

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 April	YEAR 2019
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 June 10, 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.

A significant storm system brought tornadoes, flash flooding, and river flooding to eastern OK and northwest AR at the end of the month, with additional rain events mid- and late-month. Normal precipitation for the month of April ranges from 3.1 inches in Pawnee County to 4.7 inches in Latimer County. The Ozark region of northwest Arkansas averages 4.3 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 April 2019 ranged from 3" to around 10" across eastern OK and northwest AR. The majority of this rainfall occurred with the April 30 heavy rain event. These rainfall totals correspond to 50%-90% of the normal April rainfall across a large portion of Osage, Pawnee, and eastern Kay Counties. A few smaller areas across northwest OK and west central AR received 90-110% of the normal April rainfall. Elsewhere, much of eastern OK and northwest AR received 110% to around 200% of the normal April (Fig. 1b).

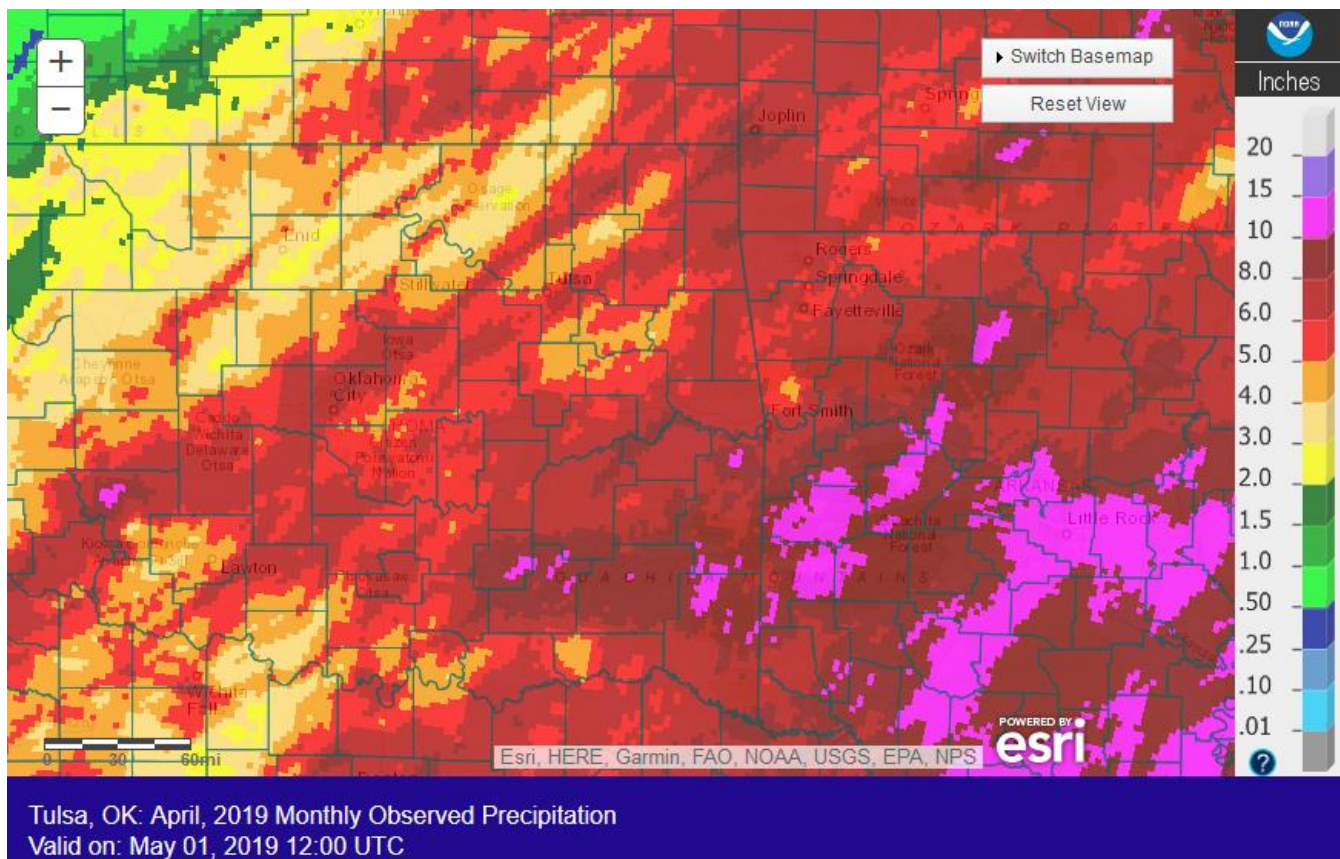


Fig. 1a. Estimated Observed Rainfall for April 2019

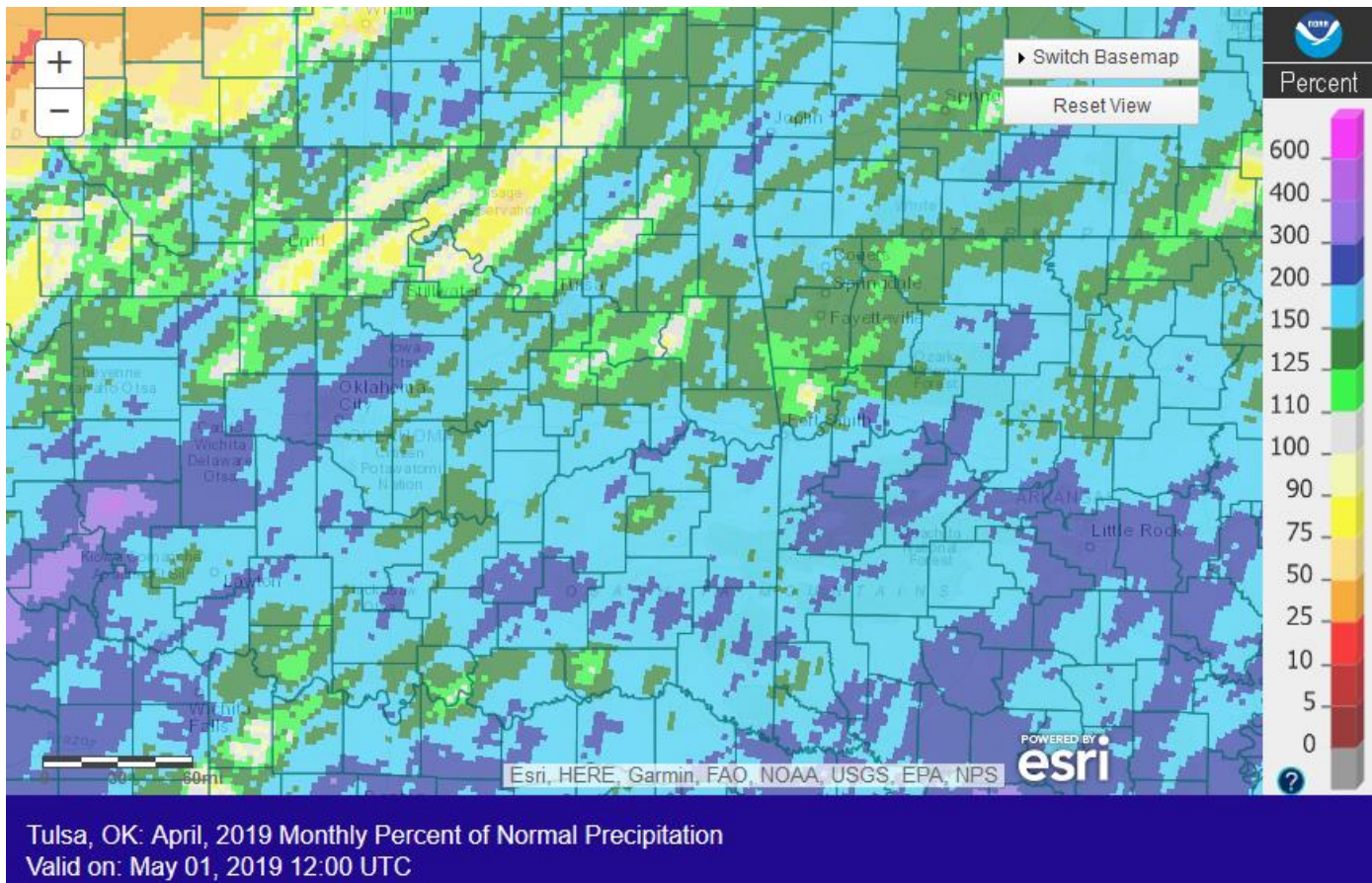


Fig. 1b. Estimated % of Normal Rainfall for April 2019

In Tulsa, OK, April 2019 ranked as the 30th warmest April (62.9°F, tied 2015; since records began in 1905) and the 35th wettest April (5.34"; since records began in 1888). Fort Smith, AR had the 39th warmest April (63.3°F, tied 1887; since records began in 1883) and the 26th wettest April (6.71", tied 1908; since records began in 1883). Fayetteville, AR had the 29th warmest (58.5°F) and the 25th wettest (5.11") April since records began in 1950.

Some of the larger precipitation reports (in inches) for April 2019 included (coop/coco values are through 7am CDT May 1; meso/ASOS values are through 1am CDT May 1; heavy rain was occurring through the night of April 30 into the morning of May 1):

Kingston 2S, AR (coop)	8.68	Jay, OK (meso)	7.92	Winslow 7NE, AR (coop)	7.89
Miami, OK (meso)	7.78	Nowata, OK (meso)	7.77	Ozark, AR (coop)	7.76
St. Paul 1E, AR (coop)	7.74	Cloudy, OK (meso)	7.31	Mountainburg 2NE, AR (coop)	7.07

Some of the lowest precipitation reports (in inches) for April 2019 included (see caveats above):

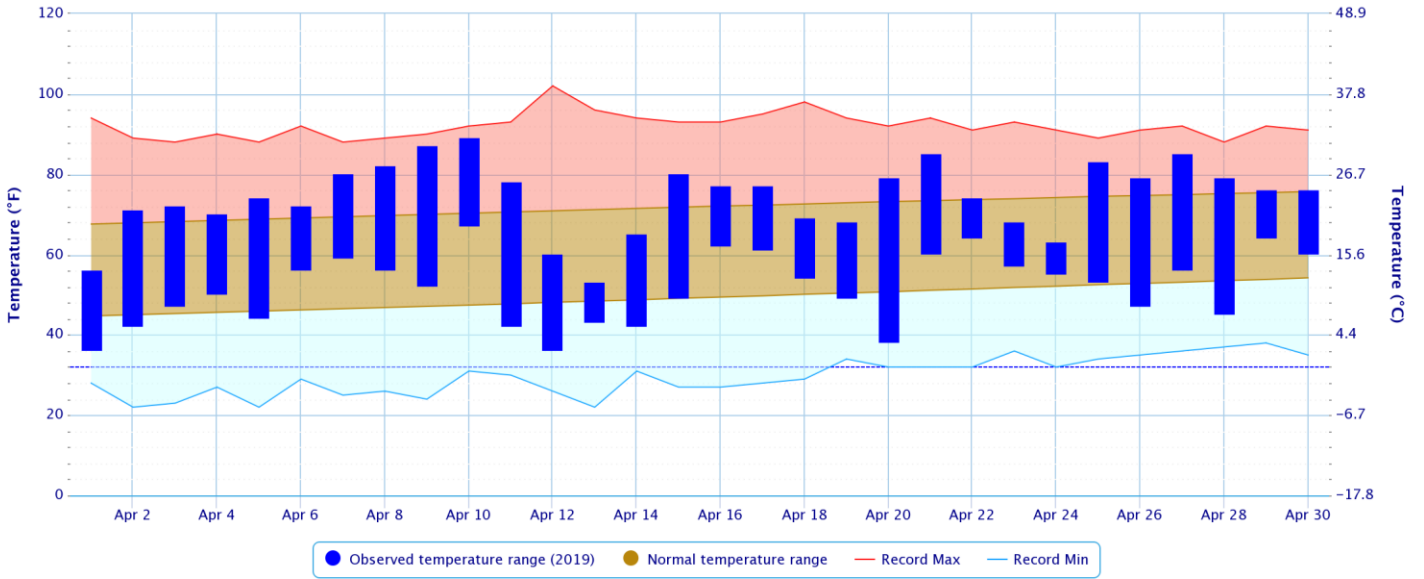
Copan, OK (meso)	3.80	Burbank, OK (meso)	3.88	Bartlesville, OK (ASOS)	3.90
Wynona, OK (meso)	3.96	Vinita, OK (meso)	4.57	Hectorville, OK (meso)	4.59
Porter, OK (meso)	4.70	Tulsa, OK (meso)	4.71	Haskell, OK (meso)	4.73

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

Rank since 1921	April 2019	Spring-to-Date (Mar 1 – Apr 30)	Last 90 Days (Jan 31 – Apr 30)	Year-to-Date (Jan 1 – Apr 30)	Last 180 Days (Nov 2 – Apr 30)	Water Year-to-Date (Oct 1 – Apr 30)	Last 365 Days (May 1, 2018–Apr 30, 2019)
Northeast OK	24 th wettest	36 th wettest	34 th wettest	17 th wettest	24 th wettest	21 st wettest	39 th wettest
East Central OK	29 th wettest	35 th wettest	30 th wettest	14 th wettest	23 rd wettest	22 nd wettest	18 th wettest
Southeast OK	24 th wettest	38 th wettest	34 th wettest	37 th wettest	26 th wettest	15 th wettest	18 th wettest
Statewide	22 nd wettest	25 th wettest	26 th wettest	21 st wettest	24 th wettest	10th wettest	12 th wettest

Daily Temperature Data – Tulsa Area, OK (ThreadEx)

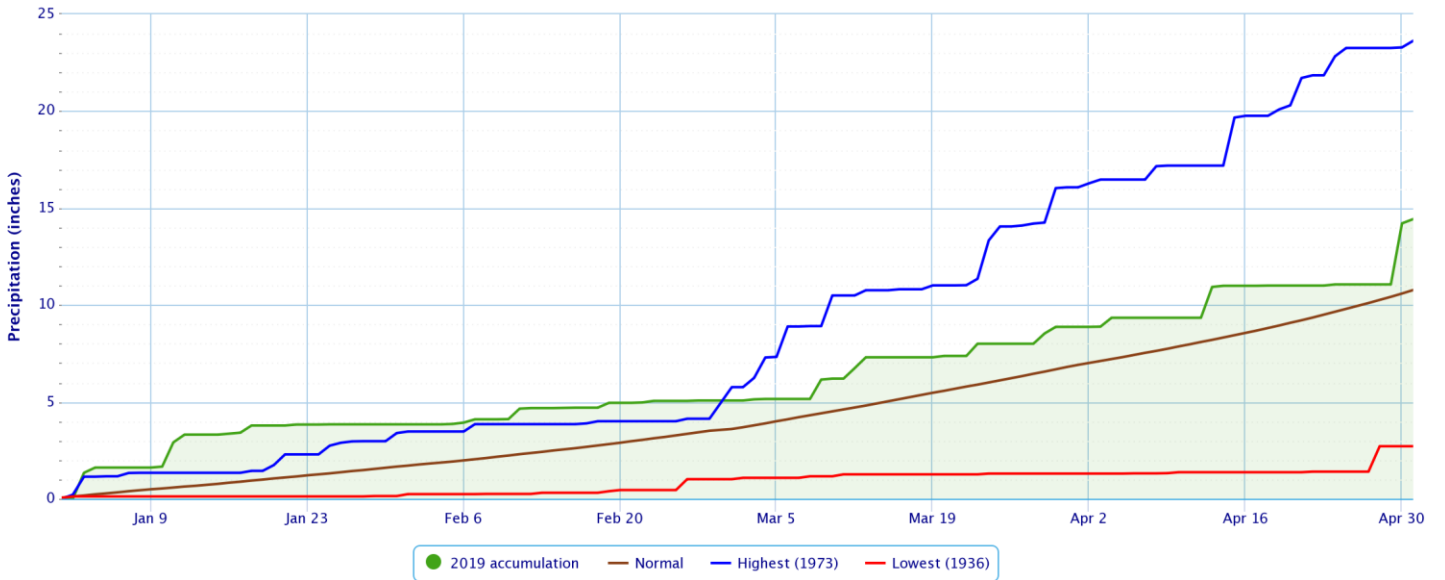
Period of Record – 1905-01-06 to 2019-05-01. Normals period: 1981-2010. Click and drag to zoom chart.



