

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 April YEAR 2021
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 May 14, 2021

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.

Major flooding occurred along the Illinois River and Lee Creek in east central OK and northwest AR at the end of the month due to a very heavy rain event. 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 2021 ranged from around 1.50" to around 4" northwest of I-44 and 4" to around 10" elsewhere across eastern OK and northwest AR. The heaviest rainfall occurred primarily across east central OK and northwest AR. The rainfall totals north of I-44 correspond to 25% to around 100% of the normal April rainfall, and elsewhere, the totals correspond to 110%-300% of the April normal (Fig. 1b). However, there were some pockets of slightly below normal rainfall totals across southeast OK.

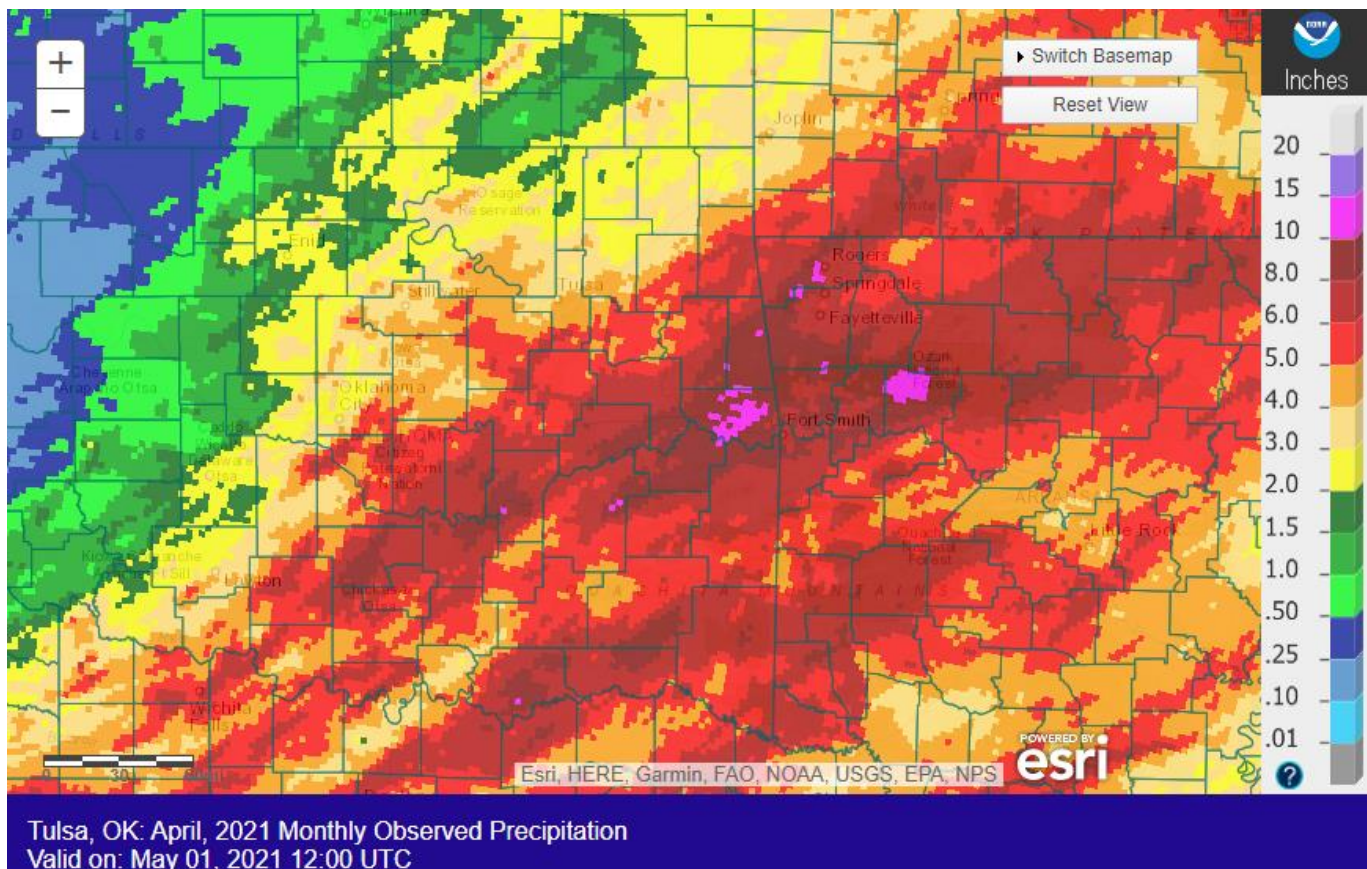


Fig. 1a. Estimated Observed Rainfall for April 2021

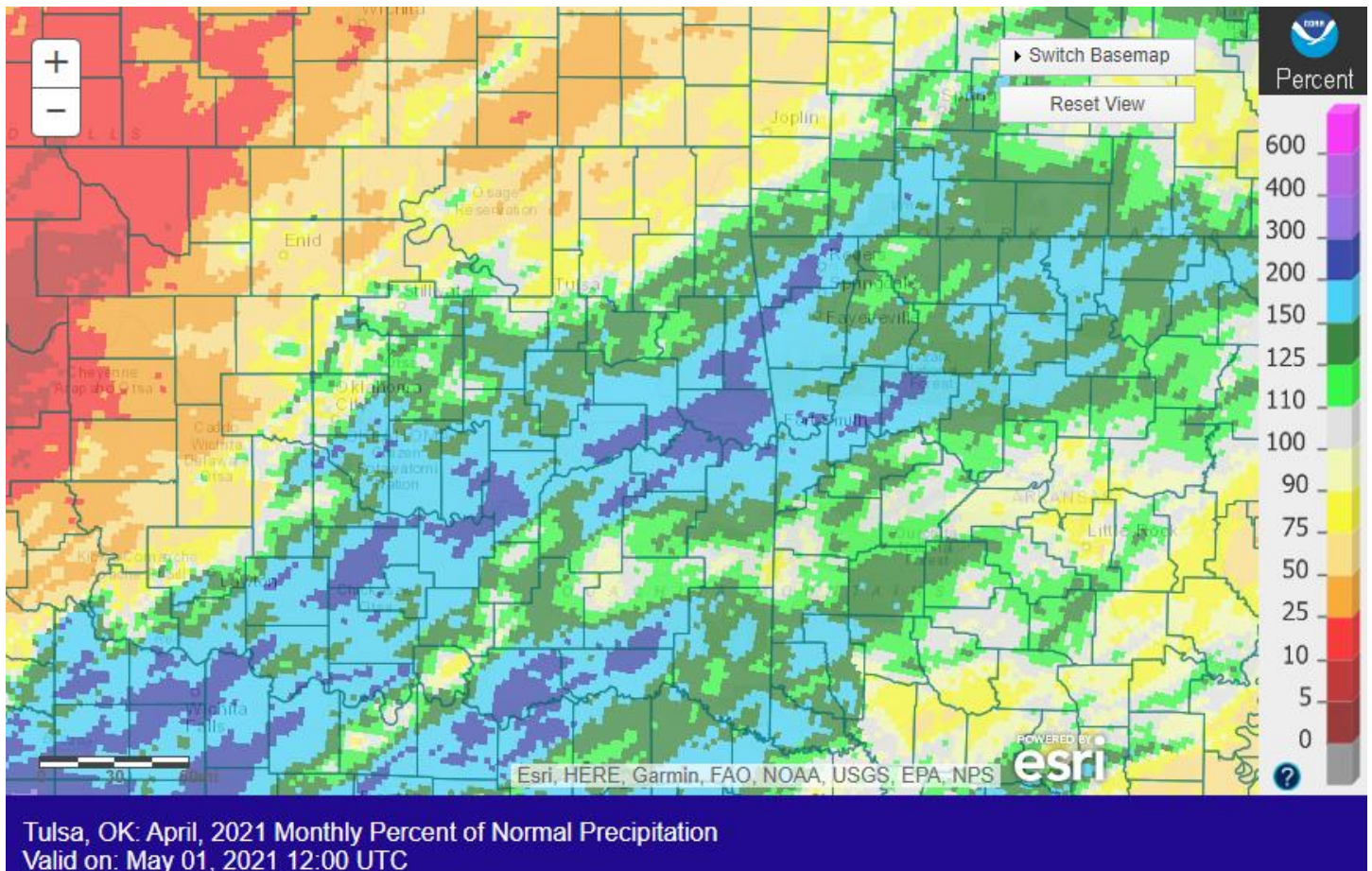


Fig. 1b. Estimated % of Normal Rainfall for April 2021

In Tulsa, OK, April 2021 ranked as the 49th coldest April (59.7°F; since records began in 1905), the 58th driest April (3.44", tied 1980; since records began in 1888), and the 5th snowiest April (Trace, tied 19 other years; since records began in 1900). Fort Smith, AR had the 24th coldest April (59.3°F; since records began in 1883) and the 19th wettest April (7.29", tied 1886; since records began in 1883). Fayetteville, AR had the 24th coldest (55.7°F, tied 1980), the 13th wettest (6.63"), and the 3rd snowiest (Trace, tied 18 other years) April since records began in 1950.

Some of the larger precipitation reports (in inches) for April 2021 included:

Rogers 2.4SSW, AR (coco)	11.33	Westville 3.0SSW, OK (coco)	10.29	Winslow 7NE, AR (coop)	10.15
Sallisaw 1.0SE, OK (coco)	10.11	Bentonville 6.6SSW, AR (coco)	10.11	Sallisaw, OK (meso)	10.09
Bunch 0.8N, OK (coco)	9.95	Springdale 6.4WSW, AR (coco)	9.76	Van Buren 2.1NNW, AR (coco)	9.47

Some of the lowest precipitation reports (in inches) for April 2021 included:

