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| 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) |
| | | REPORT FOR: MONTH February YEAR 2017 |
| MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS | | SIGNATURE Steven F. Piltz (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 March 2, 2017 |

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.

February 2017 was very warm across eastern OK and northwest AR, running 9°-10° above normal. A few rounds of rain brought above normal rain to southeast OK, while elsewhere, below normal rain continued. 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.weather.gov/tsa/hydro-monthly-summary>.

Monthly Summary

Using the radar-derived estimated observed precipitation from the RFCs (Fig. 1a), rainfall totals for February 2017 ranged from around 0.50" along the OK/KS border to around 4" in parts of southeast OK and west central AR. This corresponds to near to around 25% of the normal February rainfall north of I-40 in eastern OK and northwest AR, and 75% to around 150% of the normal rainfall south of I-40 (Fig. 1b).

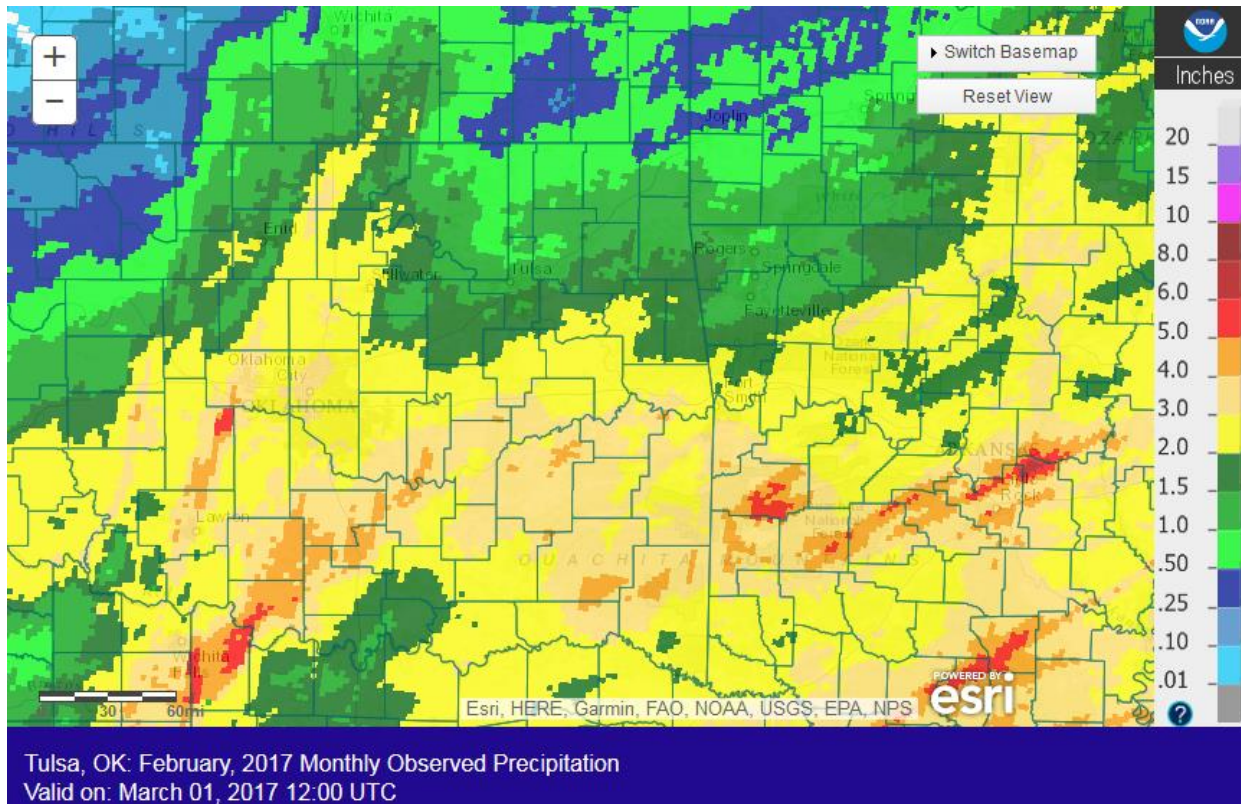


Fig. 1a. Estimated Observed Rainfall for February 2017

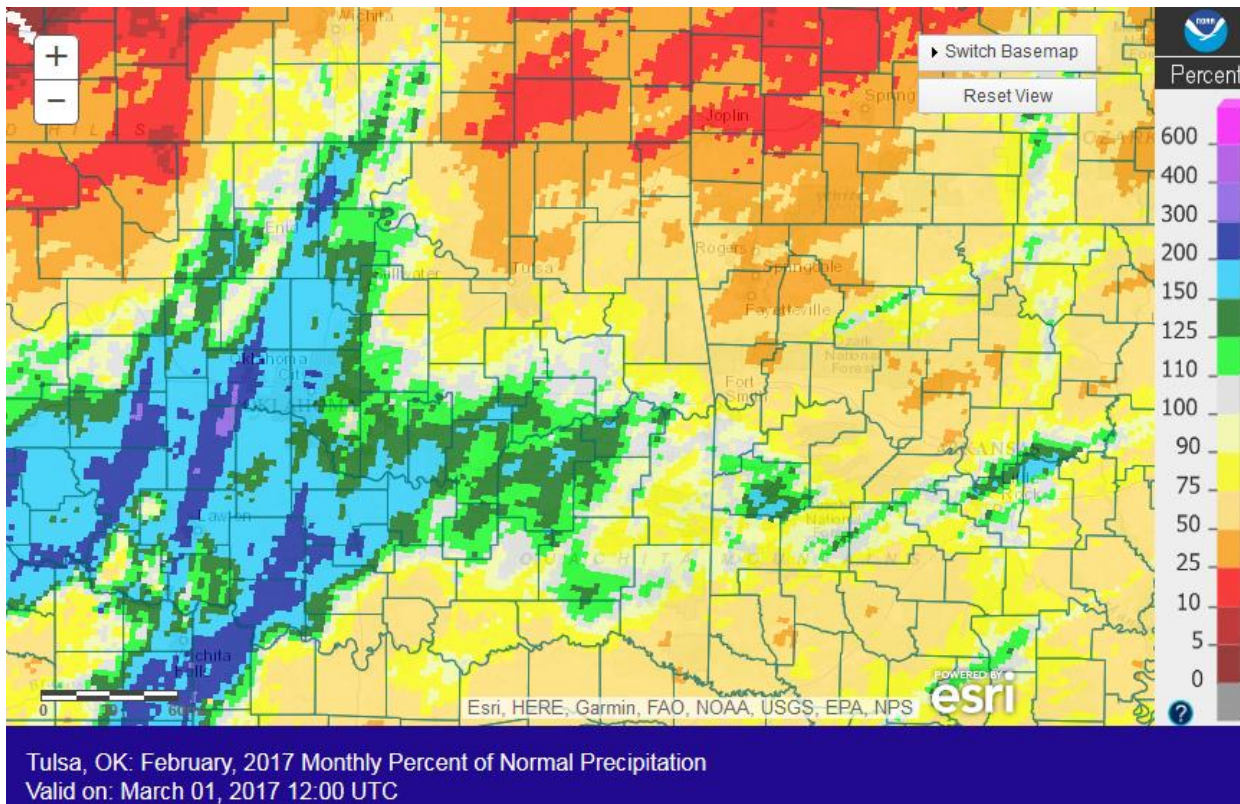


Fig. 1b. Estimated % of Normal Rainfall for February 2017

In Tulsa, OK, February 2017 ranked as the 2nd warmest February (51.4°F; since records began in 1905) and the 49th driest February (1.18"; since records began in 1888). No snow fell this month, tying 18 other years for least snowy February since records began in 1900. Fort Smith, AR had the **Record** warmest February (54.3°F, previous record was 53.0 in 1930; since records began in 1883) and the 57th wettest February (2.48"; since records began in 1883). No snow fell this month, tying 35 other years as least snowy February since records began in 1884. Fayetteville, AR had the **Record** warmest (49.0°F, previous record was 47.8 in 1976), and the 10th driest (1.11) February since records began in 1950. No snow fell this month, tying 8 other years for least snowy February.

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

| | | | | | |
|---------------------------|------|----------------------|------|----------------------|------|
| Cloudy, OK (meso) | 4.14 | Antlers, OK (meso) | 3.72 | Hugo, OK (meso) | 3.58 |
| Eufaula 4.6ENE, OK (coco) | 3.43 | Wilburton, OK (meso) | 3.33 | Stigler, OK (meso) | 3.30 |
| Krebs 0.3WNW, OK (coco) | 3.30 | Clayton, OK (meso) | 3.09 | McAlester, OK (meso) | 3.05 |

