

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:	YEAR
		MONTH August	2022
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 September 9, 2022	

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.

Despite a few isolated heavy rain events, most of eastern Oklahoma and northwest Arkansas received below normal rainfall this August. Normal rainfall for August ranges from 2.6 inches in McIntosh County to 3.8 inches in Ottawa County. In the Ozark region of northwest Arkansas, rainfall averages 3.7 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 August 2022 ranged from around 0.5" to 6" across eastern OK and northwest AR, with much of the area receiving 0.5"-3". These rainfall totals correspond to 10% to 75% of the normal August rainfall for most of eastern OK and northwest AR (Fig. 1b). Far northwest AR and isolated locations in eastern OK and west central AR received 125% to 300% of the normal August rainfall.

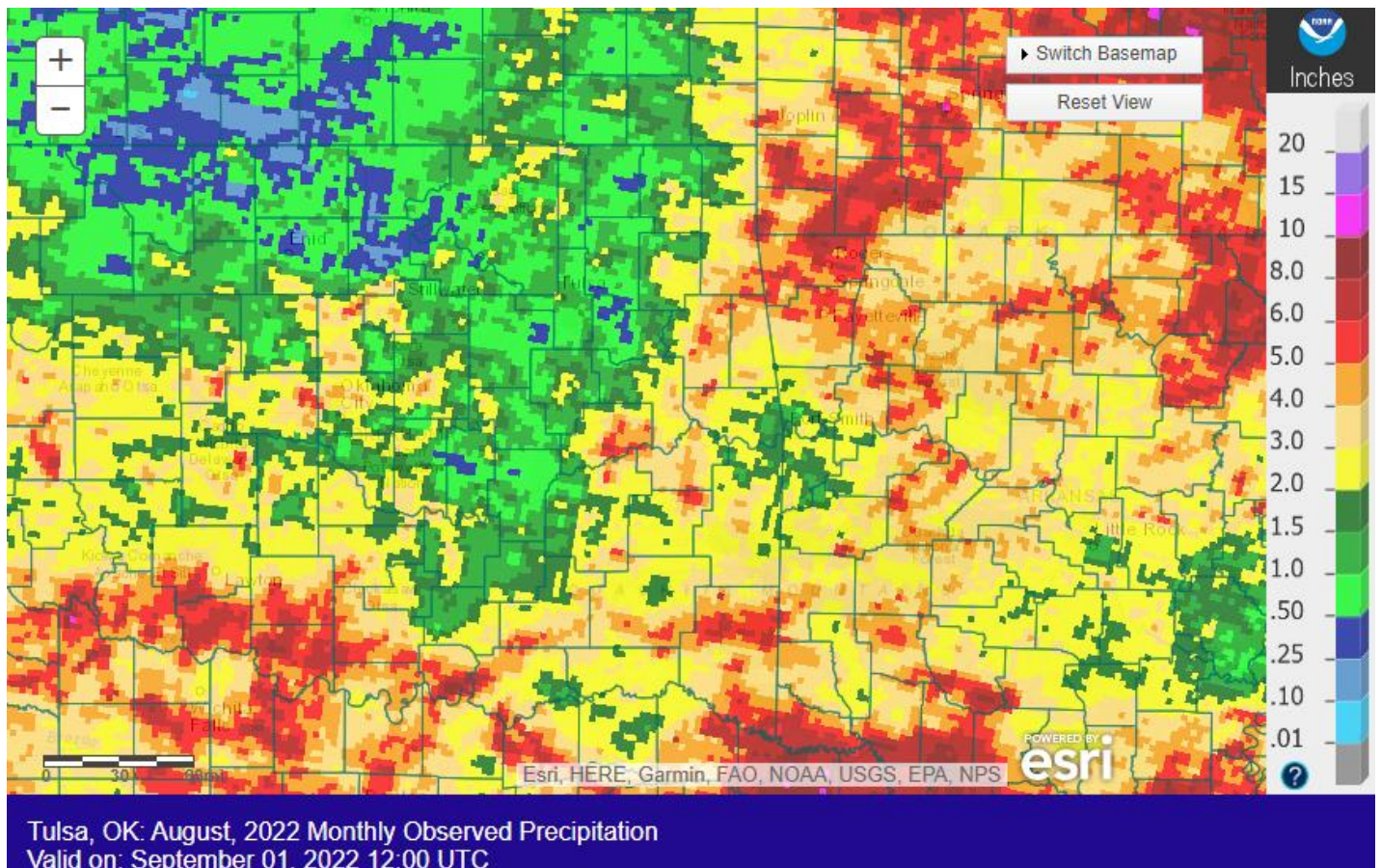


Fig. 1a. Estimated Observed Rainfall for August 2022

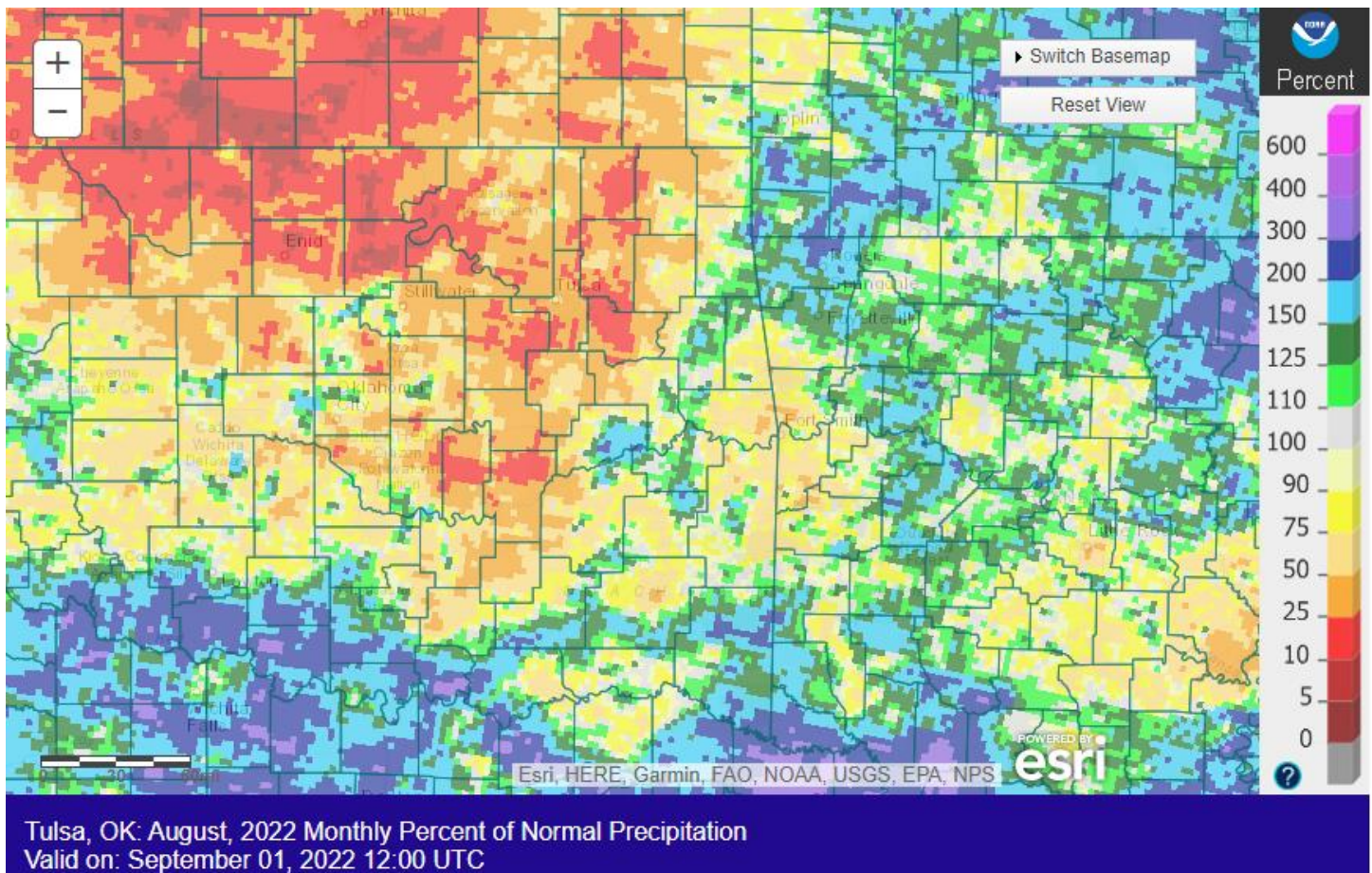


Fig. 1b. Estimated % of Normal Rainfall for August 2022

In Tulsa, OK, August 2022 ranked as the 34th warmest August (84.0°F; since records began in 1905) and the 19th driest August (0.77"; since records began in 1888). Fort Smith, AR had the 35th warmest August (83.8°F, tied 2012, 1929; since records began in 1882) and the 54th driest August (2.02", tied 1954; since records began in 1882). Fayetteville, AR had the 18th warmest (78.8°F, tied 2021, 2003) and the 23rd wettest (4.58") August since records began in 1949.

Some of the larger precipitation reports (in inches) for August 2022 included:

Bella Vista 0.6WSW, AR (coco)	8.16	Kingston 2S, AR (coop)	6.70	Bella Vista 2.2E, AR (coco)	6.66
Bentonville Airport, AR (AWOS)	6.36	Eufaula, OK (meso)	5.85	War Eagle 1.4NNW, AR (coco)	5.82
Gentry 5.6ENE, AR (coco)	5.77	Bella Vista 2.5SSE, AR (coco)	5.77	Cloudy, OK (meso)	5.32

Some of the lowest precipitation reports (in inches) for August 2022 included:

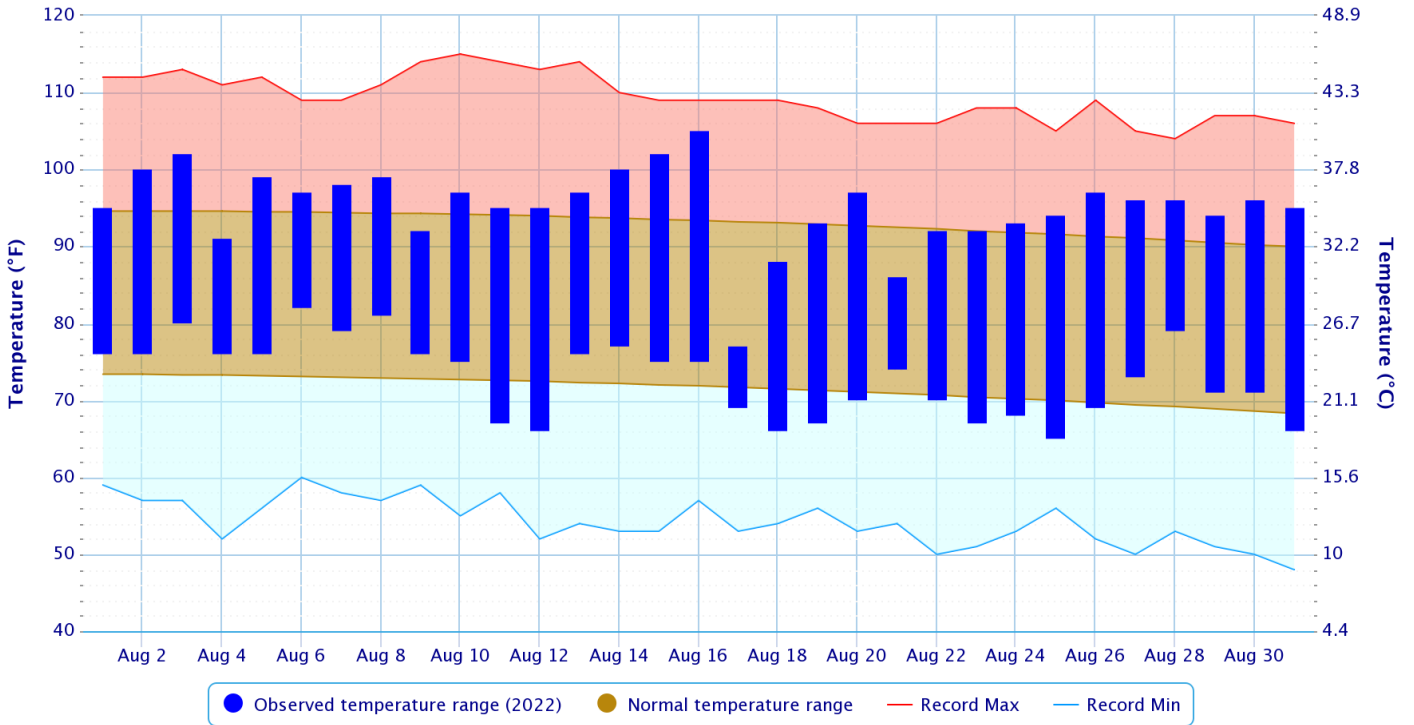
Burbank, OK (meso)	0.20	Foraker, OK (meso)	0.44	Nowata, OK (meso)	0.48
Haskell, OK (meso)	0.53	Talala, OK (meso)	0.55	Porter, OK (meso)	0.69
Bixby, OK (meso)	0.70	Oilton, OK (meso)	0.73	Wynona, OK (meso)	0.76