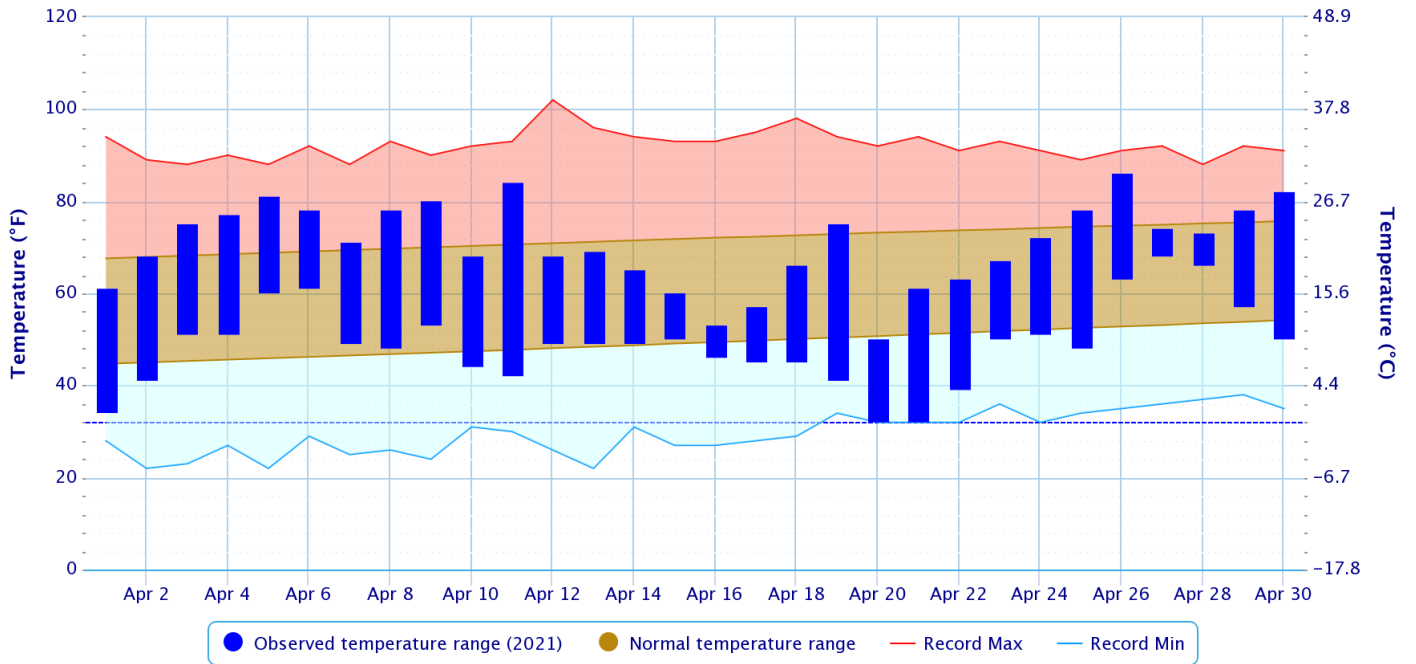
Foraker, OK (meso)	2.01	Bartlesville, OK (ASOS)	2.17	Ochelata 5.6N, OK (coco)	2.26
Copan, OK (meso)	2.38	Nowata, OK (meso)	2.63	Talala, OK (meso)	2.87
Miami, OK (meso)	2.89	Owasso 1.4NNW, OK (coco)	3.00	Vinita, OK (meso)	3.01

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

Rank since 1921	April 2021	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, 2020 – Apr 30, 2021)	Last 365 Days (May 1, 2020 – Apr 30, 2021)
Northeast OK	51 st wettest	36 th wettest	51 st wettest	31 st wettest	31 st wettest	26 th wettest	34 th wettest
East Central OK	8th wettest	18 th wettest	35 th wettest	34 th wettest	43 rd wettest	40 th wettest	19 th wettest
Southeast OK	22 nd wettest	37 th wettest	43 rd wettest	43 rd driest	45 th driest	37 th driest	23 rd wettest
Statewide	42 nd wettest	39 th wettest	45 th driest	50 th wettest	50 th driest	43 rd wettest	43 rd wettest

Daily Temperature Data - Tulsa Area, OK (ThreadEx)

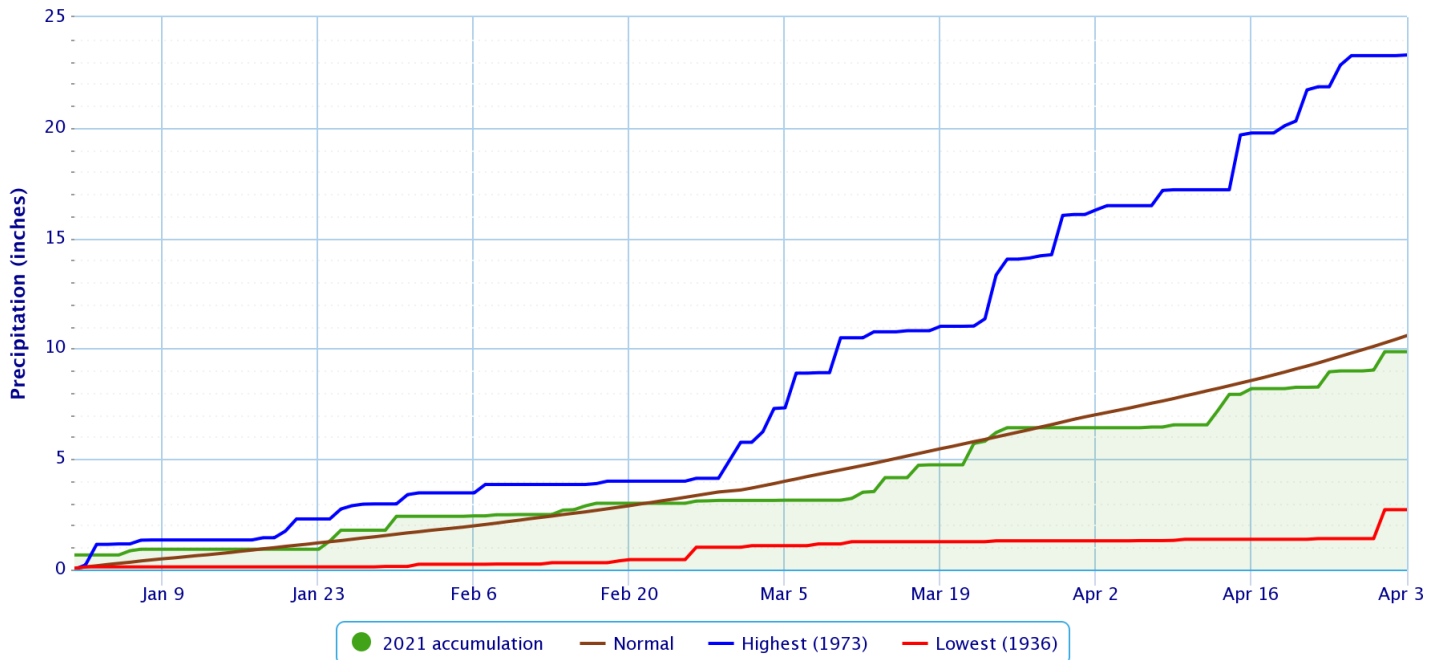
Period of Record - 1905-01-06 to 2021-05-02. Normals period: 1981-2010. Click and drag to zoom chart.



Powered by ACIS

Accumulated Precipitation - Tulsa Area, OK (ThreadEx)

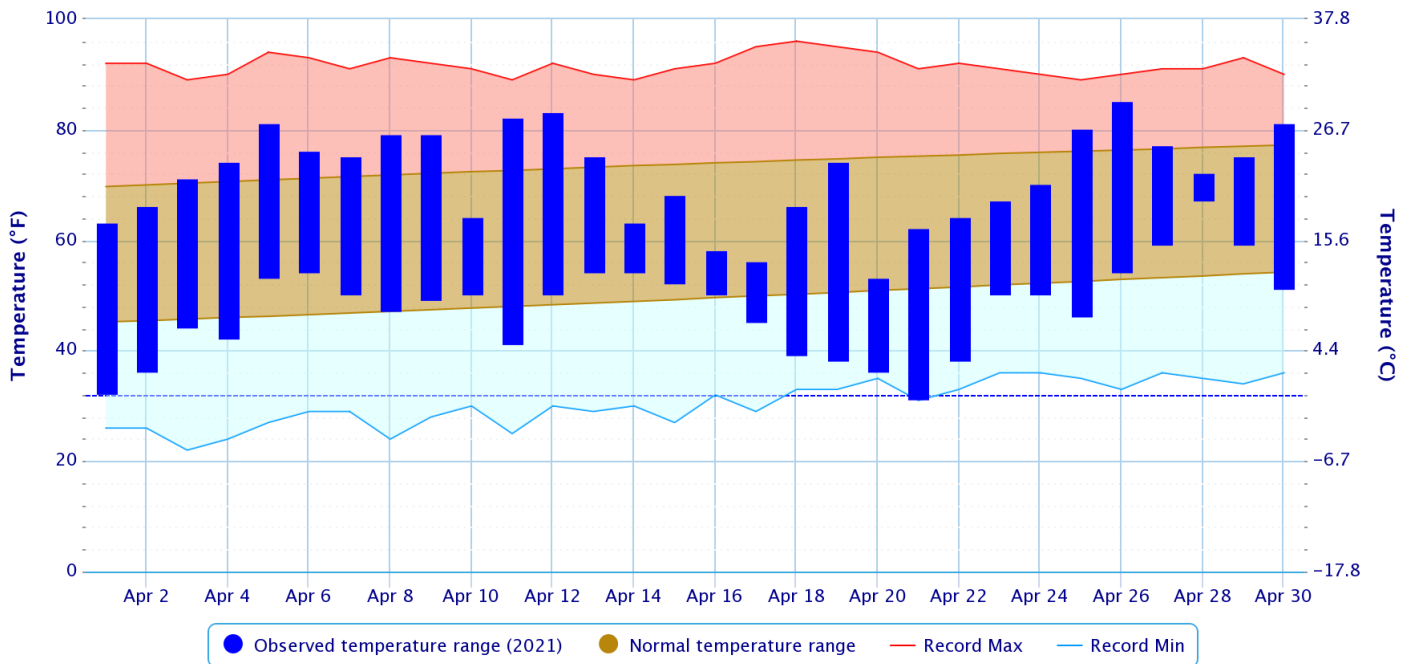
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



Powered by ACIS

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

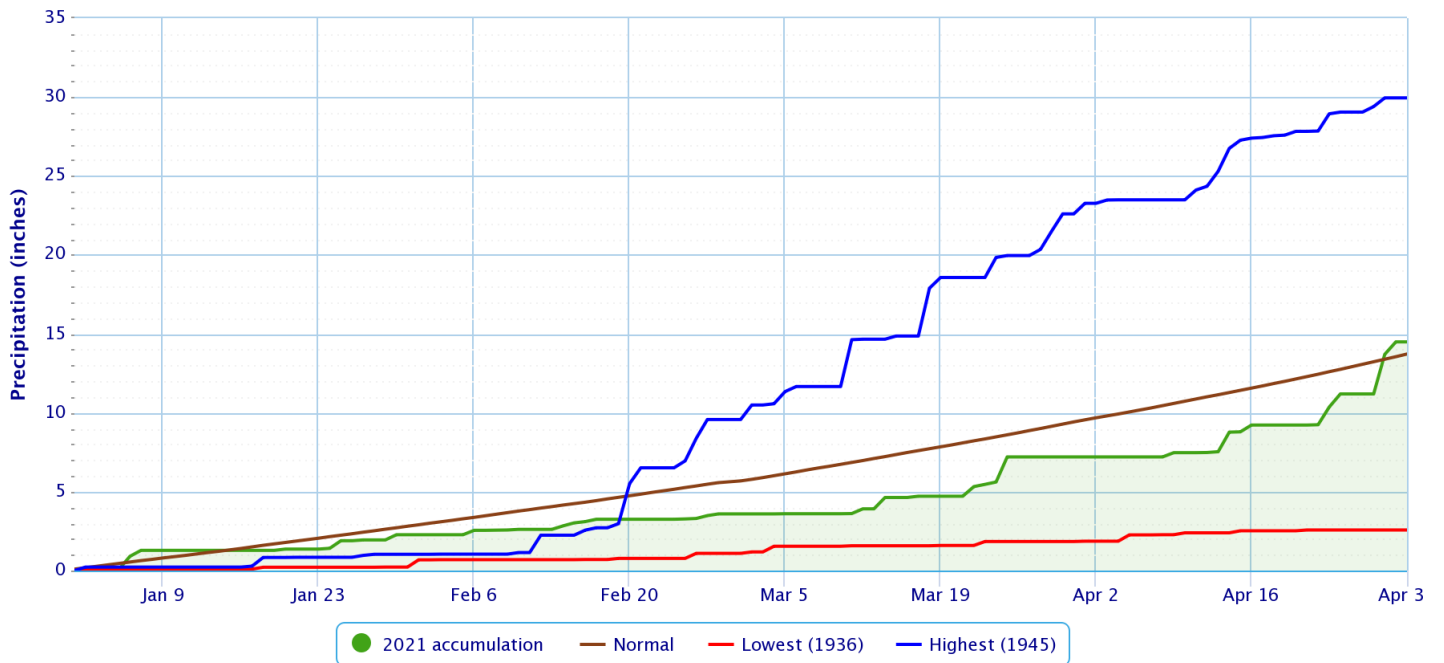
Period of Record – 1882-06-01 to 2021-05-02. Normals period: 1981-2010. Click and drag to zoom chart.



