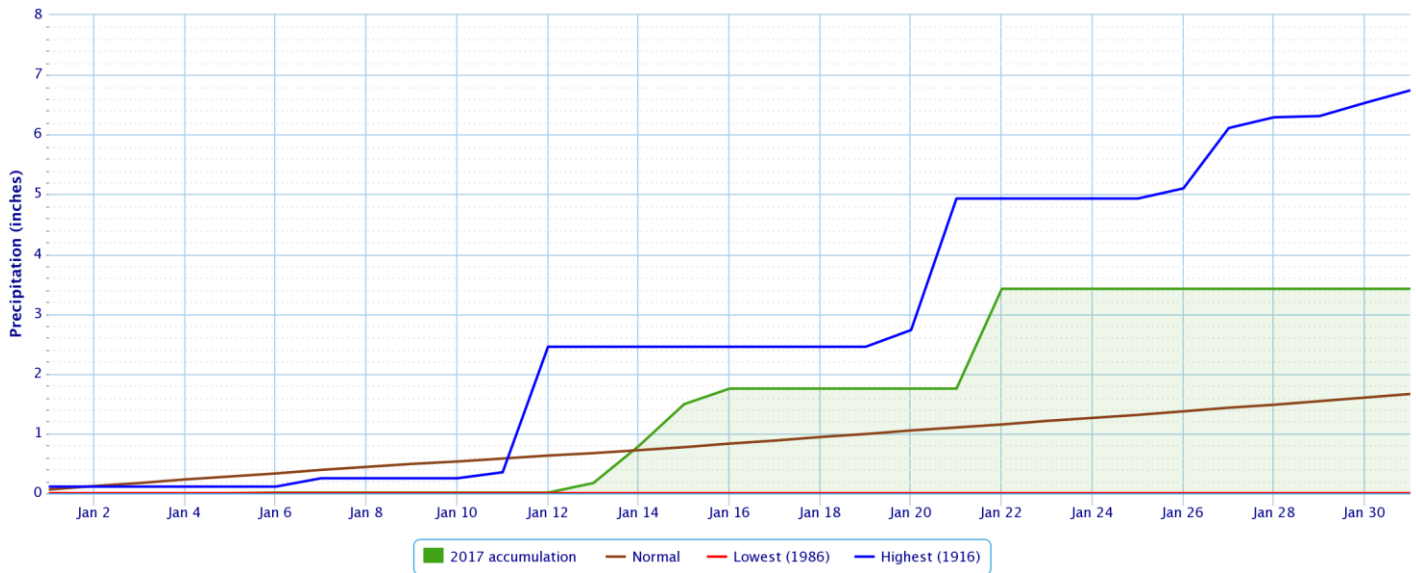
Period of Record – 1905-01-06 to 2017-01-31. Normals period: 1981-2010. Click and drag to zoom chart.



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### Accumulated Precipitation – Tulsa Area, OK (ThreadEx)

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

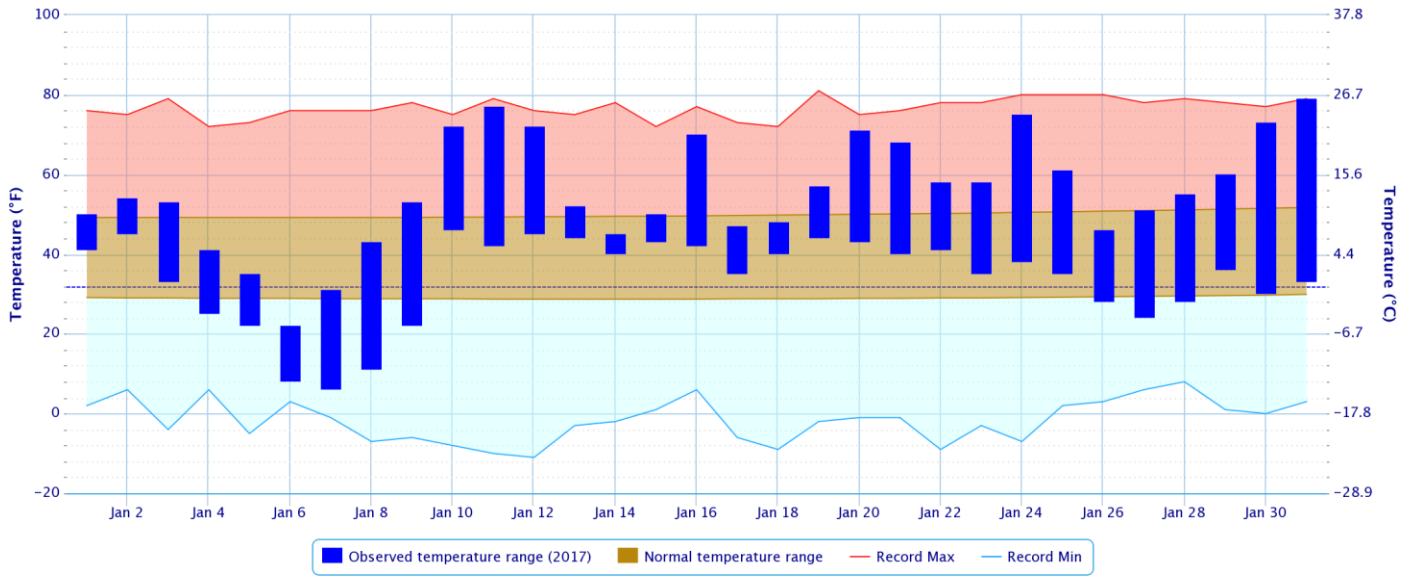


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### Daily Temperature Data – Fort Smith Area, AR (ThreadEx)

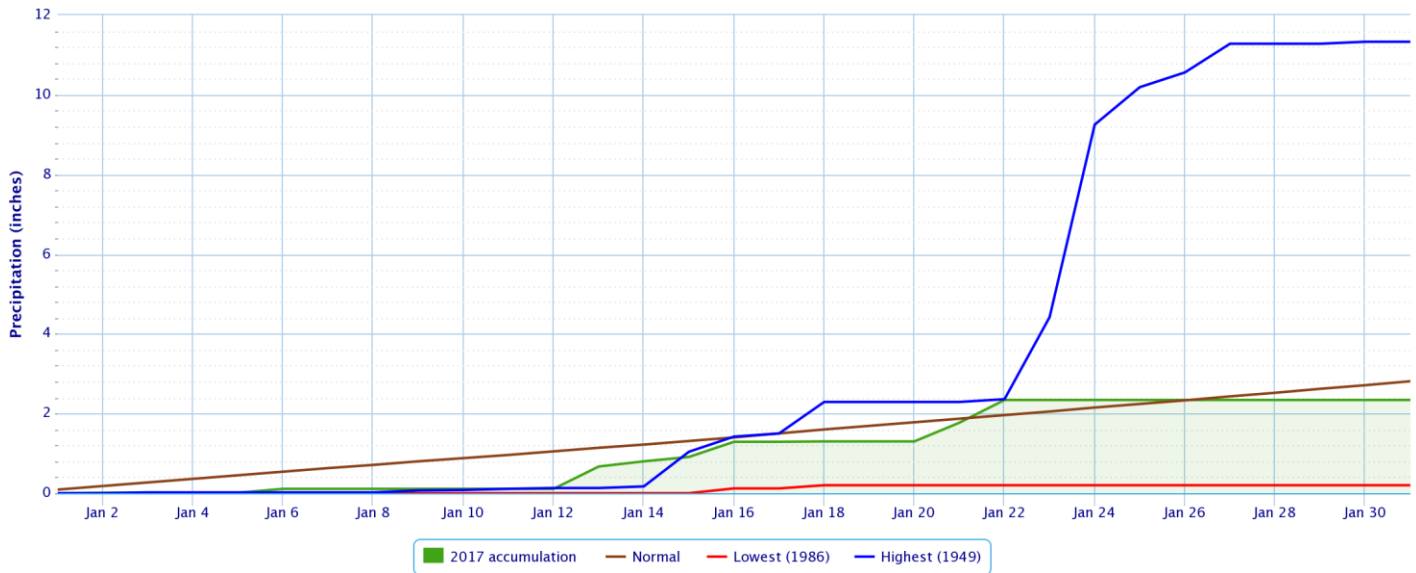
Period of Record – 1882-06-01 to 2017-01-31. Normals period: 1981-2010. Click and drag to zoom chart.



