

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 January	YEAR 2023
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 February 10, 2023	

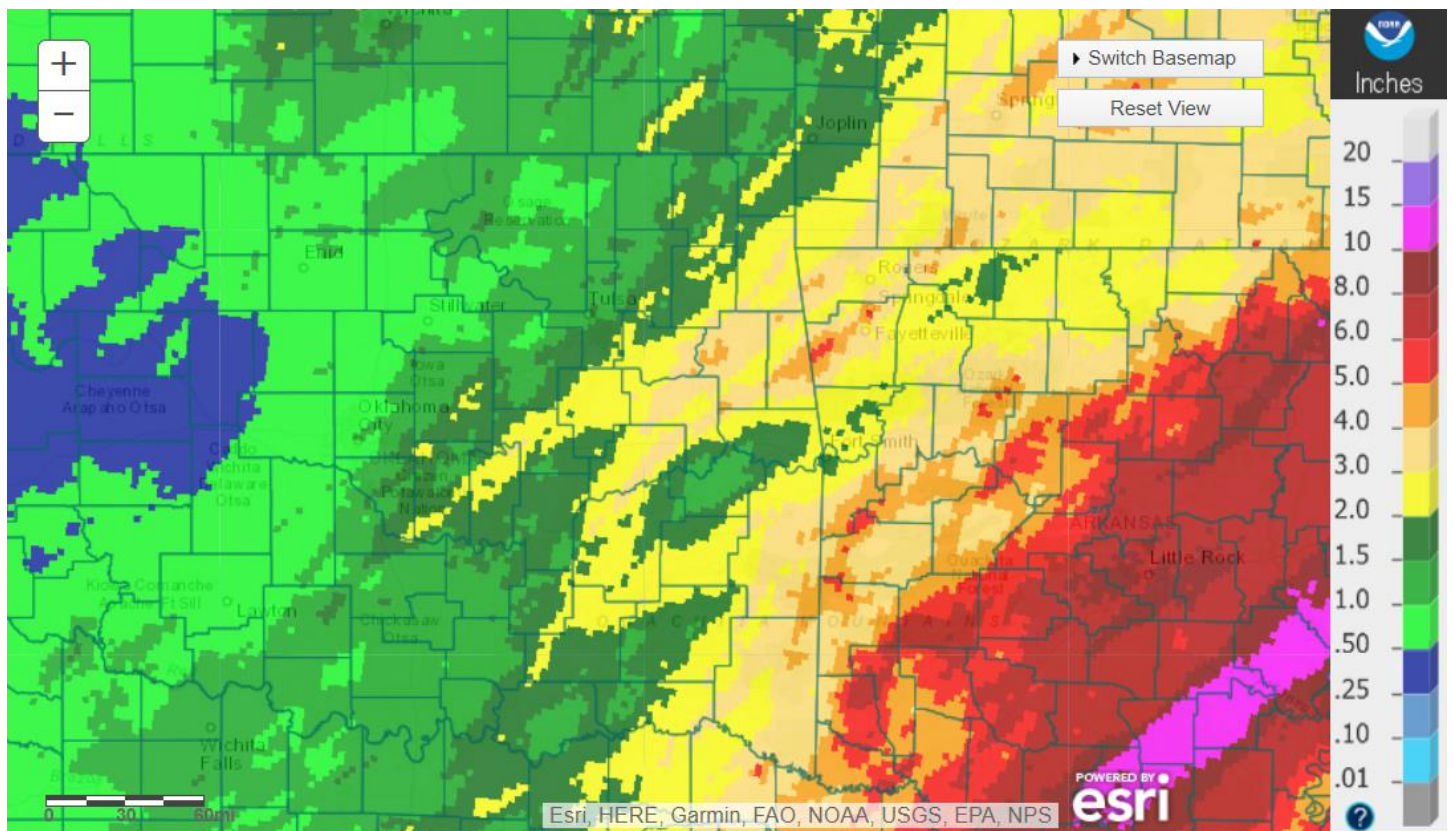
When no flooding occurs, include miscellaneous river conditions, such as significant rises, record low stages, ice conditions, snow cover, droughts, and hydrologic products issued (NWS Instruction 10-924)

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

Overall, January 2023 was a warm month, with the average temperature well above normal. However, cold air at the end of the month brought about a few rounds of wintery weather. 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 https://www.weather.gov/tsa/climo_summary_e5list.

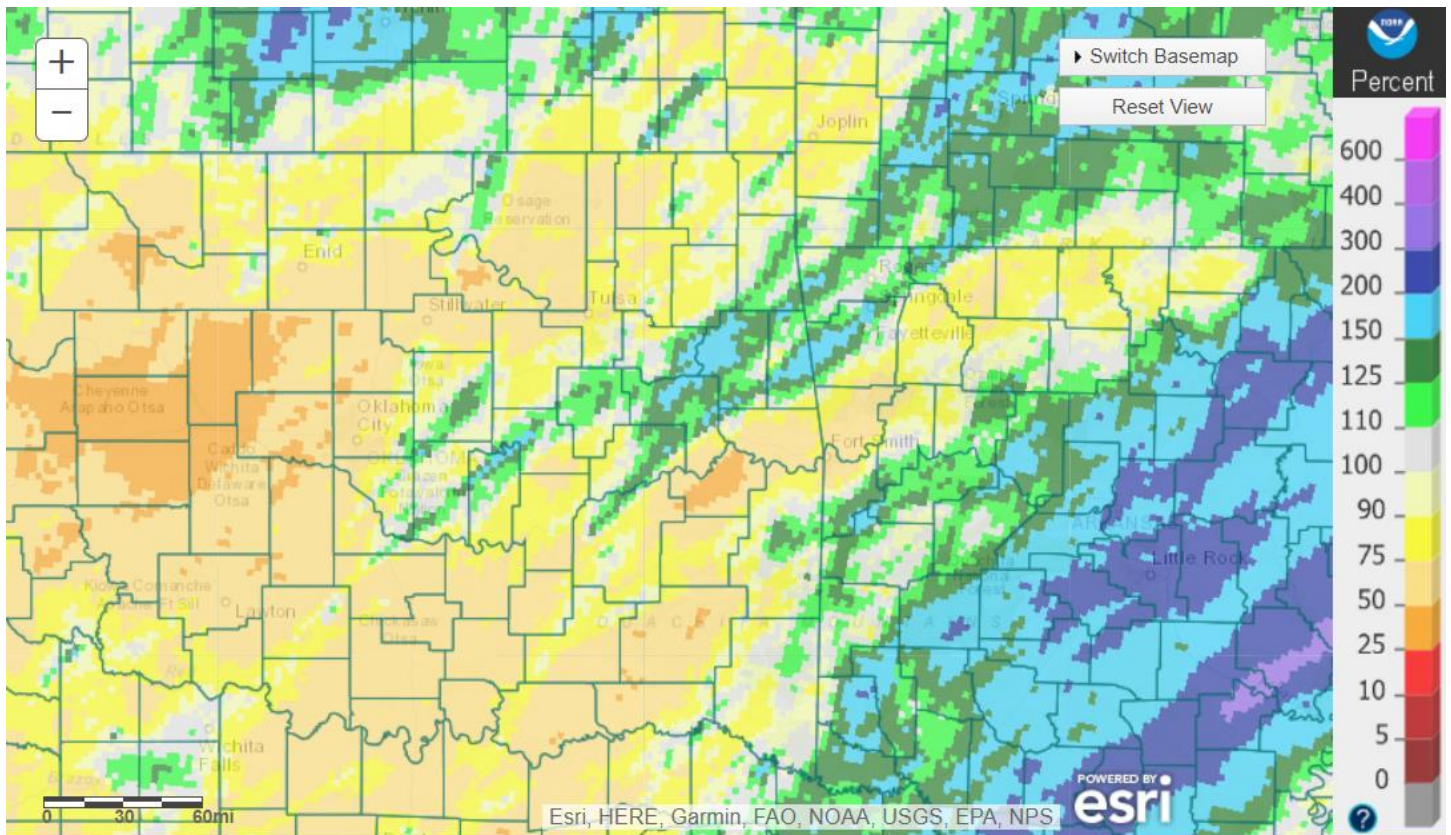
Monthly Summary

Using the radar-derived estimated observed precipitation from the RFCs (Fig. 1a), rainfall totals for January 2023 ranged from 0.5" to around 5" across eastern OK and northwest AR, with much of the area receiving 1"-3". These rainfall totals correspond to 25% to 200% of the normal January rainfall, though the majority of the area was below normal for the month (Fig. 1b).



Tulsa, OK: January, 2023 Monthly Observed Precipitation
 Valid on: February 01, 2023 12:00 UTC

Fig. 1a. Estimated Observed Rainfall for January 2023



Tulsa, OK: January, 2023 Monthly Percent of Normal Precipitation
Valid on: February 01, 2023 12:00 UTC

Fig. 1b. Estimated % of Normal Rainfall for January 2023

In Tulsa, OK, January 2023 ranked as the 17th warmest January (41.9°F; since records began in 1905), the 66th driest January (1.33", tied 1962; since records began in 1888), and the 42nd least snowy January (0.5", tied 2012, 1935, 1907; since records began in 1900). Fort Smith, AR had the 12th warmest January (45.3°F; since records began in 1883), the 57th driest January (1.93", tied 1977; since records began in 1883), and the 26th snowiest January (4.0", tied 2010; since records began in 1884). Fayetteville, AR had the 6th warmest (41.7°F), the 15th wettest (3.40"), and the 5th snowiest (9.0") January since records began in 1950.

