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 **June** YEAR **2024**
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 **July 10, 2024**

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.**

June 2024 saw above normal temperatures and below normal rainfall, despite a few heavy rain events this month. Normal rainfall in the month of June ranges from 3.9 inches in McIntosh County to 5.9 inches in Wagoner County. The Ozark region of northwest Arkansas averages 5.1 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 June 2024 ranged from around 0.50" to 10" across eastern OK and northwest AR, with much of the area receiving 1.5"-4". These rainfall totals correspond to 10% to 200% of the normal June rainfall, with most of the area below normal for the month (Fig. 1b).

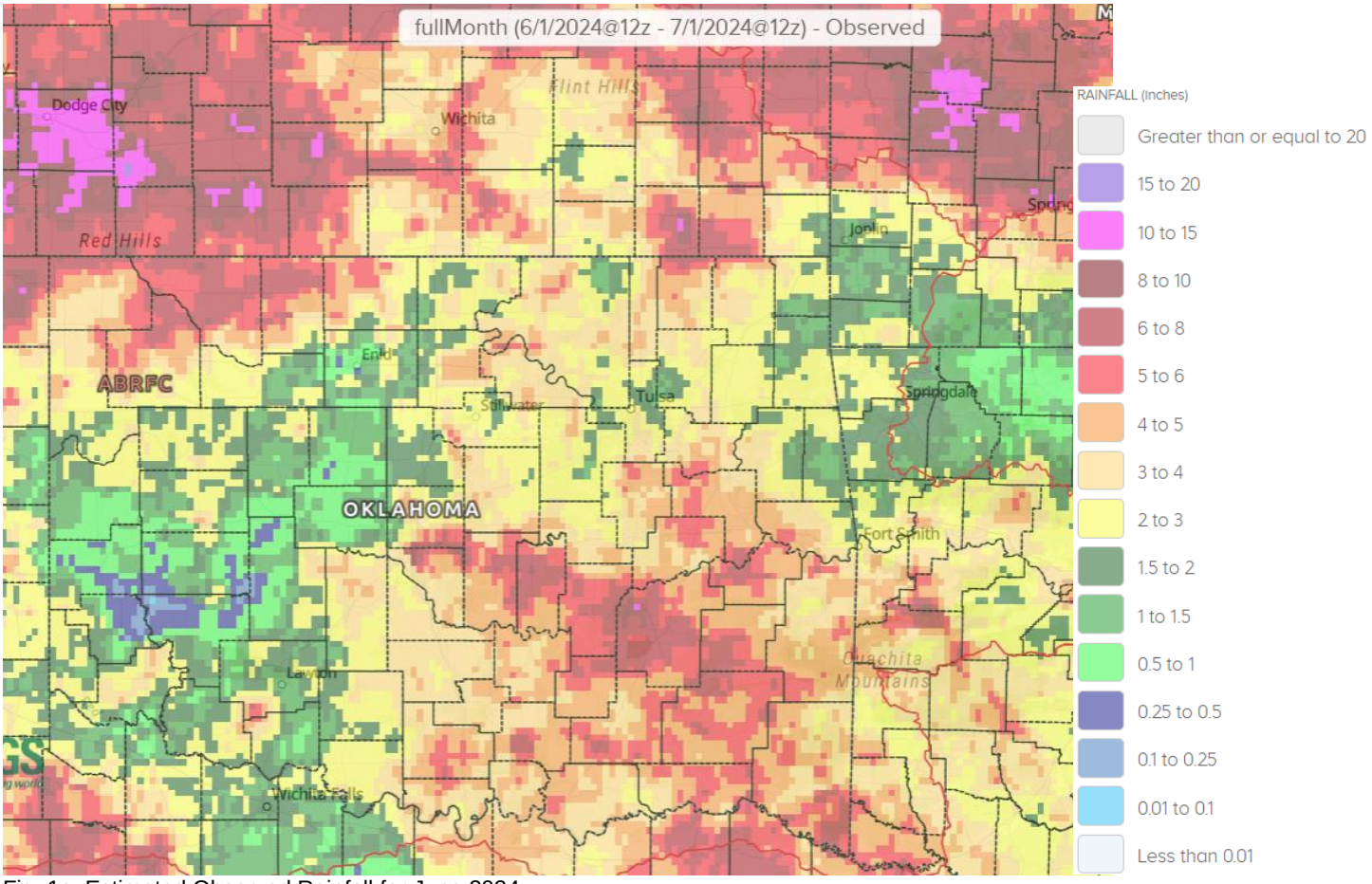


Fig. 1a. Estimated Observed Rainfall for June 2024

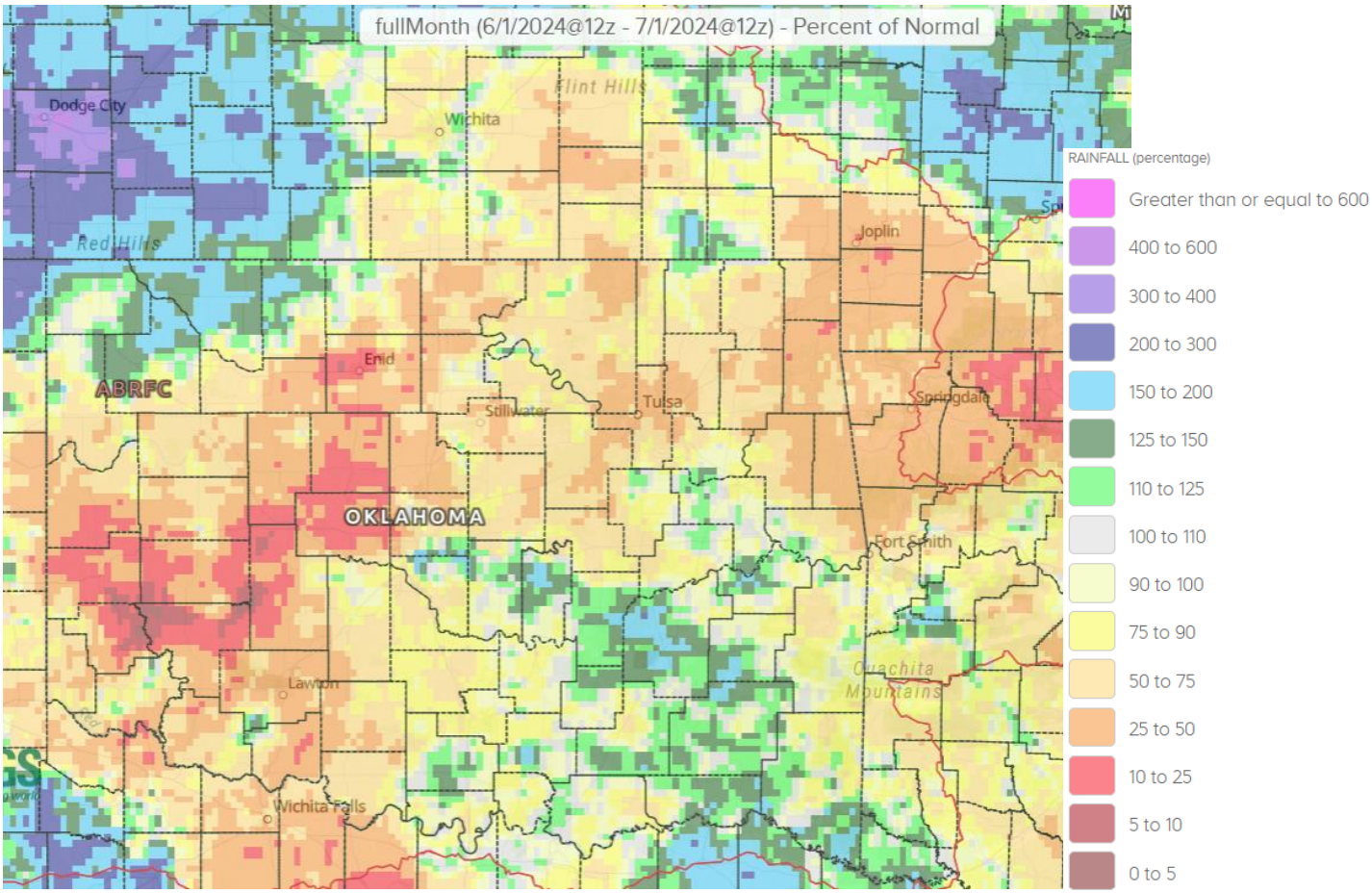


Fig. 1b. Estimated % of Normal Rainfall for June 2024

In Tulsa, OK, June 2024 ranked as the 17th warmest June (81.6°F; since records began in 1905) and the 21st driest June (1.75"; since records began in 1888). Fort Smith, AR had the 12th warmest June (82.1°F; since records began in 1882) and the 68th driest June (3.45"; since records began in 1882). Fayetteville, AR had the 4th warmest (78.0°F) and the 8th driest (1.88") June since records began in 1950.

Some of the larger precipitation reports (in inches) for June 2024 included:

McAlester, OK (ASOS)	8.08	Hugo 1.9ENE, OK (coco)	6.78	Krebs 0.3WNW, OK (coco)	6.71
Clayton, OK (meso)	6.31	Stuart, OK (meso)	6.19	Antlers, OK (meso)	5.77
Porter, OK (meso)	5.69	Stigler, OK (meso)	5.68	Antlers 6.3 SE, OK (coco)	5.48

Some of the lowest precipitation reports (in inches) for June 2024 included:

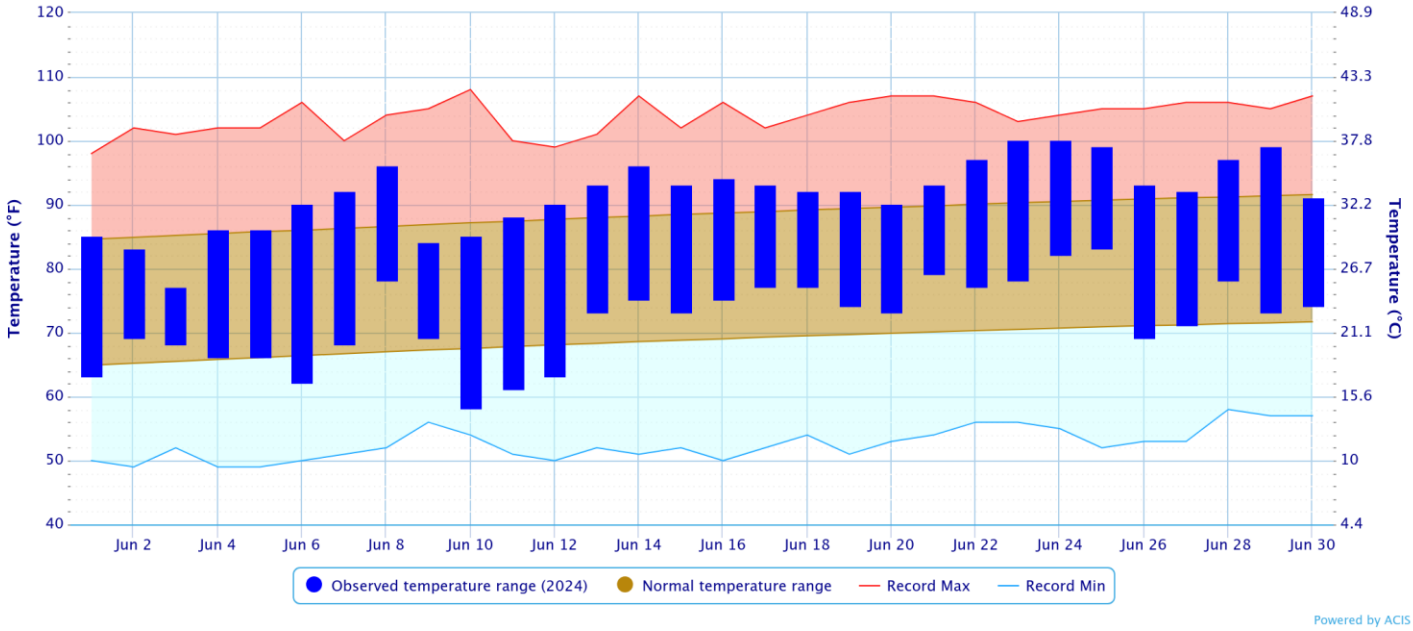
Metalton 3.5W, AR (coco)	1.15	Huntsville 10N, AR (coop)	1.25	Owasso 3.6ENE, OK (coco)	1.33
Tulsa 7.7SSE, OK (coco)	1.40	Bristow, OK (meso)	1.41	Rogers Airport, AR (AWOS)	1.43
Owasso 1.5ESE, OK (coco)	1.44	Elkins 10.6SSE, AR (coco)	1.48	Bella Vista 2.2E, AR (coco)	1.50