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### Accumulated Precipitation – Fort Smith Area, AR (ThreadEx)

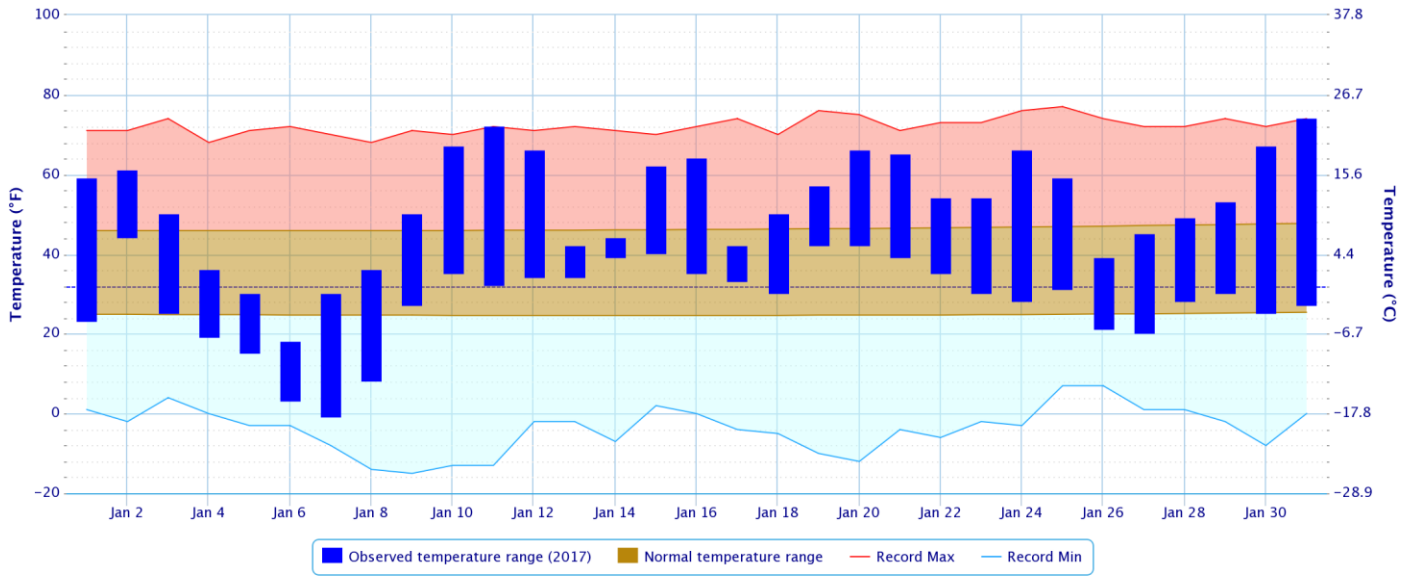
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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### Daily Temperature Data – FAYETTEVILLE DRAKE FLD, AR

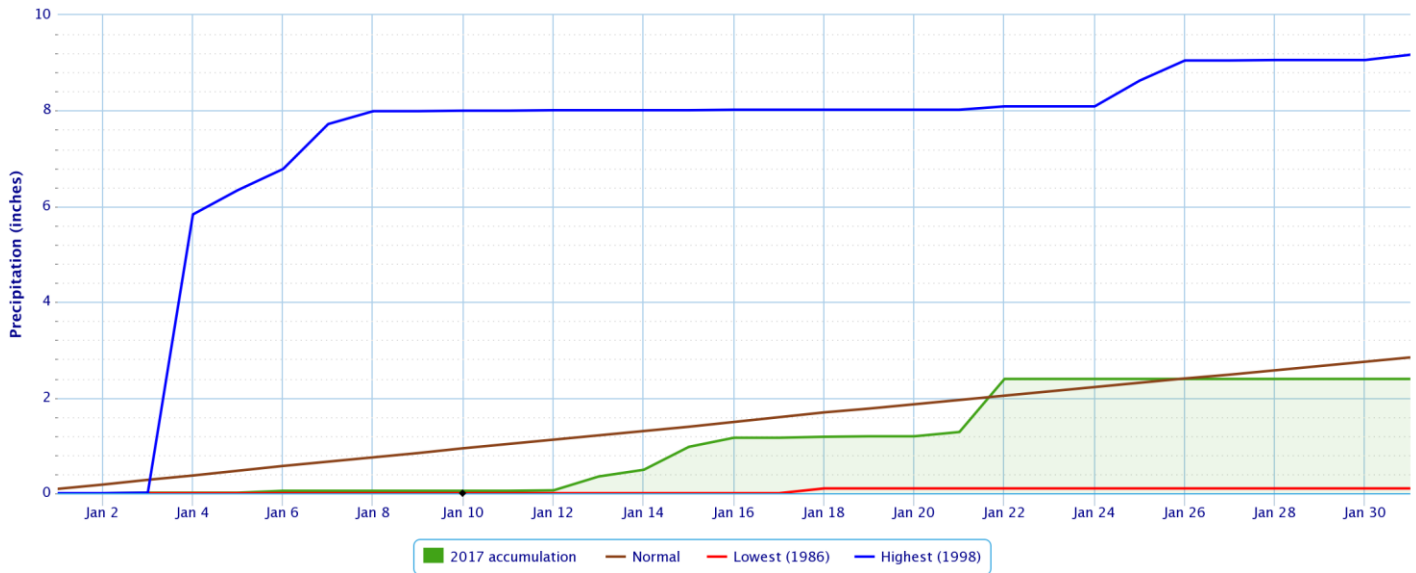
Period of Record – 1949-07-14 to 2017-01-31. Normals period: 1981-2010. Click and drag to zoom chart.