Powered by ACIS

Accumulated Precipitation – Tulsa Area, OK (ThreadEx)

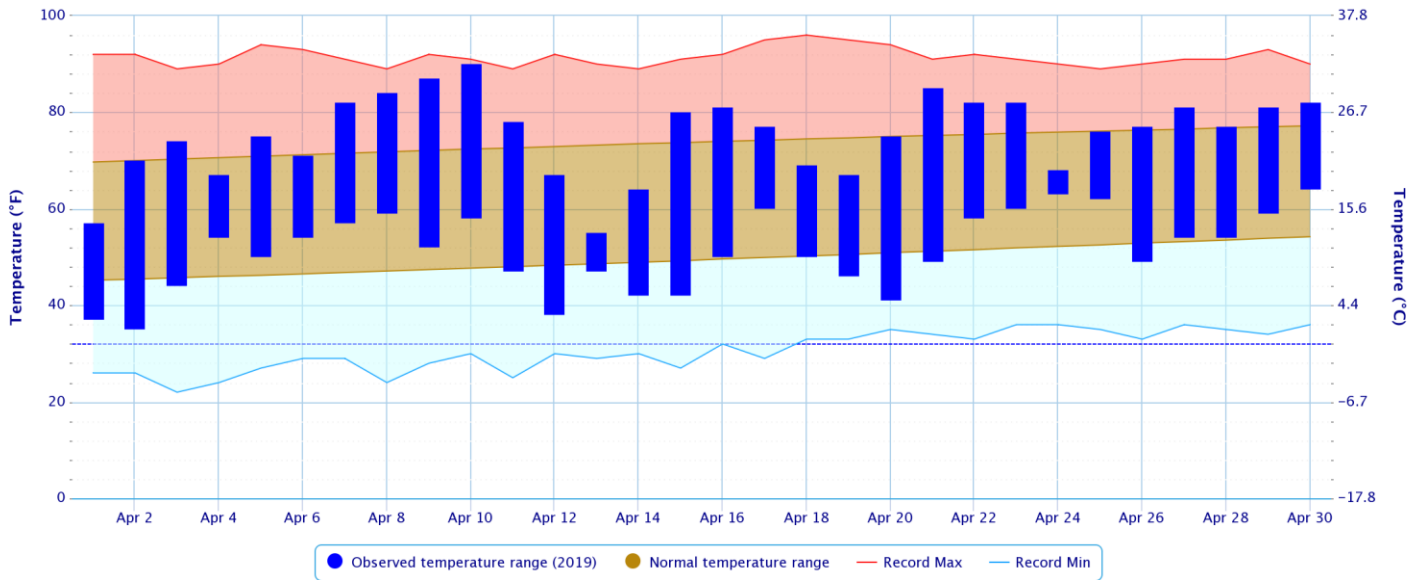
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



Powered by ACIS

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

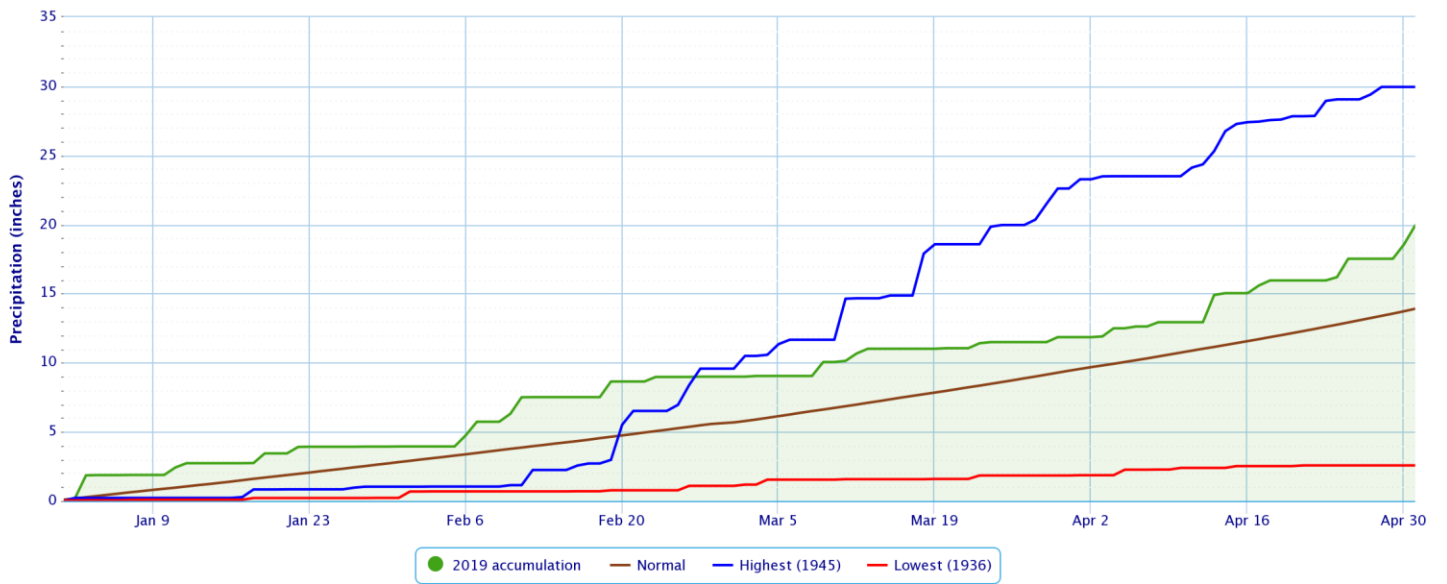
Period of Record – 1882-06-01 to 2019-05-01. Normals period: 1981-2010. Click and drag to zoom chart.



Powered by ACIS

Accumulated Precipitation – Fort Smith Area, AR (ThreadEx)

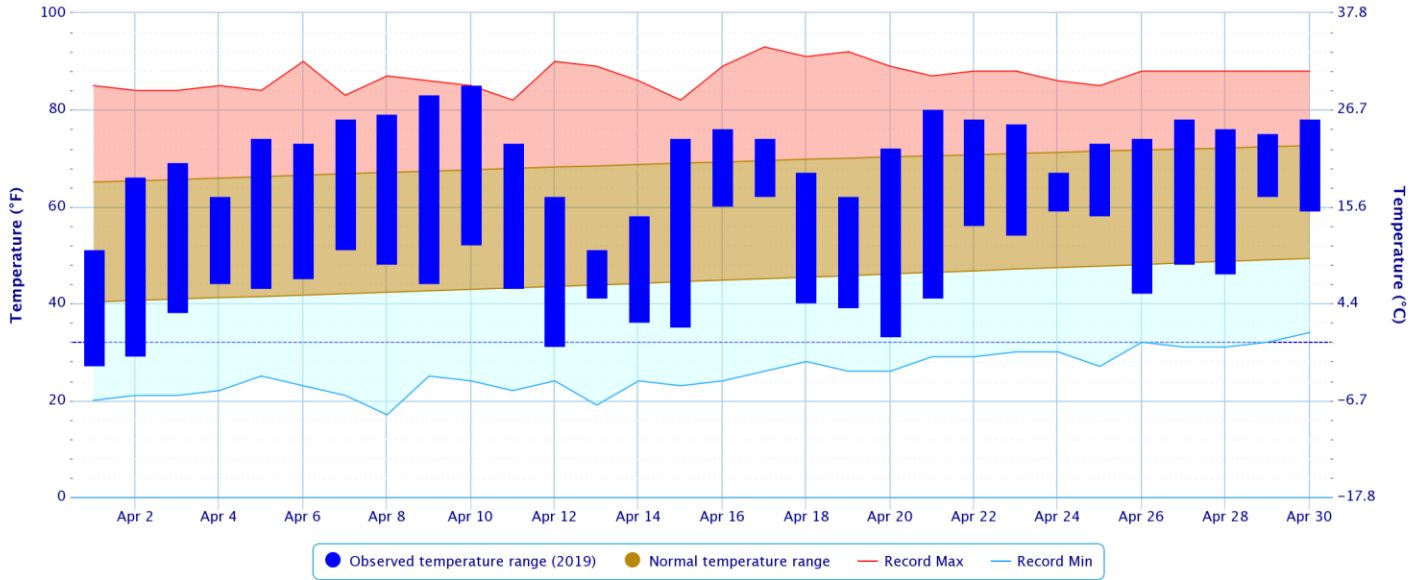
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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Daily Temperature Data – FAYETTEVILLE DRAKE FIELD, AR

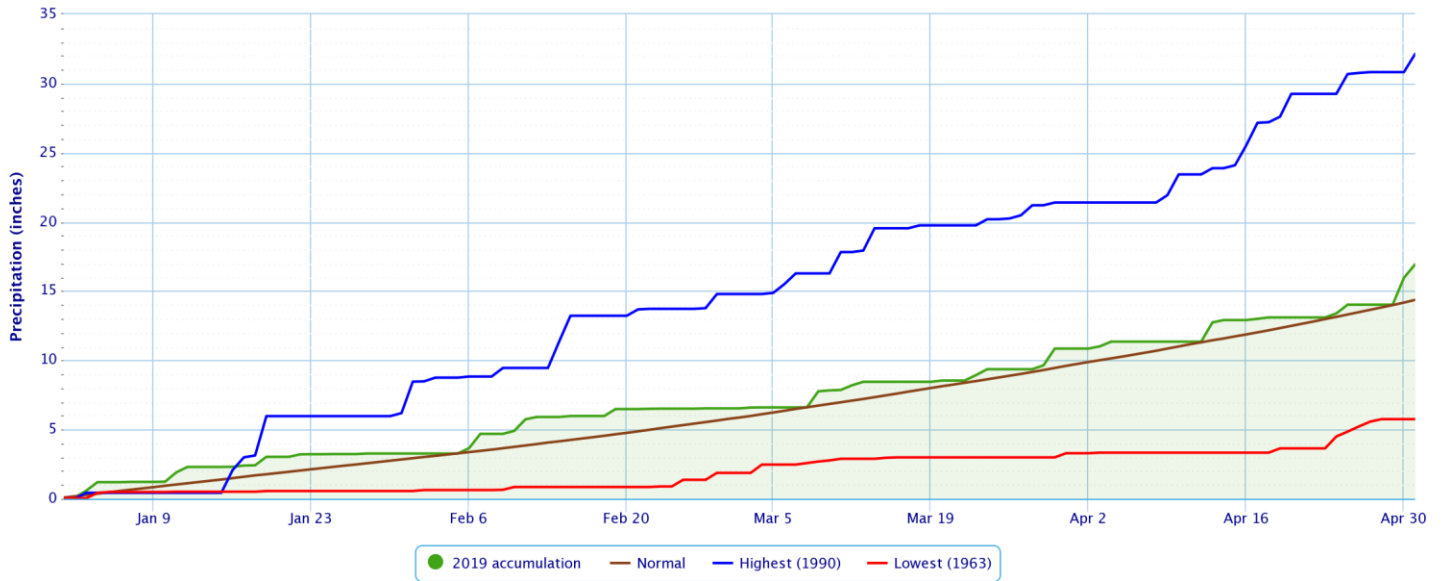
Period of Record – 1949-07-14 to 2019-05-01. Normals period: 1981-2010. Click and drag to zoom chart.



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

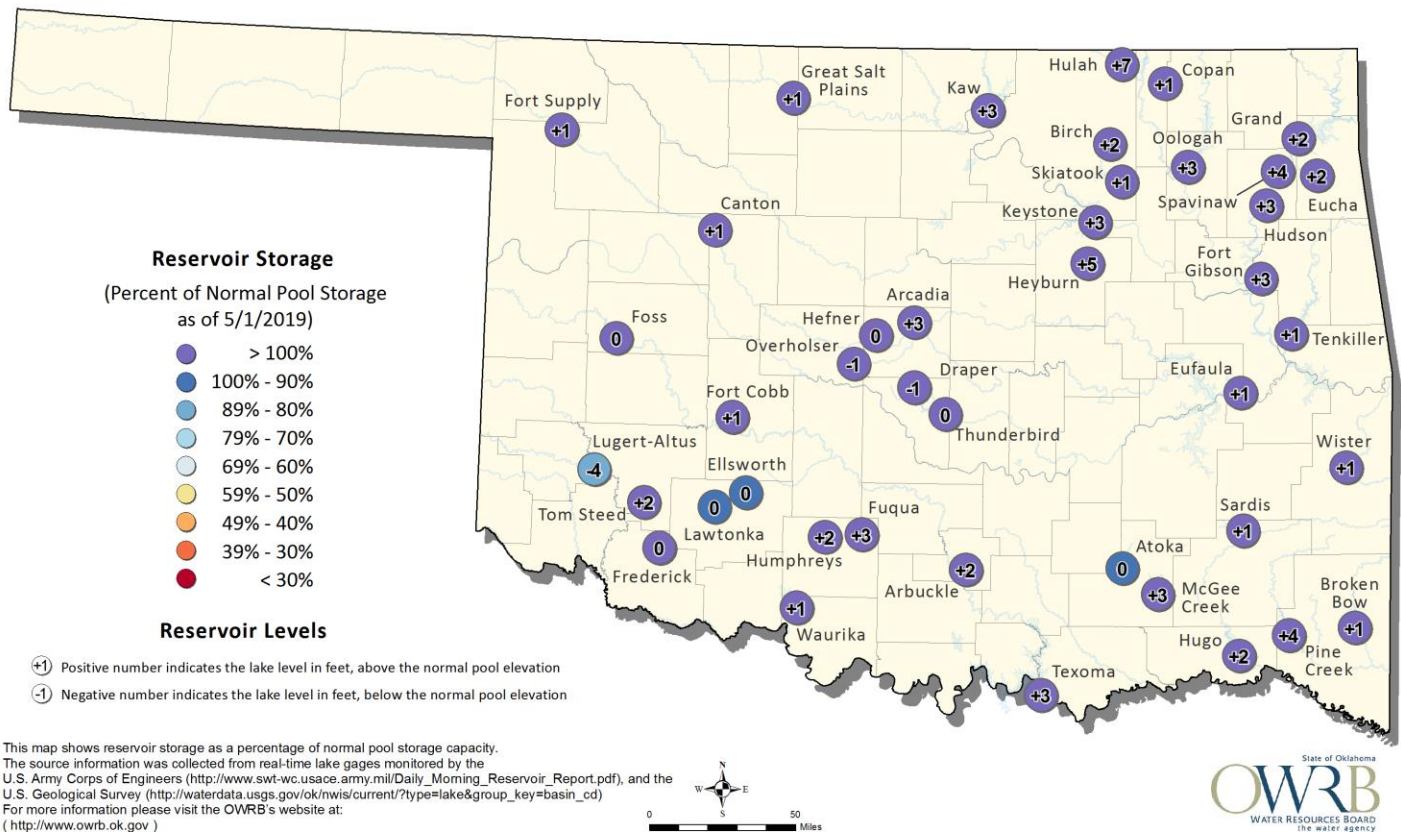


Powered by ACIS

Reservoirs

Oklahoma Surface Water Resources

Reservoir Levels and Storage as of 5/1/2019



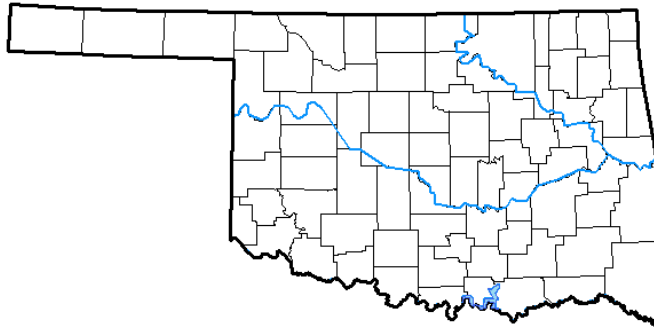
According to the USACE, most lakes in the HSA were above 3% of their conservation pool level as of 5/01/2019: Grand Lake/Pensacola 114%, Hudson Lake 113%, Oologah Lake 110%, Hulah Lake 110%, Ft. Gibson Lake 107%, Sardis Lake 107%, Eufaula Lake 106%, Kaw Lake 106%, Skiatook Lake 106%, Birch Lake 105%, Beaver Lake 105%, and Keystone Lake 105%.

Drought

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

U.S. Drought Monitor Oklahoma

April 30, 2019
(Released Thursday, May 2, 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 <i>04-23-2019</i>	100.00	0.00	0.00	0.00	0.00	0.00
3 Months Ago <i>01-29-2019</i>	99.22	0.78	0.00	0.00	0.00	0.00
Start of Calendar Year <i>01-01-2019</i>	94.85	5.15	0.00	0.00	0.00	0.00
Start of Water Year <i>09-25-2018</i>	72.93	27.07	9.11	4.16	0.00	0.00
One Year Ago <i>05-01-2018</i>	42.23	57.77	47.44	42.07	34.84	23.93

Intensity:
 D0 Abnormally Dry D3 Extreme Drought
 D1 Moderate Drought D4 Exceptional Drought
 D2 Severe Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Brad Rippey
U.S. Department of Agriculture

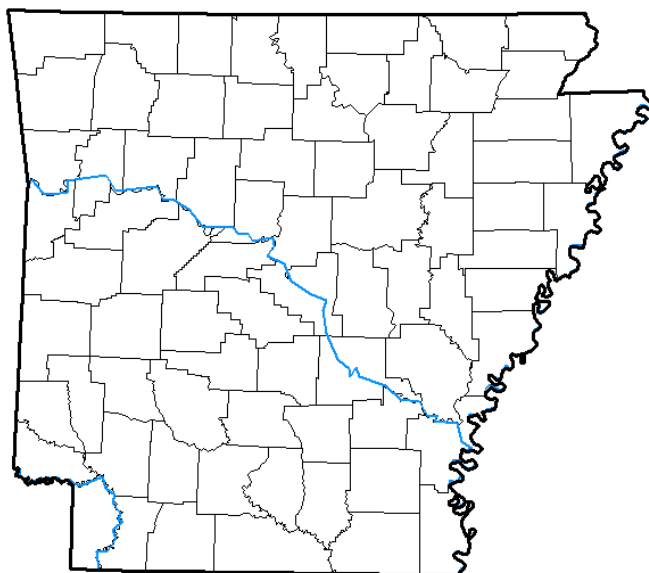


<http://droughtmonitor.unl.edu/>

Fig. 2. Drought Monitor for Oklahoma

U.S. Drought Monitor Arkansas

April 30, 2019
(Released Thursday, May 2, 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 <i>04-23-2019</i>	100.00	0.00	0.00	0.00	0.00	0.00
3 Months Ago <i>01-29-2019</i>	100.00	0.00	0.00	0.00	0.00	0.00
Start of Calendar Year <i>01-01-2019</i>	98.79	1.21	0.00	0.00	0.00	0.00
Start of Water Year <i>09-25-2018</i>	93.15	6.85	2.59	0.00	0.00	0.00
One Year Ago <i>05-01-2018</i>	100.00	0.00	0.00	0.00	0.00	0.00

Intensity:
 D0 Abnormally Dry D3 Extreme Drought
 D1 Moderate Drought D4 Exceptional Drought
 D2 Severe Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Brad Rippey
U.S. Department of Agriculture



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

Fig. 3. Drought Monitor for Arkansas

Outlooks

The [Climate Prediction Center](#) (CPC) outlook for May 2019 (issued April 30, 2019) indicates an equal chance for above, near, and below normal temperatures and significantly increased odds for above median precipitation across all of eastern OK and northwest AR. There is a 50%-65% chance for above median rainfall from north to south across eastern OK and northwest AR in May (and a 32%-33% chance for near median rainfall and a 3%-17% for below median rainfall). This outlook takes into account weather conditions forecast over the first two weeks of May, the weeks 3-4 outlook, and the above normal soil moisture over the central and southern Plains, which will make above normal temperatures less likely. The significantly enhanced rainfall probabilities are due to the dynamical model forecasts for the first week of May, and above median rainfall is likely throughout the month. This signal is consistent with the current El Niño base state as modified by Madden-Julian Oscillation (MJO) activity over the western Pacific Ocean.