Some of the larger precipitation reports (in inches) for January 2023 included:

Eureka Springs 1.4WSW, AR (coco)	4.71	Springdale 0.6E, AR (coco)	4.45	Ozark 4.6, AR (coco)	4.44
Bella Vista 2.2E, AR (coco)	4.12	Holiday Island 1.3SSW, AR (coco)	3.95	Glade 1.9WSW, AR (coco)	3.68
Hulbert 3.9N, OK (coco)	3.62	Fayetteville Exp. Station, AR (coop)	3.59	Decatur 2.6ESE, AR (coco)	3.45

Some of the lowest precipitation reports (in inches) for January 2023 included:

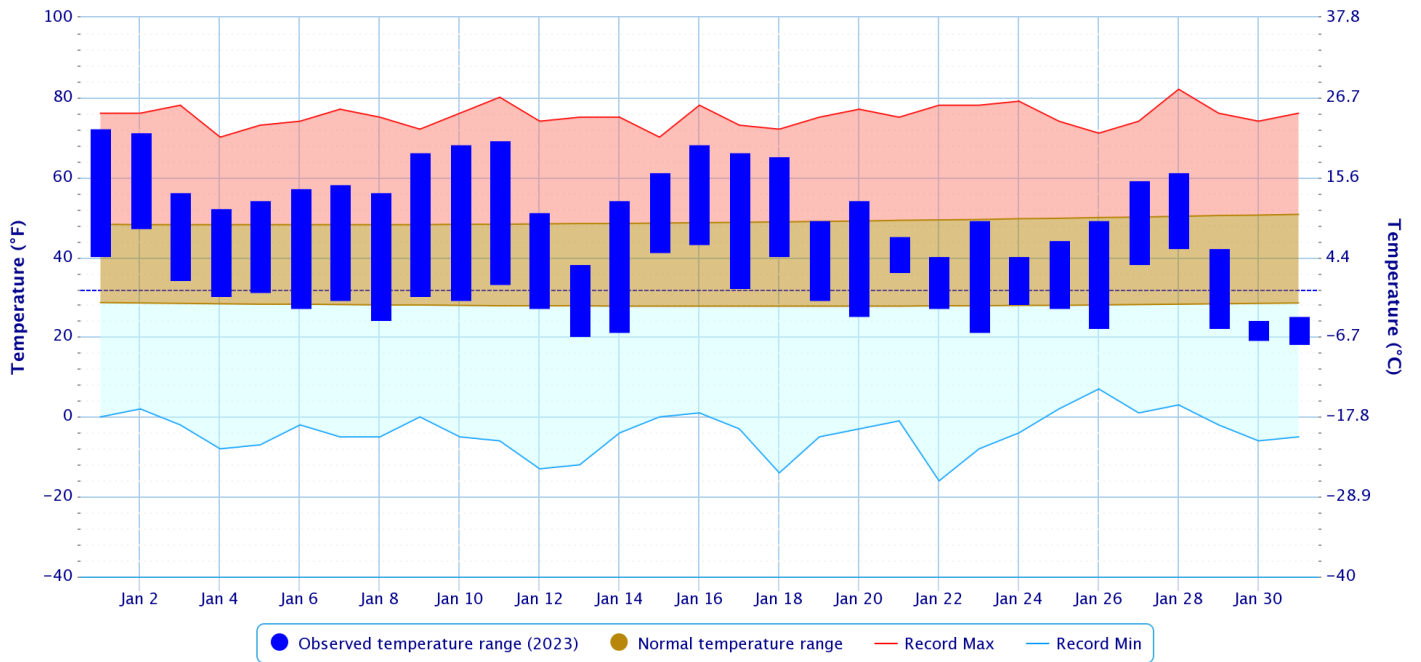
Bartlesville, OK (ASOS)	0.75	Copan, OK (meso)	0.80	Foraker, OK (meso)	0.87
Pawnee, OK (meso)	0.94	Bristow, OK (meso)	1.00	Ochelata 5.6N, OK (coco)	1.01
Nowata, OK (meso)	1.10	Stigler, OK (meso)	1.12	Talala, OK (meso)	1.14

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

Rank since 1921	January 2023	Winter-to-Date (Dec 1 – Jan 31)	Cool Growing Season (Sep 1 – Jan 31)	Last 90 Days (Nov 3 – Jan 31)	Last 180 Days (Aug 5 – Jan 31)	Water Year-to-Date (Oct 1 – Jan 31)	Last 365 Days (Feb 1, 2022 – Jan 31, 2023)
Northeast OK	49 th driest	42 nd wettest	23 rd driest	39 th wettest	15 th driest	42 nd driest	28 th driest
East Central OK	50 th wettest	38 th wettest	43 rd driest	24 th wettest	44 th driest	35 th wettest	37 th wettest
Southeast OK	42 nd driest	36 th driest	43 rd driest	50 th wettest	44 th driest	42 nd wettest	36 th driest
Statewide	44 th driest	48 th driest	24 th driest	41 st wettest	24 th driest	45 th wettest	23 rd driest

Daily Temperature Data – Tulsa Area, OK (ThreadEx)

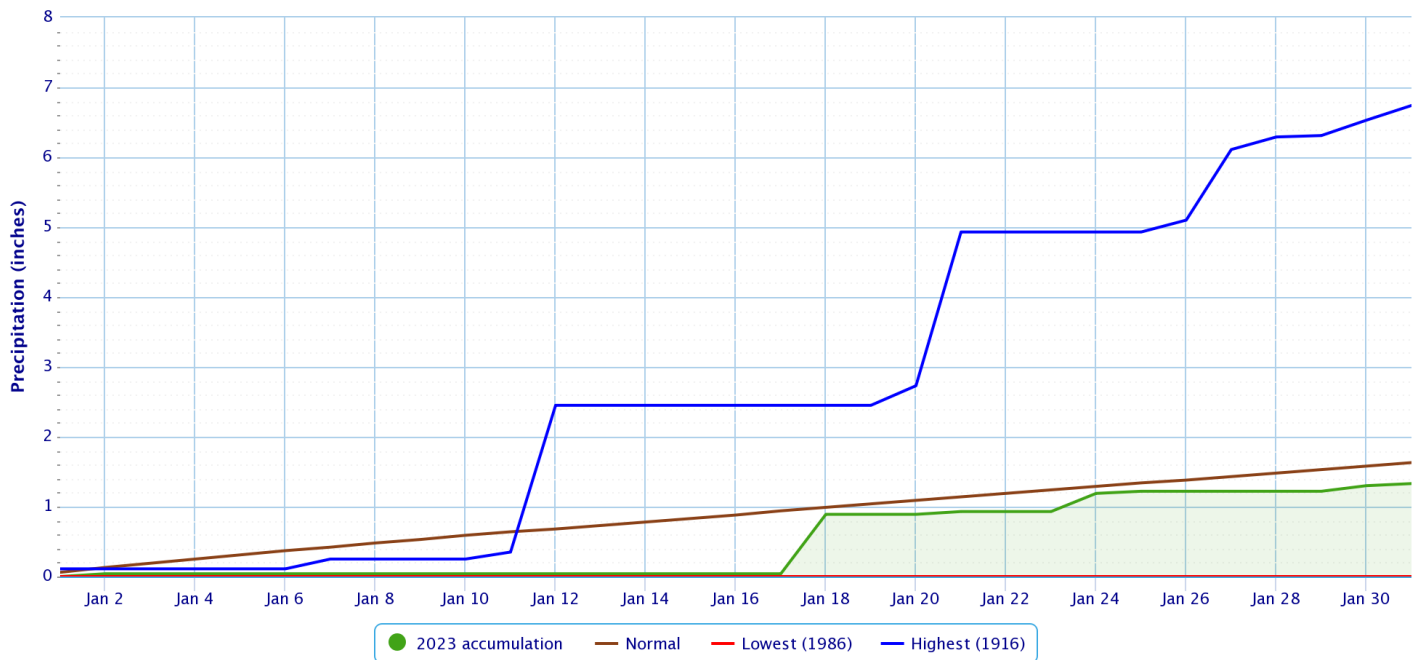
Period of Record – 1905-01-06 to 2023-02-08. Normals period: 1991-2020. Click and drag to zoom chart.



Powered by ACIS

Accumulated Precipitation – Tulsa Area, OK (ThreadEx)

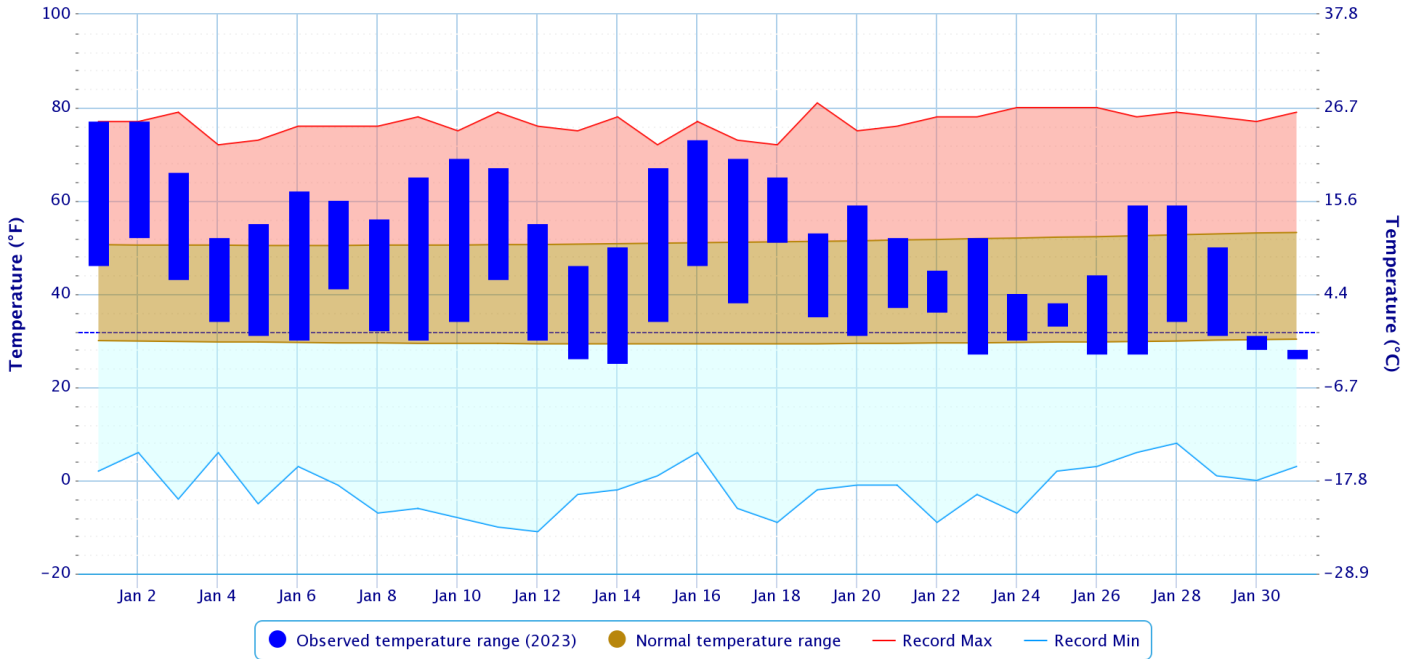
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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