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### Accumulated Precipitation – FAYETTEVILLE DRAKE FLD, AR

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



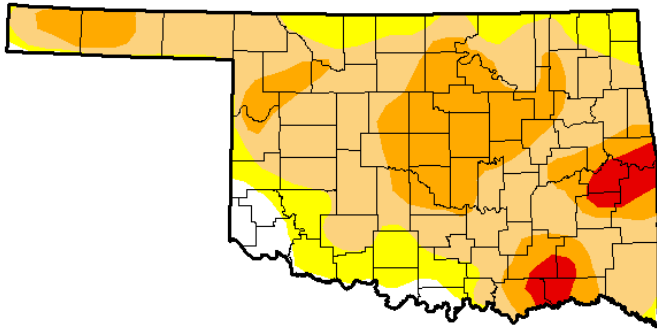
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## Drought

According to the [U.S. Drought Monitor](#) (USDM) from January 31, 2017 (Figs. 2, 3), D3 (Extreme Drought) conditions continued over western Pushmataha and western Choctaw Counties and developed over portions of Haskell, Latimer, Sequoyah, Le Flore, Crawford, Sebastian, and Franklin Counties in southeast OK through west central AR. D2 (Severe Drought) encompassed portions of Pawnee, Creek, Tulsa, Rogers, Wagoner, Adair, Muskogee, Okfuskee, Okmulgee, McIntosh, Pittsburg, Haskell, Sequoyah, Latimer, Le Flore, Choctaw, and Pushmataha Counties in eastern OK, and Washington, Madison, Sebastian, Crawford, and Franklin Counties in west central AR. D1 (Moderate Drought) conditions existed over portions of Osage, Washington, Nowata, Rogers, Wagoner, Mayes, Delaware, Cherokee, Adair, Muskogee, Okmulgee, Okfuskee, McIntosh, Pittsburg, Latimer, Le Flore, and Pushmataha Counties in eastern OK and Benton, Carroll, Washington, and Madison Counties in northwest AR. D0 (abnormally dry conditions but not in drought) were present across portions of Osage, Nowata, Delaware, Craig and Ottawa Counties in eastern OK, and Benton and Carroll Counties in northwest AR.

# U.S. Drought Monitor Oklahoma

**January 31, 2017**  
(Released Thursday, Feb. 2, 2017)  
Valid 7 a.m. EST



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	4.44	95.56	79.46	30.95	3.90	0.00
<b>Last Week</b> 1/24/2017	4.49	95.51	79.90	30.95	3.90	0.00
<b>3 Months Ago</b> 11/1/2016	42.61	57.39	36.44	7.90	0.00	0.00
<b>Start of Calendar Year</b> 1/3/2017	5.61	94.39	83.21	55.75	5.55	0.00
<b>Start of Water Year</b> 9/27/2016	57.82	42.18	19.04	3.05	0.00	0.00
<b>One Year Ago</b> 2/2/2016	100.00	0.00	0.00	0.00	0.00	0.00

Intensity:



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

**Author:**

David Simeral  
Western Regional Climate Center

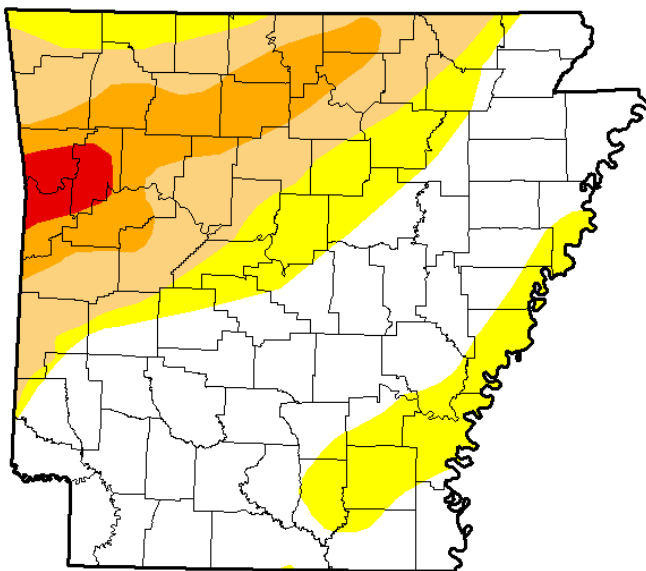


<http://droughtmonitor.unl.edu/>

Fig. 2. Drought Monitor for Oklahoma

# U.S. Drought Monitor Arkansas

**January 31, 2017**  
(Released Thursday, Feb. 2, 2017)  
Valid 7 a.m. EST



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	49.31	50.69	30.46	12.50	2.02	0.00
<b>Last Week</b> 1/24/2017	49.31	50.69	30.46	12.50	2.02	0.00
<b>3 Months Ago</b> 11/1/2016	16.47	83.53	61.29	3.88	0.00	0.00
<b>Start of Calendar Year</b> 1/3/2017	27.05	72.95	39.03	7.99	2.02	0.00
<b>Start of Water Year</b> 9/27/2016	71.02	28.98	0.00	0.00	0.00	0.00
<b>One Year Ago</b> 2/2/2016	100.00	0.00	0.00	0.00	0.00	0.00

Intensity:



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

**Author:**

David Simeral  
Western Regional Climate Center



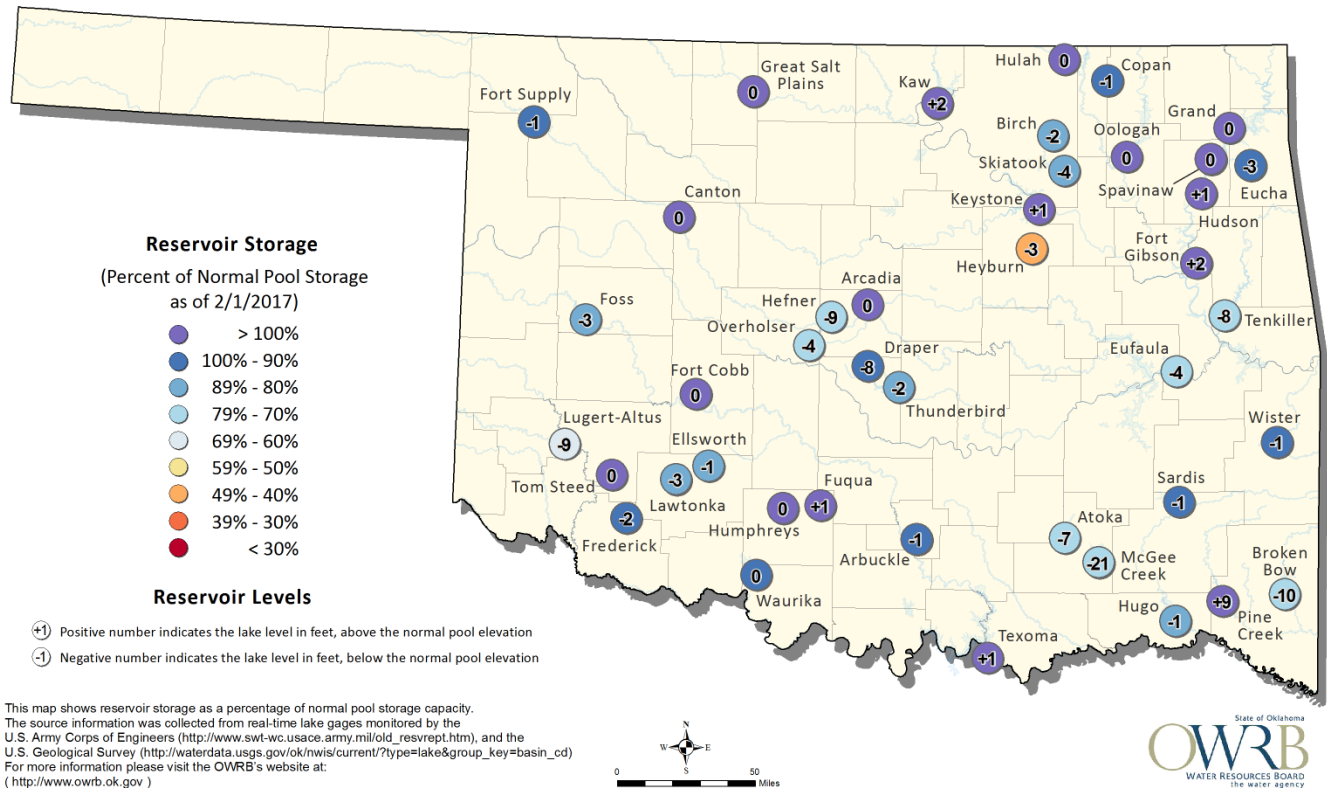
<http://droughtmonitor.unl.edu/>

Fig. 3. Drought Monitor for Arkansas

## Reservoirs

# Oklahoma Surface Water Resources

## Reservoir Levels and Storage as of 2/1/2017



According to the USACE, the lakes in the HSA were at or below the top of their conservation pool levels as of 2/01/2017. Reservoirs operating more than 3% below of the top of their conservation level include: Heyburn Lake 40%, Ft. Gibson 52%, Eufaula Lake 72%, Beaver Lake 73%, Hugo Lake 75%, Tenkiller Lake 76%, Birch Lake 81%, Skiatook Lake 86%, Keystone Lake 88%, Copan Lake 90%, Wister Lake 92%, and Sardis Lake 96%.

## Outlooks

The [Climate Prediction Center](#) (CPC) outlook for February 2017 (issued January 31, 2017) indicates an enhanced chance for above normal temperatures and an equal chance of above, near, and below median precipitation across all of eastern OK and northwest AR. This outlook takes into account weather conditions forecast over the next 1-2 weeks, potential influences from the Madden-Julian Oscillation, sea surface temperatures along the U.S. coast, as well as subseasonal climate signals in the weeks 2-4 time frame. The current La Niña continues to fade, and therefore, climate signals associated with it were not largely considered.

For the 3-month period February-March-April 2017, CPC is forecasting an enhanced chance for above normal temperatures and an equal chance for above, near, and below median rainfall across all of eastern OK and northwest AR (outlook issued January 19, 2017). This outlook is based on both statistical and dynamical forecast tools and decadal timescale climate trends. According to CPC, Pacific sea surface temperatures along the equator continue to reflect weak La Niña conditions, with a transition to ENSO-neutral during February 2017. ENSO-neutral is then favored to persist through the summer.

**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](http://water.weather.gov/precip/index.php?location_type=wfo&location_name=tsa)

**January 1-15**

A complex of thunderstorms moved east across northern TX, with the northern portion of the complex extending into southeast OK just before sunrise on the 2<sup>nd</sup>. Some scattered showers and thunderstorms developed further north, affecting locations near the OK/AR state line eastward into northwest AR. Rainfall totals were around 0.10" to around 0.50".

A band of light snow and flurries moved across northeast OK and northwest AR during the early evening hours of the 5<sup>th</sup>. More significant snow, however, moved south out of KS later in the evening and continued through the morning hours of the 6<sup>th</sup> in response to a northern upper-level wave approaching the Southern Plains and an upper-level low in the west pushing into the lee of the Rocky Mountains. While the heaviest snow bands ended during the afternoon of the 6<sup>th</sup>, some lighter snow continued through the early evening across southeast OK. The measurable snow affected locations along and south of Hwy 412 (Fig. 5), with snowfall totals of a trace to 5" (Fig. 4). 1"-2" snowfall totals were common. Liquid equivalent values ranged from a few hundredths to near 0.50".

Some of the larger snowfall reports (in inches) for Jan. 5-6, 2017 included:

Oktaha, OK	5.0"	Bunch 3ESE, OK	4.0"	Checotah, OK	4.0"	Morris, OK	4.0"
Okmulgee, OK	4.0"	Cookson, OK	4.0"	Bunch, OK	3.5"	Preston, OK	3.5"
Oktaha 2NE, OK	3.2"	Muskogee, OK	3.0"	Gore, OK	3.0"	Henryetta, OK	3.0"