For the 3-month period May-June-July 2019, CPC is forecasting an equal chance for above, near, and below normal temperatures and an enhanced chance for above median precipitation across all of eastern OK and northwest AR (outlook issued April 18, 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. The enhanced odds for above median rainfall is primarily based on dynamical model. According to CPC, the combined effect of the ocean-atmosphere system is consistent with the continuation of weak El Niño conditions through April 2019. A continuation of the weak El Niño is expected, though there is considerable spread among the various predictive models as the year progresses. There is a 65% chance that El Niño conditions will continue through summer 2019, and a 50-55% chance it will continue in the fall. There is a very low chance for La Niña. CPC continues the El Niño Advisory.

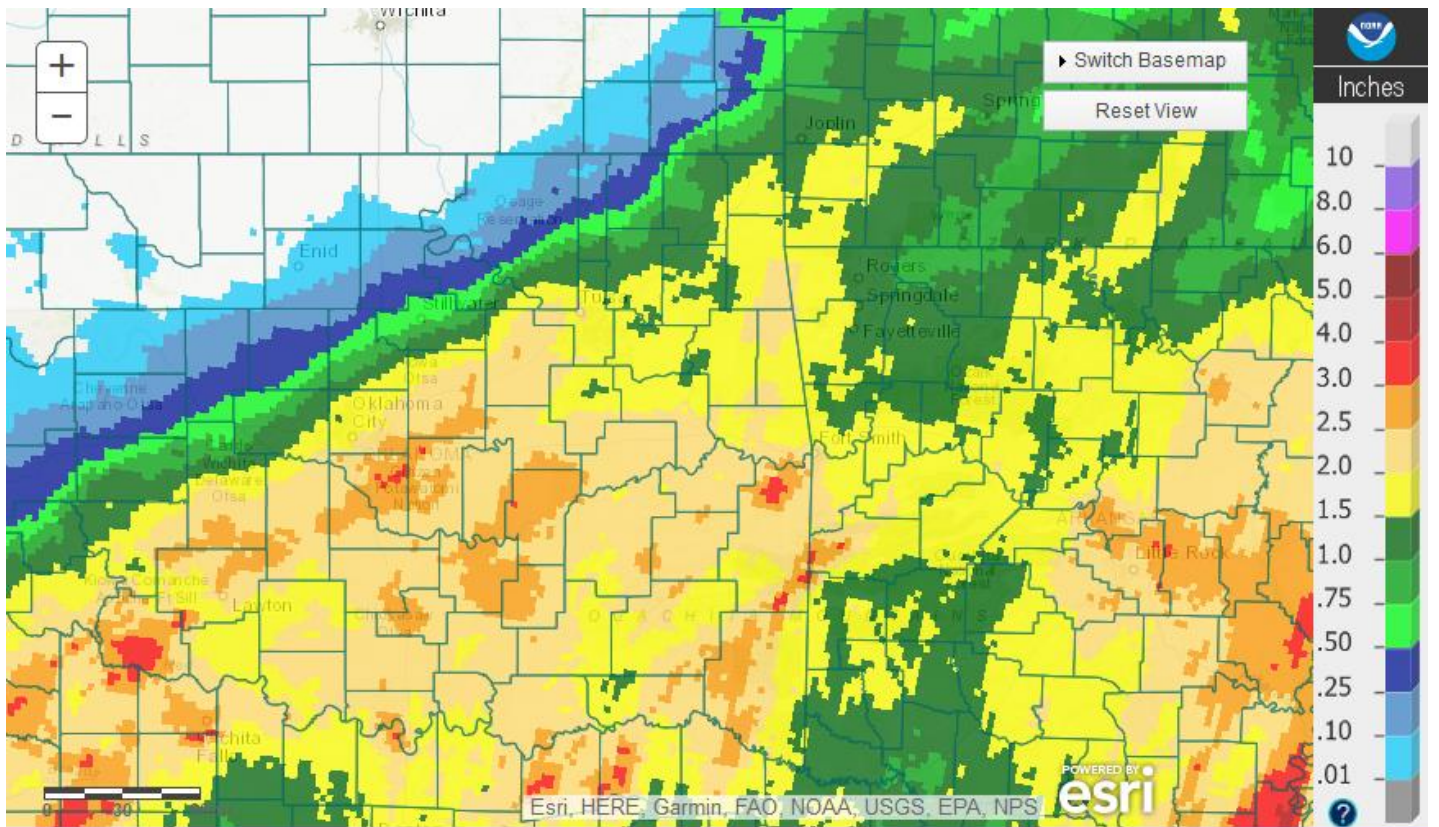
Summary of Heavy Precipitation Events Daily quality-controlled rainfall maps can be found at: http://water.weather.gov/precip/index.php?location_type=wfo&location_name=tsa

Showers and thunderstorms moved north out of TX and into southeast OK and west central AR during the morning of the 14th, as an upper-level low moved across northwest TX. This activity remained widespread as it spread northward through the afternoon hours. By evening, the upper low began to move into southeast OK, with the rainfall continuing along the northern periphery across northeast OK and northwest AR. As the low continued to move east into AR, the rain spread back into all of eastern OK and western AR on the back side through the overnight hours, and came to an end around sunrise on the 14th. Rainfall totals ranged from 1.5"-3" southeast of I-44, with significantly lesser amounts northwest of I-44 (Fig. 4). This rainfall caused the Poteau River near Panama to rise to flood stage (see preliminary hydrographs at the end of this report; see E3 Report for details).

Isolated thunderstorms affected southeast OK and west central AR during the afternoon and evening of the 17th. Then, by late evening, two different lines of thunderstorms moved out of central OK into eastern OK. The northern line, associated with a cold front, weakened as it moved across northeast OK and northwest AR. The southern line, associated with dry line convection, moved across southeast OK and west central AR, bringing more widespread rainfall through the overnight and early morning hours. Rainfall totals ranged from around 0.50" to around 2" in southeast OK and western AR (Fig 5.). Further north, the rainfall totals were around 0.50" or less northwest of I-44. However, just northwest of the NWS Tulsa area, heavy rainfall of 1.5"-3" fell across southern KS and north central OK, with the upper portions of the Arkansas and Verdigris River basins.

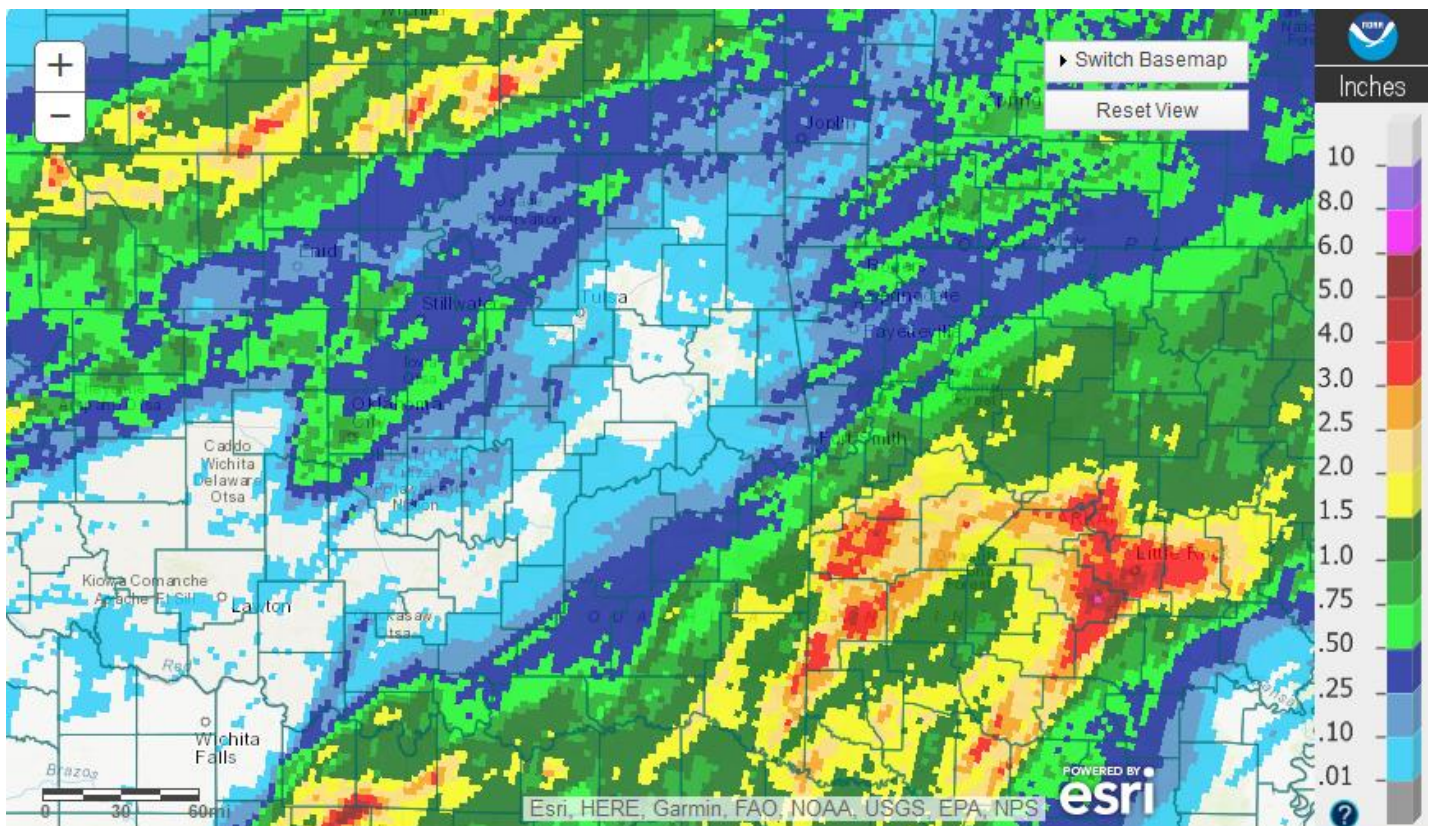
The remnants of a mesoscale convective system (MCS) moved across northeast OK, northwest of I-44, during the mid-morning hours of the 23rd. This activity brought widespread 0.50"-1.5" of rainfall across the affected area, with a narrow band of 1.5"-2.5" of rain to northern Pawnee and the adjacent portion of Osage Counties. Isolated to scattered activity during the evening and overnight hours brought localized 0.50" to 1.5" of rain to portions of eastern OK.

Showers and thunderstorms moved north out of TX into southeast OK and west central AR during the evening of the 24th. This activity continued through the overnight hours and lingered until noon on the 25th, affecting southeast OK and western AR southeast of an Okmulgee-Bentonville line. Rainfall totals were primarily 0.50"-1" with a few isolated amounts around 1.5" in northern Le Flore County, which resulted in minor flooding on the Poteau River near Panama (see preliminary hydrographs at the end of this report; E3 Report for details).



Tulsa, OK: April 14, 2019 1-Day Observed Precipitation
Valid on: April 14, 2019 12:00 UTC

Fig. 4. 24-hour Estimated Observed Rainfall ending at 7am CDT 4/14/2019.



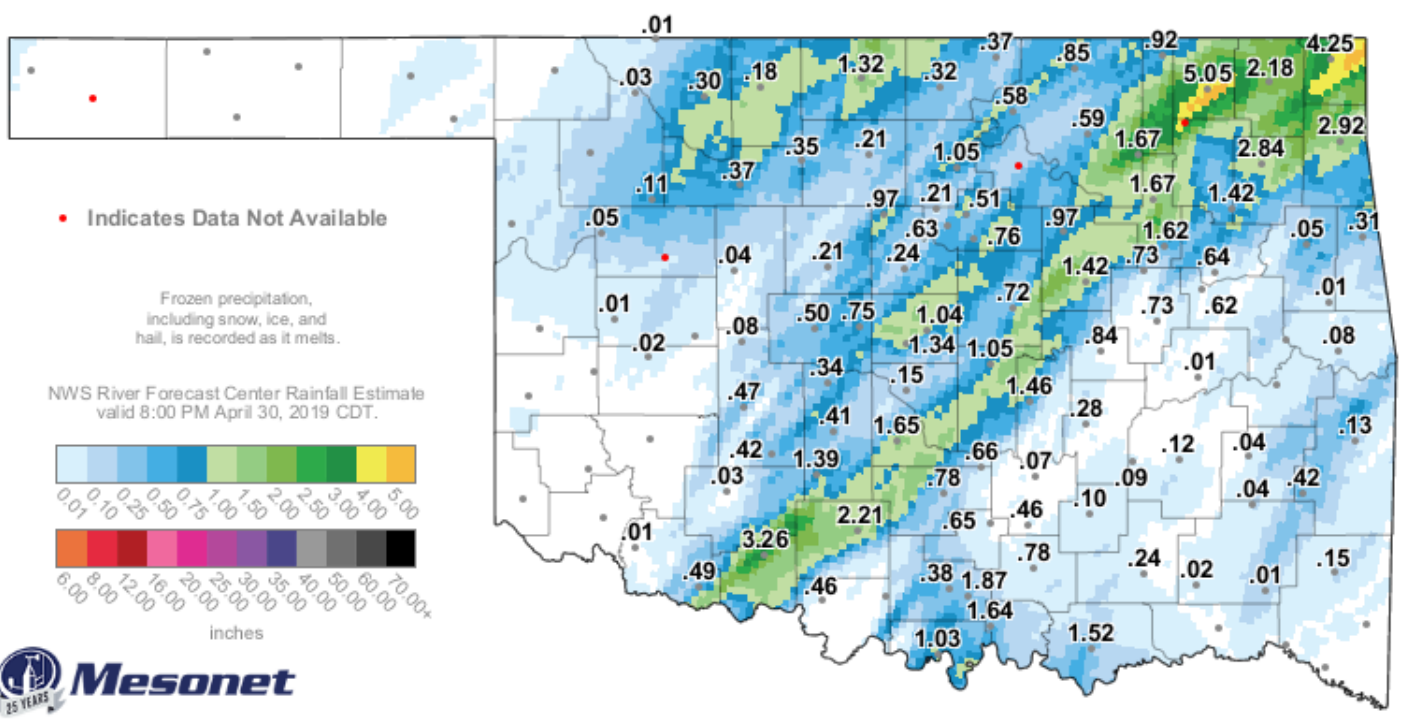
Tulsa, OK: April 18, 2019 1-Day Observed Precipitation
Valid on: April 18, 2019 12:00 UTC

Fig. 5. 24-hour Estimated Observed Rainfall ending at 7am CDT 4/18/2019.

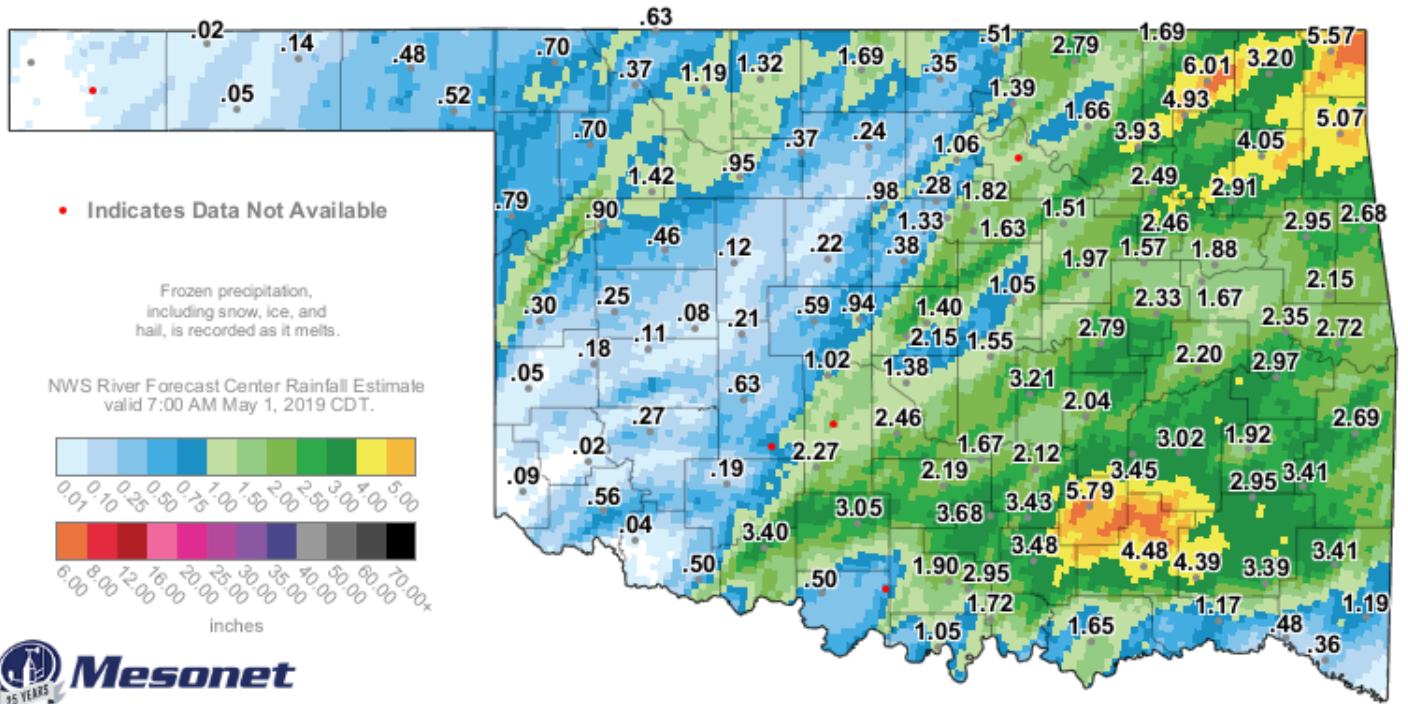
A line of showers and thunderstorms near a surface boundary moved across north central and northeast OK in the pre-dawn hours of the 30th. As this activity moved north into KS at mid-morning, another line of showers and thunderstorms from central OK spread northeast into northeast OK along the front as it slowly moved south. Additional thunderstorms developed near, as well as ahead of the front in the warm sector, during the afternoon. Several of these storms became severe, with moisture and shear parameters supportive of rotating supercells. 13 tornadoes (ranging from EF-0 to EF-2) occurred across eastern OK (see <https://arcg.is/1X8eW1> for more information). On the synoptic scale, southwest deep-layer flow (parallel to the front) and a high precipitable water (near 2") airmass supported repeated rounds of training thunderstorms, which resulted in heavy rain and flooding. By early evening, thunderstorms congealed into a line across northeast OK, spread east through the evening, and produced very heavy rainfall. Widespread showers and thunderstorms continued behind the leading line, covering all of eastern OK and northwest AR by late evening. As this area of rain pushed east of the region in the very early morning hours, yet another area of showers and thunderstorms developed over southeast OK and moved northeast, and a line of thunderstorms over central OK moved east as a squall line. All of this activity brought additional rainfall to a large portion of eastern OK and northwest AR. The rain finally came to an end by mid-morning on May 1. Most of eastern OK and northwest AR received 2"-3" of rain from this event, with higher totals of 4"-6.5" in portions of northeast OK and southeast OK (Figs. 6-12). Widespread flash flooding occurred with this heavy rain, and one fatality (pending medical examiner's report) occurred in Tulsa, OK when a motorist left the highway, drove into a swollen drainage ditch, and was washed downstream. The official observing site in Tulsa, OK recorded 3.15" of rain on April 30, most of which fell in a few hours, setting a new daily rainfall record for that day (previous record was 3.00" in 1970). Additionally, all of the water resulted in significant rises along area creeks and rivers, and minor to moderate river flooding (Fig. 13) along the Polecreek near Sapulpa, Bird Creek near Sperry, Caney River near Collinsville, Verdigris River near Lenapah, Illinois River near Watts, Chewey, and Tahlequah, Poteau River near Poteau and Panama, Neosho River near Commerce, Spring River near Quapaw, and the Kiamichi River near Antlers (see preliminary hydrographs at the end of this report; see E3 Report for details).