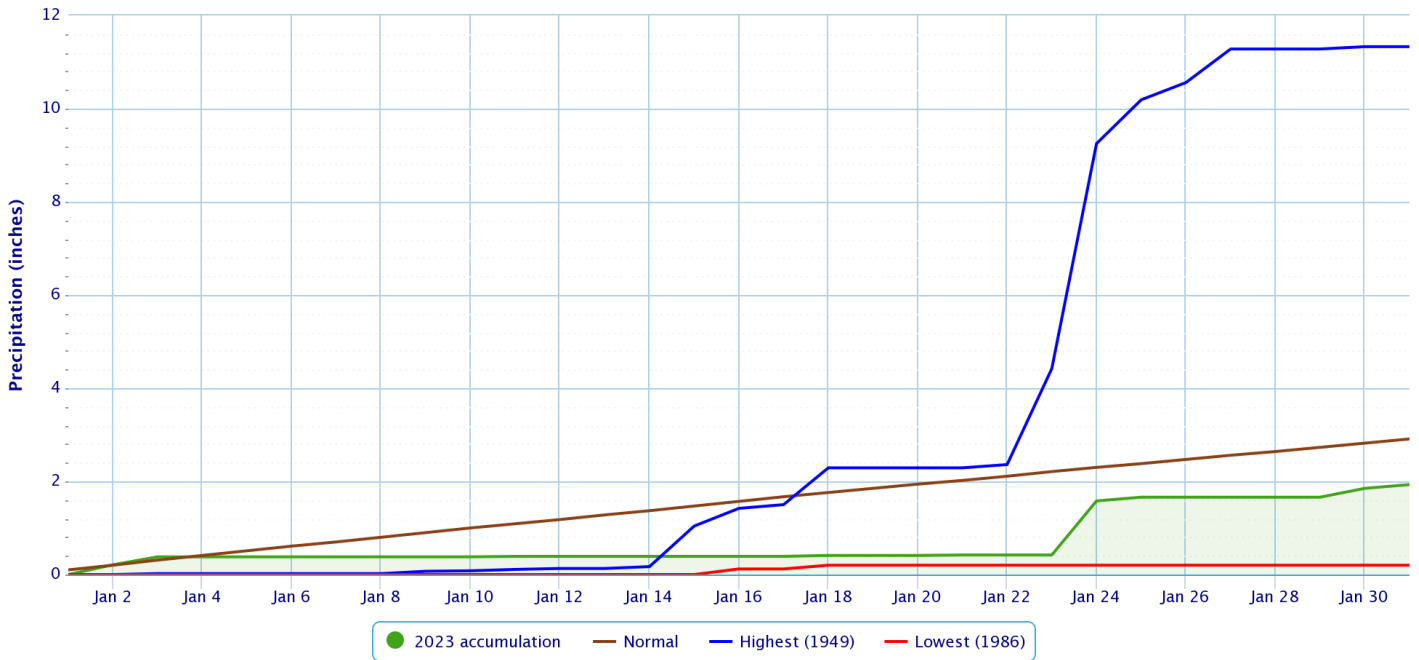
Period of Record – 1882-06-01 to 2023-02-08. Normals period: 1991-2020. Click and drag to zoom chart.



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Accumulated Precipitation – Fort Smith Area, AR (ThreadEx)

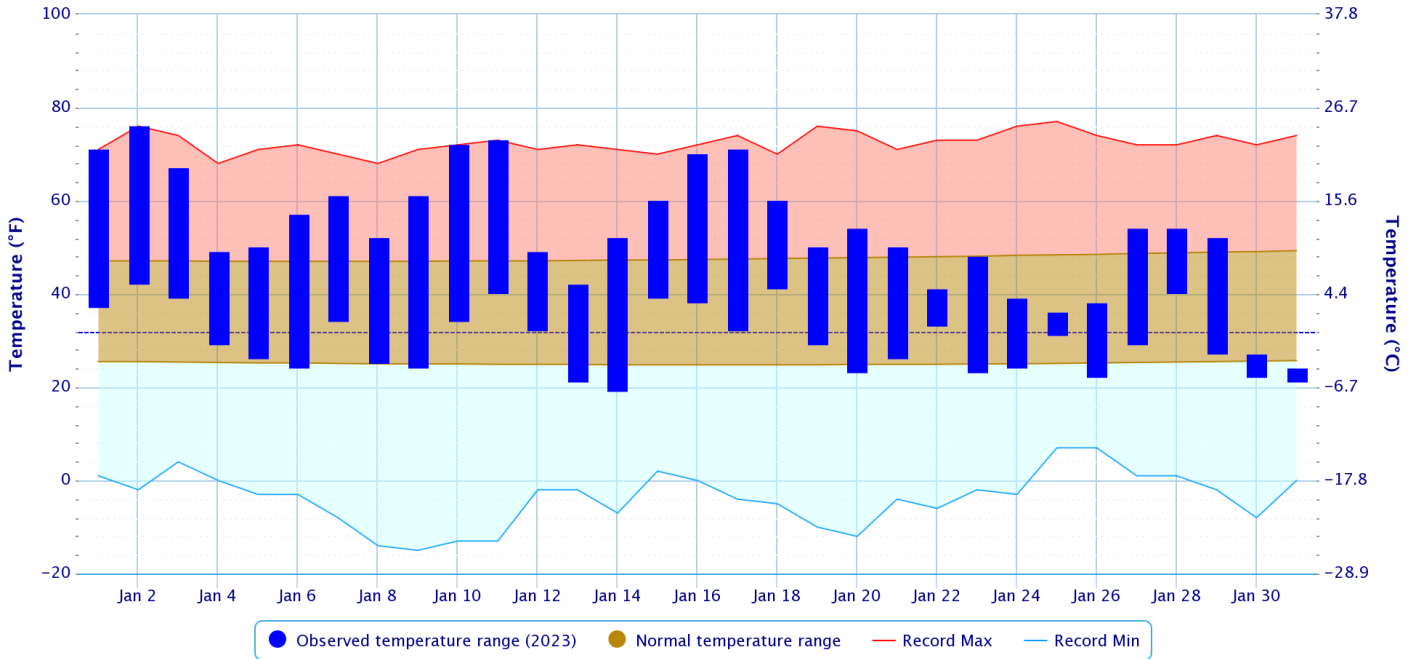
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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Daily Temperature Data – FAYETTEVILLE DRAKE FIELD, AR

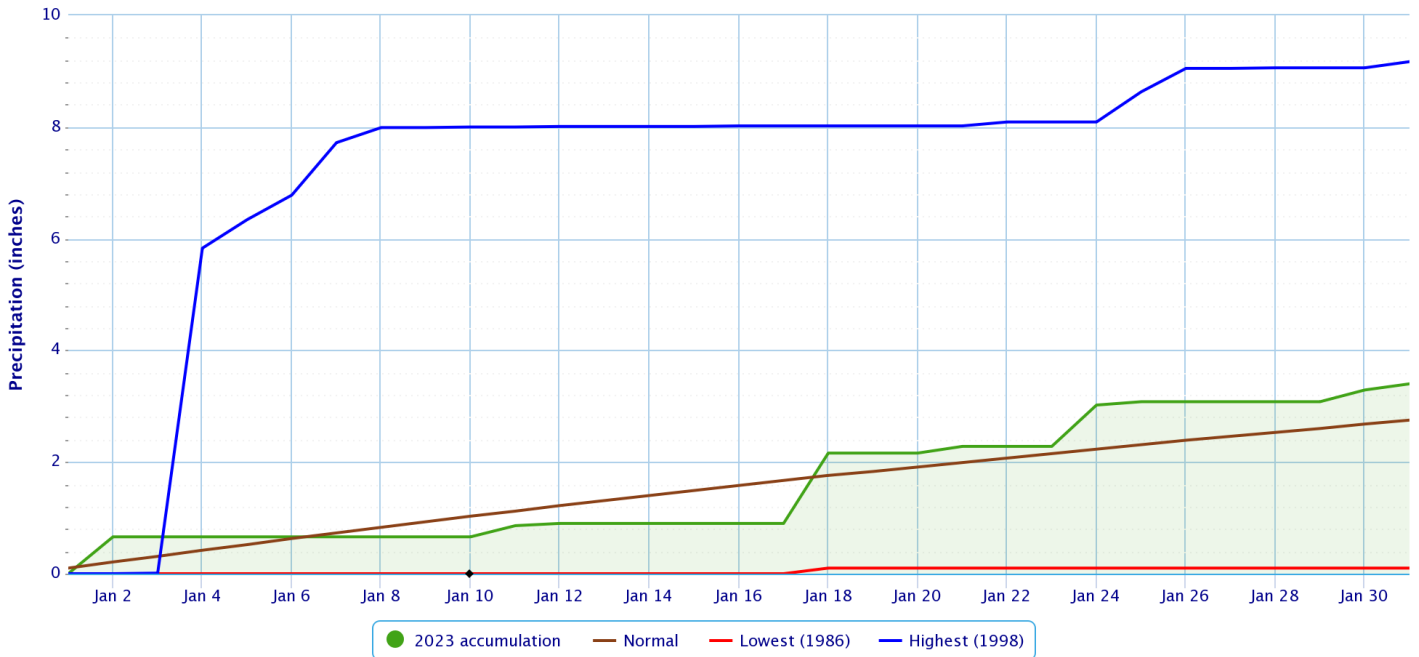
Period of Record – 1949-07-14 to 2023-02-08. Normals period: 1991-2020. Click and drag to zoom chart.



