

NWS FORM E-5 (11-88) (PRES. by NWS Instruction 10-924)	U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL WEATHER SERVICE	HYDROLOGIC SERVICE AREA (HSA) Tulsa, Oklahoma (TSA)
		REPORT FOR: MONTH July YEAR 2019
MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS		SIGNATURE Steven F. Piltz (Meteorologist-in-Charge)
TO: Hydrometeorological Information Center, W/OH2 NOAA / National Weather Service 1325 East West Highway, Room 7230 Silver Spring, MD 20910-3283		DATE August 23, 2019

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.

After an extremely wet May and June, July 2019 ended up with below normal rainfall for most of eastern OK and northwest AR. Some minor rises occurred along area rivers this month. Overall, temperatures were near normal 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 July 2019 ranged from around 0.50" to near 8" across eastern OK and northwest AR. A large portion of the HSA received 1"-3" of rain this month. These rainfall totals correspond to 25%-90% of the normal July rainfall for most of eastern OK and western AR, with some locations receiving as little as 10%-25% and others receiving 125%-250% of the normal July rainfall (Fig. 1b).

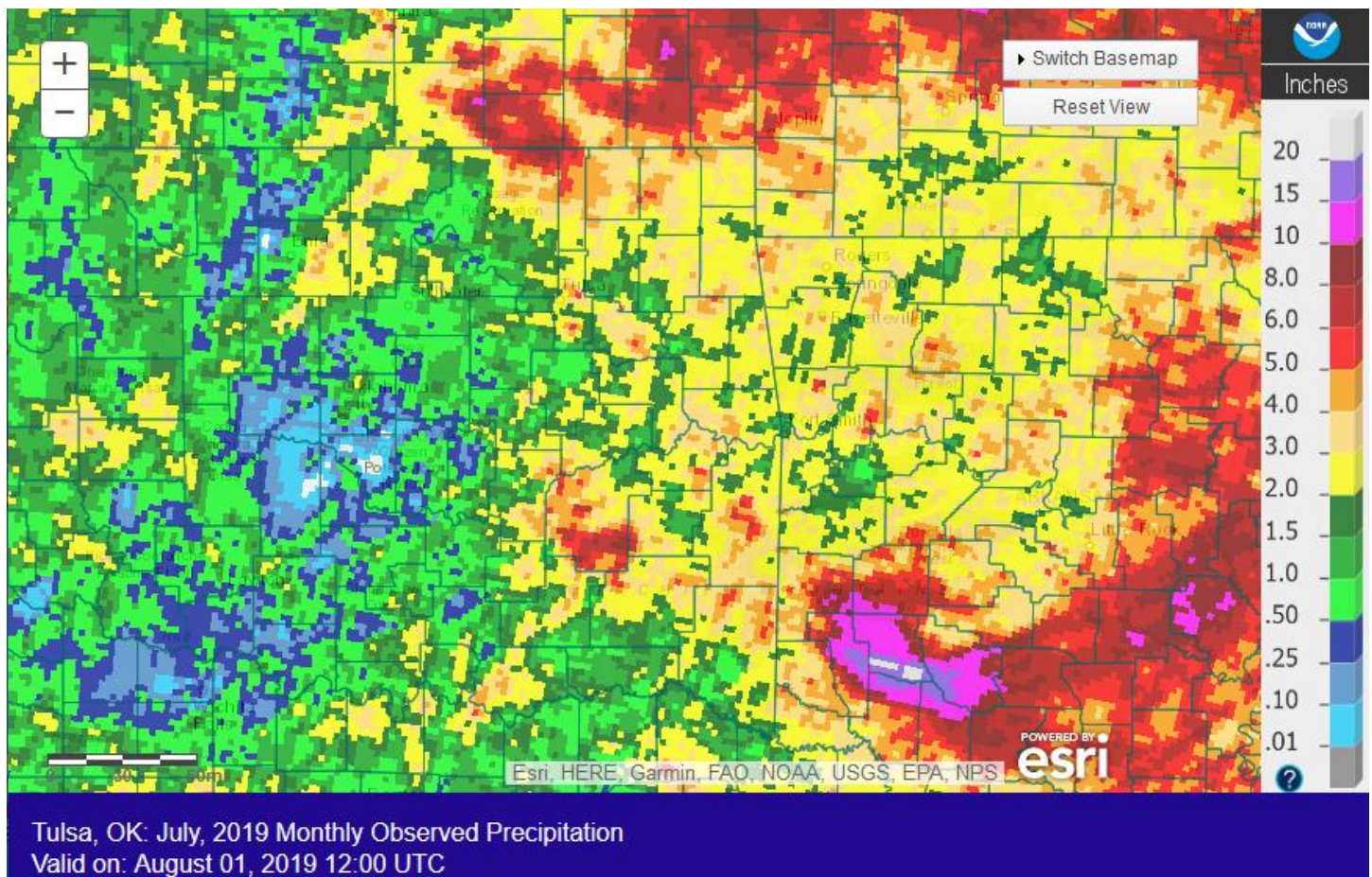
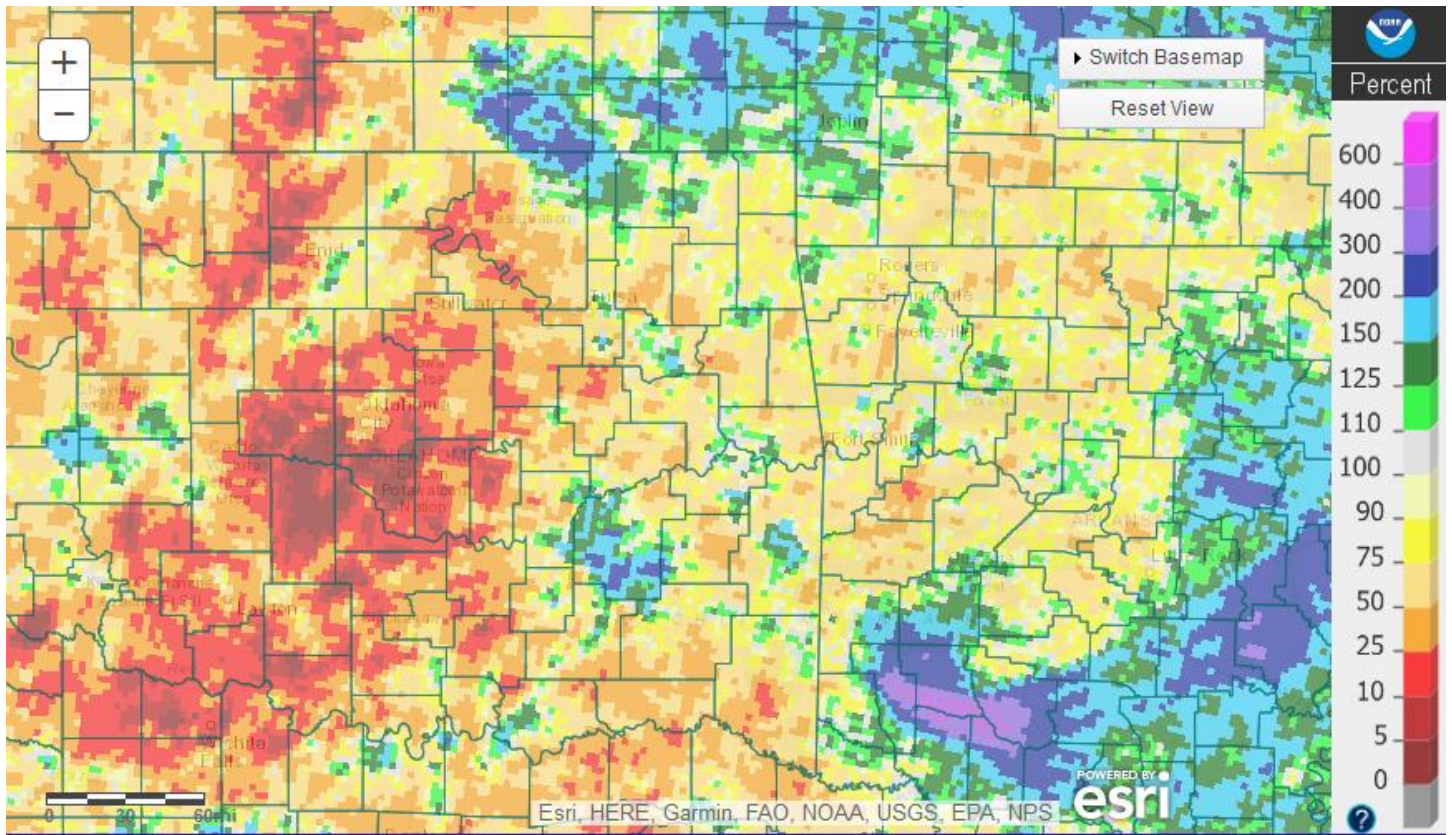


Fig. 1a. Estimated Observed Rainfall for July 2019



Tulsa, OK: July, 2019 Monthly Percent of Normal Precipitation
 Valid on: August 01, 2019 12:00 UTC

Fig. 1b. Estimated % of Normal Rainfall for July 2019

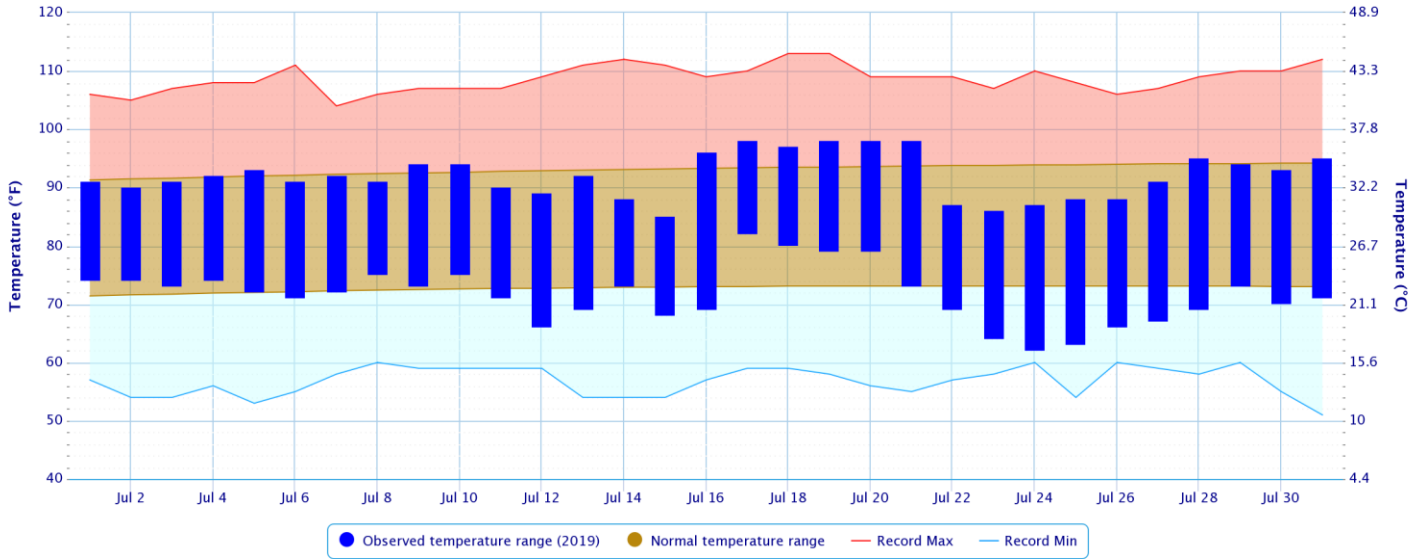
In Tulsa, OK, July 2019 ranked as the 43rd coldest July (81.7°F, tied 1997; since records began in 1905) and the 45th wettest July (4.05"; since records began in 1888). Fort Smith, AR had the 59th coldest July (81.7°F; since records began in 1882) and the 46th wettest July (3.33", tied 1984; since records began in 1882). Fayetteville, AR had the 17th coldest (76.4°F) and the 31st wettest (3.07") July since records began in 1950.

Some of the larger precipitation reports (in inches) for July 2019 included:

Hulah 5.3 WSW, OK (coco)	7.24	Mountainburg 2NE, AR (coop)	6.38	Copan, OK (meso)	5.81
Dewey 1.1N, OK (coco)	5.58	Bartlesville, OK (ASOS)	5.50	Sallisaw 0.3SE, OK (coco)	5.37
Wister, OK (meso)	5.35	Westville 3.0 SSW, OK (coco)	5.27	Tulsa 3.4 ENE, OK (coco)	5.04

Daily Temperature Data – Tulsa Area, OK (ThreadEx)

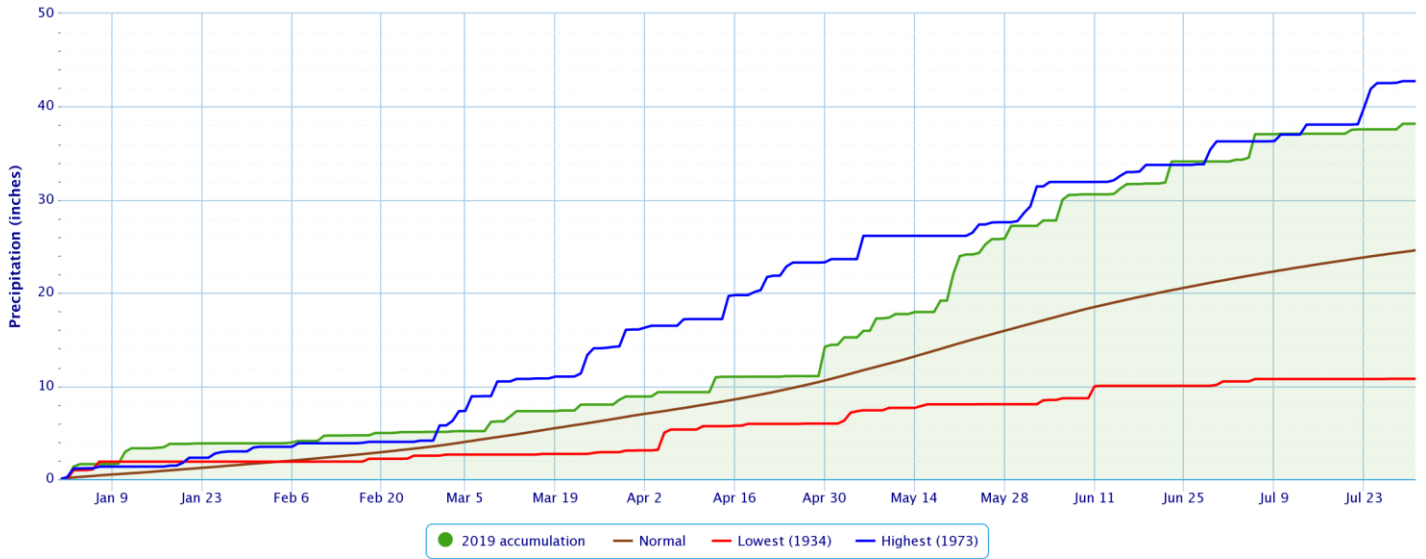
Period of Record – 1905-01-06 to 2019-08-14. Normals period: 1981-2010. Click and drag to zoom chart.



