

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
		August	YEAR 2018
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 7, 2018

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.

An active weather pattern mid-month brought several rounds of heavy rain to portions of eastern OK and northwest AR, resulting in both flash flooding and river flooding. 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 <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 August 2018 ranged from around 1.5" to isolated amounts around 15" across eastern OK and northwest AR. The highest rainfall totals of over 8" were primarily across far northeast OK, east central OK and west central AR, and Creek and Tulsa Counties in southeast OK. This corresponds to 50-400% of the normal August rainfall across the area, with around 600% of the August rainfall normal in northern Le Flore County (Fig. 1b).

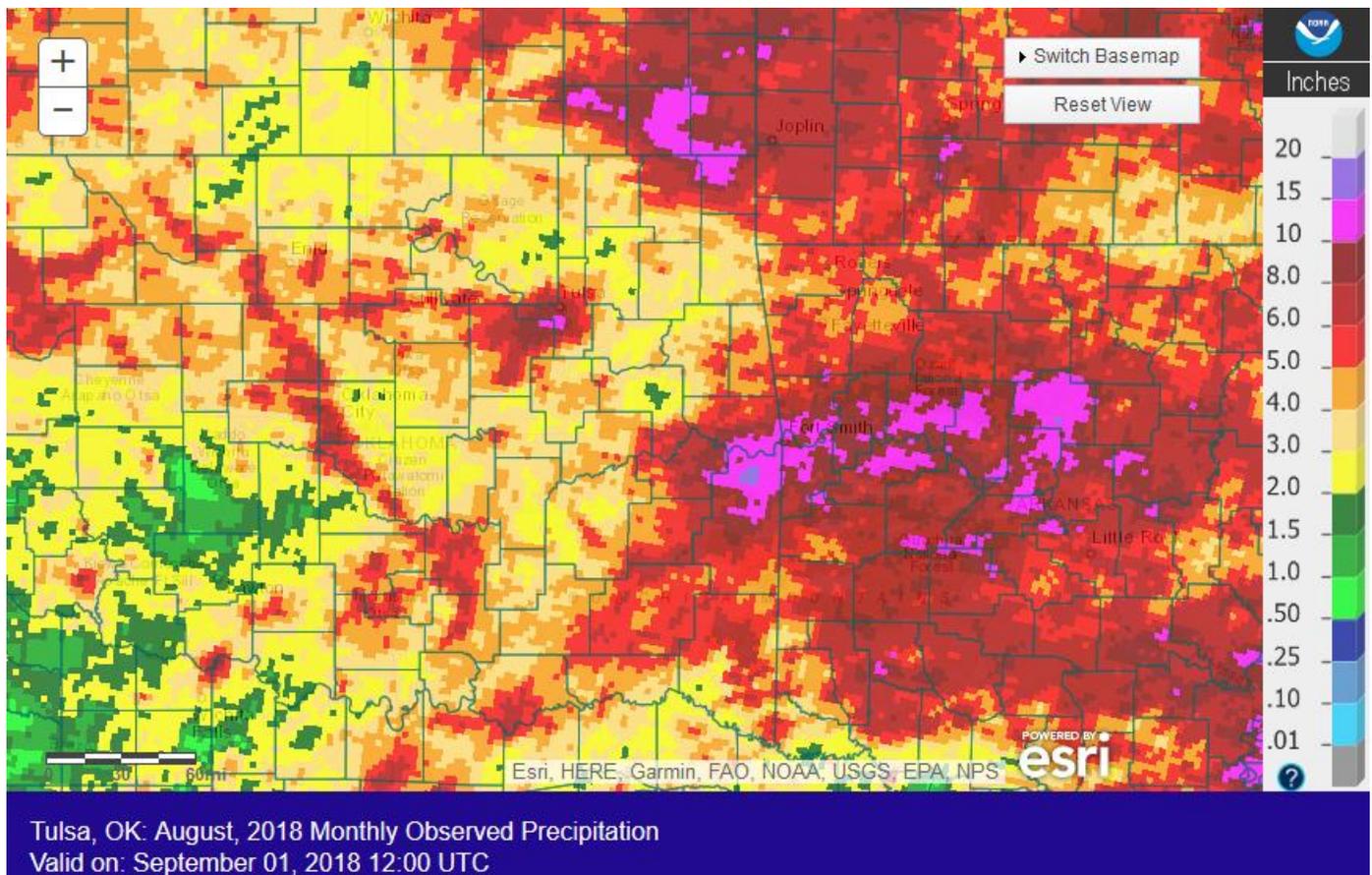


Fig. 1a. Estimated Observed Rainfall for August 2018

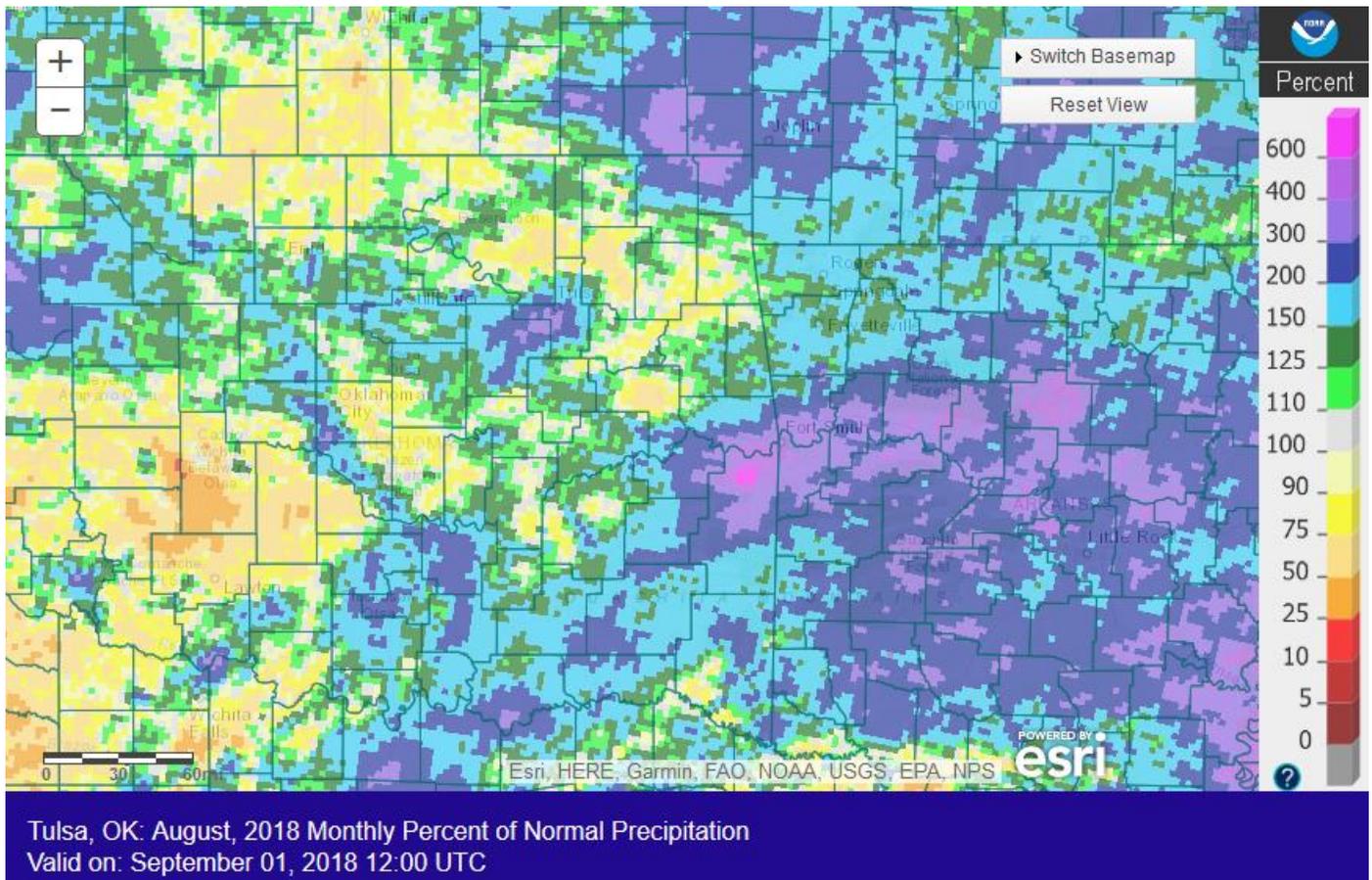


Fig. 1b. Estimated % of Normal Rainfall for August 2018

In Tulsa, OK, August 2018 ranked as the 44th coldest August (81.2°F; since records began in 1905) and the 29th wettest August (4.85"; since records began in 1888). Fort Smith, AR had the 65th coldest August (80.9°F, tied 1984, 1965, 1957, 1955, 1910; since records began in 1882) and the 3rd wettest August (9.53"; since records began in 1882). Fayetteville, AR had the 29th coldest (76.2°F) and the 11th wettest (6.18") August since records began in 1949.

Some of the larger precipitation reports (in inches) for August 2018 included:

Ozark, AR (coop)	12.28	Greenwood 1.4W, AR (coco)	12.14	Greenwood 1.9WNW, AR (coco)	11.92
Van Buren 2.1NNW, AR (coco)	11.46	Miami, OK (meso)	11.28	Van Buren 0.7SSE, AR (coco)	10.98
Wister, OK (meso)	10.56	Charleston 1.7E, AR (coco)	10.53	Fort Smith, AR (ASOS)	9.53

Some of the lowest precipitation reports (in inches) for August 2018 included:

Muskogee, OK (ASOS)	1.79	Skiatook, OK (meso)	2.20	Stuart, OK (meso)	2.61
Foraker, OK (meso)	2.86	Wynona, OK (meso)	3.02	Porter, OK (meso)	3.05
Burbank, OK (meso)	3.14	Okemah, OK (meso)	3.22	Inola, OK (meso)	3.39

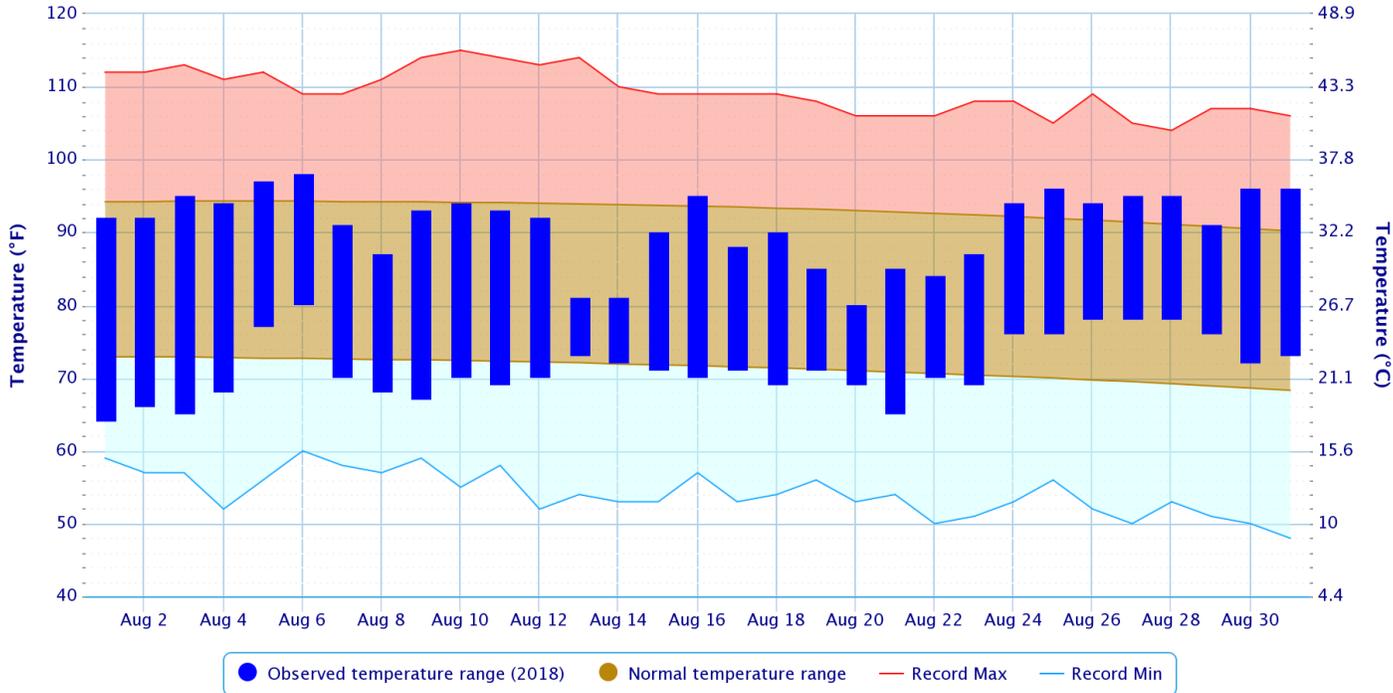
According to statistics from the [Oklahoma Climatological Survey](#) (OCS) Mesonet:

Rank since 1921	Last 30 Days (Aug 2- Aug 31)	Summer 2018 (Jun 1 – Aug 31)	Last 120 Days (May 4 – Aug 31)	Warm Growing Season (Mar 1 – Aug 31)	Year-to-Date (Jan 1 – Aug 31)	Water-Year-to-Date (Oct 1– Aug 31)	Last 365 Days (Sep 1, 2017 – Aug 31, 2018)
Northeast OK	23 rd wettest	44 th driest	32 nd driest	23 rd driest	34 th driest	34 th driest	29 th driest
East Central OK	21 st wettest	37 th wettest	40 th driest	42 nd wettest	18 th wettest	40 th wettest	49 th wettest
Southeast OK	10th wettest	27 th wettest	35 th driest	24 th driest	22 nd wettest	47 th wettest	35 th driest
Statewide	16 th wettest	33 rd wettest	40 th driest	36 th driest	49 th driest	36 th driest	27 th driest

In Tulsa, OK, Summer (June-July-August) 2018 ranked as the 27th warmest Summer (82.3°F, tied 1913, 1911; since records began in 1905) and the 55th driest Summer (9.64"; since records began in 1888). Fort Smith, AR had the 17th warmest Summer (82.6°F, tied 1938, 1932, 1896; since records began in 1882) and the 12th wettest Summer (16.58"; since records began in 1882). Fayetteville, AR had the 23rd warmest (77.0°F) and the 27th wettest (12.57") Summer since records began in 1950.

Daily Temperature Data – Tulsa Area, OK (ThreadEx)

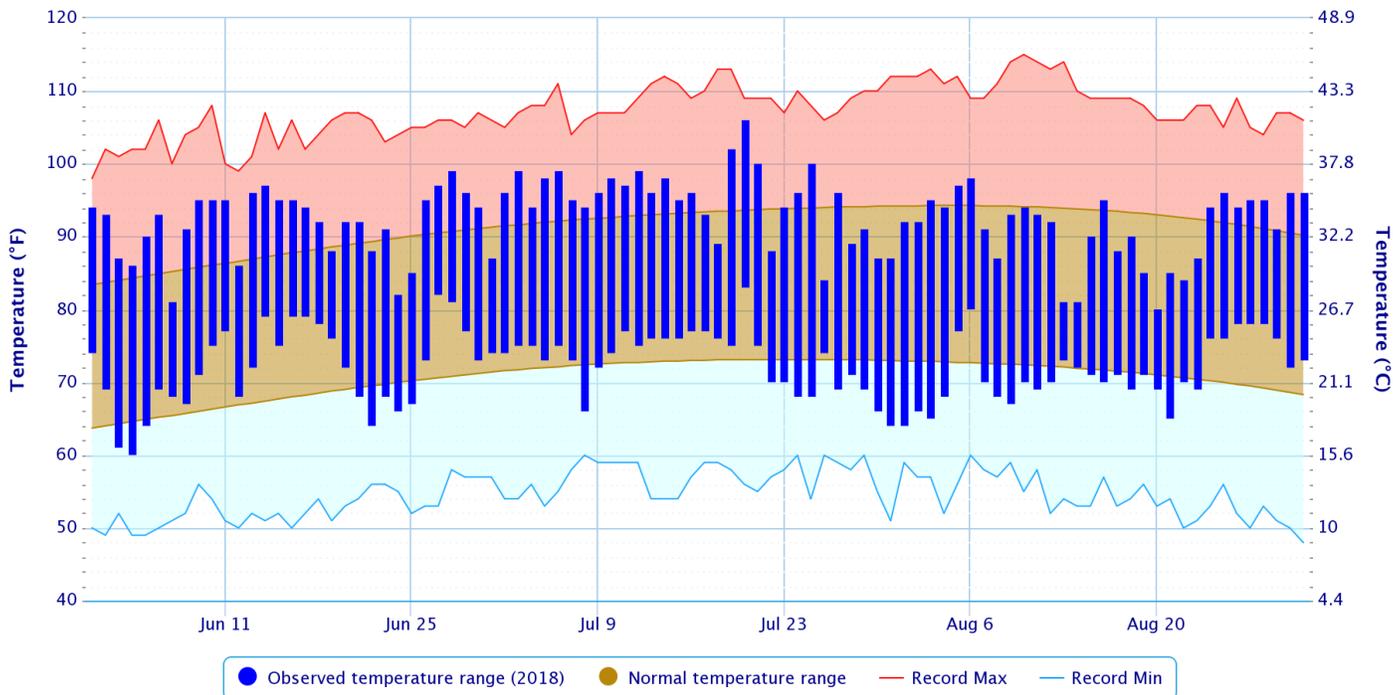
Period of Record – 1905-01-06 to 2018-09-03. Normals period: 1981-2010. Click and drag to zoom chart.