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Accumulated Precipitation – FAYETTEVILLE DRAKE FIELD, AR

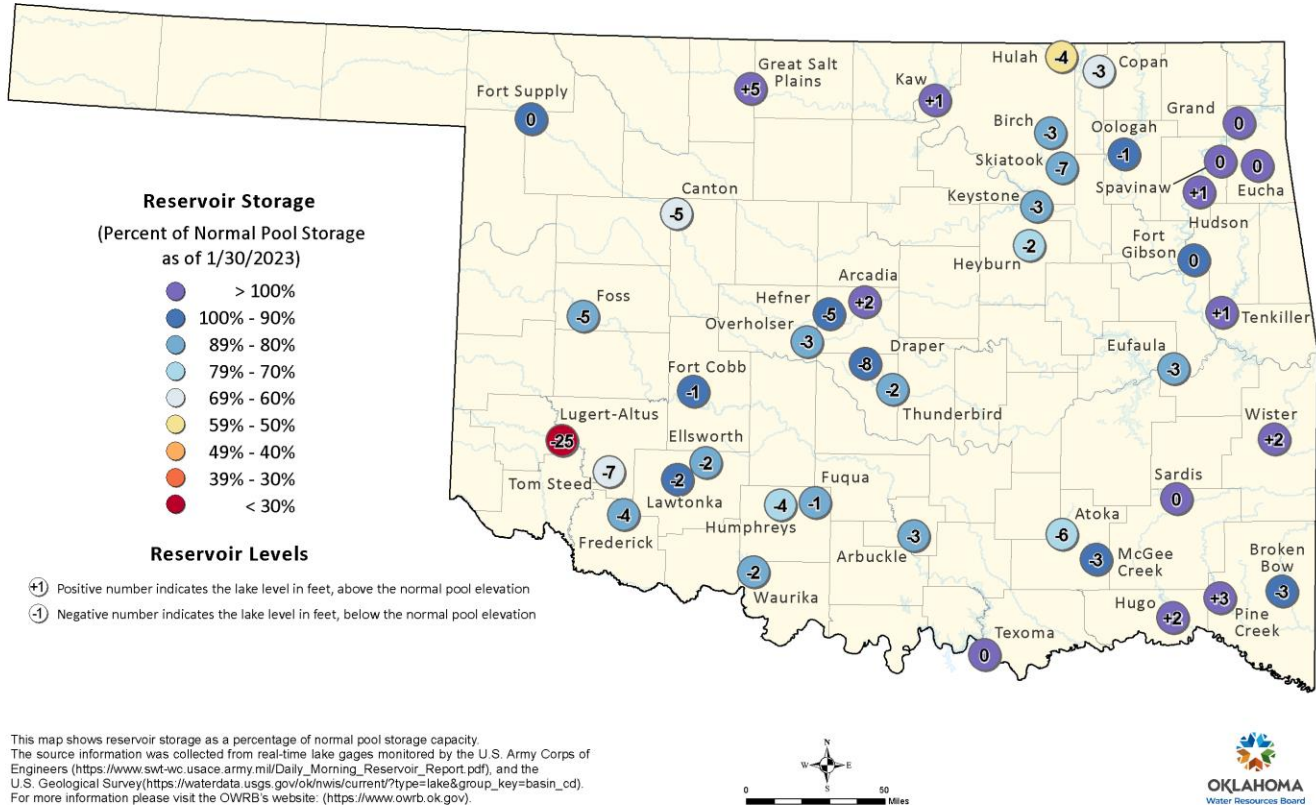
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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Reservoirs

Oklahoma Reservoir Levels and Storage as of 1/30/2023



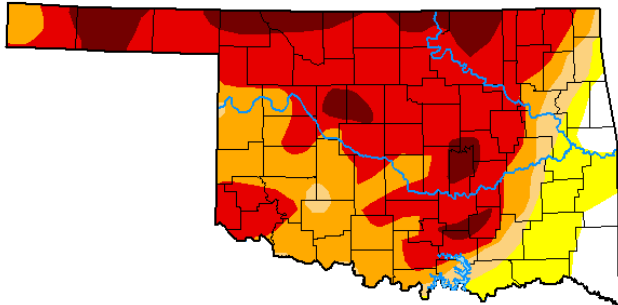
According to the USACE, many of the lakes in the HSA were below 3% of top of their conservation pools as of 02/01/2023: Hulah Lake 52%, Heyburn Lake 58%, Copan Lake 65%, Keystone Lake 75%, Eufaula Lake 77%, Birch Lake 78%, Skiatook Lake 79%, Ft. Gibson Lake 92%, Oologah Lake 92%, and Beaver Lake 95%. Two lakes were above 3% of the top of their conservation pools: Hudson Lake 4% and Wister 5%.

Drought

According to the [U.S. Drought Monitor](#) (USDM) from January 31, 2023 (Figs. 2, 3), Exceptional (D4) Drought conditions remained across portions of eastern Kay, Osage, and Okfuskee Counties in eastern OK. Extreme (D3) Drought conditions were occurring in portions of Osage, Pawnee, Craig, Ottawa, Rogers, Mayes, Wagoner, Tulsa, Creek, Okfuskee, Okmulgee, Muskogee, McIntosh, and Pittsburg Counties in eastern Oklahoma. Severe (D2) Drought conditions exist in portions of Muskogee, Wagoner, Rogers, Mayes, Delaware, Ottawa, McIntosh, and Pittsburg Counties in eastern Oklahoma. Moderate (D1) Drought conditions were present in portions of Ottawa, Delaware, Mayes, Cherokee, Wagoner, Cherokee, Muskogee, McIntosh, and Pittsburg Counties in eastern OK. Abnormally Dry (D0) but not in drought areas included Delaware, Cherokee, Muskogee, Haskell, Latimer, Sequoyah, Le Flore, Pittsburg, Pushmataha, and Choctaw Counties in eastern Oklahoma, and Benton and Sebastian Counties in northwest Arkansas.

U.S. Drought Monitor Oklahoma

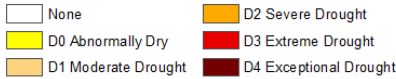
January 31, 2023
(Released Thursday, Feb. 2, 2023)
Valid 7 a.m. EST



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	5.16	94.84	84.95	79.21	55.71	10.17
Last Week 01-24-2023	2.04	97.96	89.12	81.01	57.90	11.77
3 Months Ago 11-01-2022	0.00	100.00	100.00	97.43	66.77	21.06
Start of Calendar Year 01-03-2023	1.82	98.18	89.73	80.92	56.13	11.65
Start of Water Year 09-27-2022	0.00	100.00	99.88	94.44	64.44	17.25
One Year Ago 02-01-2022	3.91	96.09	88.62	77.66	49.17	2.90

Intensity:



The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>

Author:

Rocky Bilotta
NCEI/NOAA

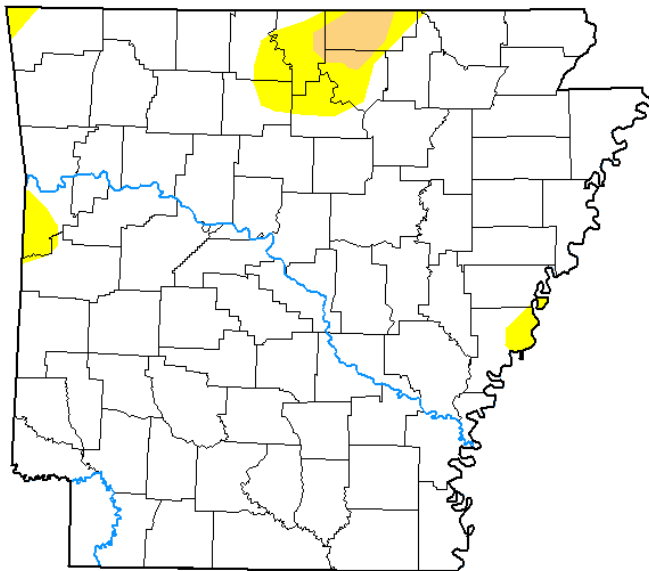


droughtmonitor.unl.edu

Fig. 2. Drought Monitor for Oklahoma

U.S. Drought Monitor Arkansas

January 31, 2023
(Released Thursday, Feb. 2, 2023)
Valid 7 a.m. EST



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	94.66	5.34	1.13	0.00	0.00	0.00
Last Week 01-24-2023	79.55	20.45	1.14	0.00	0.00	0.00
3 Months Ago 11-01-2022	0.00	100.00	99.97	65.99	8.79	0.00
Start of Calendar Year 01-03-2023	53.09	46.91	2.26	0.00	0.00	0.00
Start of Water Year 09-27-2022	4.99	95.01	69.68	39.30	2.96	0.00
One Year Ago 02-01-2022	57.18	42.82	29.99	19.32	3.78	0.00

Intensity:



The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>

Author:

Rocky Bilotta
NCEI/NOAA



droughtmonitor.unl.edu

Fig. 3. Drought Monitor for Arkansas

Outlooks

The [Climate Prediction Center](#) (CPC) outlook for February 2023 (issued January 31, 2023) indicates a slightly enhanced chance for above normal temperatures from southeast OK to northwest AR, and an equal chance for above, near, and below normal temperatures across northeast OK. This outlook also calls for an enhanced chance for above median precipitation across all of eastern OK and northwest AR. This outlook was largely based on dynamical model output and La Niña and Madden-Julian Oscillation (MJO) influences. The ENSO and MJO patterns are at odds with each other, which reduces the confidence in the outlook. However, the MJO is likely to be the stronger of the two patterns and the outlook reflects its influence more.