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

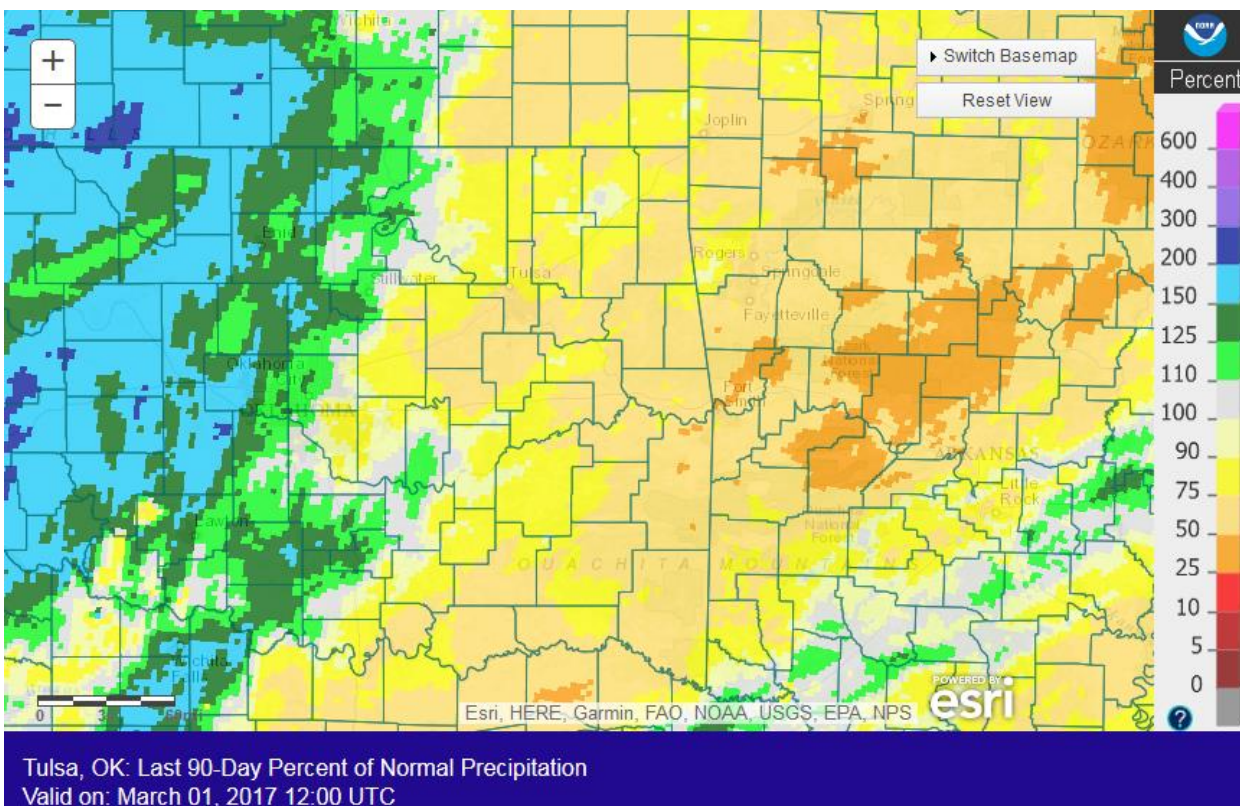
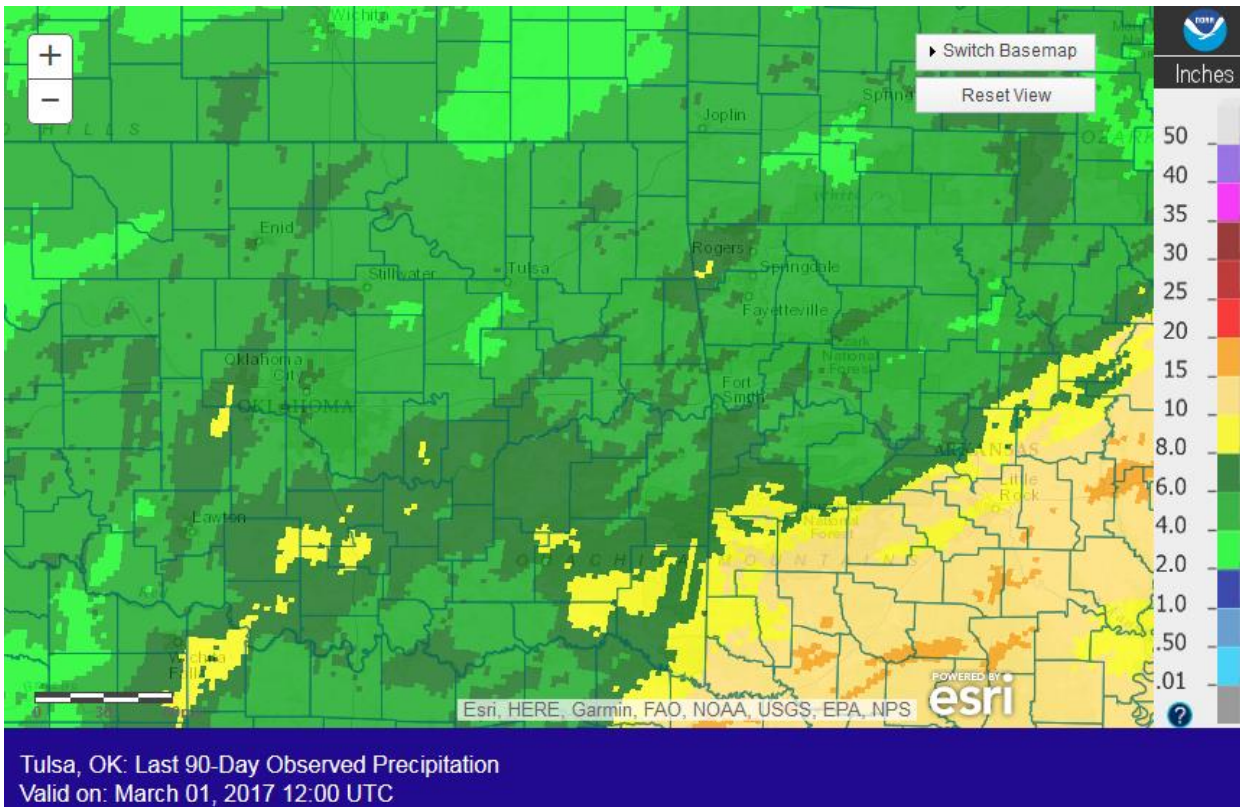
| | | | | | |
|-------------------|------|-----------------------------------|------|-------------------------|------|
| Miami, OK (meso) | 0.63 | Copan, OK (meso) | 0.79 | Bartlesville, OK (ASOS) | 0.91 |
| Vinita, OK (meso) | 0.95 | Foraker, OK (meso) | 0.96 | Nowata, OK (meso) | 0.98 |
| Talala, OK (meso) | 1.09 | Fayetteville Drake Fld, AR (ASOS) | 1.11 | Jay, OK (meso) | 1.11 |

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

| Rank since 1921 | Last 30 Days (Jan. 30-Feb 28) | Winter 2017 (Dec 1 – Feb 28) | Year-to-Date (Jan 1 – Feb 28) | Last 120 Days (Nov 1 – Feb 28) | Water Year-to-Date (Oct 1 – Feb 28) | Cool Growing Season-to-date (Sep 1 – Feb 28) | Last 365 Days (Mar 1, 2016–Feb 28, 2017) |
|-----------------|-------------------------------|------------------------------|-------------------------------|--------------------------------|-------------------------------------|--|--|
| Northeast OK | 34 th driest | 44 th driest | 20 th wettest | 20 th driest | 43 rd driest | 30 th driest | 29 th driest |
| East Central OK | 39 th wettest | 38 th driest | 38 th wettest | 16 th driest | 13 th driest | 10th driest | 21 st driest |
| Southeast OK | 48 th wettest | 22 nd driest | 44 th driest | 21 st driest | 9th driest | 6th driest | 40 th driest |
| Statewide | 34 th wettest | 35 th wettest | 17 th wettest | 47 th driest | 32 nd driest | 30 th driest | 48 th wettest |

Winter 2016-17 (Dec-Jan-Feb)

Using the radar-derived estimated observed precipitation from the RFCs (Fig. 2a), rainfall totals for Winter 2016-17 ranged from around 2" to around 8". This corresponds to near to 25% below the normal Winter rainfall for all except eastern Kay, western Osage and western Pawnee Counties, where Winter rainfall was 110%-150% of normal (Fig. 2b).



In Tulsa, OK, Winter 2016-17 ranked as the 6th warmest Winter (44.1°F; since records began in 1905-06) and the 61st wettest Winter (5.04"; since records began in 1888-89). Fort Smith, AR had the 3rd warmest Winter (47.0°F; since records began in 1882-83) and the 26th driest Winter (5.59"; since records began in 1882-83). Fayetteville, AR had the 2nd warmest (42.2°F) and the 10th driest (5.33") Winter since records began in 1949-50.

Some of the larger precipitation reports (in inches) for Winter 2016-17 included:

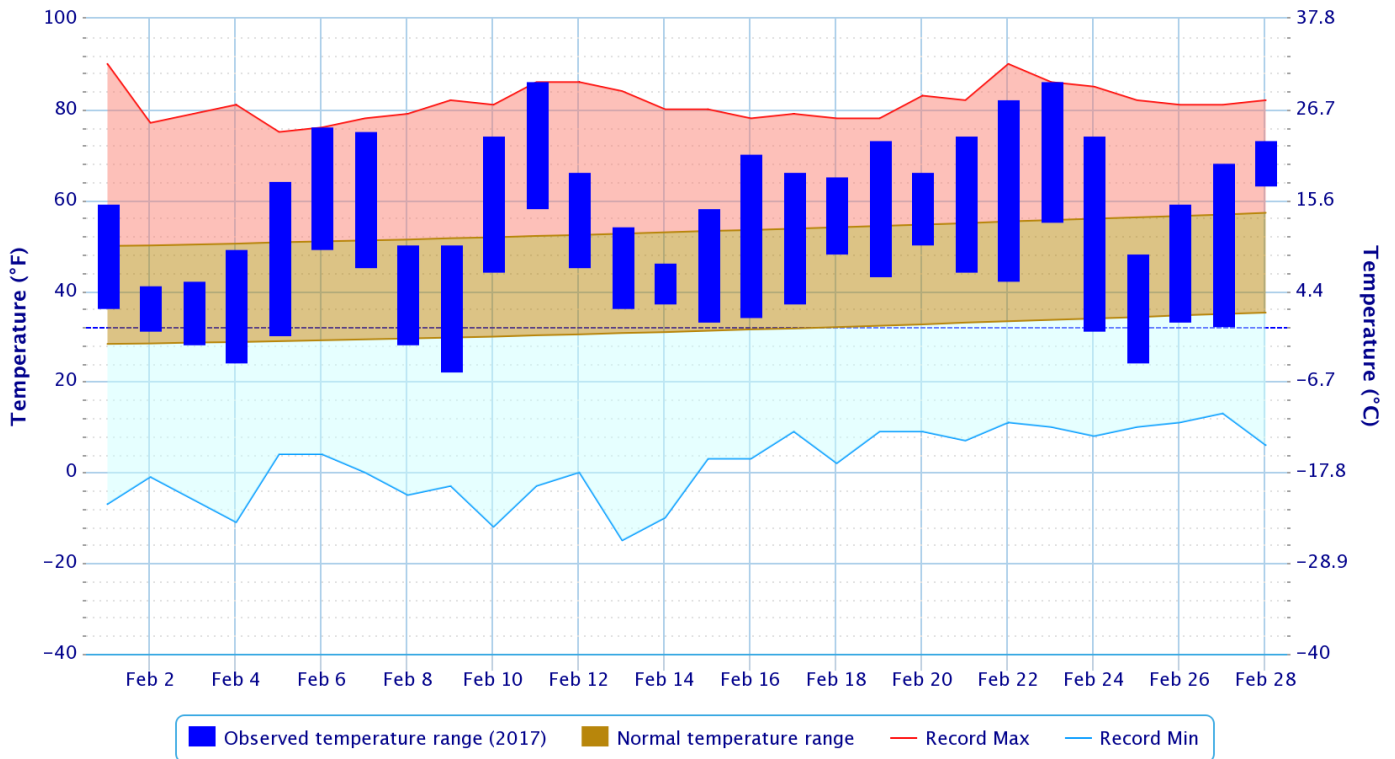
| | | | | | |
|-----------------------------|------|--------------------------------|------|--------------------------------|------|
| Cloudy, OK (meso) | 8.85 | Hugo, OK (meso) | 8.18 | Antlers, OK (meso) | 7.96 |
| Kingston 2S, AR (coop) | 7.90 | Eufaula 4.6 ENE, OK (coco) | 7.45 | Upper Spavinaw Port, OK (coop) | 7.31 |
| Westville 0.2ENE, OK (coco) | 7.29 | Siloam Springs 1.8N, AR (coco) | 7.20 | Wilburton, OK (meso) | 7.19 |