24-hour precipitation reports >5" ending at 7am CDT May 1, 2019:

Quapaw 3SE, OK	6.35	Nowata 3NNE, OK	6.10	Jay 3.3 NNE, OK	5.75
Miami 2NE, OK	5.57	Pryor 6.9ESE, OK	5.55	Wyandotte 7.3NE, OK	5.53
Jay 4N, OK	5.07	Spavinaw, OK	5.05	Talala 4NW, OK	5.01



6-Hour Rainfall Accumulation (inches) 9:05 PM April 30, 2019 CDT
Created 9:11:41 PM April 30, 2019 CDT. © Copyright 2019
 Fig. 6. OK Mesonet (values) and NWS RFC rainfall estimate (image) 6-hour rainfall ending at 9:05 pm CDT 04/30/2019.

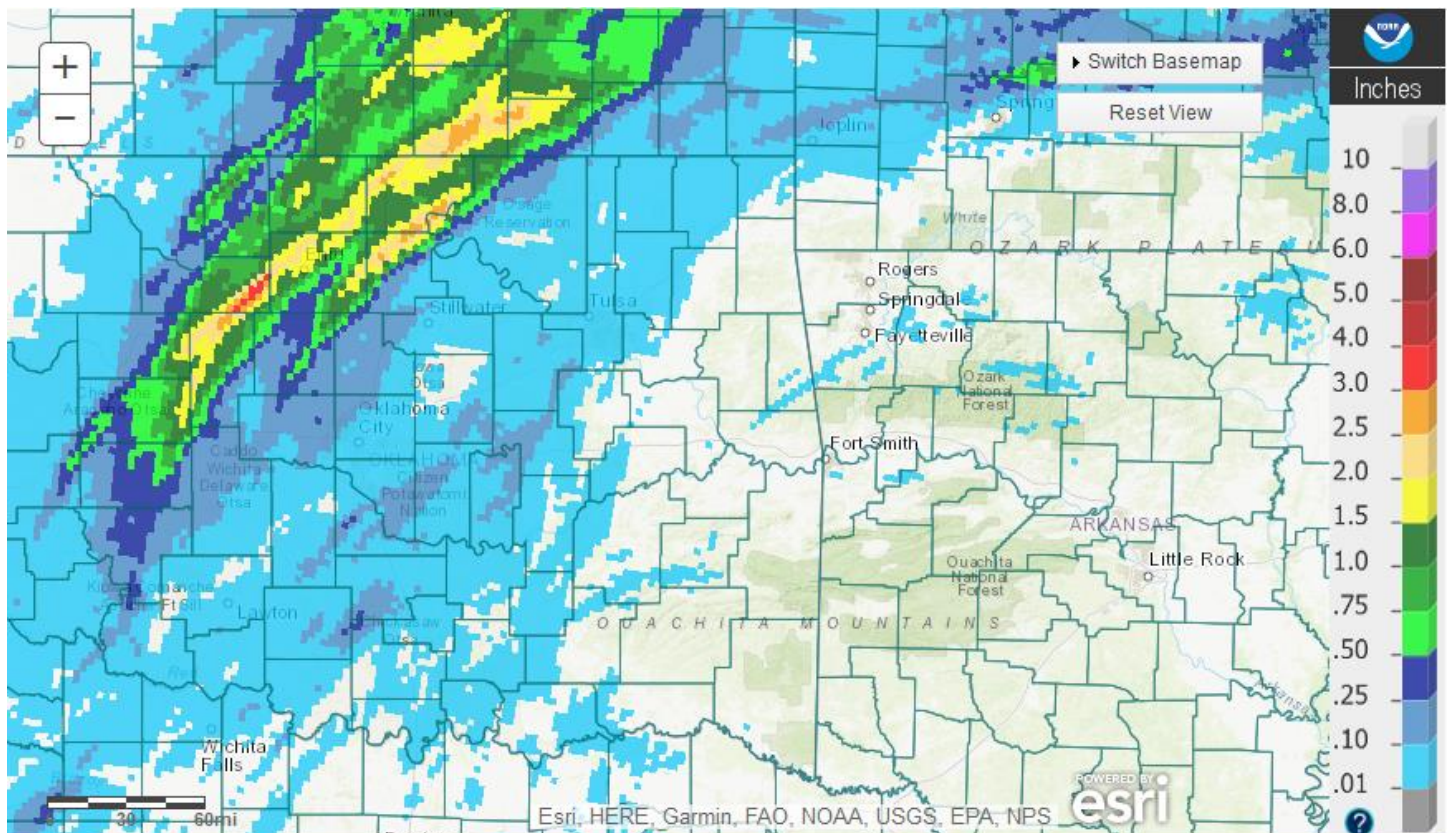


24-Hour Rainfall Accumulation (inches)

8:00 AM May 1, 2019 CDT

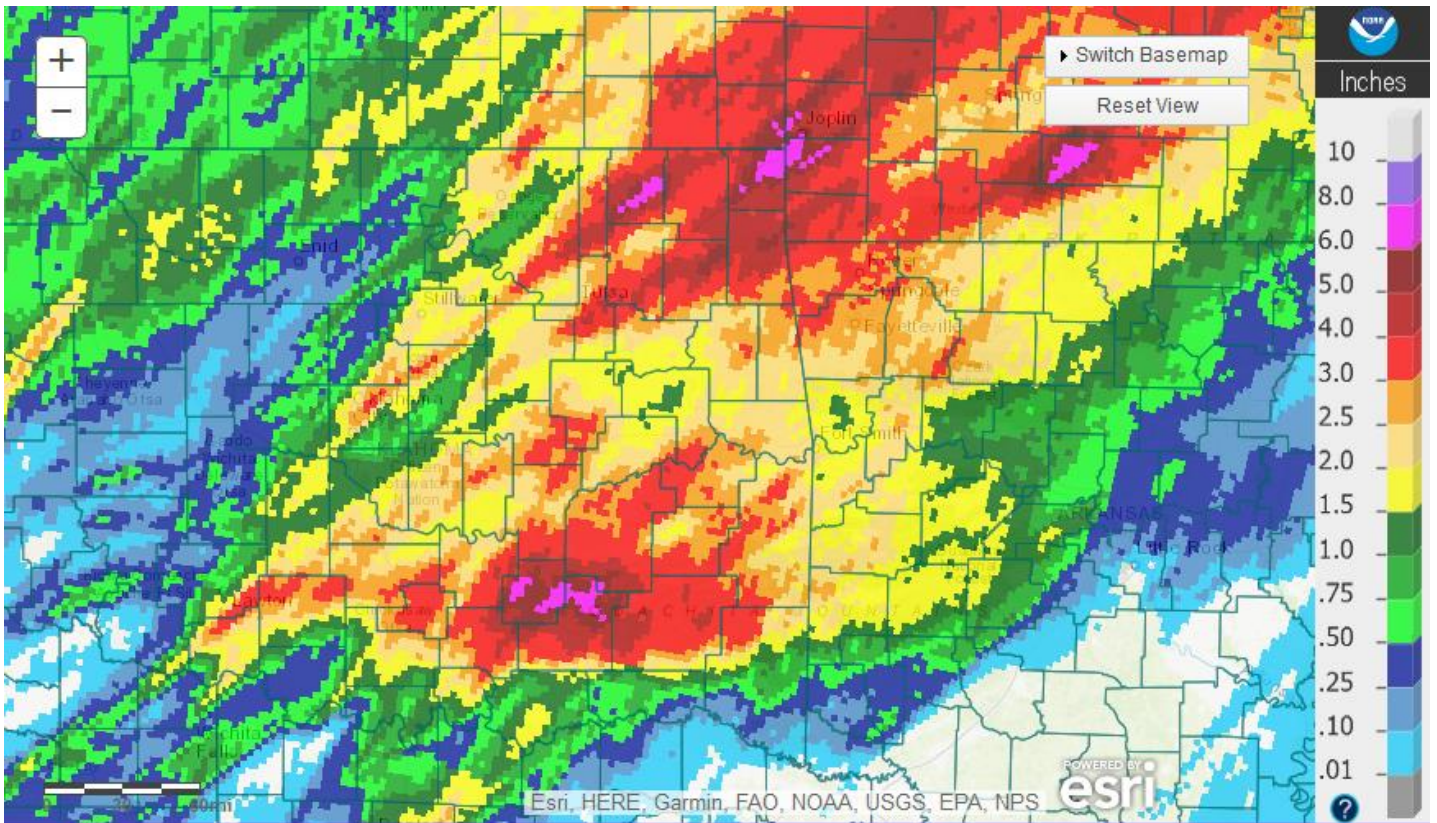
Created 8:05:57 AM May 1, 2019 CDT. © Copyright 2019

Fig. 7. OK Mesonet (values) and NWS RFC rainfall estimate (image) 24-hour rainfall ending at 8:00 am CDT 05/01/2019.



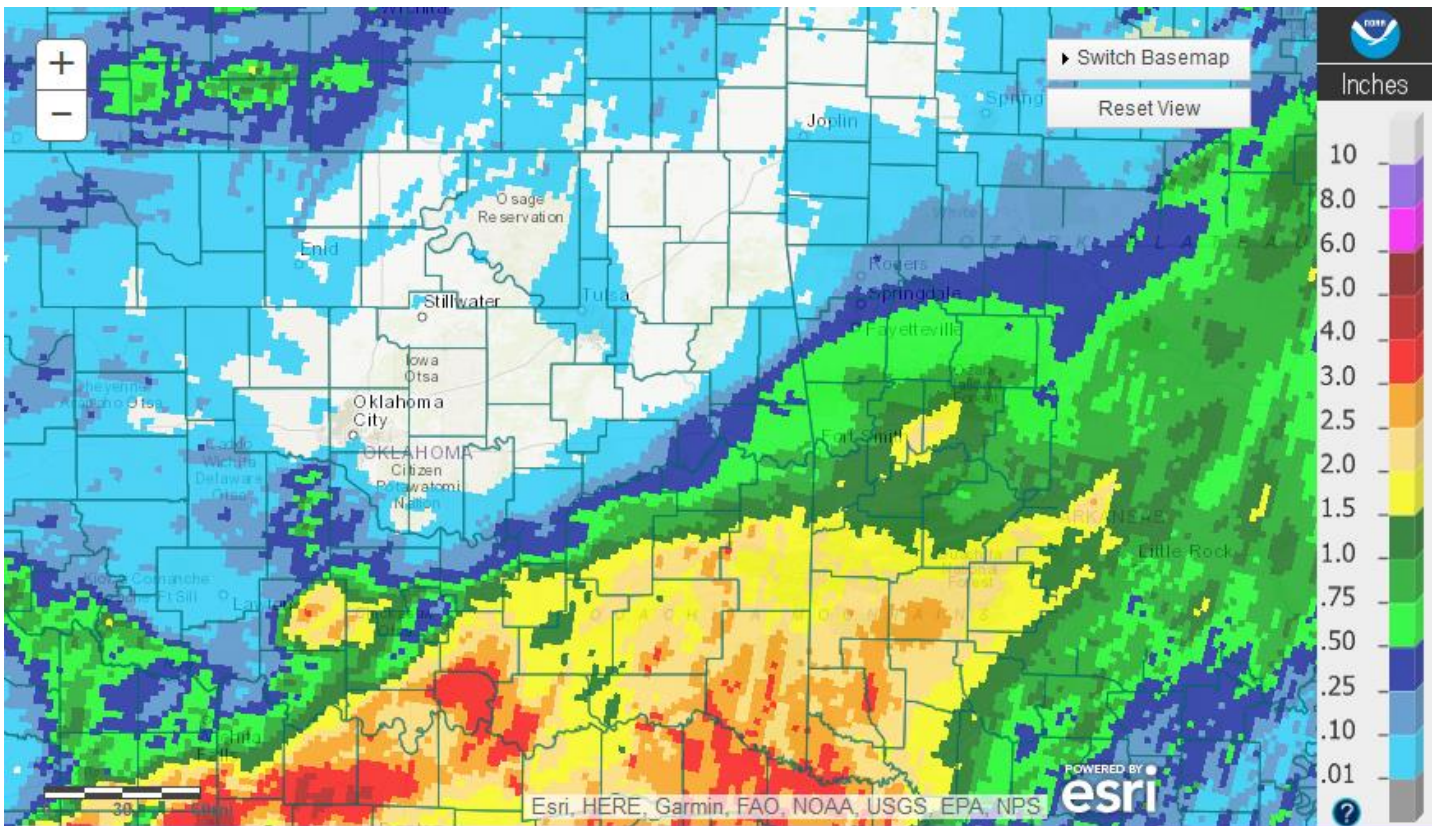
Tulsa, OK: April 30, 2019 1-Day Observed Precipitation
Valid on: April 30, 2019 12:00 UTC

Fig. 8. 24-hour Estimated Observed Rainfall ending at 7am CDT 4/30/2019.



Tulsa, OK: Current 1-Day Observed Precipitation
Valid on: May 01, 2019 12:00 UTC

Fig. 9. 24-hour Estimated Observed Rainfall ending at 7am CDT 5/01/2019.



Tulsa, OK: Current 1-Day Observed Precipitation
Valid on: May 02, 2019 12:00 UTC

Fig. 10. 24-hour Estimated Observed Rainfall ending at 7am CDT 5/02/2019.

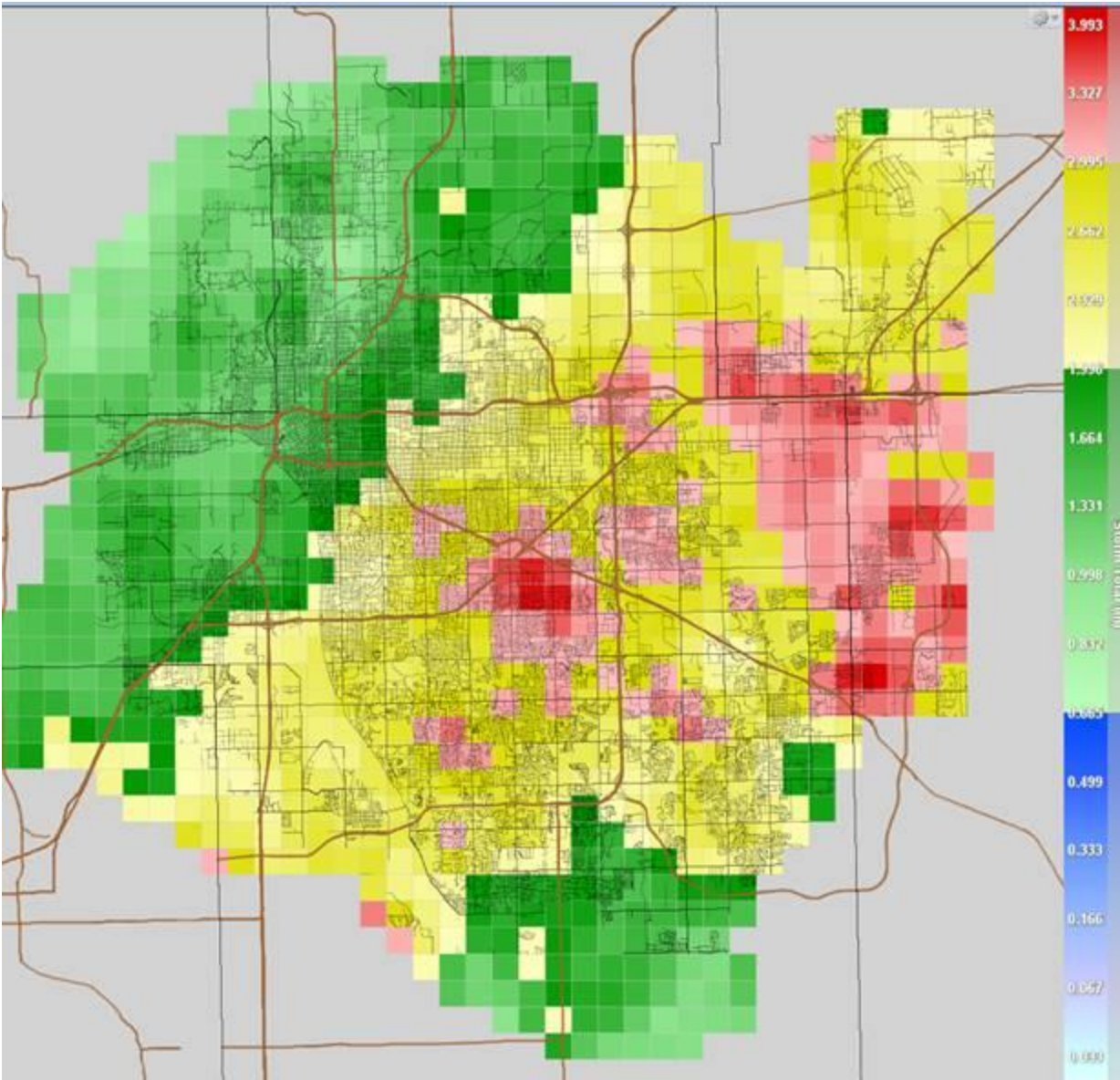


Fig. 11. Image courtesy of the City of Tulsa. Rainfall analysis of April 30, 2019 heavy rain event over Tulsa street map. "The vicinity of 51st and Memorial was hardest hit receiving almost 4 inches of rain in two and a half hours; and 5 inches over the course of the day."