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

Rank since 1921	Last 30 Days (Aug 2-31)	Summer 2022 (Jun 1 – Aug 31)	Last 60 Days (Jul 3 – Aug 31)	Last 120 Days (May 4 – Aug 31)	Year-to-Date (Jan 1 – Aug 31)	Water Year-to-Date (Oct 1, 2021 – Aug 31, 2022)	Last 365 Days (Sep 1, 2021 – Aug 31, 2022)
Northeast OK	10 th driest	15 th driest	24 th driest	45 th driest	36 th driest	39 th driest	29 th driest
East Central OK	48 th driest	42 nd driest	34 th driest	46 th wettest	28 th wettest	30 th wettest	41 st wettest
Southeast OK	37 th wettest	23 rd driest	25 th driest	14 th driest	31 st driest	21 st driest	15 th driest
Statewide	32 nd driest	26 th driest	25 th driest	30 th driest	28 th driest	24 th driest	17 th driest

Daily Temperature Data - Tulsa Area, OK (ThreadEx)

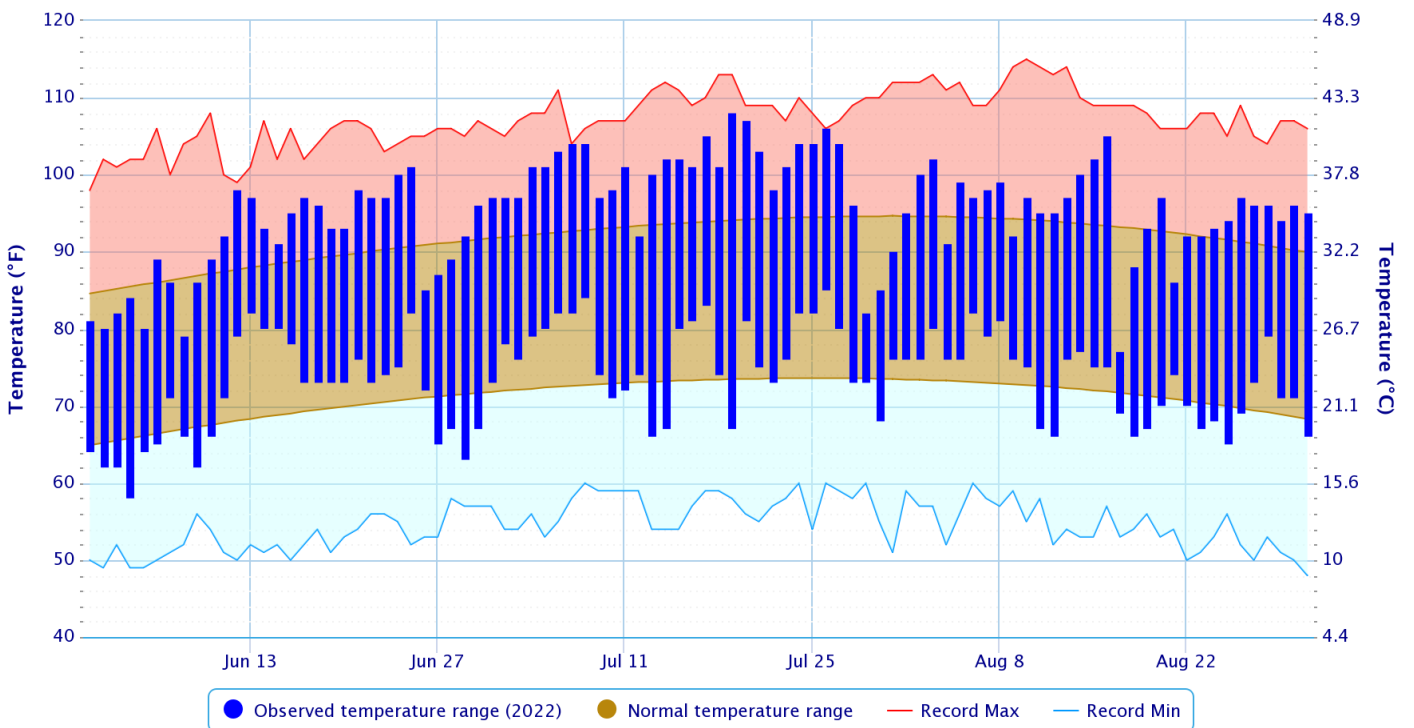
Period of Record - 1905-01-06 to 2022-09-01. Normals period: 1991-2020. Click and drag to zoom chart.



Powered by ACIS

Daily Temperature Data - Tulsa Area, OK (ThreadEx)

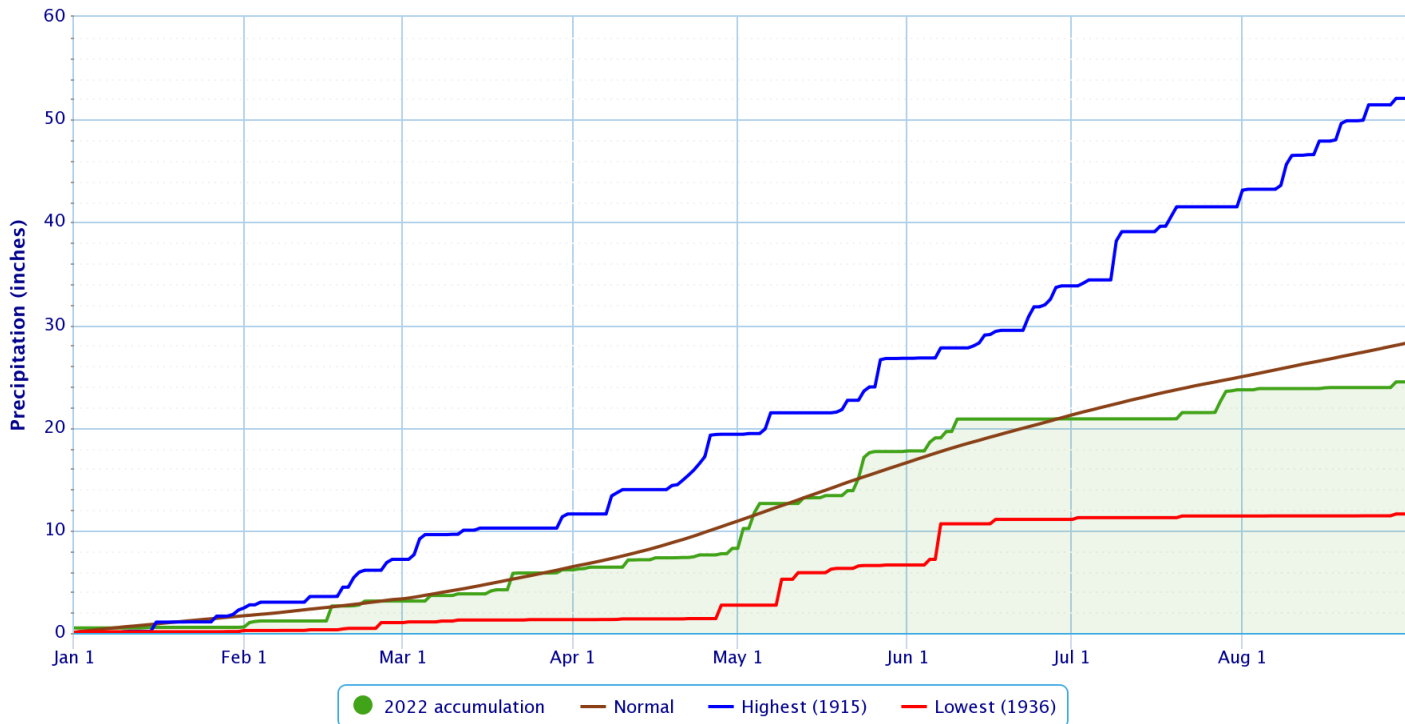
Period of Record - 1905-01-06 to 2022-09-01. Normals period: 1991-2020. Click and drag to zoom chart.



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Accumulated Precipitation - Tulsa Area, OK (ThreadEx)

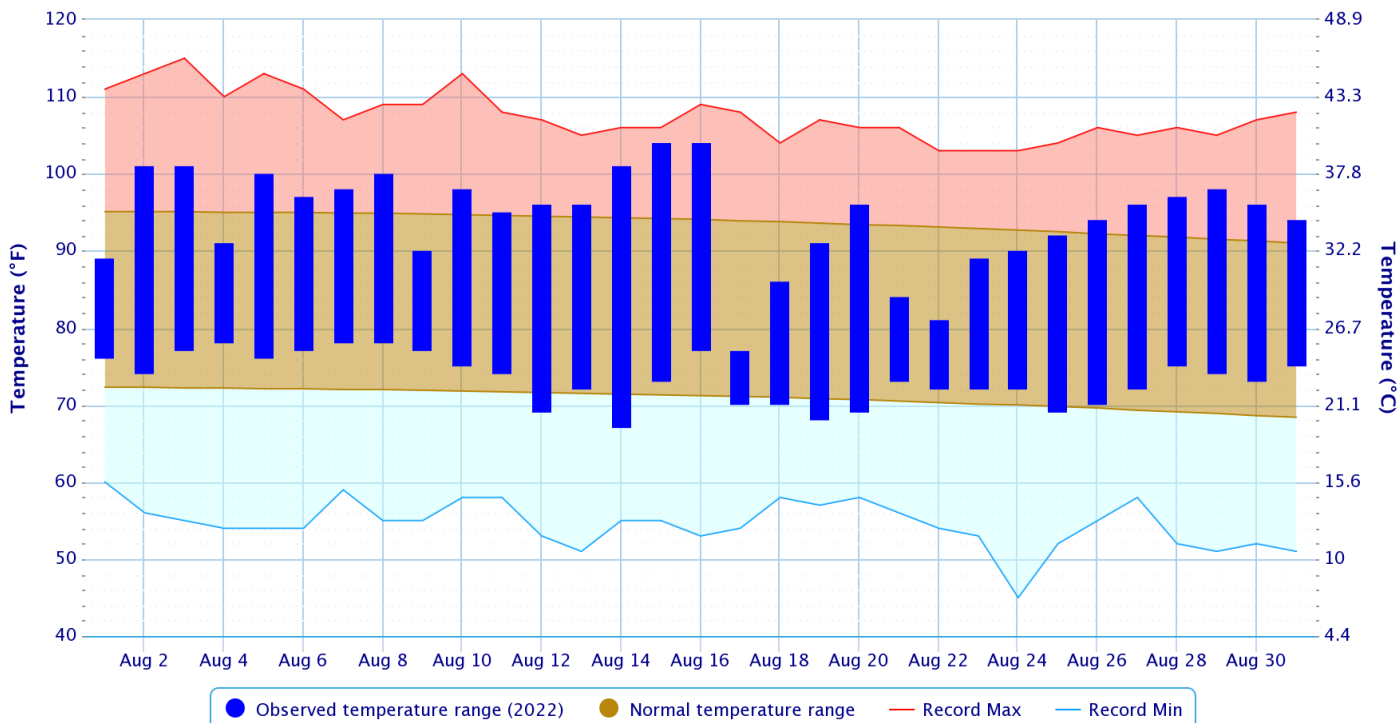
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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