Some of the lowest precipitation reports (in inches) for Winter 2016-17 included:

| | | | | | |
|-------------------------|------|--------------------|------|---------------------------------|------|
| Bartlesville, OK (coop) | 3.91 | Bixby, OK (meso) | 3.97 | Pawnee, OK (meso) | 4.00 |
| Hectorville, OK (meso) | 4.14 | Copan, OK (meso) | 4.17 | Jenks Riverside Aprt, OK (ASOS) | 4.19 |
| Nowata, OK (meso) | 4.25 | Bristow, OK (meso) | 4.47 | Miami, OK (meso) | 4.47 |

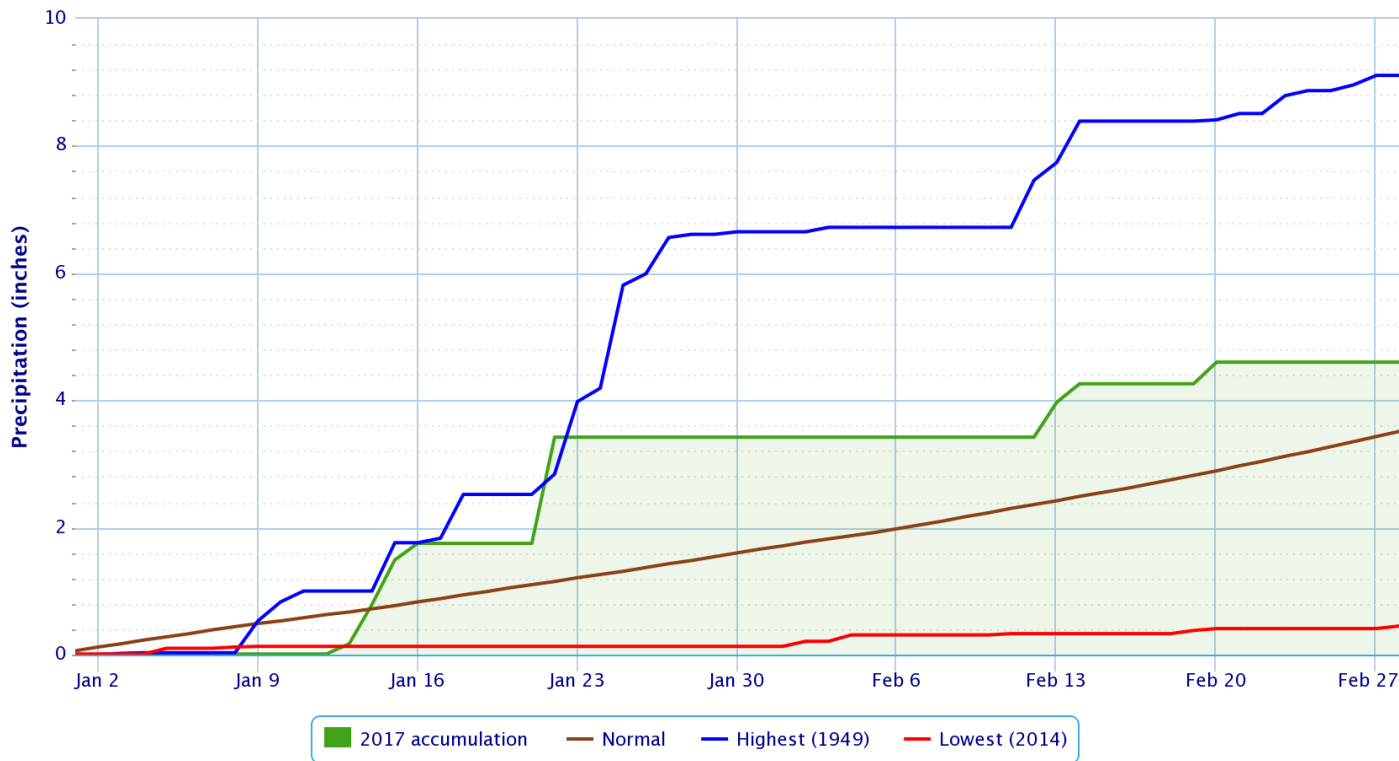
Daily Temperature Data – Tulsa Area, OK (ThreadEx)

Period of Record – 1905-01-06 to 2017-02-28. Normals period: 1981-2010. Click and drag to zoom chart.



Accumulated Precipitation – Tulsa Area, OK (ThreadEx)

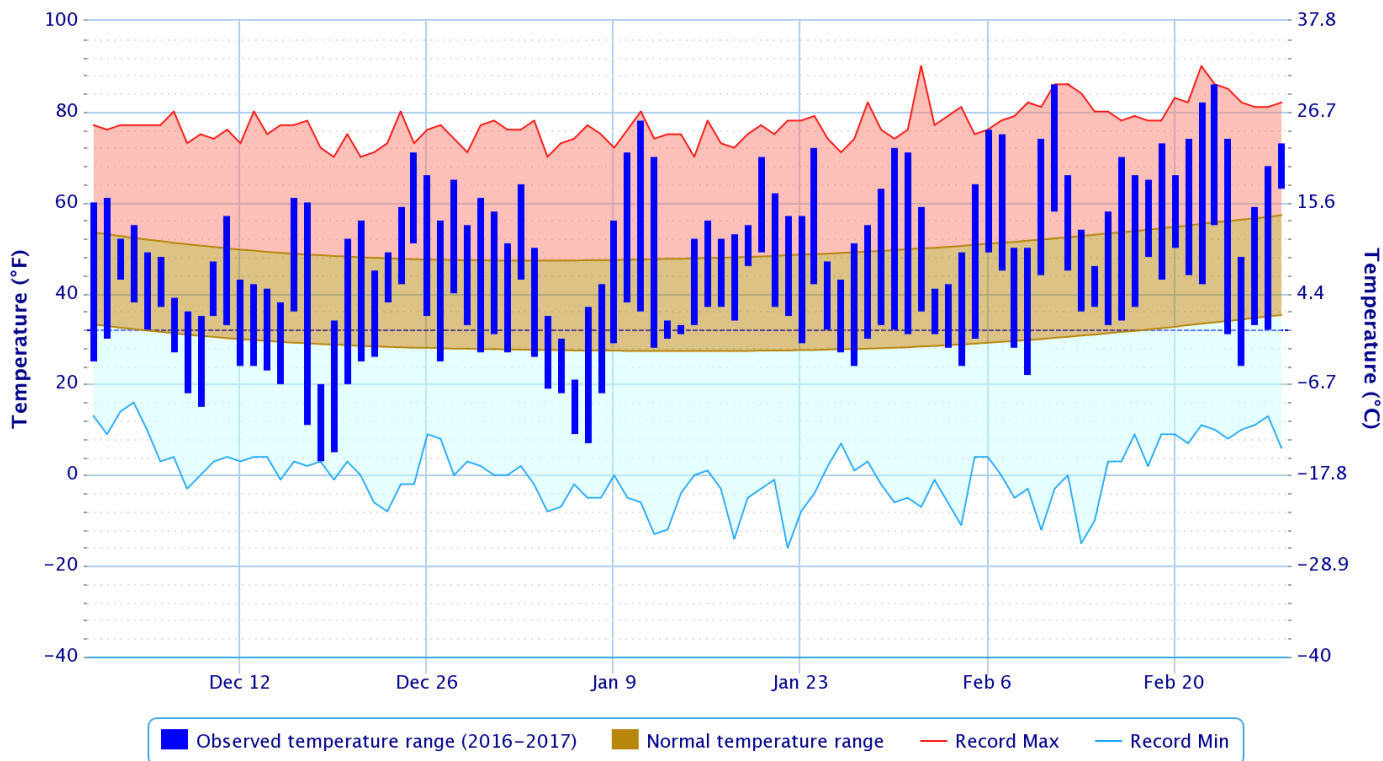
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



Powered by ACIS

Daily Temperature Data – Tulsa Area, OK (ThreadEx)