Powered by ACIS

Daily Temperature Data – Tulsa Area, OK (ThreadEx)

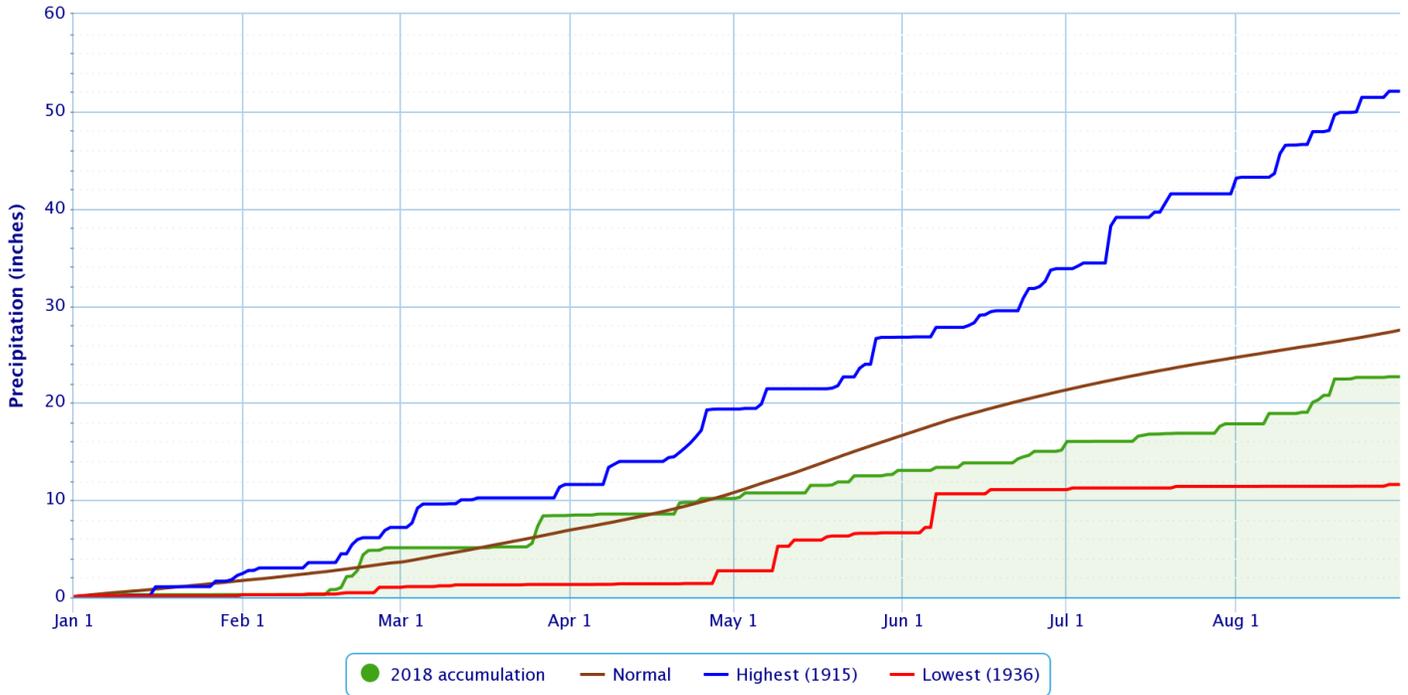
Period of Record – 1905-01-06 to 2018-09-03. Normals period: 1981-2010. Click and drag to zoom chart.



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Accumulated Precipitation – Tulsa Area, OK (ThreadEx)

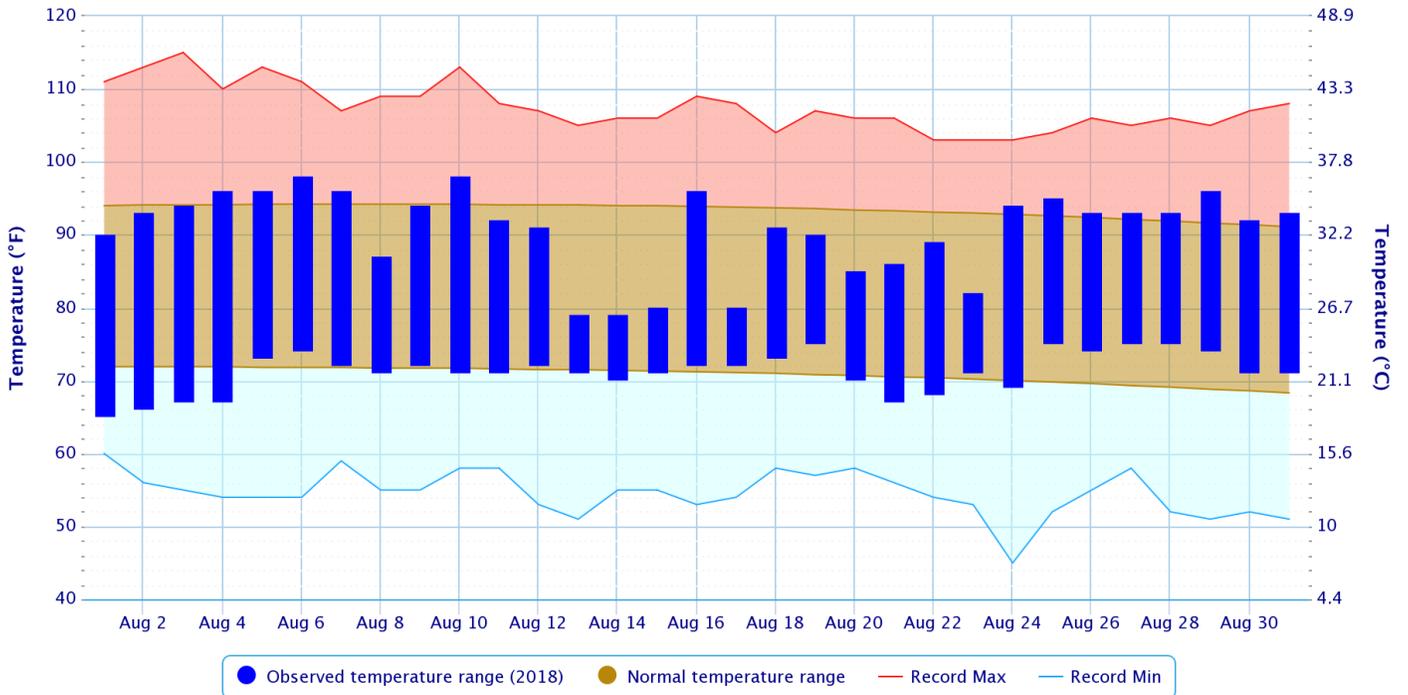
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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

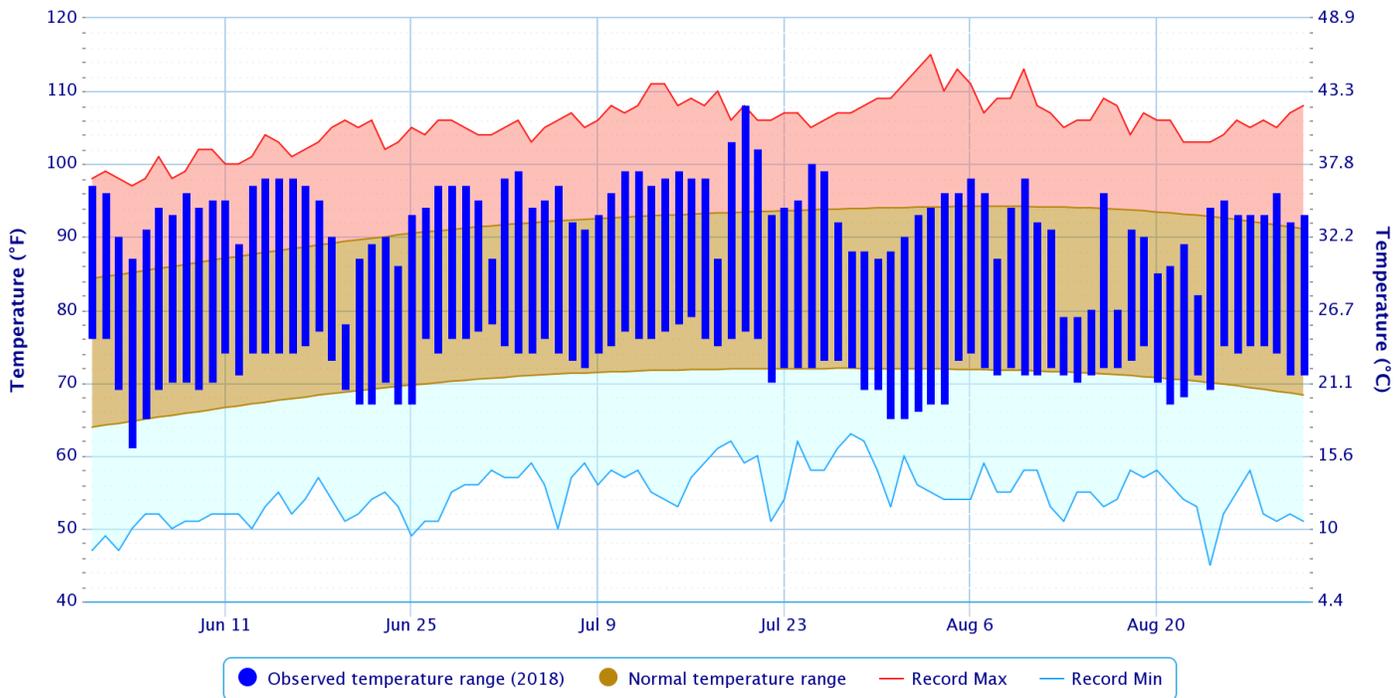
Period of Record – 1882-06-01 to 2018-09-03. Normals period: 1981-2010. Click and drag to zoom chart.



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

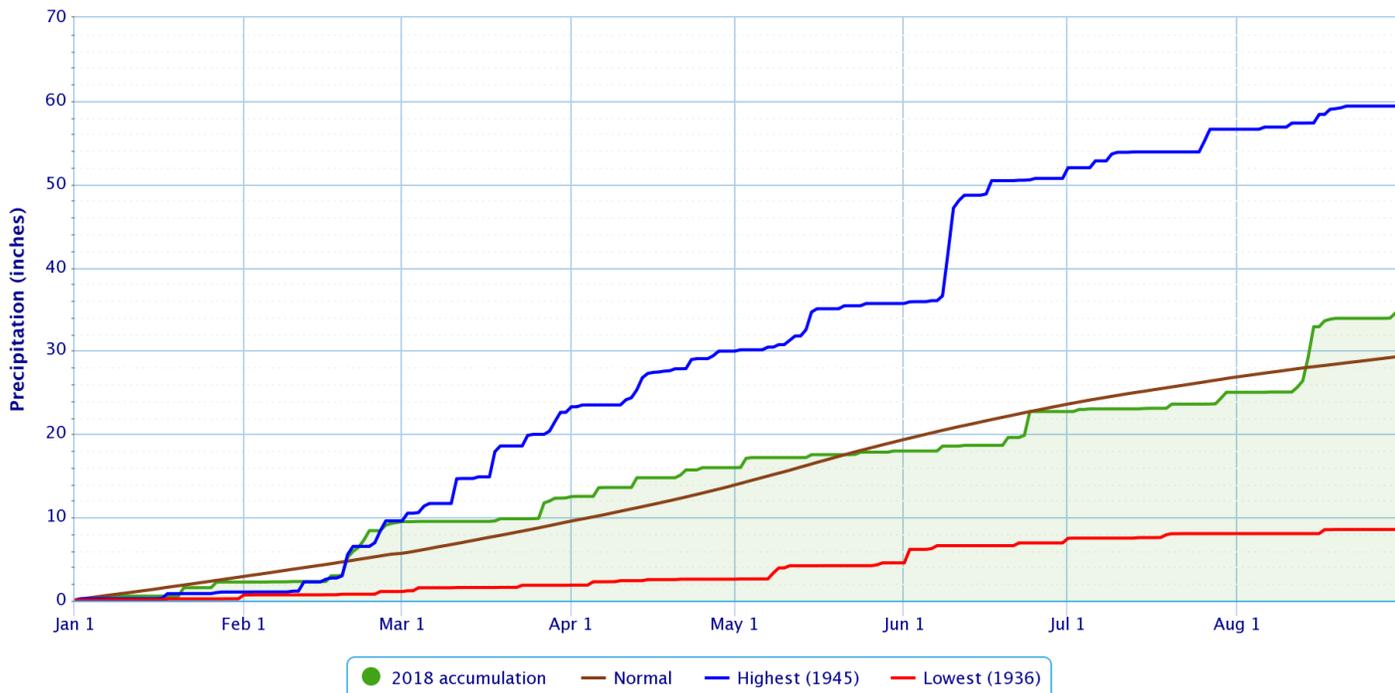
Period of Record – 1882-06-01 to 2018-09-03. Normals period: 1981-2010. Click and drag to zoom chart.



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Accumulated Precipitation – Fort Smith Area, AR (ThreadEx)

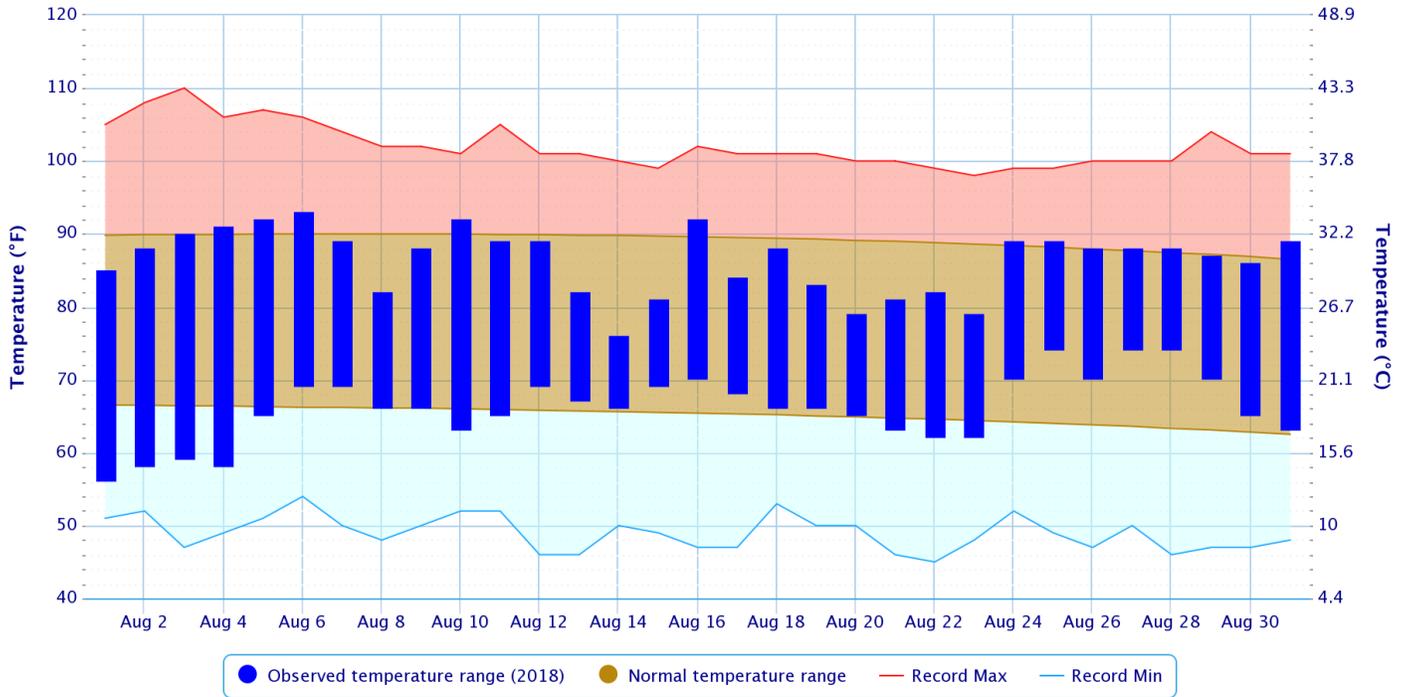
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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Daily Temperature Data – FAYETTEVILLE DRAKE FIELD, AR

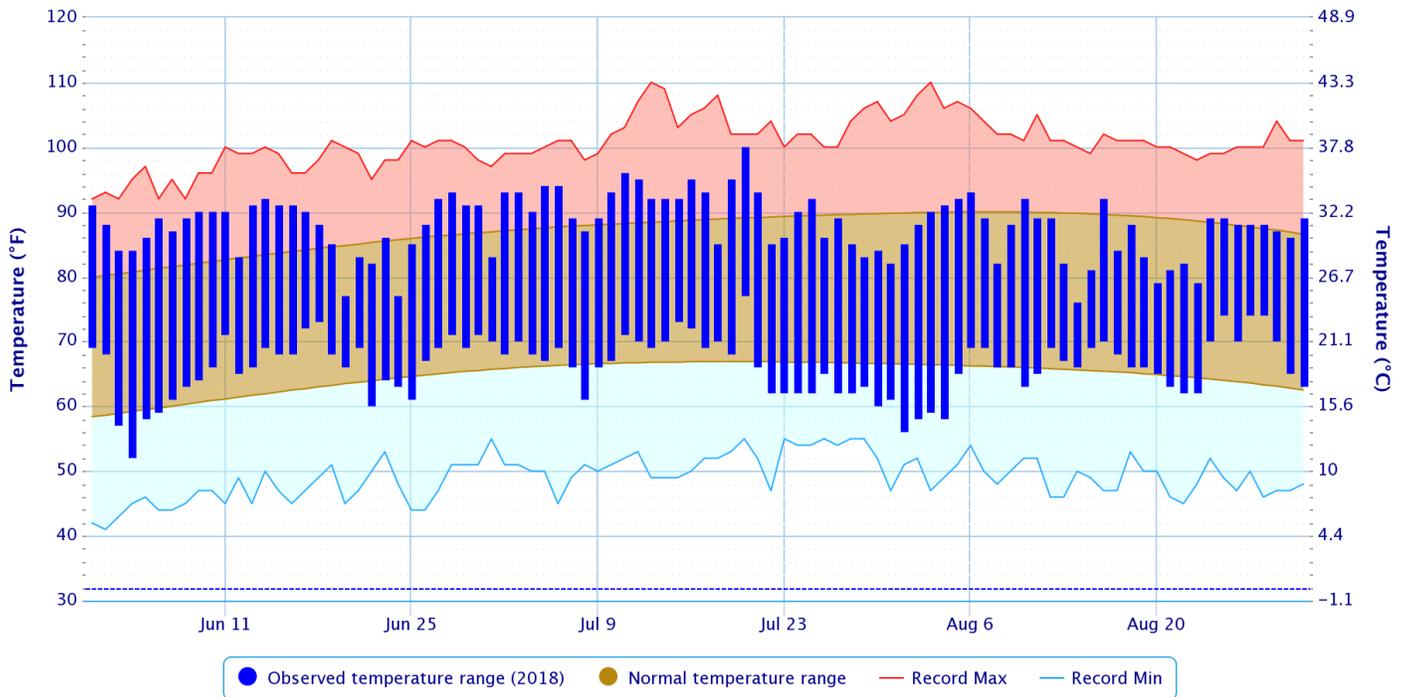
Period of Record – 1949-07-14 to 2018-09-03. Normals period: 1981-2010. Click and drag to zoom chart.