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

Rank since 1921	June 2024	Warm Growing Season (Mar 1 – Jun 30)	Water Year-to-Date (Oct 1, 2023 – Jun 30, 2024)	Year-to-Date (Jan 1 – Jun 30)	Last 60 Days (May 2 – Jun 30)	Last 365 Days (Jul 2, 2023 – Jun 30, 2024)
Northeast OK	31st driest	46th wettest	50th driest	42nd wettest	51st driest	44th wettest
East Central OK	48th wettest	34th wettest	43rd wettest	38th wettest	52nd wettest	40th wettest
Southeast OK	32nd wettest	22nd wettest	40th wettest	28th wettest	34th wettest	38th wettest
Statewide	42nd driest	51st driest	45th wettest	48th wettest	45th driest	40th wettest

Daily Temperature Data – Tulsa Area, OK (ThreadEx)

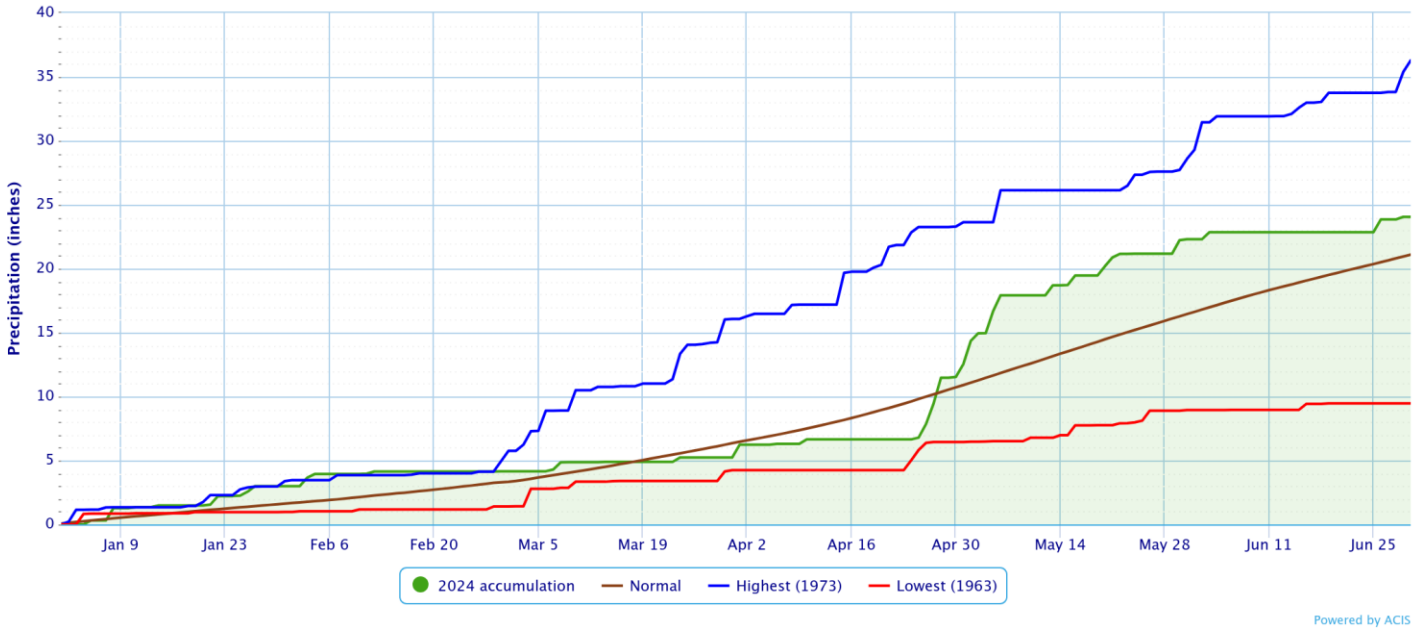
Period of Record – 1905-01-06 to 2024-06-30. Normals period: 1991-2020. Click and drag to zoom chart.



Powered by ACIS

Accumulated Precipitation – Tulsa Area, OK (ThreadEx)

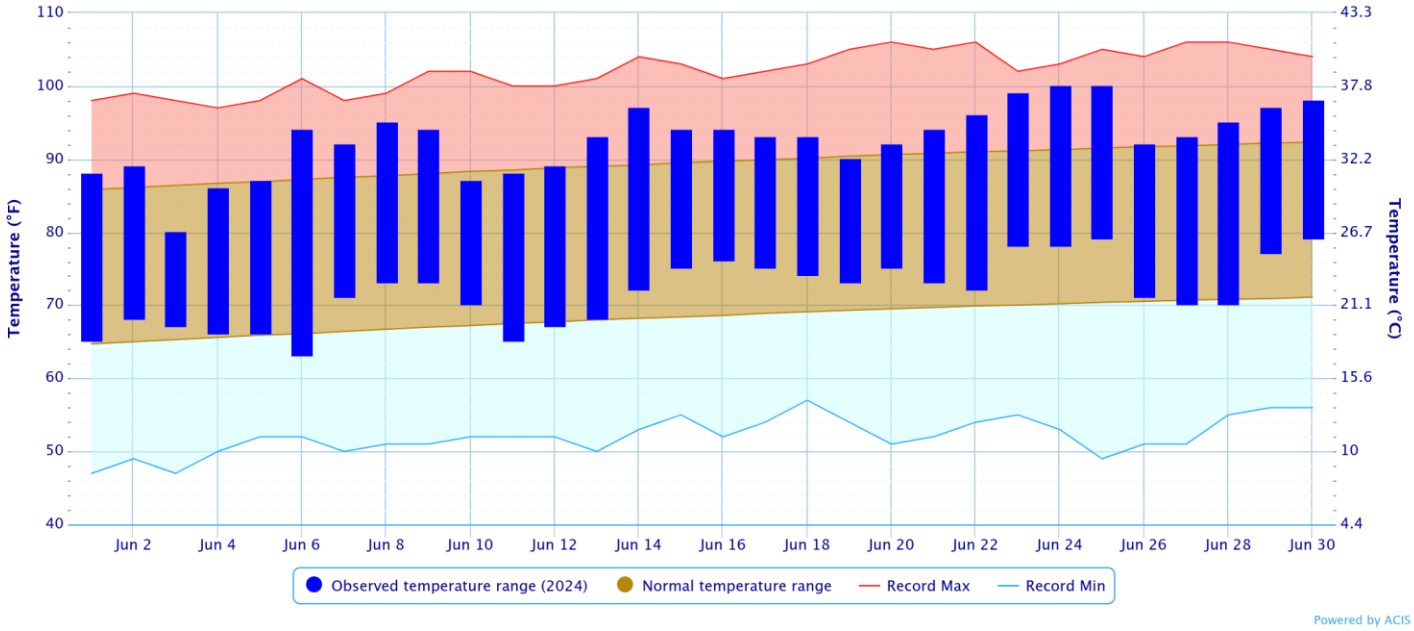
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



Powered by ACIS

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

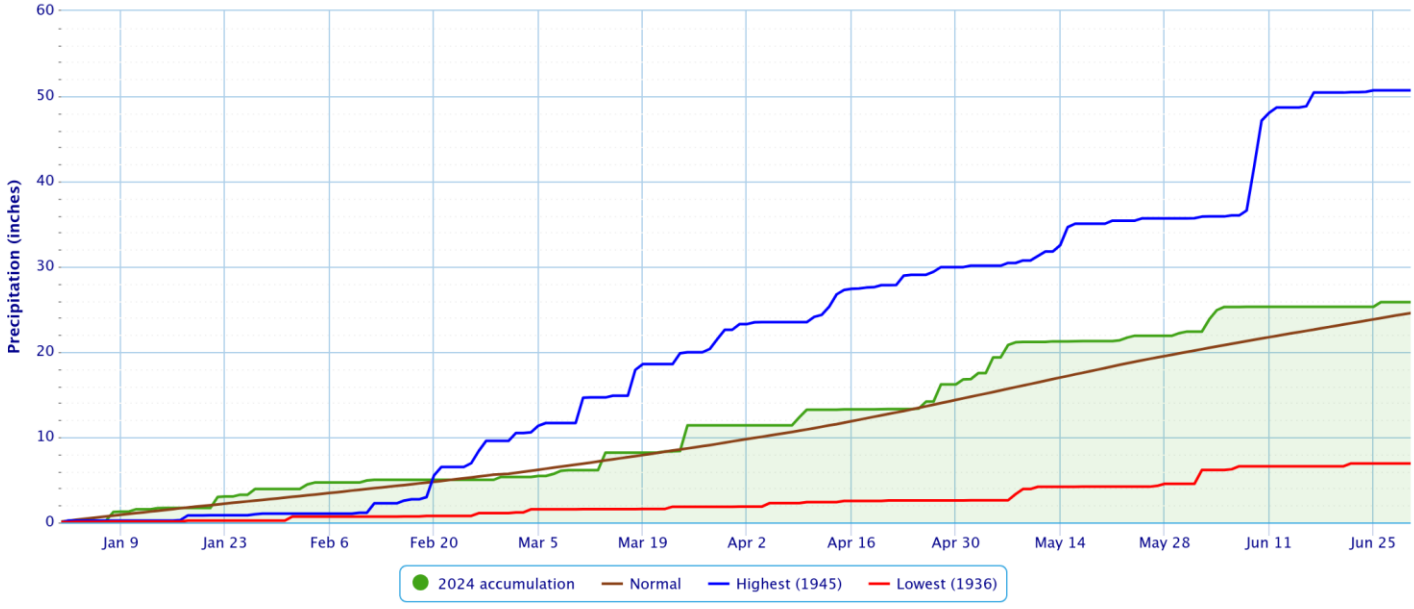
Period of Record – 1882-06-01 to 2024-06-30. Normals period: 1991-2020. Click and drag to zoom chart.



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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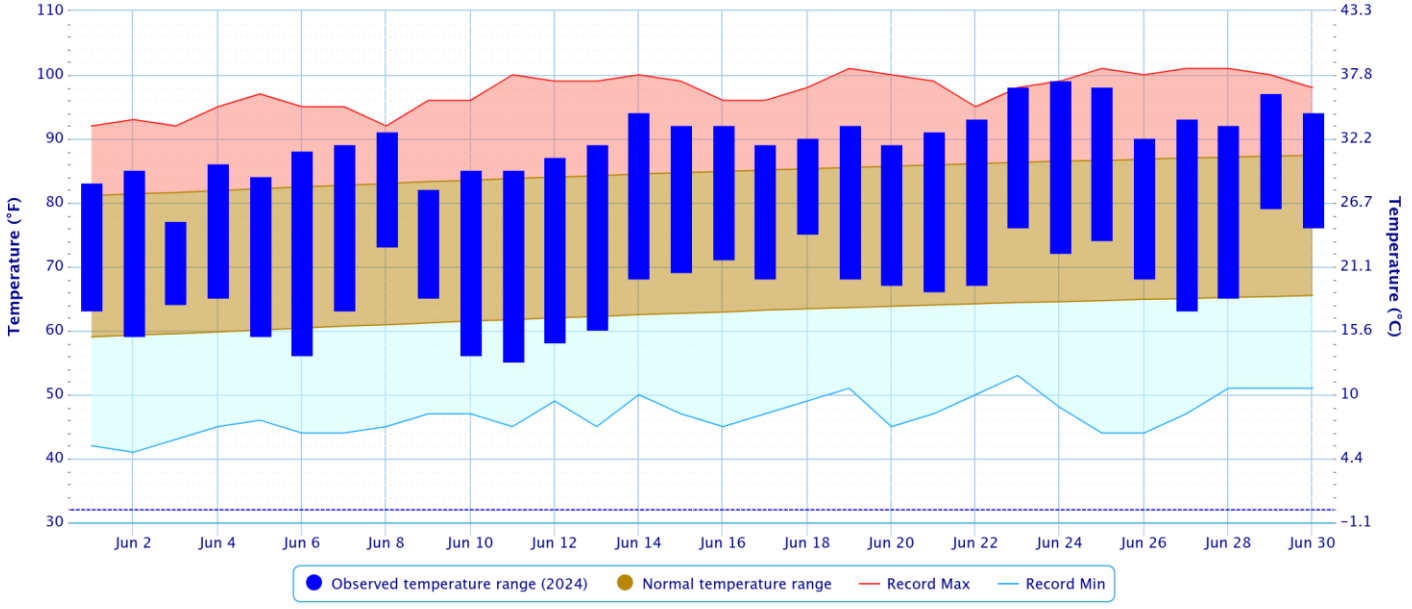
Daily Temperature Data – FAYETTEVILLE DRAKE FIELD, AR