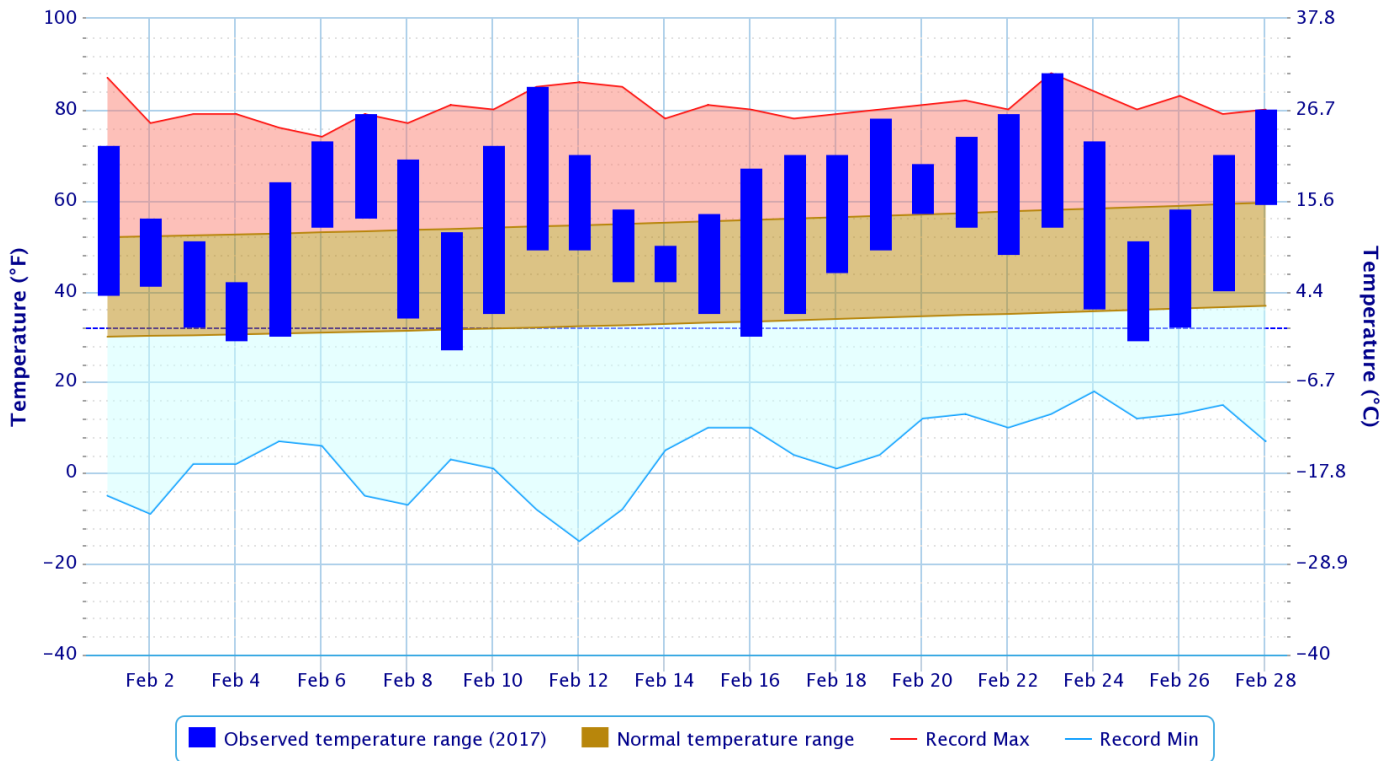
Period of Record – 1905-01-06 to 2017-02-28. Normals period: 1981-2010. Click and drag to zoom chart.



Powered by ACIS

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

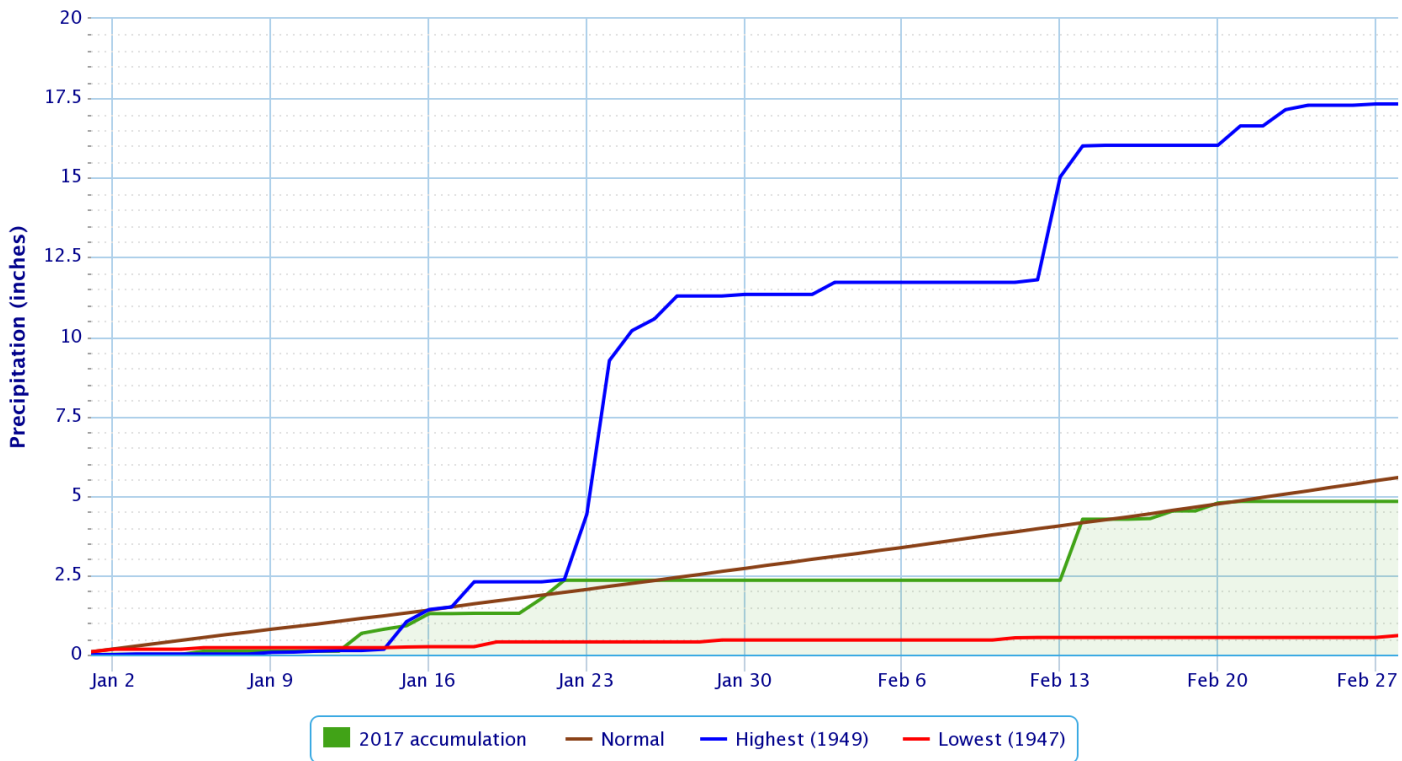
Period of Record – 1882–06–01 to 2017–02–28. Normals period: 1981–2010. Click and drag to zoom chart.



Powered by ACIS

Accumulated Precipitation – Fort Smith Area, AR (ThreadEx)

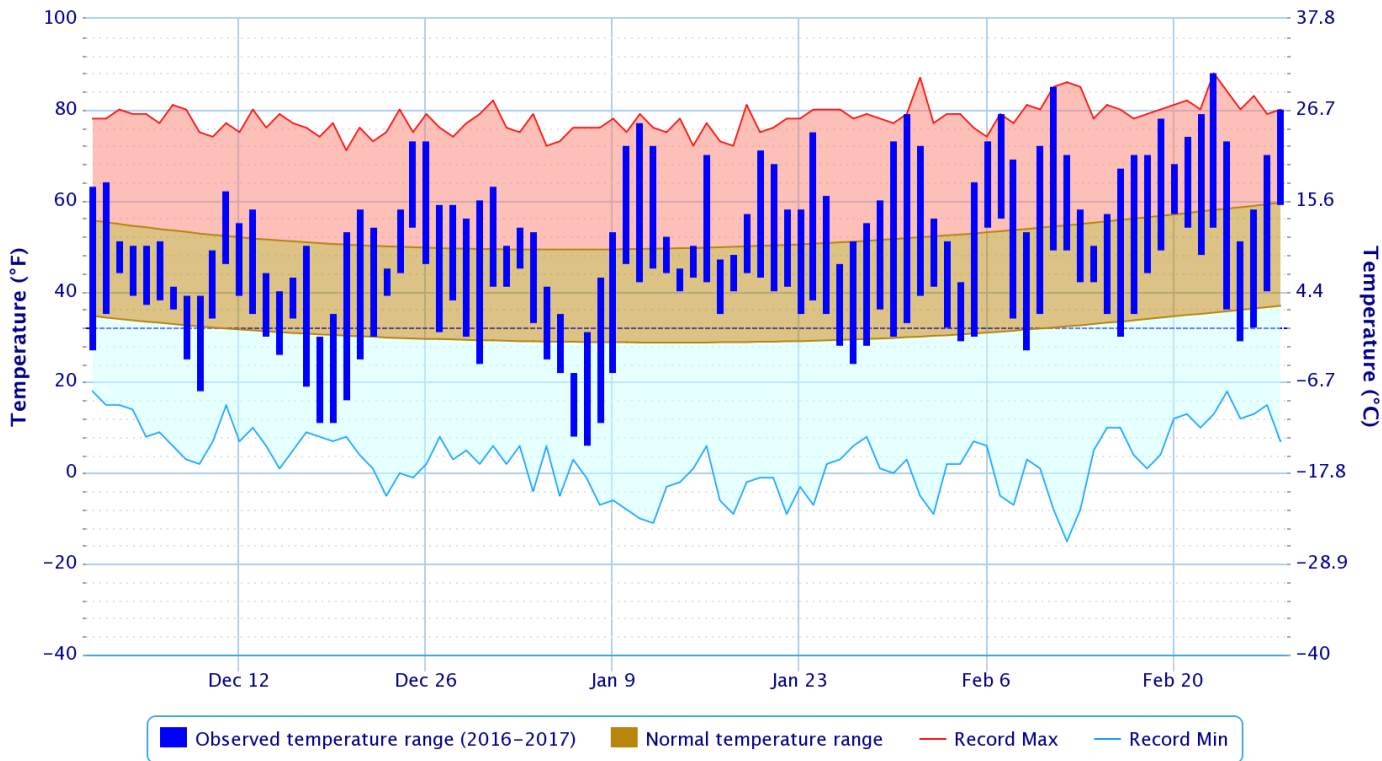
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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