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Daily Temperature Data – FAYETTEVILLE DRAKE FIELD, AR

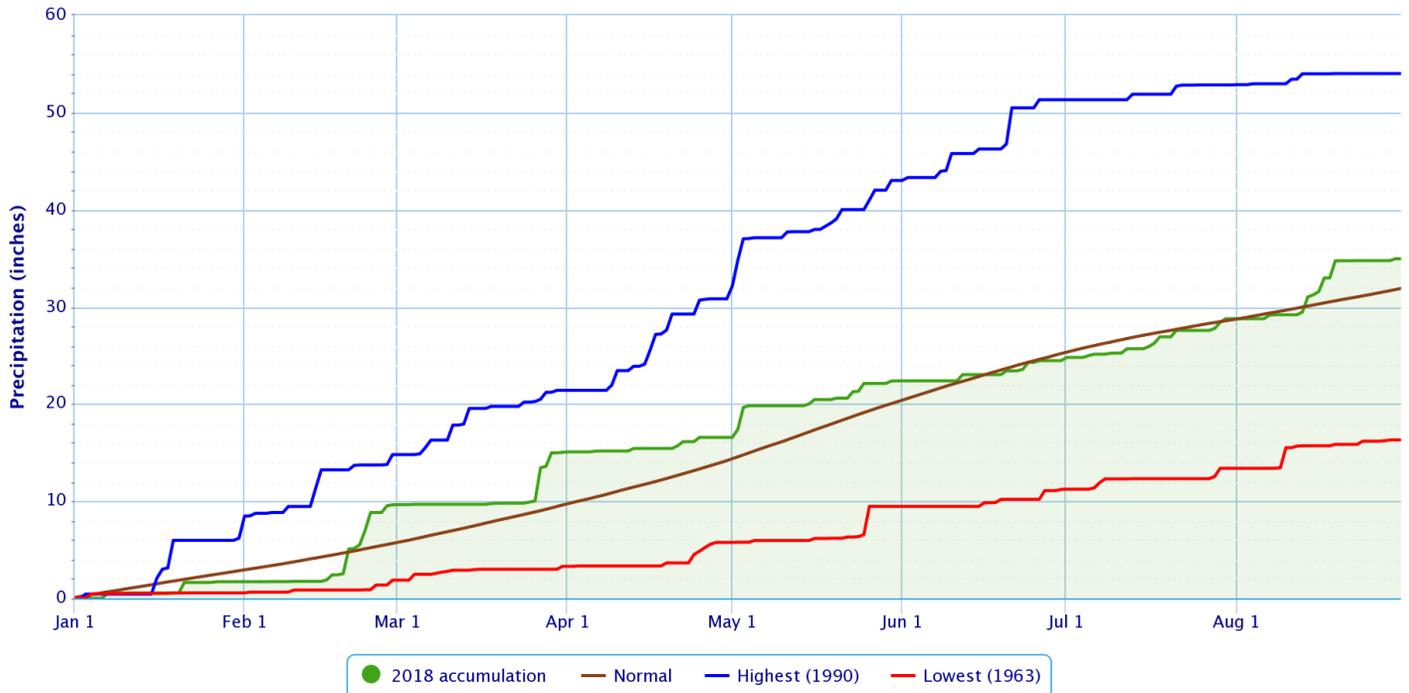
Period of Record – 1949-07-14 to 2018-09-03. Normals period: 1981-2010. Click and drag to zoom chart.



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



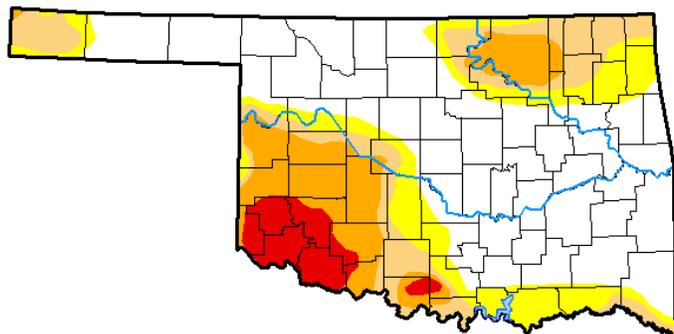
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Drought

According to the [U.S. Drought Monitor](#) (USDM) from August 28, 2018 (Figs. 2, 3), Severe (D2) Drought conditions were impacting Osage, northern Pawnee, and southern Washington Counties in eastern OK. Moderate (D1) drought conditions were present across portions of Osage, Pawnee, eastern Kay, Washington, Tulsa, Nowata, Craig, Ottawa, Rogers, Mayes, and Choctaw Counties in eastern OK, and Benton and Carroll Counties in northwest Arkansas. Abnormally Dry (D0) but not in drought conditions encompassed portions of Pawnee, Osage, eastern Kay, Creek, Tulsa, Rogers, Mayes, Craig, Ottawa, Delaware, Cherokee, and Choctaw Counties in eastern Oklahoma and Benton, Carroll, and Madison Counties in northwest Arkansas.

U.S. Drought Monitor Oklahoma

August 28, 2018
(Released Thursday, Aug. 30, 2018)
Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	53.85	46.15	31.47	18.63	5.65	0.00
Last Week <small>08-21-2018</small>	50.09	49.91	32.00	18.58	5.77	1.28
3 Months Ago <small>05-29-2018</small>	37.27	62.73	45.53	40.54	29.71	9.81
Start of Calendar Year <small>01-02-2018</small>	0.00	100.00	77.15	38.76	0.00	0.00
Start of Water Year <small>09-26-2017</small>	64.46	35.54	0.77	0.00	0.00	0.00
One Year Ago <small>08-29-2017</small>	97.84	2.16	0.00	0.00	0.00	0.00

Intensity:

- 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. See accompanying text summary for forecast statements.

Author:

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NCEI/NOAA

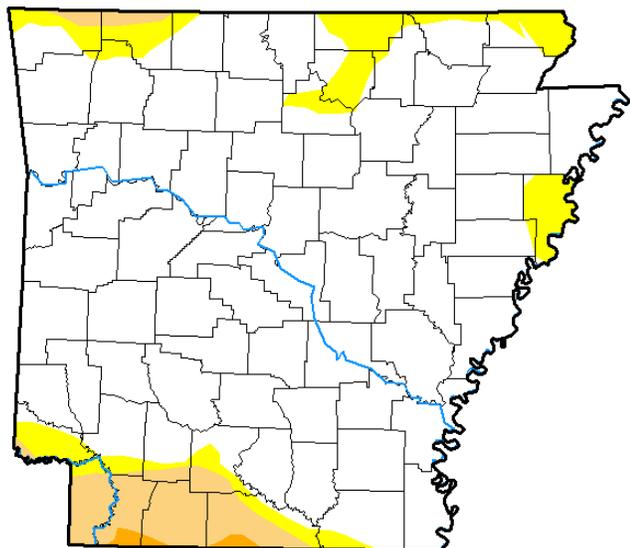


<http://droughtmonitor.unl.edu/>

Fig. 2. Drought Monitor for Oklahoma

U.S. Drought Monitor Arkansas

August 28, 2018
(Released Thursday, Aug. 30, 2018)
Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	85.49	14.51	6.08	0.43	0.00	0.00
Last Week <small>08-21-2018</small>	46.08	53.92	9.31	0.43	0.00	0.00
3 Months Ago <small>05-29-2018</small>	92.22	7.78	0.80	0.00	0.00	0.00
Start of Calendar Year <small>01-02-2018</small>	8.22	91.78	71.27	32.01	2.37	0.00
Start of Water Year <small>09-26-2017</small>	39.57	60.43	0.46	0.00	0.00	0.00
One Year Ago <small>08-29-2017</small>	100.00	0.00	0.00	0.00	0.00	0.00

Intensity:

- 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. See accompanying text summary for forecast statements.

Author:

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NCEI/NOAA



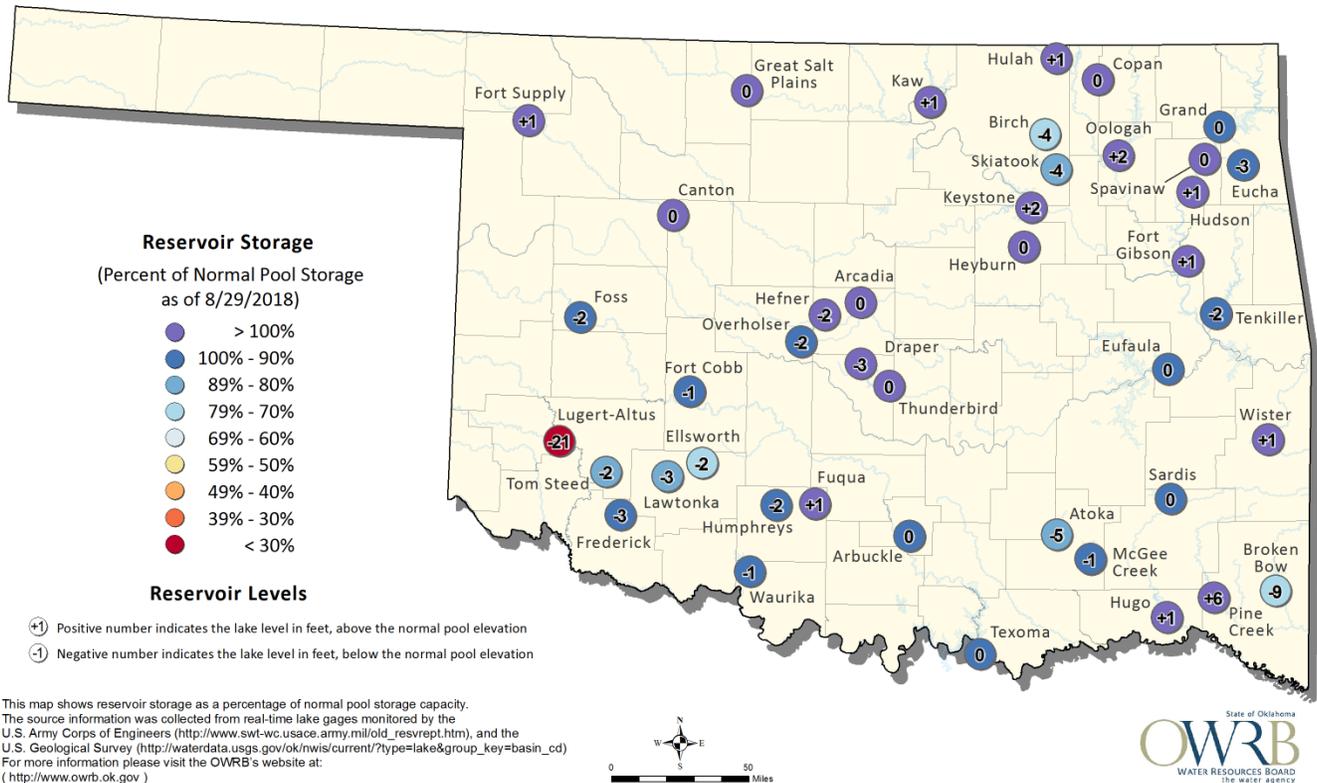
<http://droughtmonitor.unl.edu/>

Fig.3. Drought Monitor for Arkansas

Reservoirs

Oklahoma Surface Water Resources

Reservoir Levels and Storage as of 8/29/2018



According to the USACE, most lakes in the HSA were within $\pm 3\%$ of their conservation pool level. Reservoirs below 3% of their conservation pool storage as of 8/31/2018: Birch Lake 75%, Skiatook Lake 89%, Tenkiller Lake 92%, and Beaver Lake 94%. Only one reservoir was above 3% of its conservation pool storage as of 8/31/2018: Hudson Lake 104%.

Outlooks

The [Climate Prediction Center](#) (CPC) outlook for September 2018 (issued August 31, 2018) indicates an enhanced chance for above normal temperatures and an equal chance for 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, soil moisture conditions, and sub-seasonal climate signals.

For the 3-month period September-October-November 2018, CPC is forecasting an enhanced chance for above normal temperatures and an equal chance for above, near, and below median precipitation across all of eastern OK and northwest AR (outlook issued August 16, 2018). This outlook is based on both statistical and dynamical forecast tools, decadal timescale climate trends, and influence from El Niño. According to CPC, ENSO neutral conditions persisted through early August, though positive sea surface temperature anomalies were observed over almost the entire equatorial Pacific Ocean. El Niño conditions are still favored to begin this fall, with probabilities of El Niño conditions near 70% for winter 2018-19. An El Niño Watch has been issued by CPC.

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

Showers and thunderstorms moved across northeast OK and northwest AR during the morning and early afternoon hours of the 7th. More intense convection developed during the afternoon along a cold front, bringing heavy rain and damaging winds to the Tulsa area before moving more quickly east across east central OK and northwest AR. Storms continued into the late night hours, with additional heavy rain across northern Franklin and southern Madison Counties. Rainfall totals ranged from around 0.25" to near 3" across the affected areas (Fig. 4). Urban street flooding occurred in Tulsa.

An active northwest flow weather pattern set up over the region on the 13th-20th. Several waves moving through a strong upper-level low brought several rounds of rainfall to eastern OK and northwest AR. With precipitable water values around 2", this resulted in significant heavy rain.

Showers and thunderstorms affected southeast OK during the morning of the 13th, expanding northward during the day. A second area of showers and thunderstorms moved into southeast OK during the evening and moved northeast into northwest AR. Rain continued over this region for much of the overnight hours. By 7am on the 14th, most of southeast OK and west central AR had received 2"-4" of rain (Fig. 5). The showers and thunderstorms continued across this area until late afternoon, resulting in another 1"-2" of rain (Figs. 6, 7). Scattered convection then continued across all of eastern OK and northwest AR through the evening and overnight hours aided by the low-level jet. 24-hour rainfall totals were generally 0.50" to around 2" by 7am on the 15th, however an area of 3"-8" of rain fell over the Verdigris River basin in southeast KS just north of the OK state line (Fig. 8). The rain led to a rapid 20' rise along the Verdigris River near Lenapah (Fig. 9), but due to antecedent dry conditions, the river remained below flood stage.

24-hour rainfall >3" ending at 7am CDT 8/14/2018

Cloudy 5ENE, OK	4.37	Talihina 4SE, OK	4.16	Van Buren 2.1NNW, AR	3.91
Honobia 1S, OK	3.58	Yanush 1.8WNW, OK	3.56	Panama 2E, OK	3.55
Poteau 1ENE, OK	3.47	Van Buren 0.7SSE, AR	3.47	Cloudy 6SSE, OK	3.35
Wister 3ENE, OK	3.32	Charleston 1.7E, AR	3.07	Antlers 1W, OK	3.00

24-hour rainfall >3" ending at 7am CDT 8/15/2018

Panama 2E, OK	3.42
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Heavy rain continued primarily over east central OK and west central AR during the morning and early afternoon of the 15th as storms trained over the same area. To make matters worse, this heavy rain fell on areas which had already received high rainfall totals the previous two days. There was finally a break in the activity, with only isolated showers and thunderstorms across west central AR during the evening hours. Several locations across east central OK and west central AR received 3"-4" of additional rainfall (Fig. 10), with 7.5" of rain measured near Panama in Le Flore County. Flash flooding occurred across east central OK and west central AR, including widespread closures of streets and state highways and stranded vehicles in Le Flore, Crawford, and Sebastian Counties.

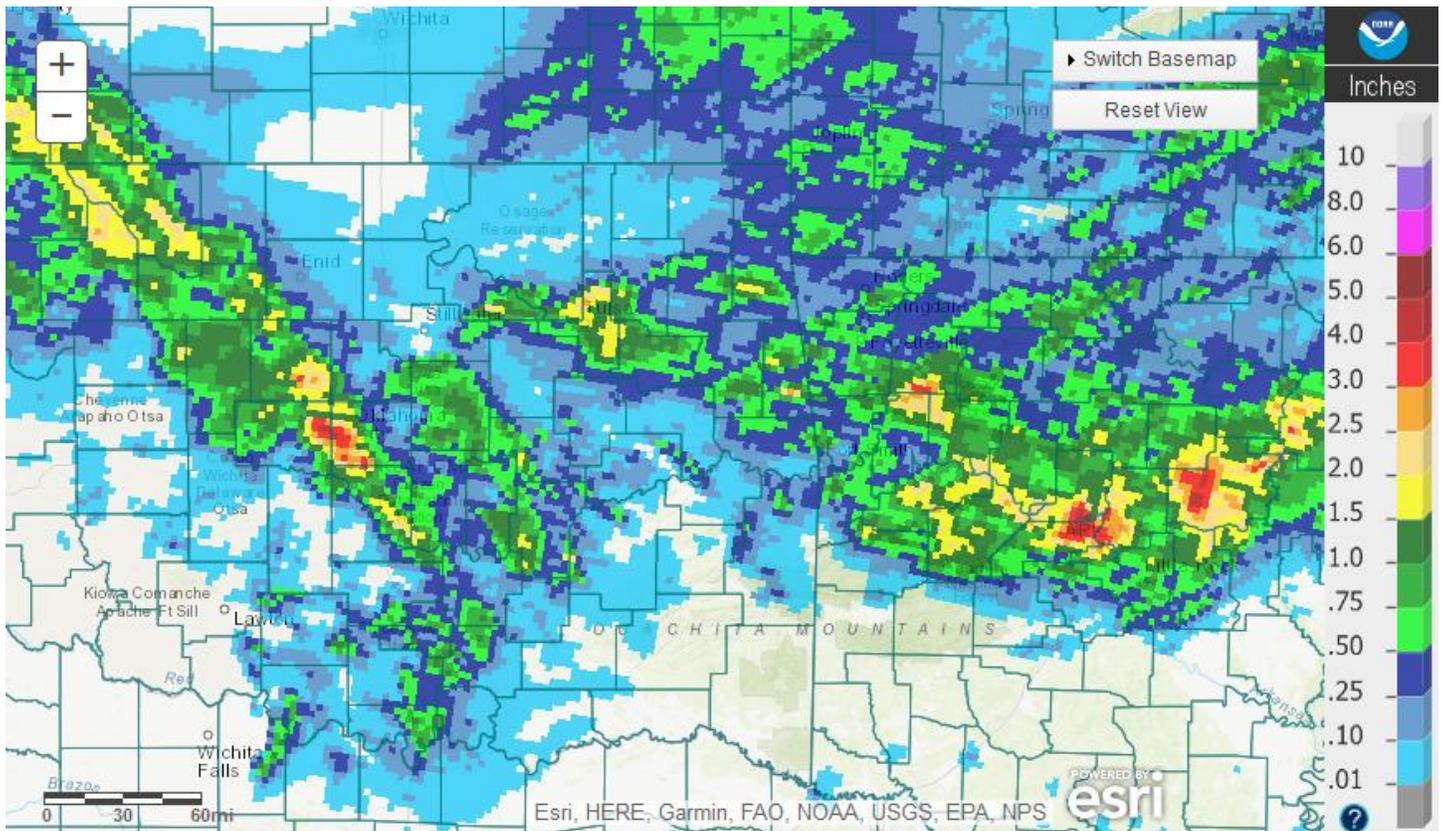
24-hour rainfall >3" ending at 7am CDT 8/16/2018

Panama 2E, OK	7.50	Cameron 3.5WSW, OK	4.55	Wister 3ENE, OK	4.13
Van Buren 2.1NNW, AR	3.67	Fort Smith, AR	3.45	Van Buren 0.7SSE, AR	3.40
Greenwood 1.4W, AR	3.20				

The 3-day rainfall total ending at 7am CDT 8/16/18 at Panama 2E, OK was 14.47". This is approximately a 500-year recurrence interval (or 0.2% annual chance of occurrence) for a 3-day rainfall. Widespread 6"-12" occurred within a 3.5-day period (see Figs. 11-15). The 3.5-day heavy rainfall impacted the Poteau, Lower Arkansas, and Upper Kiamichi River basins. Moderate river flooding occurred along the Poteau River (see preliminary hydrographs at the end of this report; see E3 Report for details).