Powered by ACIS

Accumulated Precipitation – Tulsa Area, OK (ThreadEx)

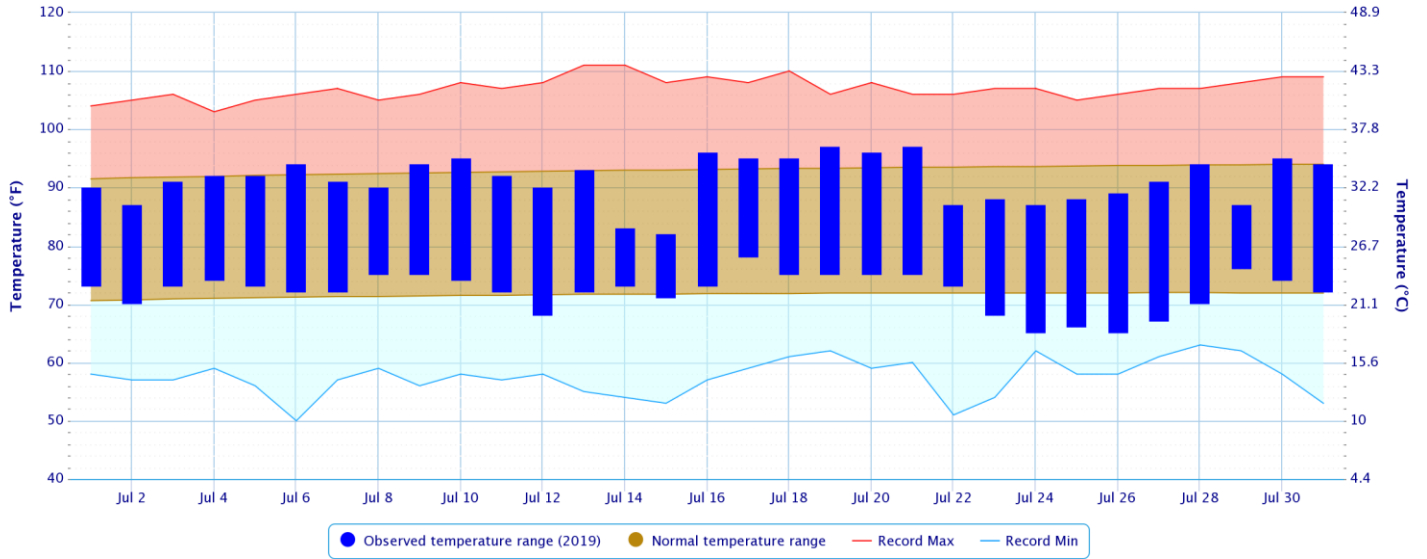
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



Powered by ACIS

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

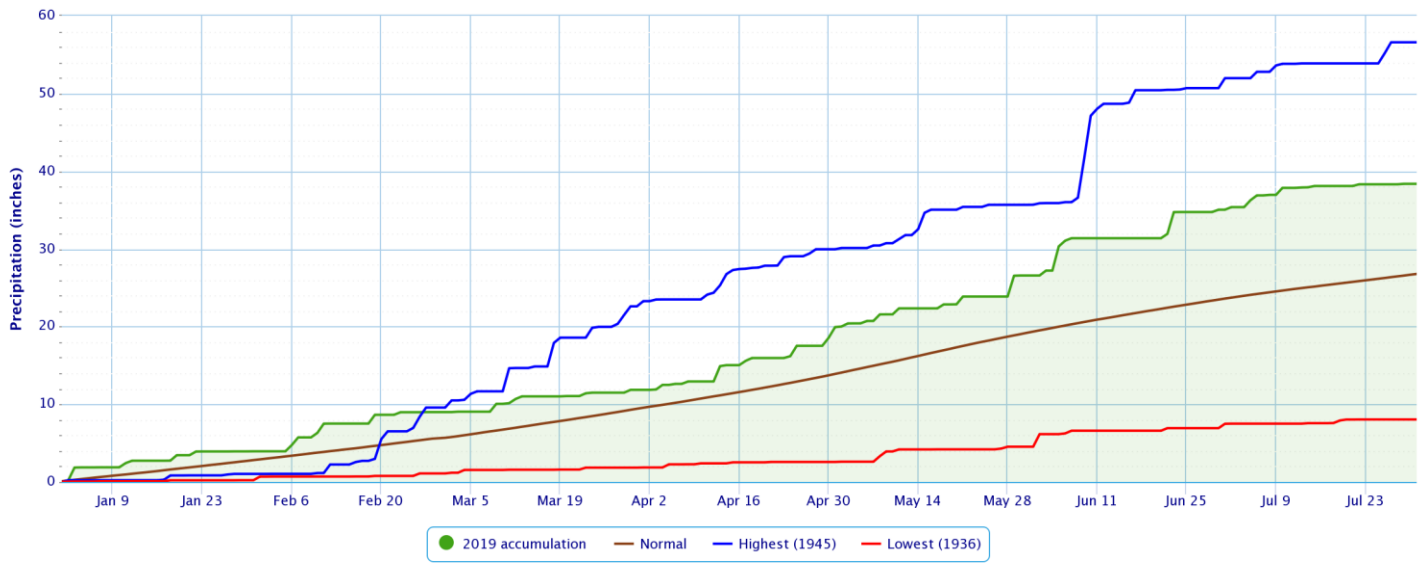
Period of Record – 1882-06-01 to 2019-08-14. Normals period: 1981-2010. Click and drag to zoom chart.



Powered by ACIS

Accumulated Precipitation – Fort Smith Area, AR (ThreadEx)

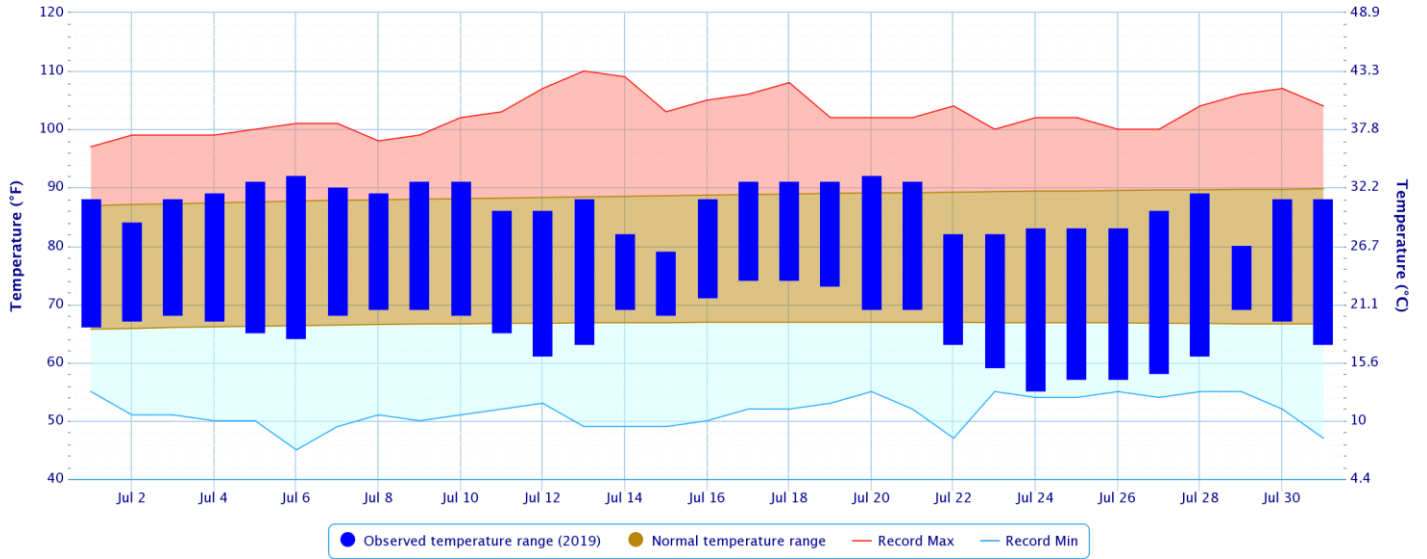
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



Powered by ACIS

Daily Temperature Data – FAYETTEVILLE DRAKE FIELD, AR

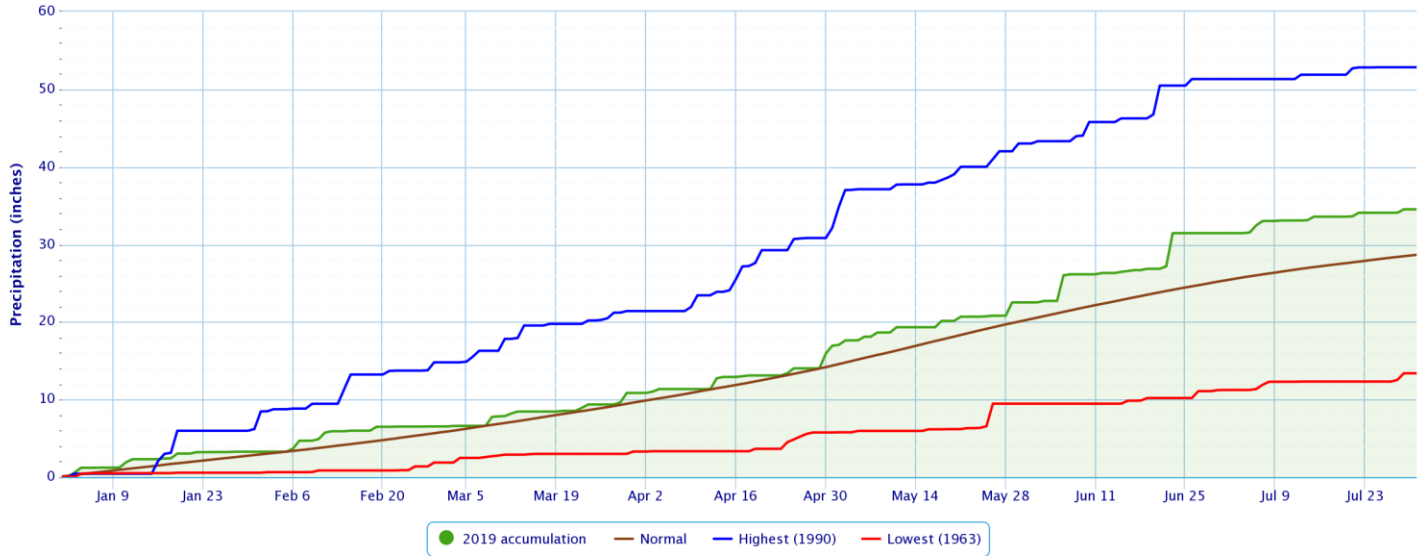
Period of Record – 1949-07-14 to 2019-08-14. Normals period: 1981-2010. Click and drag to zoom chart.



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

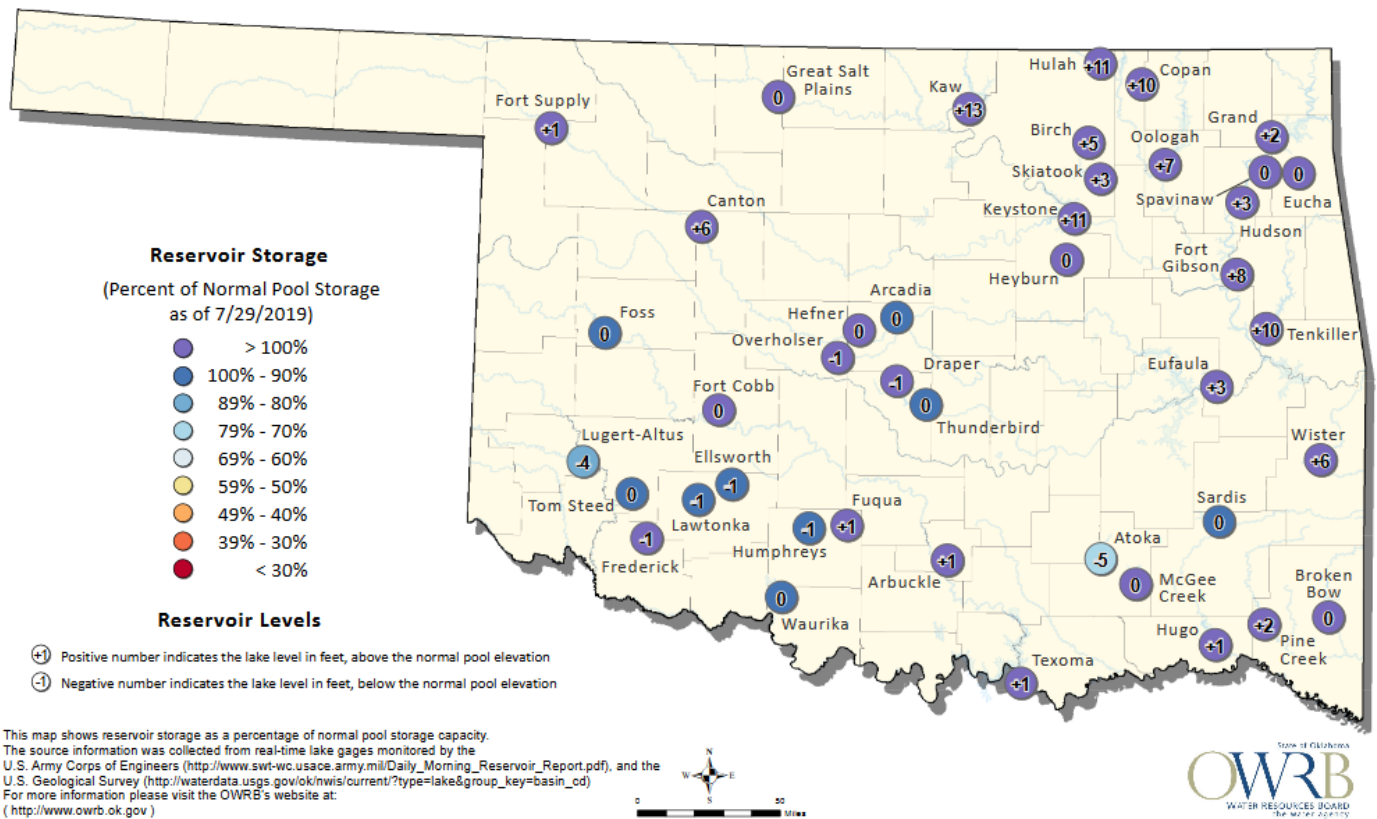


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Reservoirs

Oklahoma Surface Water Resources

Reservoir Levels and Storage as of 7/29/2019



Drought

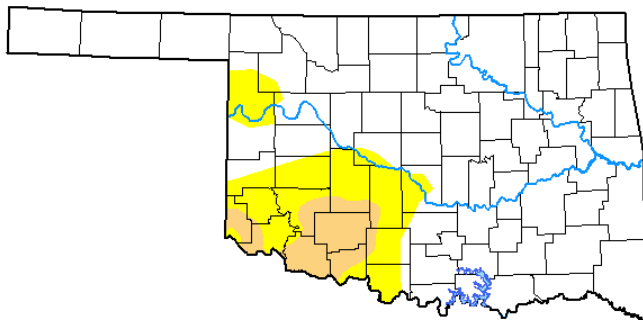
According to the [U.S. Drought Monitor](#) (USDM) from July 30, 2019 (Figs. 2, 3), no drought or abnormally dry conditions were present across eastern OK and northwest AR.