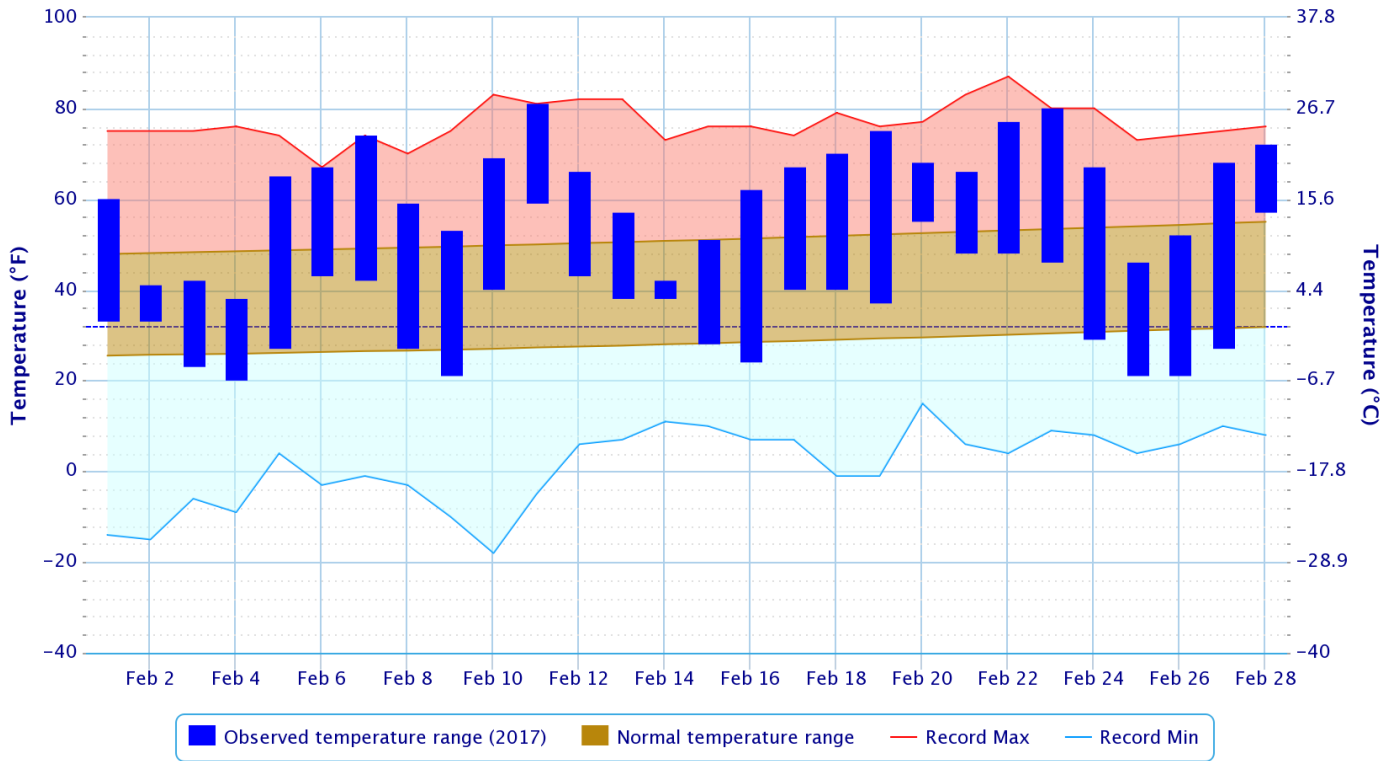
Period of Record – 1882-06-01 to 2017-02-28. Normals period: 1981-2010. Click and drag to zoom chart.



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Daily Temperature Data – FAYETTEVILLE DRAKE FLD, AR

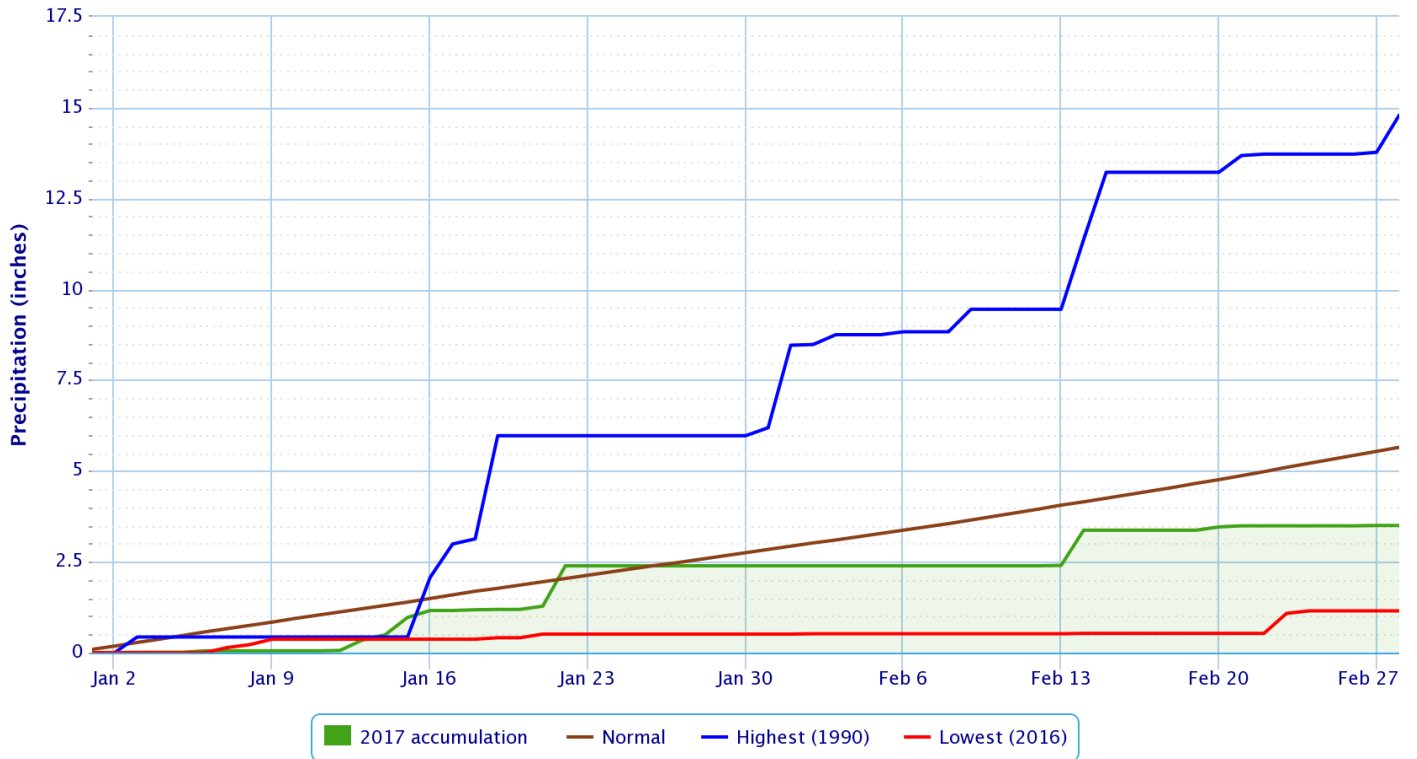
Period of Record – 1949-07-14 to 2017-02-28. Normals period: 1981-2010. Click and drag to zoom chart.



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Accumulated Precipitation - FAYETTEVILLE DRAKE FLD, AR

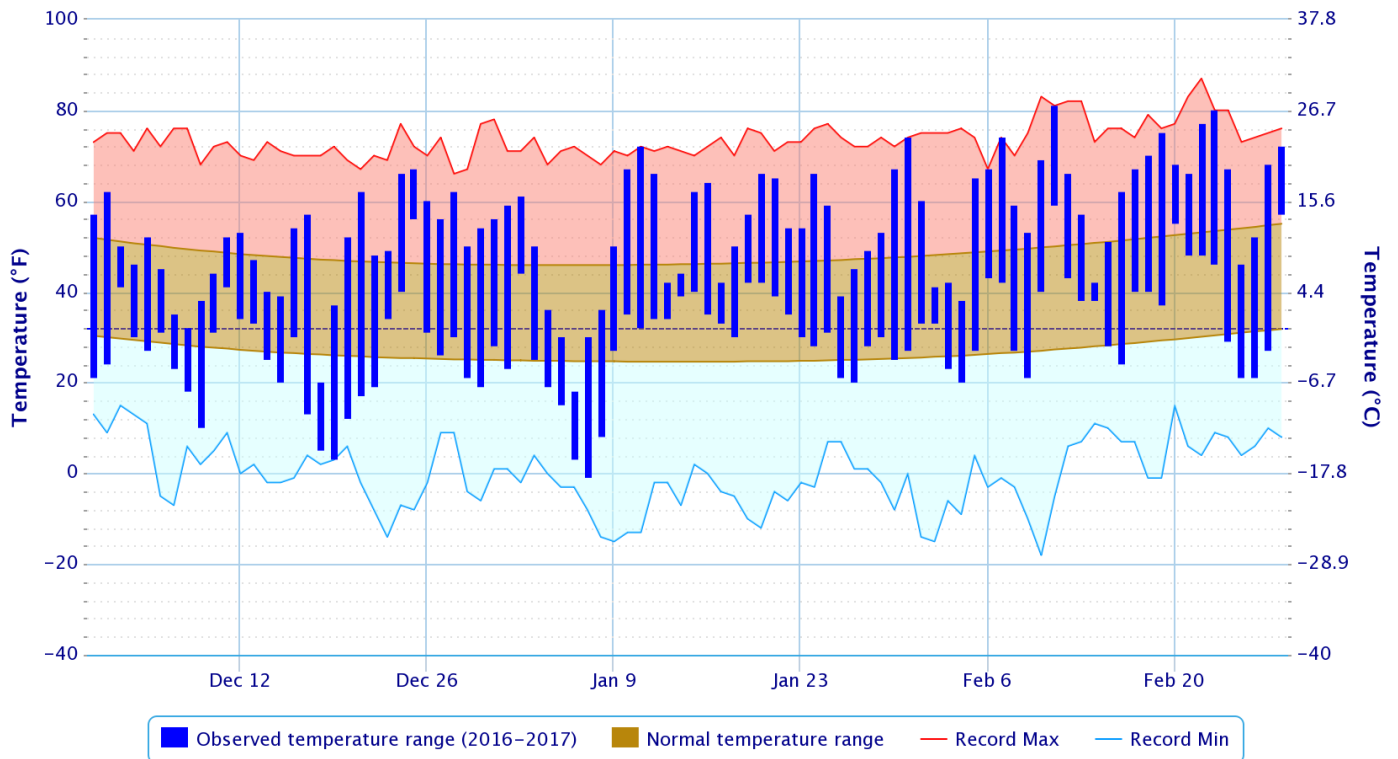
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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Daily Temperature Data - FAYETTEVILLE DRAKE FLD, AR

Period of Record - 1949-07-14 to 2017-02-28. Normals period: 1981-2010. Click and drag to zoom chart.