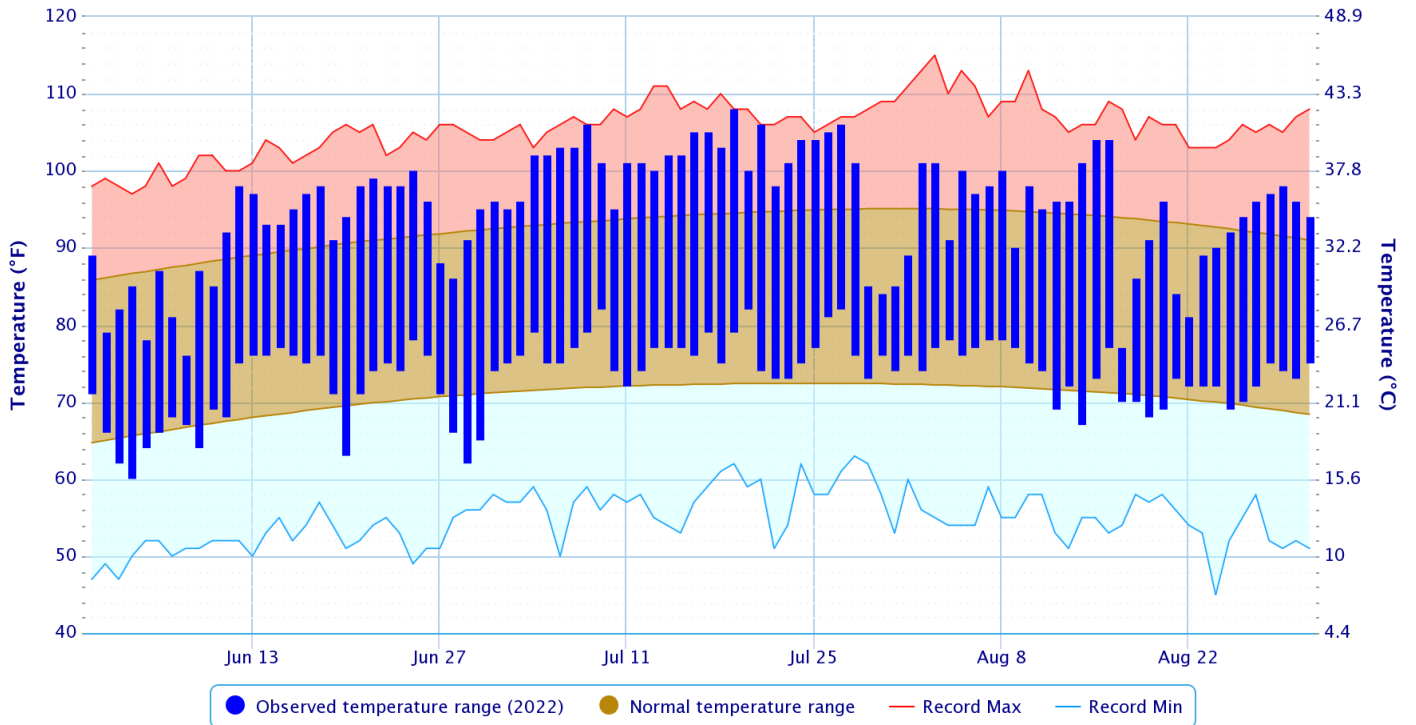
Period of Record - 1882-06-01 to 2022-09-01. Normals period: 1991-2020. Click and drag to zoom chart.



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

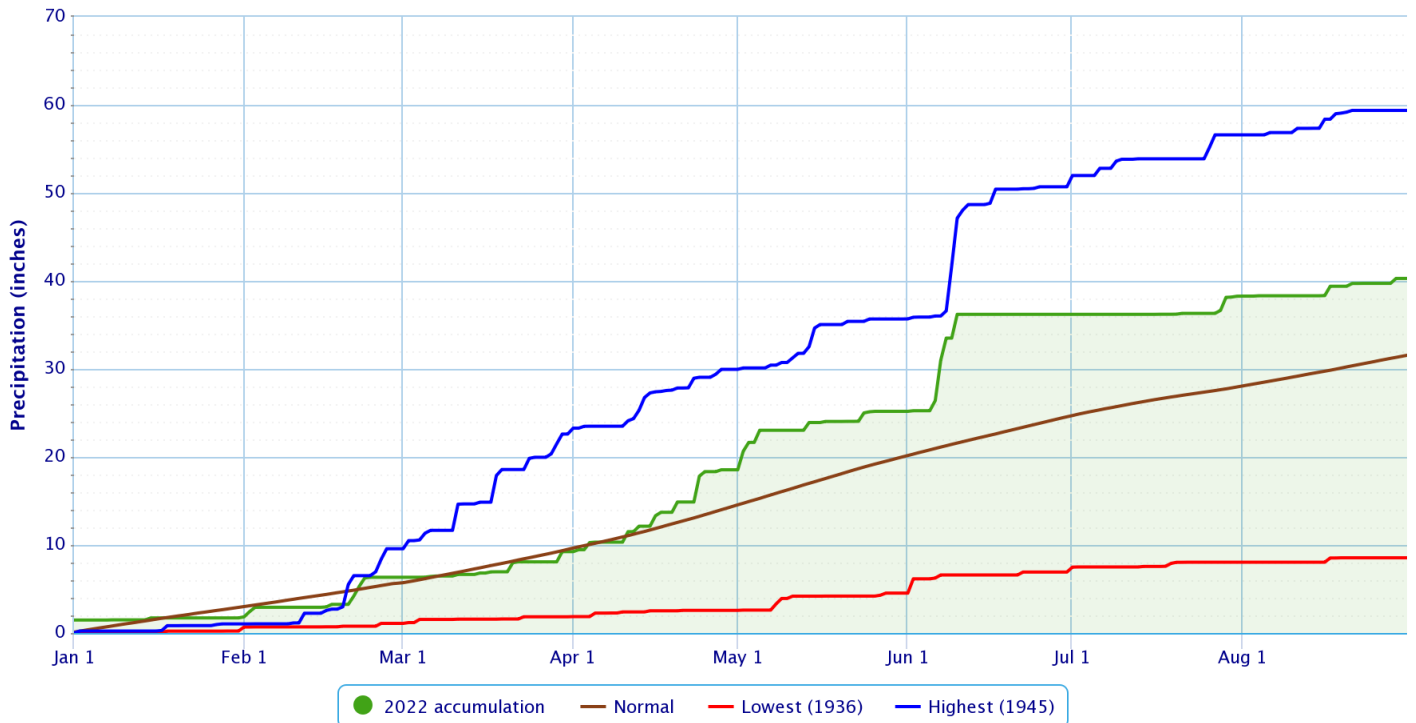
Period of Record – 1882-06-01 to 2022-09-01. Normals period: 1991-2020. Click and drag to zoom chart.



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Accumulated Precipitation – Fort Smith Area, AR (ThreadEx)

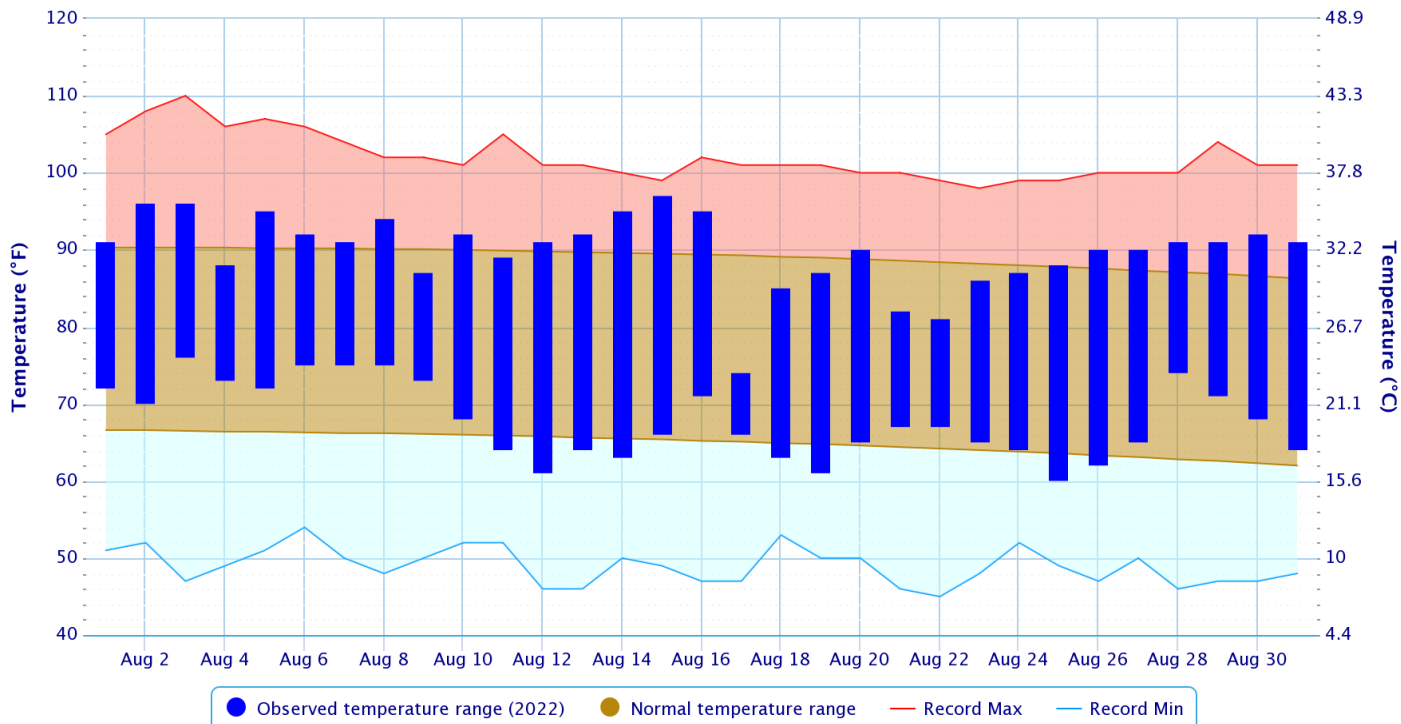
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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Daily Temperature Data – FAYETTEVILLE DRAKE FIELD, AR

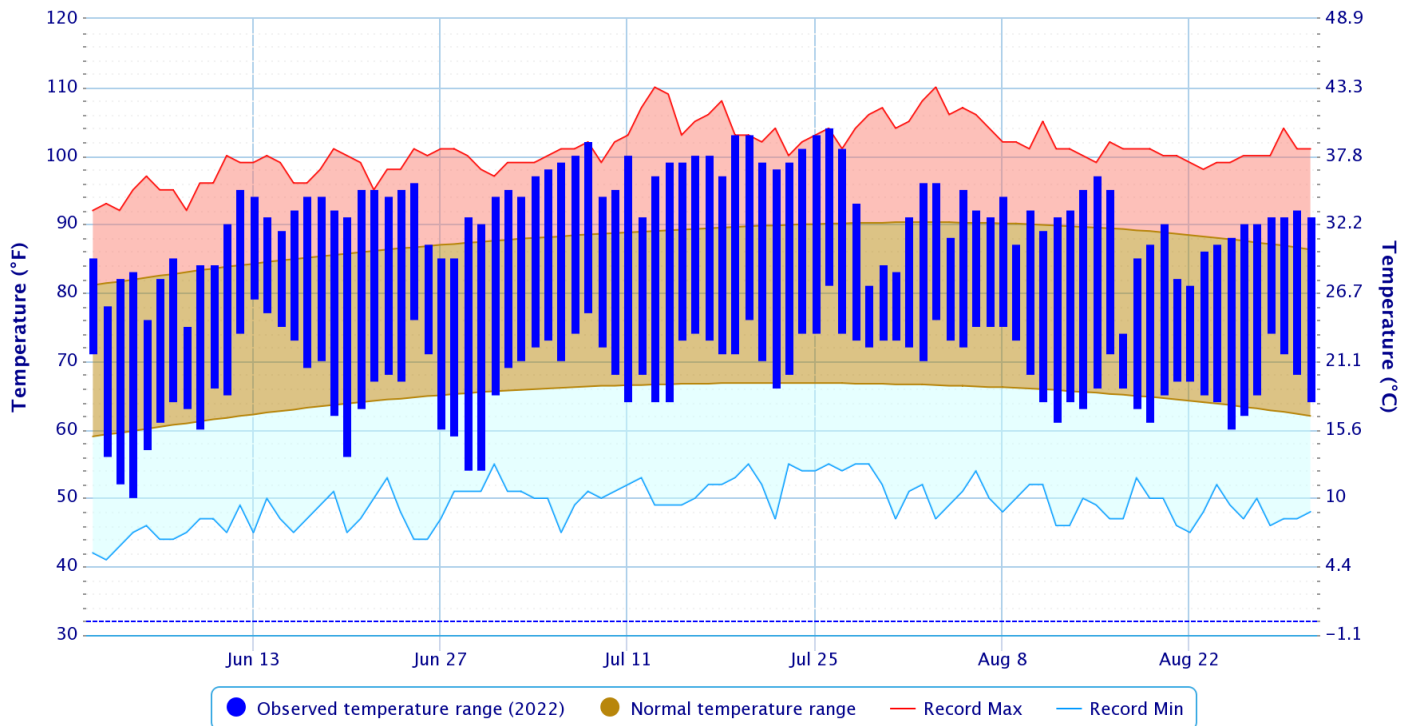
Period of Record – 1949-07-14 to 2022-09-01. Normals period: 1991–2020. Click and drag to zoom chart.