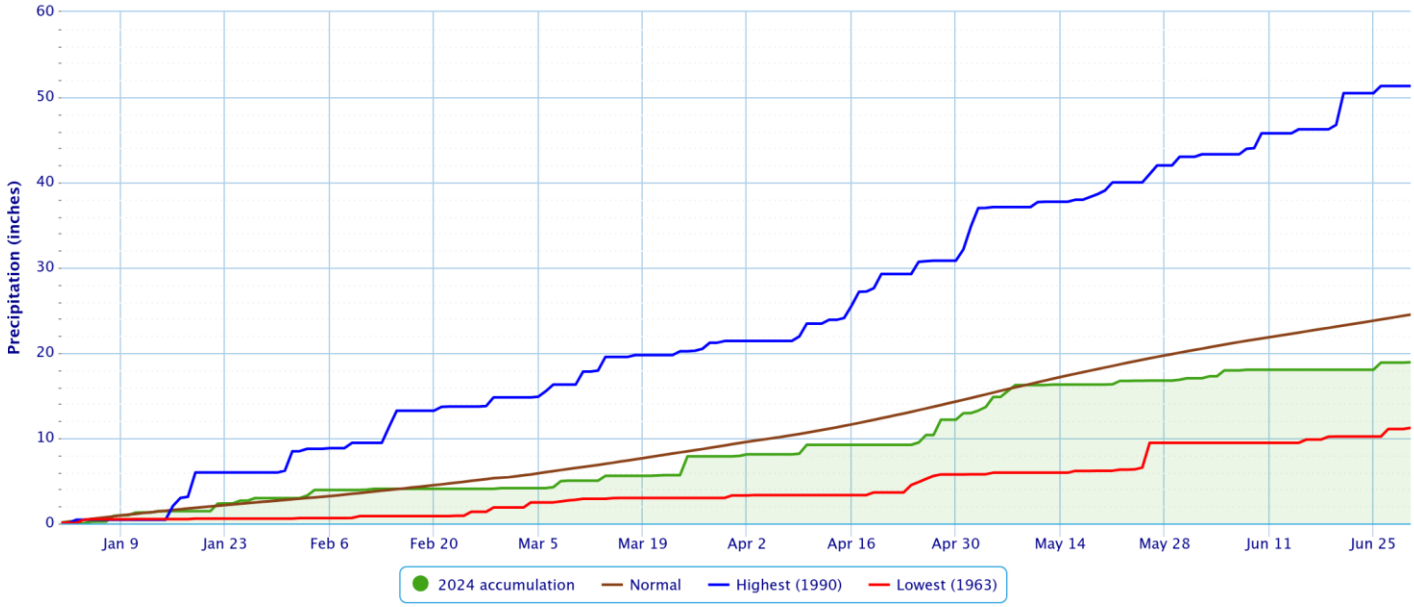
Period of Record – 1949-07-14 to 2024-06-30. Normals period: 1991-2020. Click and drag to zoom chart.



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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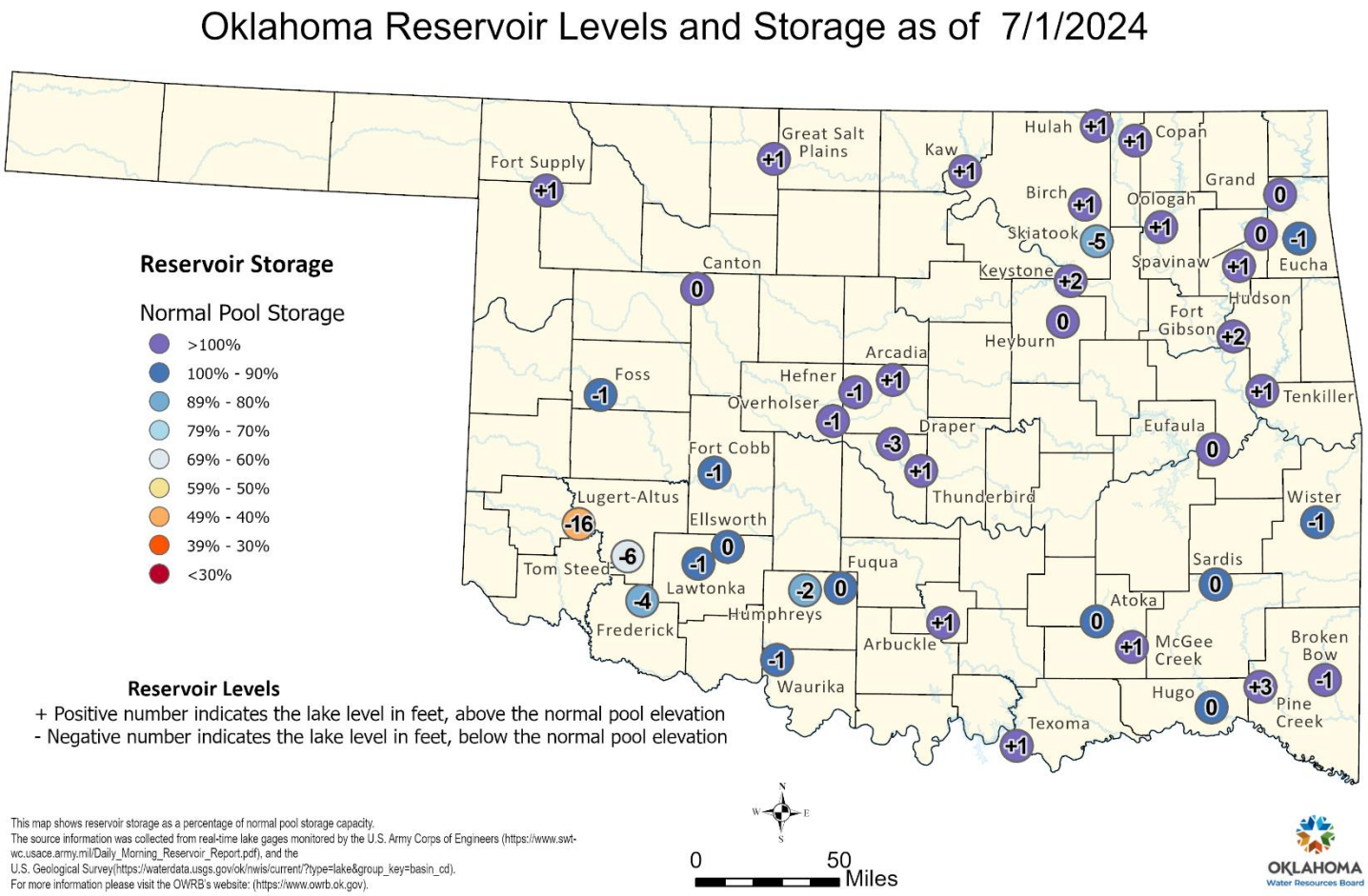
Reservoirs



According to the USACE, a few of the lakes in the HSA were below 3% of top of their conservation pools as of 7/01/2024: Skiatook Lake 84%, Birch Lake 95%, Wister Lake 96%, and Heyburn Lake 96%. A few lakes were above 3% of the top of their conservation pools: Oologah Lake 5%, Eufaula Lake 5%, Ft. Gibson Lake 4%, and Hudson Lake 4%.

Drought

According to the U.S. Drought Monitor (USDM) from July 2, 2024 (Figs. 2, 3), Moderate (D1) drought conditions were occurring across portions of Adair County in eastern Oklahoma and Washington, Crawford, Carroll, and Madison Counties in northwest AR. Abnormally Dry (D0) but not in drought conditions were occurring in parts of Osage, Pawnee, Creek, Okmulgee, Okfuskee, Tulsa, Washington, Nowata, Craig, Rogers, Mayes, Wagoner, Ottawa, Delaware, Cherokee, Adair, Sequoyah, and Le Flore Counties in eastern OK and Benton, Washington, Crawford, Sebastian, Carroll, Madison, and Franklin Counties in northwest AR.