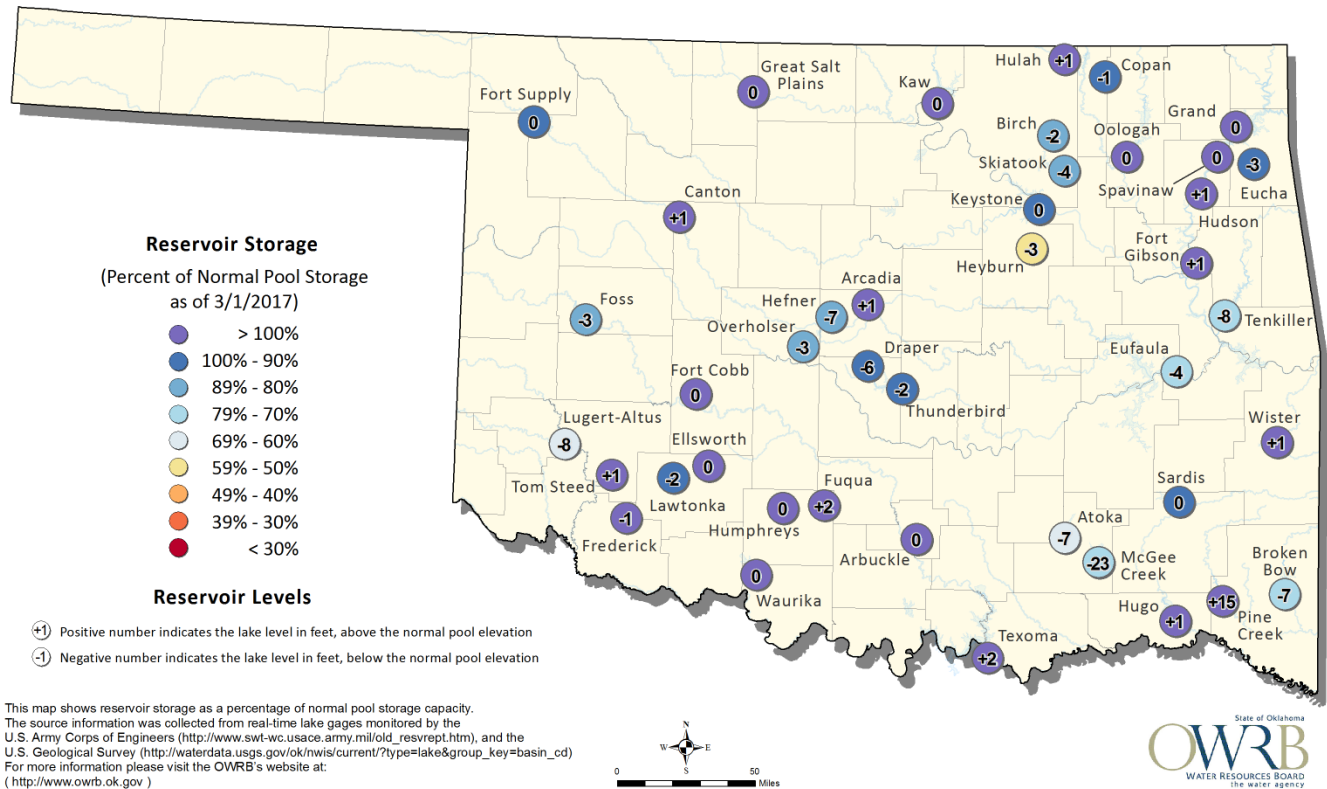


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Reservoirs

Oklahoma Surface Water Resources

Reservoir Levels and Storage as of 3/1/2017



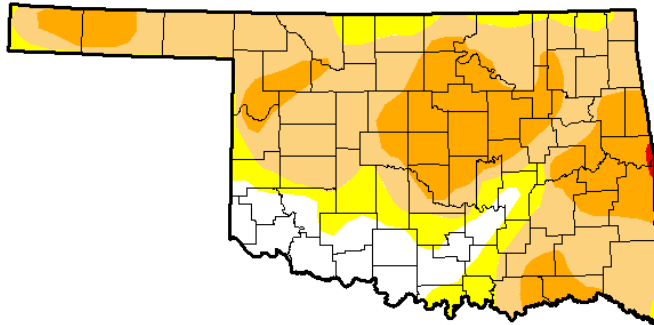
According to the USACE, the lakes in the HSA were at or below the top of their conservation pool levels as of 2/28/2017. Reservoirs operating more than 5% below of the top of their conservation level include: Heyburn Lake 49%, Beaver Lake 73%, Tenkiller Lake 74%, Eufaula Lake 75%, Birch Lake 86%, Skiatook Lake 87%, and Copan Lake 92%.

Drought

According to the [U.S. Drought Monitor](#) (USDM) from February 28, 2017 (Figs. 3, 4), D3 (Extreme Drought) conditions remained over Crawford, Sebastian, and Franklin Counties in west central AR. D2 (Severe Drought) encompassed portions of Osage, Pawnee, Creek, Tulsa, Rogers, Wagoner, Cherokee, Adair, Muskogee, Okfuskee, Okmulgee, McIntosh, Pittsburg, Haskell, Sequoyah, Latimer, Le Flore, Choctaw, and Pushmataha Counties in eastern OK, and Carroll, 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, Craig, Ottawa, Delaware, Cherokee, Muskogee, Okmulgee, Okfuskee, McIntosh, Pittsburg, Latimer, Le Flore, Choctaw, and Pushmataha Counties in eastern OK and Benton and Carroll Counties in northwest AR. D0 (abnormally dry conditions but not in drought) were present across small portions of Osage, Washington, Nowata, Delaware, Craig, and Pittsburg Counties in eastern OK.

U.S. Drought Monitor Oklahoma

February 28, 2017
(Released Thursday, Mar. 2, 2017)
Valid 7 a.m. EST



Drought Conditions (Percent Area)

| | None | D0-D4 | D1-D4 | D2-D4 | D3-D4 | D4 |
|------------------------------------|-------|-------|-------|-------|-------|------|
| Current | 12.64 | 87.36 | 73.14 | 28.77 | 0.18 | 0.00 |
| Last Week 2/21/2017 | 11.49 | 88.51 | 67.93 | 26.61 | 0.18 | 0.00 |
| 3 Months Ago 11/29/2016 | 15.59 | 84.41 | 56.94 | 18.48 | 2.80 | 0.00 |
| Start of Calendar Year 1/5/2017 | 5.61 | 94.39 | 83.21 | 55.75 | 5.55 | 0.00 |
| Start of Water Year 9/27/2016 | 57.82 | 42.18 | 19.04 | 3.05 | 0.00 | 0.00 |
| One Year Ago 3/1/2016 | 78.72 | 21.28 | 0.00 | 0.00 | 0.00 | 0.00 |

Intensity:
■ D0 Abnormally Dry ■ D3 Extreme Drought
■ D1 Moderate Drought ■ D4 Exceptional Drought
■ D2 Severe Drought

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

Author:
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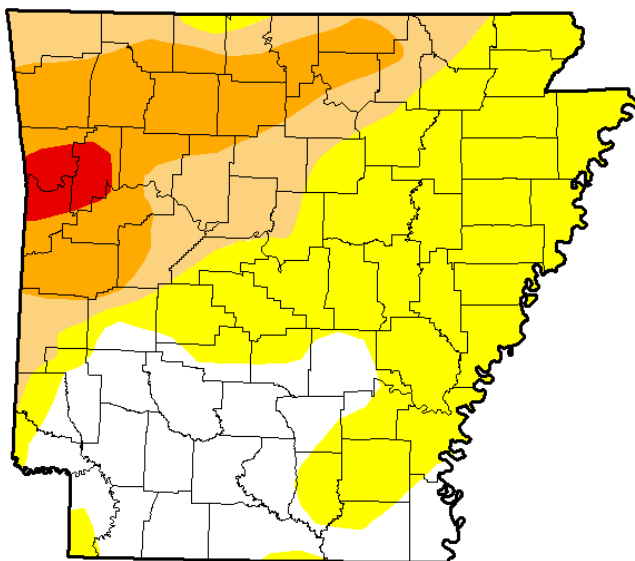


<http://droughtmonitor.unl.edu/>

Fig. 3. Drought Monitor for Oklahoma

U.S. Drought Monitor Arkansas

February 28, 2017
(Released Thursday, Mar. 2, 2017)
Valid 7 a.m. EST



Drought Conditions (Percent Area)

| | None | D0-D4 | D1-D4 | D2-D4 | D3-D4 | D4 |
|------------------------------------|-------|--------|-------|-------|-------|------|
| Current | 23.31 | 76.69 | 34.06 | 18.29 | 2.00 | 0.00 |
| Last Week 2/21/2017 | 26.39 | 73.61 | 33.46 | 14.80 | 2.00 | 0.00 |
| 3 Months Ago 11/29/2016 | 0.00 | 100.00 | 86.49 | 46.92 | 0.49 | 0.00 |
| Start of Calendar Year 1/3/2017 | 27.05 | 72.95 | 39.03 | 7.99 | 2.02 | 0.00 |
| Start of Water Year 9/27/2016 | 71.02 | 28.98 | 0.00 | 0.00 | 0.00 | 0.00 |
| One Year Ago 3/1/2016 | 94.99 | 5.01 | 0.00 | 0.00 | 0.00 | 0.00 |

Intensity:
■ D0 Abnormally Dry ■ D3 Extreme Drought
■ D1 Moderate Drought ■ D4 Exceptional Drought
■ D2 Severe Drought

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

Author:
Richard Heim
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<http://droughtmonitor.unl.edu/>

Fig. 4. Drought Monitor for Arkansas

Outlooks

The [Climate Prediction Center](#) (CPC) outlook for March 2017 (issued February 28, 2017) indicates a greatly enhanced chance for above normal temperatures across all of eastern OK and northwest AR. This outlook also indicates a slightly enhanced chance for below median rainfall over northeast OK and far northwest AR, with an equal chance of above, near, and below median rainfall elsewhere. This outlook takes into account weather conditions forecast over the next 1-2 weeks, potential influences from the Madden-Julian Oscillation (MJO), and to a lesser extent, subseasonal climate signals in the weeks 3-4 time frame. MJO activity entering March favors warmer conditions for the central and eastern CONUS.