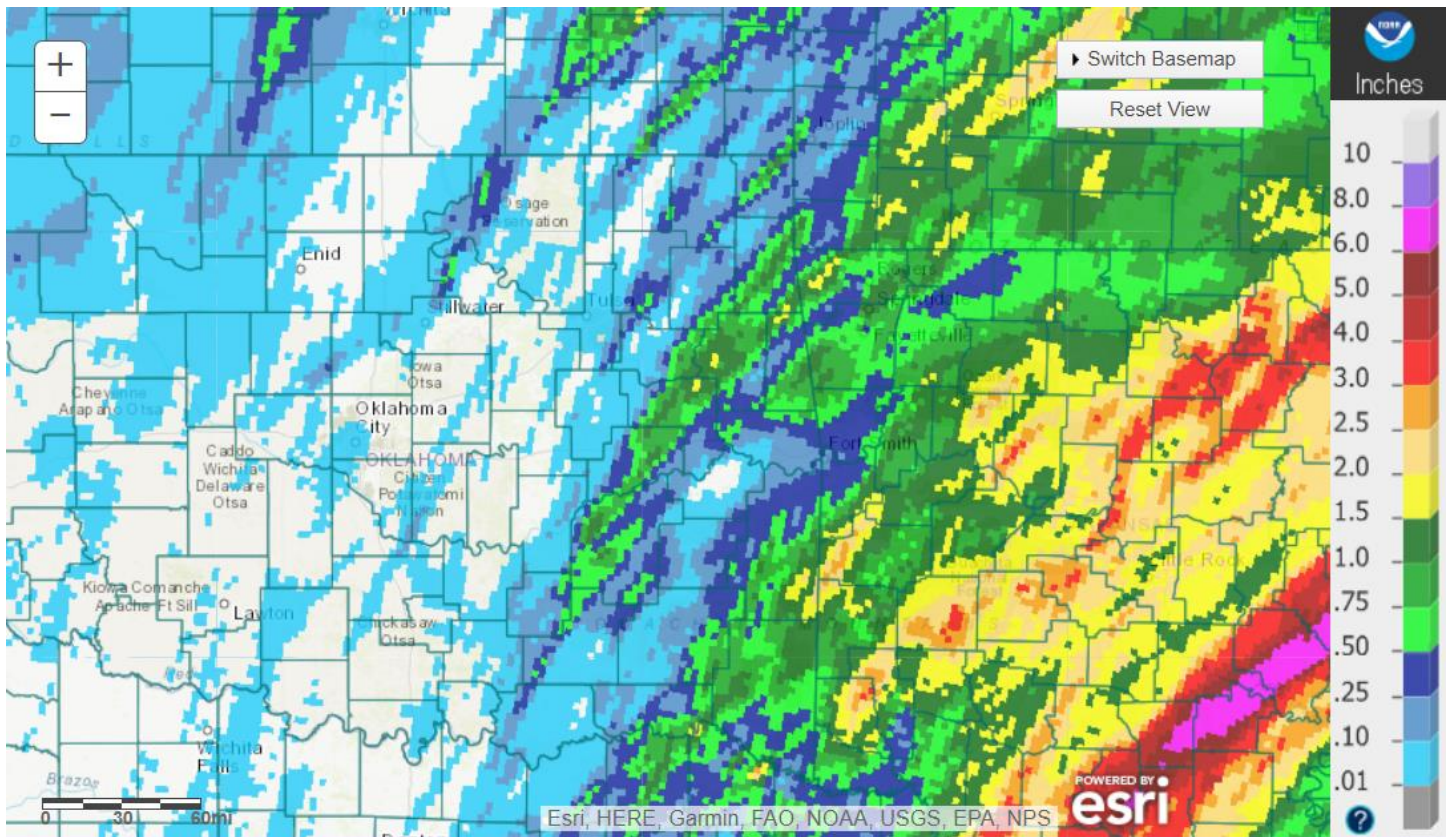
For the 3-month period February-March-April 2023, CPC is forecasting an equal chance for above, near, and below normal temperatures along the OK-KS state line, and a slightly enhanced chance for above normal temperatures across the remainder of eastern OK and northwest AR. This outlook also indicates a slightly enhanced chance for above median precipitation for northwest and west central AR, and equal chances for above, near, and below median rainfall across eastern OK (outlook issued January 19, 2023). This outlook is based on long-term trends, La Niña impacts, and incorporates both statistical and dynamical forecast tools. The potential for cold air outbreaks in the central plains remains for February and March. According to CPC, the combined effect of the ocean-atmosphere system remains consistent with La Niña conditions. La Niña conditions are expected to transition to ENSO-neutral with an 82% chance of ENSO-neutral by spring. CPC continues the La Niña Advisory.

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

Unseasonably warm, moist, and unstable air was in place across eastern OK and northwest AR on the 2nd, ahead of an approaching cold front and strong upper-level disturbance. Strong to severe thunderstorms developed into and across eastern OK and northwest AR during the afternoon and evening hours and moved eastward. The moderately unstable air, combined with strong deep-layer and low-level wind shear, resulted in the evolution of some of the thunderstorms into supercells. Several of these supercells produced tornadoes in OK, including 2 EF-1, 1 EF-0, and 2 EF-unknown tornadoes (see <https://arcg.is/8jKji> for details). This is the earliest in January that there has been a (recorded) tornado in the NWS Tulsa area (previous was January 7th, 2008). However, including this year, the NWS Tulsa area has now had tornadoes in 4 of the last 6 Januarys: 2 in 2018, 3 in 2020, 4 in 2021, and 5 in 2023. Since 1950, there have been a total of 34 tornadoes recorded in January. From 1950 through 2017 (68 Januarys), there were 6 Januarys that recorded tornadoes, and from 2000 through 2023 (24 Januarys), there have been 6 Januarys that have recorded tornadoes. Of the winter months (December, January, and February), it is more common to have a tornado in January than the other two winter months. Most of the storms shifted east of the area by midnight, though a few isolated thunderstorms continued for a couple more hours across southeast OK and west central AR. Rainfall totals ranged from around 0.10" to around 2" (Figs. 4, 5).

An upper-level wave moved into the Plains creating downstream lift that resulted in the development of showers across eastern OK during the late evening hours of the 17th. This activity continued to spread eastward into northwest AR after midnight. Thunderstorms developed during the overnight hours due to ample elevated instability, with the strongest storms affecting locations primarily north of I-40 and south of I-44. Around sunrise on the 18th, a cold front approached eastern OK and continued to move eastward across the area through the morning and early afternoon hours, bringing additional showers and thunderstorms. This activity weakened and moved east of the region by mid-afternoon. Rainfall totals were around 0.10" to 2.5" for most of eastern OK and northwest AR (Figs. 6, 7).

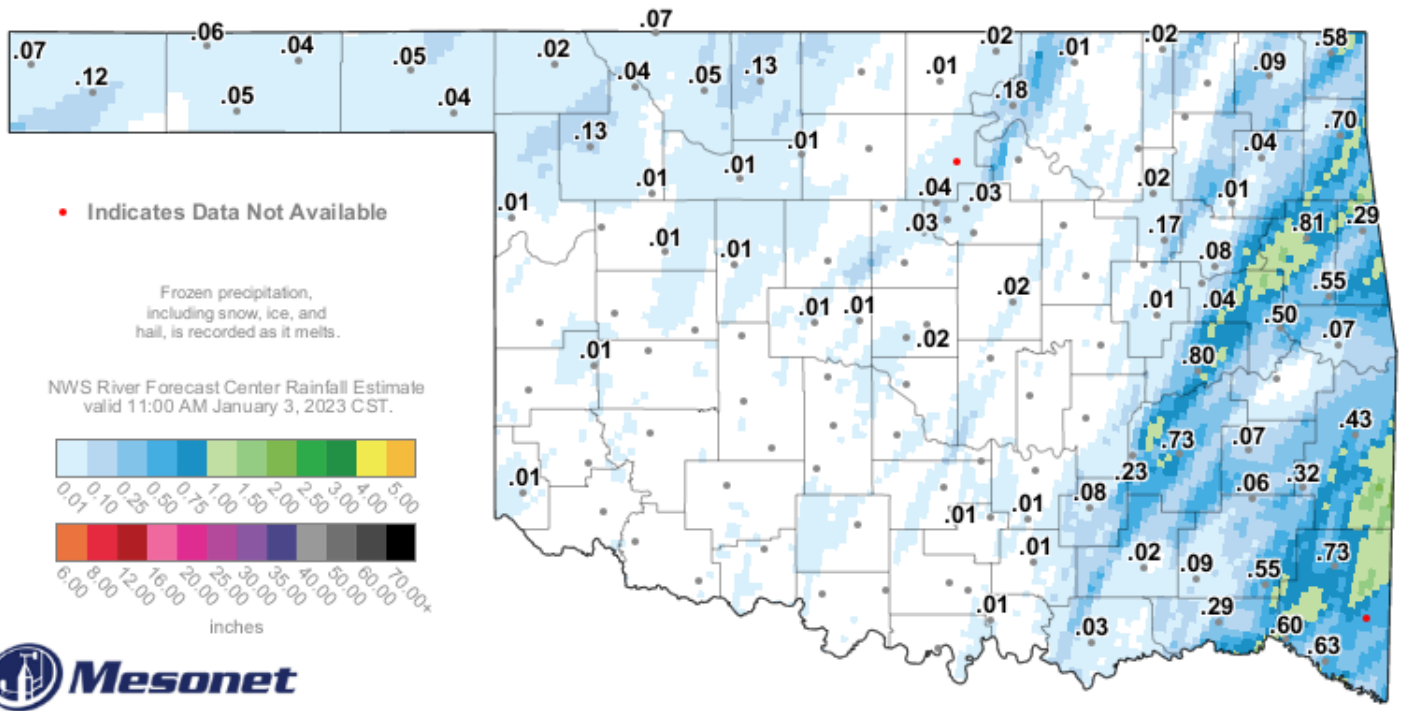
A strong upper-level disturbance translated from far west TX through the Southern Plains on the 24th through 25th. Widespread precipitation began as rain as it moved into the area during the morning of the 24th, but it then changed to snow during the afternoon and evening hours. Some of the snow was heavy at times, resulting in a swath of 4"-10" of snow from southeast/east central OK into northwest AR (Figs. 8, 9). After midnight, the precipitation began to quickly move northeast out of the area. Rainfall and liquid equivalent totals ranged from around 0.25" to near 2" (Fig. 10).



Tulsa, OK: January 03, 2023 1-Day Observed Precipitation

Valid on: January 03, 2023 12:00 UTC

Fig. 4. 24-hour Estimated Observed Rainfall ending at 6am CST 1/03/2023.