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Accumulated Precipitation – Fort Smith Area, AR (ThreadEx)

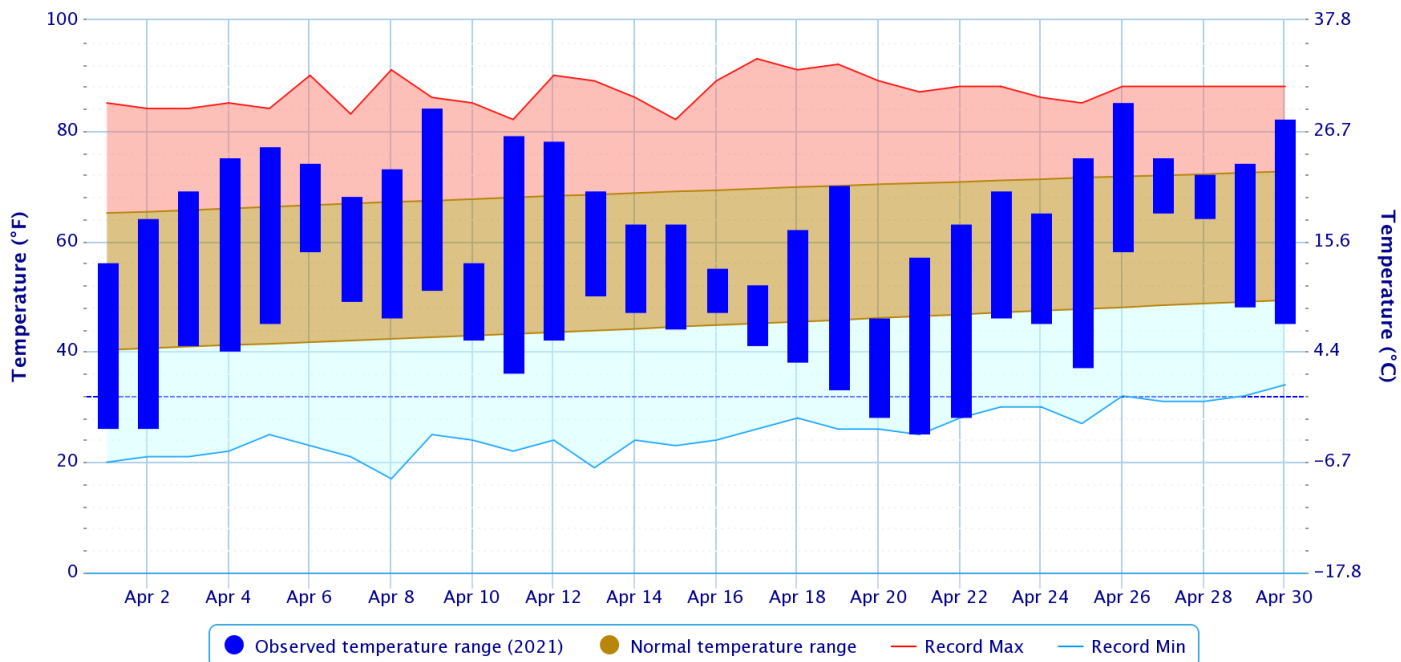
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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Daily Temperature Data – FAYETTEVILLE DRAKE FIELD, AR

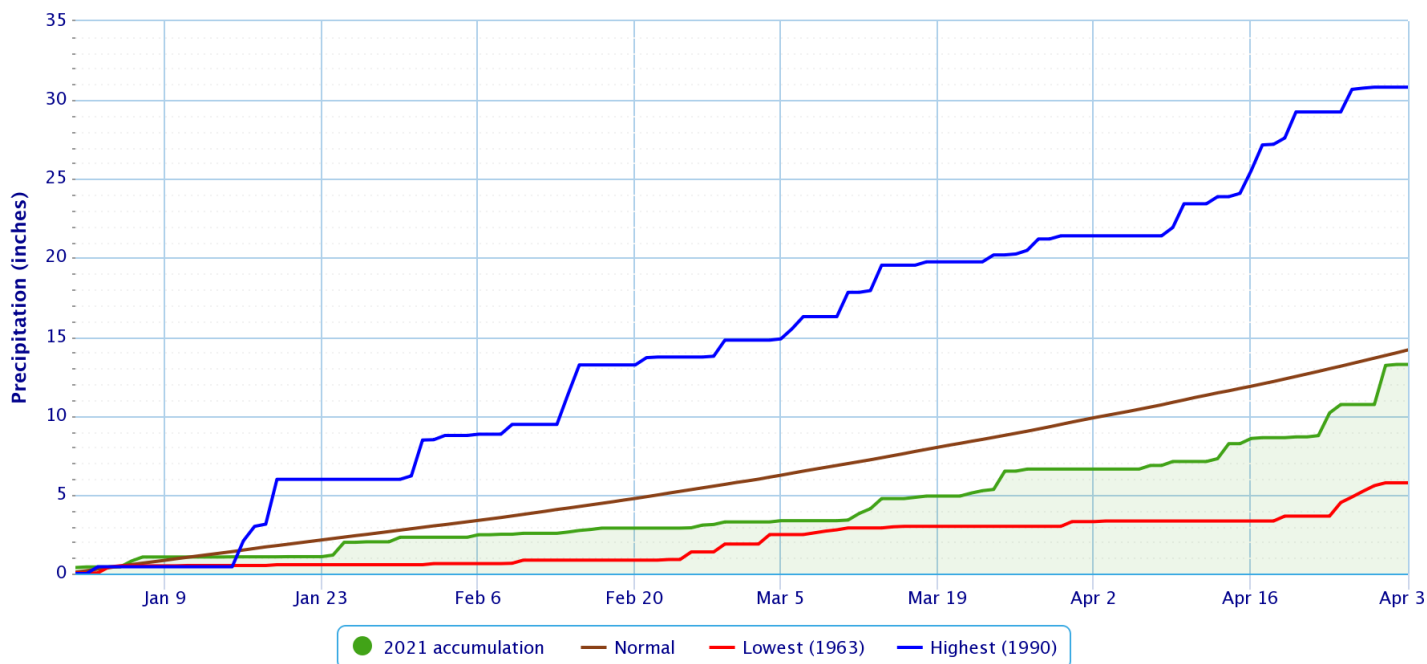
Period of Record – 1949-07-14 to 2021-05-02. Normals period: 1981-2010. Click and drag to zoom chart.