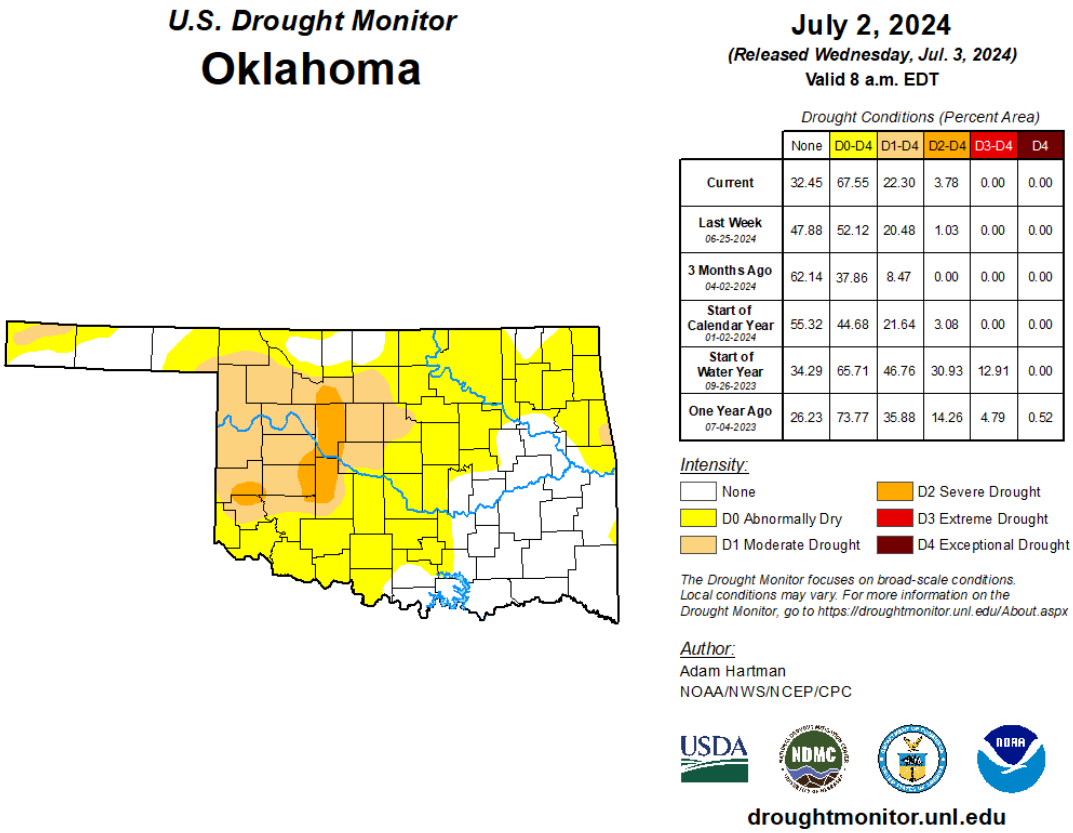


Fig. 2. Drought Monitor for Oklahoma

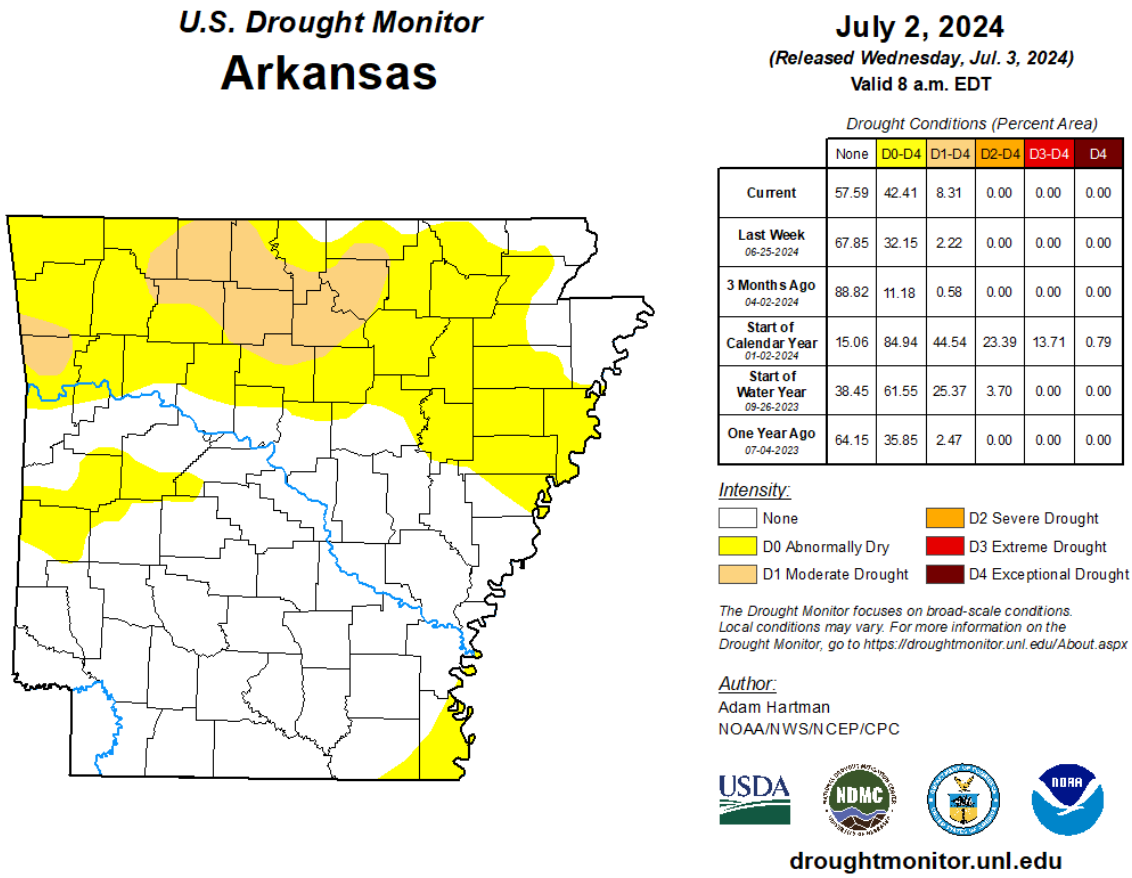


Fig. 3. Drought Monitor for Arkansas

Outlooks

The Climate Prediction Center (CPC) outlook for July 2024 (issued June 30, 2024) indicates a greatly enhanced chance for above normal temperatures and an enhanced chance for below median precipitation across all of eastern OK and northwest AR. This outlook was based on dynamical and statistical model output along with long-term trends and soil moisture conditions. The Madden-Julian Oscillation (MJO) and ENSO did not influence this month's outlook.

For the 3-month period July-August-September 2024, CPC is forecasting an enhanced chance for below median precipitation across portions of Creek, Pawnee, Osage, and Washington Counties in northeast OK and an equal chance of above, near, or below median precipitation elsewhere across eastern OK and northwest AR. This outlook also calls for an increased chance of above normal temperatures across eastern OK and northwest AR (outlook issued June 20, 2024). This outlook is based on long-term trends, ENSO state, and incorporates both statistical and dynamical forecast tools. According to CPC, El Niño conditions are no longer present in the equatorial Pacific Ocean and ENSO-neutral conditions are now present. La Niña conditions are expected to develop in the July-September 2024 season (65% chance) and persist through the winter (85% chance November-January). CPC issued its final the El Niño Advisory June 13th and continues the La Niña Watch.

Summary of Heavy Precipitation Events Daily quality-controlled rainfall maps can be found at: https://water.noaa.gov/wfo/TSA

A line of thunderstorms moved into eastern OK from the west during the late afternoon of the 2nd. These storms continued to move southeast through the evening hours, affecting east central and southeast OK, and far west central AR. Around sunrise on the 3rd, two clusters of thunderstorms moved into eastern Oklahoma from the west: one from south central KS and one from central OK. The northern area of storms moved east along the KS/OK state line through the morning hours, while the southern cluster moved east southeast across east central and southeast OK and west central AR. Widely scattered storms also occurred elsewhere across northeast OK and northwest AR during this time. Meanwhile, a third, larger storm complex moved into northeast OK from south central KS/north central OK during the late morning hours. This complex developed into a mesoscale convective system (MCS) with a leading line of thunderstorms that marched southeast across the area. This MCS brought rain to all of eastern OK and northwest AR before exiting the area by early evening of the 3rd. Just before midnight of the 4th, convection developed along the Red River as upglide increased over the leftover, shallow cold pool from the earlier storms. This activity initially moved north before congealing into a bow echo that then moved southeast. The storms finally exited the area during the late morning. 24-hour rainfall totals ending at 7am June 3 ranged from around 0.25" to 2.5" (Fig. 4), and the 24-hour rainfall totals ending at 7am June 4 ranged from around 0.25" to around 6" (Figs. 5, 6).

During the afternoon and evening hours of the 4th, the atmosphere rapidly destabilized as surface low pressure deepened across northern TX and advected strong warm and deep-layer moisture into the region. Convection quickly developed from southeast KS through central OK by late evening as an upper-level trough and associated weak cold front moved into the area. These storms grew into an MCS that moved eastward across most of eastern OK and northwest AR during the overnight hours. The rain ended from northwest to southeast by around sunrise on the 5th. Along and south of I-44, rainfall totals were 0.50" to near 3", while north of the interstate, totals were around 1" or less (Fig. 8).

From just before midnight of the 9th through sunrise, an MCS moved across eastern KS. Rainfall totals of 1"-4" fell over the upper-Neosho River basin (Fig. 9), resulting in a rise above action stage along the Neosho River near Commerce (see the preliminary hydrograph at the end of this report). However, the river remained below flood stage.

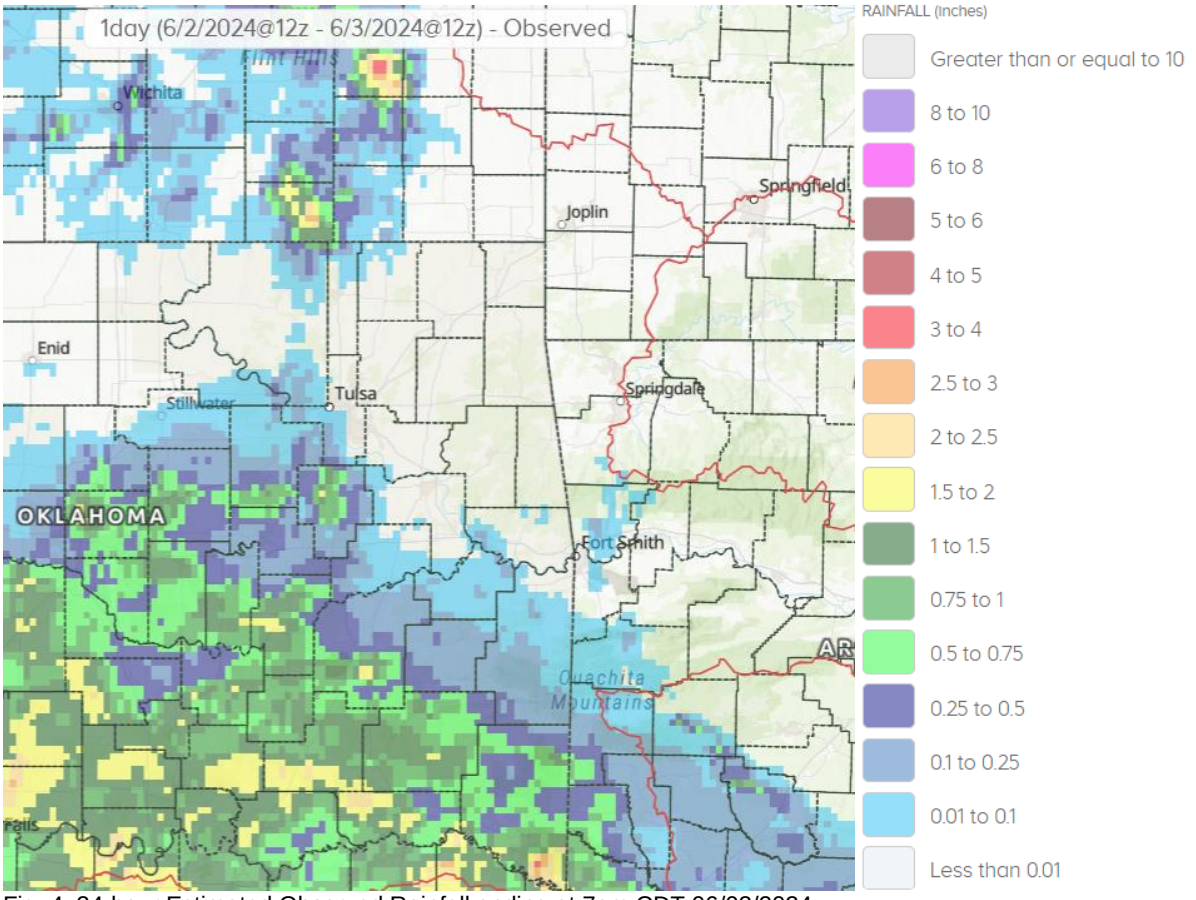


Fig. 4. 24-hour Estimated Observed Rainfall ending at 7am CDT 06/03/2024.

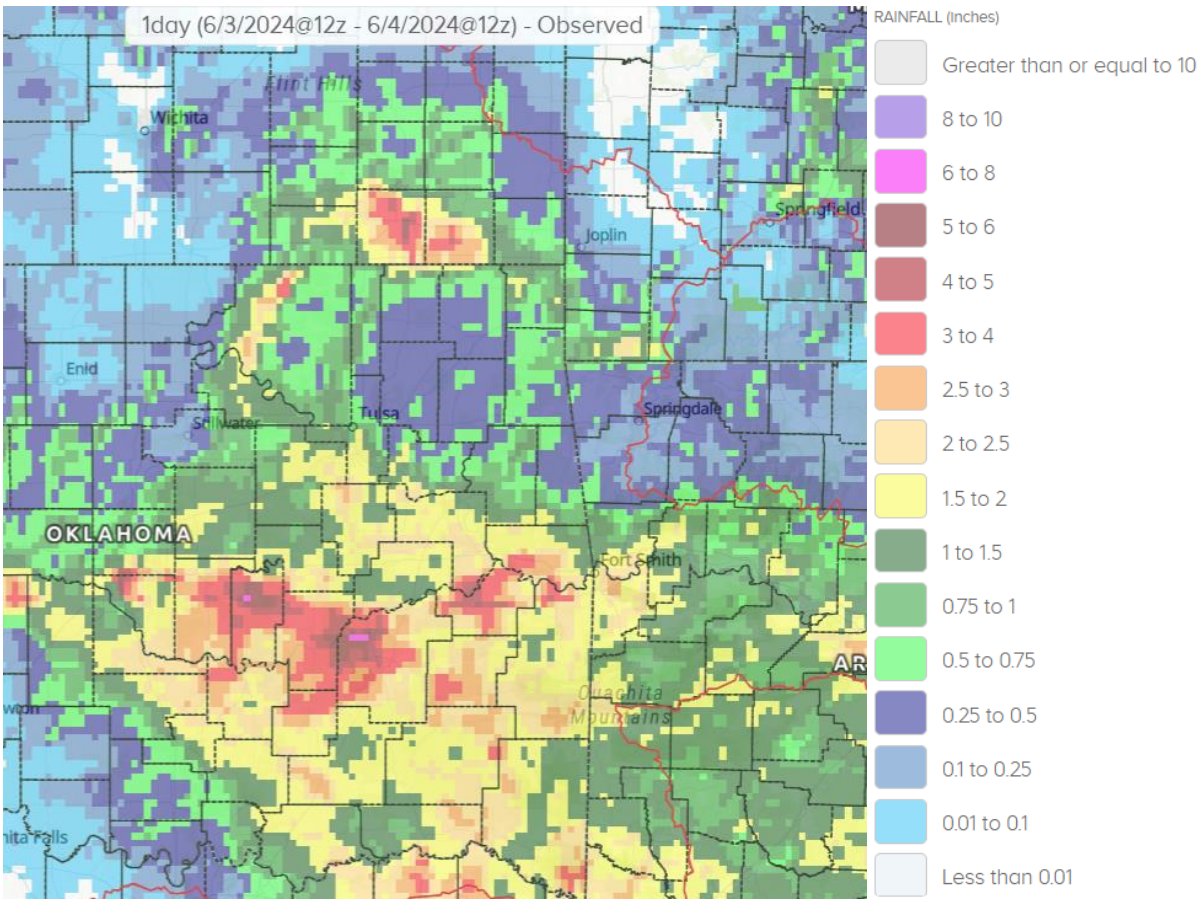


Fig. 5. 24-hour Estimated Observed Rainfall ending at 7am CDT 06/04/2024.