U.S. Drought Monitor Oklahoma

July 30, 2019

(Released Thursday, Aug. 1, 2019)

Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	81.30	18.70	5.67	0.00	0.00	0.00
Last Week 07-23-2019	94.33	5.67	0.00	0.00	0.00	0.00
3 Months Ago 04-30-2019	100.00	0.00	0.00	0.00	0.00	0.00
Start of Calendar Year 01-01-2019	94.85	5.15	0.00	0.00	0.00	0.00
Start of Water Year 09-25-2018	72.93	27.07	9.11	4.16	0.00	0.00
One Year Ago 07-31-2018	22.31	77.69	55.48	32.39	6.81	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. See accompanying text summary for forecast statements.

Author:

Curtis Riganti
National Drought Mitigation Center



droughtmonitor.unl.edu

Fig. 2. Drought Monitor for Oklahoma

U.S. Drought Monitor Arkansas

July 30, 2019

(Released Thursday, Aug. 1, 2019)

Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	100.00	0.00	0.00	0.00	0.00	0.00
Last Week 07-23-2019	100.00	0.00	0.00	0.00	0.00	0.00
3 Months Ago 04-30-2019	100.00	0.00	0.00	0.00	0.00	0.00
Start of Calendar Year 01-01-2019	98.79	1.21	0.00	0.00	0.00	0.00
Start of Water Year 09-25-2018	93.15	6.85	2.59	0.00	0.00	0.00
One Year Ago 07-31-2018	10.90	89.10	60.54	3.35	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. See accompanying text summary for forecast statements.

Author:

Curtis Riganti
National Drought Mitigation Center



droughtmonitor.unl.edu

Fig. 3. Drought Monitor for Arkansas

Outlooks

The [Climate Prediction Center](#) (CPC) outlook for August 2019 (issued July 18, 2019) indicates a slightly enhanced chance for above median rainfall across northern OK and equal chances for above, near, or below median rainfall elsewhere. This outlook also indicates equal chances for above, near, and below normal temperatures for all of eastern OK and northwest AR. This outlook takes into account the weeks 3-4 outlook, continued influence of a weak El Niño, and the above normal soil moisture over the central and southern Plains, which will make above normal temperatures less likely.

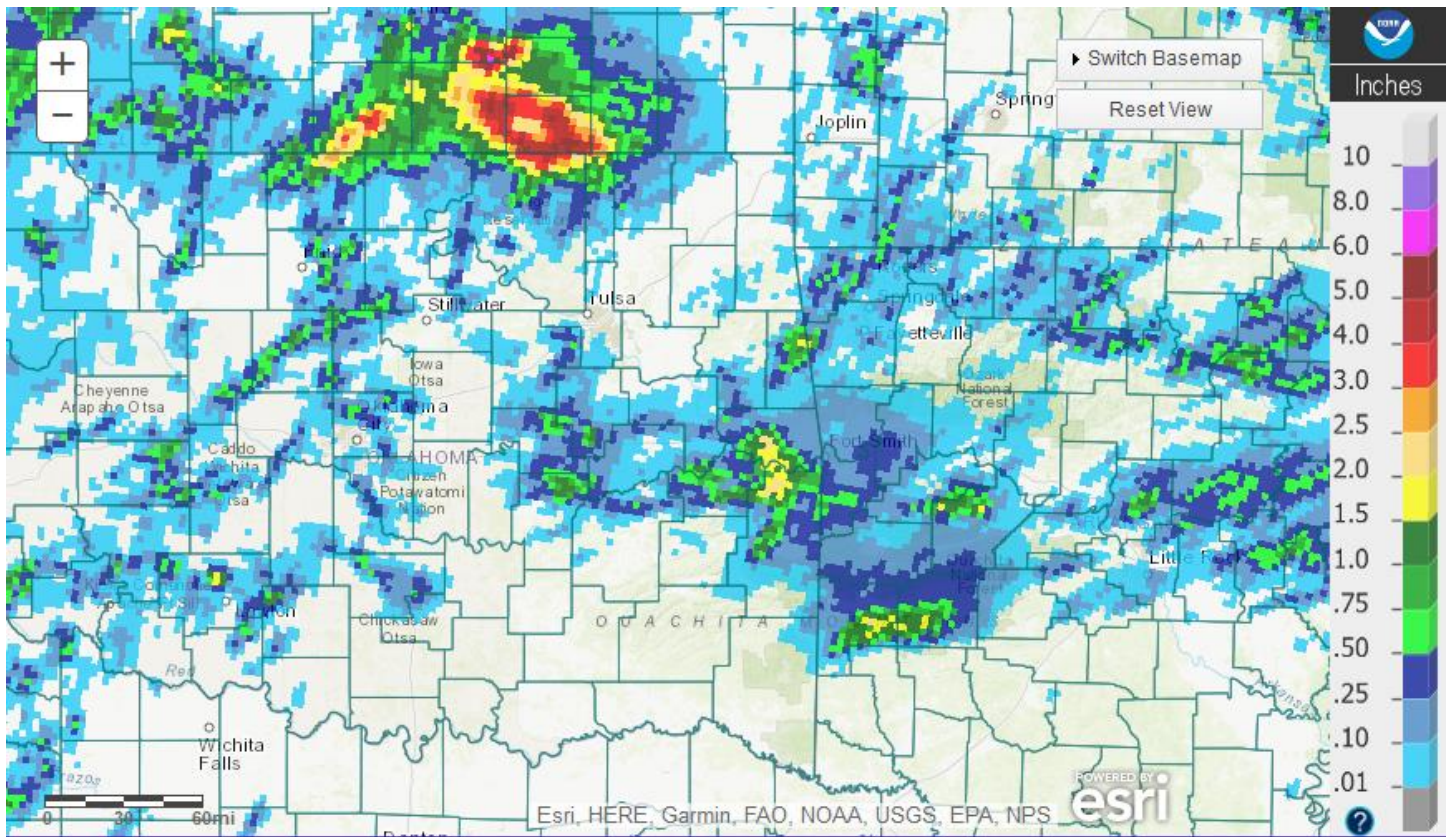
For the 3-month period August-September-October 2019, CPC is forecasting a slightly enhanced chance for above normal temperatures and equal chances for above, near, or below median rainfall across all of eastern OK and northwest AR (outlook issued July 21, 2019). This outlook is based on both statistical and dynamical forecast tools, decadal timescale climate trends, current soil moisture conditions, and influence from El Niño. According to CPC, the combined effect of the ocean-atmosphere system is consistent with the continuation of weak El Niño conditions through July 2019, but a transition to ENSO neutral is expected within the next two months. Computer models are split between a weak El Niño and ENSO neutral conditions through the winter. The consensus forecast is for a 50% chance of ENSO neutral conditions for autumn and winter, and a very low chance for La Niña. CPC continues the El Niño 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

Showers and thunderstorms moved across east central OK, northwest AR, and west central AR through the morning hours of the 2nd, as an upper-level disturbance lifted north across the area. This activity brought 0.10" to around 1.5" of rain, with 1.5" to around 2" in southern Sequoyah and northern Le Flore Counties (Fig. 4). This localized rainfall resulted in the Arkansas River at Van Buren and at Ozark to rise a little above flood stage (see preliminary hydrographs at the end of this report; see E3 Report for details). Later in the day, showers and thunderstorms developed over north central OK and south central KS near a weak cold front that was slowly sagging south. These storms congealed into a small complex, which began to impact northeast OK just before midnight. Storms slowly moved east along the OK/KS state line, bringing heavy rain of 1.5"-4" to primarily Osage and Washington Counties (as well as the adjacent counties just north of the state line in KS) through the early morning hours of the 3rd (Figs. 4, 5). Soon after sunrise, the storms moved further south, affecting locations north of I-44 in northeast OK. Additional redevelopment occurred in north central OK during the mid-morning hours near, which then moved into Osage County by noon. This activity continued through the afternoon and early evening hours, impacting locations along and northwest of the I-44 corridor. Rainfall totals were 0.25" to around 2.5" (Fig. 6). Rises occurred along the Caney River, but flood stage was not exceeded .

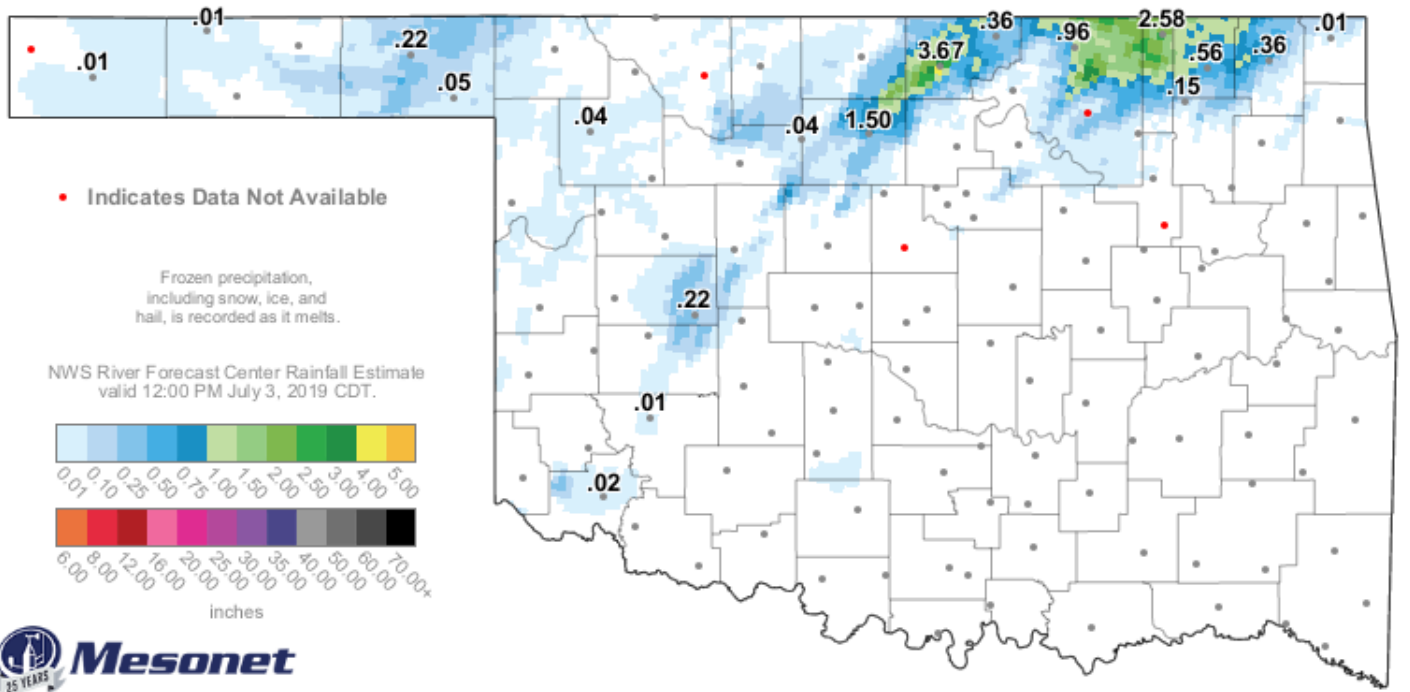
A line of showers and thunderstorms moved south out of southeast KS and southwest MO into northeast OK and northwest AR during the afternoon of the 5th. These storms weakened, but additional development occurred along its outflow boundary, primarily over the Arkansas River valley from Tulsa, OK to Ozark, AR. This activity didn't last long, weakening during the evening with the loss of daytime heating. Most of the affected area received 0.25" to around 1" of rain, but small pockets of 1.5"-2" occurred (Fig. 7).

Scattered showers and thunderstorms developed during the afternoon of the 6th as a gust front from a decaying mesoscale convective system (MCS) moved into a moist and unstable airmass. These storms produced locally heavy rain and continued through the evening before dissipating with the loss of daytime heating. However, some convection continued just north of the OK/KS line in southeast KS through midnight. Rainfall totals ranged from around 0.10" to around 3" (Fig. 8). This rain impacted the Neosho River, causing the river to rise to near, but just below, flood stage near Commerce (see preliminary hydrographs at the end of this report).



Tulsa, OK: July 03, 2019 1-Day Observed Precipitation
Valid on: July 03, 2019 12:00 UTC

Fig. 4. 24-hour Estimated Observed Rainfall ending at 7am CDT 7/03/2019.