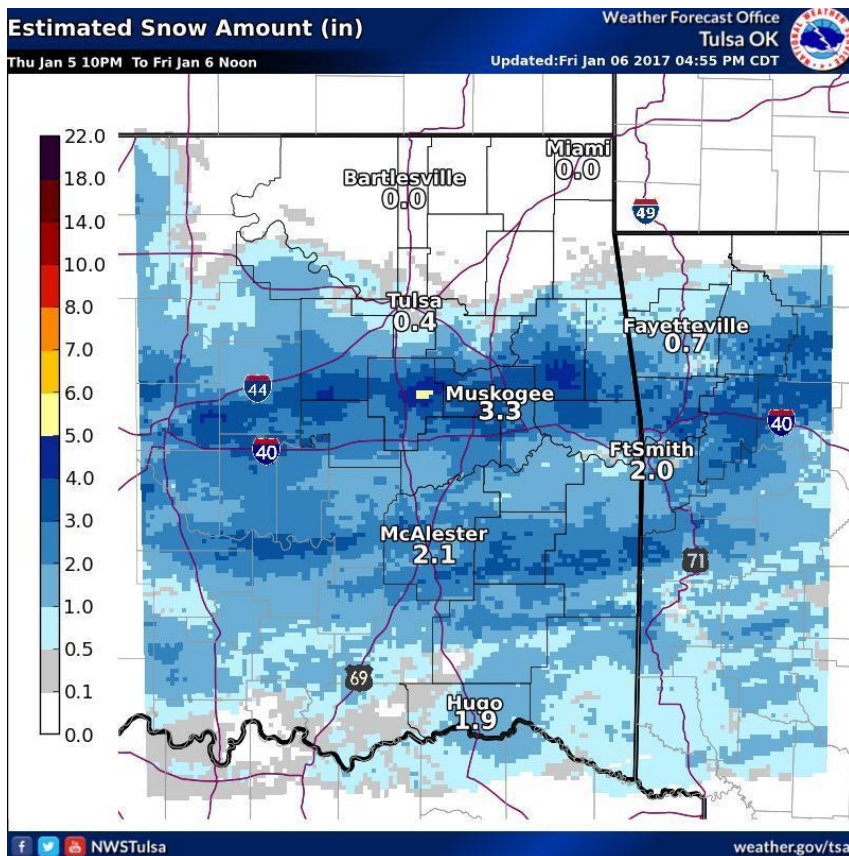


Fig. 4. Storm Total Sleet/Snowfall for January 5-6, 2017



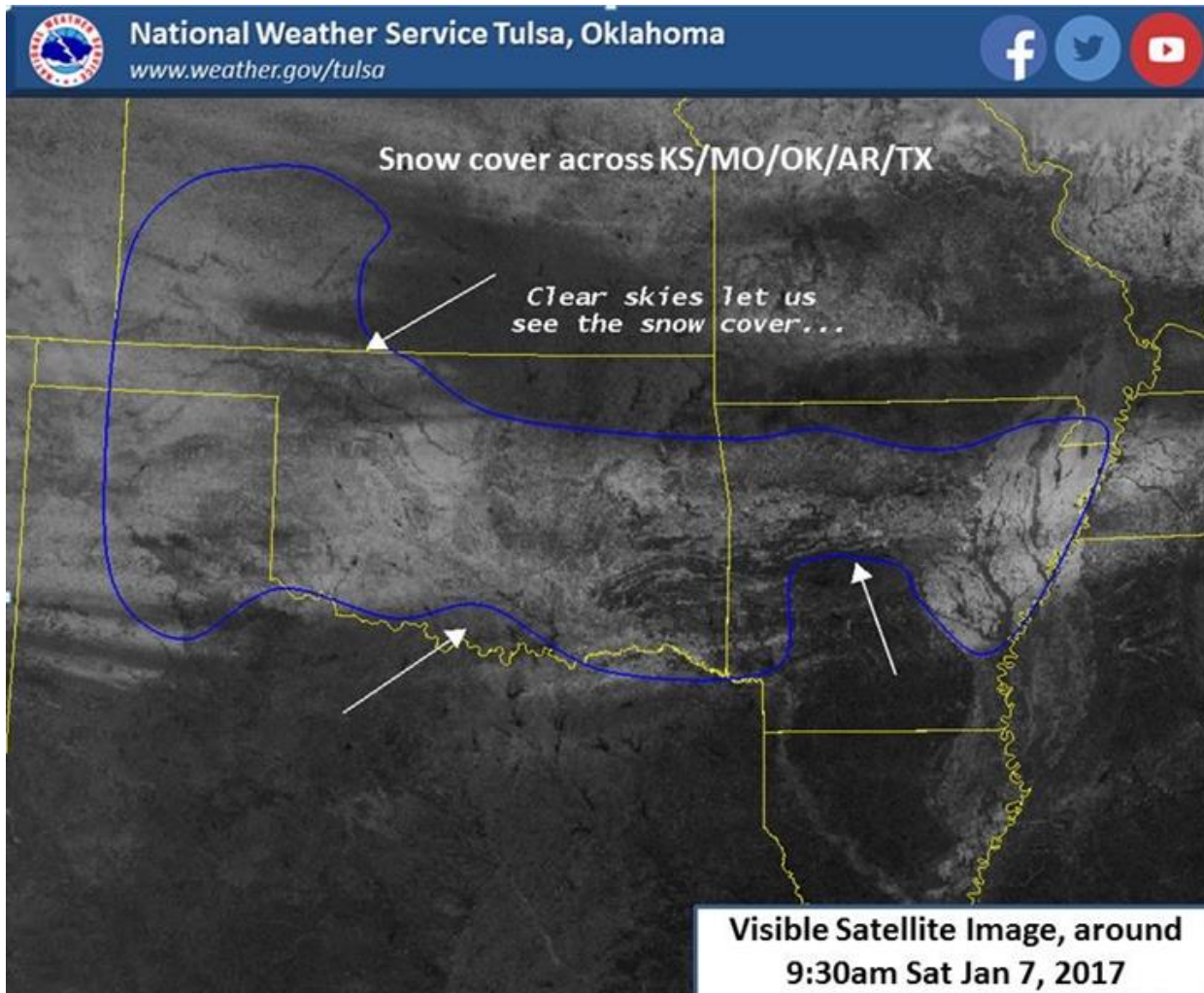


Fig. 5. Visible satellite image from 9:30am CST 01/07/2017 shows snow cover over eastern OK and western AR.

A shallow cold airmass moved into eastern OK and far northwest AR, but due to its shallow nature, did not make it south of the higher terrain. Warm air advection resulted in bands of precipitation starting around midnight on the 13<sup>th</sup>. These bands moved northwest across western AR and eastern OK through the morning hours. With freezing temperatures at the surface along and north of I-44, freezing rain began accumulating. By mid-morning of the 13<sup>th</sup>, a glaze to around 0.20" of ice had accumulated on elevated surfaces (Fig. 6). Rainfall totals also ranged from a trace to around 0.20". After a brief break in the rain, showers and isolated thunderstorms moved back into southeast OK during the evening and spread northeast across a large portion of eastern OK and northwest AR. In the pre-dawn through the morning hours of the 14<sup>th</sup>, the rain once again fell into the shallow cold layer creating additional ice accumulations along and northwest of I-44, with just a cold rain falling where temperatures remained above freezing. Widely scattered showers and freezing rain continued north of I-40 through the afternoon, before another round of more widespread and heavier rain affected northeast and east central OK and northwest AR during the evening and overnight hours due to synoptic scale lift from an approaching upper-level low. The rain ended by sunrise on the 15<sup>th</sup>, but a final round of precipitation moved east into the area during the afternoon. This last round of showers and thunderstorms affected all of eastern OK and northwest AR during the evening and overnight hours, and finally moved east of the region by sunrise on the 16<sup>th</sup>. Thankfully, temperatures had warmed above freezing and no additional ice accumulated during this time.

The freezing line location wobbled slightly around I-44 and a little south, causing periods of ice accumulation and melting. However, further north and west, surface temperatures remained below freezing allowing for greater ice accumulation with each round of freezing rain. Ice accumulation totals ranged from a glaze to around 0.50" (Fig. 7) from Okfuskee through Delaware Counties and north. Each round of rain brought 0.25" to around 1" of rain to the region, with some isolated locations receiving around 1.50" of rain. Rainfall totals for the entire 13<sup>th</sup>-16<sup>th</sup> event ranged from 0.50" to near 3" across eastern OK and northwest AR (Figs. 8, 9).