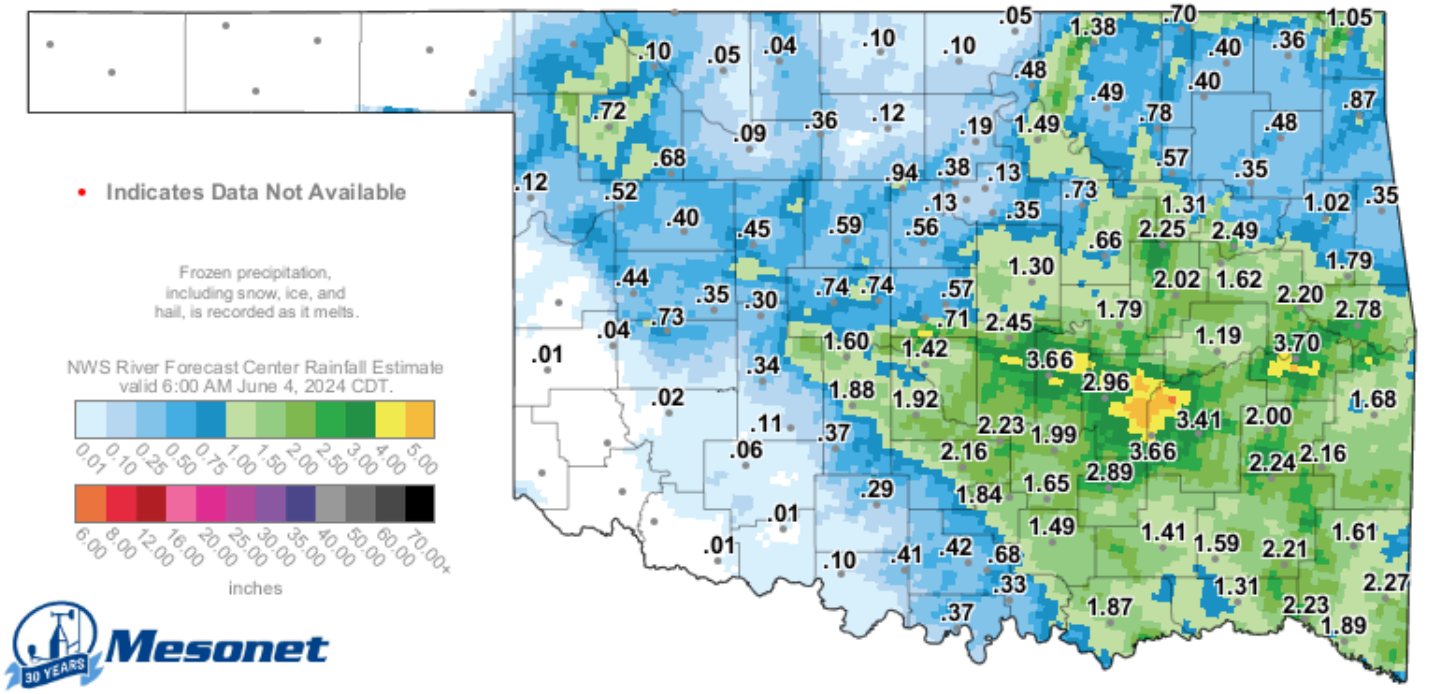


Fig. 6. OK Mesonet (values) and NWS RFC rainfall estimate (image) 24-hour rainfall ending at 7:15 am CDT 06/04/2024.

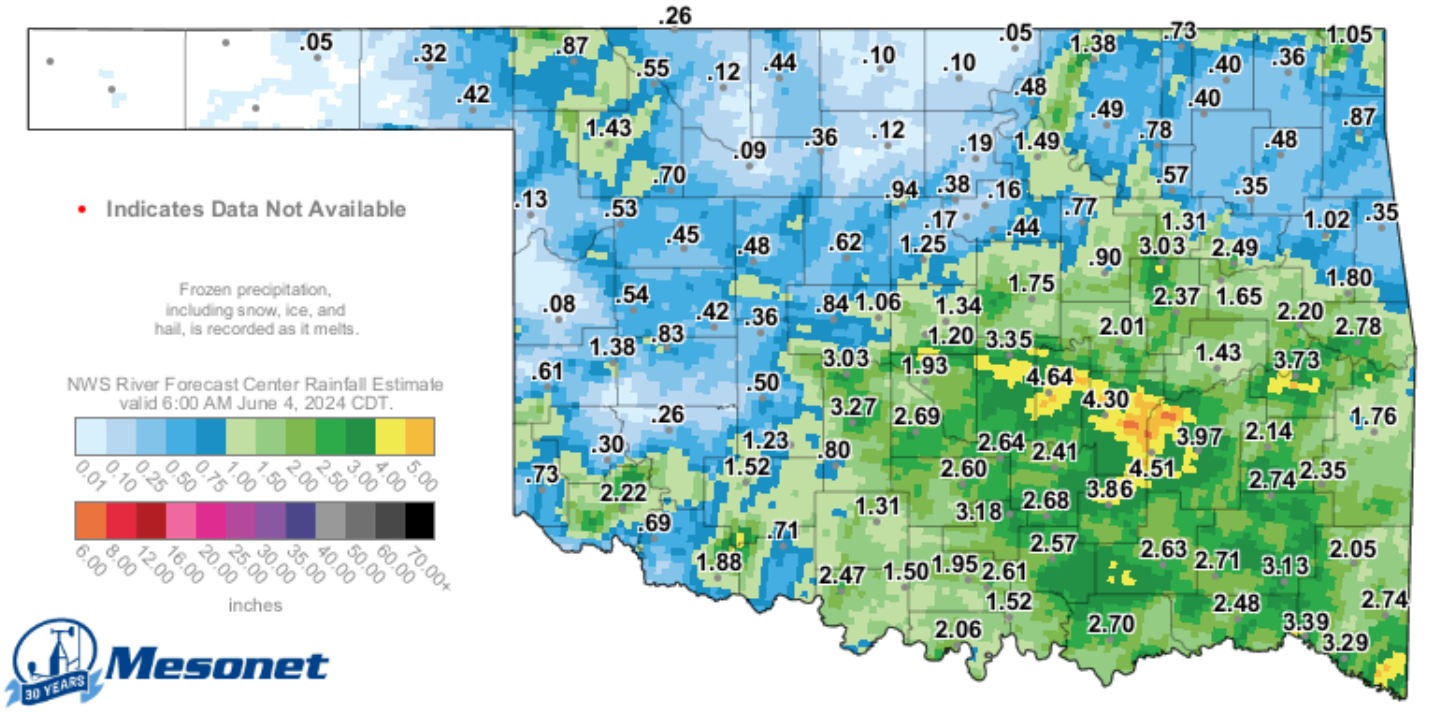


Fig. 7. OK Mesonet (values) and NWS RFC rainfall estimate (image) 48-hour rainfall ending at 7:20 am CDT 06/04/2024.

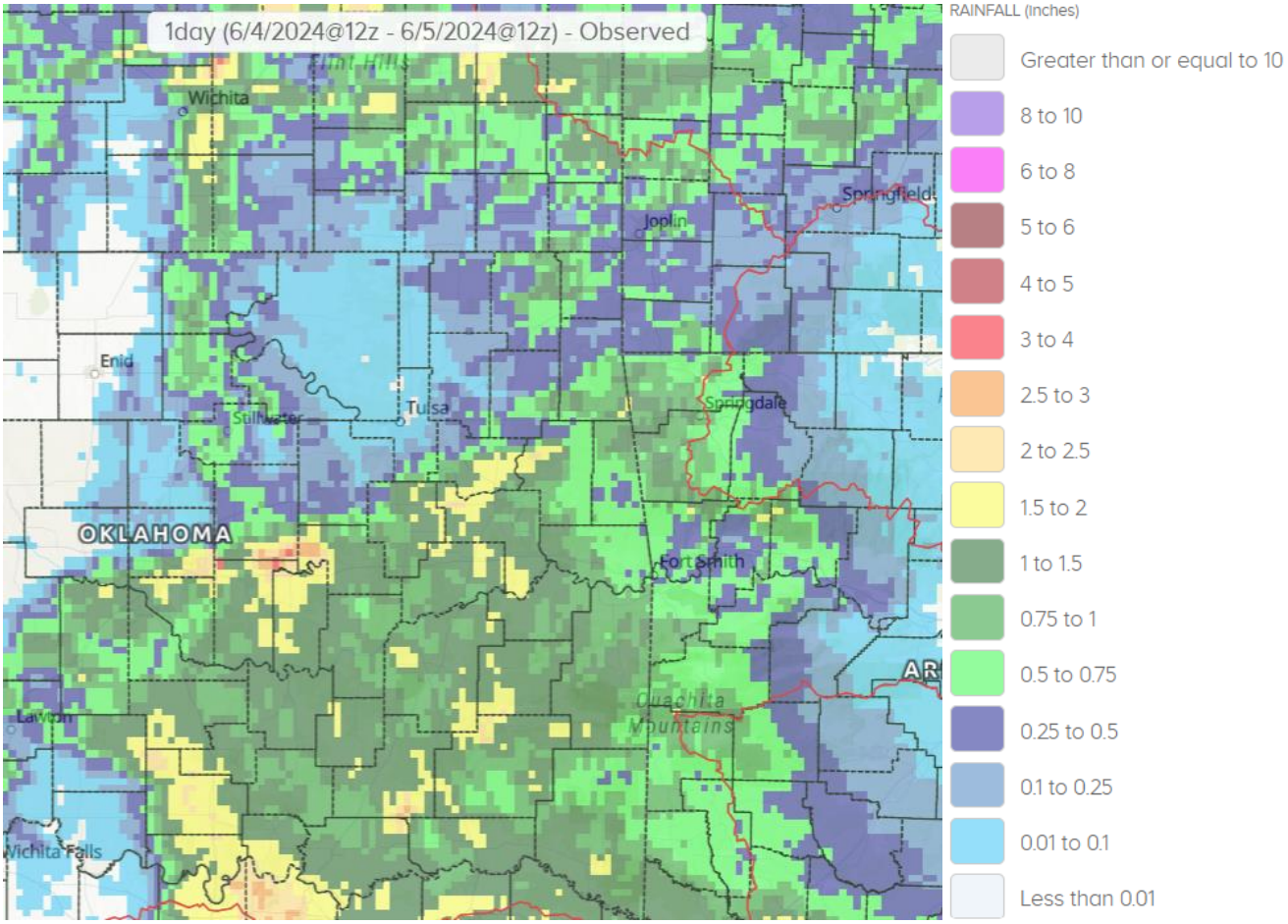


Fig. 8. 24-hour Estimated Observed Rainfall ending at 7am CDT 06/05/2024.