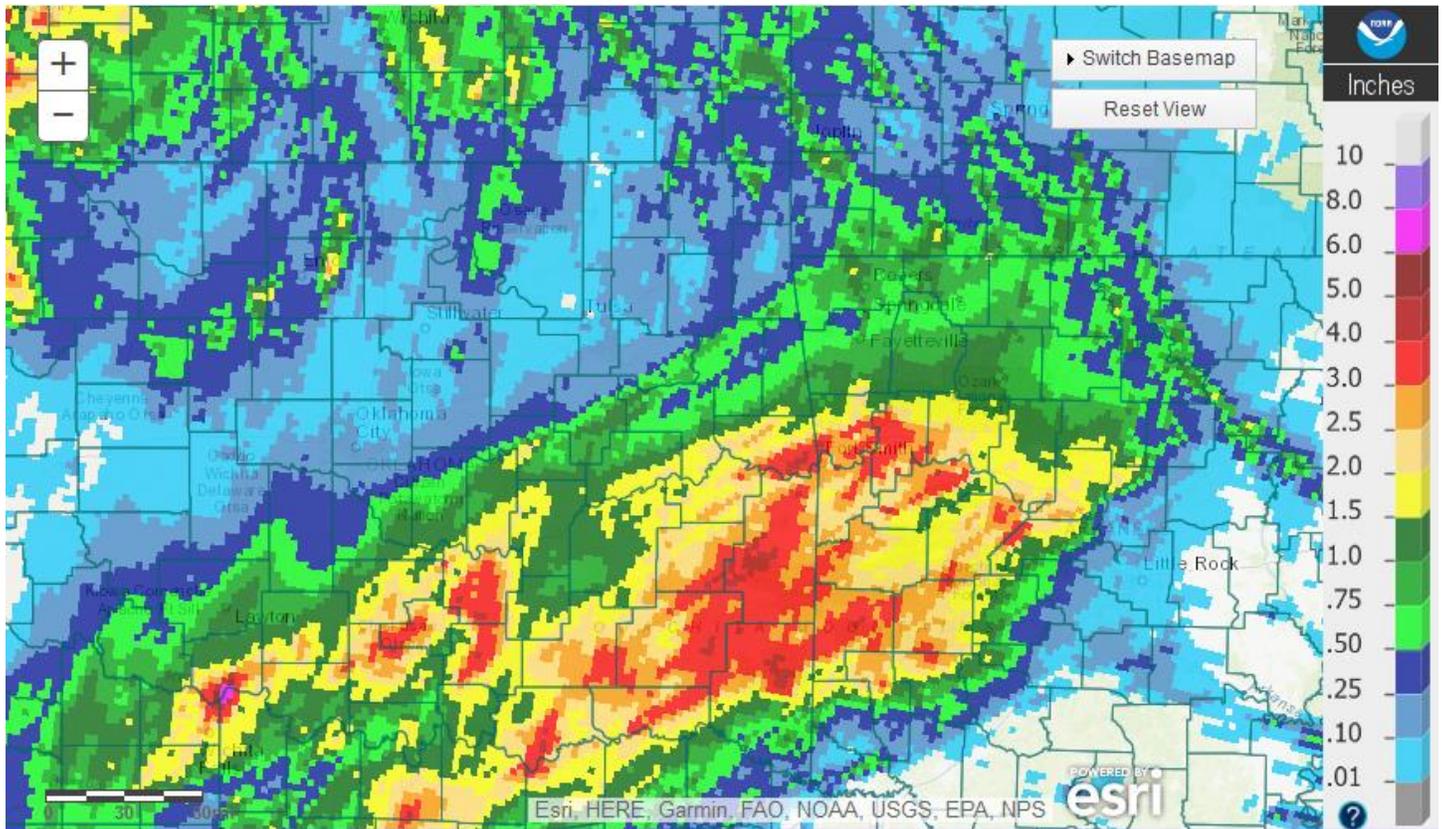
3.5-Day (84-hour) Total >6" ending at 10am CDT 8/16/2018 (Impacting Poteau River, Lower Arkansas River, and Upper Kiamichi River basins)

Panama 2E, OK	14.47	Fort Smith, AR	11.73	Wister Lake, OK	9.33
Poteau 1ENE, OK	8.75	RS Kerr Lock & Dam, OK	8.32	Stigler, OK	7.63
Talihina 3ENE, OK	7.39	Rudy, AR	7.00	Lee Creek/Van Buren Reservoir, AR	6.93
Short 4S, OK	6.82	WD May Lock & Dam, OK	6.64	Honobia, OK	6.44
Ozark Lock & Dam, AR	6.34	Page 5N, OK	6.21		



Tulsa, OK: August 08, 2018 1-Day Observed Precipitation
Valid on: August 08, 2018 12:00 UTC

Fig. 4. 24-hour Estimated Observed Rainfall ending at 7am CDT 8/08/2018.



Tulsa, OK: August 14, 2018 1-Day Observed Precipitation
Valid on: August 14, 2018 12:00 UTC

Fig. 5. 24-hour Estimated Observed Rainfall ending at 7am CDT 8/14/2018.

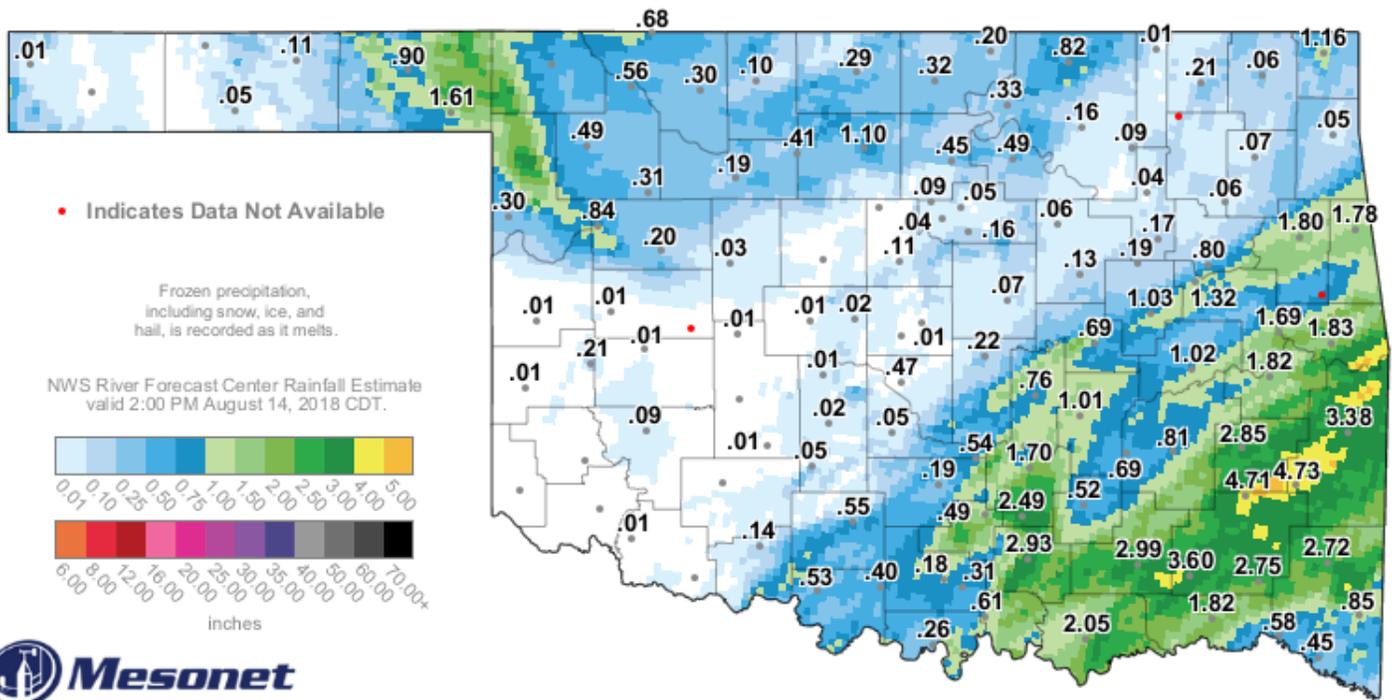


Fig. 6. 24-hour Estimated Observed Rainfall (image) and OK Mesonet measurements ending at 3:30 pm CDT 8/14/2018.

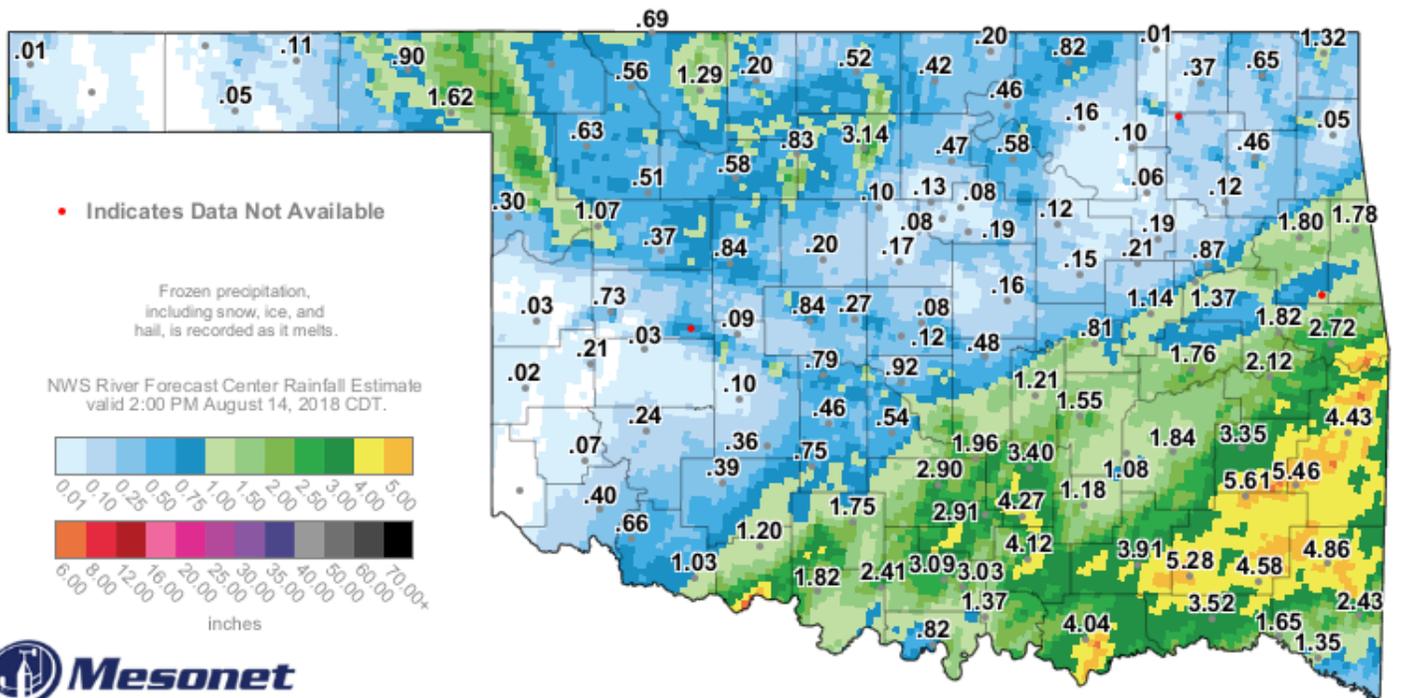
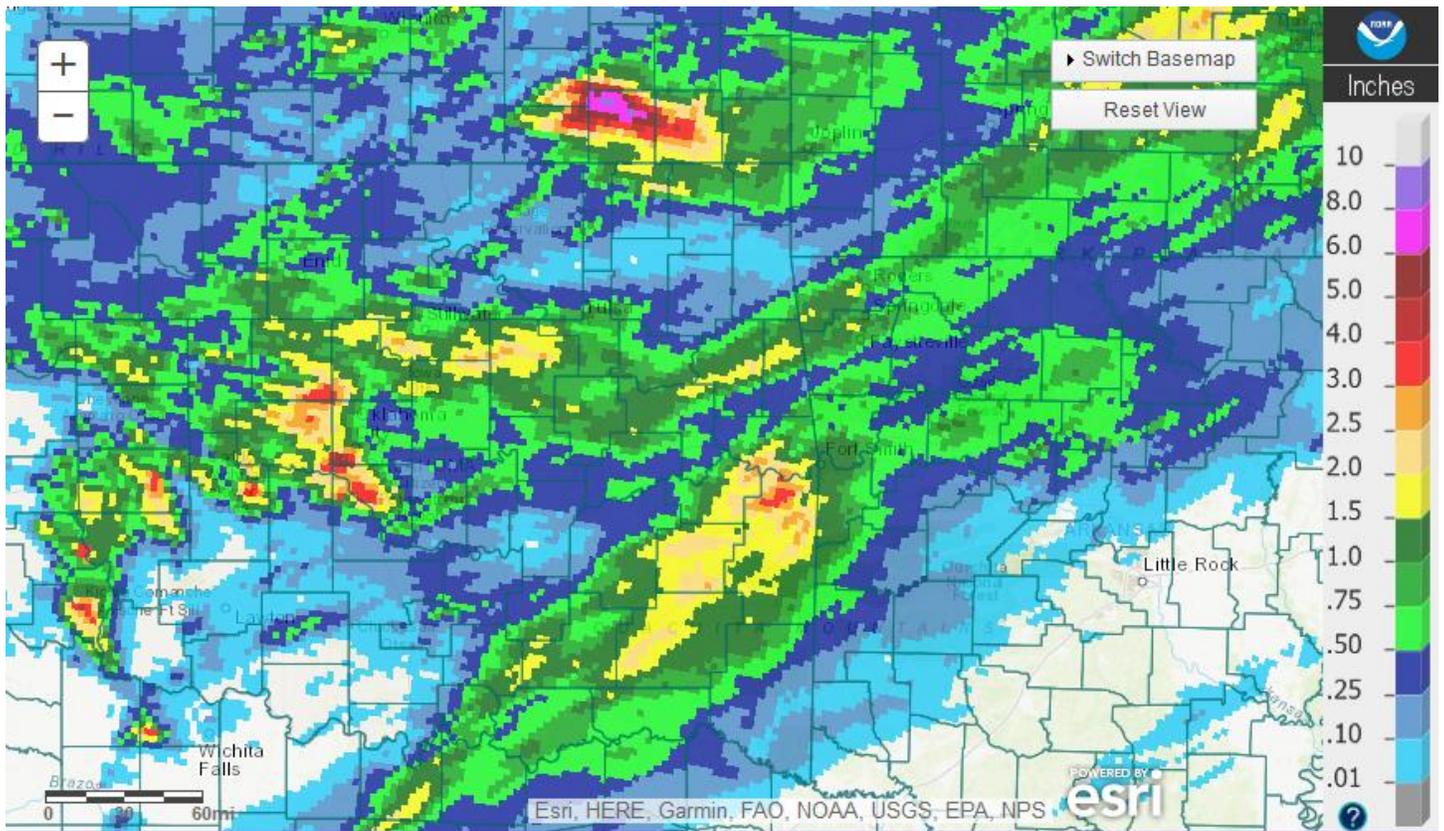
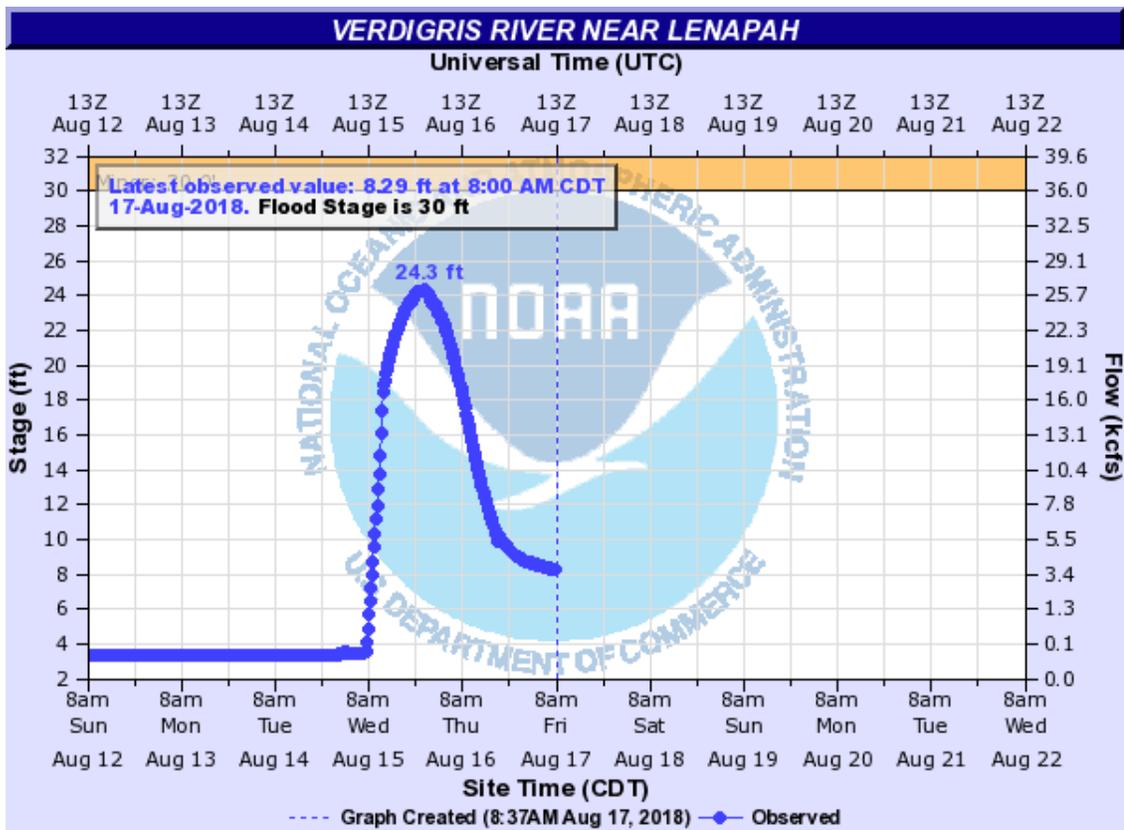


Fig. 7. 48-hour Estimated Observed Rainfall (image) and OK Mesonet measurements ending at 3:30 pm CDT 8/14/2018.