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

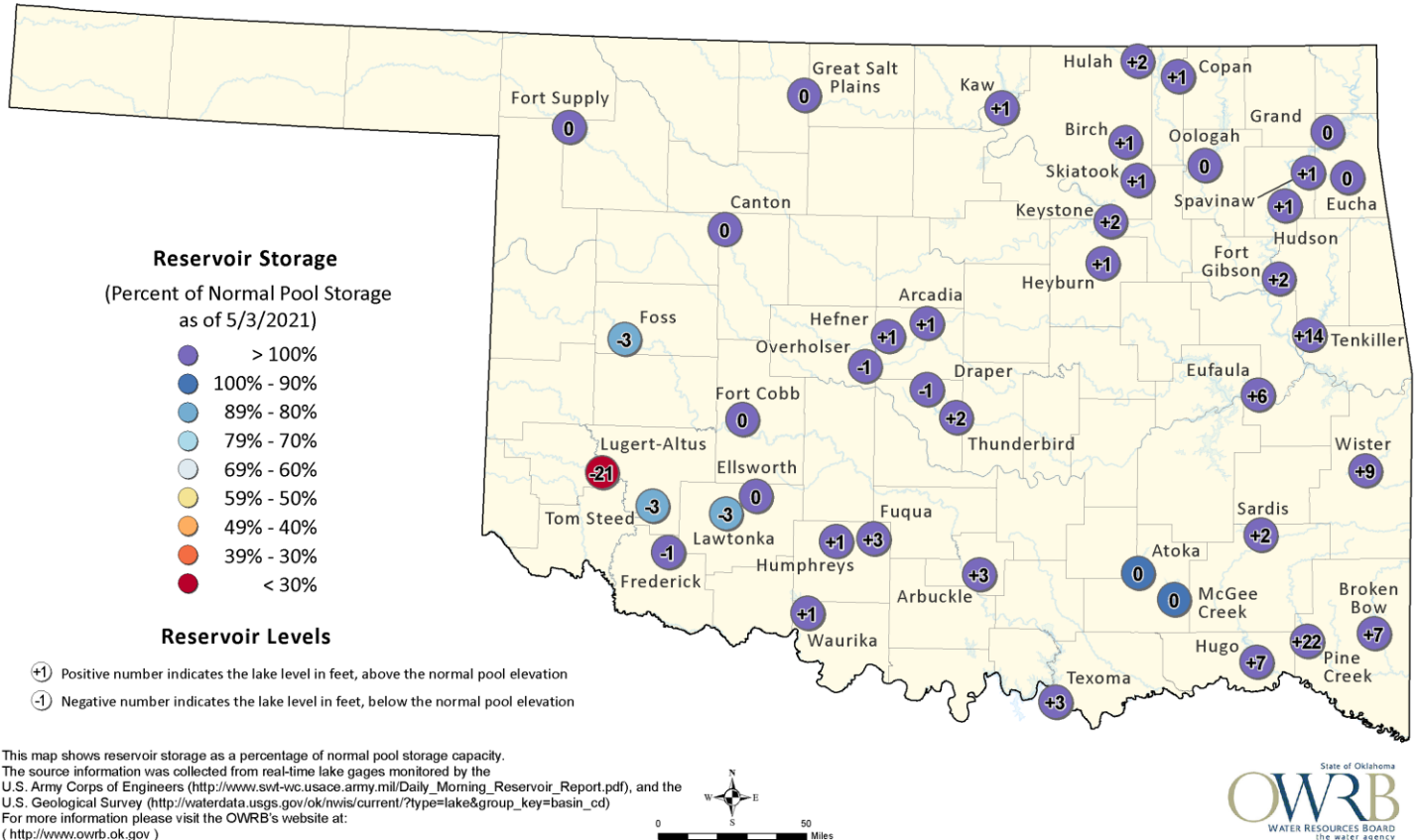


Powered by ACIS

Reservoirs

Oklahoma Surface Water Resources

Reservoir Levels and Storage as of 5/3/2021



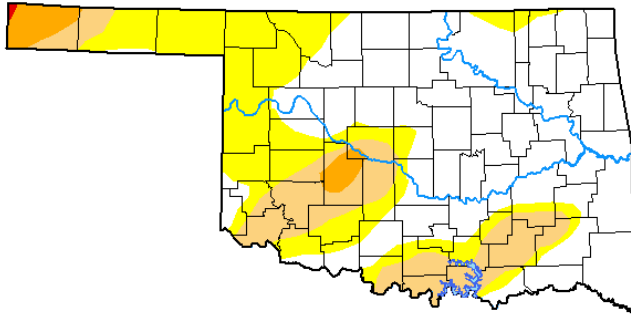
According to the USACE, many of the lakes in the HSA were higher than 3% of top of their conservation pools as of 4/30/2021: Beaver Lake 76%, Lake Eufaula 45%, Tenkiller Lake 38%, Sardis Lake 27%, Wister Lake 20%, Fort Gibson Lake 15%, Skiatook Lake 10%, Hugo Lake 10%, Keystone Lake 6%, Birch Lake 5%, and Grand Lake 4%.

Drought

According to the [U.S. Drought Monitor](#) (USDM) from May 4, 2021 (Figs. 3a, 3b), Moderate Drought (D1) conditions were present across portions of Pittsburg, Latimer, and Pushmataha Counties eastern OK. Abnormally Dry (but not in drought) conditions were occurring in a portion of Osage, Washington, Nowata, Pittsburg, Latimer, and Pushmataha Counties in eastern OK. No drought or abnormally dry conditions were present across northwest AR.

U.S. Drought Monitor Oklahoma

May 4, 2021
(Released Thursday, May. 6, 2021)
Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	57.13	42.87	17.20	3.02	0.08	0.00
Last Week 04-27-2021	43.60	56.40	20.02	6.30	0.08	0.00
3 Months Ago 02-02-2021	75.76	24.24	10.93	4.05	0.23	0.00
Start of Calendar Year 12-29-2020	56.83	43.17	25.21	7.75	1.45	0.00
Start of Water Year 09-29-2020	66.79	33.21	17.71	11.97	1.55	0.00
One Year Ago 05-05-2020	76.46	23.54	5.44	2.40	0.00	0.00

Intensity:

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

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>

Author:

David Simeral
Western Regional Climate Center



droughtmonitor.unl.edu

Fig. 3a. Drought Monitor for Oklahoma

U.S. Drought Monitor Arkansas

May 4, 2021
(Released Thursday, May. 6, 2021)
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 04-27-2021	99.34	0.66	0.00	0.00	0.00	0.00
3 Months Ago 02-02-2021	90.44	9.56	0.00	0.00	0.00	0.00
Start of Calendar Year 12-29-2020	16.45	83.55	6.87	0.00	0.00	0.00
Start of Water Year 09-29-2020	96.07	3.93	0.62	0.00	0.00	0.00
One Year Ago 05-05-2020	100.00	0.00	0.00	0.00	0.00	0.00

Intensity:

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

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>

Author:

David Simeral
Western Regional Climate Center



droughtmonitor.unl.edu

Fig. 3b. Drought Monitor for Arkansas

Outlooks

The [Climate Prediction Center](#) (CPC) outlook for May 2021 (issued April 30, 2021) indicates a greatly 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 was largely based on dynamical model output combined with the influence from La Niña and the Madden-Julian Oscillation (MJO), which is in a phase that would be counter to the impacts from La Niña.

For the 3-month period May-June-July 2021, CPC is forecasting a greatly enhanced chance for above normal temperatures and a slightly enhanced chance for below median precipitation across all of eastern OK and northwest AR (outlook issued April 15, 2021). This outlook is based on La Niña impacts and long-term trends, as well as incorporating both statistical and dynamical forecast tools. According to CPC, the combined effect of the ocean-atmosphere system is consistent with weakening La Niña conditions during April. There is an 80% chance of a transition from La Niña to ENSO-neutral conditions during May through June. CPC continues the La Niña Advisory.

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

Widespread showers and isolated thunderstorms moved into eastern OK and northwest AR during the evening of the 13th as a jet streak approached the region from the west. This activity continued through the overnight hours, before coming to an end from northwest to southeast during the early through mid-morning hours on the 14th. Rainfall totals ranged from 0.10" to 2", with the highest totals across east central OK and west central AR (Fig. 4).

A strong cold front brought an unseasonable cold airmass to eastern OK and northwest AR on the 20th. As an upper-level trough axis moved east-southeast across KS and OK behind the front, a mid-level band of frontogenetic forcing developed, resulting in a band of snow that affected northeast OK and northwest AR north of I-40 during the morning through afternoon hours. Most locations only received a trace of snow, with a trace to around 0.20" of liquid precipitation (Fig. 5). However, portions of far northwest AR received 1"-2" of snow. This was the second latest trace of snowfall on record for Tulsa OK. This late freeze set several record cold temperatures across the area during the day of the 20th and morning of the 21st.