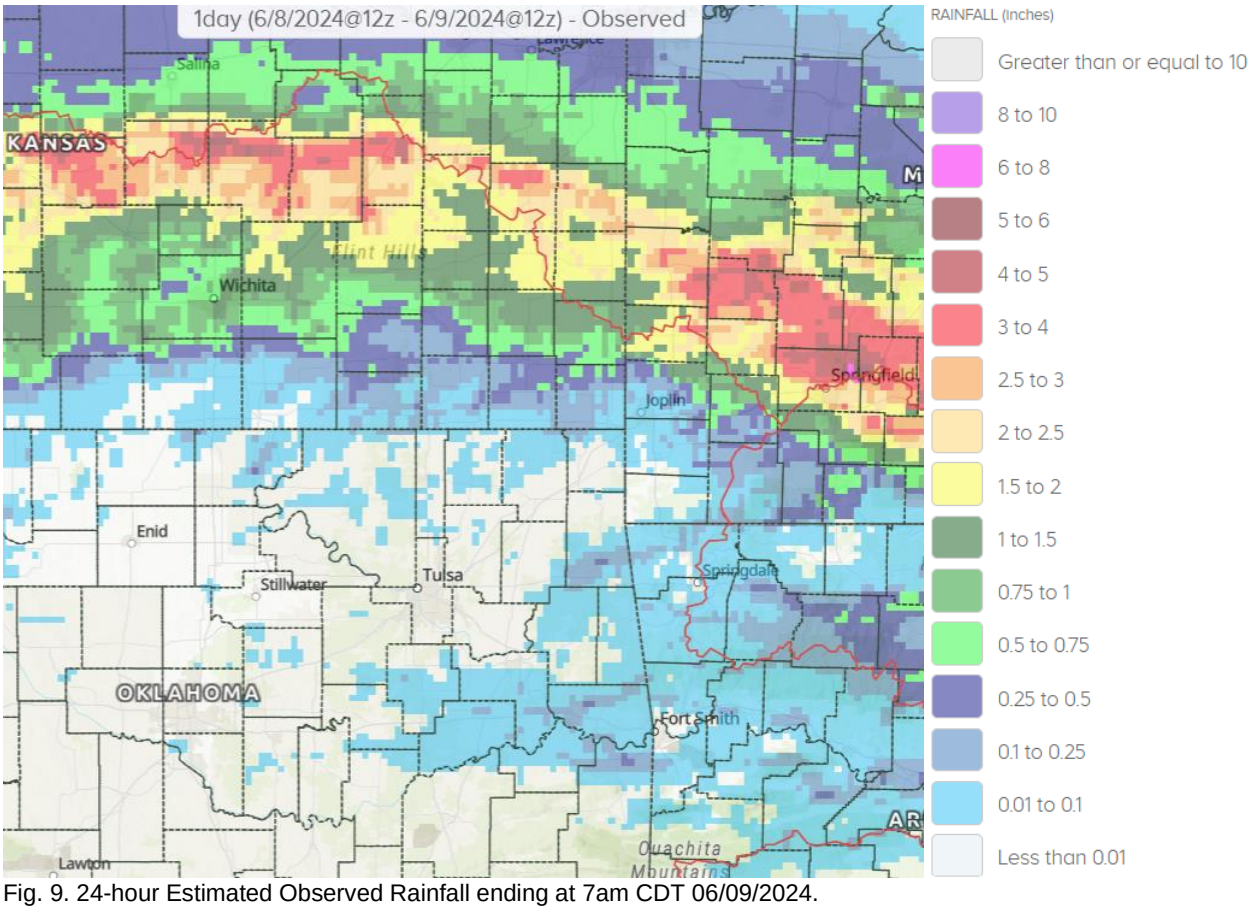


Fig. 9. 24-hour Estimated Observed Rainfall ending at 7am CDT 06/09/2024.

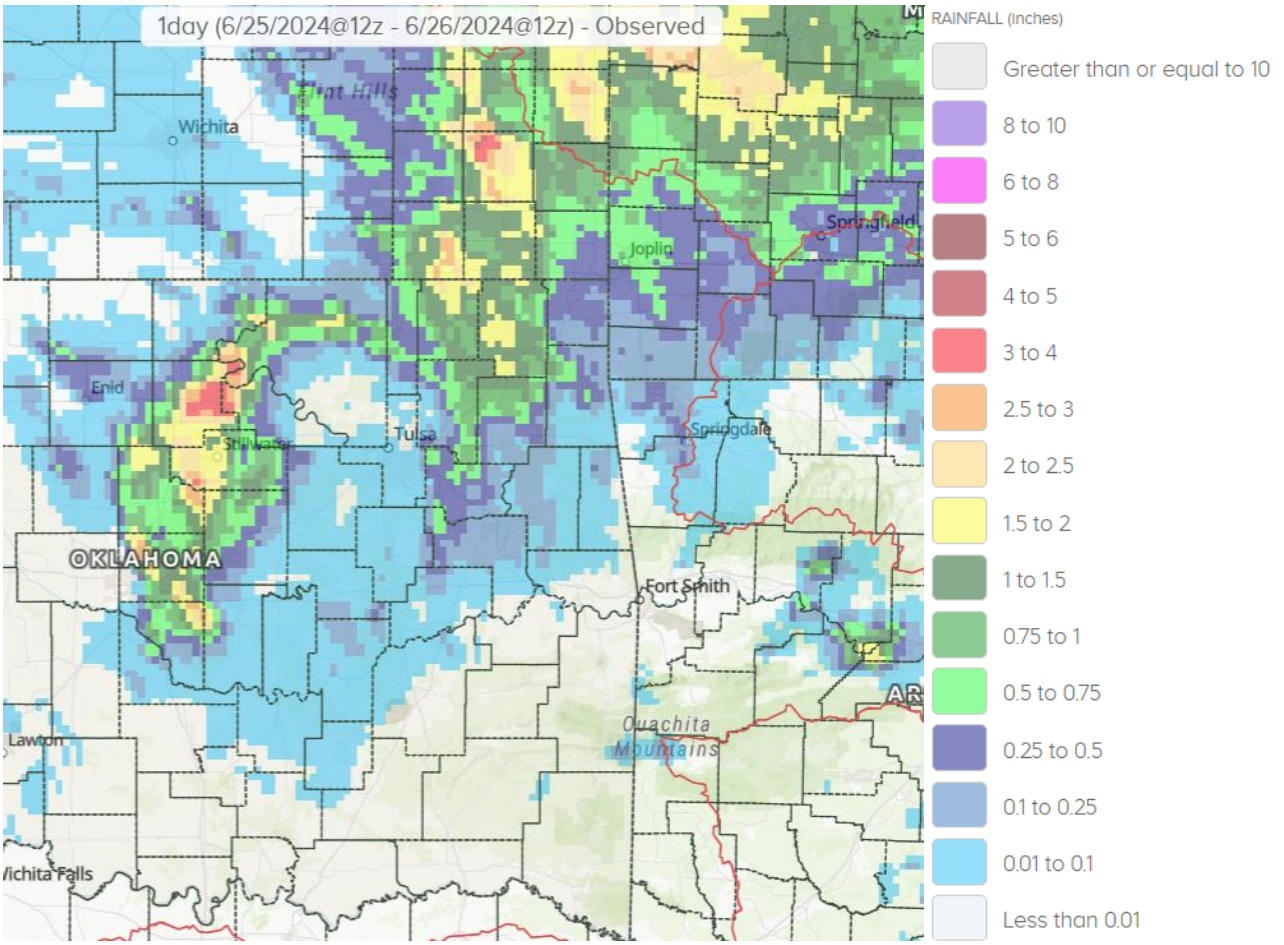


Fig. 10. 24-hour Estimated Observed Rainfall ending at 7am CDT 06/26/2024.

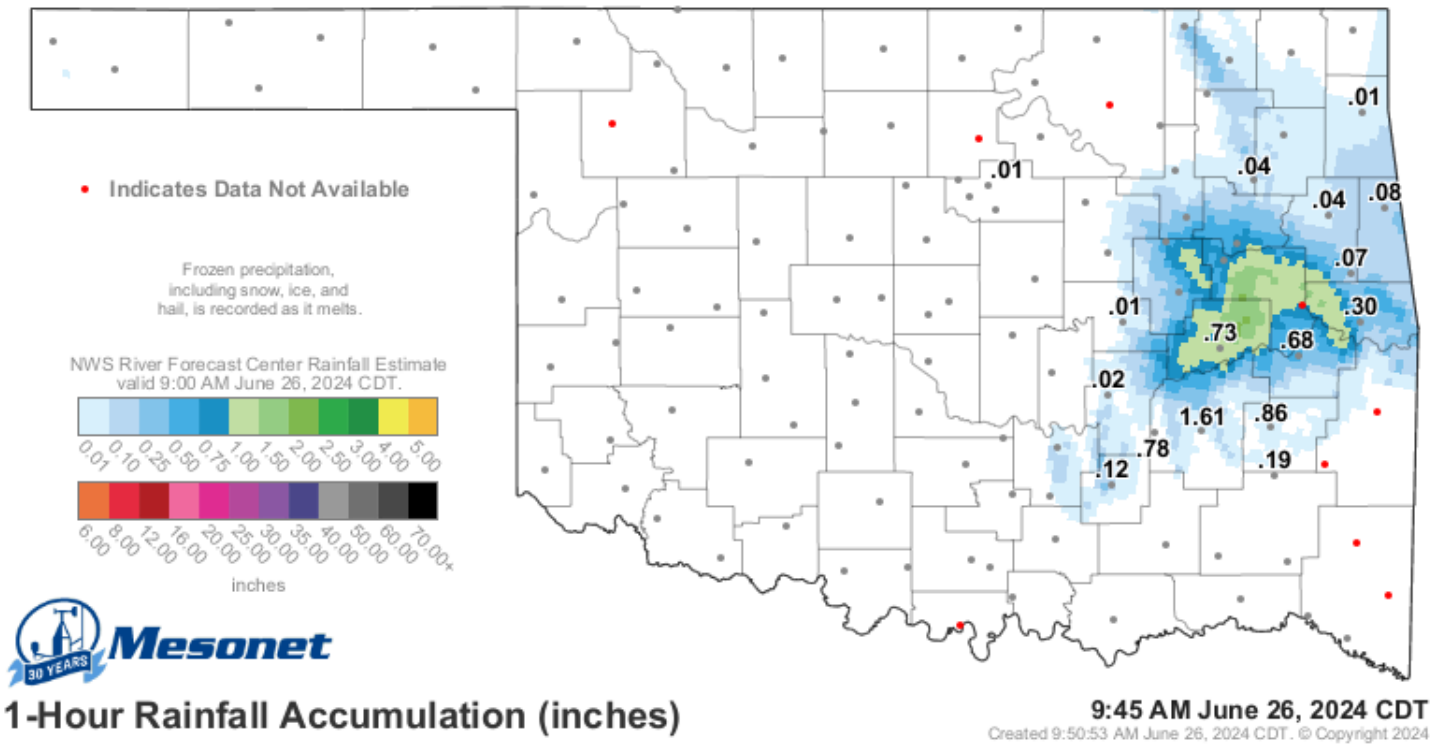


Fig. 11. OK Mesonet (values) and NWS RFC rainfall estimate (image) 1-hour rainfall ending at 9:45 am CDT 06/26/2024.