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Daily Temperature Data – FAYETTEVILLE DRAKE FIELD, AR

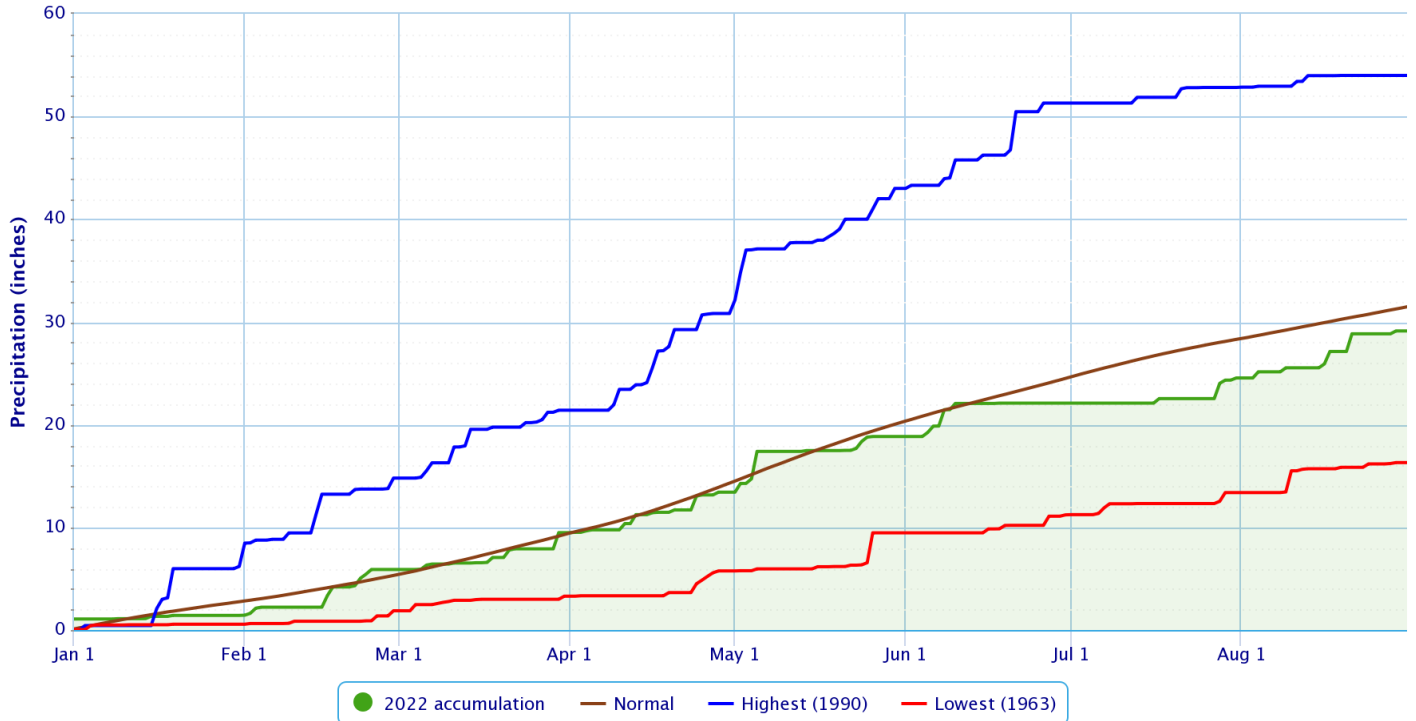
Period of Record – 1949-07-14 to 2022-09-01. Normals period: 1991–2020. Click and drag to zoom chart.



Powered by ACIS

Accumulated Precipitation - FAYETTEVILLE DRAKE FIELD, AR

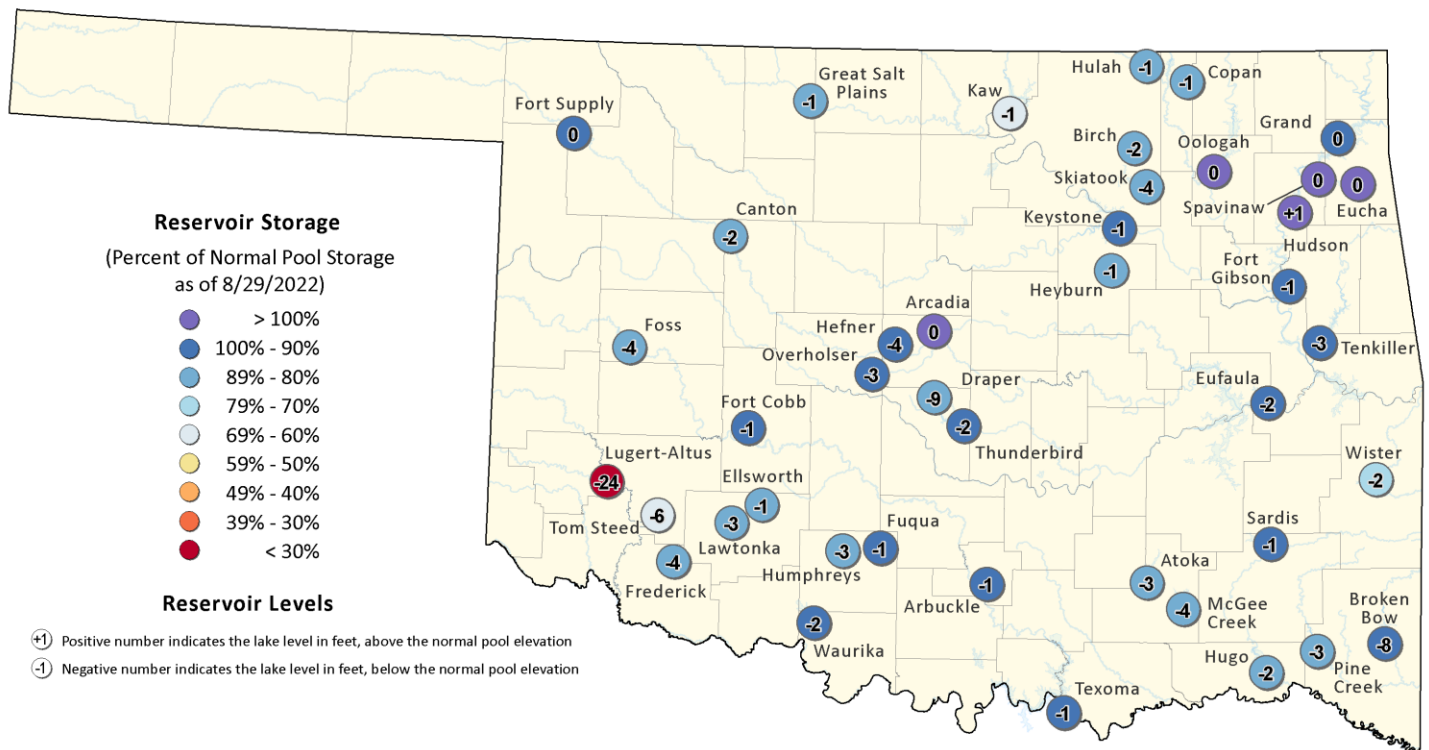
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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Reservoirs

Oklahoma Reservoir Levels and Storage as of 8/29/2022



This map shows reservoir storage as a percentage of normal pool storage capacity. The source information was collected from real-time lake gages monitored by the U.S. Army Corps of Engineers (https://www.swt-wc.usace.army.mil/Daily_Morning_Reservoir_Report.pdf), and the U.S. Geological Survey (https://waterdata.usgs.gov/ok/nwis/current/?type=lake&group_key=basin_cd). For more information please visit the OWRB's website: (<https://www.owrb.ok.gov>).



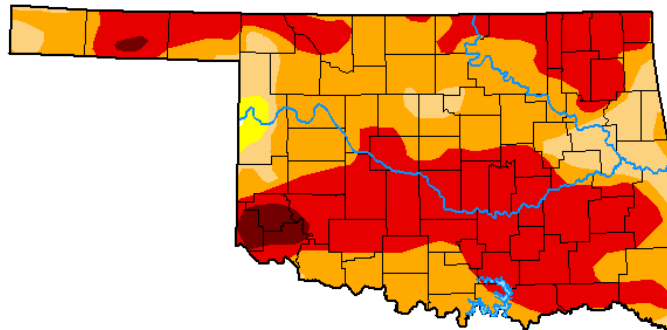
According to the USACE, several of the lakes in the HSA were below 3% of top of their conservation pools as of 8/31/2022: Ft. Gibson Lake 60%, Wister Lake 78%, Hugo Lake 78%, Eufaula Lake 87%, Heyburn Lake 73%, Copan Lake 83%, Birch Lake 85%, Hulah Lake 87%, Skiatook Lake 89%, Tenkiller 89%, Keystone Lake 93%, Sardis Lake 94%, and Kaw Lake 95%. One lake was above 3% of the top of its conservation pool: Hudson Lake 4%.

Drought

According to the [U.S. Drought Monitor](#) (USDM) from August 30, 2022 (Figs. 2, 3), Extreme (D3) Drought conditions were occurring in portions of eastern Kay, Osage, Washington, Nowata, Craig, Ottawa, Delaware, Mayes, Rogers, Wagoner, Tulsa, Okfuskee, Okmulgee, McIntosh, Pittsburg, Haskell, Latimer, Le Flore, Pushmataha, and Choctaw Counties in eastern Oklahoma. Severe (D2) Drought conditions exist in portions of Osage, Pawnee, Tulsa, Rogers, Creek, Okmulgee, Muskogee, Wagoner, Cherokee, Delaware, Adair, Sequoyah, McIntosh, Haskell, Pushmataha, and Le Flore Counties in eastern Oklahoma, and Carroll, Washington, Madison, Crawford, Sebastian, and Franklin Counties in northwest Arkansas. Moderate (D1) Drought conditions were present in portions of Okmulgee, McIntosh, Muskogee, Cherokee, Delaware, Adair, Sequoyah, Haskell, and Le Flore Counties in eastern Oklahoma, and Benton, Washington, Carroll, Madison, and Sebastian Counties in northwest Arkansas.

**U.S. Drought Monitor
Oklahoma**

August 30, 2022
(Released Thursday, Sep. 1, 2022)
Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.02	99.98	98.98	88.22	47.13	2.19
Last Week <small>08-23-2022</small>	0.02	99.98	98.64	89.68	48.60	2.19
3 Months Ago <small>05-31-2022</small>	51.02	48.98	42.58	34.82	17.16	2.93
Start of Calendar Year <small>01-04-2022</small>	5.02	94.98	88.14	72.26	40.44	0.00
Start of Water Year <small>09-28-2021</small>	6.45	93.55	73.23	23.72	2.65	0.00
One Year Ago <small>08-31-2021</small>	81.57	18.43	6.61	0.72	0.00	0.00

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

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:

Deborah Bathke
National Drought Mitigation Center

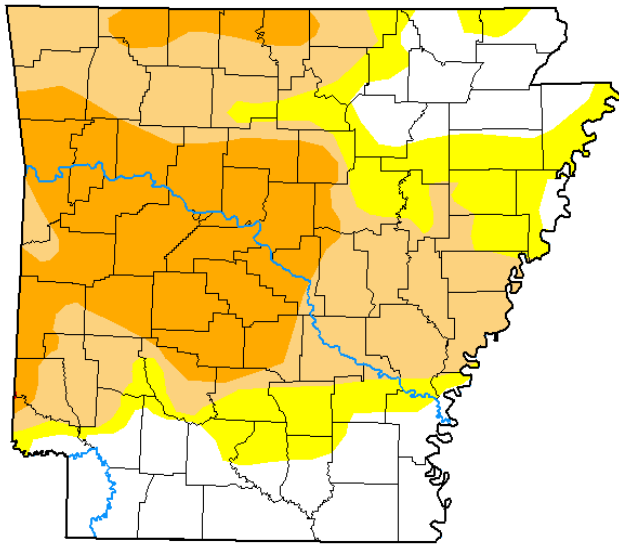


droughtmonitor.unl.edu

Fig. 2. Drought Monitor for Oklahoma

U.S. Drought Monitor
Arkansas

August 30, 2022
(Released Thursday, Sep. 1, 2022)
Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	24.29	75.71	58.13	28.33	0.01	0.00
Last Week 08-23-2022	20.98	79.02	59.35	33.72	0.96	0.00
3 Months Ago 05-31-2022	96.22	3.78	0.00	0.00	0.00	0.00
Start of Calendar Year 01-01-2022	39.91	60.09	28.99	14.24	0.41	0.00
Start of Water Year 09-28-2021	51.41	48.59	5.17	0.00	0.00	0.00
One Year Ago 08-31-2021	90.47	9.53	0.00	0.00	0.00	0.00

Intensity:
 None
 D0 Abnormally Dry
 D1 Moderate Drought
 D2 Severe Drought
 D3 Extreme Drought
 D4 Exceptional Drought

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:
Deborah Bathke
National Drought Mitigation Center



droughtmonitor.unl.edu

Fig. 3. Drought Monitor for Arkansas

Summer (June-July-August) 2022 Summary

In Tulsa, OK, Summer 2022 ranked as the 6th warmest Summer (84.3°F; since records began in 1905) and the 25th driest Summer (6.78"; since records began in 1888). Fort Smith, AR had the 8th warmest Summer (84.2°F; since records began in 1882) and the 21st wettest Summer (15.10"; since records began in 1882). Fayetteville, AR had the 5th warmest (79.8°F) and the 27th driest (10.28") Summer since records began in 1950.