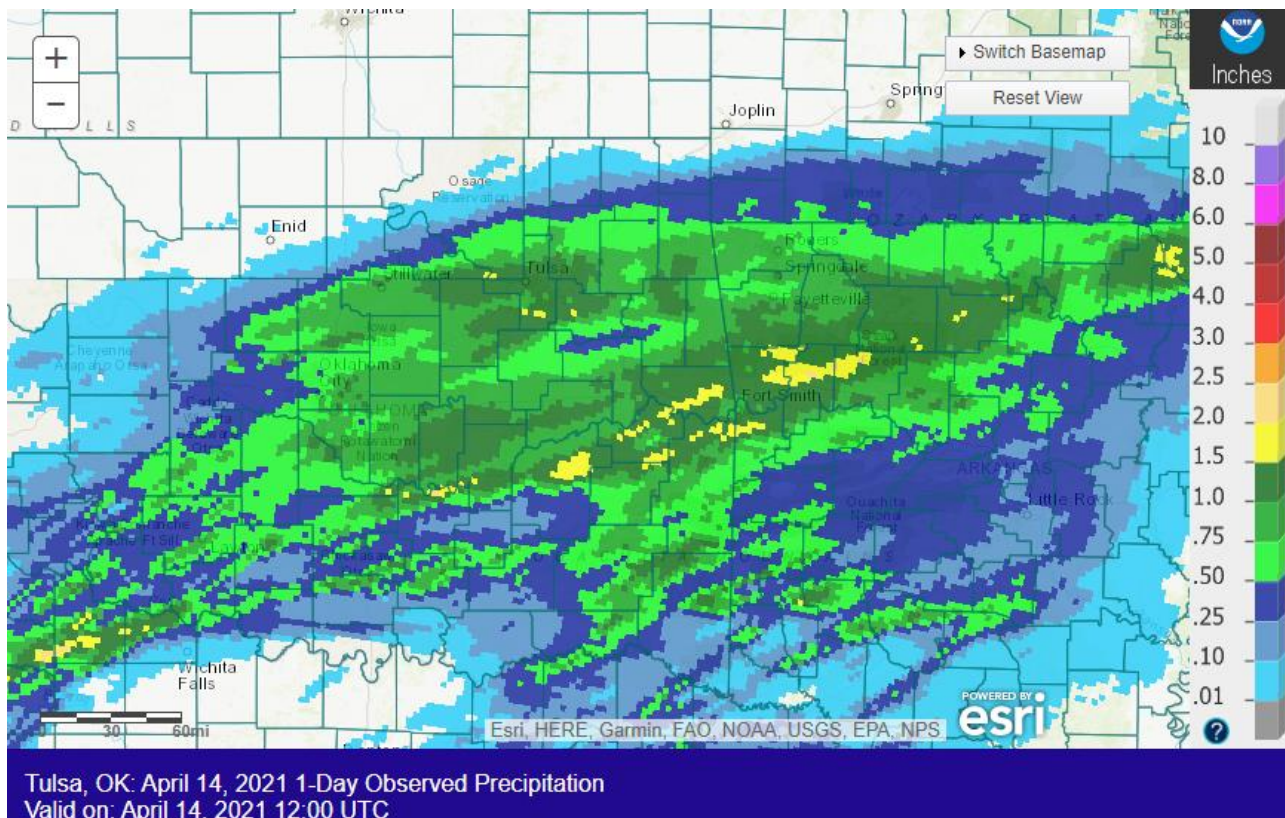
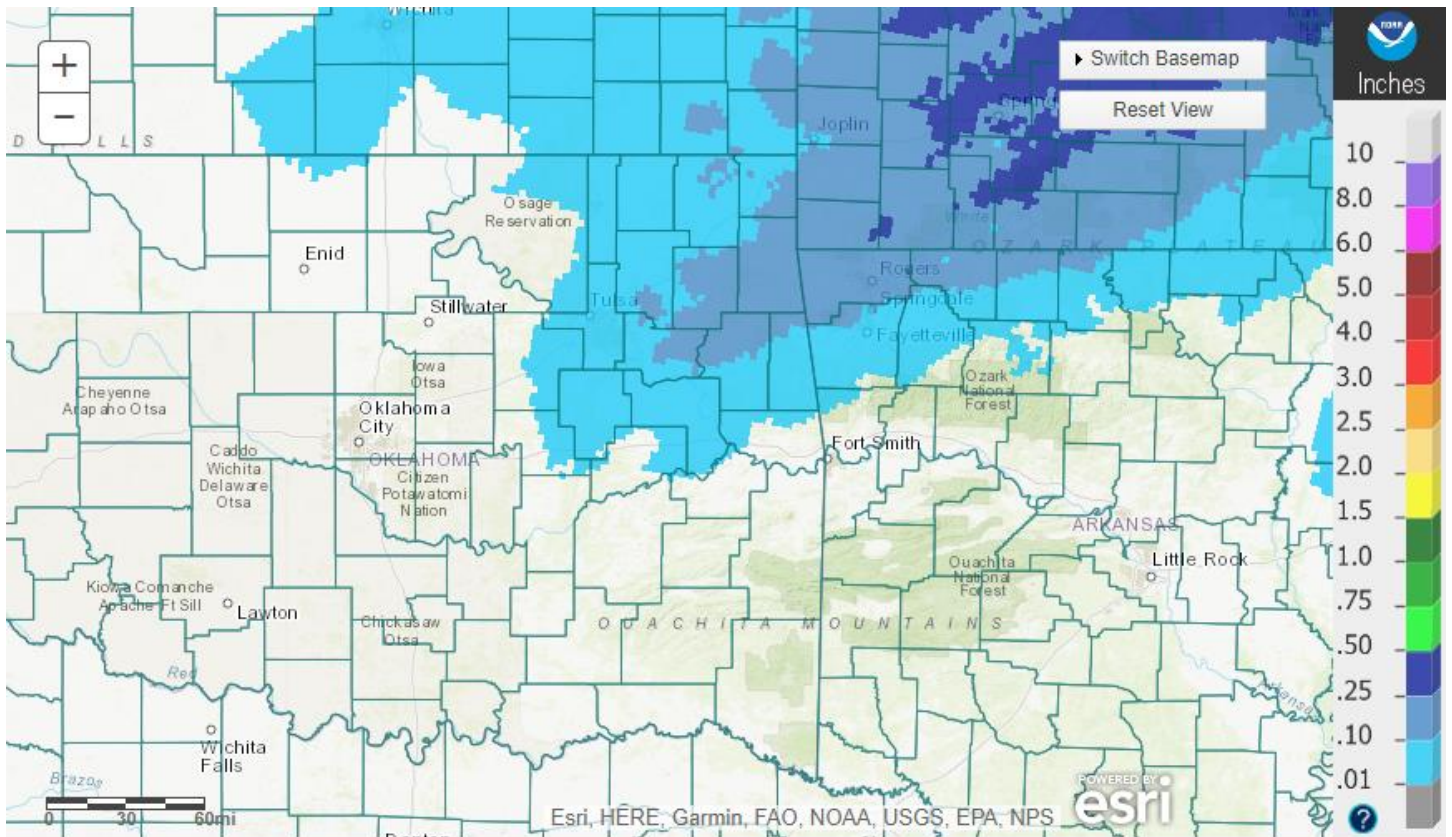
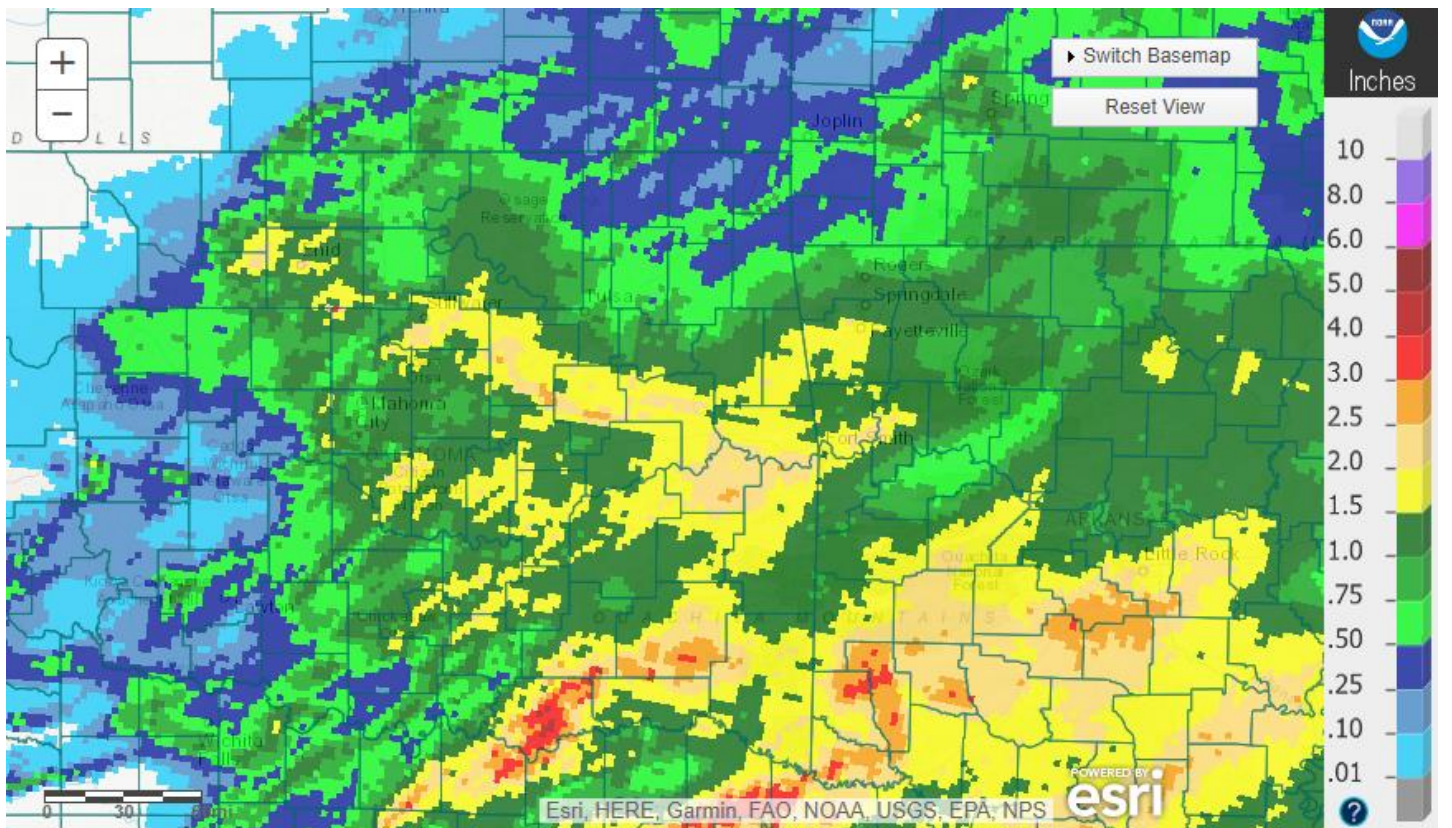


Fig. 4. 24-hour Estimated Observed Rainfall ending at 7am CDT 04/14/2021.



Tulsa, OK: April 21, 2021 1-Day Observed Precipitation
Valid on: April 21, 2021 12:00 UTC

Fig. 5. 24-hour Estimated Observed Rainfall ending at 7am CDT 04/21/2021.



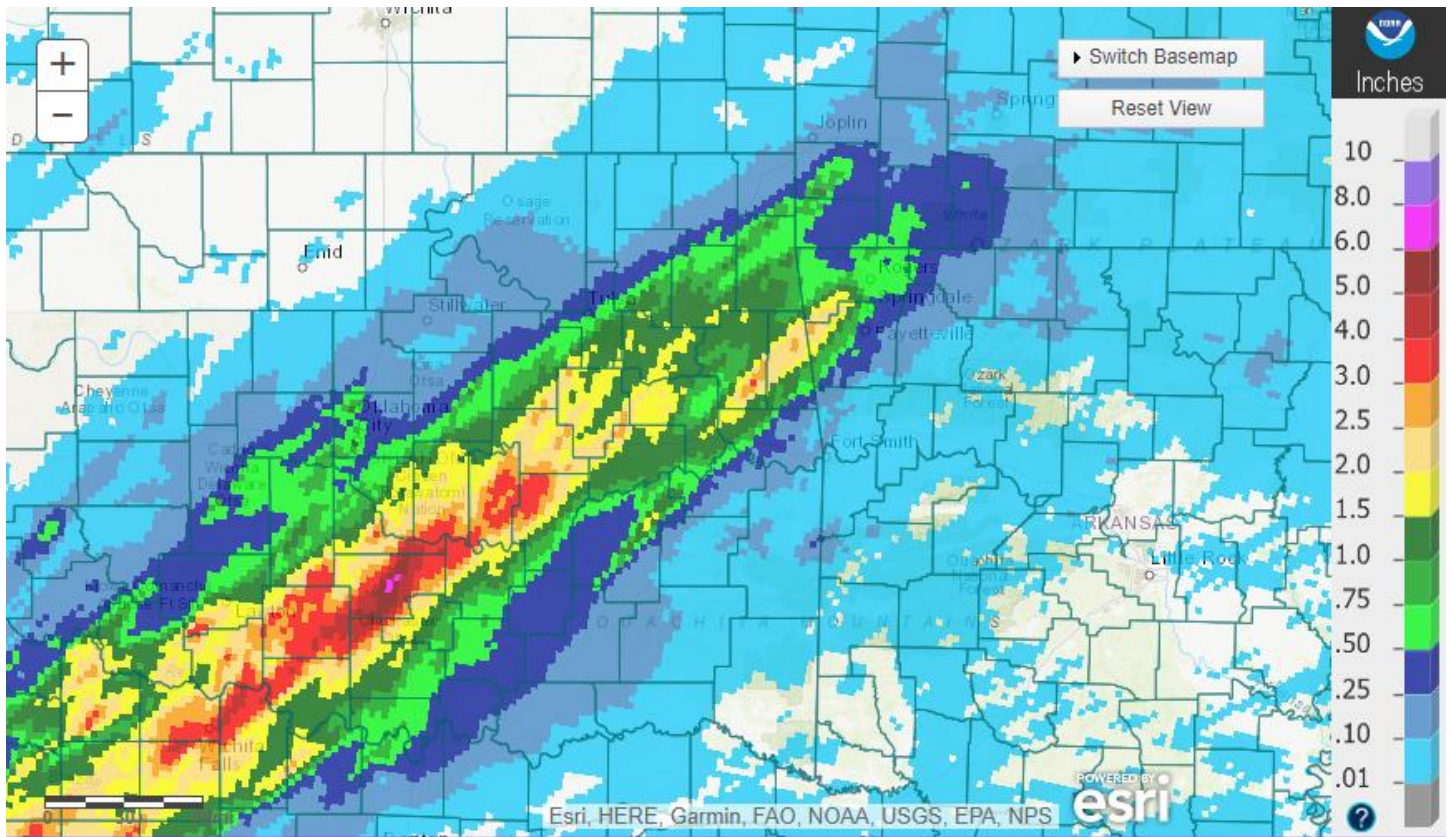
Tulsa, OK: April 24, 2021 1-Day Observed Precipitation
Valid on: April 24, 2021 12:00 UTC

Fig. 6. 24-hour Estimated Observed Rainfall ending at 7am CDT 04/24/2021.

Thunderstorms developed across southeast OK during the early afternoon of the 23rd within an area of modest warm air advection and instability. This activity increased and spread northward through the afternoon hours within the zone of enhanced lift. By mid-evening, widespread showers and thunderstorms were impacting eastern OK and northwest AR. Meanwhile, thunderstorms developed across northwest TX and southwest OK near the dryline-warm front intersection. These storms developed into a mesoscale convective system (MCS) as they moved eastward. The MCS entered eastern OK just before midnight and quickly progressed eastward across the region. The main area of rainfall ended from west to east during the pre-dawn hours, though some wrap around showers continued during the morning hours as the upper-level disturbance moved through. Rainfall totals were around 0.50" to around 3" for most of eastern OK and northwest AR (Fig. 6). This rainfall did cause a rise on area rivers, but the mainstem rivers did not flood (see preliminary hydrographs at the end of this report for the below flood stage rise along portions of the Illinois River and Poteau River).