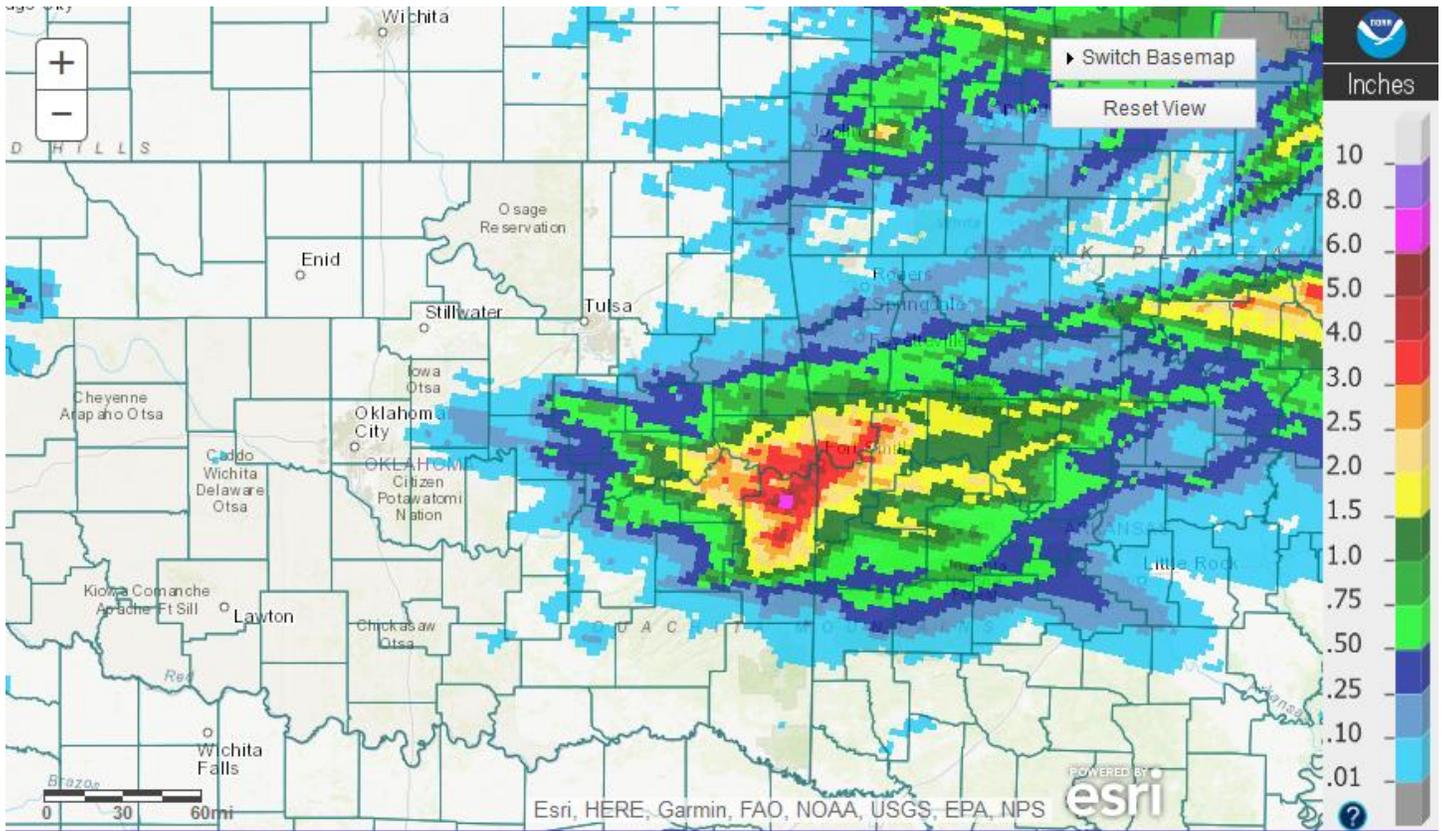
Tulsa, OK: August 15, 2018 1-Day Observed Precipitation
Valid on: August 15, 2018 12:00 UTC

Fig. 8. 24-hour Estimated Observed Rainfall ending at 7am CDT 8/15/2018.



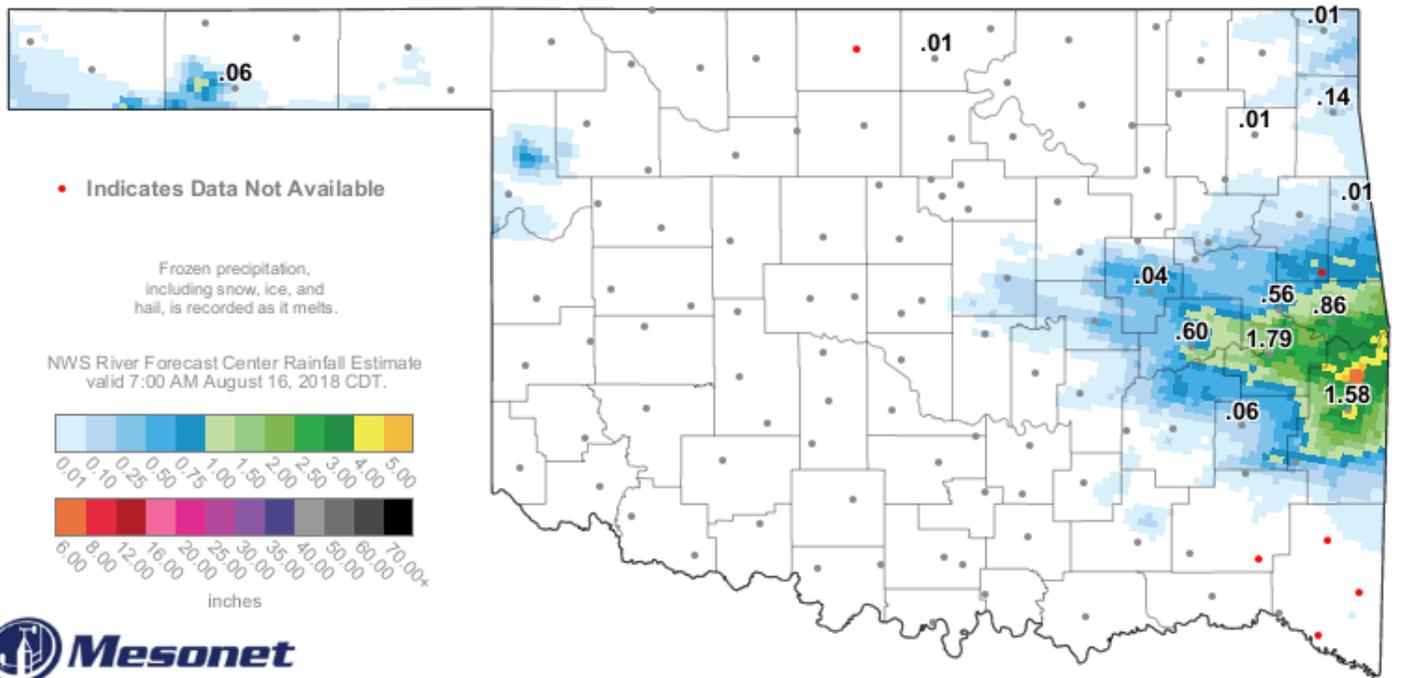
LEPO2(plotting HGIRG) "Gage 0" Datum: 644.9' Observations courtesy of US Geological Survey

Fig. 9. River observations (data courtesy of the USGS) for the Verdigris River near Lenapah.



Tulsa, OK: August 16, 2018 1-Day Observed Precipitation
Valid on: August 16, 2018 12:00 UTC

Fig. 10. 24-hour Estimated Observed Rainfall ending at 7am CDT 8/15/2018.

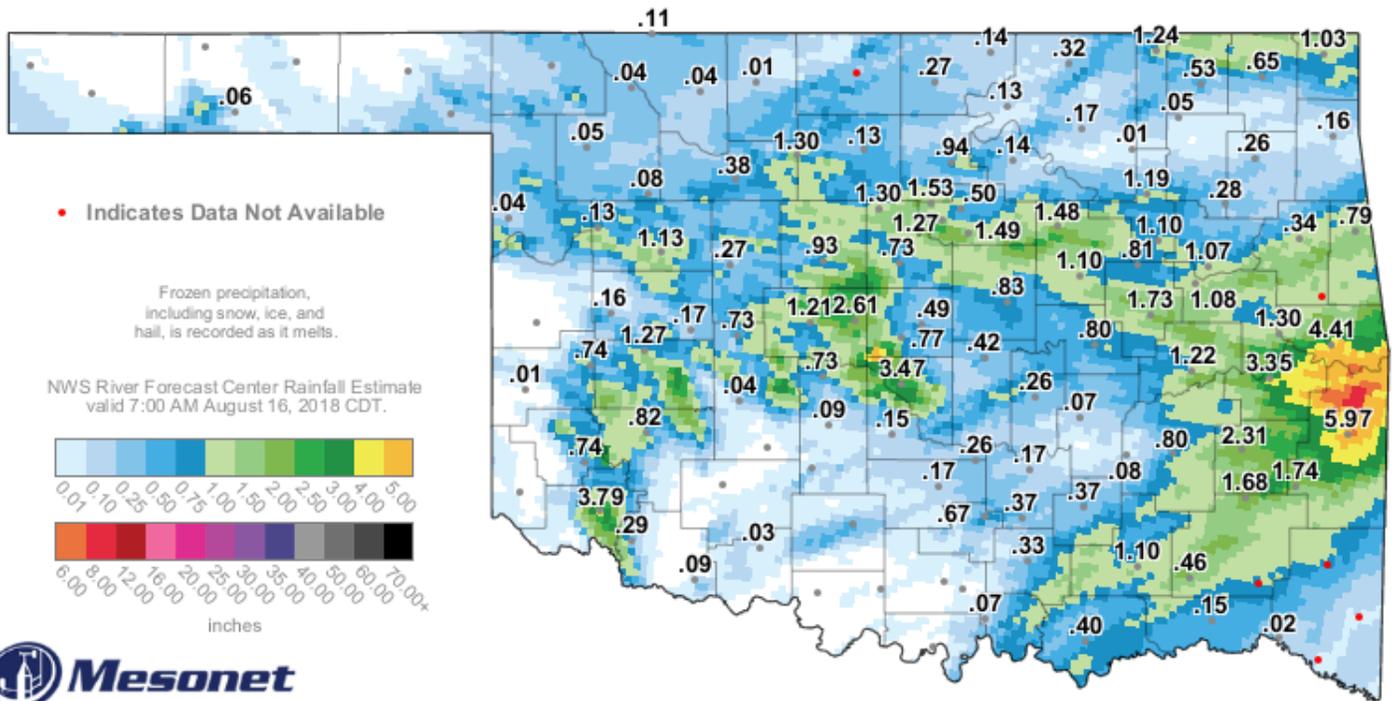


24-Hour Rainfall Accumulation (inches)

9:15 AM August 16, 2018 CDT

Created 9:19:43 AM August 16, 2018 CDT. © Copyright 2018

Fig. 11. 24-hour Estimated Observed Rainfall (image) and OK Mesonet measurements ending at 9:15 pm CDT 8/16/2018.

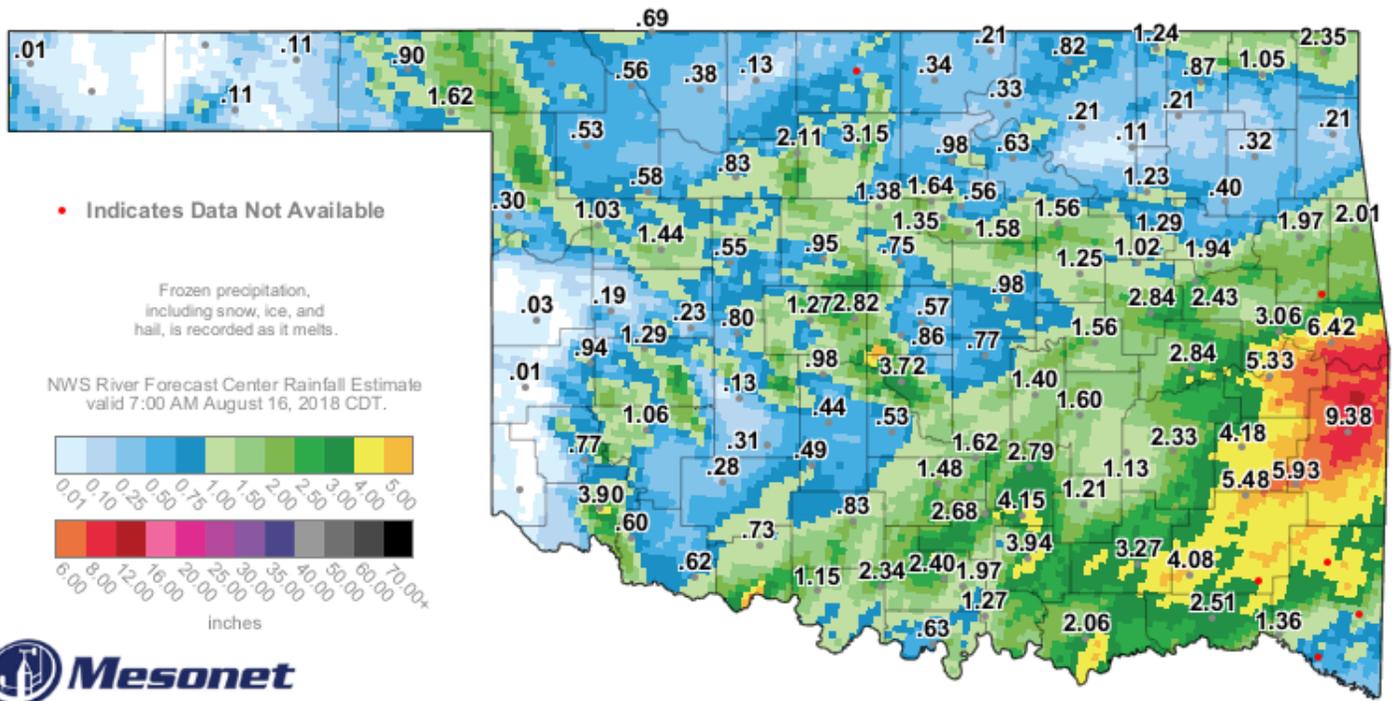


2-Day Rainfall Accumulation (inches)

9:15 AM August 16, 2018 CDT

Created 9:19:43 AM August 16, 2018 CDT. © Copyright 2018

Fig. 12. 2-Day Estimated Observed Rainfall (image) and OK Mesonet measurements ending at 9:15 pm CDT 8/16/2018.

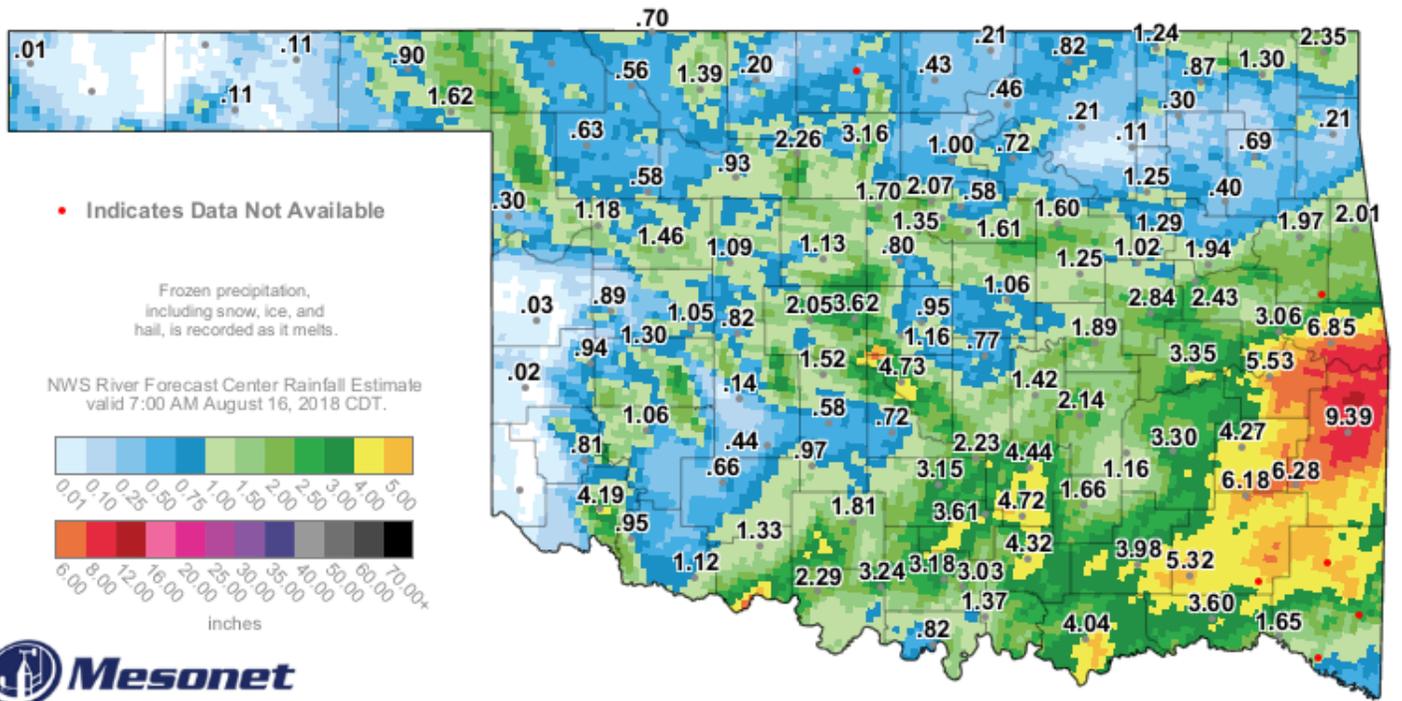


3-Day Rainfall Accumulation (inches)

9:15 AM August 16, 2018 CDT

Created 9:19:43 AM August 16, 2018 CDT. © Copyright 2018

Fig. 13. 3-Day Estimated Observed Rainfall (image) and OK Mesonet measurements ending at 9:15 pm CDT 8/16/2018.