Outlooks

The [Climate Prediction Center](#) (CPC) outlook for September 2022 (issued August 31, 2022) indicates a slight chance for above median precipitation across southeast OK and equal chances for above, near, and below median precipitation for the remainder of eastern OK and northwest AR. This outlook also indicates an equal chance for above, near, and below normal temperatures. This outlook was largely based on dynamical model output, La Niña and Madden-Julian Oscillation (MJO) influences, and soil moisture. CPC states, "These inputs predict strong anomalous ridging over the western CONUS and Northern Plains during the beginning of the month. Cyclonic flow is depicted across much of Alaska and troughing or a weakness in subtropical ridging is forecast across much of the eastern and south-central CONUS. By mid-month, above normal heights are forecast to overspread most of the northern CONUS and a slight tilt toward below normal heights is expected across most of the Southern Tier...The updated September 2022 precipitation outlook favors above normal precipitation across most of the Southern Tier of the CONUS due to predicted weaknesses in subtropical ridging, near to below normal heights, and potential influxes of tropical moisture."

For the 3-month period September-October-November 2022, CPC is forecasting an enhanced chance for above normal temperatures and a slightly enhanced chance for below median precipitation across all of eastern OK and northwest AR (outlook issued August 18, 2022). This outlook is based on long-term trends, La Niña impacts, current soil moisture, and incorporates both statistical and dynamical forecast tools. According to CPC, the combined effect of the ocean-atmosphere system remains consistent with La Niña conditions. La Niña conditions are expected to continue through fall 2022 (86% chance), and there is a 60% chance of La Niña continuing into the winter. 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

Scattered showers and thunderstorms moved into northeast OK and northwest AR just before sunrise on the 4th as a mesoscale convective system (MCS) moved southeast out of KS and MO. This activity continued to slowly sag south through the morning hours, reaching the I-40 corridor by late morning. The showers continued to progress south, though they quickly dissipated during the afternoon. Rainfall totals ranged from a few hundredths to 2" (Fig. 4).

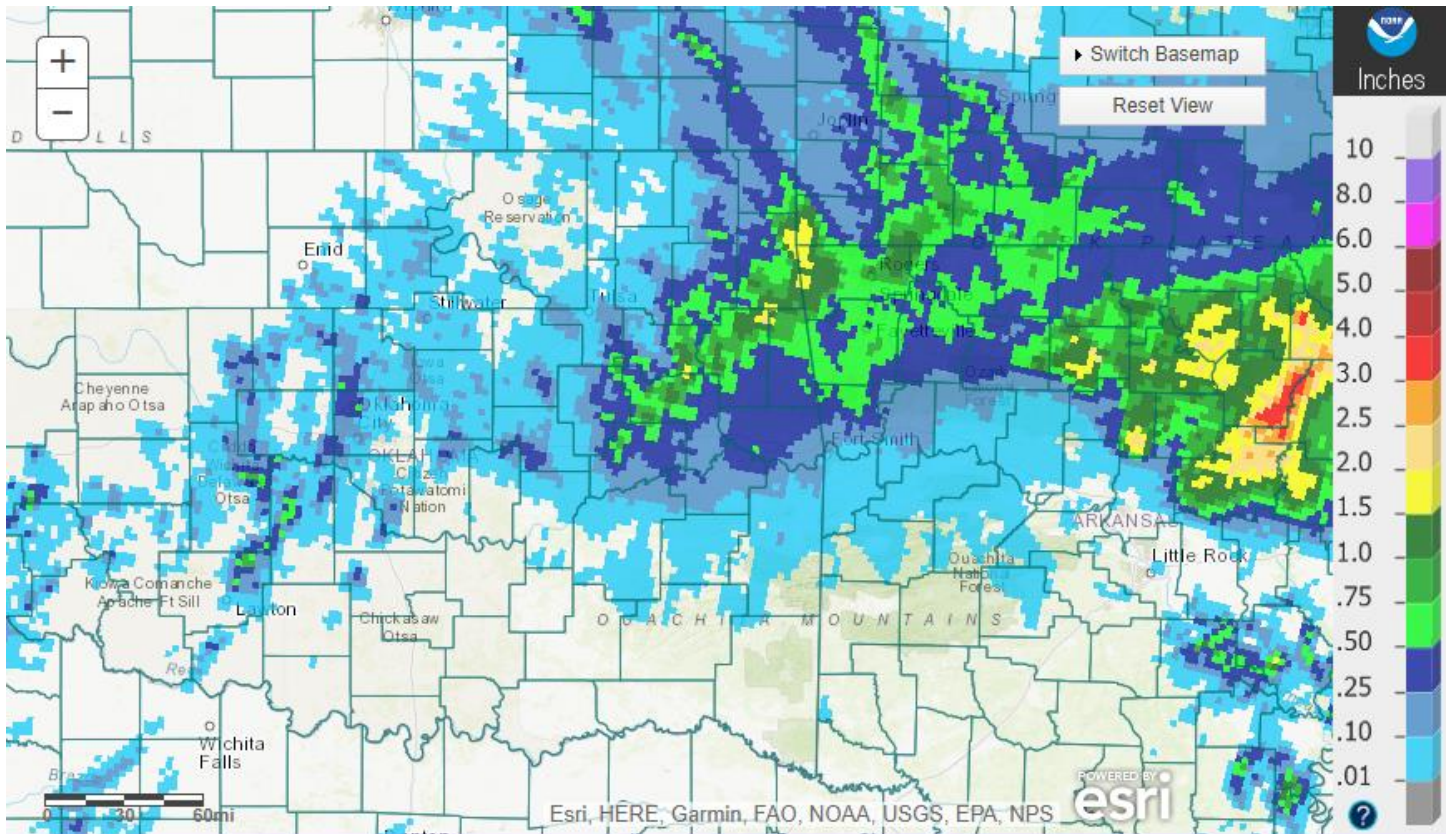
Widely scattered showers and thunderstorms impacted eastern OK and northwest AR from late morning through late evening of the 8th as deep layer moisture increased over the region. Storms fired up again after midnight from southeast OK into southwest MO. A mesoscale convective vortex (MCV) leftover from the evening storms in MO drifted south across northwest AR. This MCV supported additional convection during the overnight hours, especially on the western side of the MCV where favorable lift was maximized. Precipitable water (PWAT) values were around 2", making these storms efficient rain producers. The convection became more widespread through the morning of the 9th, impacting a large portion of eastern OK and northwest AR southeast of I-44, before rapidly weakening through the afternoon. The heaviest rain fell across Muskogee, Cherokee, Delaware, Adair, Sequoyah and Benton Counties, where 2"-3" of rain fell within a 5-hour time period (Fig. 5).

A cold front moved into the area on the 16th, with isolated to scattered thunderstorms occurring along and north of it during the late afternoon through around 2 AM on the 17th. This activity affected locations along and north of I-40. After midnight, additional showers and thunderstorms formed over northeast OK and northwest AR as an upper-level shortwave moved southeast into the region. These storms moved southward and were affecting east central OK and west central AR by sunrise. The rain finally moved south of the Red River by noon. PWATs were once again near 2", resulting in high rainfall totals, especially across northwest AR where multiple rounds of storms occurred. Some light showers lingered near the 925mb front during the afternoon across southeast OK. While overall the rain was light, a stronger storm did produce a pocket of heavy rain in far southeast Pittsburg County. Rainfall totals ranged from around 0.10" to 4" (Figs. 9-10).

Ahead of a cold front, thunderstorms developed in northeast OK and northwest AR along a southeastward moving outflow boundary around midnight of the 21st. Most of this activity remained in northwest and west central AR through sunrise, producing around 0.25" to near 2.5" of rain (Fig. 11). Washington County AR received widespread 1.5"-2.5" of rain. Meanwhile, a west-to-east moisture axis, with PWATs in excess of 2", had developed near the Red River. As the front continued to move south during the day, an upper-level disturbance approached the region from the west. By mid-morning, widespread showers and thunderstorms had moved into southeast OK and west central AR, with lighter and more scattered activity north of I-40. The widespread rain continued through much of the afternoon before waning. While widespread rainfall remained south of the Red River, only widely scattered light rain showers sporadically affected southeast OK and west central AR for the remainder of the day and overnight hours. The heaviest rain was mainly confined to Pushmataha, Choctaw, and southern Le Flore Counties, where 1"-4" of rain fell (Fig. 12).

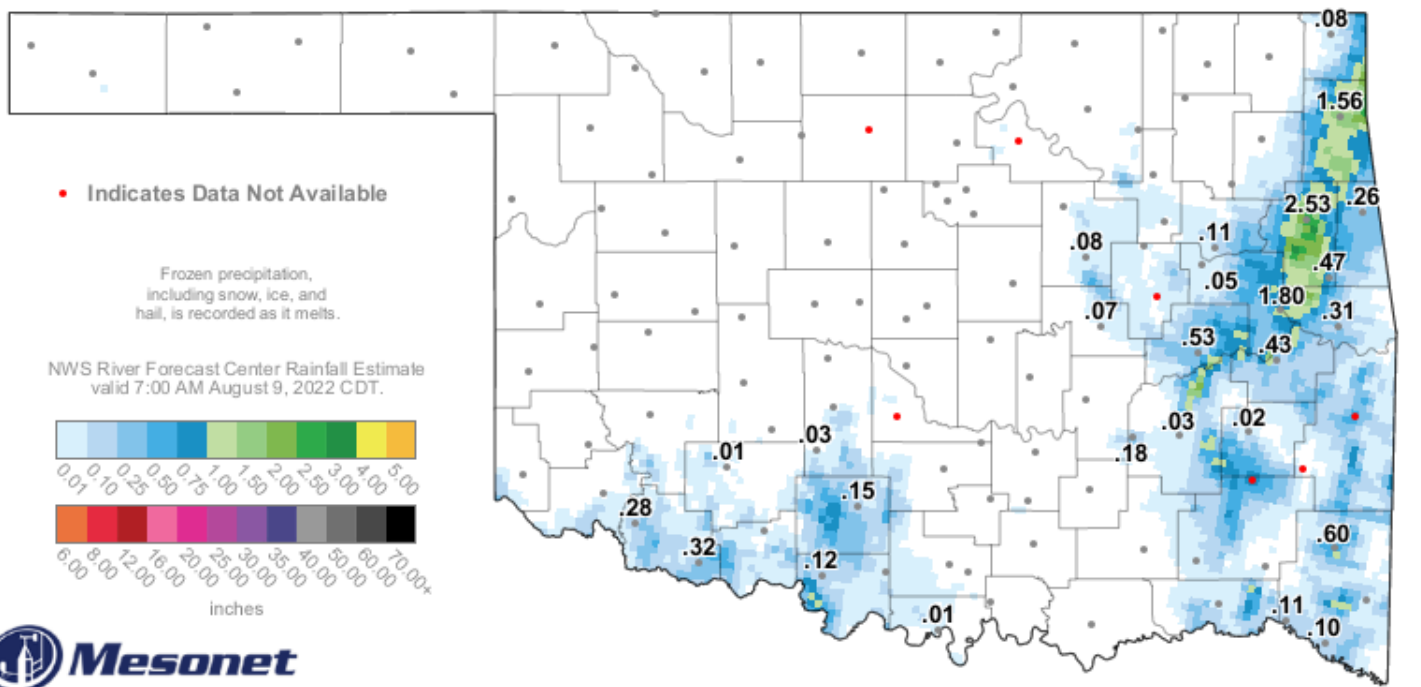
Once again, PWAT values were 1.5" to over 2" on the 28th. Some widely scattered showers and isolated thunderstorms affected northeast OK in the morning. However, more vigorous afternoon thunderstorms ignited along subtle outflow boundaries and differential heating zones in east central OK and west central AR as an upper-level wave moved across the plains. This activity dissipated in the evening with the loss of daytime heating. Rainfall totals in the affected areas were 0.25" to around 2.5" (Fig. 13).