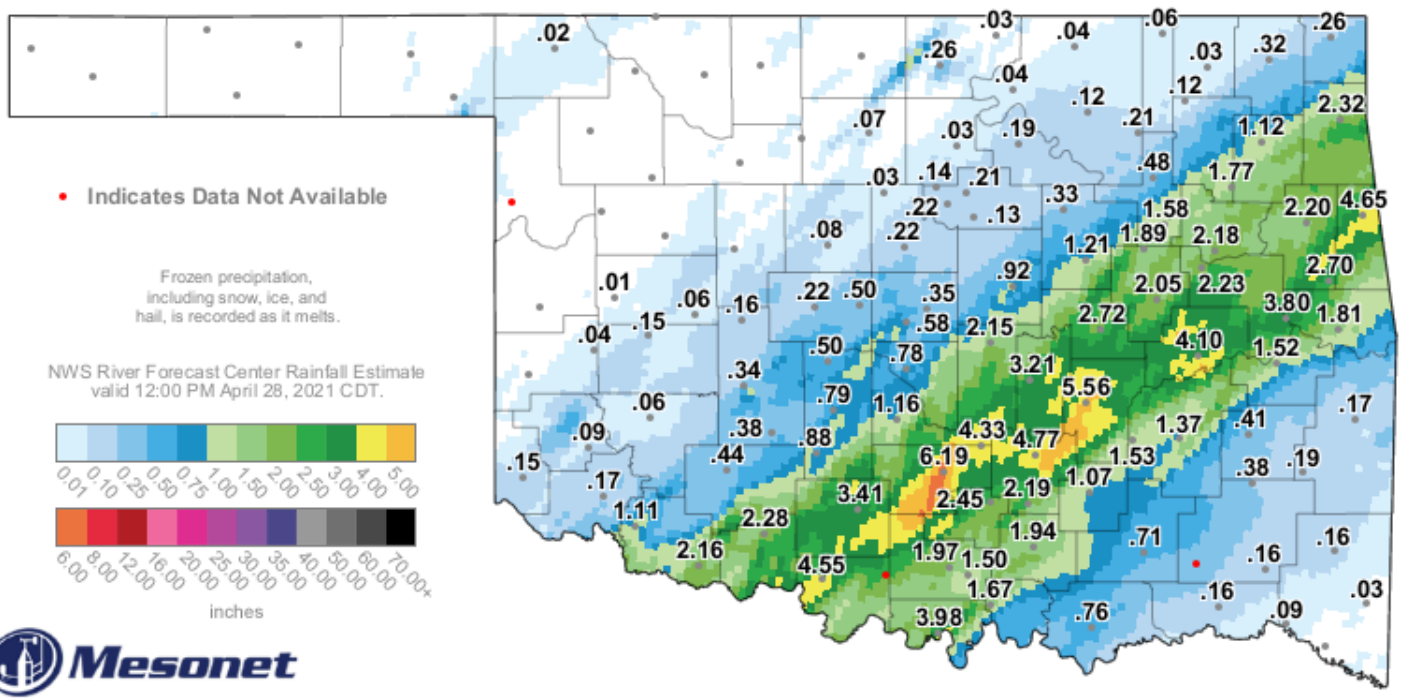
Showers and isolated thunderstorms moved into northeast OK mid-evening of the 27th. This activity continued during the evening near the I-44 corridor. As the night progressed, this activity spread further south and east and increased in intensity as the moisture depth increased along with a strengthening low-level jet. Precipitable water values were 1.4"-1.5" across the area, which is well above the 90th percentile and borderline historic for this time of year. As a result, intense rainfall rates occurred and several rounds of storms moved through the area during the overnight hours through much of the 28th. During the morning commute of the 28th, very heavy rain fell across northwest AR and adjacent portions of eastern OK, with one report of 6.44" of rain falling in just a couple of hours near Bentonville, AR. There were numerous reports of flooded streets and water rescues from this round of heavy rain. Moderate to strong low-level shear was also in place, and two tornadoes developed near Stilwell, OK on the morning of the 28th (see <https://arcg.is/8WXi1> for details). By 7 am CDT on the 28th, rainfall totals were around 0.50" to 3" from central OK into northwest AR (Fig. 7), but the rain was still ongoing. While the most intense rain ended by mid-morning on the 28th, widespread light to moderate rainfall continued across much of eastern OK and northwest AR south of I-44 through early afternoon. Some locations in northeast OK and northwest AR had received 3"-7" of rain at this point (Fig. 8). The convection then became more scattered during the afternoon hours across the region as warm air advection continued over a surface boundary located just south of the Red River. Periods of intense rainfall continued through the evening hours (Figs. 9, 10, 11). An area of stronger thunderstorms developed over southeast OK and west central AR during the late evening and continued for several hours past midnight before shifting east of the area. While the rain had ended for most of eastern OK and northwest AR by the pre-dawn hours, showers and thunderstorms continued across southeast OK into west central AR through noon on the 29th. Scattered showers then lingered until mid-evening near the Red River. The 24-hour rainfall total ending at 7am CDT on April 29 ranged from around 0.25" to around 7", with widespread 2"-4" across most of east central OK, southeast OK, and northwest AR (Fig. 11). Locations that had rain after 7am only received an additional trace to 0.50" of rain, though much of Choctaw County saw 0.25" to 0.75" of additional rain.

Rainfall totals for the entire event ranged from 1"-7" southeast of I-44 (Figs. 12, 13). The intense rainfall that fell primarily during the morning of April 28 impacted the Illinois River and Lee Creek basins (Fig. 14), resulting in major flooding (minor flooding occurred along the Baron Fork near Eldon). The heavy rainfall across east central OK and west central AR also caused flooding along the Arkansas River, Poteau River, and Mulberry River (Fig. 14). See the preliminary hydrographs at the end of this report and the E3 Report for details.



Tulsa, OK: April 28, 2021 1-Day Observed Precipitation
Valid on: April 28, 2021 12:00 UTC

Fig. 7. 24-hour Estimated Observed Rainfall ending at 7am CDT 04/28/2021.

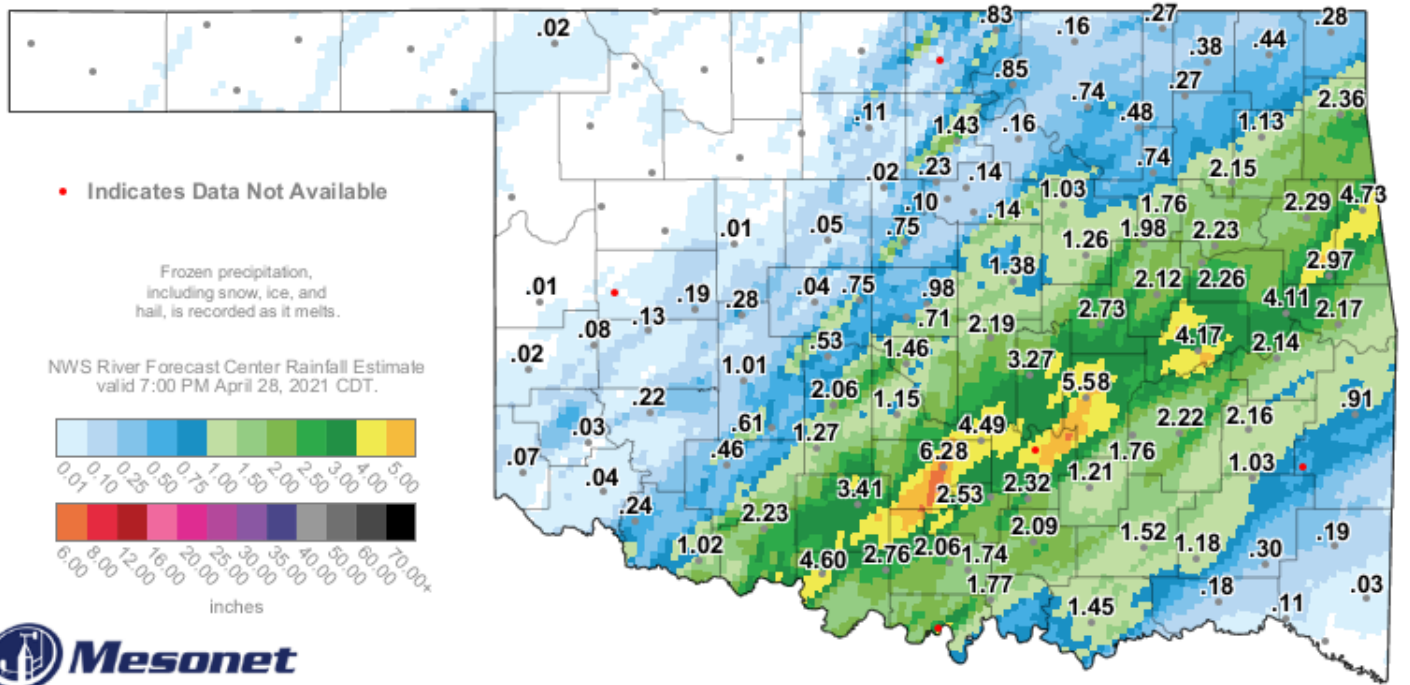


24-Hour Rainfall Accumulation (inches)

12:45 PM April 28, 2021 CDT

Created 12:50:55 PM April 28, 2021 CDT. © Copyright 2021

Fig. 8. OK Mesonet (values) and NWS RFC rainfall estimate (image) 24-hour rainfall ending at 12:45 pm CDT 4/28/2021. Rain was still ongoing at this time.