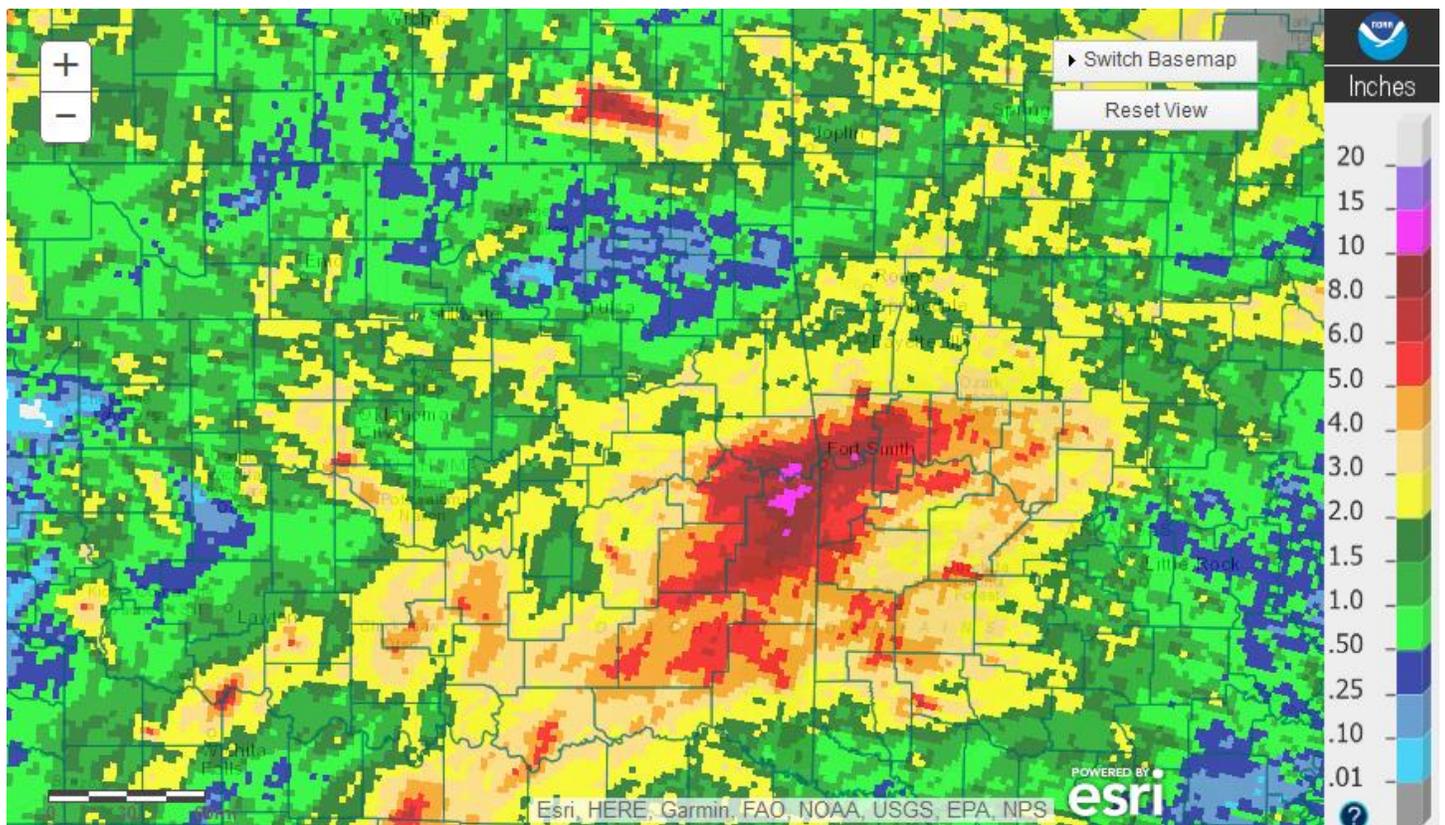


4-Day Rainfall Accumulation (inches)

9:15 AM August 16, 2018 CDT

Created 9:19:43 AM August 16, 2018 CDT. © Copyright 2018

Fig. 14. 4-Day Estimated Observed Rainfall (image) and OK Mesonet measurements ending at 9:15 pm CDT 8/16/2018.



Tulsa, OK: Last 7-Day Observed Precipitation

Valid on: August 16, 2018 12:00 UTC

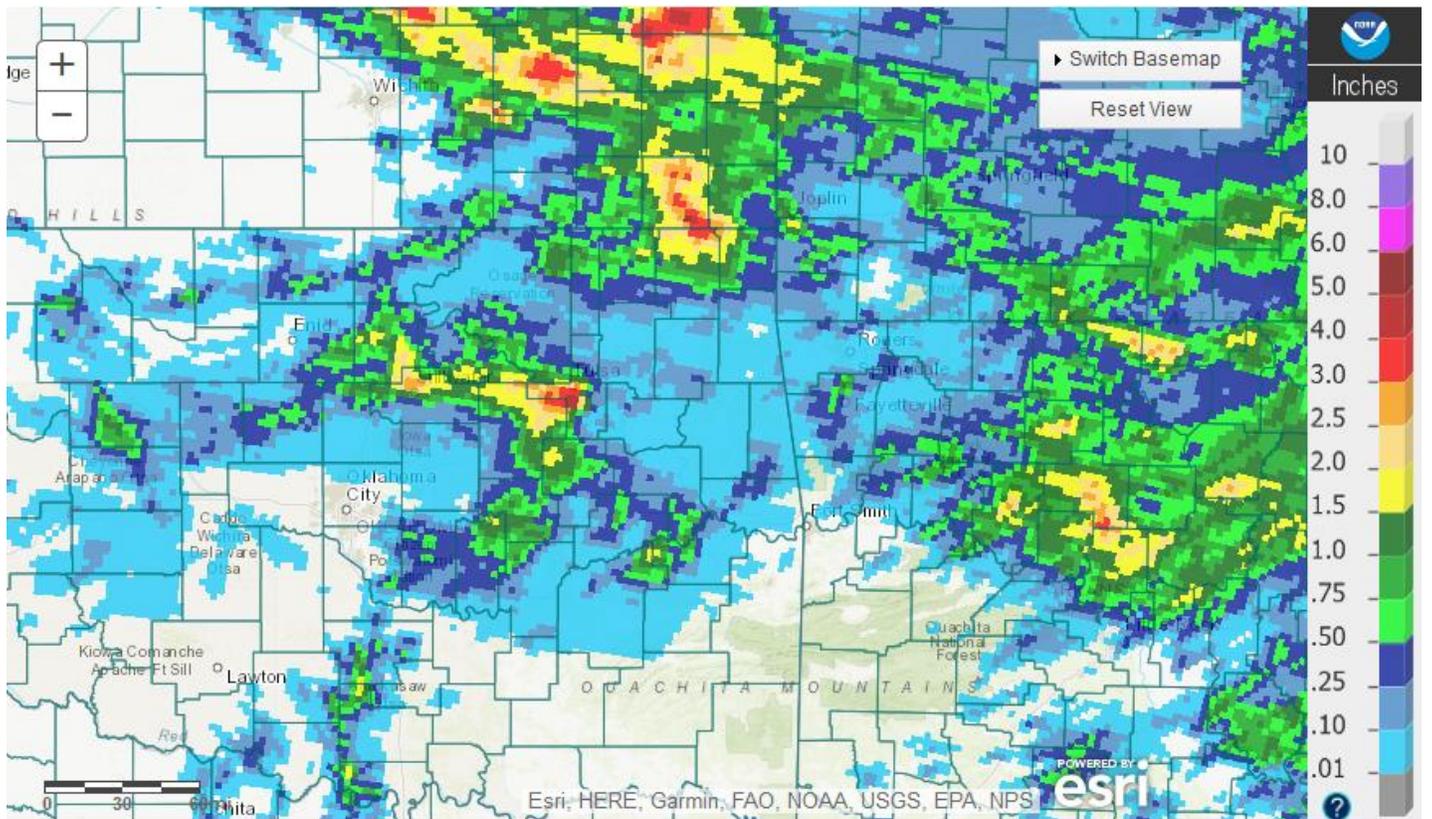
Fig. 15. 7-day Estimated Observed Rainfall ending at 7am CDT 8/16/2018.

A subtle boundary was located near Highway 412, as noted by moisture pooling and high heat index values to its south. As an mesoscale convective vortex (MCV) from High Plains convection the night before approached the area, thunderstorms developed along the boundary from Tulsa westward during the afternoon of the 16th. These storms brought heavy rain to Tulsa before expanding in area across northeast OK and northwest AR during the evening. Shortly after midnight on the 17th, an area of showers and thunderstorms moved south out of KS into northeast OK, affecting the area through the pre-dawn hours. By 7am on the 17th, northern Creek, western Tulsa, northern Craig, and northwestern Ottawa Counties had received 2"-5" of rain (Fig. 16). One site, Tulsa 5SSW, OK, measured 4.66" of rain. The showers and thunderstorms continued to the southeast through the morning, primarily affecting northeast OK through northwest AR before shifting southeast of the area. This activity brought 0.5" to 2.5" of rain (Fig. 17). Flash flooding resulted in high water over roadways and led to stranded cars near Sand Springs, urban street flooding in the Tulsa metro area, numerous side roads flooded in Craig County, water in a business and encroaching on a home both near Sapulpa, and street and state highway flooding across portions of Creek, Benton, and Franklin Counties. Storms redeveloped during the late evening hours of the 17th near I-40 where an outflow boundary left from the morning convection was located, and they continued into the pre-dawn hours of the 18th. Training storms across northern Le Flore and Sebastian Counties resulted in 1.5" to around 4" of rain. The heaviest of this rain was centered near Panama in Le Flore County, the same area that had just received heavy rain from the previous storm activity. The rain gauge at Panama 2E, OK measured another high 24-hour rainfall total of 4.07" by 7am CDT 8/18/2018. The 6-day total rainfall ending at 7am CDT 8/18/2018 at Panama 2E, OK was 19.14". This amount is greater than a 1,000 year recurrence interval (or less than a 0.1% annual chance of occurrence) for a 7-day rainfall (Fig. 18)! The Poteau River near Panama had been receding from the previous heavy rain, but this additional water resulted in another rise to minor flooding (see preliminary hydrographs at the end of this report; see E3 Report for details).

In the pre-dawn hours of the 19th, a large complex of thunderstorms moved into northeast OK. This activity continued to progress to the northeast, affecting northeast OK north of I-40 and far northwest AR during the morning and early afternoon hours. Additional scattered thunderstorms developed during the afternoon and evening across far eastern OK and western AR. Several of these were low-topped, mini supercells. Two of these supercells produced EF-1 tornadoes in Mayes and Rogers Counties (see <https://arcg.is/1f5Ob4> for details). Rainfall totals were 1.5" to 5" along the I-44 corridor from Creek to Ottawa Counties (Figs. 19-21). The 24-hour rainfall total ending at 7am 8/20/2018 at Quapaw 3SE, OK was 4.82". Flash flooding affecting urban roadways was reported across the Tulsa metro area. Figures 22-24 illustrate the heavy rain received across eastern OK and northwest AR for the week ending at 7am CDT 8/20/2018.

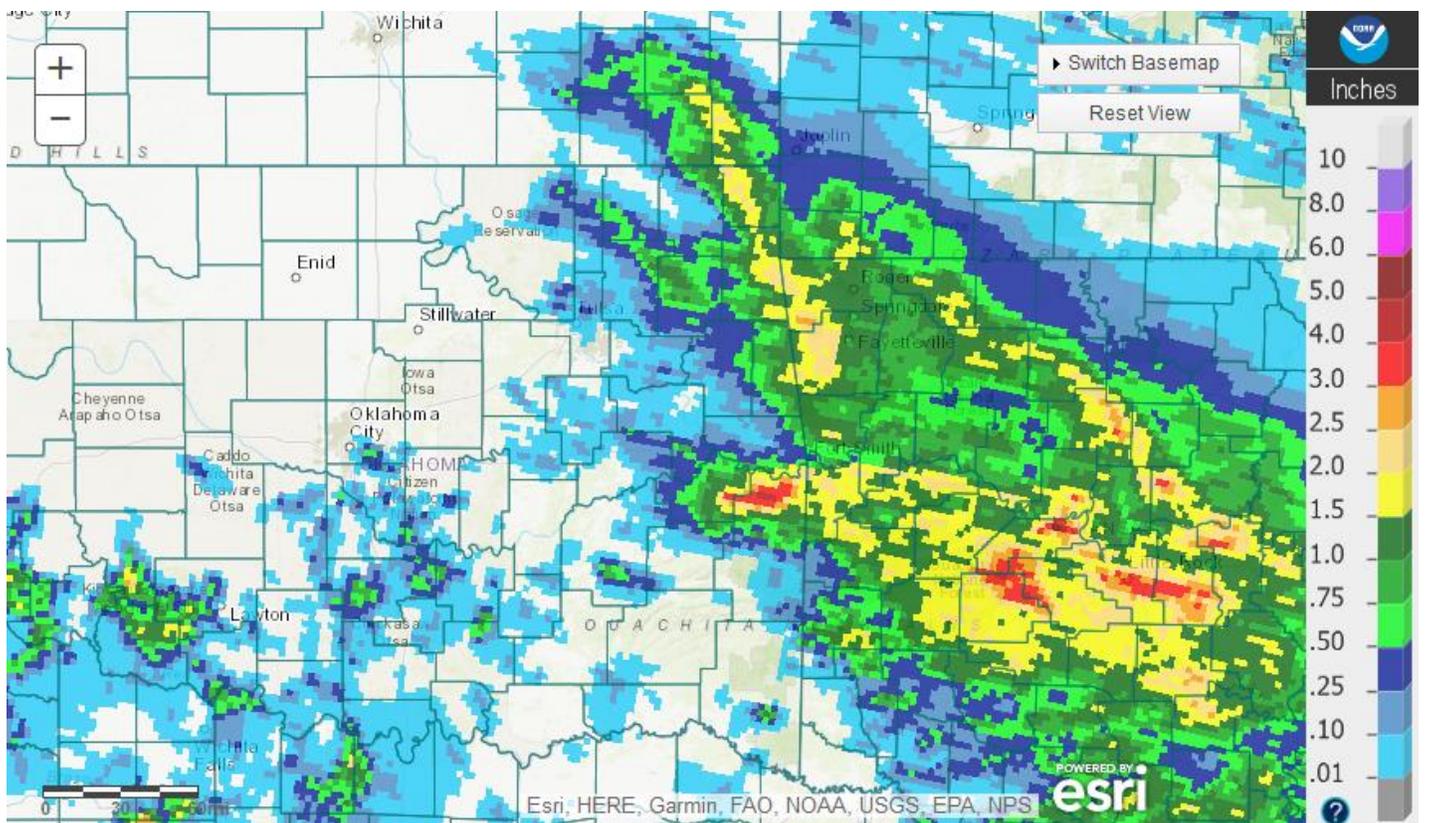
Thunderstorms developed across eastern Kay, Pawnee, Osage, Washington, and Nowata Counties during the early morning hours of the 25th within an area of favorable isentropic lift and warm air advection. This activity continued through the morning and finally dissipated in the early afternoon. While most of the affected area received around 0.50" or less of rain, eastern Kay, western Osage, and northwestern Pawnee Counties, just south of the Ponca City area, received 0.75" to around 3" of rain.

Two rounds of showers and thunderstorms affected southeast KS and northeast OK both during the morning and afternoon hours of the 30th. The afternoon activity moved southeast and also affected northwest AR. While rainfall totals in far northeast OK and northwest AR ranged from around 0.50" to around 2.5", heavier rainfall of 1.5" to 4" fell in the Neosho River basin in southeast KS (Fig. 25). This resulted in the Neosho River near Commerce rising to just below flood stage (see preliminary hydrographs at the end of this report).