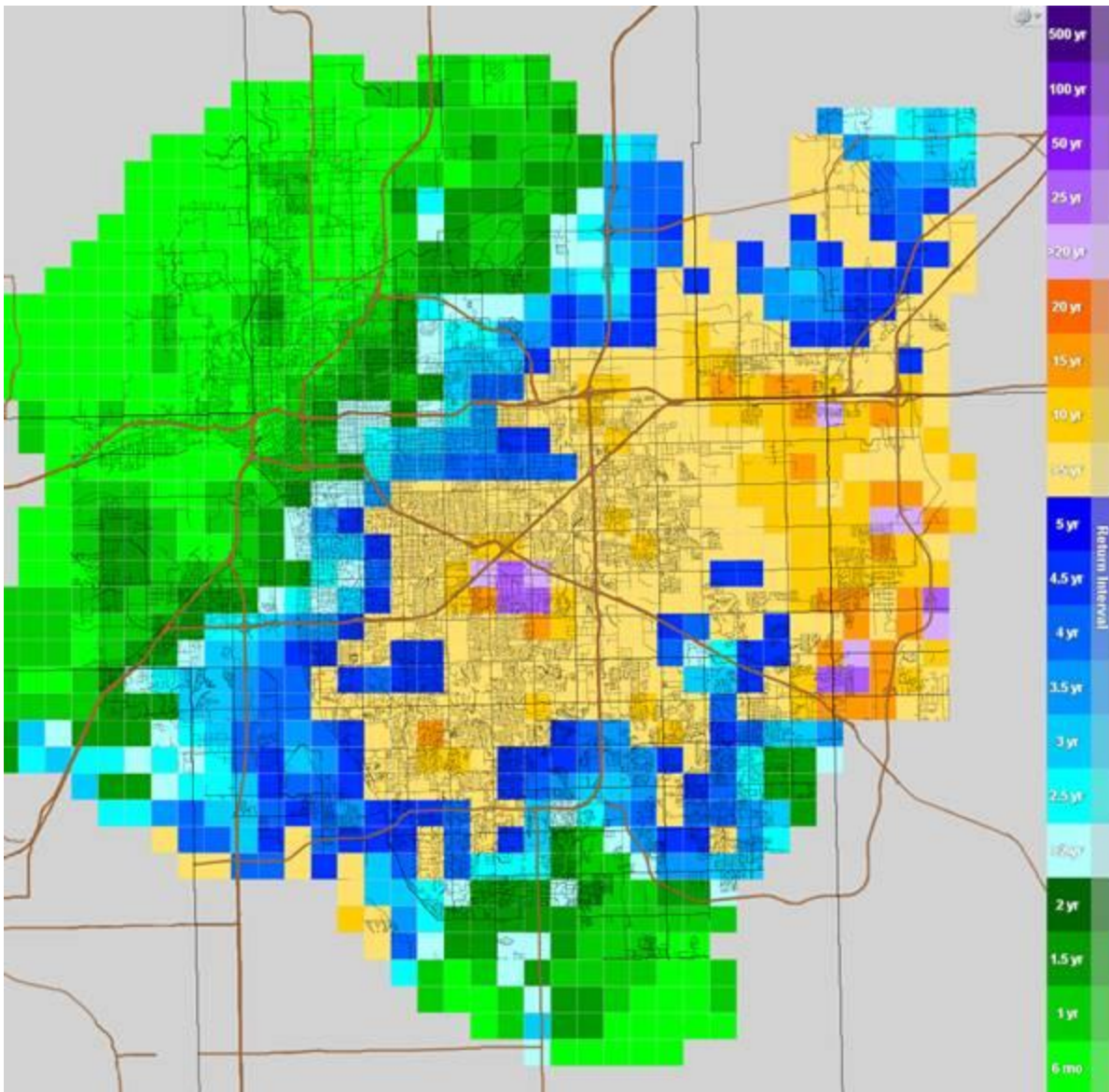


Fig. 12. Image courtesy of the City of Tulsa. Rainfall intensity recurrence interval for the April 30, 2019 heavy rain event over Tulsa street map. “The same areas received the highest rainfall intensities – a 25-year, 2-hr event. Intensities in most of the Mingo basin were above the 5-yr event, as well as the eastern portions of the Joe Creek system, and the northern portions of the Haikey Creek system.”

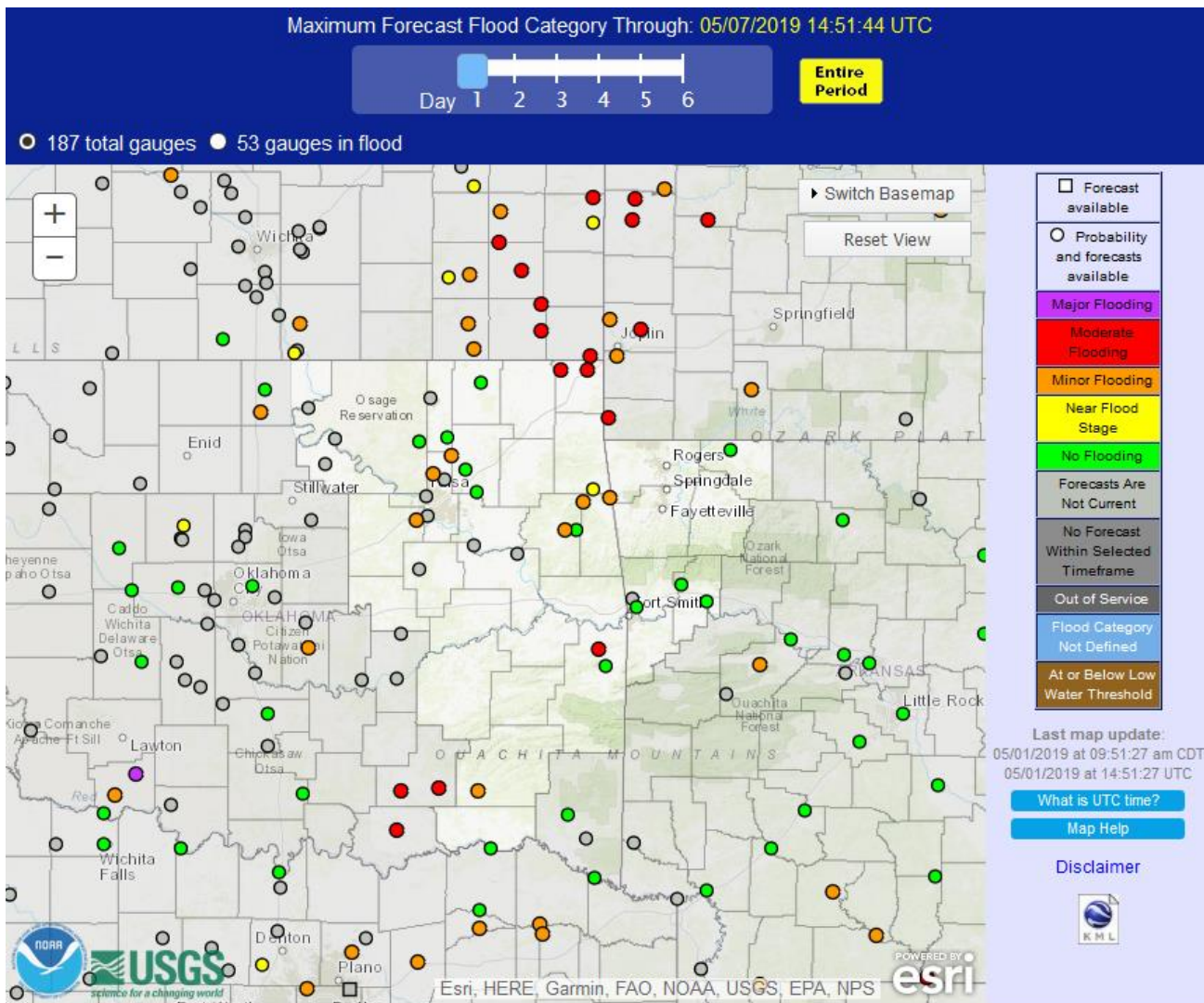


Fig. 13. Maximum forecast category for rivers across eastern OK as of 10am CDT May 1, 2019.

Written by:

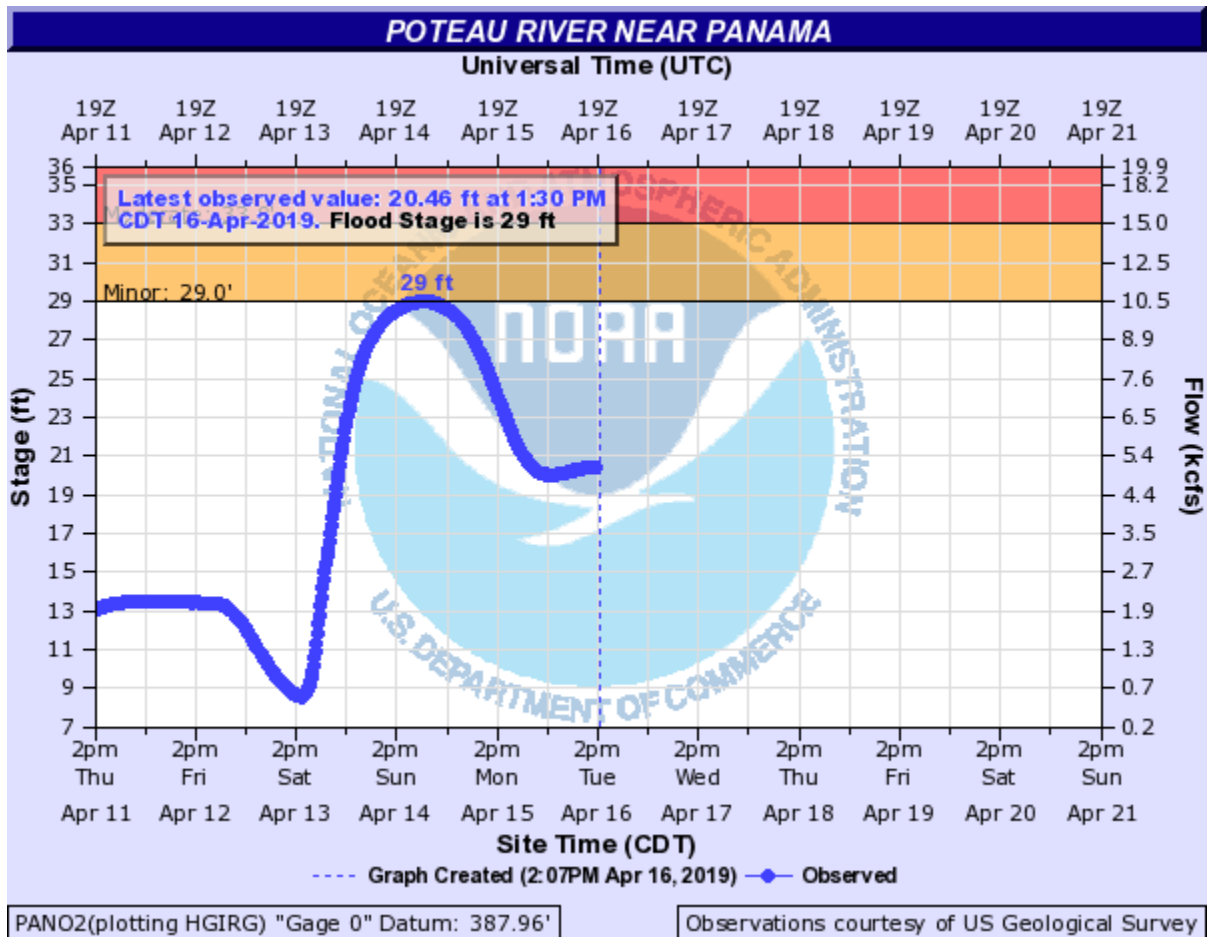
Nicole McGavock
Service Hydrologist
WFO Tulsa

Products issued in April 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

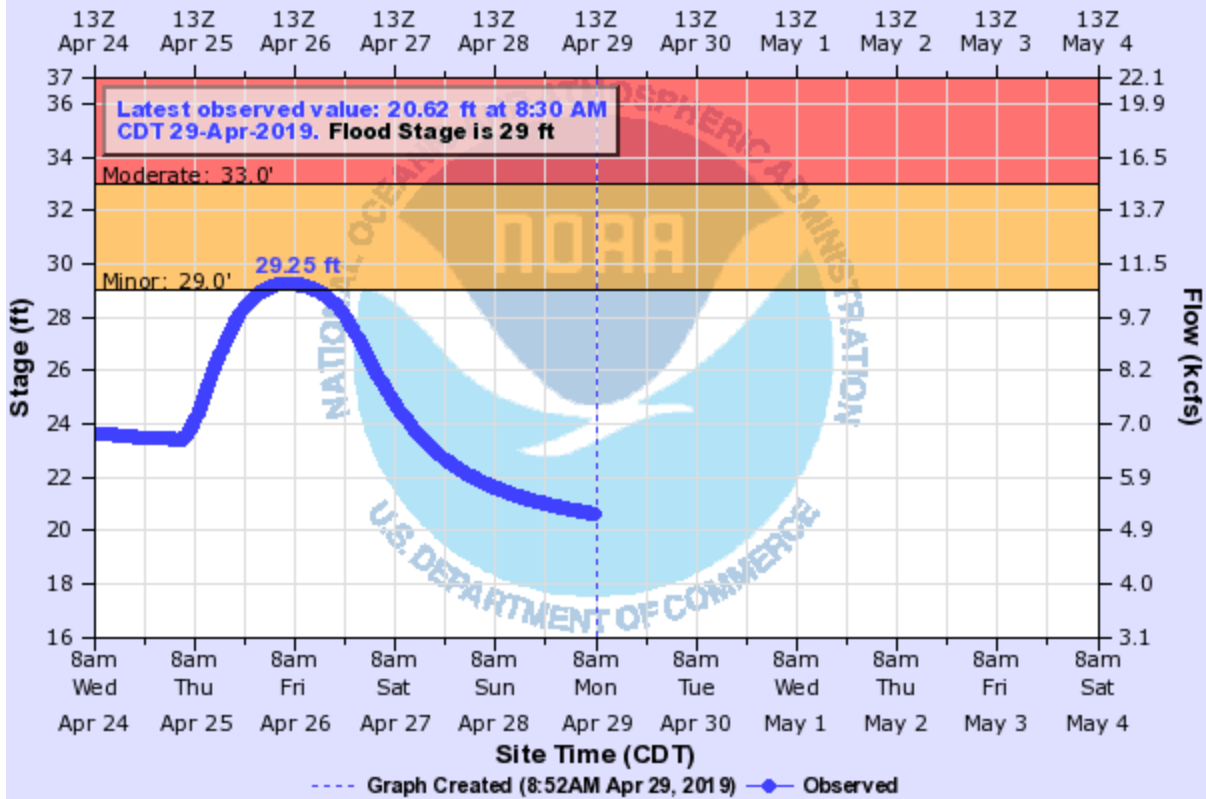
- 5 Flash Flood Warnings (FFW)
- 2 Flash Flood Statements (FFS)
- 1 Flash/Areal Flood Watches (FFA) (7 Watch FFA CON/EXT/EXA/EXB/CAN)
- 7 Urban and Small Stream Advisories (FLS)
- 1 Areal Flood Warnings (FLW)
- 0 Areal Flood Statements (FLS)
- 11 River Flood Warnings (FLW) (includes category increases)
- 26 River Flood Statements (FLS)
- 3 River Flood Advisories (FLS) (6 Advisory FLS CON/EXT/CAN)
- 14 River Flood Watches (FFA) (34 Watch FFA CON/EXT/CAN)
- 0 River Statements (RVS)
- 0 Hydrologic Outlooks (ESF)
- 0 Drought Information Statements (DGT)

Preliminary Hydrographs:



POTEAU RIVER NEAR PANAMA

Universal Time (UTC)

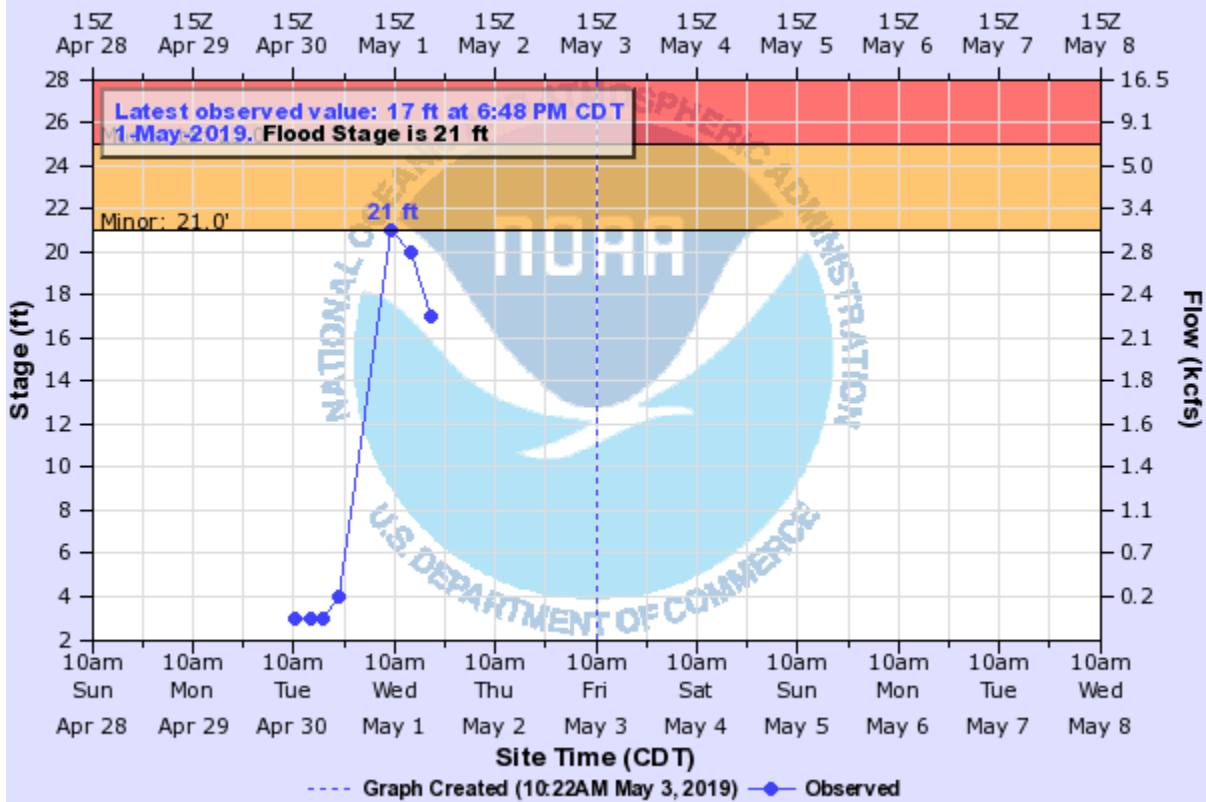


PANO2(plotting HGIRG) "Gage 0" Datum: 387.96'