12-Hour Rainfall Accumulation (inches)

12:45 PM July 3, 2019 CDT

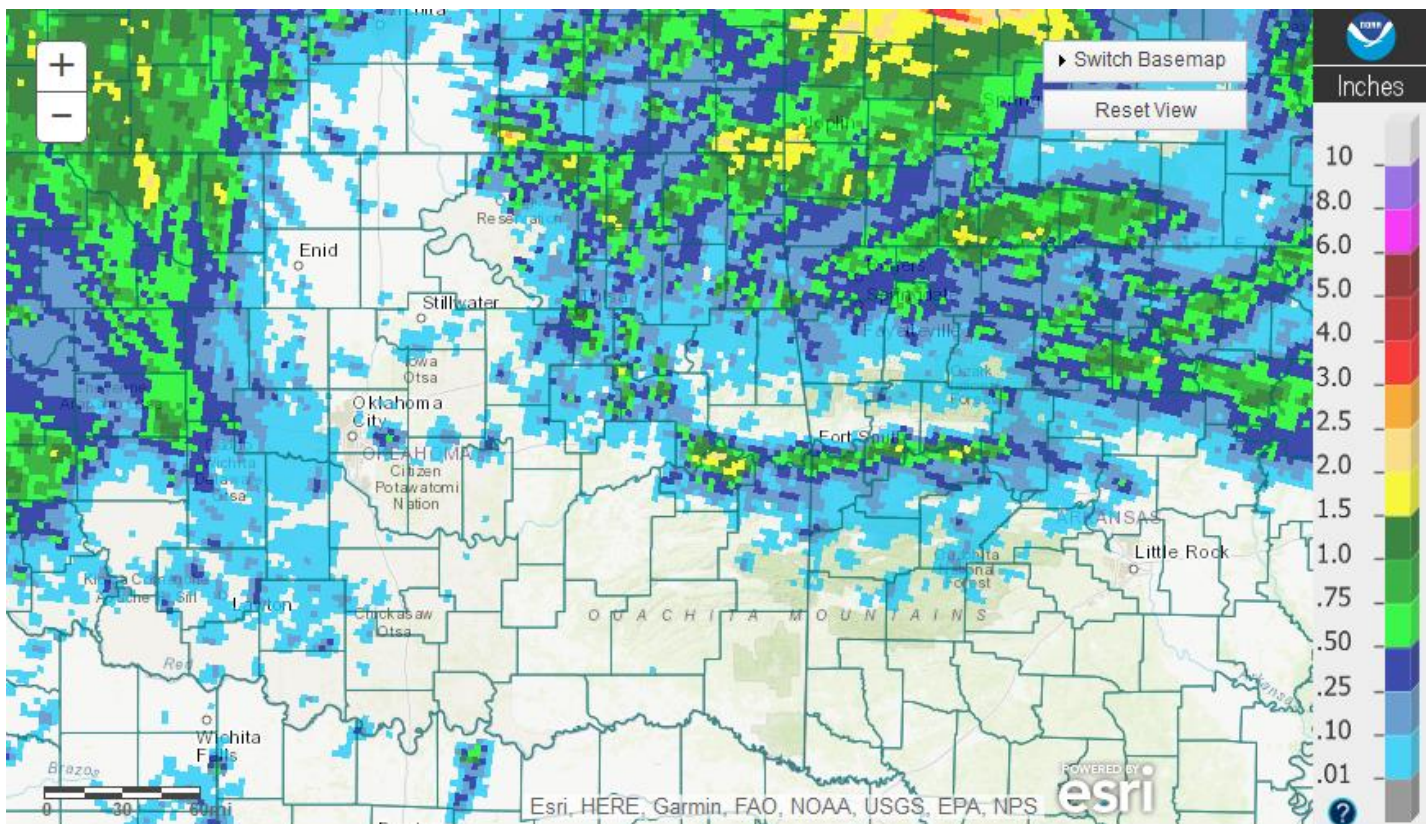
Created 12:50:54 PM July 3, 2019 CDT. © Copyright 2019

Fig. 5. OK Mesonet (values) and NWS RFC rainfall estimate (image) 12-hour rainfall ending at 12:45 pm CDT 07/03/2019.



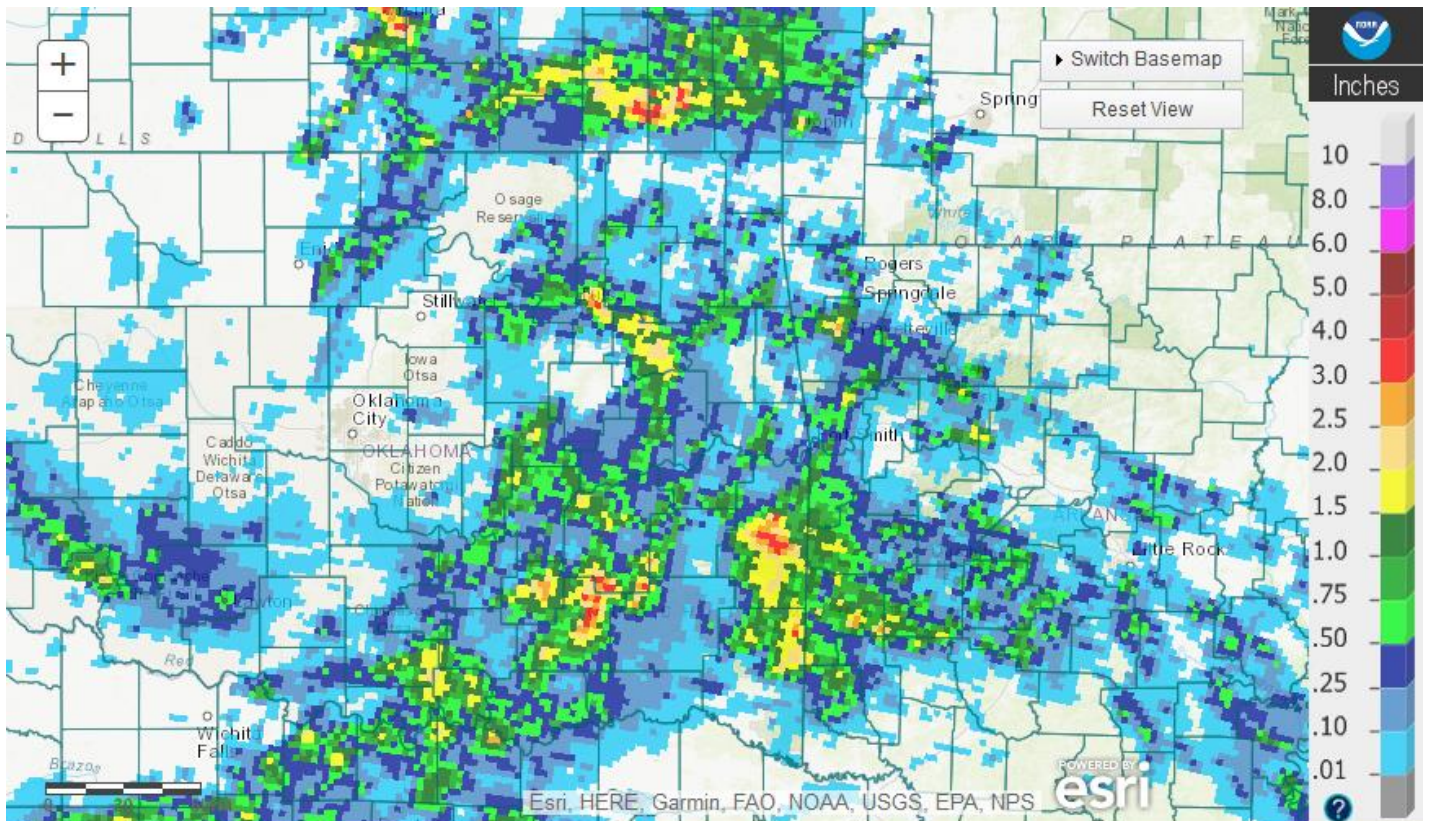
Tulsa, OK: July 04, 2019 1-Day Observed Precipitation
Valid on: July 04, 2019 12:00 UTC

Fig. 6. 24-hour Estimated Observed Rainfall ending at 7am CDT 7/04/2019.



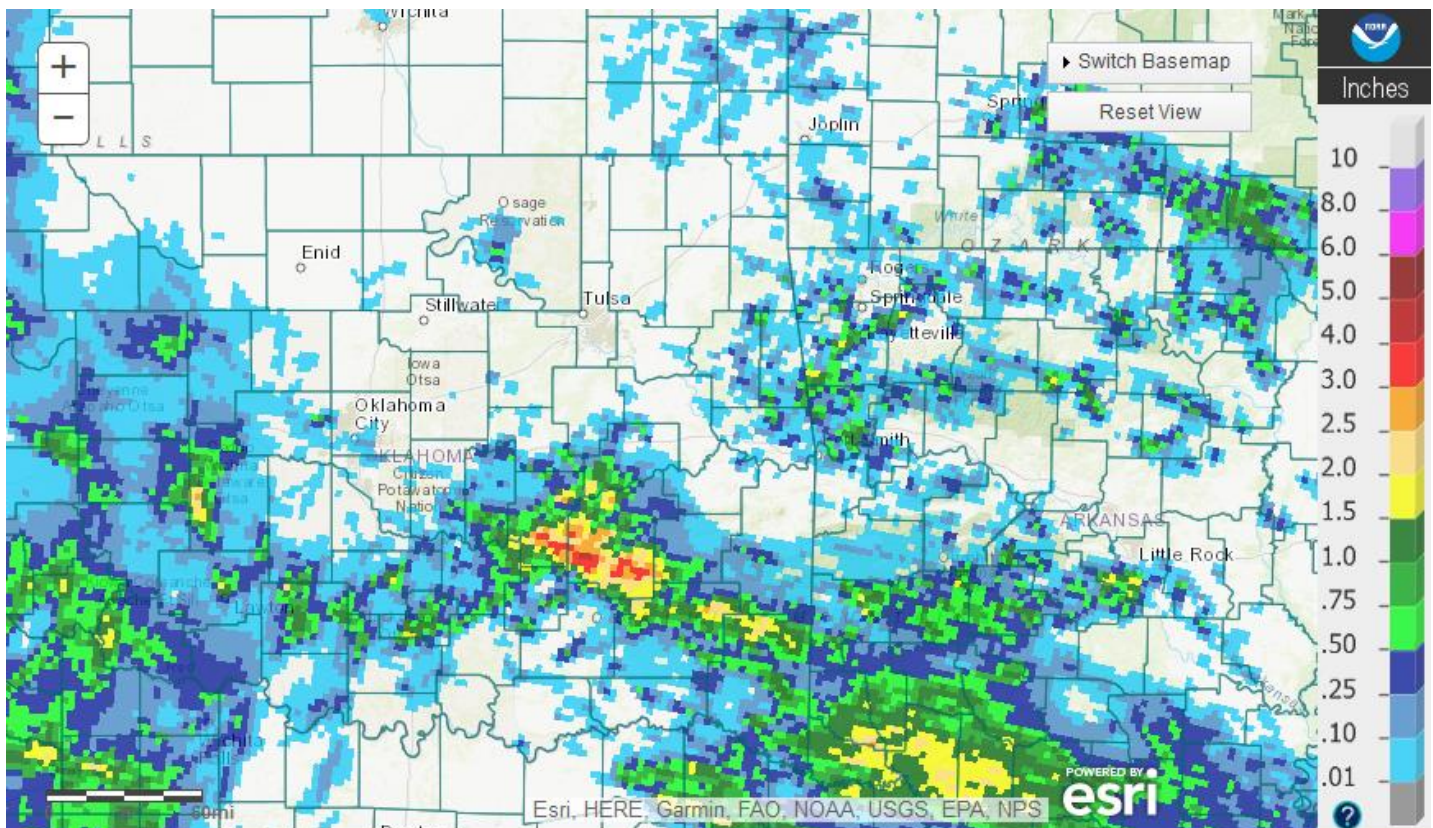
Tulsa, OK: July 06, 2019 1-Day Observed Precipitation
Valid on: July 06, 2019 12:00 UTC

Fig. 7. 24-hour Estimated Observed Rainfall ending at 7am CDT 7/06/2019.



Tulsa, OK: July 07, 2019 1-Day Observed Precipitation
Valid on: July 07, 2019 12:00 UTC

Fig. 8. 24-hour Estimated Observed Rainfall ending at 7am CDT 7/07/2019.



Tulsa, OK: July 08, 2019 1-Day Observed Precipitation
Valid on: July 08, 2019 12:00 UTC

Fig. 9. 24-hour Estimated Observed Rainfall ending at 7am CDT 7/08/2019.