Widely scattered convection developed shortly after sunrise of the 29th, generally along and north of Highway 412 in northeast OK and northwest AR, within a weakly capped environment. By afternoon, a cluster of storms developed and moved eastward across northeast OK, entered northwest AR by early evening, and moved east of the area by late evening. Rainfall totals ranged from 0.25" to 3" (Fig. 14). As the storms passed Bentonville, AR, a couple of families were playing with homemade boats in a retention pond. They saw a whirlpool and began throwing sticks into it. An 11-year old boy went to retrieve a stick and fell in. Sadly, he was pulled into the storm drain. A 47-year old woman jumped in to try to save the boy and was also pulled into the pipe. Both were recovered by firefighters, but sadly the boy passed away at the hospital and the woman passed away 5 days later.



Tulsa, OK: August 05, 2022 1-Day Observed Precipitation
Valid on: August 05, 2022 12:00 UTC

Fig. 4. 24-hour Estimated Observed Rainfall ending at 7am CDT 8/05/2022.

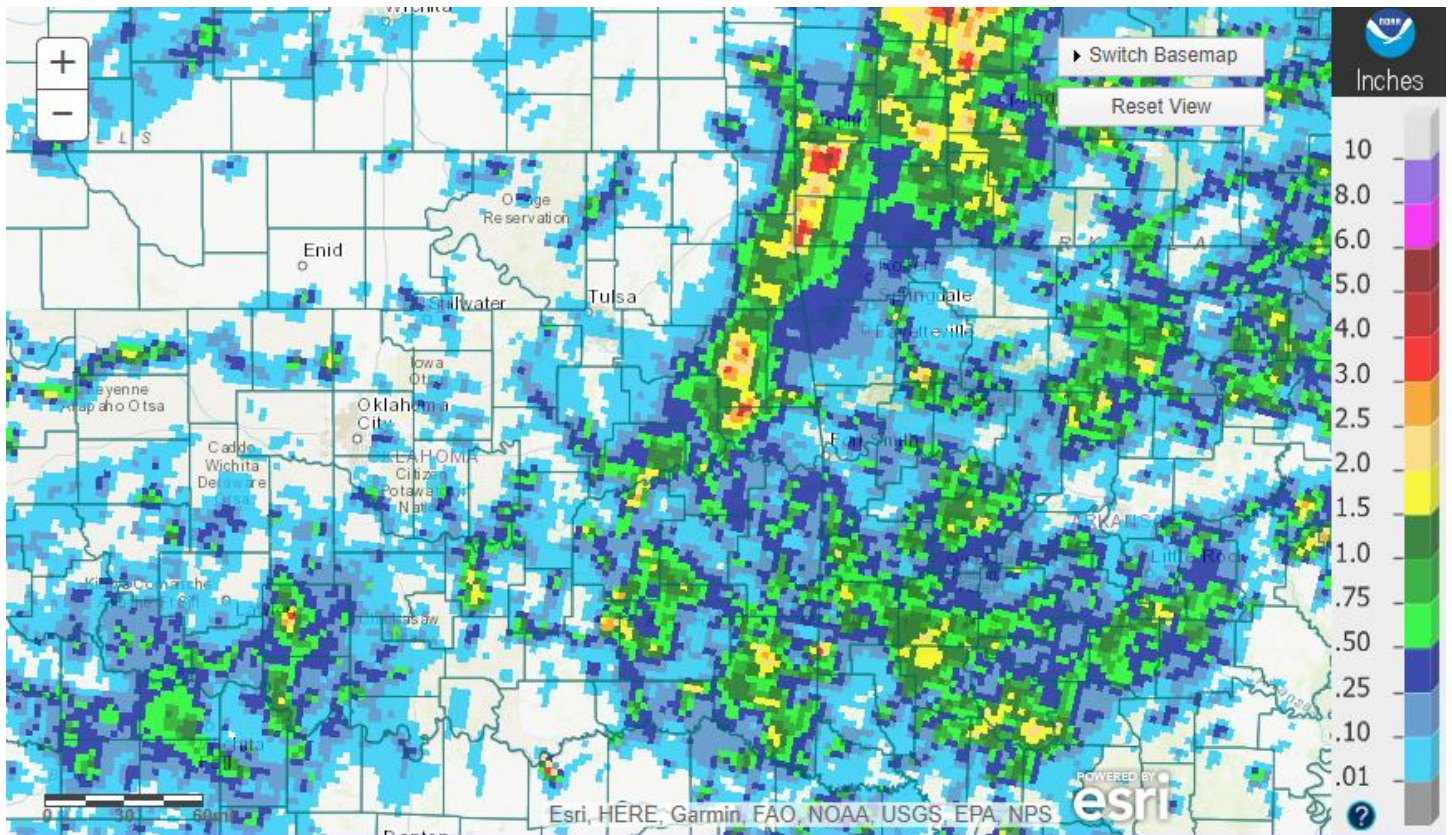


6-Hour Rainfall Accumulation (inches)

7:55 AM August 9, 2022 CDT

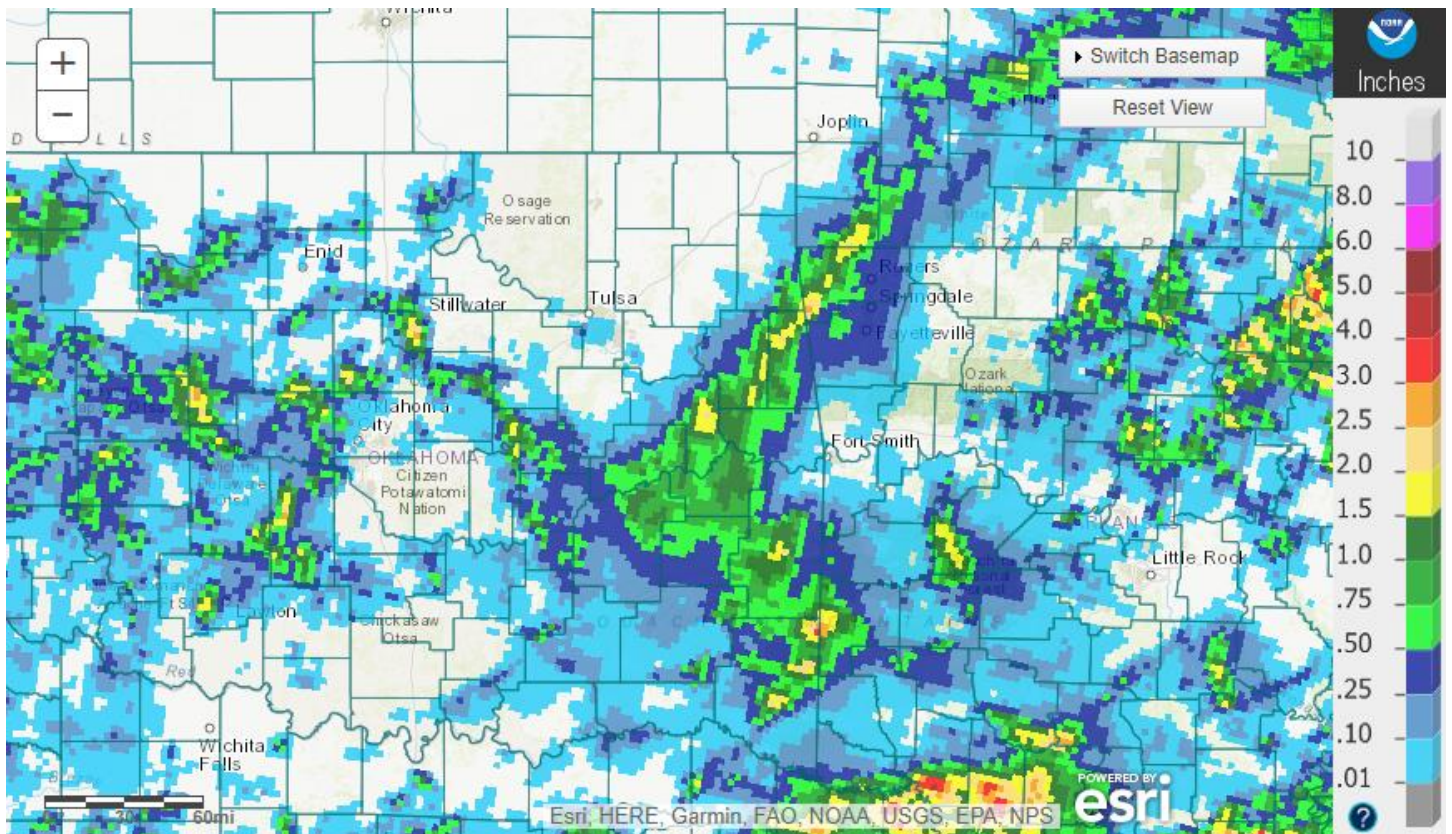
Created 8:00:51 AM August 9, 2022 CDT. © Copyright 2022

Fig. 5. OK Mesonet (values) and NWS RFC rainfall estimate (image) 6-hour rainfall ending at 7:55 am CDT 9/09/2022.



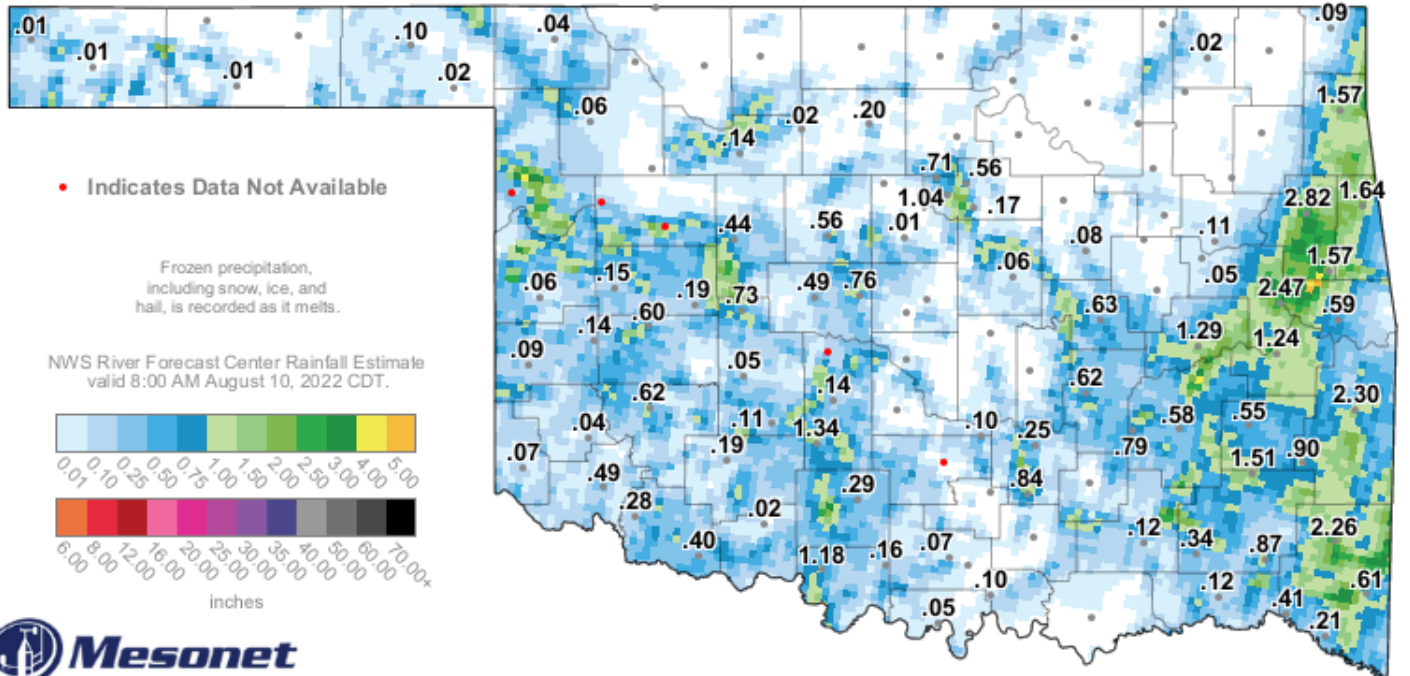
Tulsa, OK: August 09, 2022 1-Day Observed Precipitation
Valid on: August 09, 2022 12:00 UTC

Fig. 6. 24-hour Estimated Observed Rainfall ending at 7am CDT 8/09/2022.