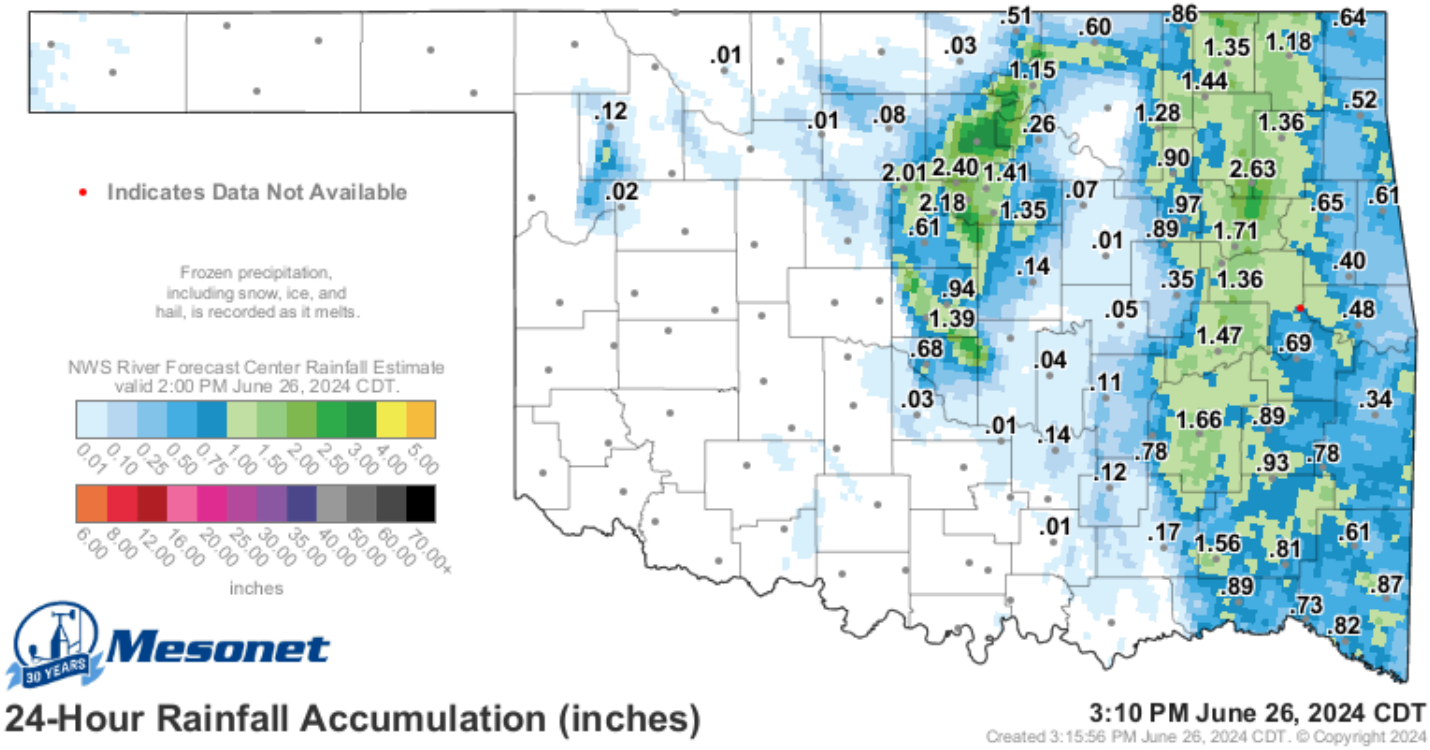


Fig. 12. OK Mesonet (values) and NWS RFC rainfall estimate (image) 24-hour rainfall ending at 3:10 pm CDT 06/26/2024.

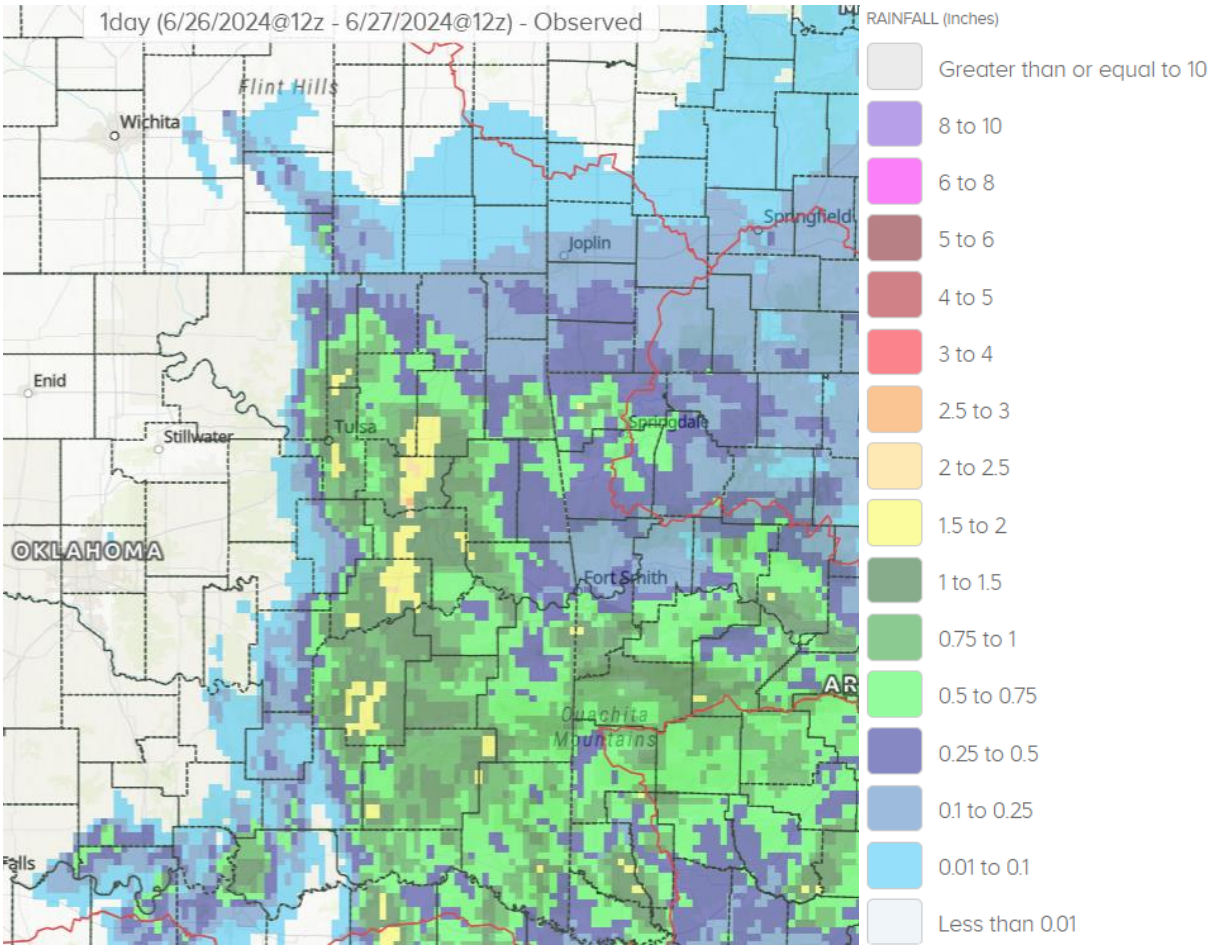


Fig. 13. 24-hour Estimated Observed Rainfall ending at 7am CDT 06/27/2024.

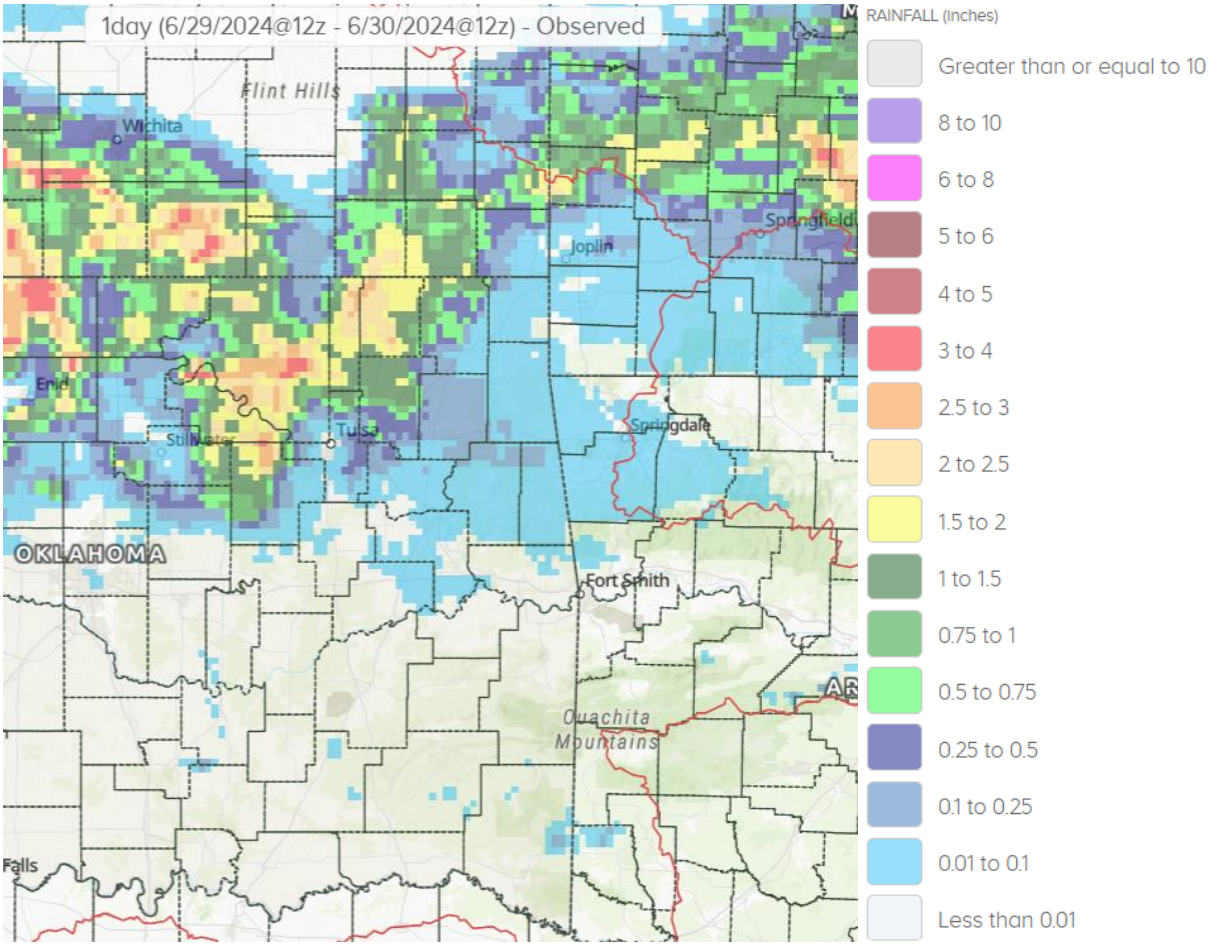


Fig. 14. 24-hour Estimated Observed Rainfall ending at 7am CDT 06/30/2024.

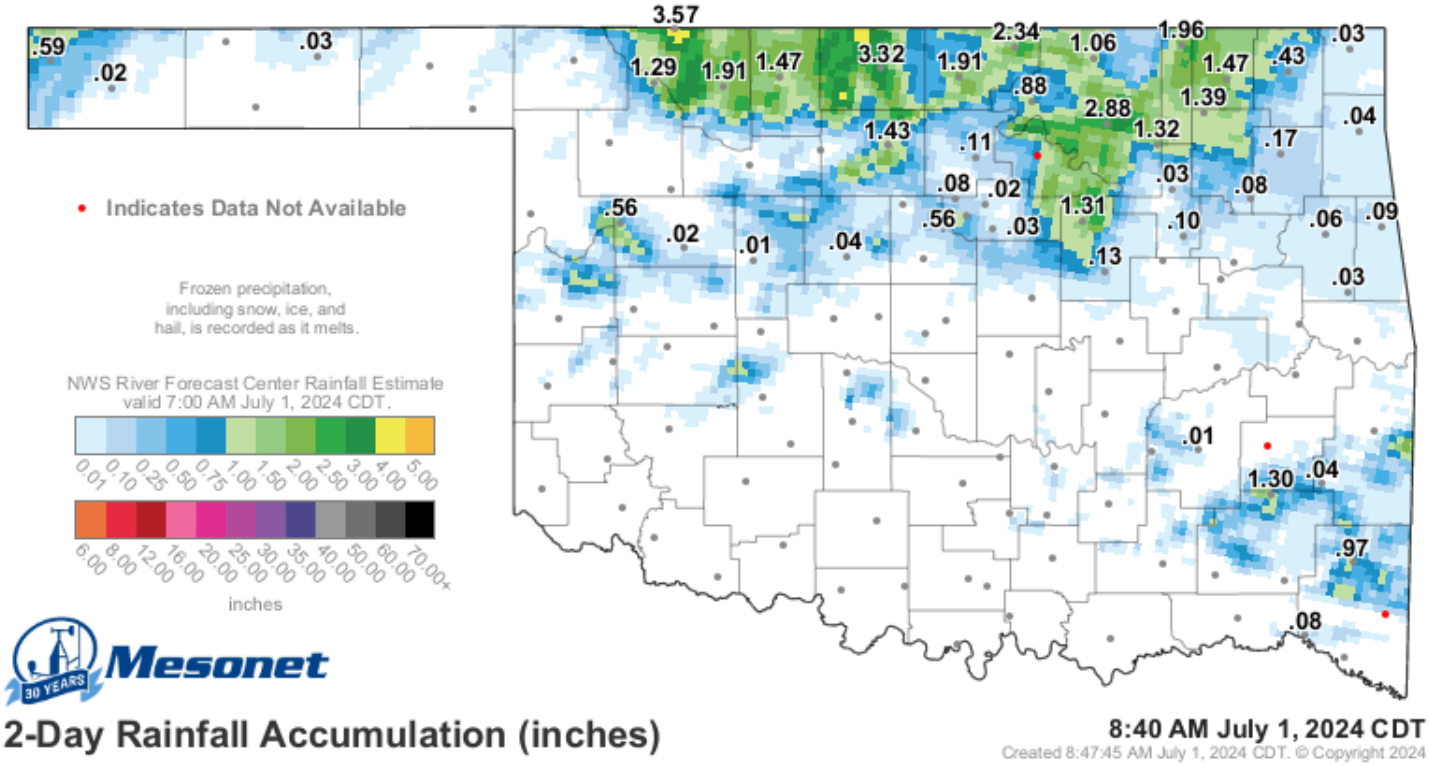


Fig. 15. OK Mesonet (values) and NWS RFC rainfall estimate (image) 48-hour rainfall ending at 8:40 am CDT 07/01/2024.