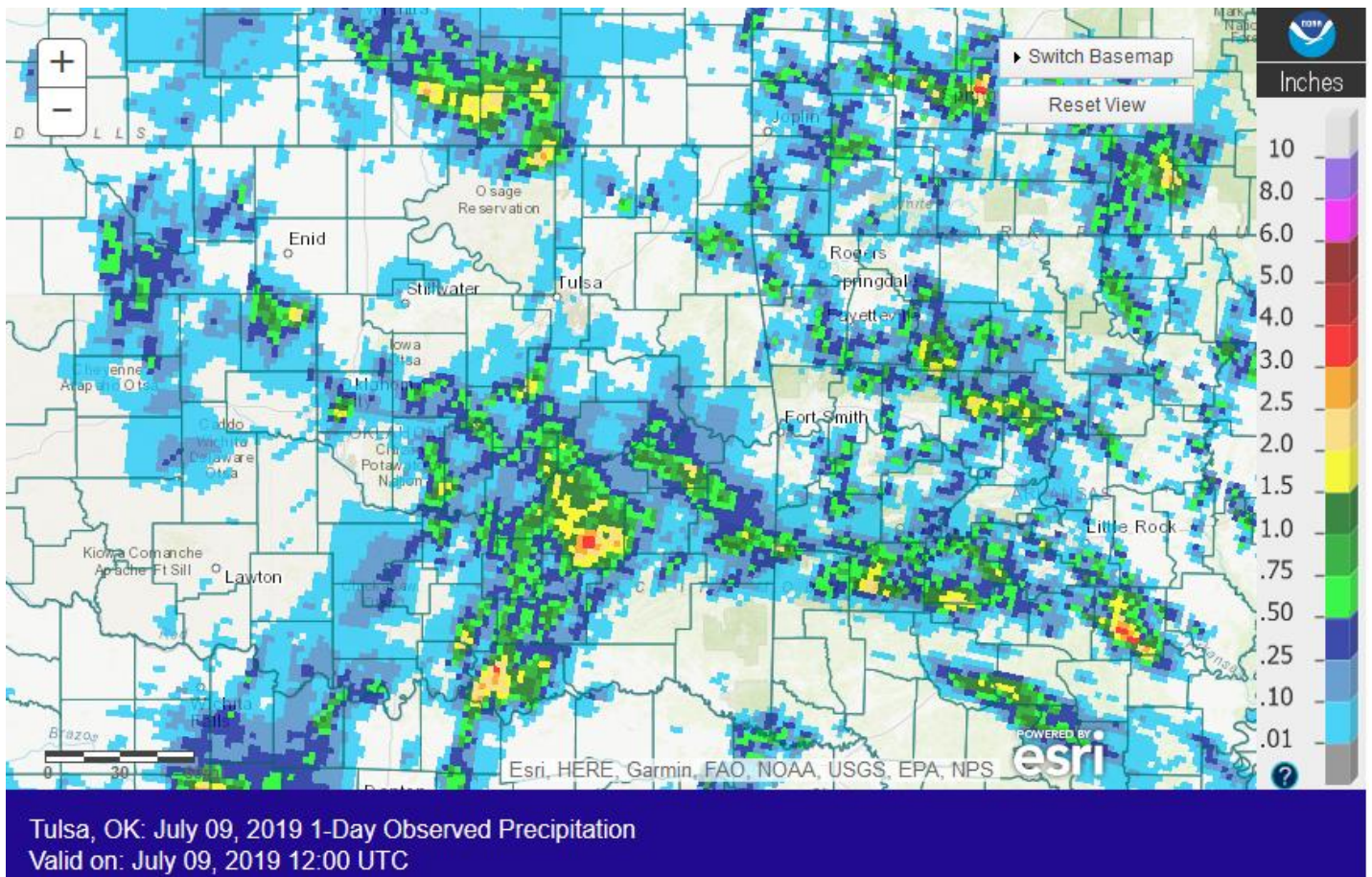


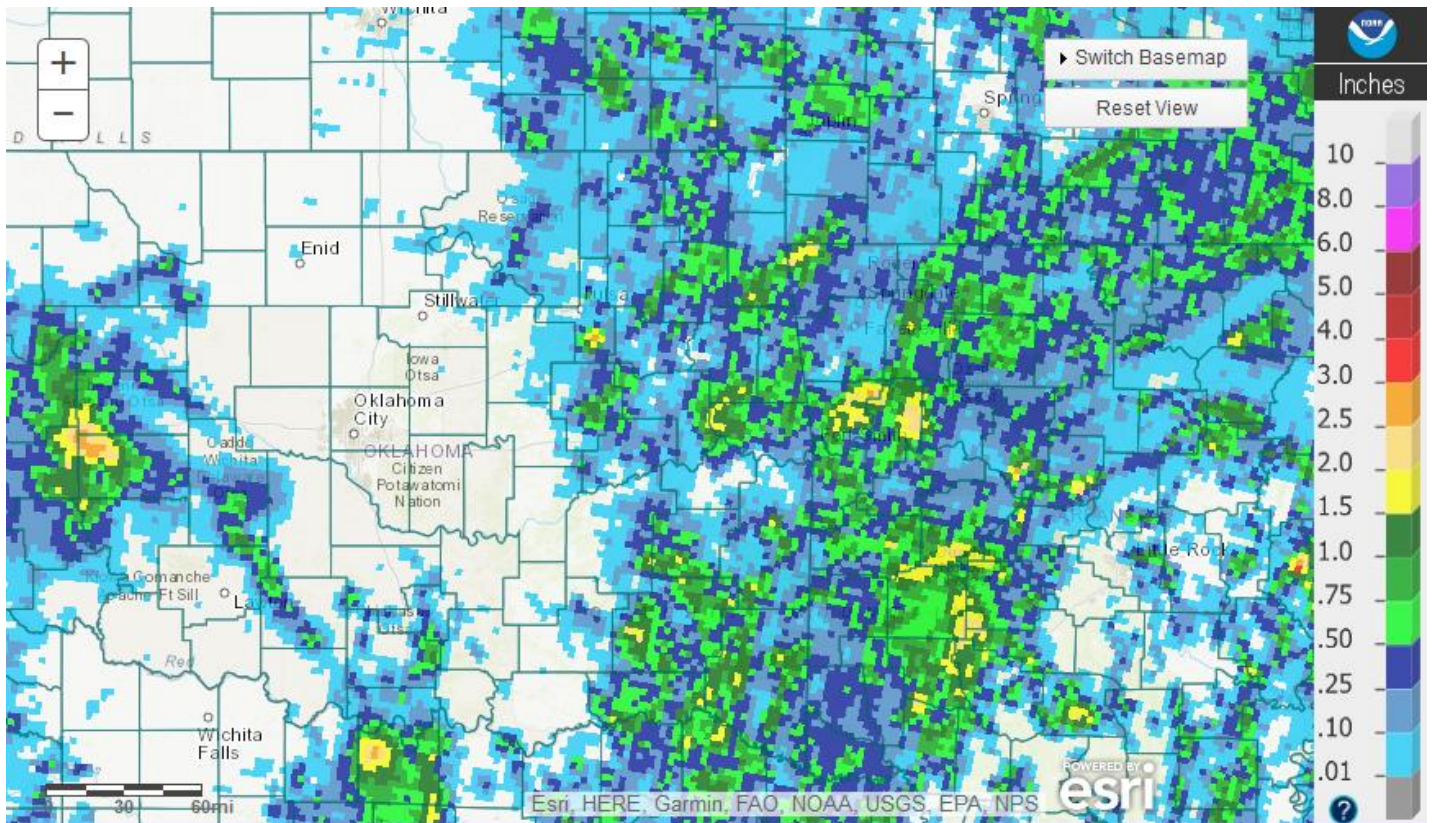
Fig. 10. 24-hour Estimated Observed Rainfall ending at 7am CDT 7/09/2019.

A series of weak disturbances moved across the region on the periphery of an upper-level ridge on the 7th-8th, bringing scattered showers and thunderstorms to parts of eastern OK and northwest AR. The heaviest rainfall occurred shortly after midnight on the 8th in southeast OK, primarily affecting Pittsburg County, due to a slow-moving cluster of storms near a weak boundary. Rainfall in this area was 1"-4" (Fig. 9) before the storms dissipated around sunrise. Scattered showers and thunderstorms redeveloped over eastern OK and northwest AR through the day as a weak upper-level wave moved east across the region. In typical summer fashion, this activity dissipated at sunset. Rainfall totals were generally around 0.10" to around 1", though Pittsburg County and other more localized areas received 1.5"-3" of rain (Fig. 10).

A line of showers and thunderstorms moved south out of southeast KS and into northeast OK during the late morning of the 10th. These storms continued to sweep south across much of eastern OK and western AR before exiting the area by mid-evening. Rainfall totals were 0.10" to around 1", with some pockets of 1"-1.5" (Fig. 11).

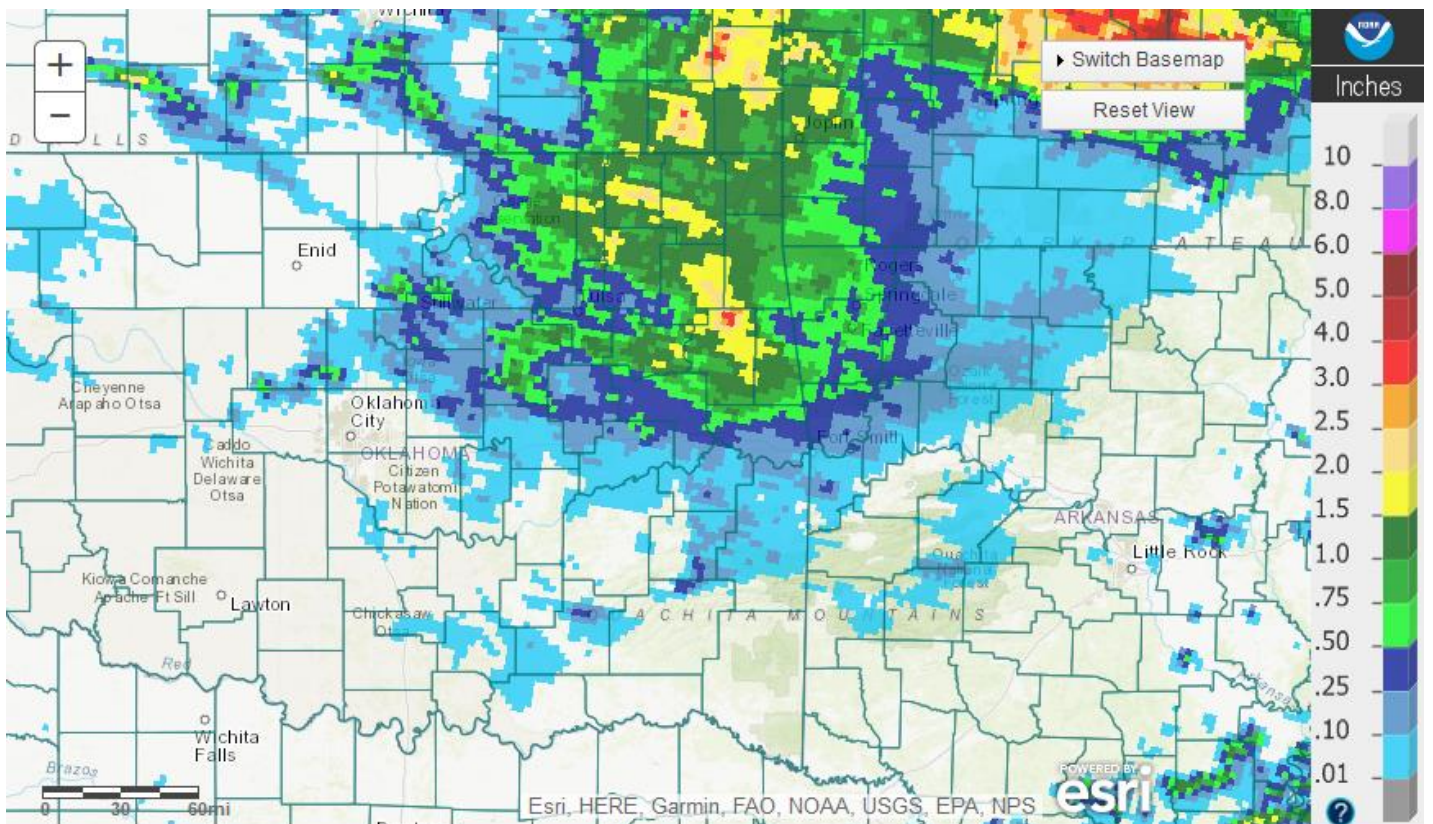
During the late evening of the 21st, a line of storms developed over southeast KS along a cold front, which moved south into northeast OK. The cold front and storms then moved southeast through the overnight hours, bringing rain to locations near and north of I-40. The rain came to an end shortly after sunrise on the 22nd. Rainfall totals ranged from around 0.25" to 3" (Fig. 12).

Scattered showers and thunderstorms moved south out of KS and into northeast OK just after midnight on the 29th, ahead of cold front. This activity continued to move southeast across eastern OK and northwest AR through the morning and afternoon hours as the boundary sagged south. An isolated thunderstorm affected locations near I-44 in the evening. Rainfall totals were generally a few hundredths of an inch to around 1", with locally higher amounts of 1"-2" (Fig. 13).



Tulsa, OK: July 11, 2019 1-Day Observed Precipitation
Valid on: July 11, 2019 12:00 UTC

Fig. 11. 24-hour Estimated Observed Rainfall ending at 7am CDT 7/11/2019.



Tulsa, OK: July 22, 2019 1-Day Observed Precipitation
Valid on: July 22, 2019 12:00 UTC

Fig. 12. 24-hour Estimated Observed Rainfall ending at 7am CDT 7/22/2019.

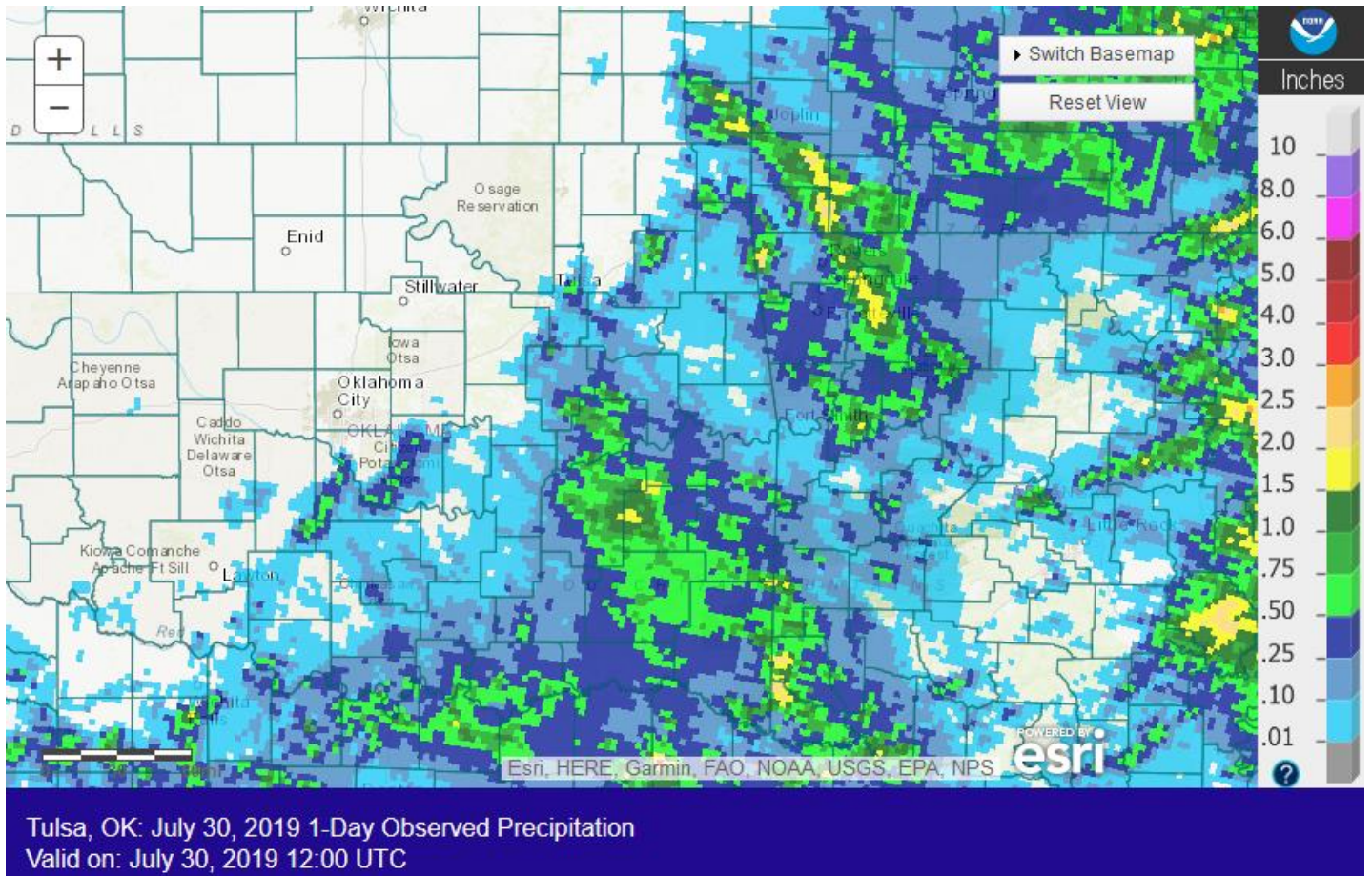


Fig. 13. 24-hour Estimated Observed Rainfall ending at 7am CDT 7/30/2019.