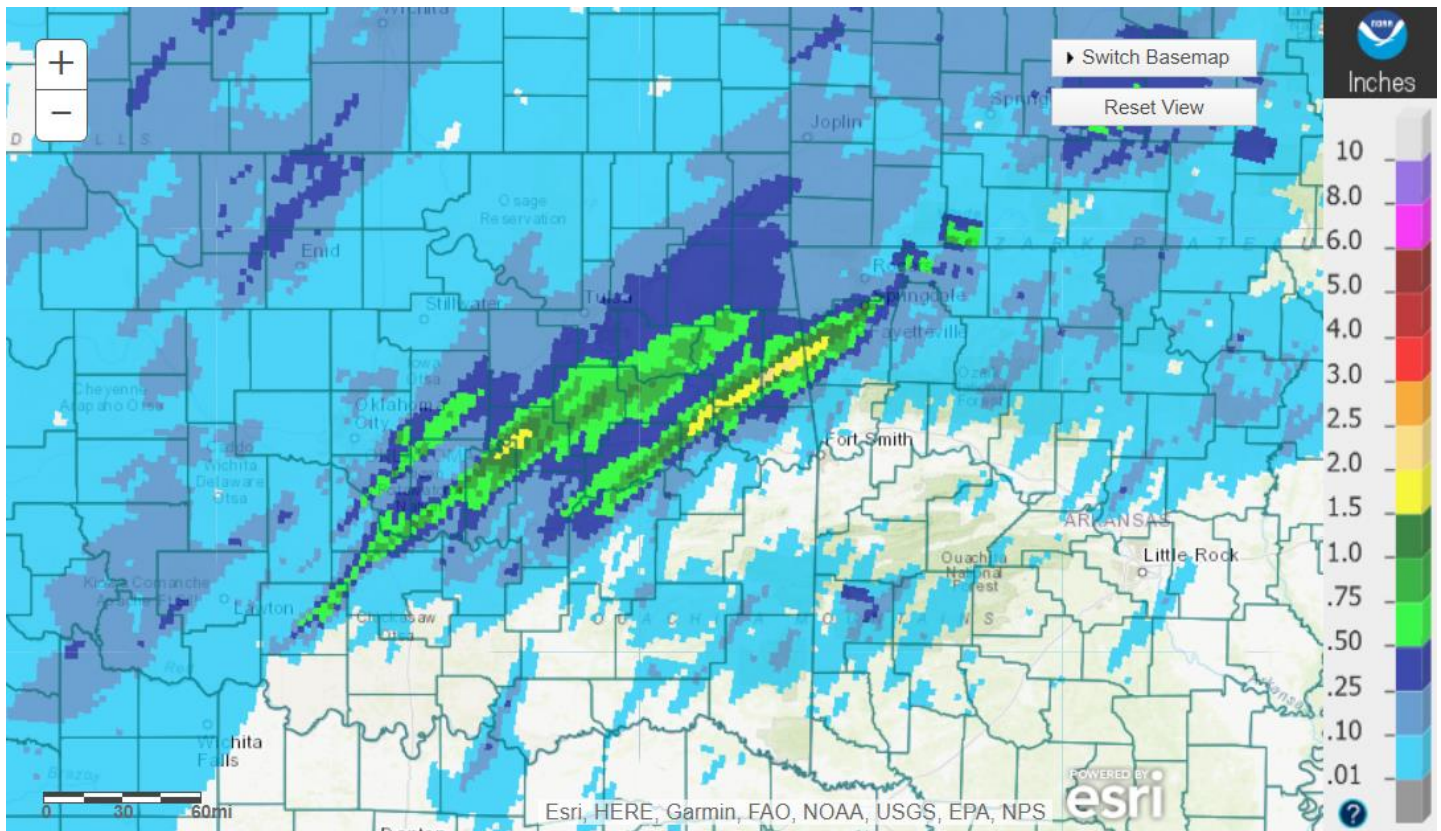
Mesonet

24-Hour Rainfall Accumulation (inches)

11:45 AM January 3, 2023 CST

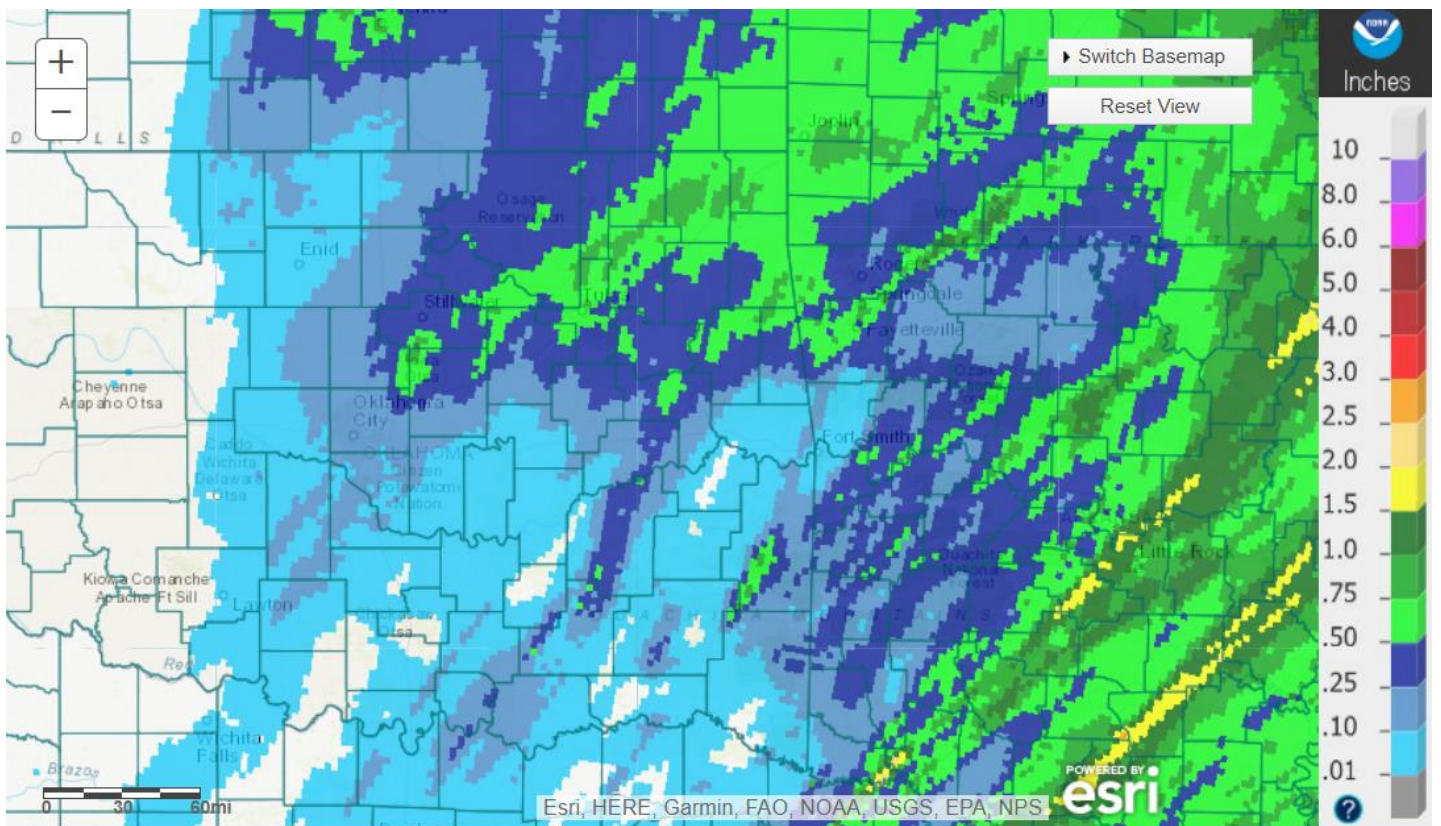
Created 11:50:55 AM January 3, 2023 CST. © Copyright 2023

Fig. 5. OK Mesonet (values) and NWS RFC rainfall estimate (image) 24-hour rainfall ending at 11:45 am CST 1/03/2023.



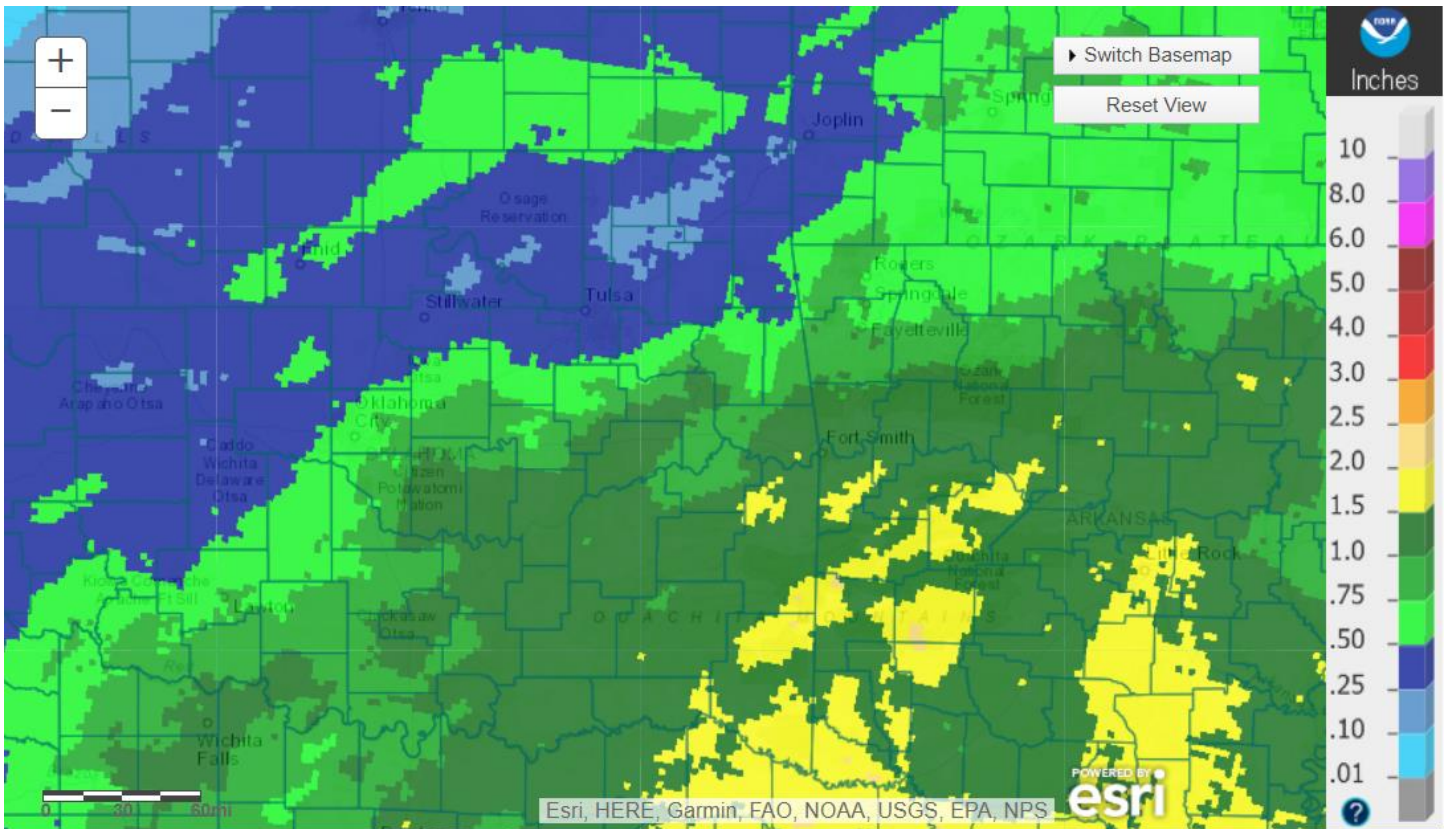
Tulsa, OK: January 18, 2023 1-Day Observed Precipitation
Valid on: January 18, 2023 12:00 UTC

Fig. 6. 24-hour Estimated Observed Rainfall ending at 6am CST 1/18/2023.