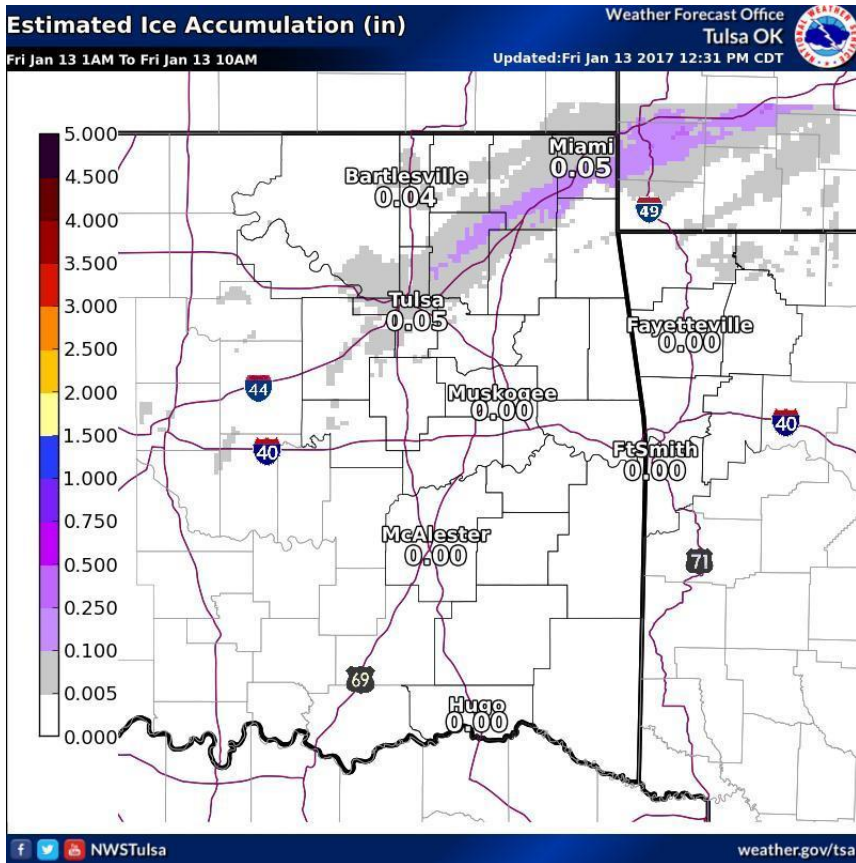


Fig. 6. Ice Accumulation for the morning of January 13, 2017

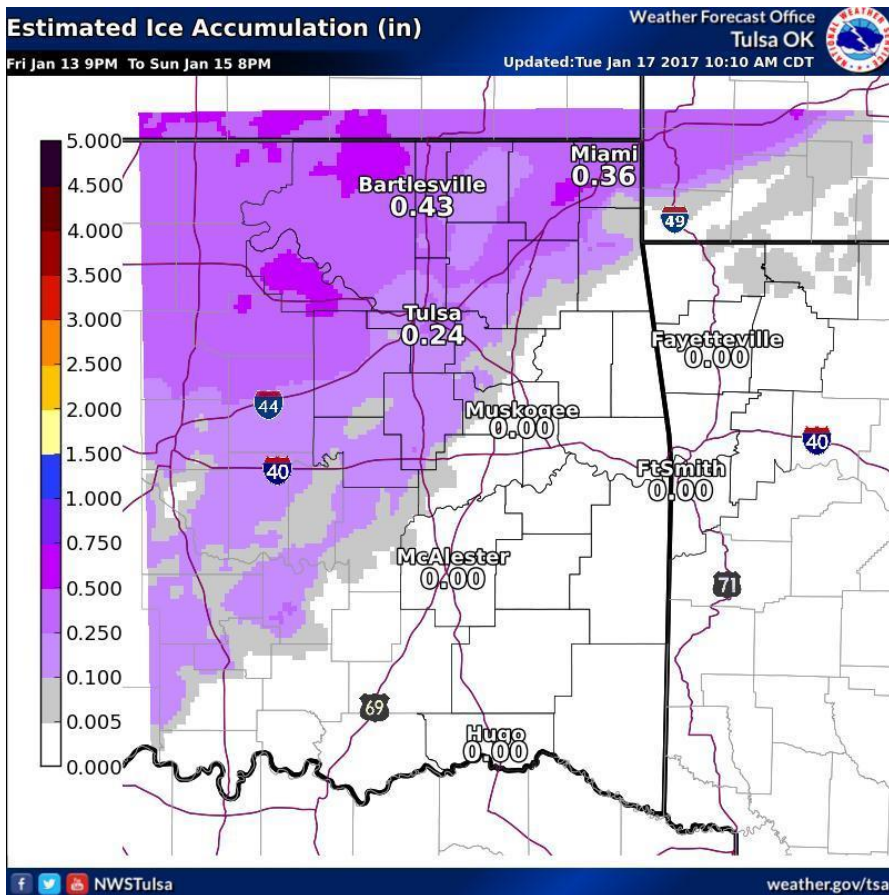


Fig. 7. Storm Total Ice Accumulation for January 13-15, 2017



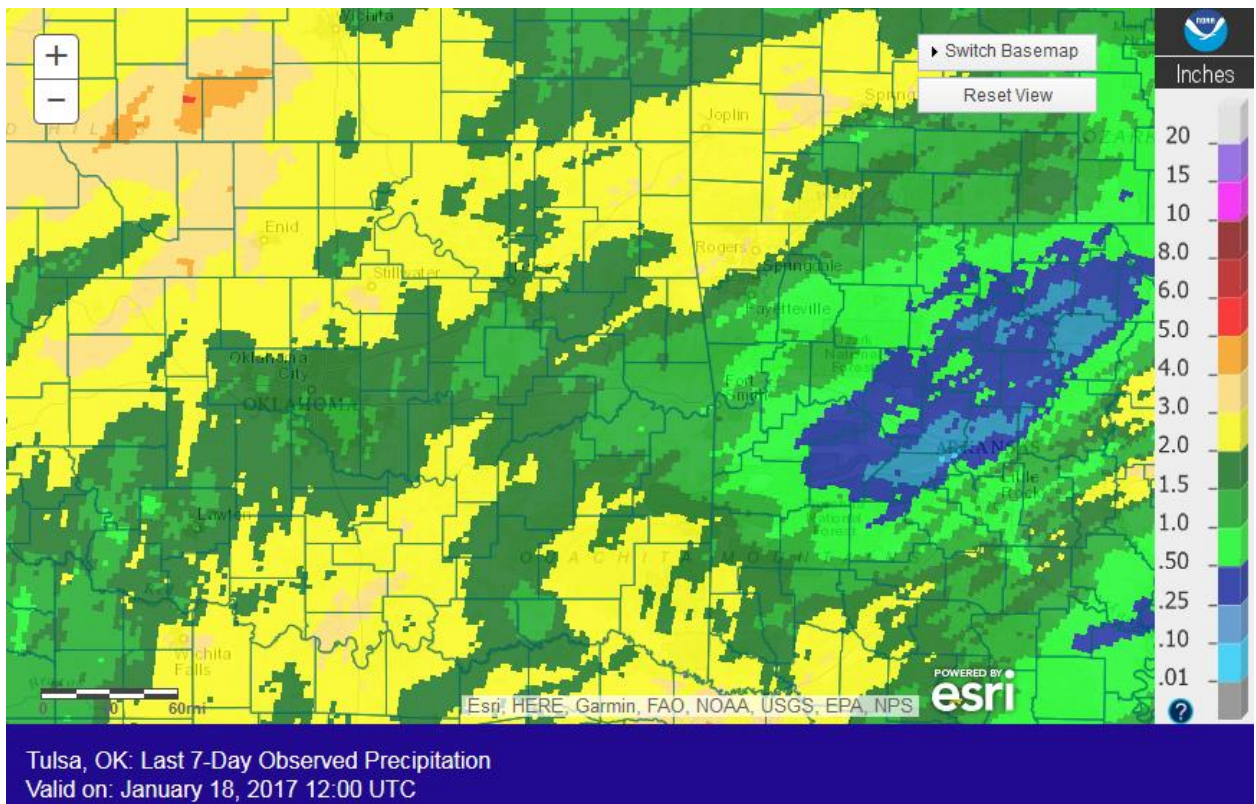


Fig. 8. 7-Day Estimated Observed Rainfall ending at 6am CST 01/18/2017.