Observations courtesy of US Geological Survey

POLECAT CREEK NEAR SAPULPA

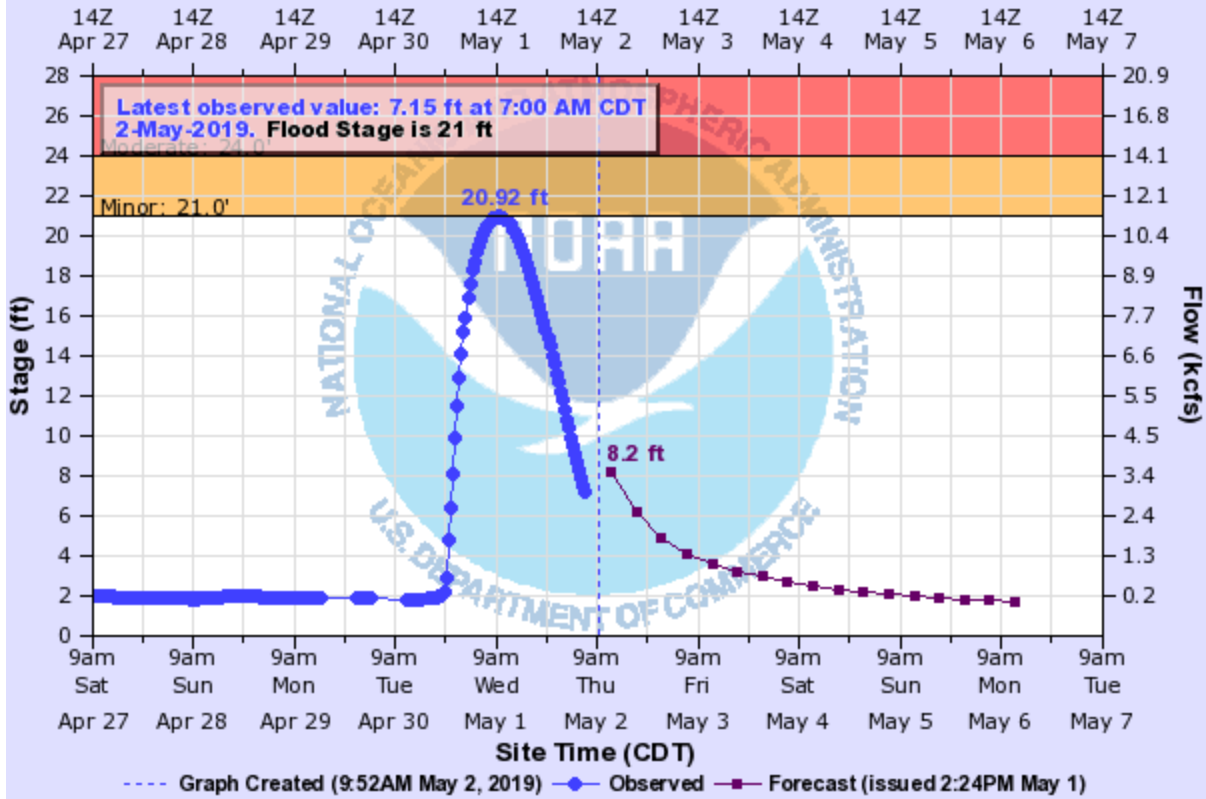
Universal Time (UTC)



SPCO2(plotting HGIRZ) "Gage 0" Datum: 626.2'

BIRD CREEK NEAR SPERRY

Universal Time (UTC)

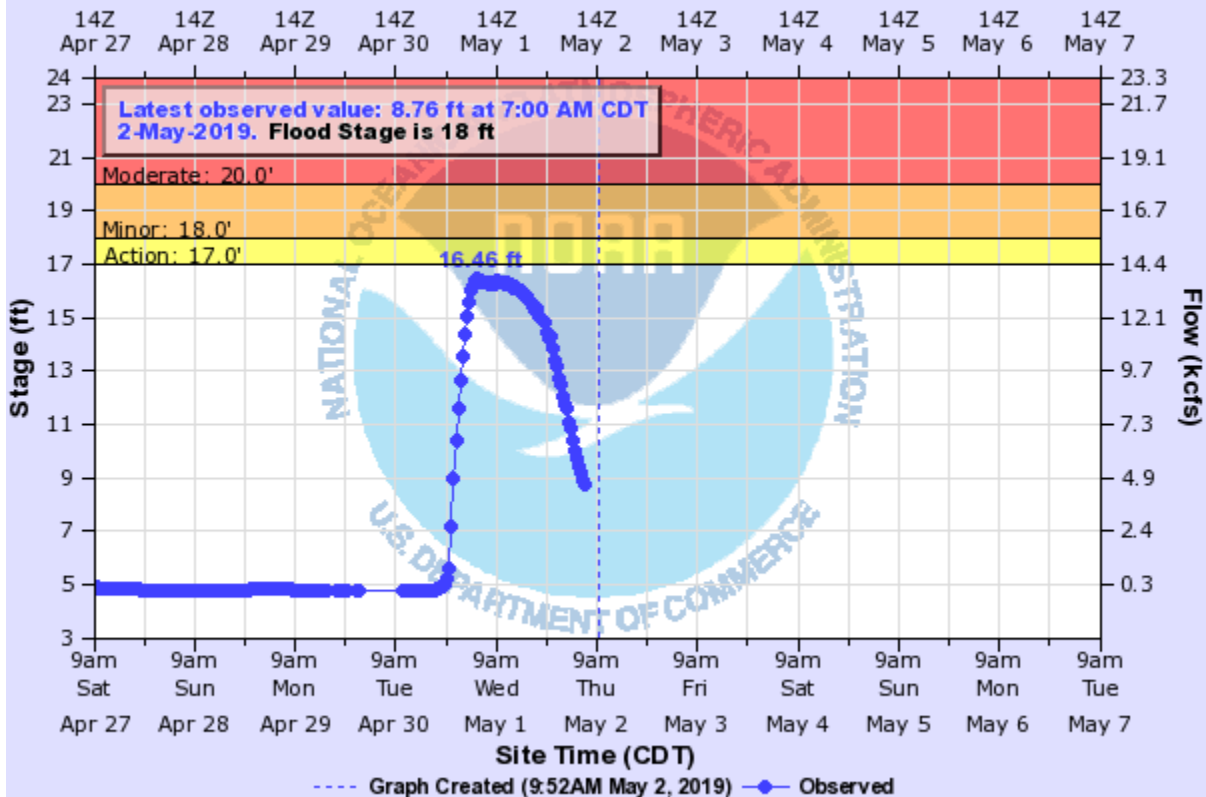


SPEO2(plotting HGIRG) "Gage 0" Datum: 579.43'

Observations courtesy of US Geological Survey

BIRD CREEK NEAR OWASSO

Universal Time (UTC)

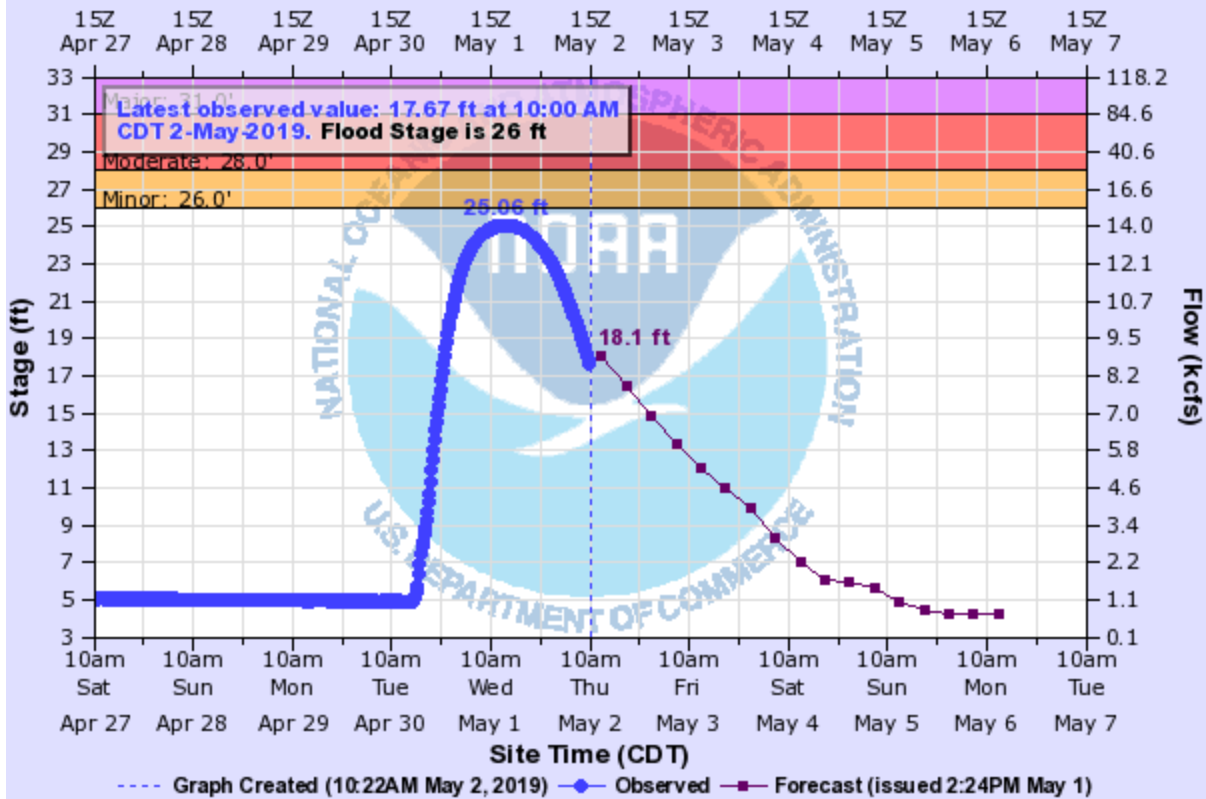


OWSO2(plotting HGIRG) "Gage 0" Datum: 560.17'

Observations courtesy of US Geological Survey

CANEY RIVER NEAR RAMONA

Universal Time (UTC)

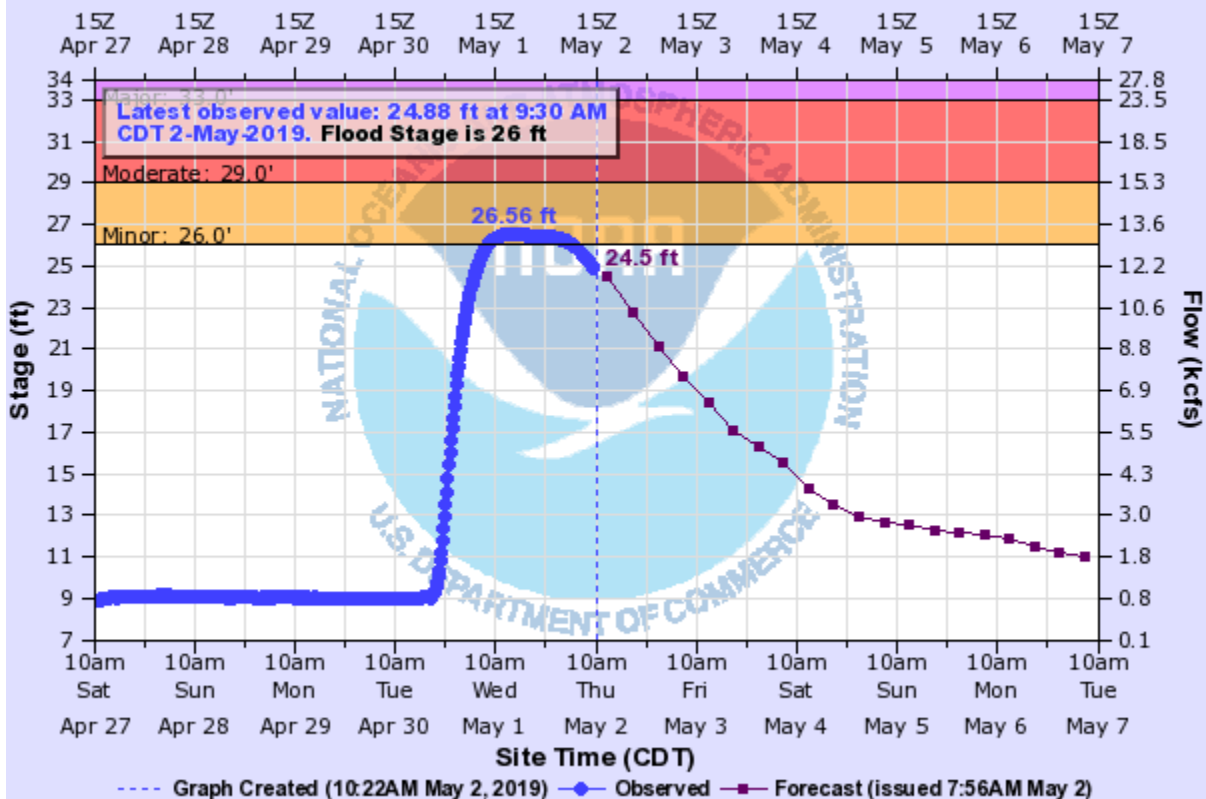


RAMO2(plotting HGIRG) "Gage 0" Datum: 586.43'

Observations courtesy of US Geological Survey

CANEY RIVER NEAR COLLINSVILLE

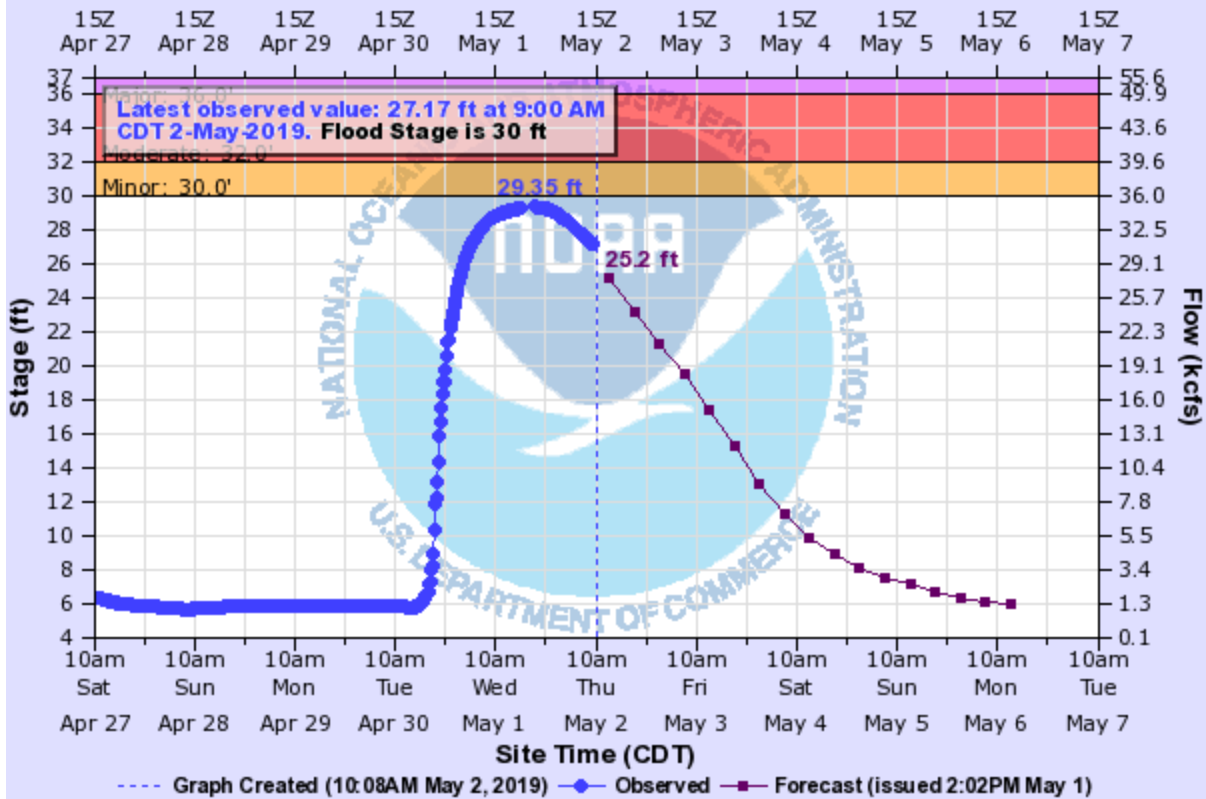
Universal Time (UTC)



CVLO2(plotting HGIRG) "Gage 0" Datum: 565.72'

VERDIGRIS RIVER NEAR LENAPAH

Universal Time (UTC)