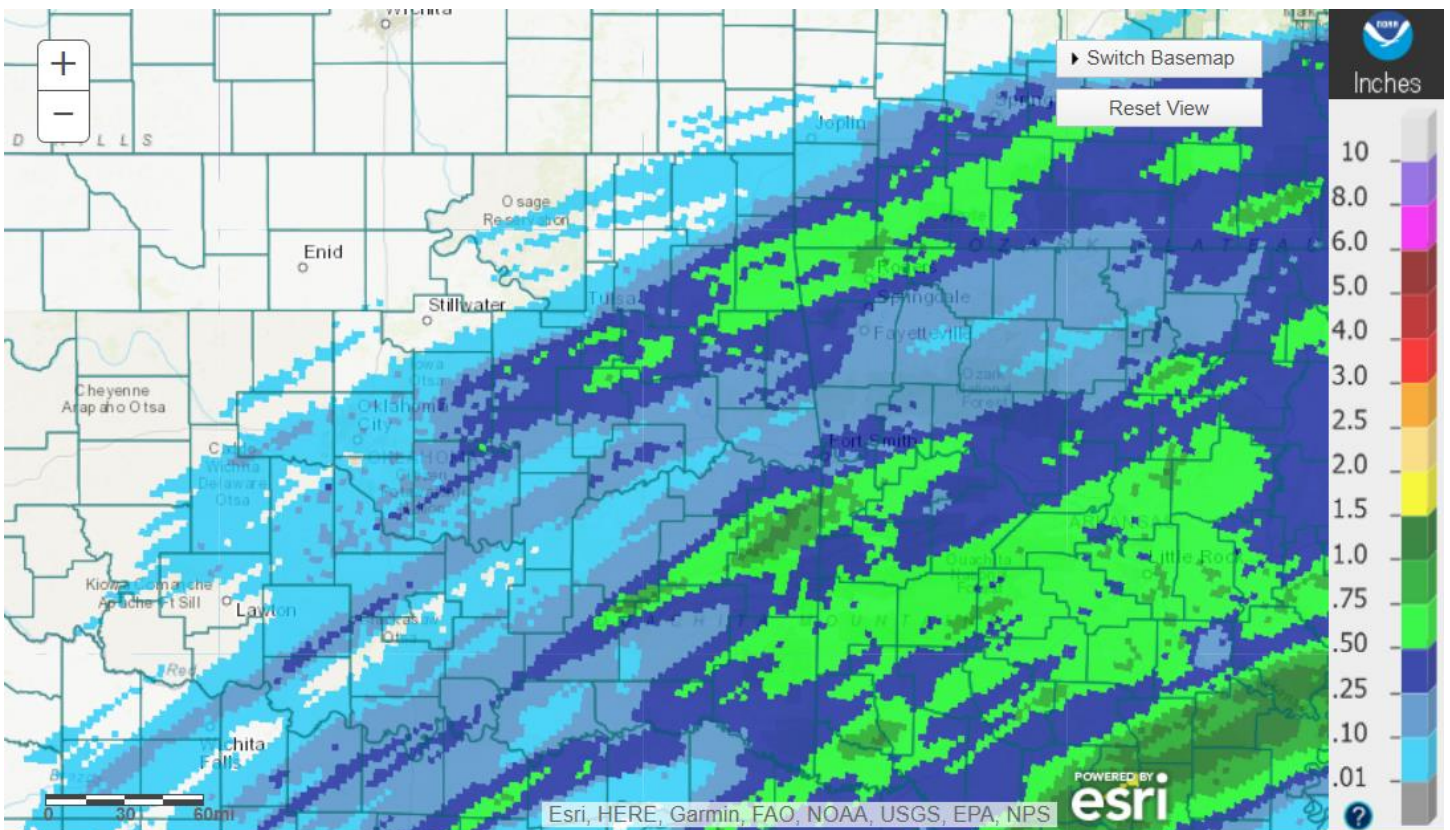
Tulsa, OK: January 19, 2023 1-Day Observed Precipitation
Valid on: January 19, 2023 12:00 UTC

Fig. 7. 24-hour Estimated Observed Rainfall ending at 6am CST 1/19/2023.



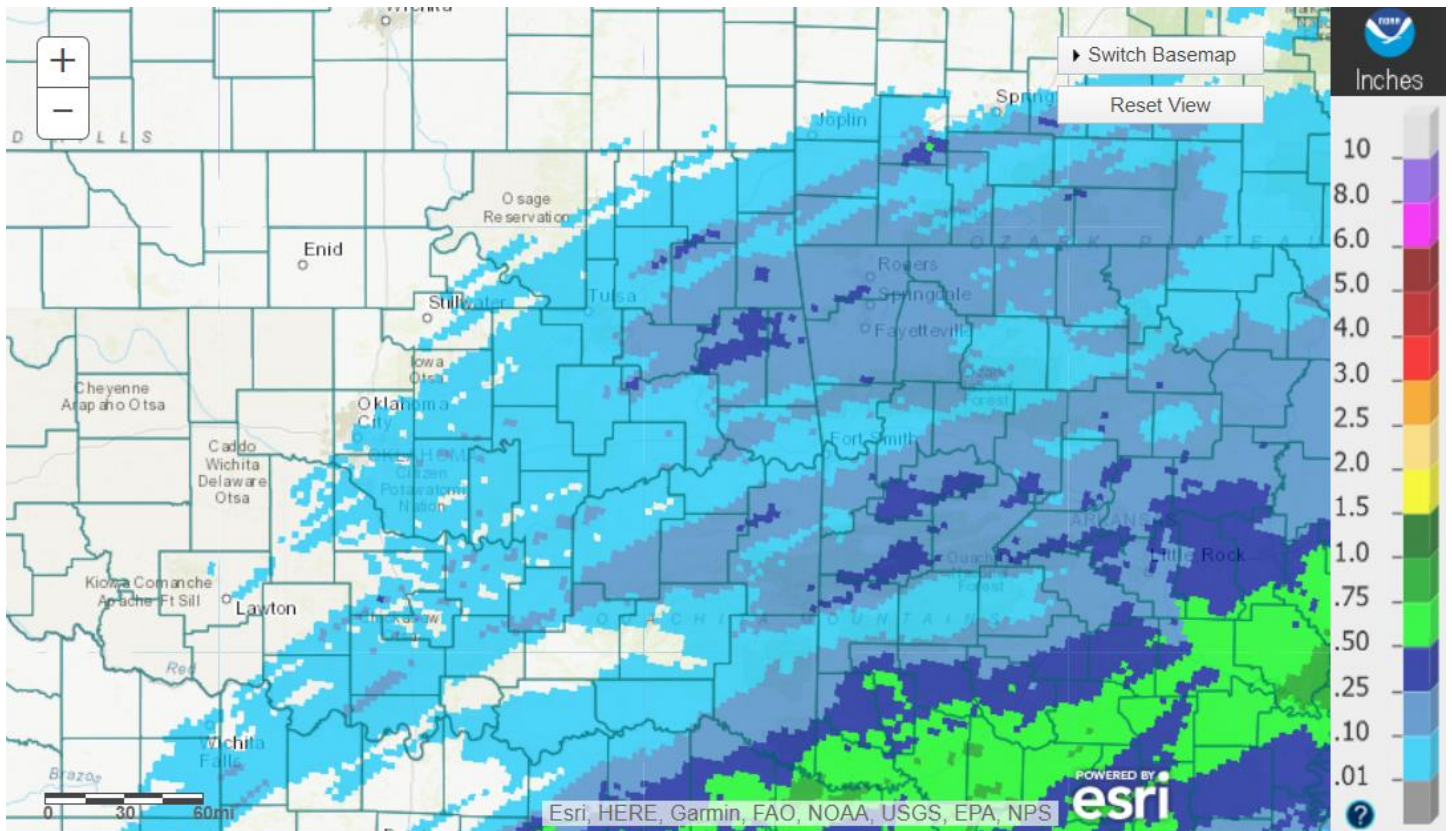
Tulsa, OK: January 25, 2023 1-Day Observed Precipitation
 Valid on: January 25, 2023 12:00 UTC

Fig. 10. 24-hour Estimated Observed Rainfall ending at 6am CST 1/25/2023.



Tulsa, OK: January 31, 2023 1-Day Observed Precipitation
 Valid on: January 31, 2023 12:00 UTC

Fig. 11. 24-hour Estimated Observed Rainfall ending at 6am CST 1/31/2023.



Tulsa, OK: February 01, 2023 1-Day Observed Precipitation
 Valid on: February 01, 2023 12:00 UTC

Fig. 12. 24-hour Estimated Observed Rainfall ending at 6am CST 2/01/2023.