For the 3-month period March-April-May 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 February 16, 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 have returned to ENSO-neutral, which is favored to persist through the spring. There is significant uncertainty in the ENSO phase beyond that time.

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

Rain moved in from the west on the evening of the 13th and spread across all of eastern OK and northwest AR during through the night and into the morning of the 14th as an upper-level low moved out of northwestern Mexico and across the southern plains. Widespread rain continued for much of the day on the 14th, generally along and southeast of I-44, before coming to an end by midnight. Rainfall totals ranged from around one third of an inch near the KS-OK border, to around 3" in parts of southeast OK (Figs. 5-7).

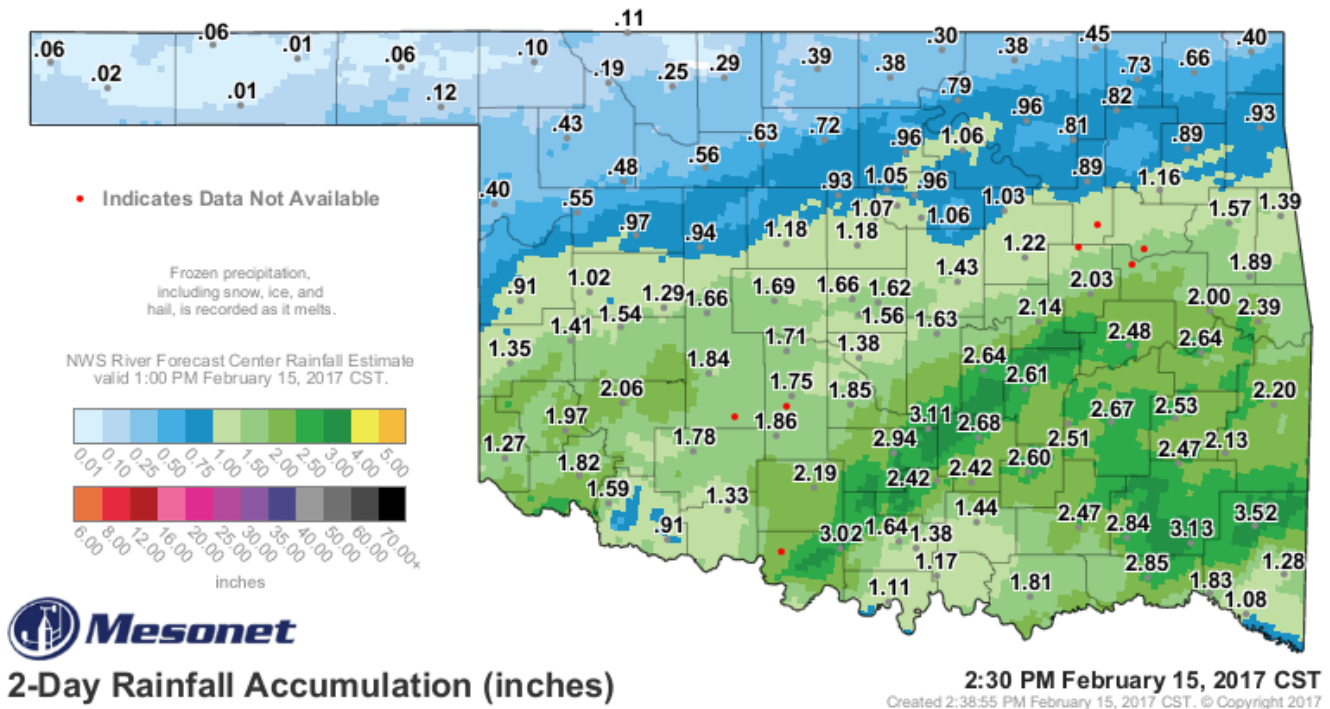


Fig. 5. 48-Hour Estimated Observed Rainfall ending at 2:30pm CST 02/15/2017. (Note that the rain started earlier than this time period in western OK, and therefore, this map does not reflect the storm total there.)

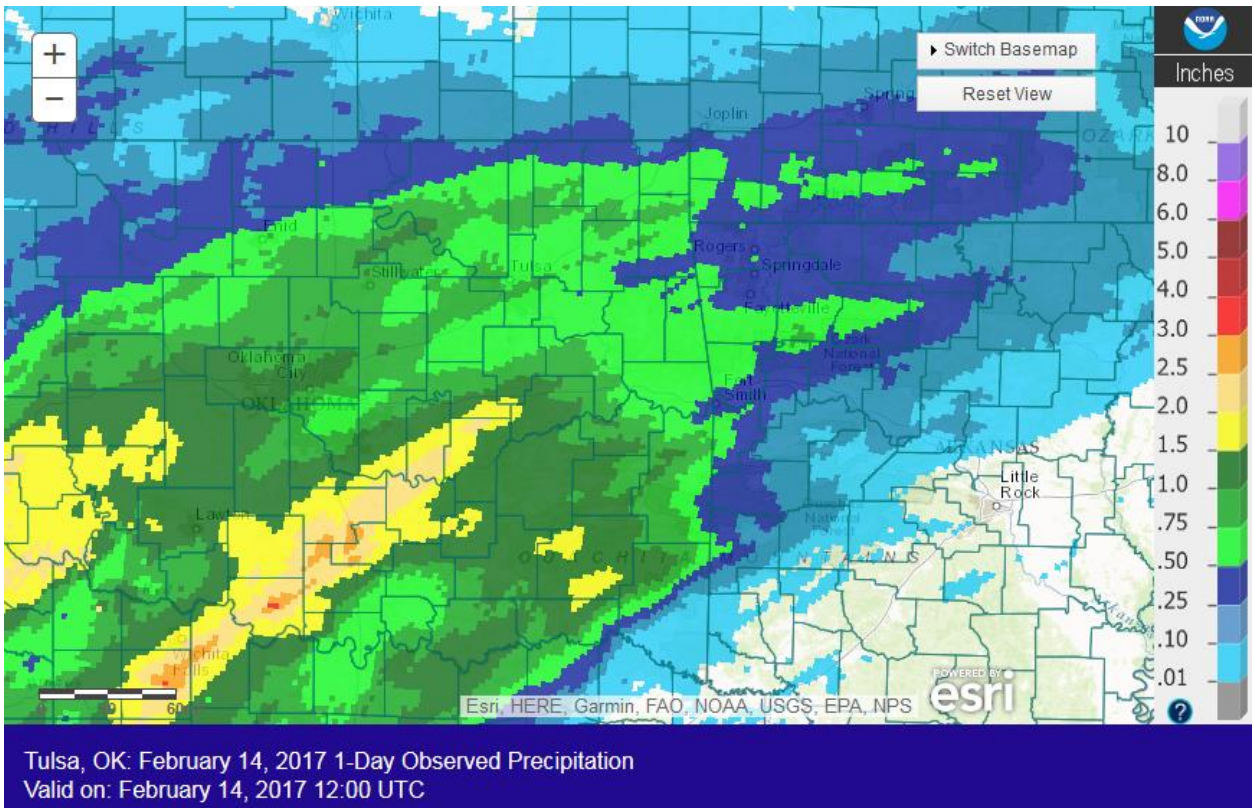


Fig. 6. 24-hour Estimated Observed Rainfall ending at 6am CST 2/14/2017.

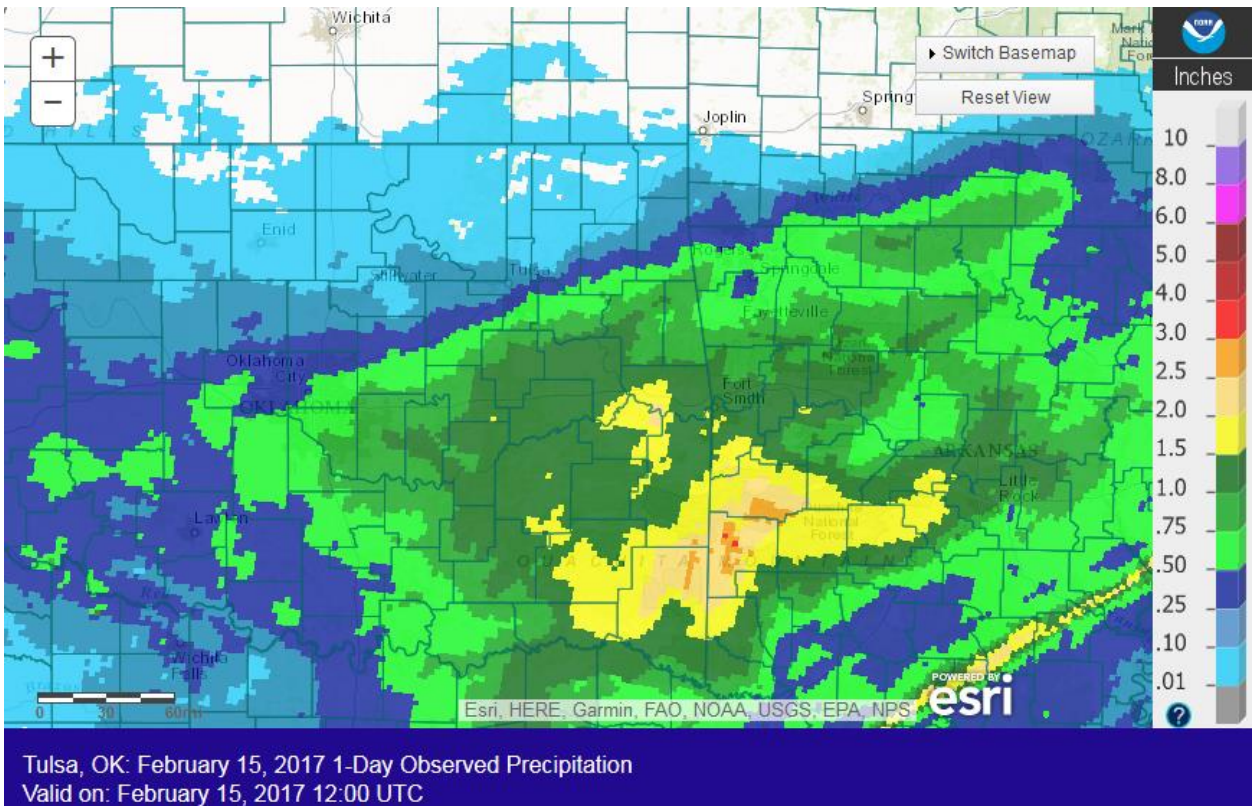


Fig. 7. 24-hour Estimated Observed Rainfall ending at 6am CST 2/15/2017.