Written by:

Nicole McGavock
Service Hydrologist
WFO Tulsa

Products issued in July 2019

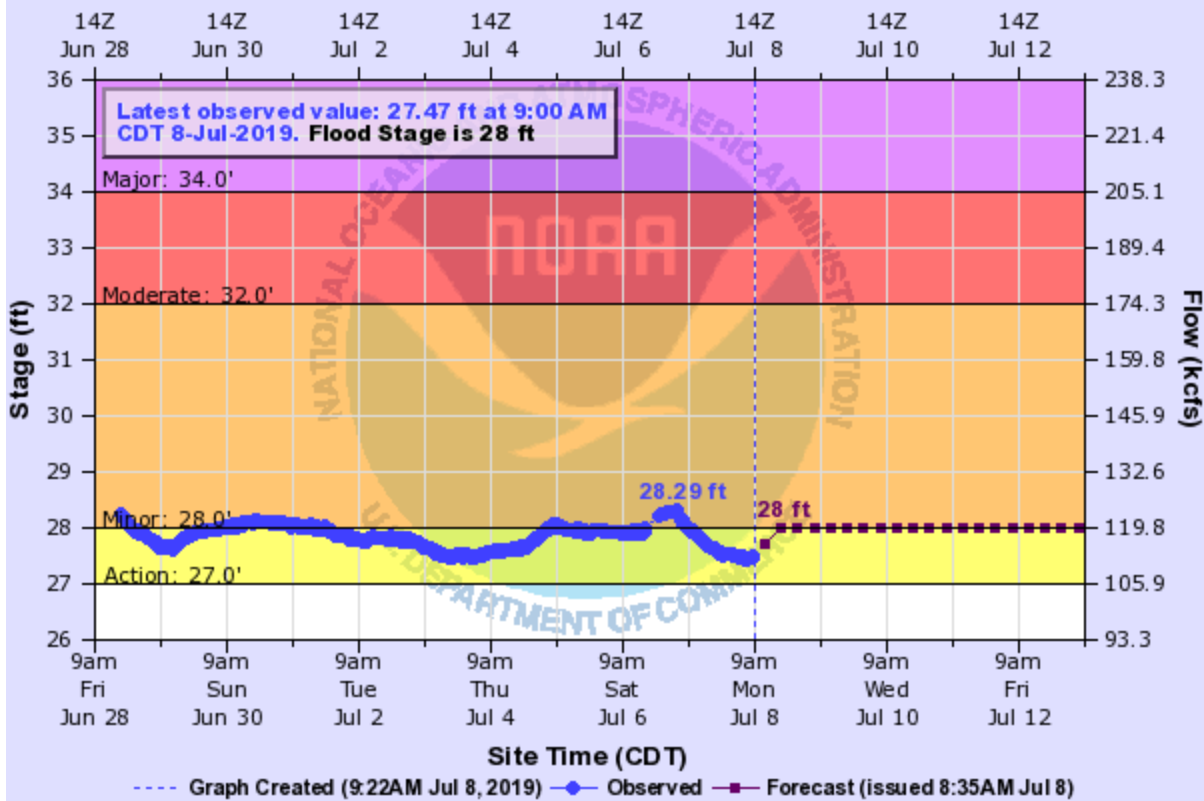
- *CWYO2 became a daily river forecast point September 7, 2016
- *MLBA4 and OZGA4 transferred to NWS Tulsa HSA February 5, 2014
- *Mixed case River Flood products began July 31, 2013

- 6 Flash Flood Warnings (FFW)
- 7 Flash Flood Statements (FFS)
- 0 Flash/Areal Flood Watches (FFA) (0 Watch FFA CON/EXT/EXA/EXB/CAN)
- 22 Urban and Small Stream Advisories (FLS)
- 0 Areal Flood Warnings (FLW)
- 0 Areal Flood Statements (FLS)
- 3 River Flood Warnings (FLW) (includes category increases)
- 85 River Flood Statements (FLS)
- 3 River Flood Advisories (FLS) (103 Advisory FLS CON/EXT/CAN)
- 0 River Flood Watches (FFA) (0 Watch FFA CON/EXT/CAN)
- 0 River Statements (RVS)
- 0 Hydrologic Outlooks (ESF)
- 0 Drought Information Statements (DGT)

Preliminary Hydrographs:

ARKANSAS RIVER NEAR MUSKOGEE

Universal Time (UTC)

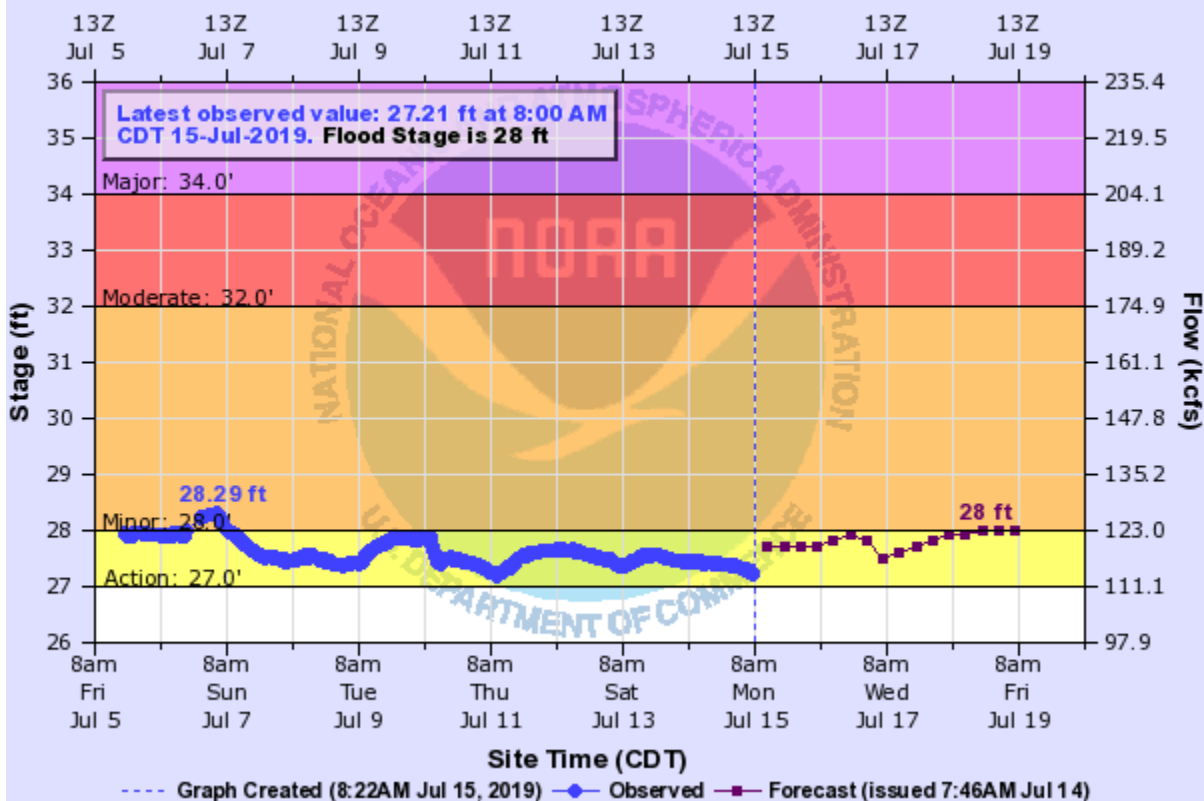


MKGO2(plotting HGIRG) "Gage 0" Datum: 471.38'

Observations courtesy of US Geological Survey

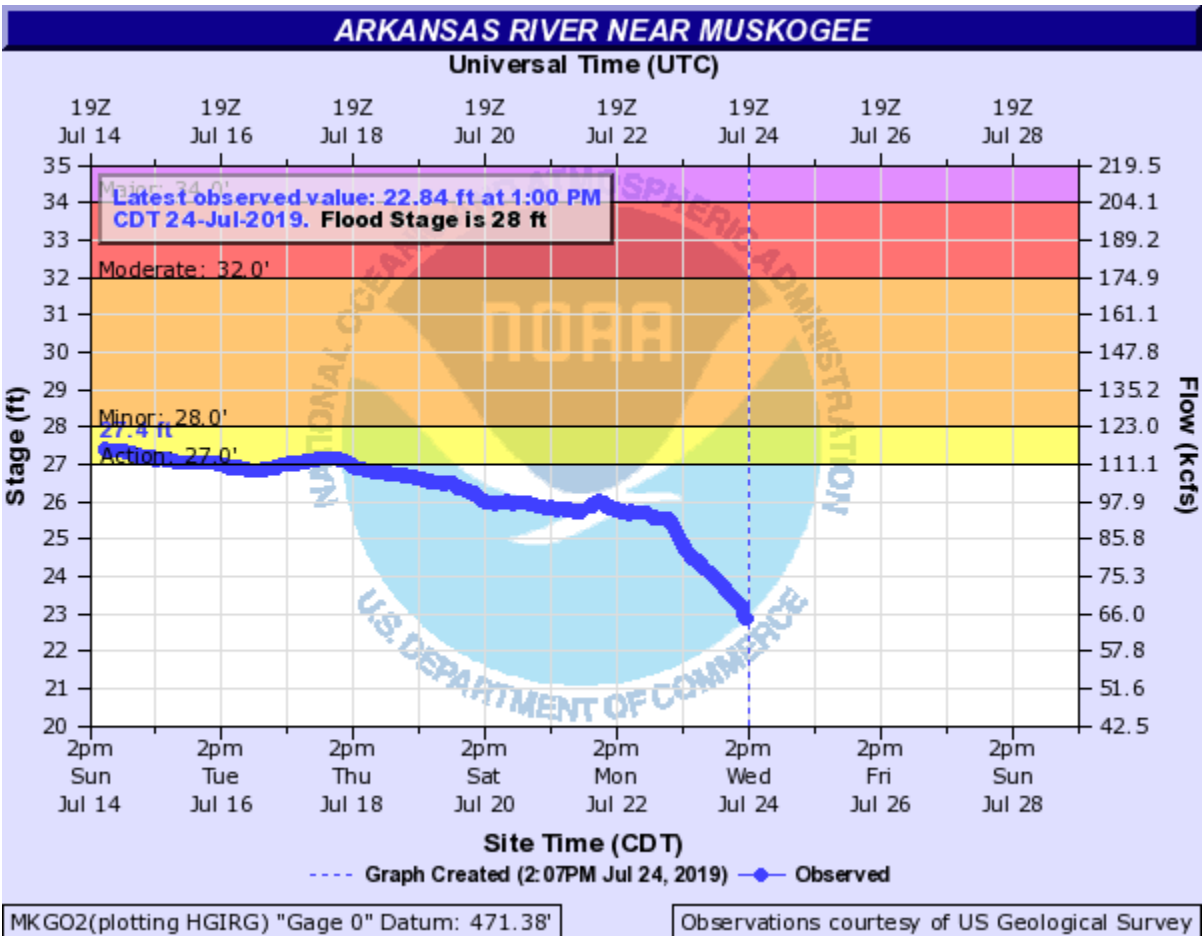
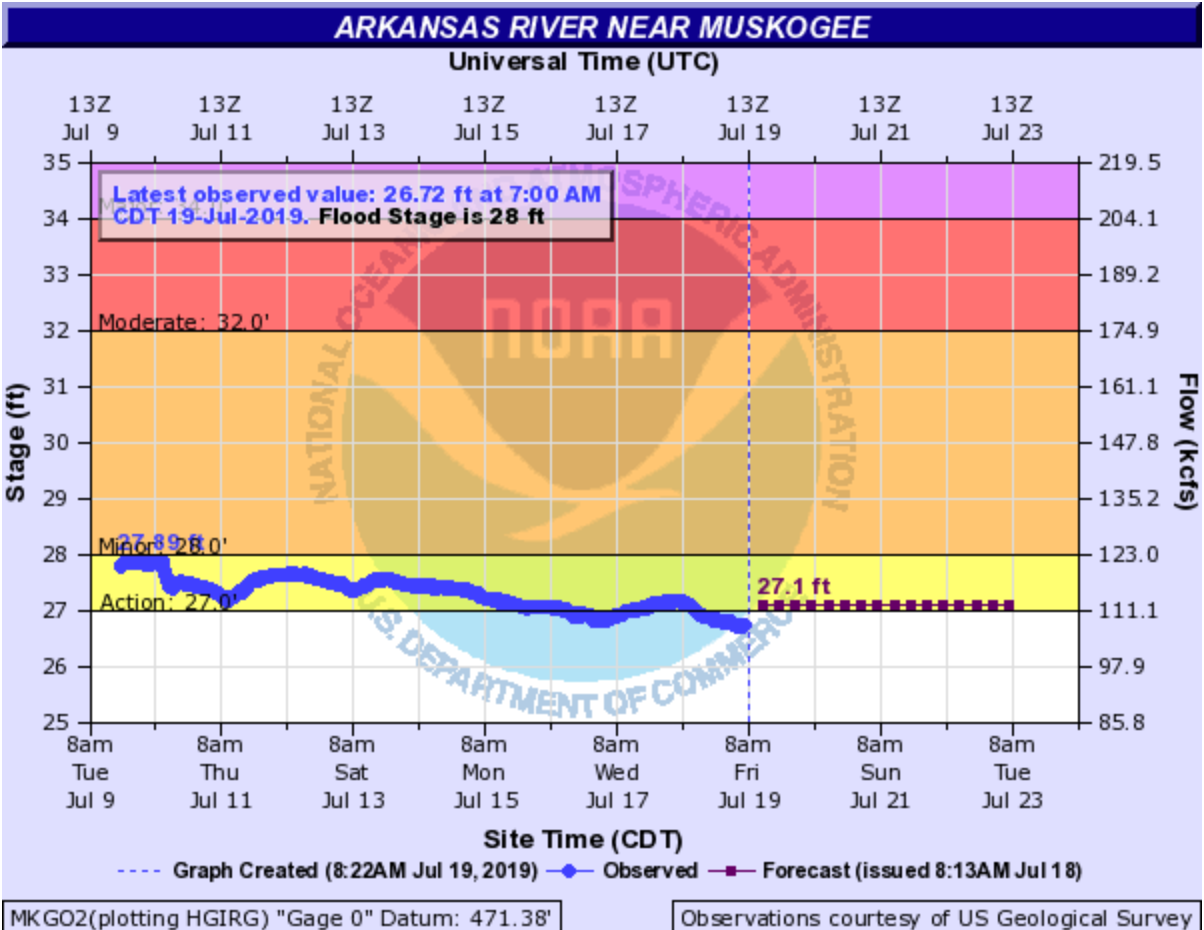
ARKANSAS RIVER NEAR MUSKOGEE