Tulsa, OK: August 10, 2022 1-Day Observed Precipitation
Valid on: August 10, 2022 12:00 UTC

Fig. 7. 24-hour Estimated Observed Rainfall ending at 7am CDT 8/10/2022.

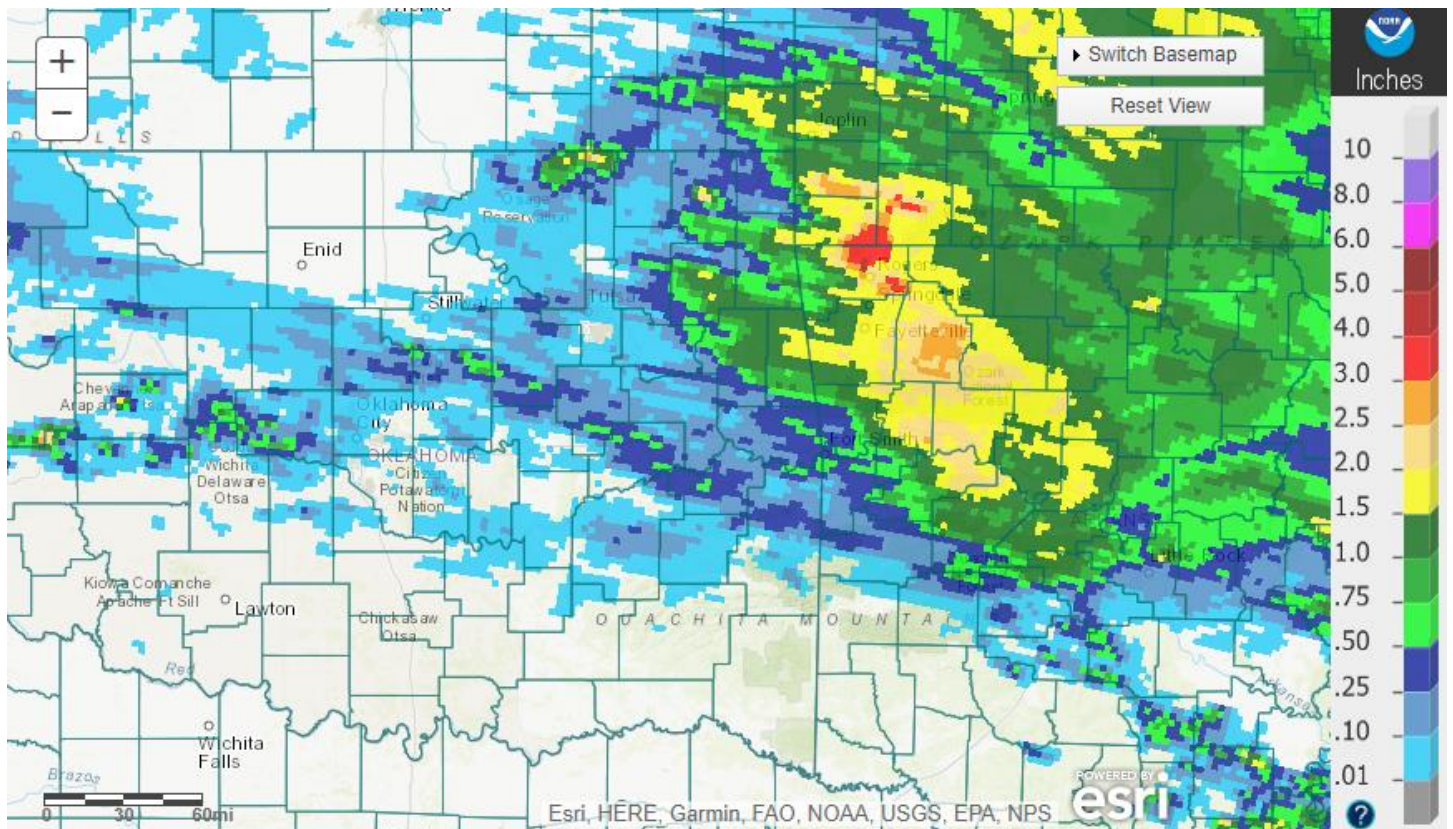


2-Day Rainfall Accumulation (inches)

9:50 AM August 10, 2022 CDT

Created 9:55:54 AM August 10, 2022 CDT. © Copyright 2022

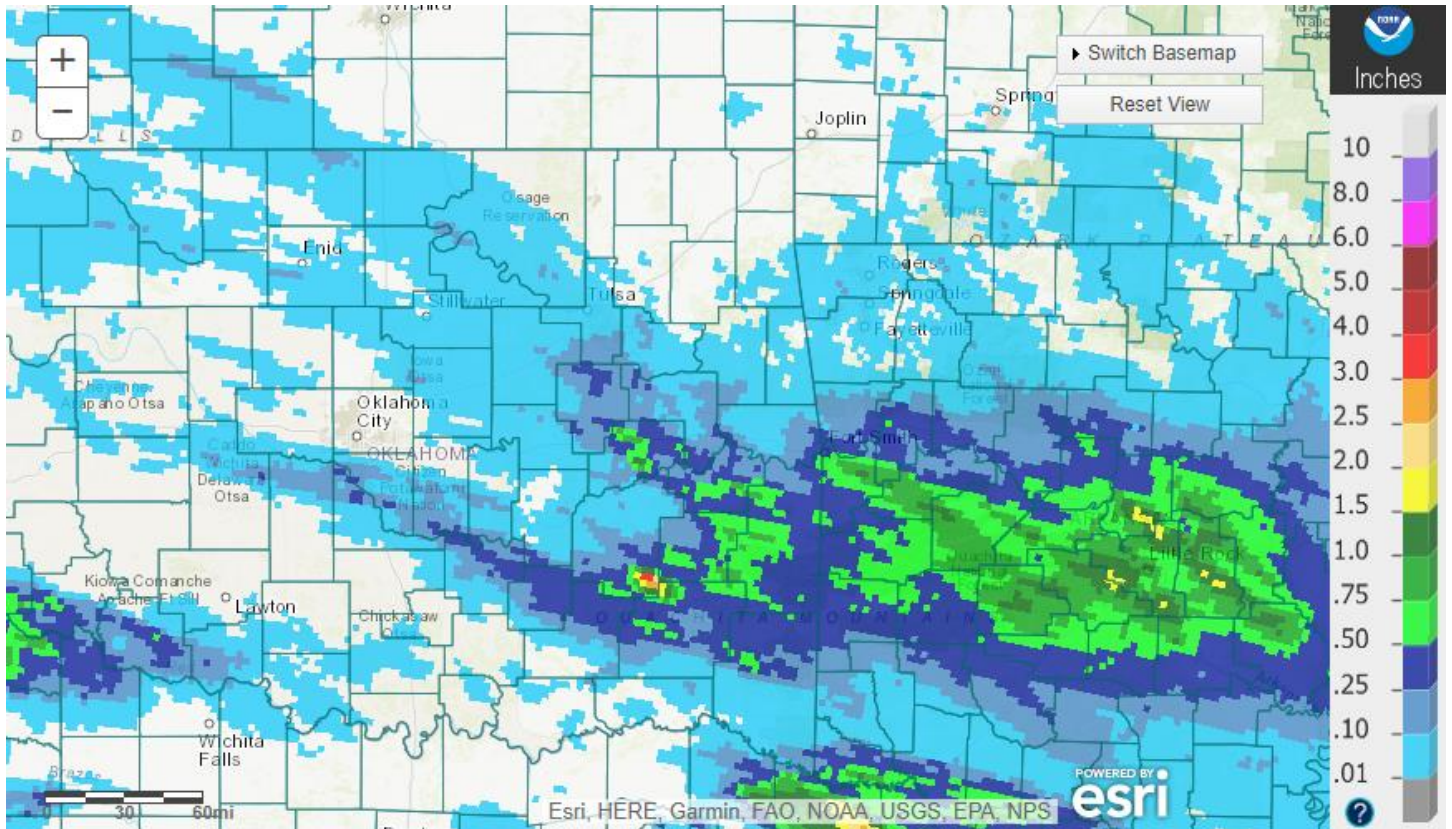
Fig. 8. OK Mesonet (values) and NWS RFC rainfall estimate (image) 48-hour rainfall ending at 9:50 am CDT 9/10/2022.



Tulsa, OK: August 17, 2022 1-Day Observed Precipitation

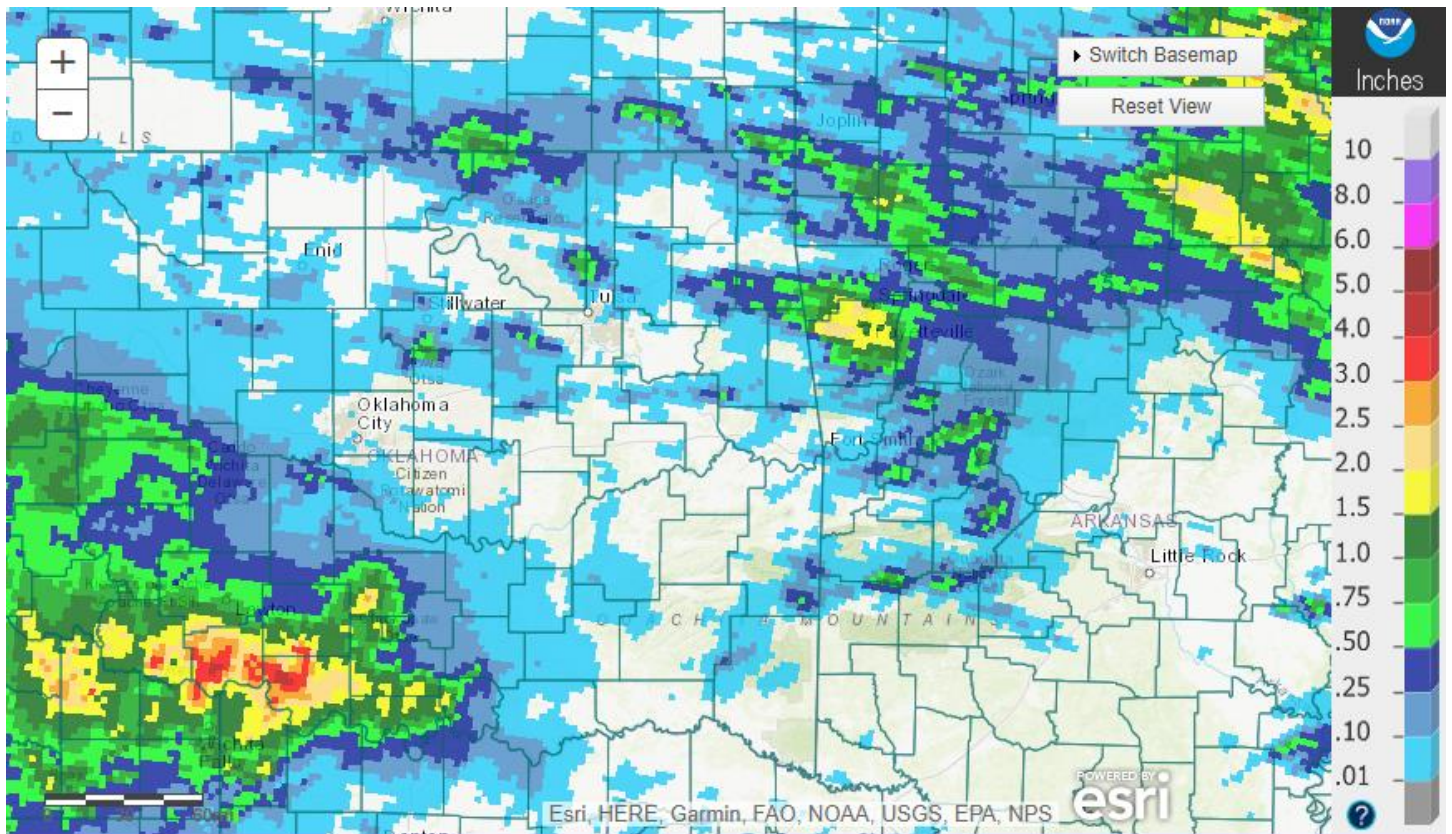
Valid on: August 17, 2022 12:00 UTC

Fig. 9. 24-hour Estimated Observed Rainfall ending at 7am CDT 8/17/2022.