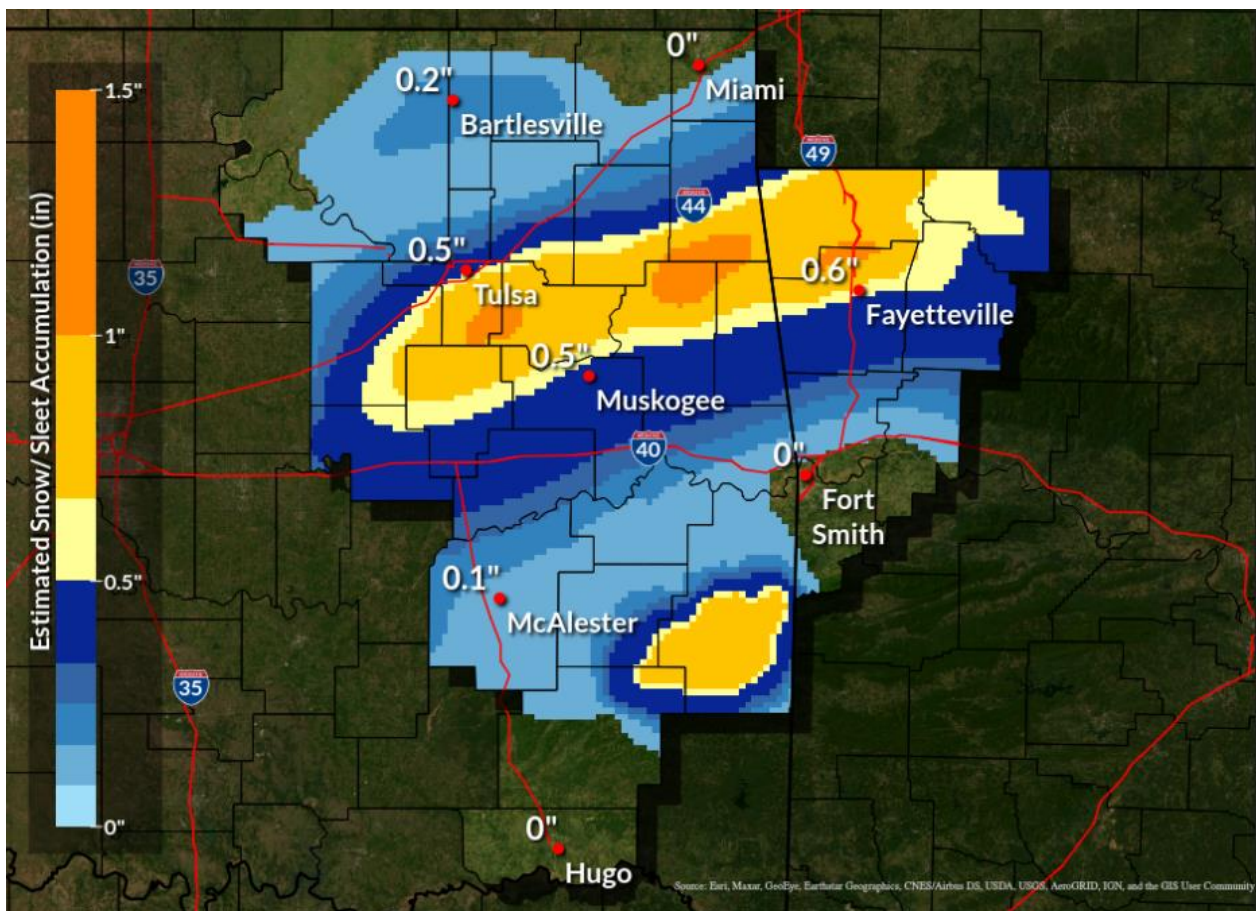


Fig. 13. 24-hour Estimated snow and sleet accumulation for January 30-31, 2023.

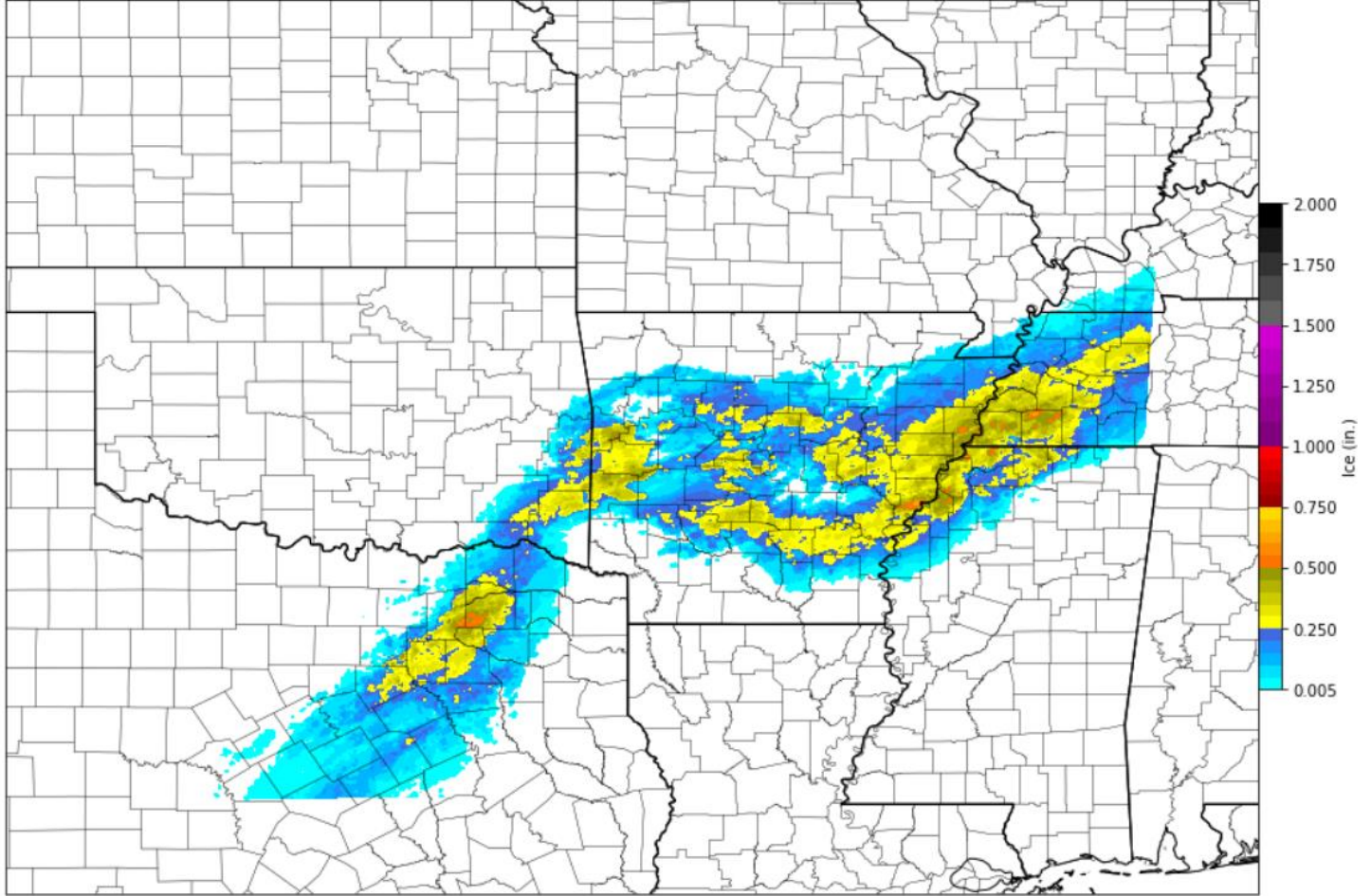
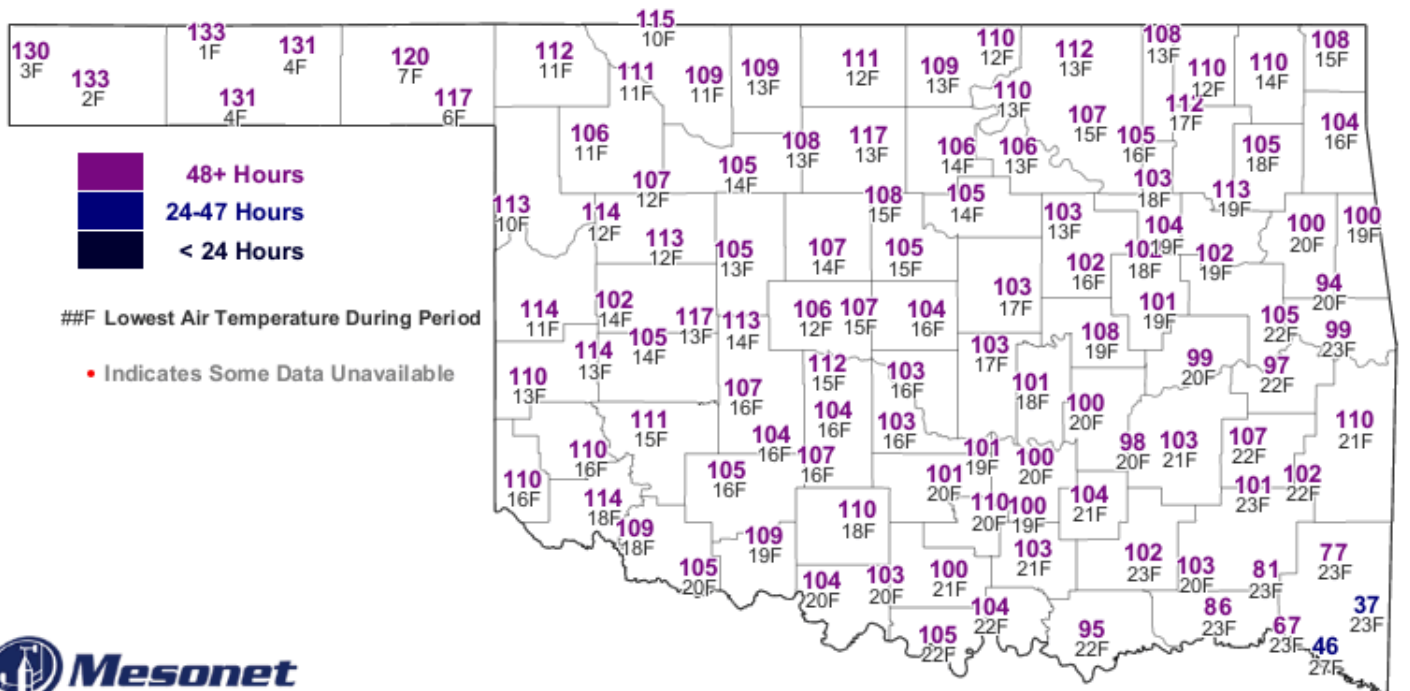


Fig. 14. Estimate ice accumulation for January 30-31, 2023.



Hours Below Freezing in the Last Week

9:20 AM February 2, 2023 CST

Created 9:25:52 AM February 2, 2023 CST. © Copyright 2023

Fig. 15. OK Mesonet consecutive hours below freezing ending at 9:20 am CST 2/02/2023.

Arctic air spread into eastern OK and northwest AR on the 29th, setting the stage for a wintry weather pattern as multiple disturbances passed through the Southern Plains from the 30th through the 31st. The first disturbance brought sleet showers and thunderstorms to the region during the morning and afternoon of the 30th. Heavy sleet accumulations from 0.5" to 1.25" occurred across portions of northeast OK and northwest AR (Fig. 13, showing 2-day event total). Heavy freezing rain occurred across portions of southeast OK and west central AR, where totals were estimated to range from 0.1" to 0.5" (Fig. 14, showing 2-day event total). The next system brought a return of sleet to the area during the morning and afternoon of the 31st. Some heavy sleet occurred once again in thunderstorms. Light amounts of wintry weather, including freezing drizzle, light freezing rain, and sleet, continued through the 31st areawide. Rainfall/liquid equivalent totals were a few hundredths of an inch to near 1" (Figs. 11, 12). The arctic air remained in place for several days, with most of eastern OK and northwest AR remaining below freezing for over 100 consecutive hours (Fig. 15).

Written by:

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Service Hydrologist
WFO Tulsa

Products issued in January 2023:

*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)
- 3 Urban and Small Stream Advisories (FLS)
- 0 Areal Flood Warnings (FLW)
- 0 Areal Flood Statements (FLS)
- 0 River Flood Warnings (FLW) (includes category increases)
- 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