Universal Time (UTC)



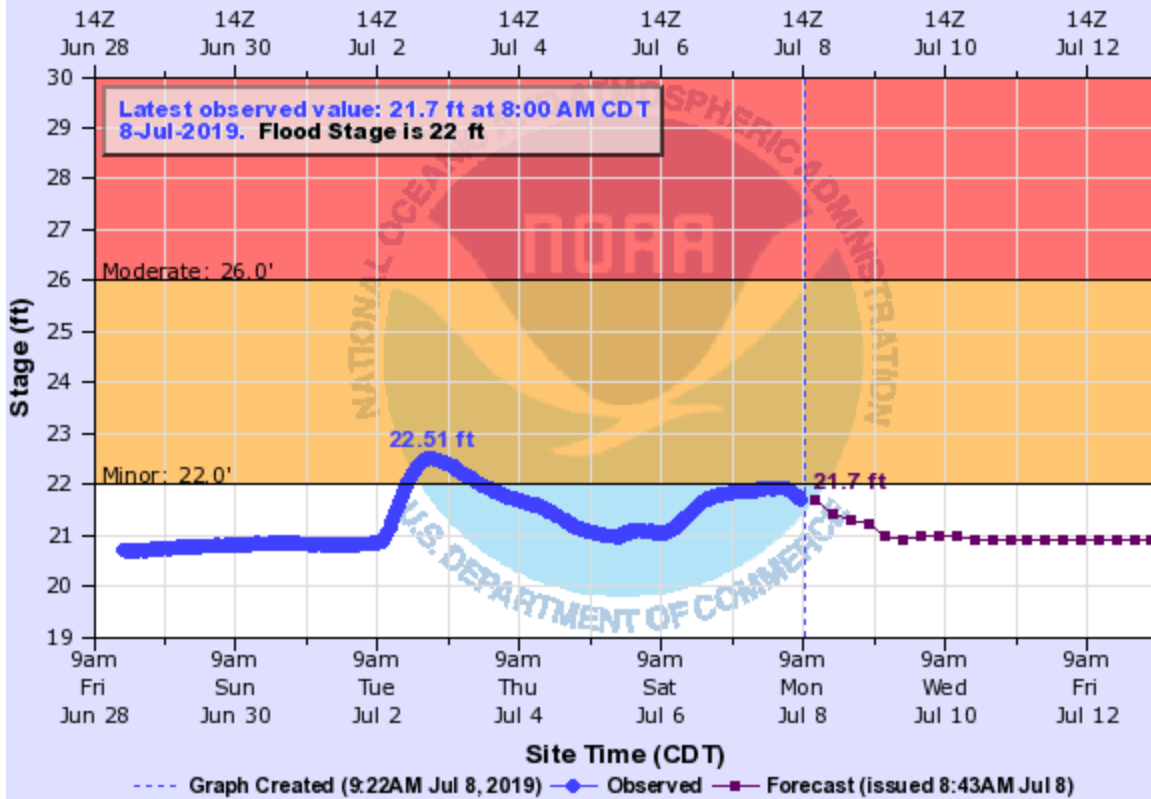
MKGO2(plotting HGIRG) "Gage 0" Datum: 471.38'

Observations courtesy of US Geological Survey



ARKANSAS RIVER AT VAN BUREN

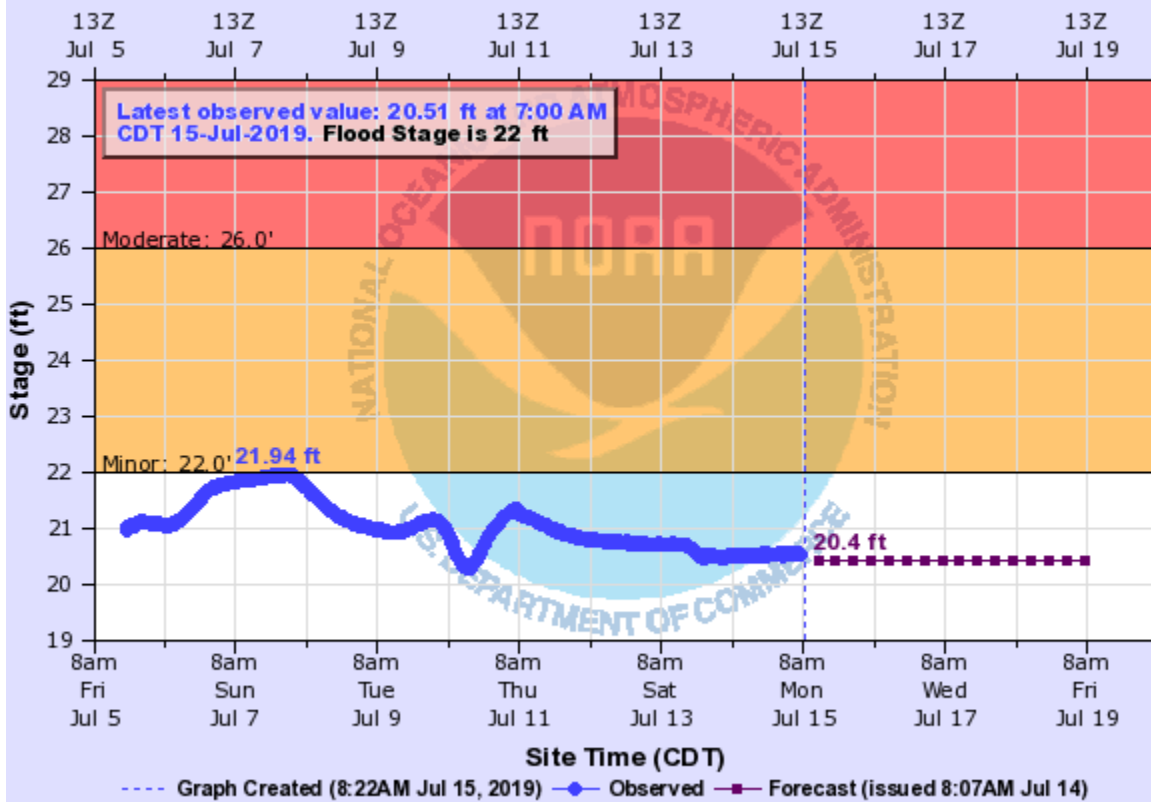
Universal Time (UTC)



VBUA4(plotting HGIRG) "Gage 0" Datum: 372.36'

ARKANSAS RIVER AT VAN BUREN

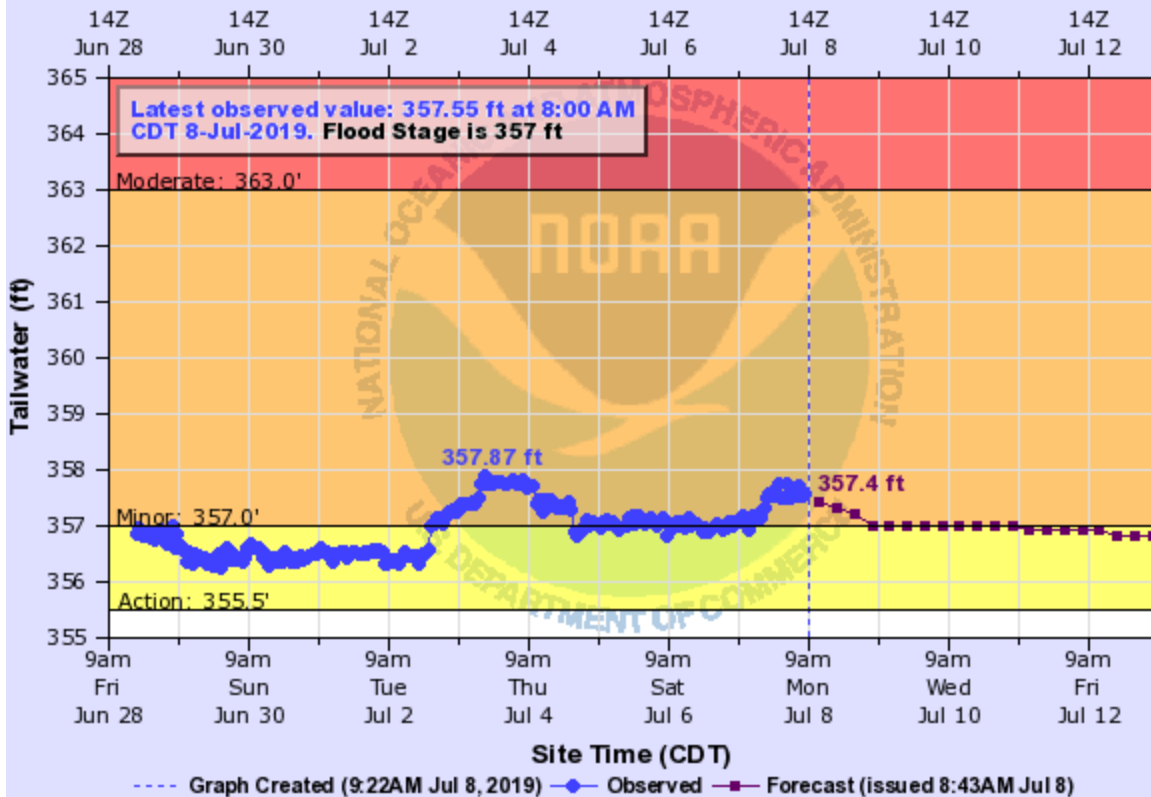
Universal Time (UTC)



VBUA4(plotting HGIRG) "Gage 0" Datum: 372.36'

ARKANSAS RIVER AT OZARK L/D TAILWATER

Universal Time (UTC)

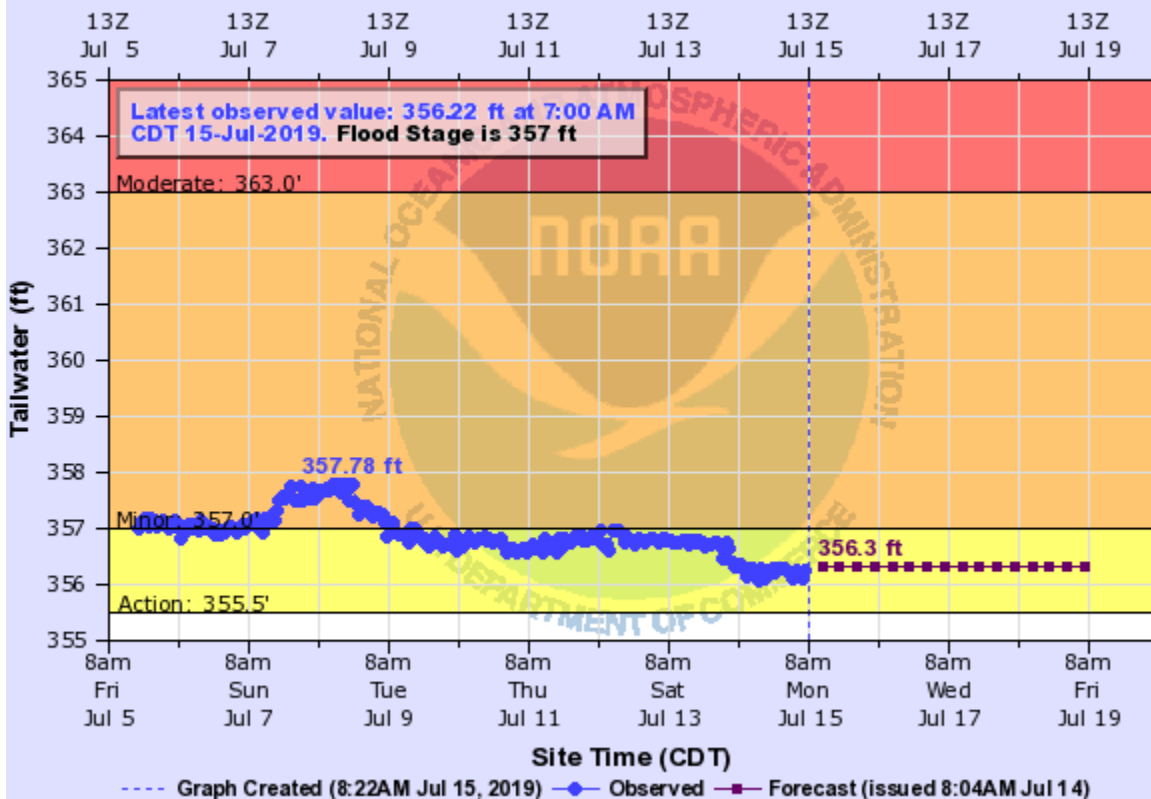


OZGA4(plotting HTIRG) "Gage 0" Datum: 0'

Observations courtesy of US Army Corps of Engineers - LRD

ARKANSAS RIVER AT OZARK L/D TAILWATER

Universal Time (UTC)

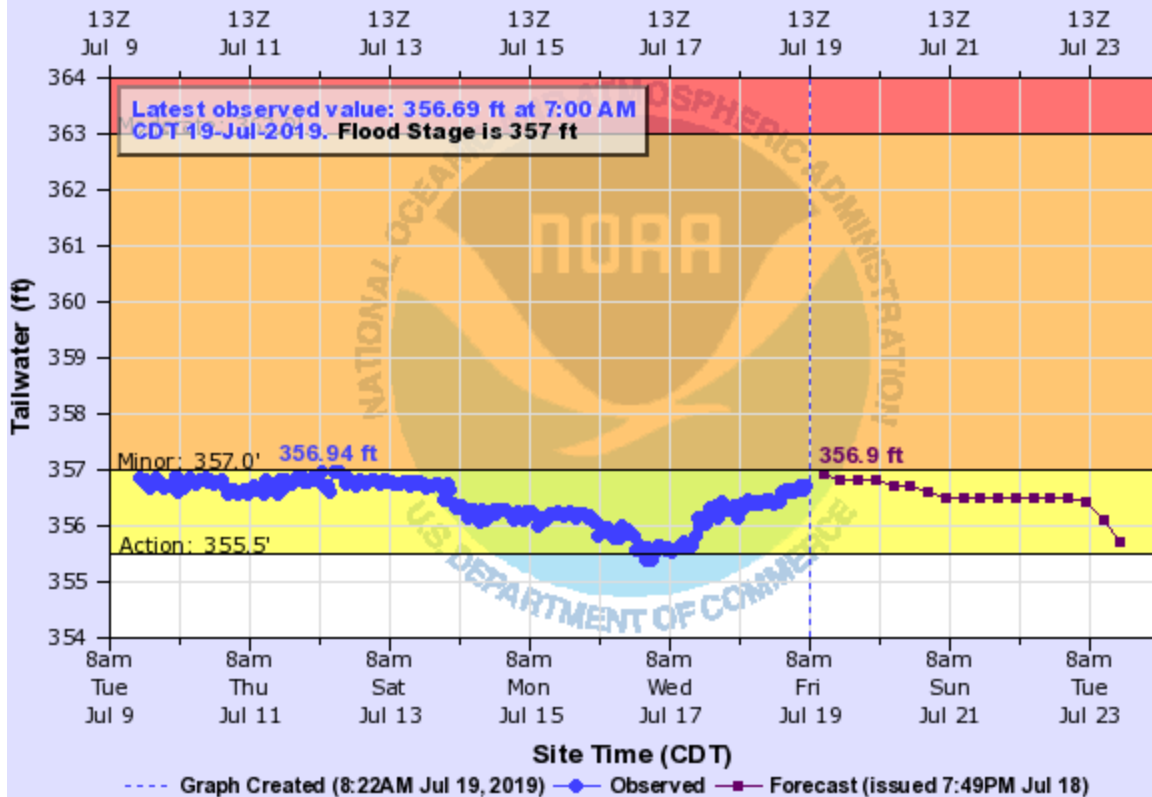


OZGA4(plotting HTIRG) "Gage 0" Datum: 0'