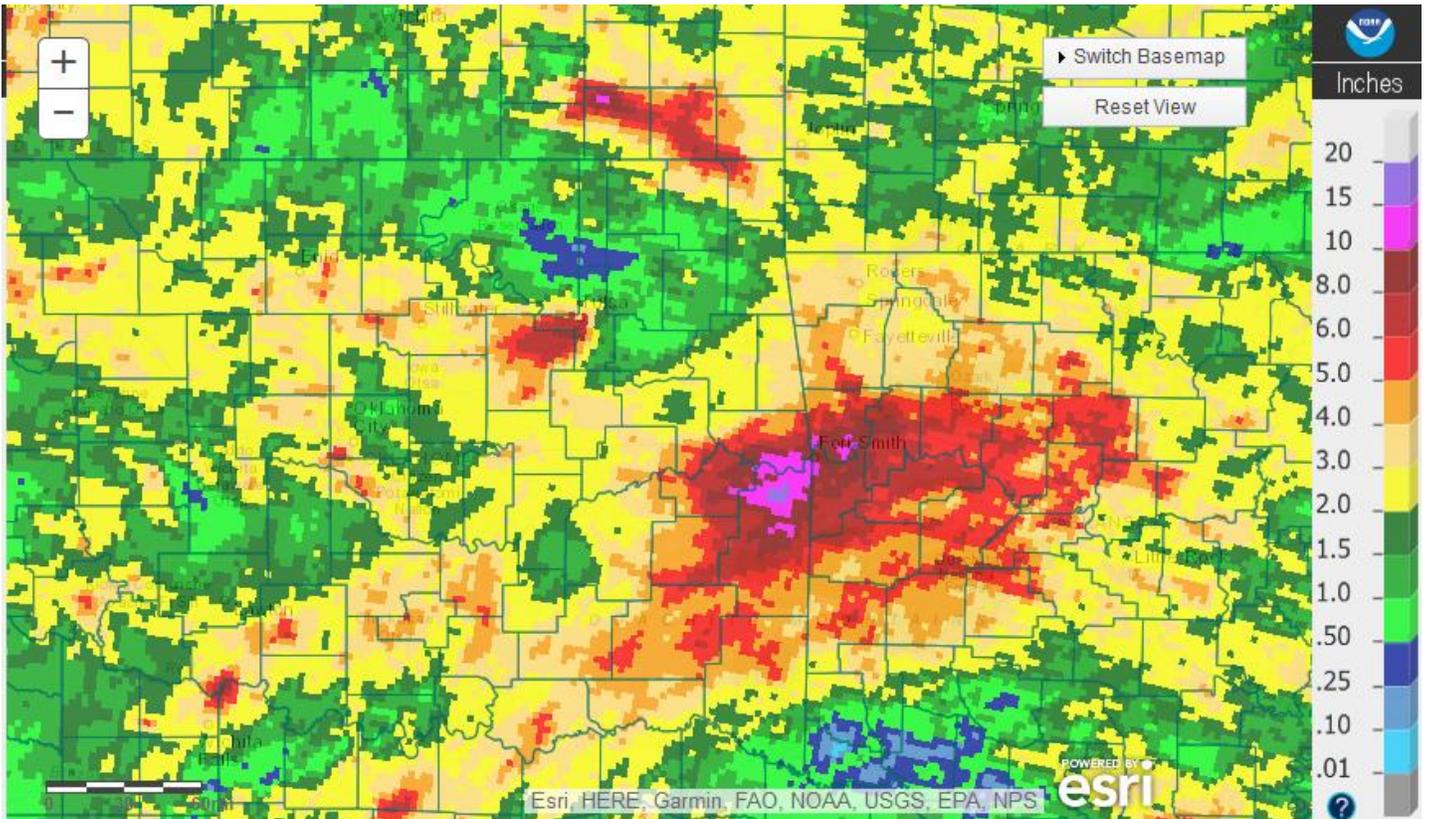
Tulsa, OK: Current 1-Day Observed Precipitation
Valid on: August 17, 2018 12:00 UTC

Fig. 16. 24-hour Estimated Observed Rainfall ending at 7am CDT 8/17/2018.



Tulsa, OK: August 18, 2018 1-Day Observed Precipitation
Valid on: August 18, 2018 12:00 UTC

Fig. 17. 24-hour Estimated Observed Rainfall ending at 7am CDT 8/18/2018.



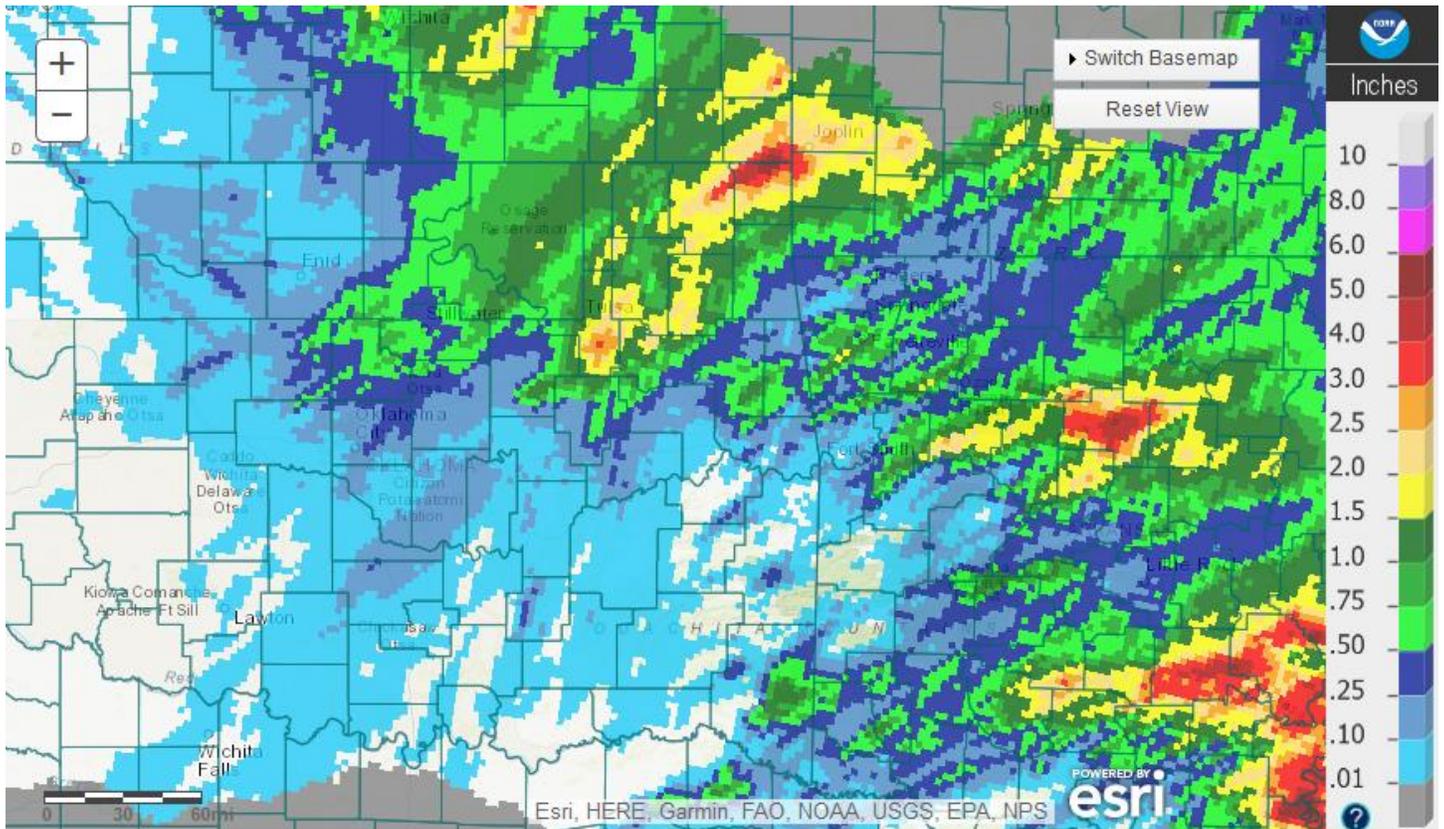
Tulsa, OK: Last 7-Day Observed Precipitation
Valid on: August 19, 2018 12:00 UTC

Fig. 18. 7-Day Estimated Observed Rainfall ending at 7am CDT 8/19/2018.



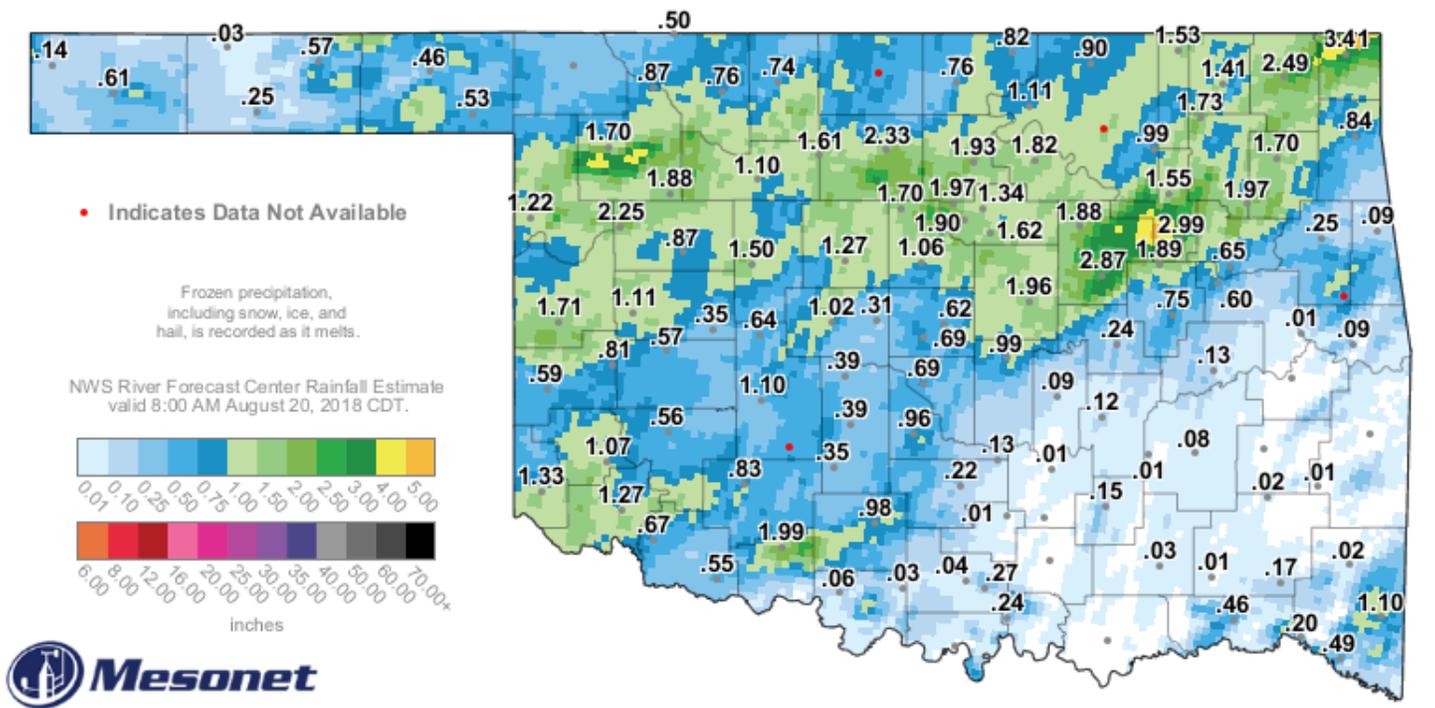
Tulsa, OK: August 19, 2018 1-Day Observed Precipitation
Valid on: August 19, 2018 12:00 UTC

Fig. 19. 24-hour Estimated Observed Rainfall ending at 7am CDT 8/19/2018.



Tulsa, OK: August 20, 2018 1-Day Observed Precipitation
Valid on: August 20, 2018 12:00 UTC

Fig. 20. 24-hour Estimated Observed Rainfall ending at 7am CDT 8/20/2018.

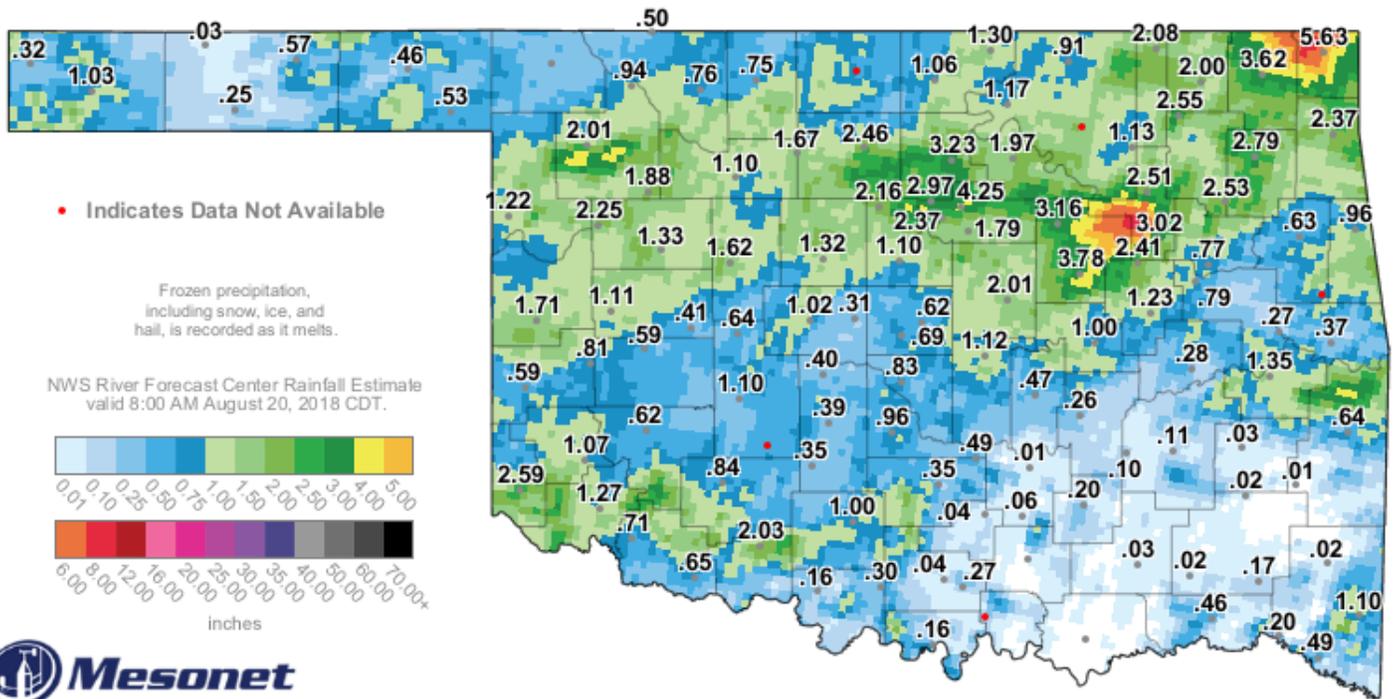


2-Day Rainfall Accumulation (inches)

8:45 AM August 20, 2018 CDT

Created 8:50:47 AM August 20, 2018 CDT. © Copyright 2018

Fig. 21. 2-Day Estimated Observed Rainfall (image) and OK Mesonet measurements ending at 8:45 pm CDT 8/20/2018.

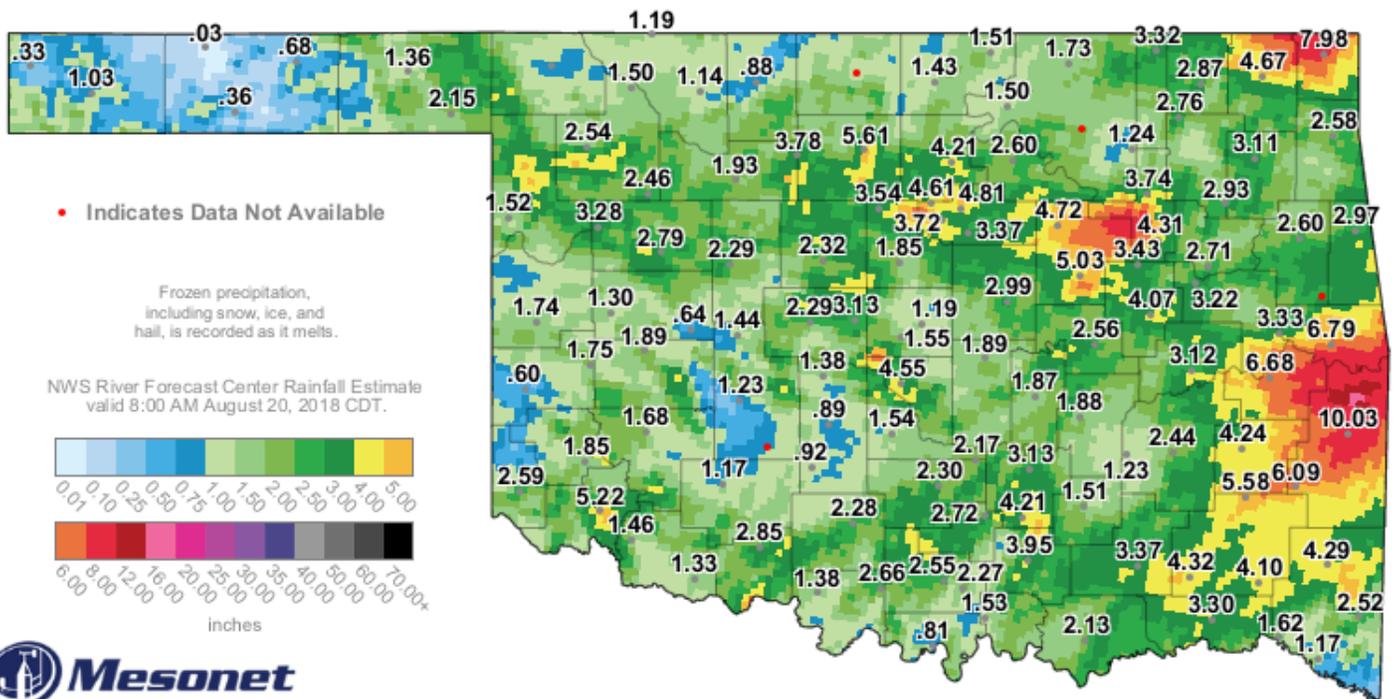


4-Day Rainfall Accumulation (inches)

8:45 AM August 20, 2018 CDT

Created 8:50:47 AM August 20, 2018 CDT. © Copyright 2018

Fig. 22. 4-Day Estimated Observed Rainfall (image) and OK Mesonet measurements ending at 8:45 pm CDT 8/20/2018.