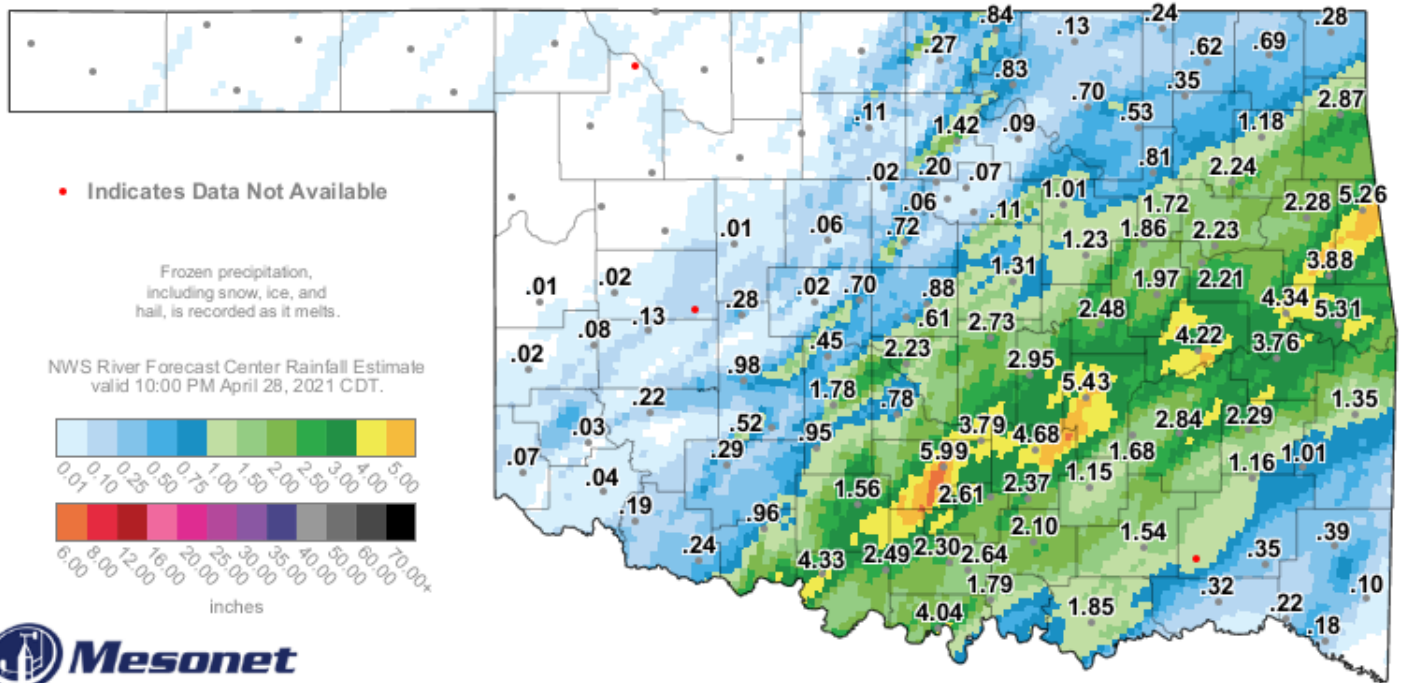


24-Hour Rainfall Accumulation (inches)

8:15 PM April 28, 2021 CDT

Created 8:20:51 PM April 28, 2021 CDT. © Copyright 2021

Fig. 9. OK Mesonet (values) and NWS RFC rainfall estimate (image) 24-hour rainfall ending at 8:15 pm CDT 4/28/2021. Rain was still ongoing at this time.

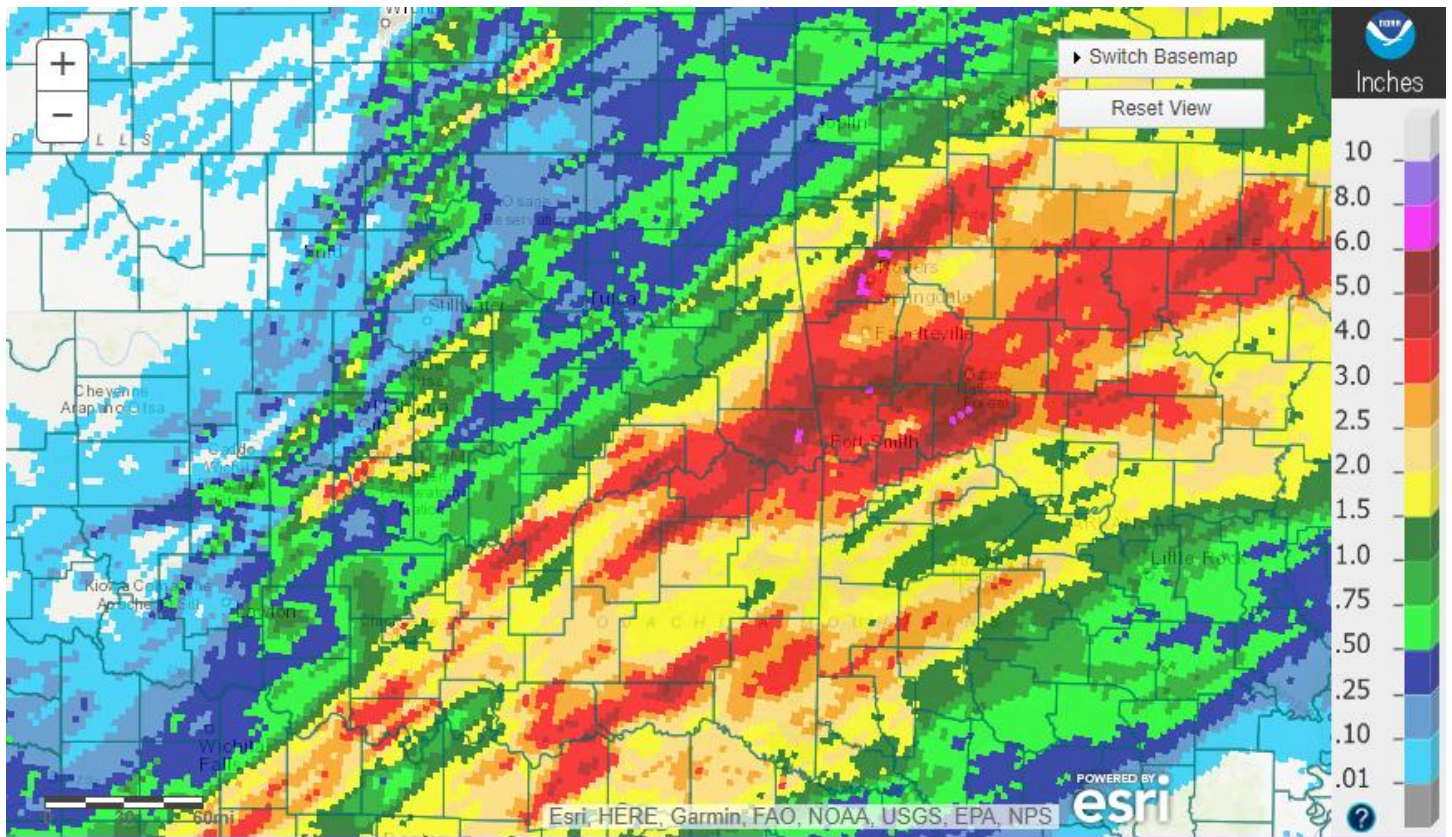


24-Hour Rainfall Accumulation (inches)

11:15 PM April 28, 2021 CDT

Created 11:20:44 PM April 28, 2021 CDT. © Copyright 2021

Fig. 10. OK Mesonet (values) and NWS RFC rainfall estimate (image) 24-hour rainfall ending at 11:15 pm CDT 4/28/2021. Rain was still ongoing at this time.



Tulsa, OK: April 29, 2021 1-Day Observed Precipitation
Valid on: April 29, 2021 12:00 UTC

Fig. 11. 24-hour Estimated Observed Rainfall ending at 7am CDT 04/29/2021.

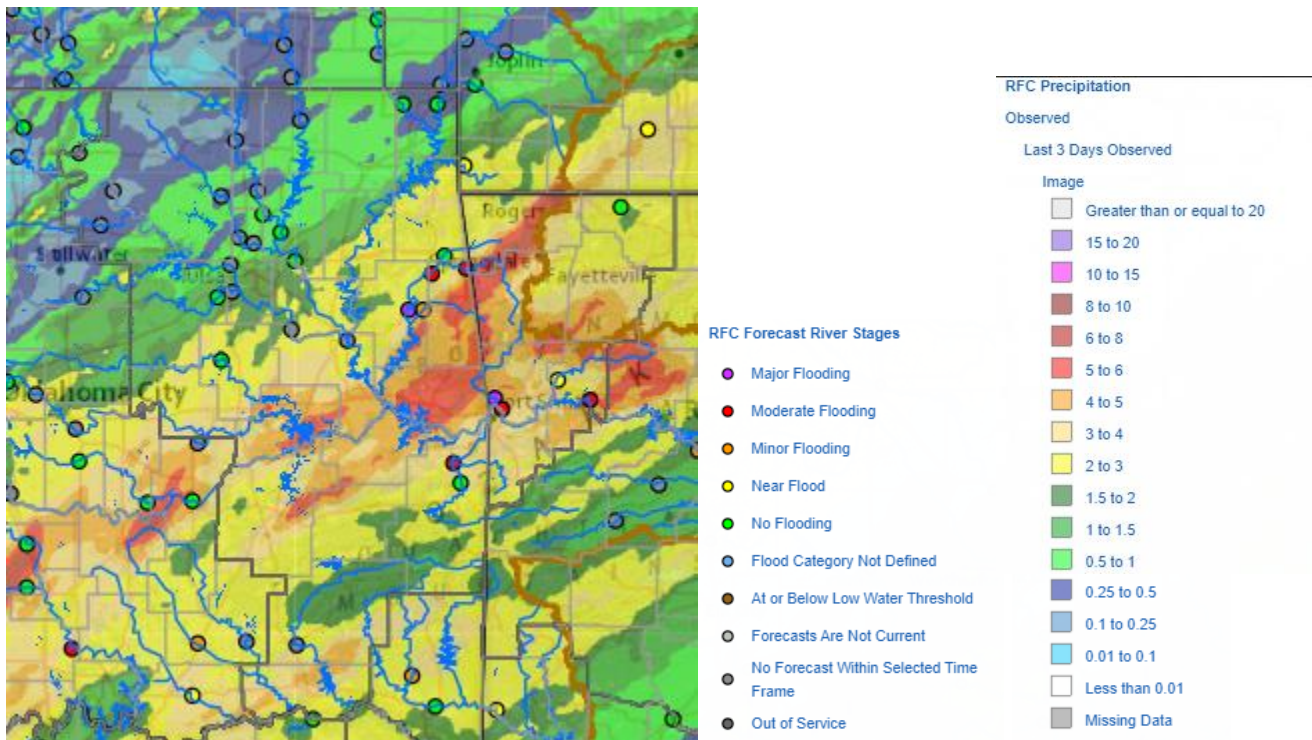
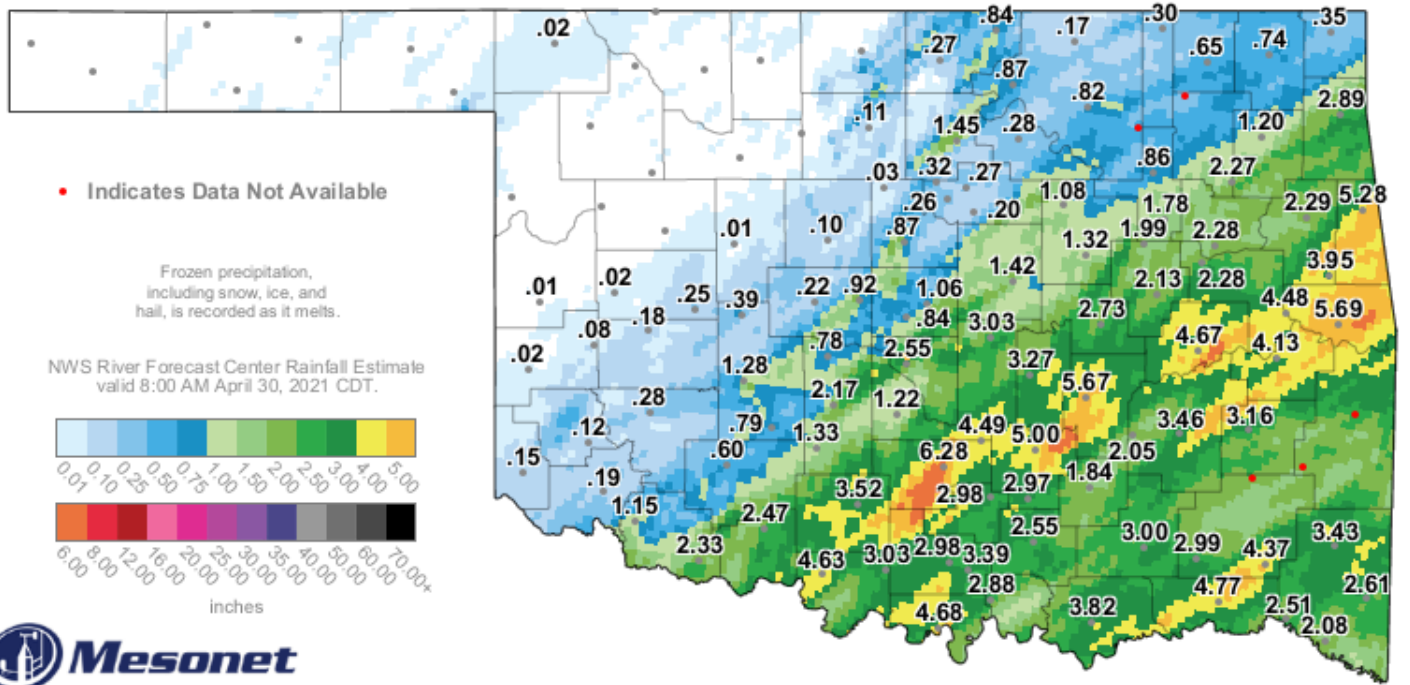