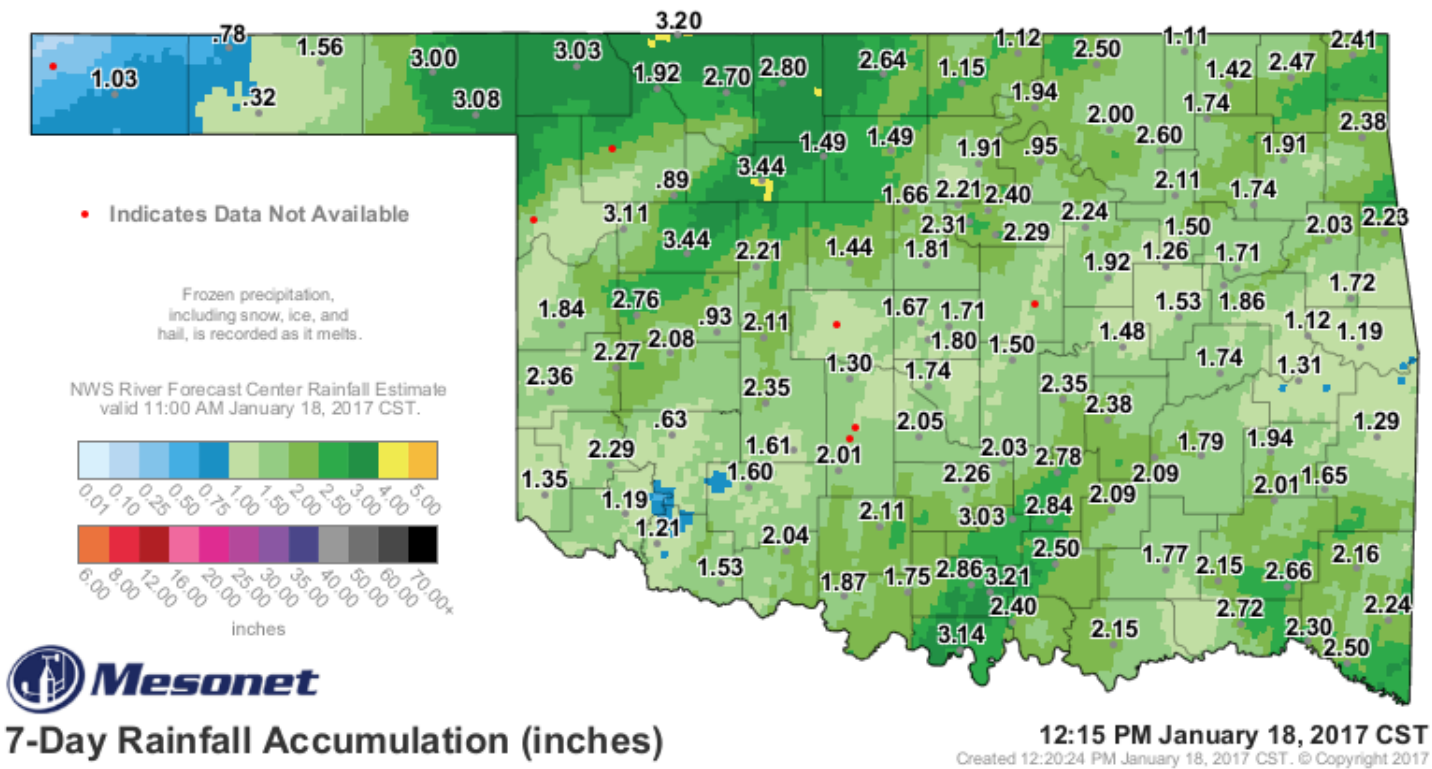


Fig. 9. 7-Day Estimated Observed Rainfall (image) and OK Mesonet measurements ending at 12:15pm CST 01/18/2017.

## January 16-31

As warm air advection increased over the region ahead of an ejecting upper-level system to the west, scattered showers and thunderstorms moved north out of TX during the evening of the 17<sup>th</sup>, bringing rain to locations south of I-40. The storm activity continued over far southeast OK during the overnight hours, ending around sunrise on the 18<sup>th</sup>. Rainfall totals were 0.10" to around 0.50" across Choctaw, Pushmataha, and southern Le Flore Counties, and a few hundredths to around 0.10" north to I-40.

A compact but potent upper-level low at the nose of a strong Pacific jet moved across the desert southwest on the morning of the 21<sup>st</sup>. The low-level flow increased out of the south in response to the approaching system, which began to draw moisture northward into western AR and far eastern OK. Showers and thunderstorms developed during the evening along and east of the OK/AR state line. After midnight, additional showers and isolated thunderstorms developed further west over eastern OK as the compact low continued to move east, tracking near the Red River. This activity continued into the afternoon of the 22<sup>nd</sup> before shifting east as the low quickly moved into the Mississippi Valley. Rainfall totals ranged from a few hundredths over southeast OK to around 2" in northeast OK and northwest AR (Figs. 10, 11, 12).

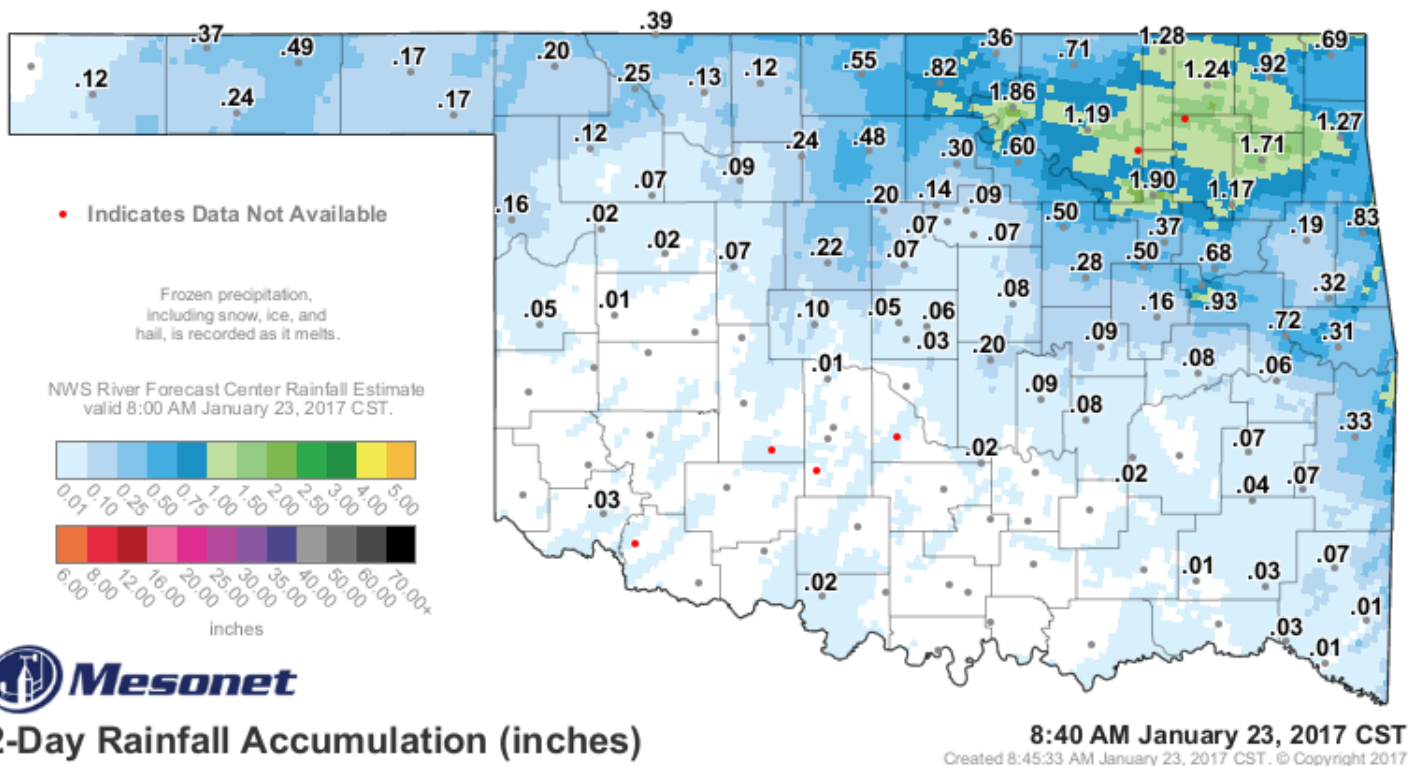


Fig. 10. 2-Day Estimated Observed Rainfall (image) and OK Mesonet measurements ending at 8:40am CST 01/23/2017.