Observations courtesy of US Army Corps of Engineers - LRD

ARKANSAS RIVER AT OZARK L/D TAILWATER

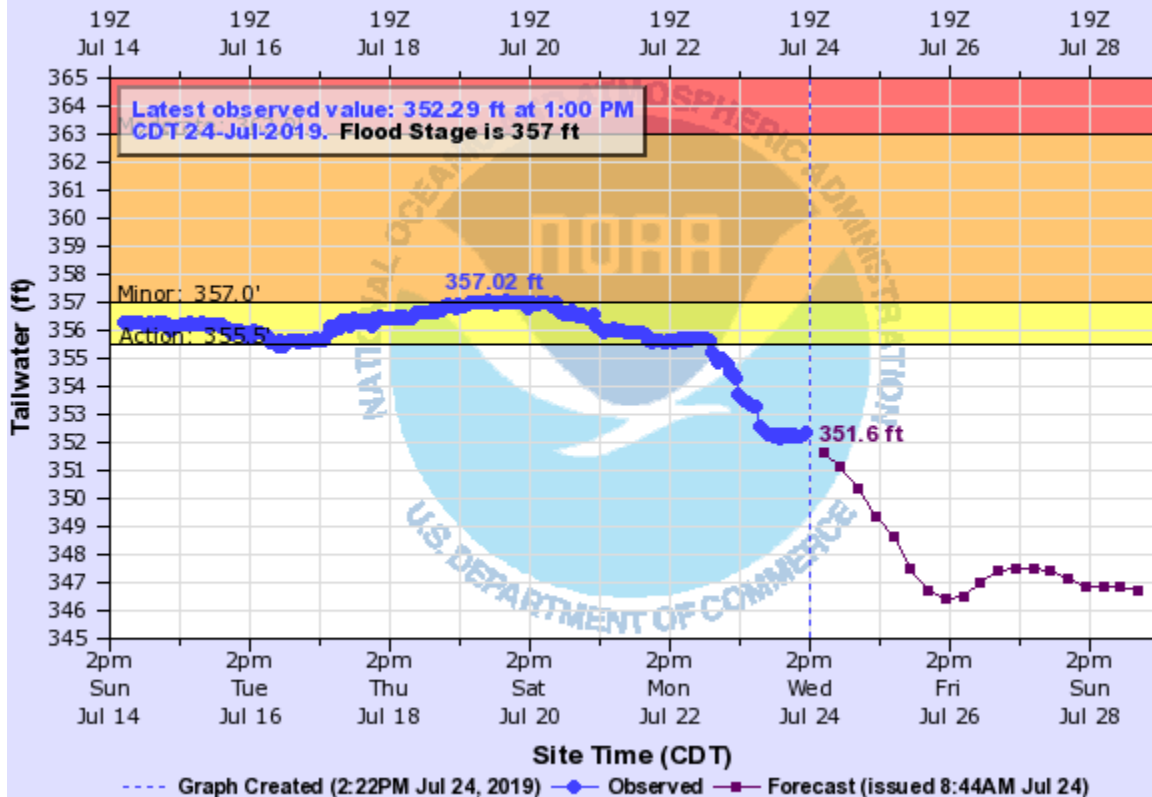
Universal Time (UTC)



OZGA4(plotting HTIRG) "Gage 0" Datum: 0' | Observations courtesy of US Army Corps of Engineers - LRD

ARKANSAS RIVER AT OZARK L/D TAILWATER

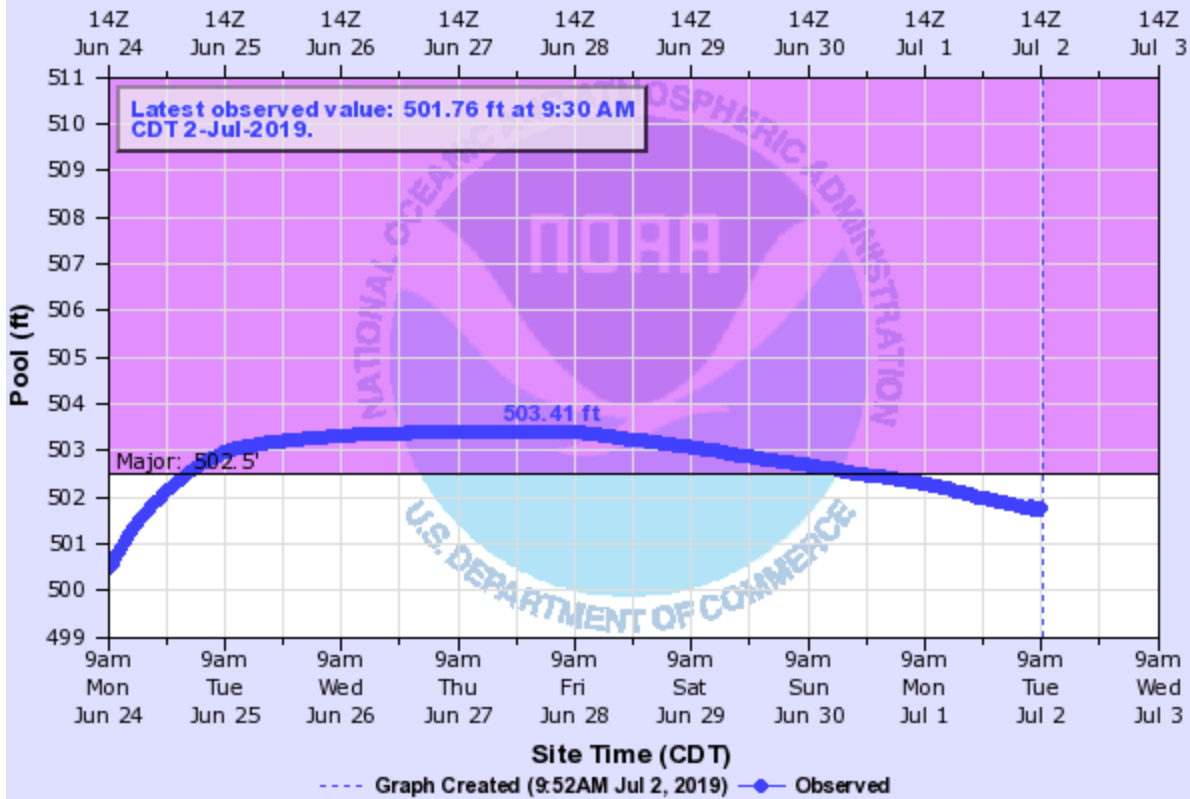
Universal Time (UTC)



OZGA4(plotting HTIRG) "Gage 0" Datum: 0' | Observations courtesy of US Army Corps of Engineers - LRD

EASTERN OKLAHOMA LAKES AT WISTER LAKE

Universal Time (UTC)

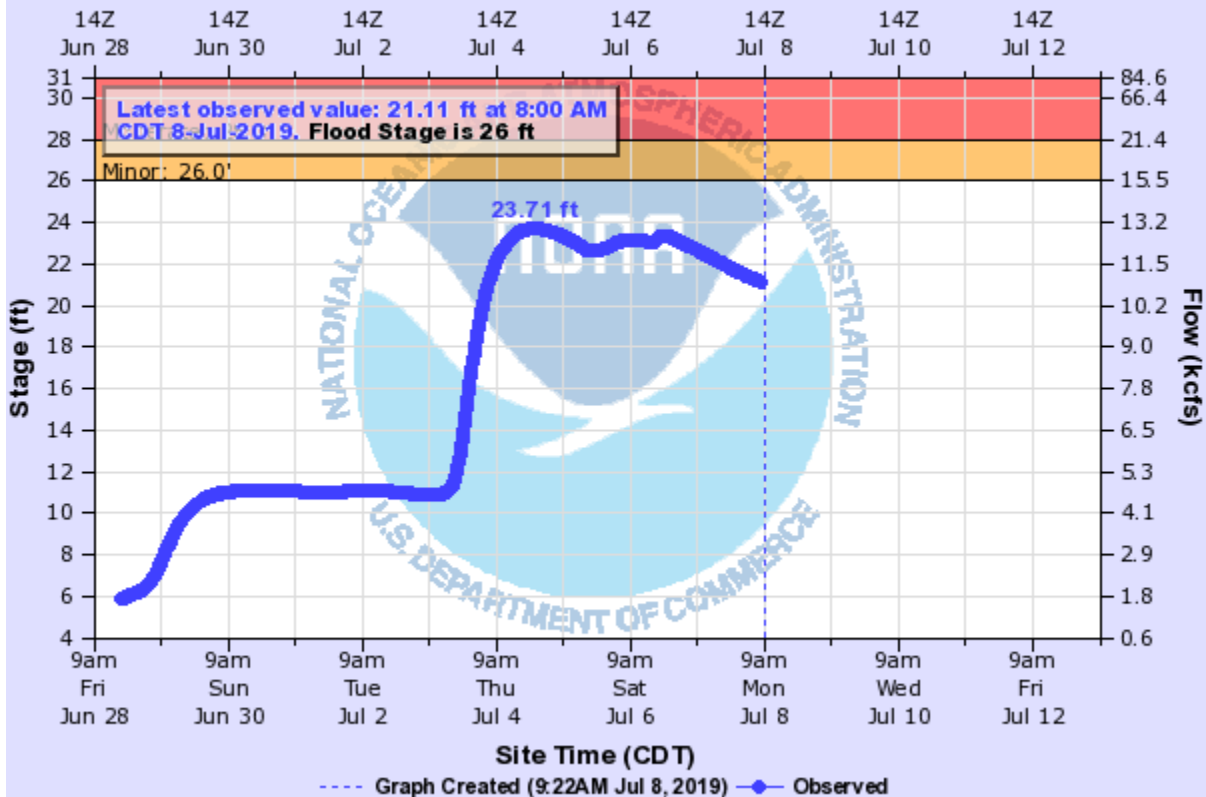


WSLO2(plotting HPIRG) "Gage 0" Datum: 0'

Observations courtesy of US Army Corps of Engineers

CANEY RIVER NEAR RAMONA

Universal Time (UTC)

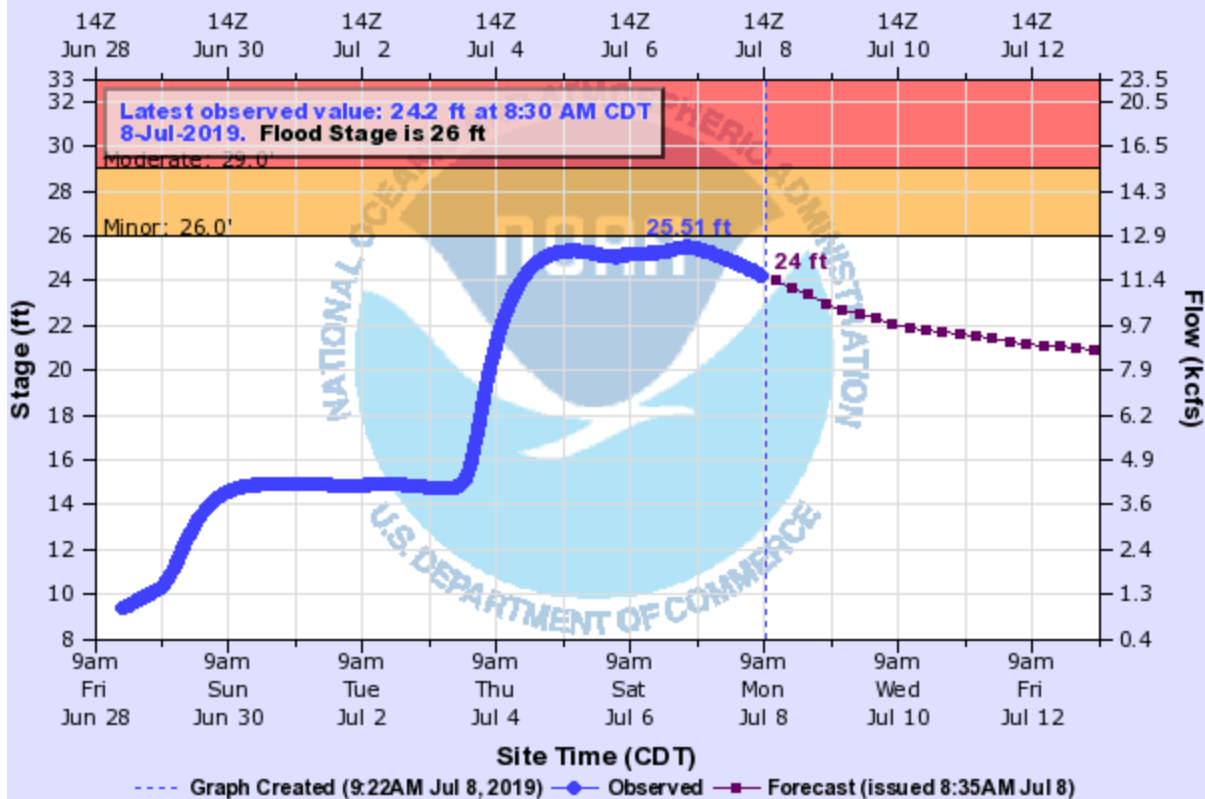


RAMO2(plotting HGIRG) "Gage 0" Datum: 586.43'

Observations courtesy of US Geological Survey

CANEY RIVER NEAR COLLINSVILLE

Universal Time (UTC)



CVL02(plotting HGIRG) "Gage 0" Datum: 565.72'

NEOSHO RIVER NEAR COMMERCE

Universal Time (UTC)