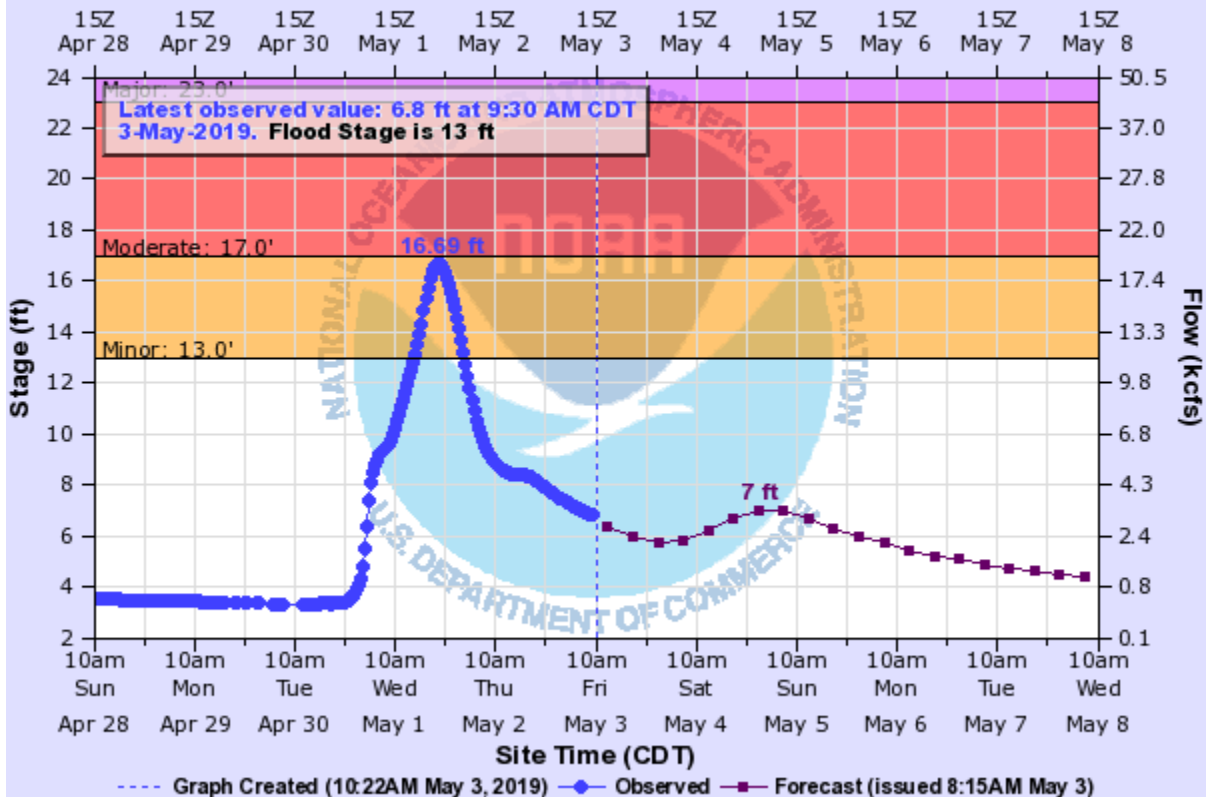


LEPO2(plotting HGIRG) "Gage 0" Datum: 644.9'

Observations courtesy of US Geological Survey

ILLINOIS RIVER (AR OK) NEAR WATTS

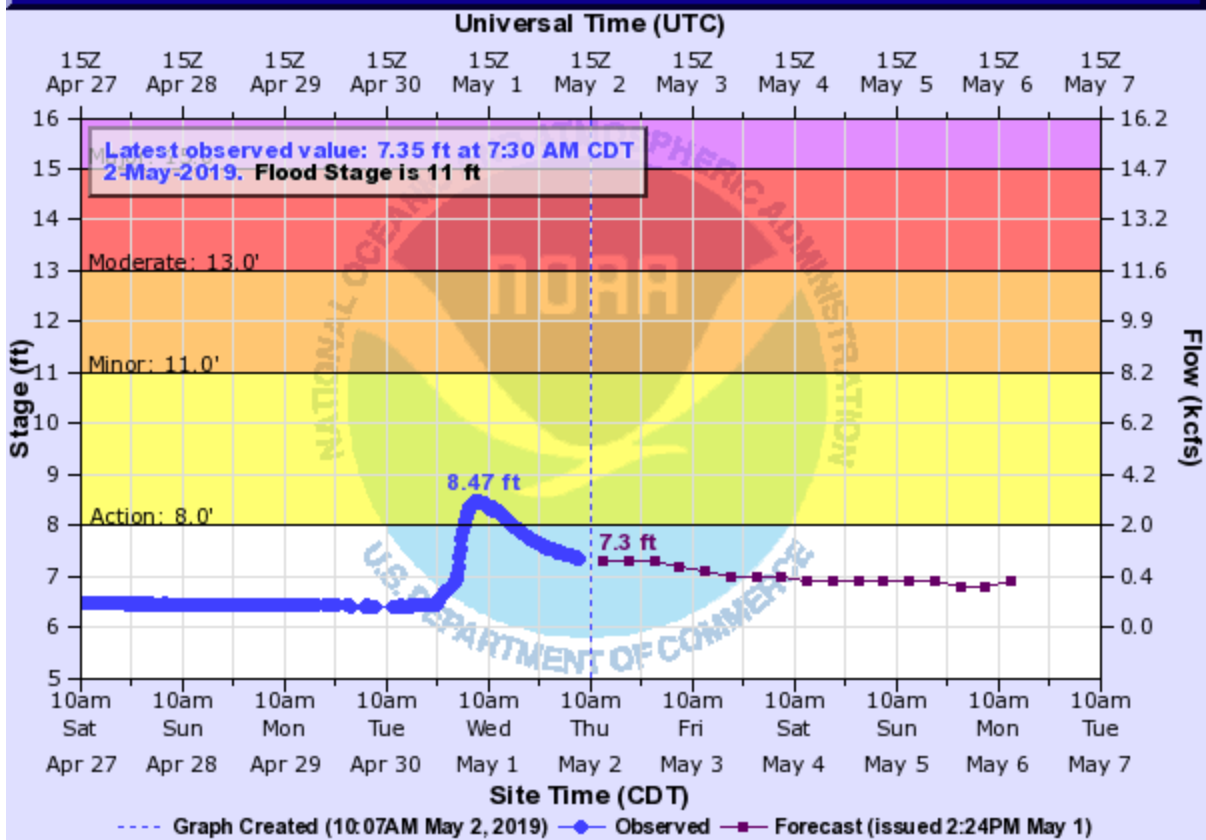
Universal Time (UTC)



WTTO2(plotting HGIRG) "Gage 0" Datum: 893.77'

Observations courtesy of US Geological Survey

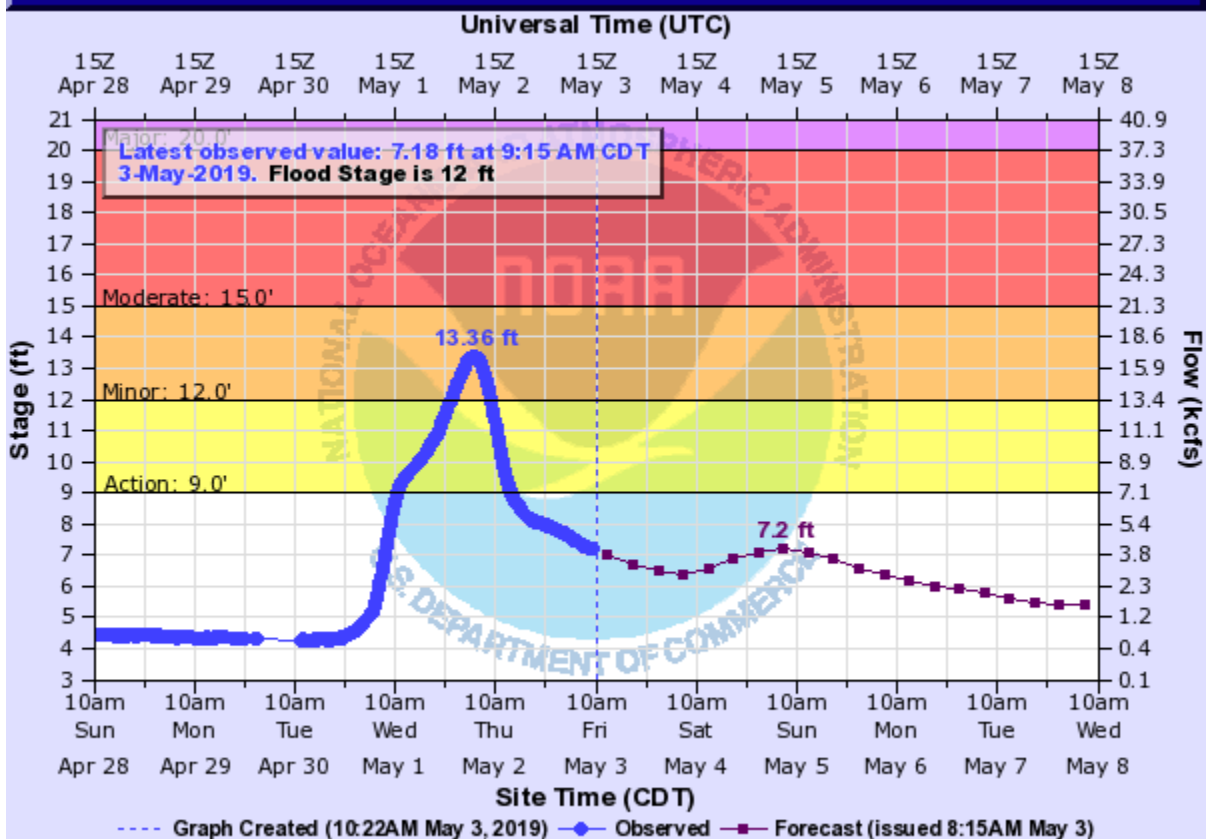
FLINT CREEK (OK) NEAR KANSAS



KNSO2(plotting HGIRG) "Gage 0" Datum: 854.59'

Observations courtesy of US Geological Survey

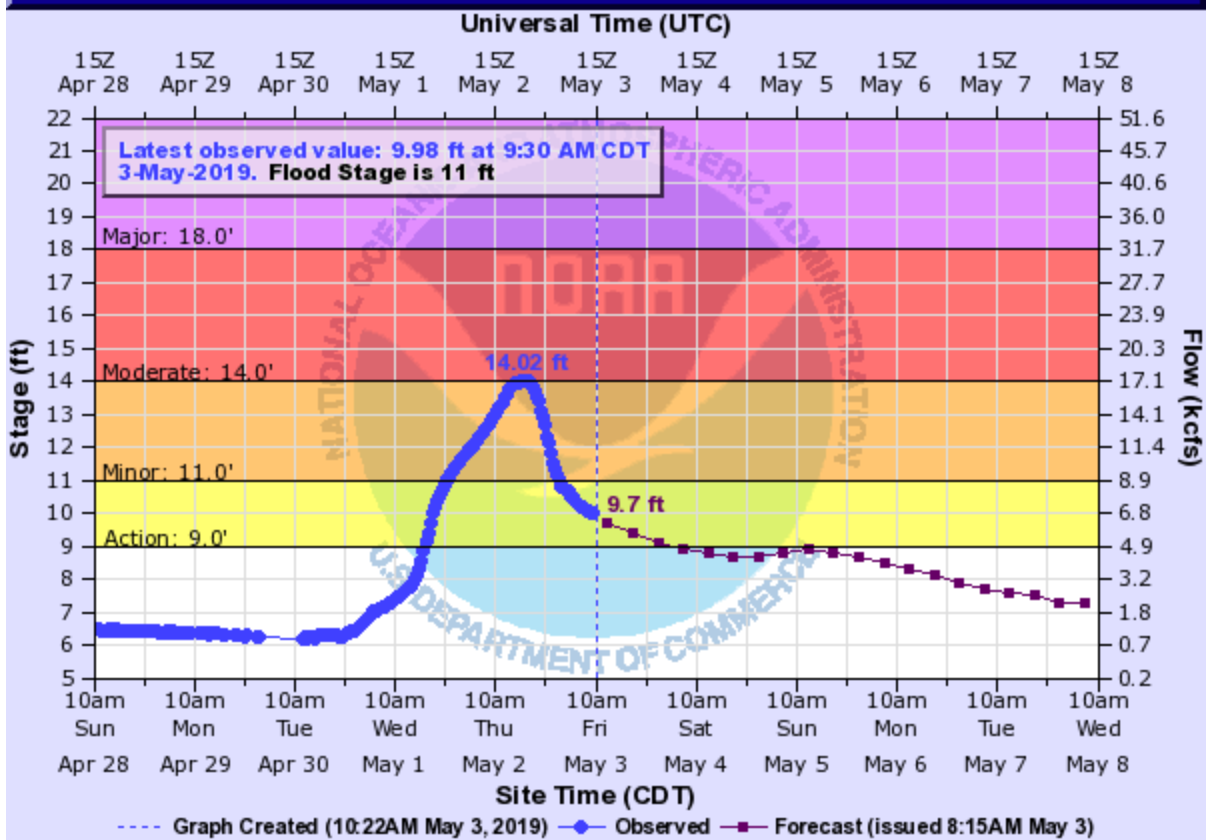
ILLINOIS RIVER (AR OK) AT CHEWEY



CWYO2(plotting HGIRG) "Gage 0" Datum: 800.88'

Observations courtesy of US Geological Survey

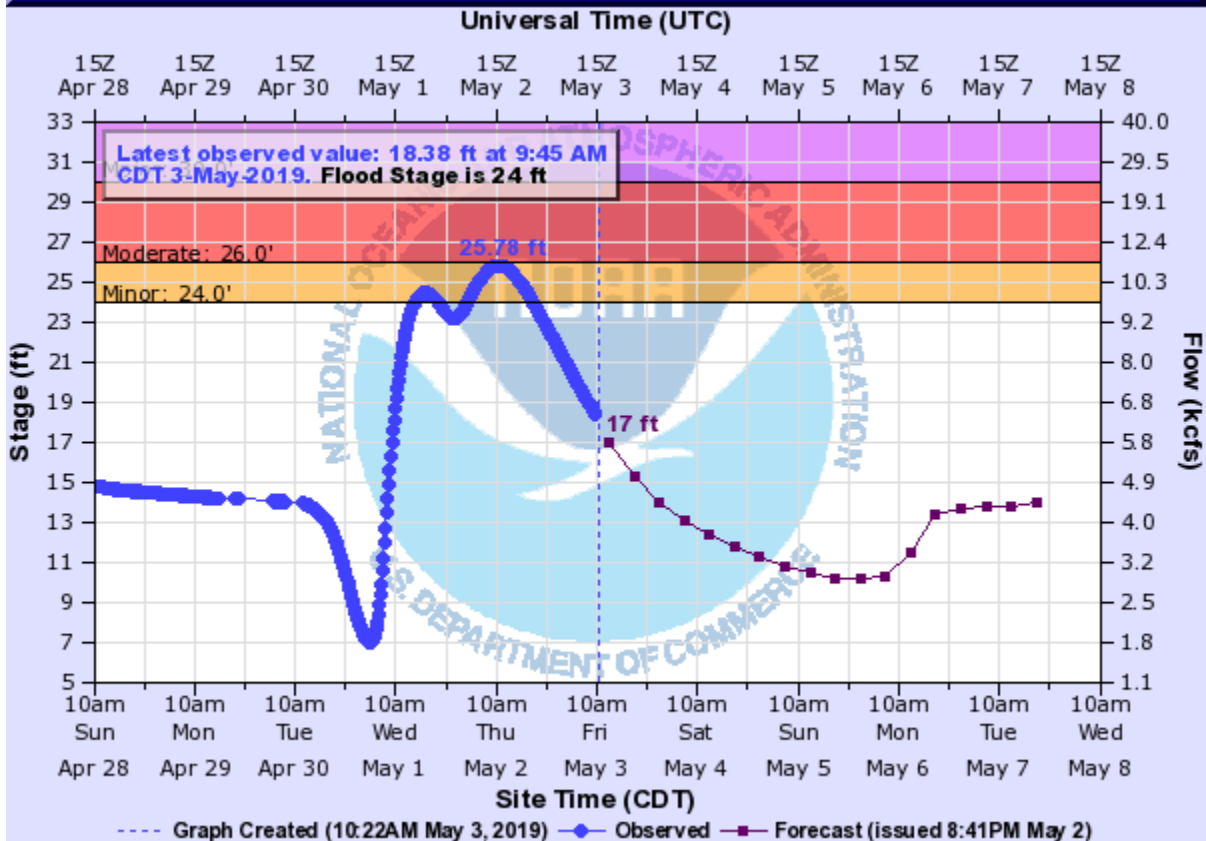
ILLINOIS RIVER (AR OK) NEAR TAHLEQUAH



TALO2(plotting HGIRG) "Gage 0" Datum: 664.14'