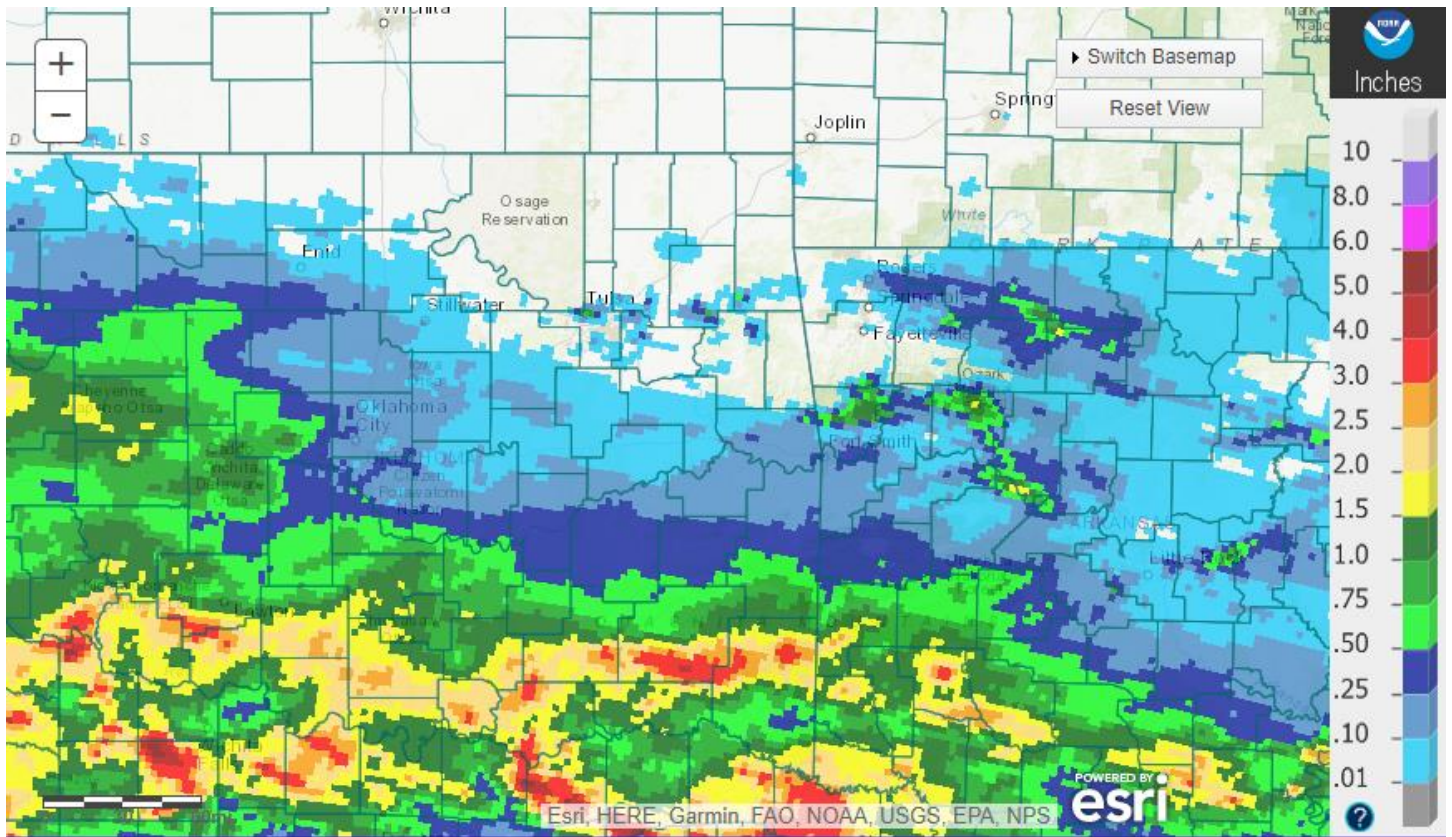
Tulsa, OK: August 18, 2022 1-Day Observed Precipitation
Valid on: August 18, 2022 12:00 UTC

Fig. 10. 24-hour Estimated Observed Rainfall ending at 7am CDT 8/18/2022.



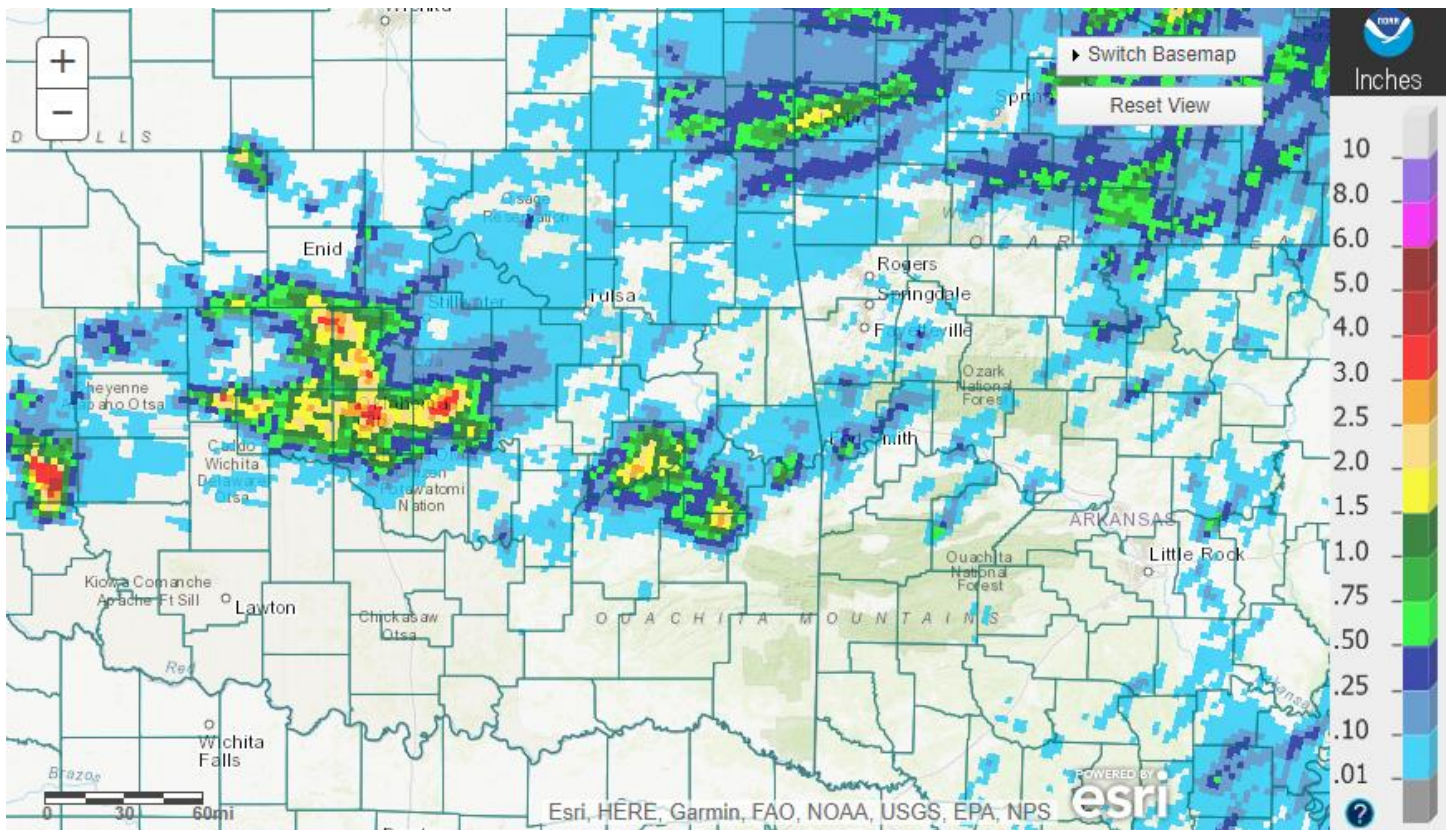
Tulsa, OK: August 21, 2022 1-Day Observed Precipitation
Valid on: August 21, 2022 12:00 UTC

Fig. 11. 24-hour Estimated Observed Rainfall ending at 7am CDT 8/21/2022.



Tulsa, OK: August 22, 2022 1-Day Observed Precipitation
Valid on: August 22, 2022 12:00 UTC

Fig. 12. 24-hour Estimated Observed Rainfall ending at 7am CDT 8/22/2022.



Tulsa, OK: August 29, 2022 1-Day Observed Precipitation
Valid on: August 29, 2022 12:00 UTC

Fig. 13. 24-hour Estimated Observed Rainfall ending at 7am CDT 8/29/2022.

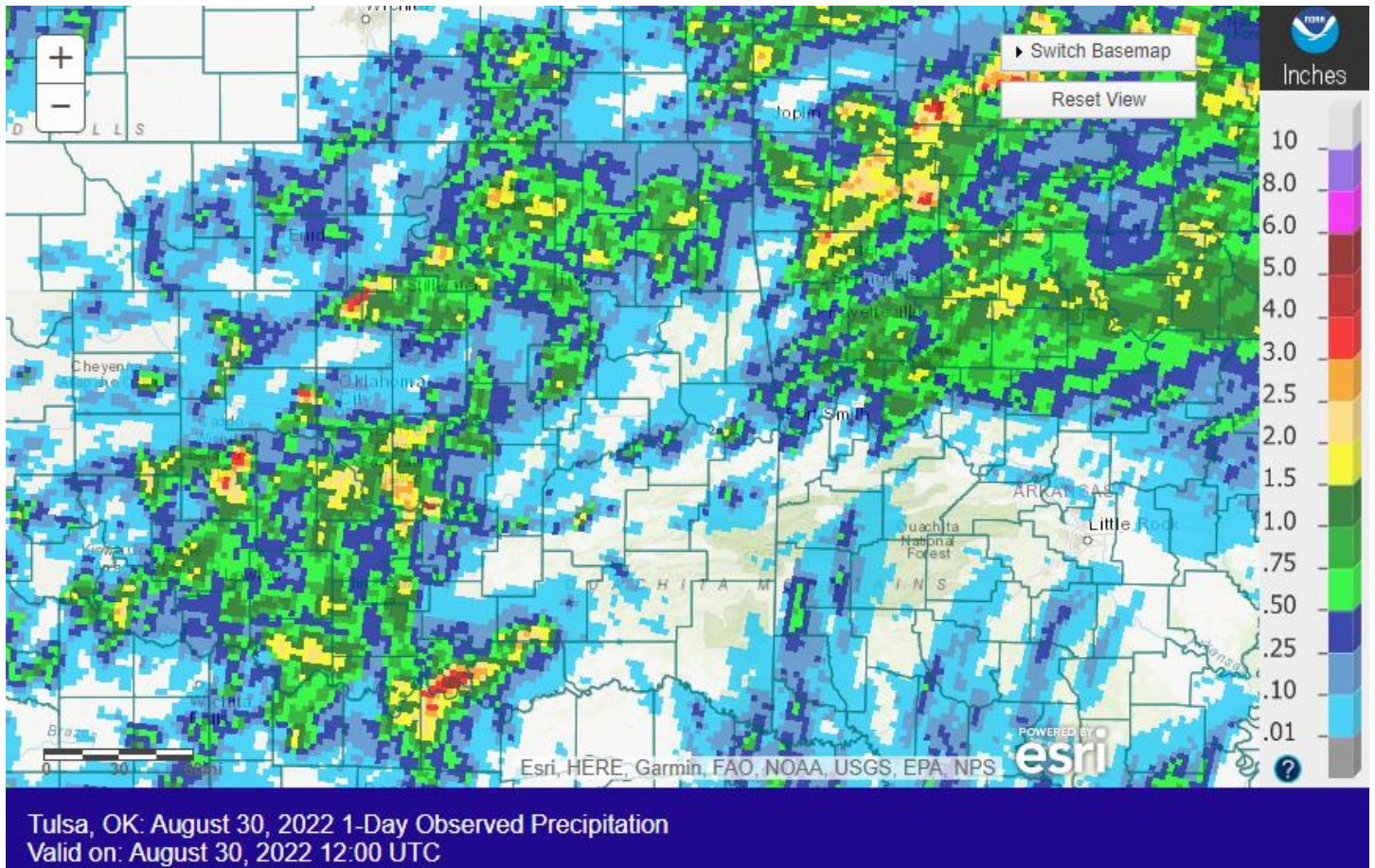


Fig. 14. 24-hour Estimated Observed Rainfall ending at 7am CDT 8/30/2022.

Written by:

Nicole McGavock
 Service Hydrologist
 WFO Tulsa

Products issued in August 2022:

- *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

- 1 Flash Flood Warnings (FFW)
- 1 Flash Flood Statements (FFS)
- 0 Flash/Areal Flood Watches (FFA) (0 Watch FFA CON/EXT/EXA/EXB/CAN)
- 9 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