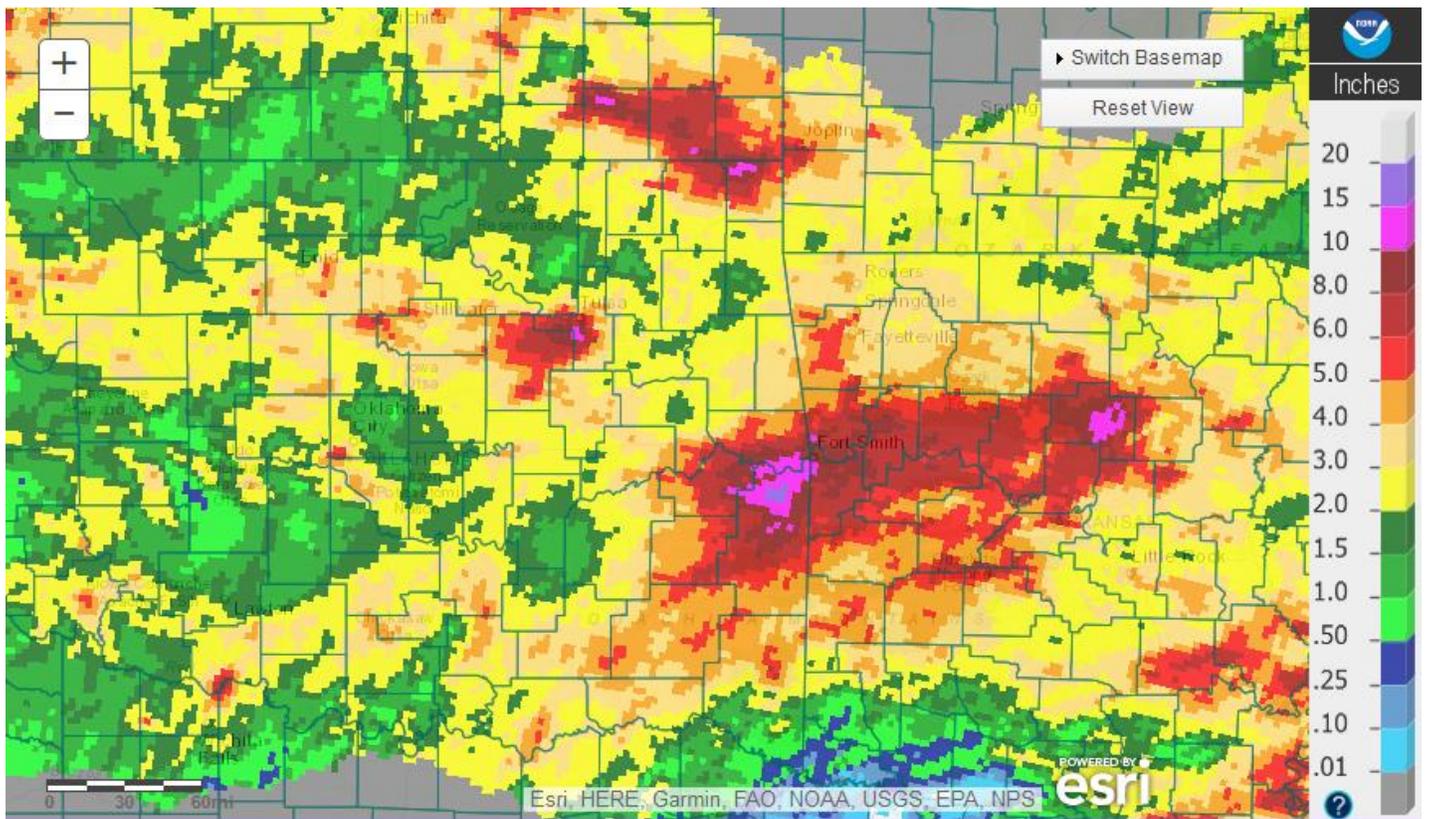


7-Day Rainfall Accumulation (inches)

8:45 AM August 20, 2018 CDT

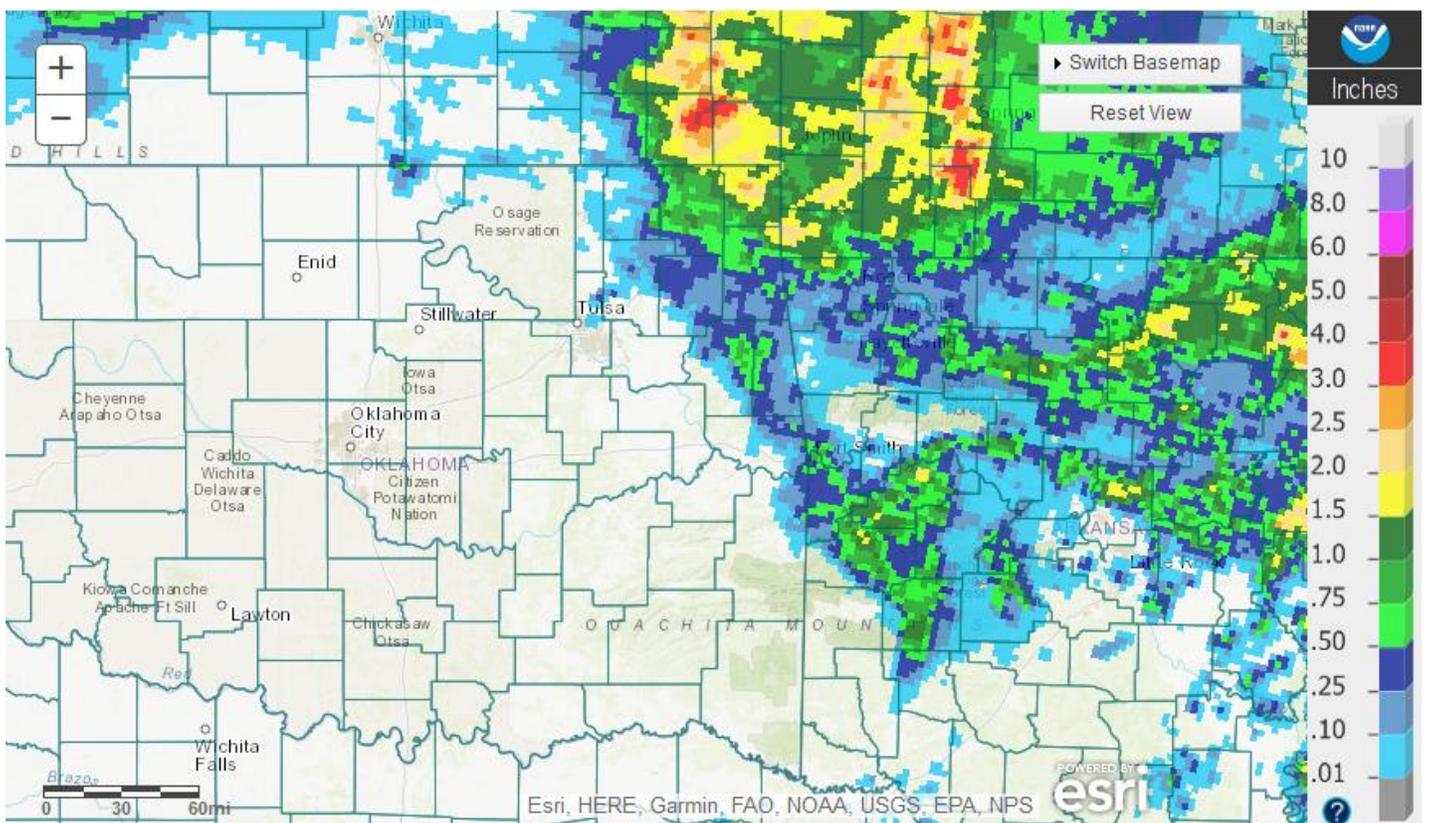
Created 8:50:47 AM August 20, 2018 CDT. © Copyright 2018

Fig. 23. 7-Day Estimated Observed Rainfall (image) and OK Mesonet measurements ending at 8:45 pm CDT 8/20/2018.



Tulsa, OK: Last 7-Day Observed Precipitation
Valid on: August 20, 2018 12:00 UTC

Fig. 24. 7-Day Estimated Observed Rainfall ending at 7am CDT 8/20/2018.



Tulsa, OK: Current 1-Day Observed Precipitation
Valid on: August 31, 2018 12:00 UTC

Fig. 25. 7-Day Estimated Observed Rainfall ending at 7am CDT 8/31/2018.

Written by:

Nicole McGavock
Service Hydrologist
WFO Tulsa

Products issued in August 2018:

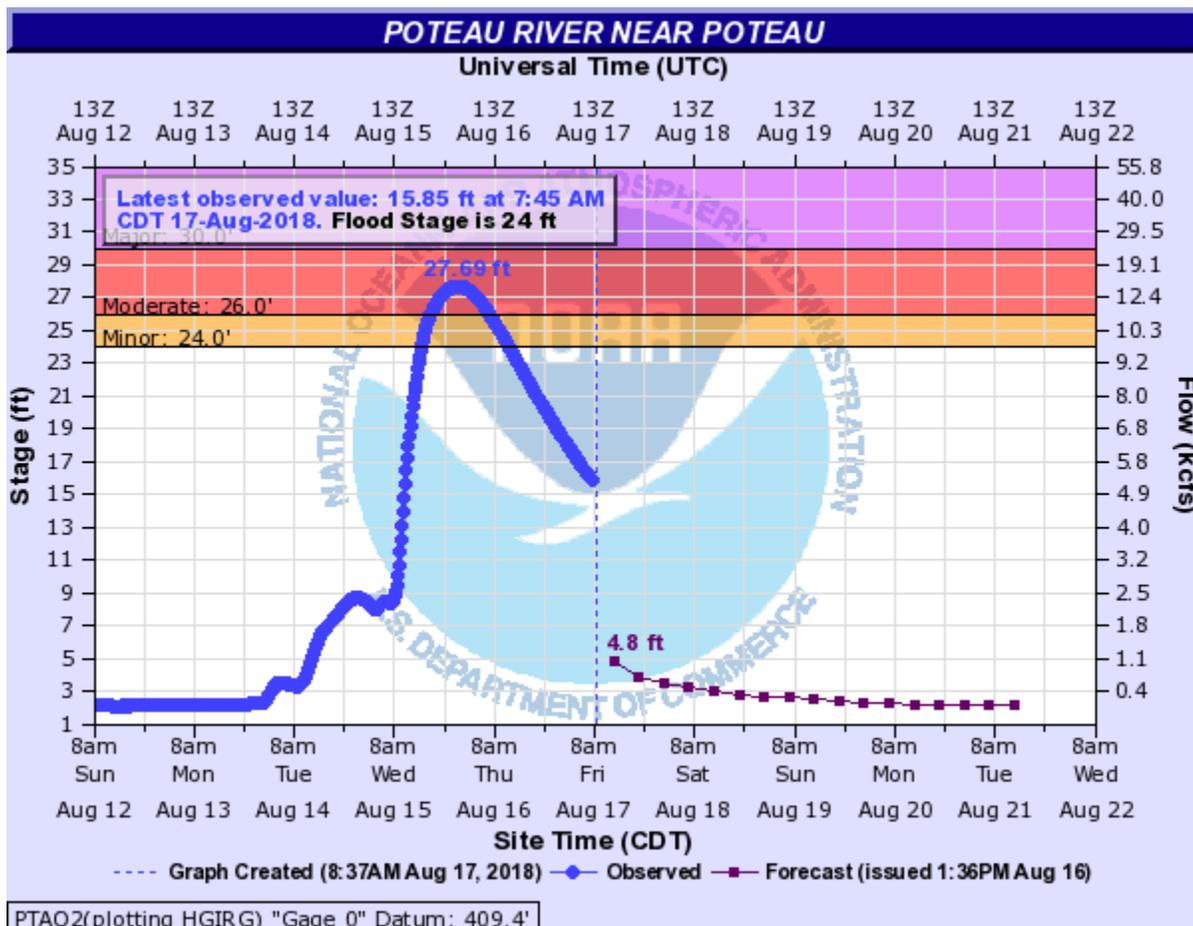
*CWYO2 became a daily river forecast point September 7, 2016

*MLBA4 and OZGA4 transferred to NWS Tulsa HSA February 5, 2014

*Mixed case River Flood products began July 31, 2013

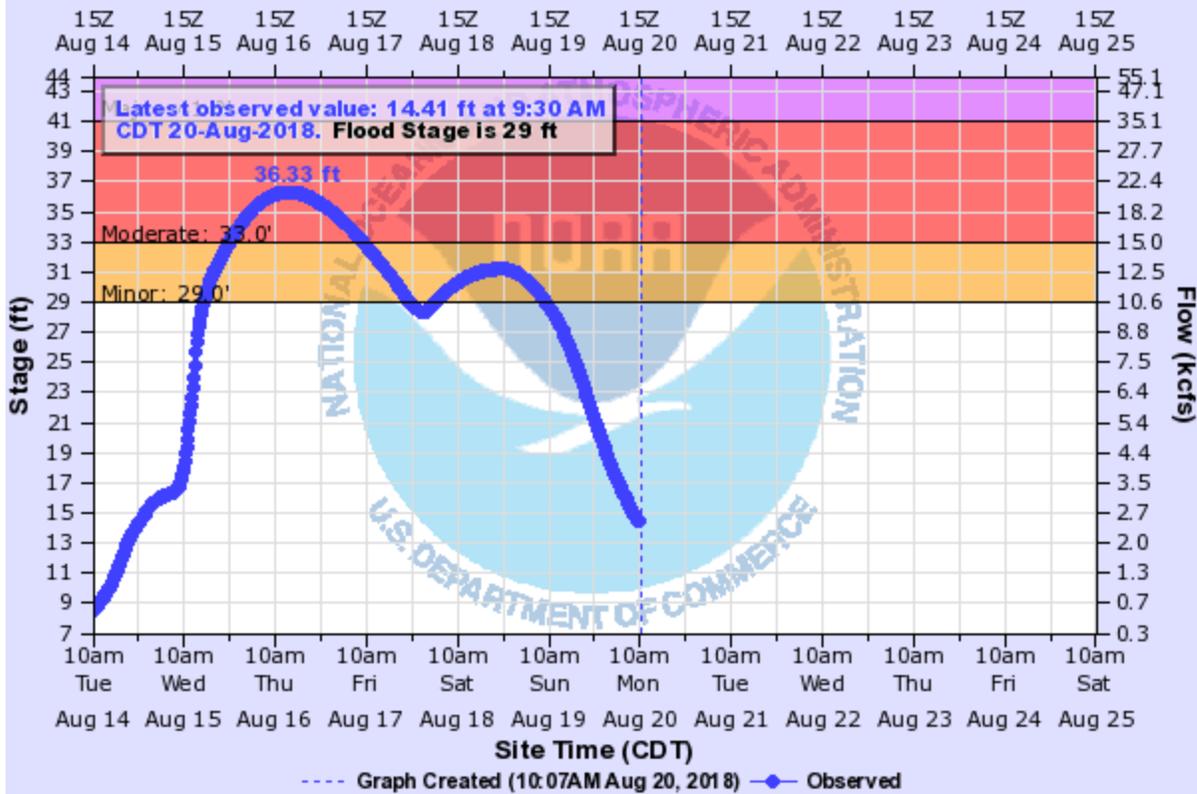
- 5 Flash Flood Warnings (FFW)
- 3 Flash Flood Statements (FFS)
- 1 Flash/Areal Flood Watches (FFA) (7 Watch FFA CON/EXT/EXA/EXB/CAN)
- 22 Urban and Small Stream Advisories (FLS)
- 5 Areal Flood Warnings (FLW)
- 0 Areal Flood Statements (FLS)
- 3 River Flood Warnings (FLW) (includes category increases)
- 25 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:



POTEAU RIVER NEAR PANAMA

Universal Time (UTC)

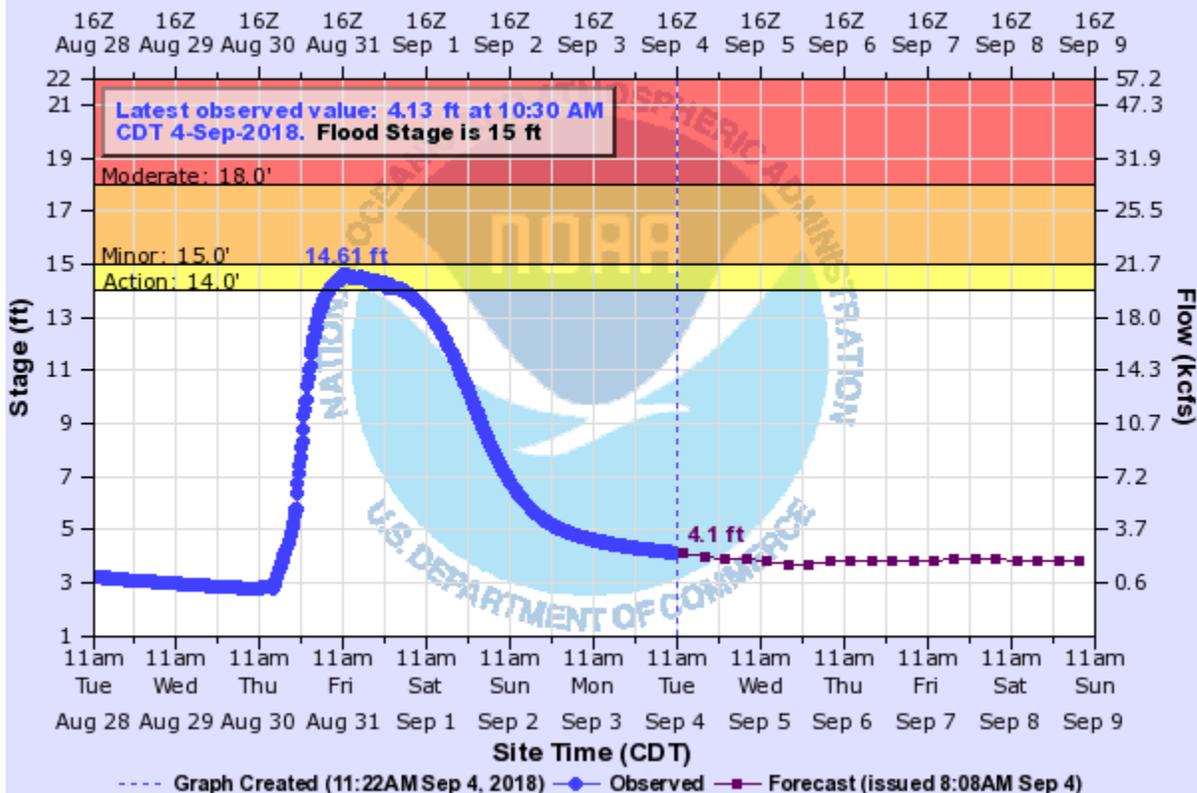


PANO2(plotting HGIRG) "Gage 0" Datum: 387.96'

Observations courtesy of US Geological Survey

NEOSHO RIVER NEAR COMMERCE

Universal Time (UTC)



COMO2(plotting HGIRG) "Gage 0" Datum: 748.97'

Observations courtesy of US Geological Survey