Observations courtesy of US Geological Survey

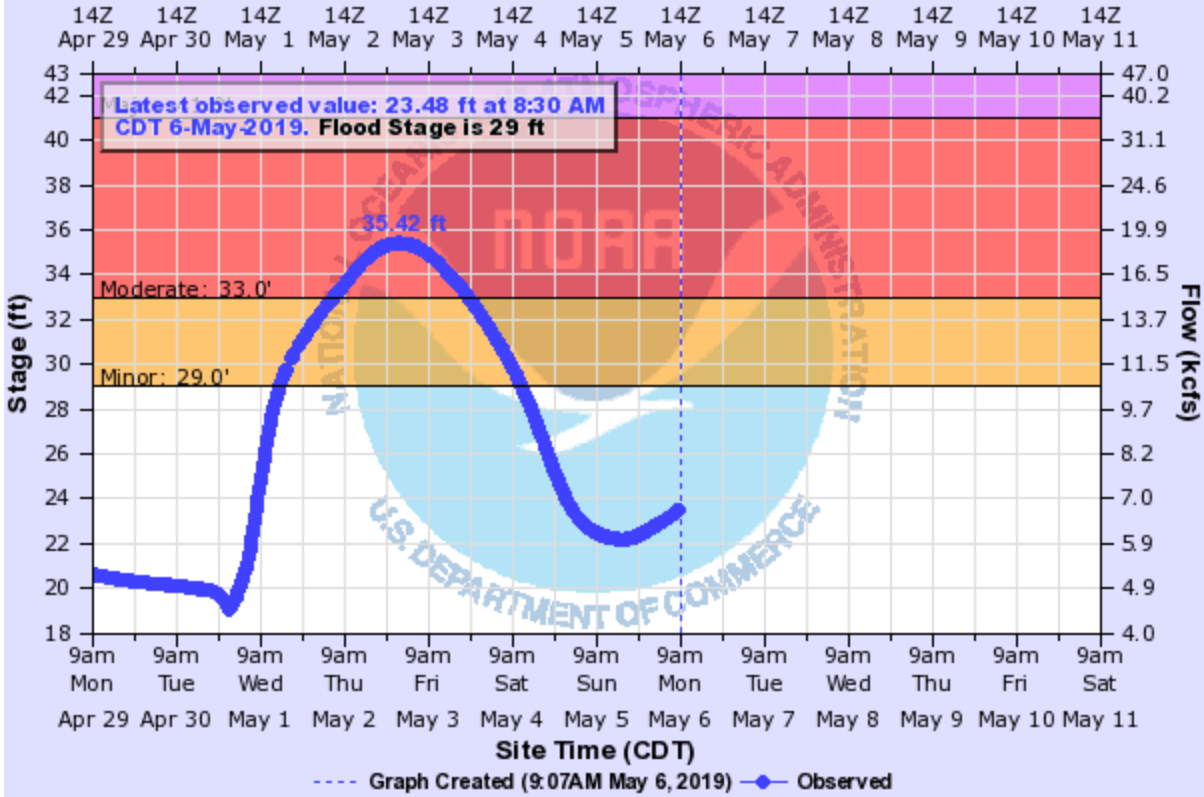
POTEAU RIVER NEAR POTEAU



PTAO2(plotting HGIRG) "Gage 0" Datum: 409.4'

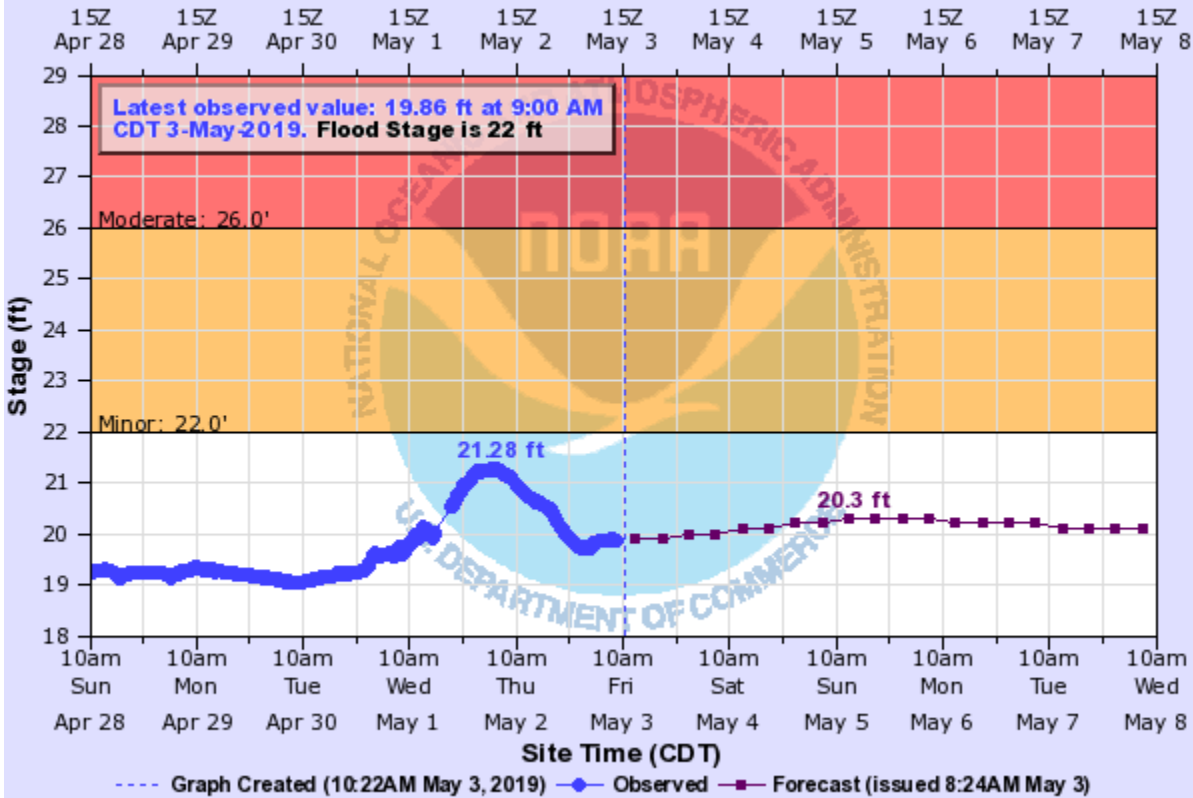
POTEAU RIVER NEAR PANAMA

Universal Time (UTC)

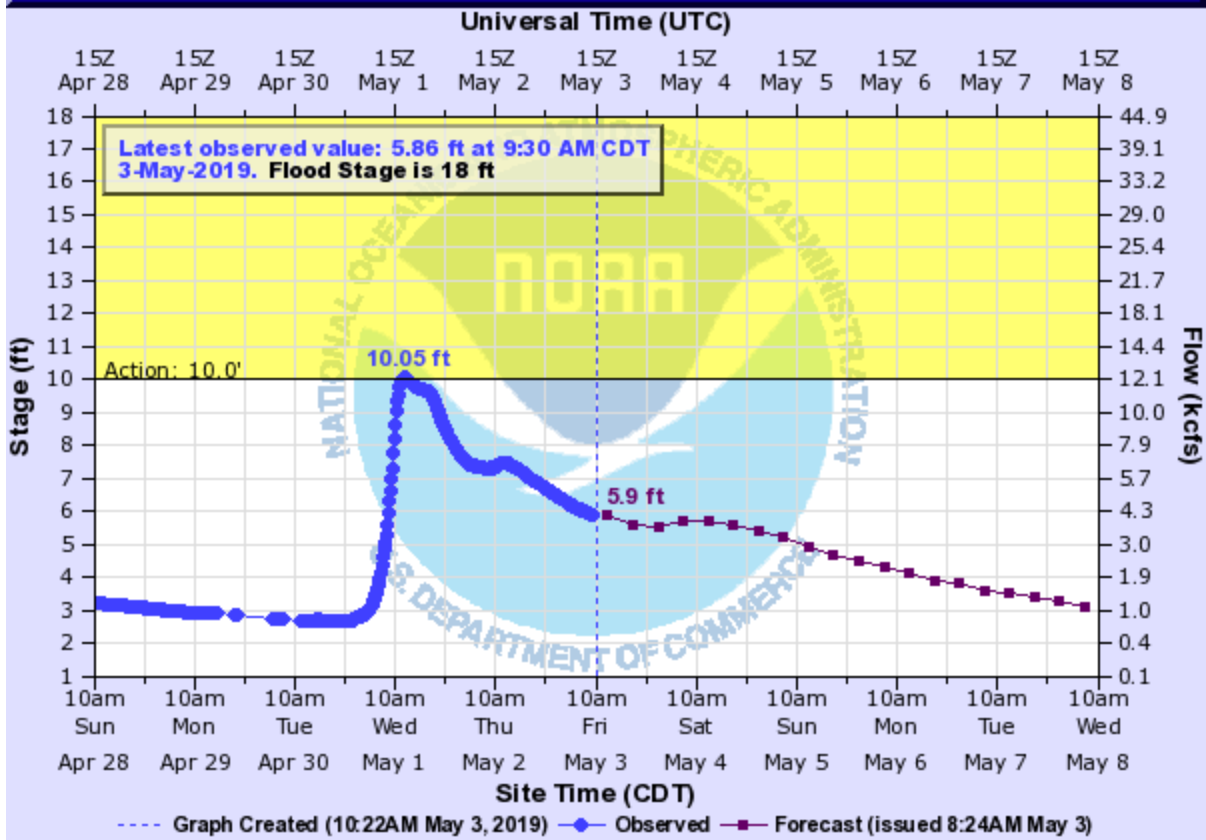


ARKANSAS RIVER AT VAN BUREN

Universal Time (UTC)



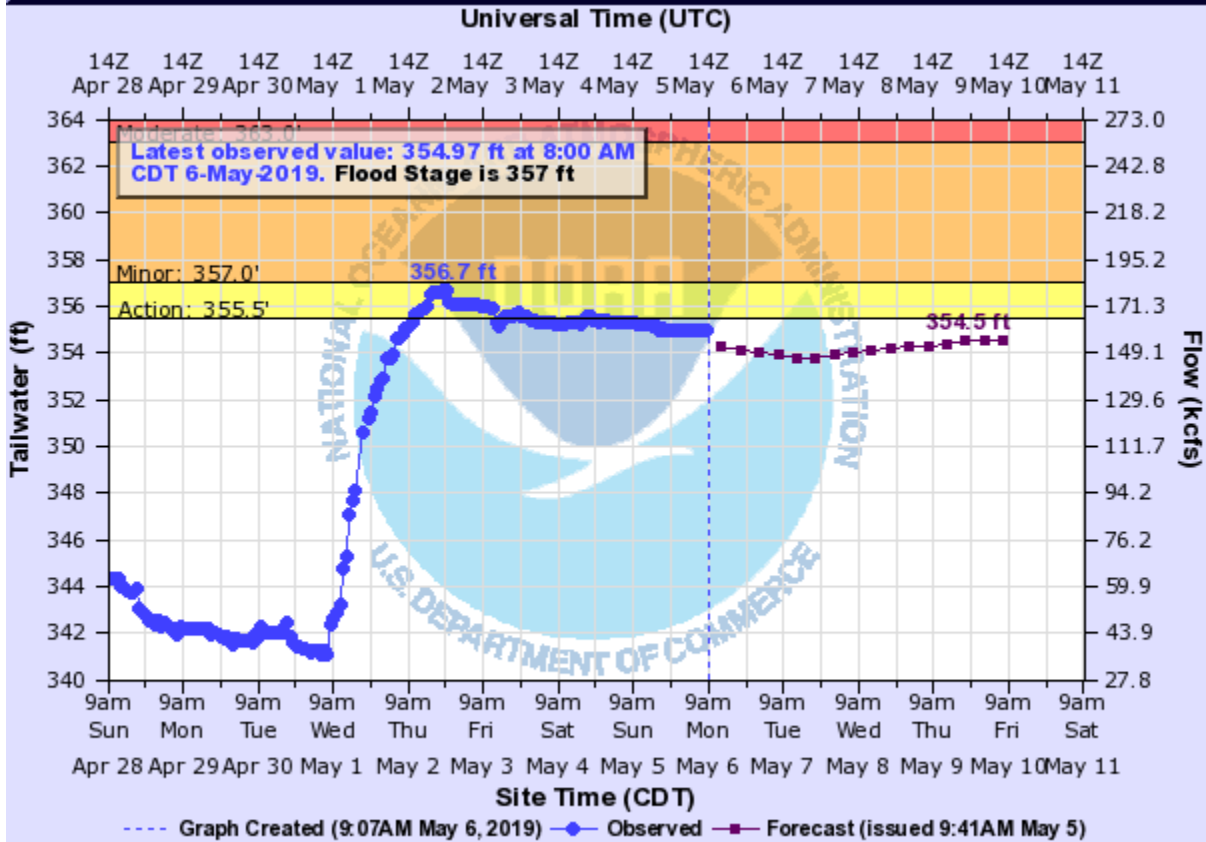
MULBERRY RIVER (AR) NEAR MULBERRY



MLBA4(plotting HGIRG) "Gage 0" Datum: 432.75'

Observations courtesy of USGS/USACE/ADEQ

ARKANSAS RIVER AT OZARK L/D TAILWATER

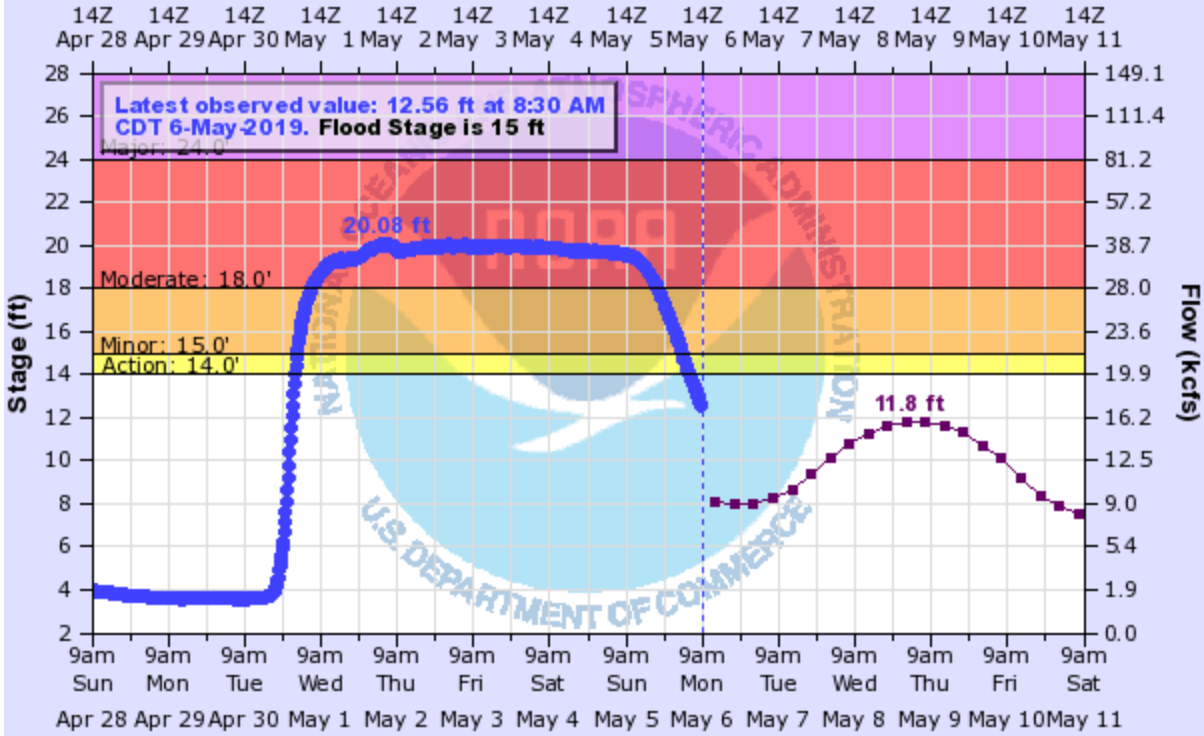


OZGA4(plotting HTIRG) "Gage 0" Datum: 0'

Observations courtesy of US Army Corps of Engineers - LRD

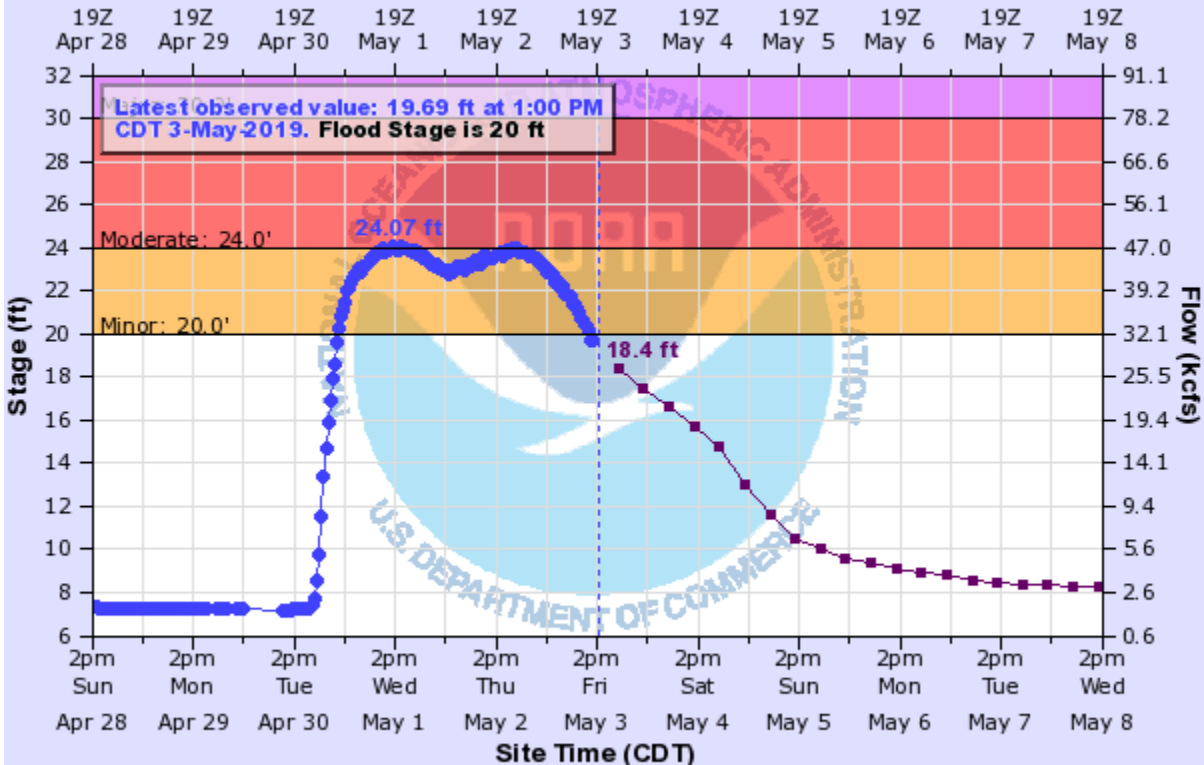
NEOSHO RIVER NEAR COMMERCE

Universal Time (UTC)



SPRING RIVER NEAR QUAPAW

Universal Time (UTC)



--- Graph Created (2:07PM May 3, 2019) ● Observed ■ Forecast (issued 1:50PM May 3)

KIAMICHI RIVER NEAR ANTLERS

Universal Time (UTC)