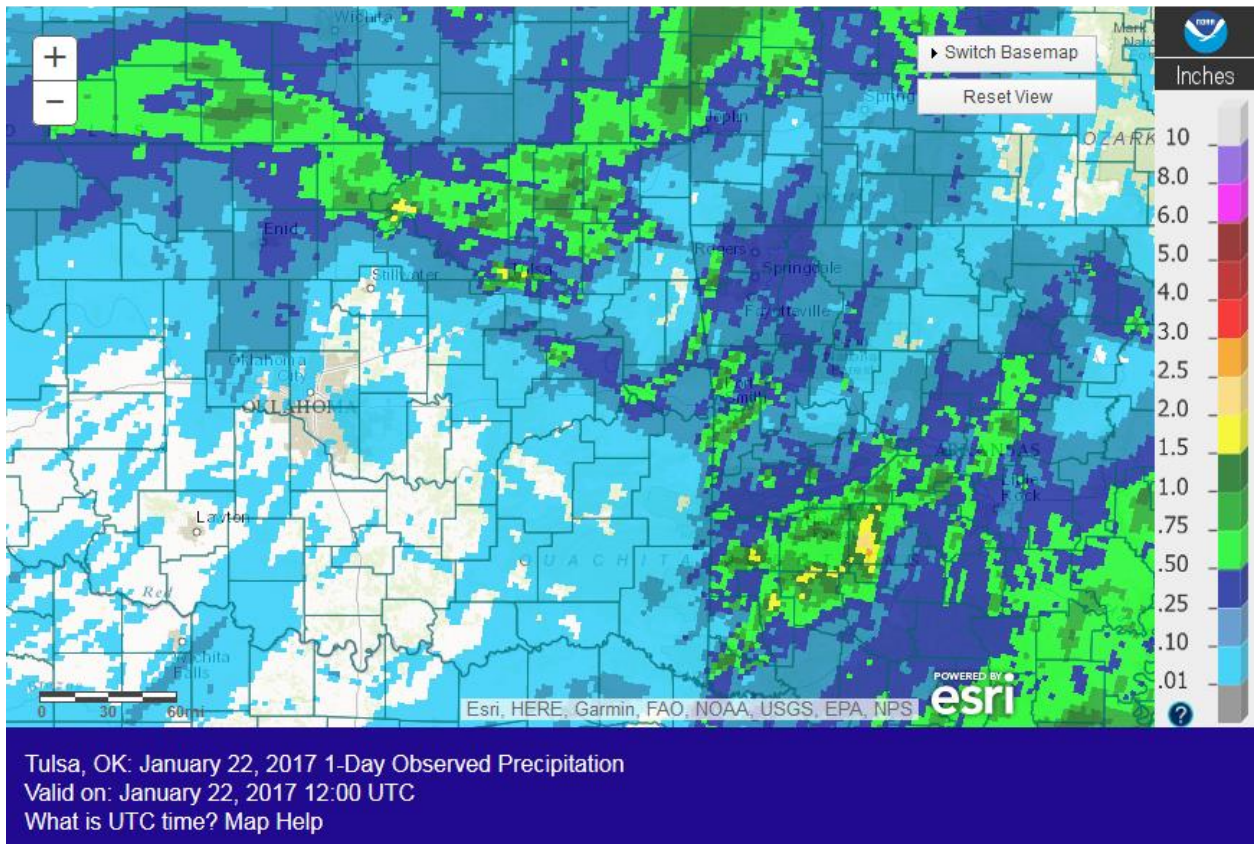


Fig. 11. 24-Hour Estimated Observed Rainfall ending at 6am CST 01/22/2017.

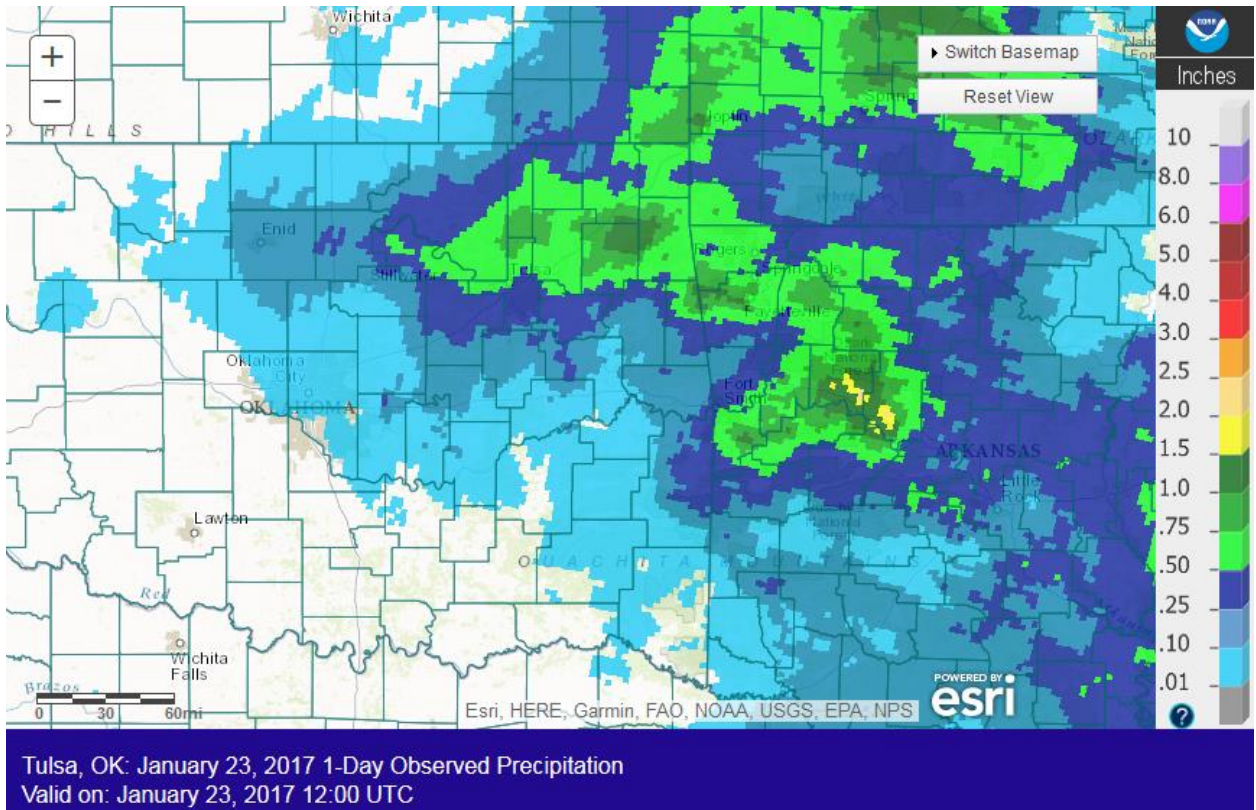


Fig. 12. 24-Hour Estimated Observed Rainfall ending at 6am CST 01/23/2017.

Written by:

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Service Hydrologist  
WFO Tulsa

**Products issued in January 2017:**

\*CWYO2 became a daily river forecast point September 7, 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)
- 1 Drought Information Statements (DGT)

**Preliminary Hydrographs:**

None