Thunderstorms developed over eastern Kay and western Osage Counties on the evening of the 25th as a weak mid-level shortwave moved through the region. These storms produced heavy rain before moving south-southwest out of the area. Then, in the predawn hours of the 26th, new convection developed over eastern KS and northeast OK. These storms continued to grow into an MCS by sunrise. At 7am on the 26th, the 24-hour rainfall totals were 0.25" to 4" across the affected locations (Fig. 10). The MCS continued quickly south during the morning, spreading across eastern OK and northwest AR before moving south of the Red River by noon. Rainfall was heavy, with the OK Mesonet measuring 1.61" in one hour at the McAlester, OK gage (Fig. 11). Rainfall after 7am ranged from around 0.25" to near 2.25" (Figs. 12, 13).

At mid-evening on the 29th, thunderstorms developed along a surface boundary that stretched from north central OK into southeast KS. The storms remained across northeast OK through much of the overnight hours before shifting west by sunrise of the 30th. These storms brought heavy rain northwest of I-44, with totals of 0.50" to 4" (Figs. 14, 15).

Written by:

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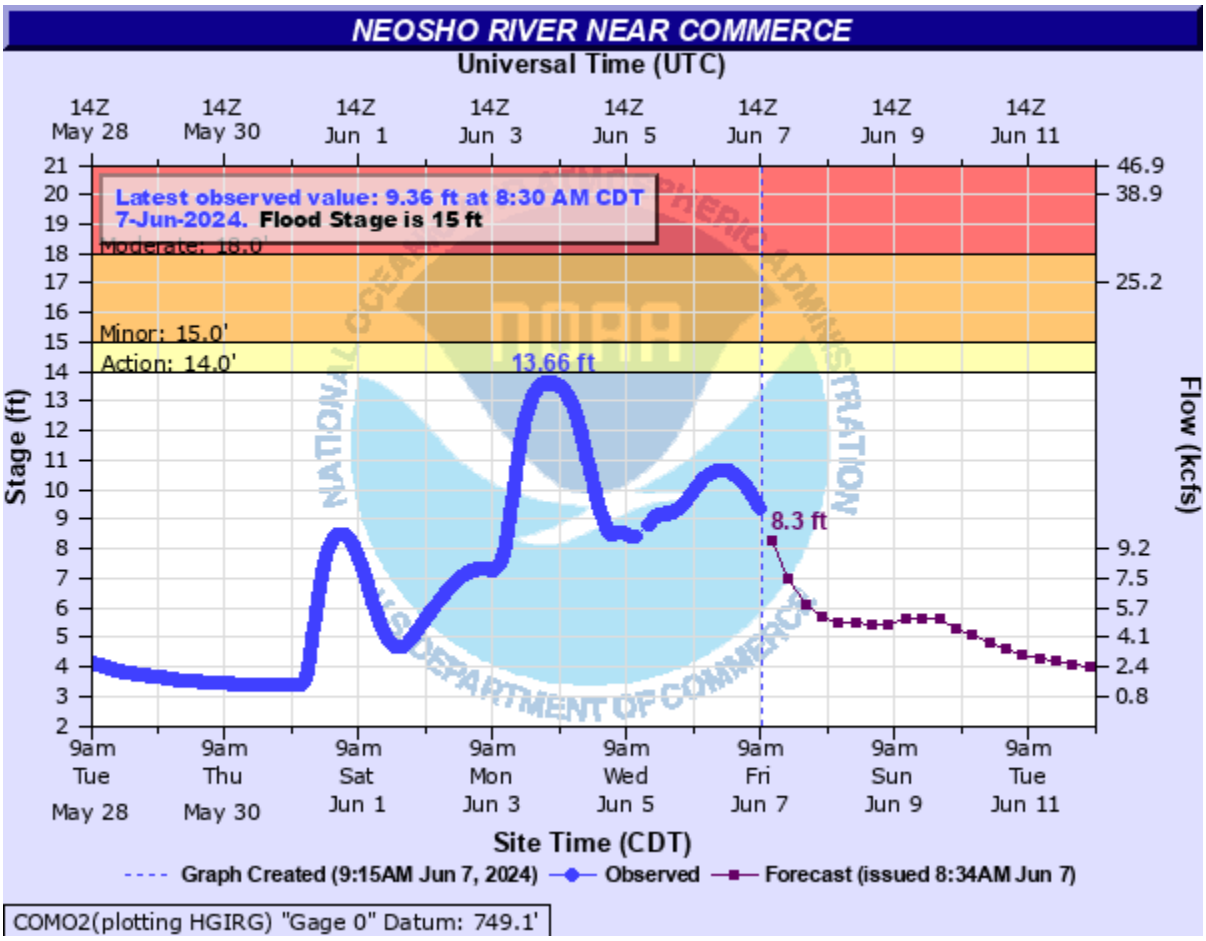
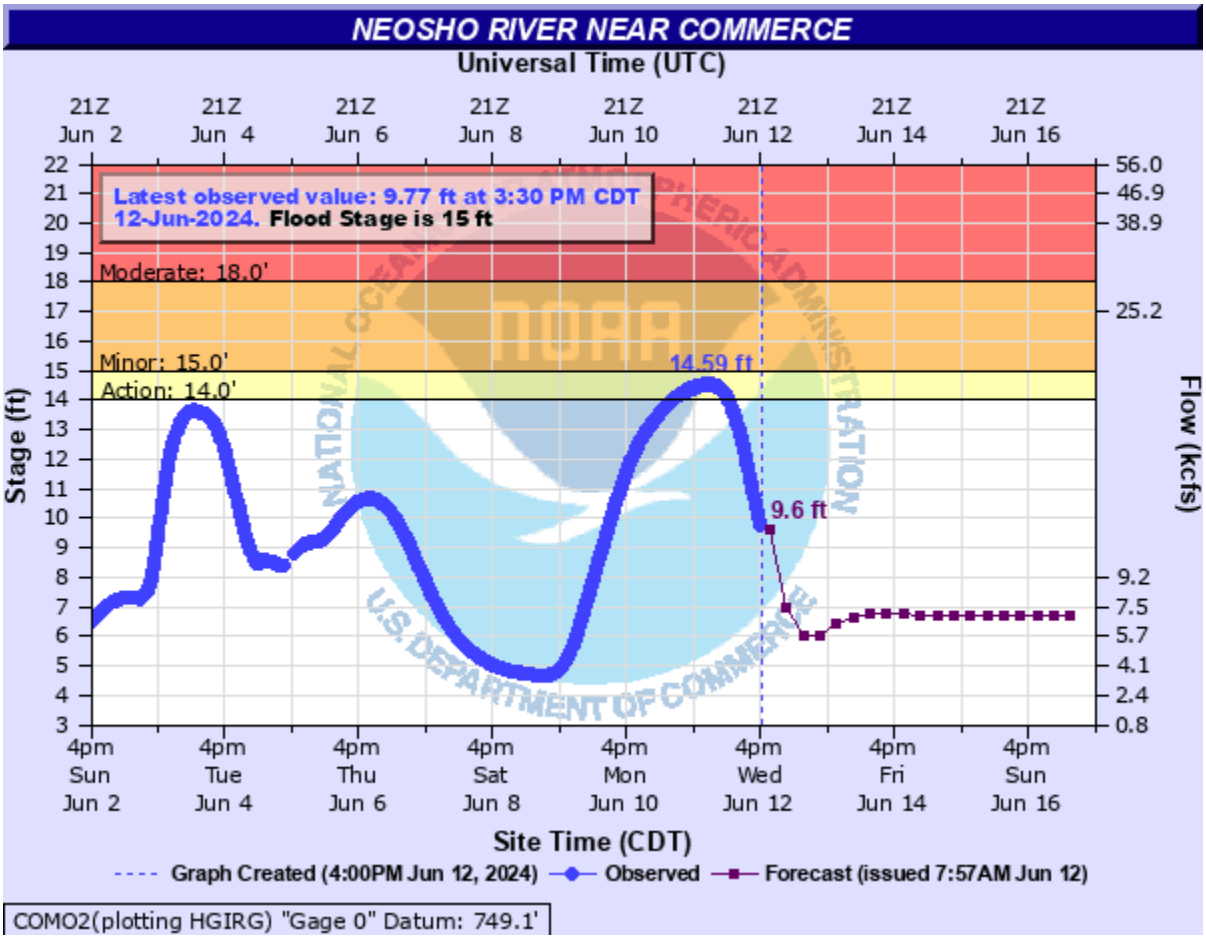
Service Hydrologist
WFO Tulsa

Products issued in June 2024:

6 Flash Flood Warnings (FFW)
8 Flash Flood Statements (FFS)
1 Flash/Areal Flood Watches (FFA) (3 Watch FFA CON/EXT/EXA/EXB/CAN)
22 Urban and Small Stream Advisories (FLS)
1 Areal Flood Warnings (FLW)
1 Areal Flood Statements (FLS)
1 River Flood Warnings (FLW) (includes category increases)
6 River Flood Statements (FLS)
1 River Flood Advisories (FLS) (7 Advisory FLS CON/EXT/CAN)
1 River Flood Watches (FFA) (3 Watch FFA CON/EXT/CAN)
0 River Statements (RVS)
0 Hydrologic Outlooks (ESF)
0 Drought Information Statements (DGT)

Preliminary Hydrographs:


NEOSHO RIVER NEAR COMMERCE
Universal Time (UTC)
14Z May 28
14Z May 30
14Z Jun 1
14Z Jun 3
14Z Jun 5
14Z Jun 7
14Z Jun 9
14Z Jun 11
Latest observed value: 9.36 ft at 8:30 AM CDT 7-Jun-2024. Flood Stage is 15 ft
Moderate: 18.0'
Minor: 15.0'
Action: 14.0'
13.66 ft
8.3 ft
Stage (ft)
Flow (kcfs)
21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2
46.9 38.9 25.2 9.2 7.5 5.7 4.1 2.4 0.8
9am Tue May 28
9am Thu May 30
9am Sat Jun 1
9am Mon Jun 3
9am Wed Jun 5
9am Fri Jun 7
9am Sun Jun 9
9am Tue Jun 11
Site Time (CDT)
Graph Created (9:15AM Jun 7, 2024)
Observed
Forecast (issued 8:34AM Jun 7)
COMO2(plotting HGIRG) "Gage 0" Datum: 749.1'


NEOSHO RIVER NEAR COMMERCE
Universal Time (UTC)
21Z Jun 2
21Z Jun 4
21Z Jun 6
21Z Jun 8
21Z Jun 10
21Z Jun 12
21Z Jun 14
21Z Jun 16
Latest observed value: 9.77 ft at 3:30 PM CDT 12-Jun-2024. Flood Stage is 15 ft
Moderate: 18.0'
Minor: 15.0'
Action: 14.0'
14.59 ft
9.6 ft
Stage (ft)
Flow (kcfs)
22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3
56.0 46.9 38.9 25.2 9.2 7.5 5.7 4.1 2.4 0.8
4pm Sun Jun 2
4pm Tue Jun 4
4pm Thu Jun 6
4pm Sat Jun 8
4pm Mon Jun 10
4pm Wed Jun 12
4pm Fri Jun 14
4pm Sun Jun 16
Site Time (CDT)
Graph Created (4:00PM Jun 12, 2024)
Observed
Forecast (issued 7:57AM Jun 12)
COMO2(plotting HGIRG) "Gage 0" Datum: 749.1'