February 15-28

Light showers developed over southeast OK during the afternoon of the 17th as an upper-level low moved out of Texas. Spotty showers continued through the evening before dissipating. A few additional light to moderate showers affected locations near the east central OK/west central AR border during the morning hours. Most locations received less than 0.10" of rain, with a few isolated spots in Sequoyah, Le Flore, and Sebastian Counties seeing 0.10"-0.50" of rain.

A strong upper-level storm system affected the southern plains on the 19th. Showers and thunderstorms developed over central OK during the evening hours and moved into the northwest portion of the HSA around midnight. A line of showers and isolated thunderstorms continued to move eastward during the night and through the morning hours of the 20th, bringing rain to much of eastern OK and northwest AR. Some light rain persisted over southeast OK and west central AR during the evening and late night hours. Rainfall totals ranged from 0.10" to near 1" across eastern OK and northwest AR (Figs. 8, 9). Some light rain continued on the back side of the upper-level system through the morning and early afternoon of the 21st, bringing an additional 0.25" or less to northwest AR.

Warm advection plus additional forcing from a passing upper-level wave resulted in very light rain across northeast OK during the morning hours of the 26th. Rainfall amounts were only a trace to a few hundredths of an inch.

Early on the 27th, isolated storms developed along an elevated frontal zone across southeast OK. This activity moved northeast across far eastern OK and northwest AR through the morning hours. A few additional diurnal storms affected east central OK and west central AR for a couple of hours during the evening. Rainfall totals remained light, with most affected locations receiving less than 0.25" of rain.

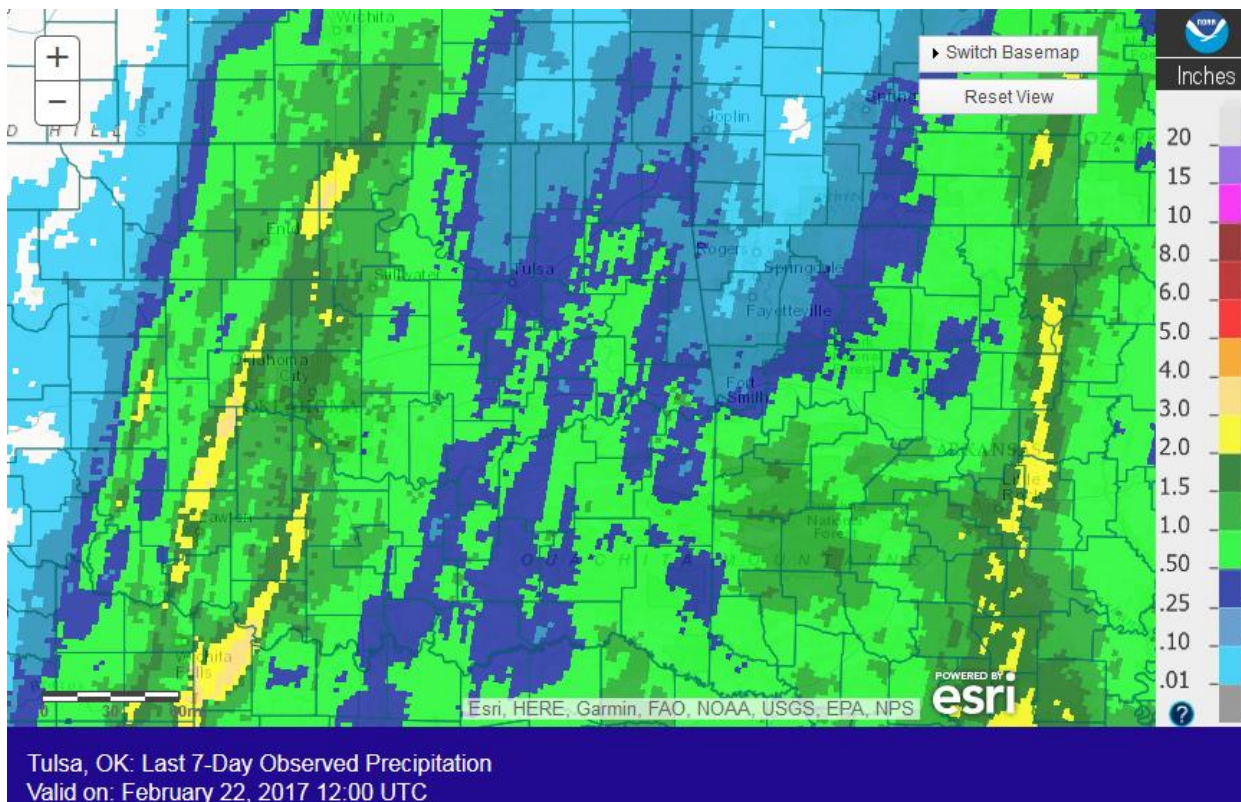


Fig. 8. 7-day Estimated Observed Rainfall ending at 6am CST 2/22/2017.

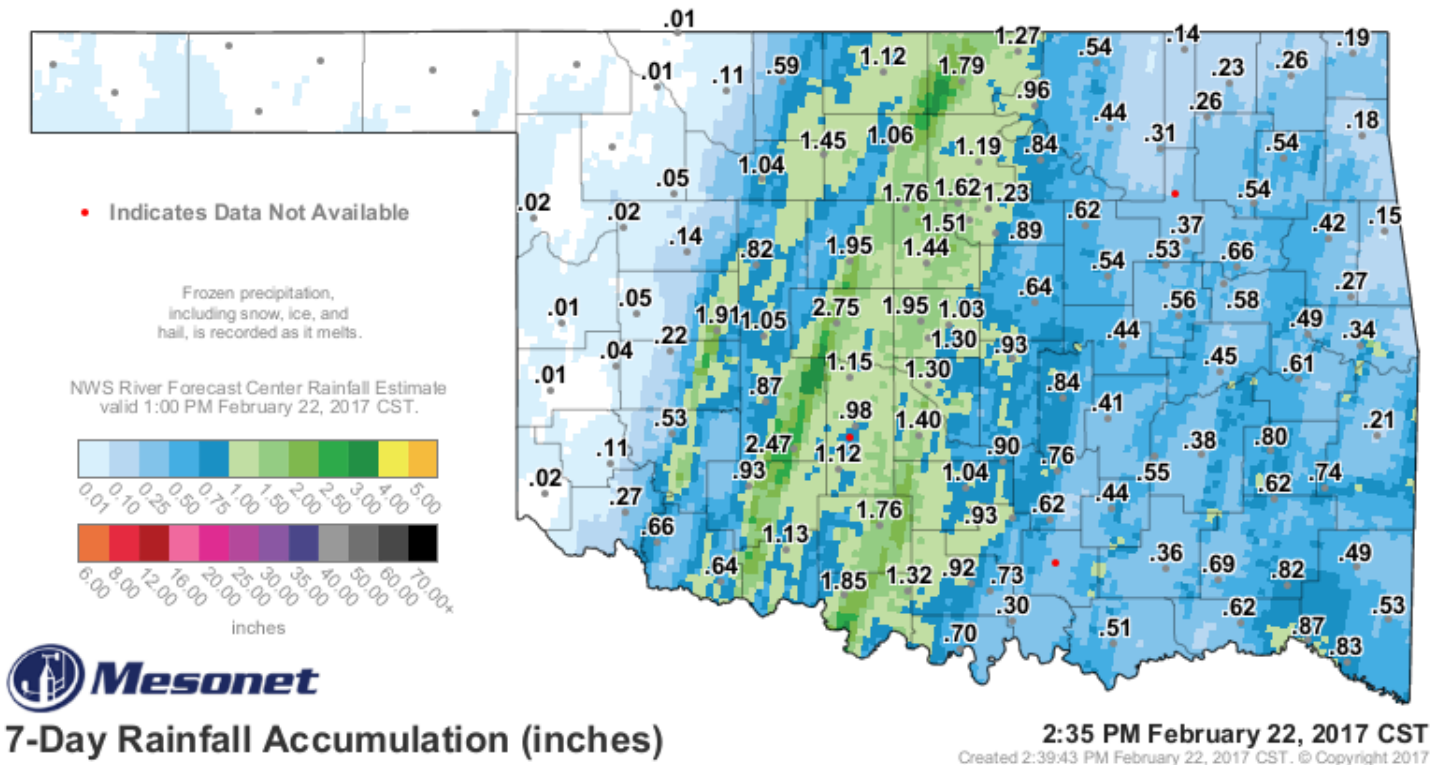


Fig. 9. 7-Day Estimated Observed Rainfall (image) and OK Mesonet measurements ending at 2:35pm CST 02/22/2017.



Fig. 10. 24-hour Estimated Observed Rainfall ending at 6am CST 3/01/2017.

On the afternoon of the 28th, showers and thunderstorms developed over northwest AR and quickly moved into MO. A line of thunderstorms developed along a cold front and then tracked into northeast OK along the OK/KS border just before midnight, moving east into northwest AR. Concurrently, a second line of thunderstorms developed further south near the front over southeast OK around midnight and moved east into western AR. Both lines were east of the area by 3 am CST on March 1st. Some of these storms produced large hail and damaging winds in the HSA. Due to their fast movement, overall rainfall totals were light at around 0.50" or

less (Fig. 10). However, 0.50"-1" of rain fell over Pittsburg County. This storm system went on to produce damaging severe and tornadic thunderstorms across the Ohio and Tennessee Valleys.

Written by:

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Products issued in February 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