Fig. 12. 3-Day Estimated Observed Rainfall ending at 7am CDT 04/29/2021 and River Forecasts (dots) as of noon 04/29/2021.



3-Day Rainfall Accumulation (inches)

8:50 AM April 30, 2021 CDT

Created 8:55:51 AM April 30, 2021 CDT. © Copyright 2021

Fig. 13. OK Mesonet (values) and NWS RFC rainfall estimate (image) 3-Day rainfall ending at 8:50 am CDT 4/30/2021.

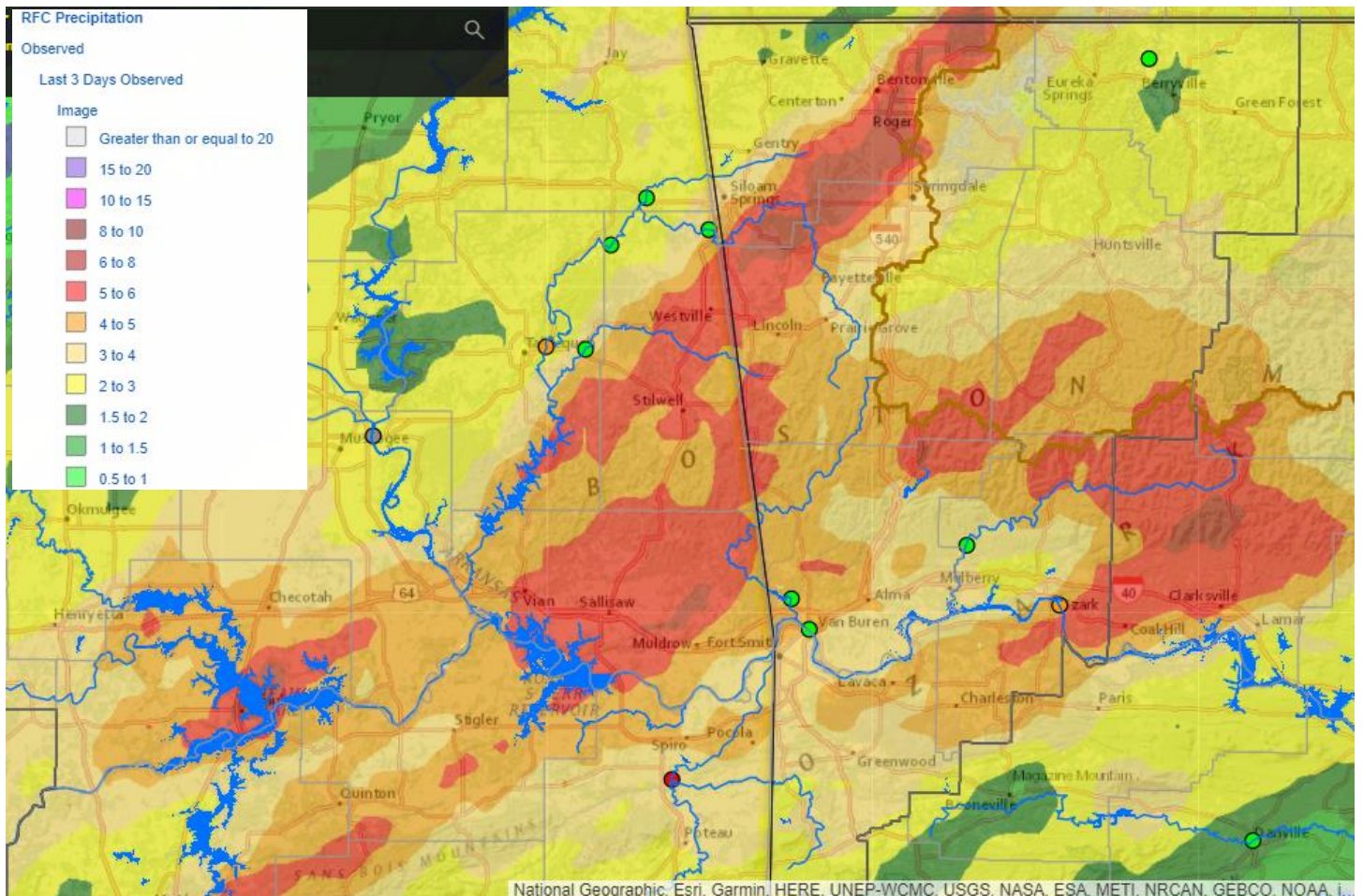


Fig. 14. 3-Day Estimated Observed Rainfall ending at 7am CDT 04/30/2021 and rivers, zoomed into east central OK and northwest AR.

Written by:

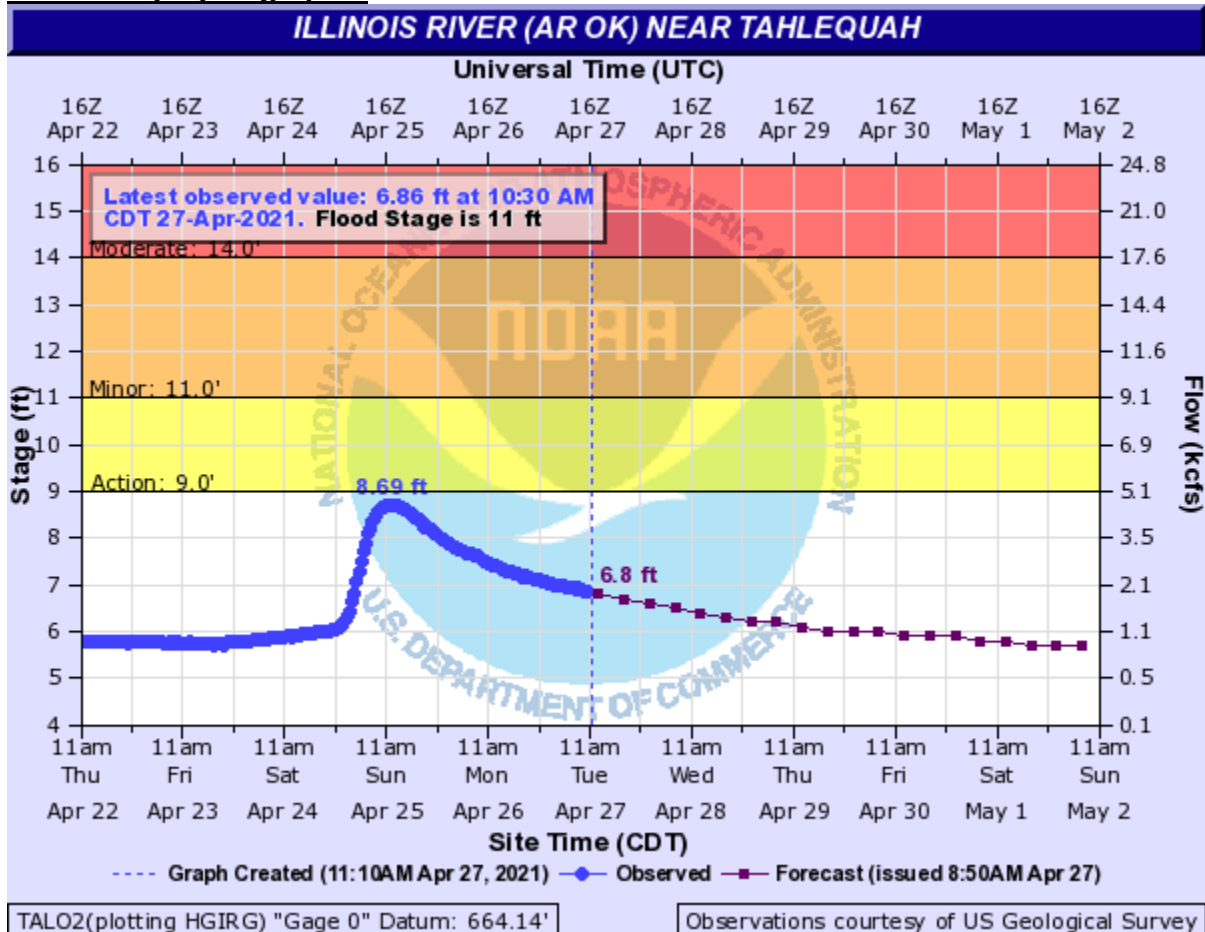
Nicole McGavock
Service Hydrologist
WFO Tulsa

Products issued in April 2021:

- *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

- 9 Flash Flood Warnings (FFW)
- 3 Flash Flood Statements (FFS)
- 1 Flash/Areal Flood Watches (FFA) (3 Watch FFA CON/EXT/EXA/EXB/CAN)
- 7 Urban and Small Stream Advisories (FLS)
- 4 Areal Flood Warnings (FLW)
- 1 Areal Flood Statements (FLS)
- 17 River Flood Warnings (FLW) (includes category increases)
- 60 River Flood Statements (FLS)
- 2 River Flood Advisories (FLS) (8 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:

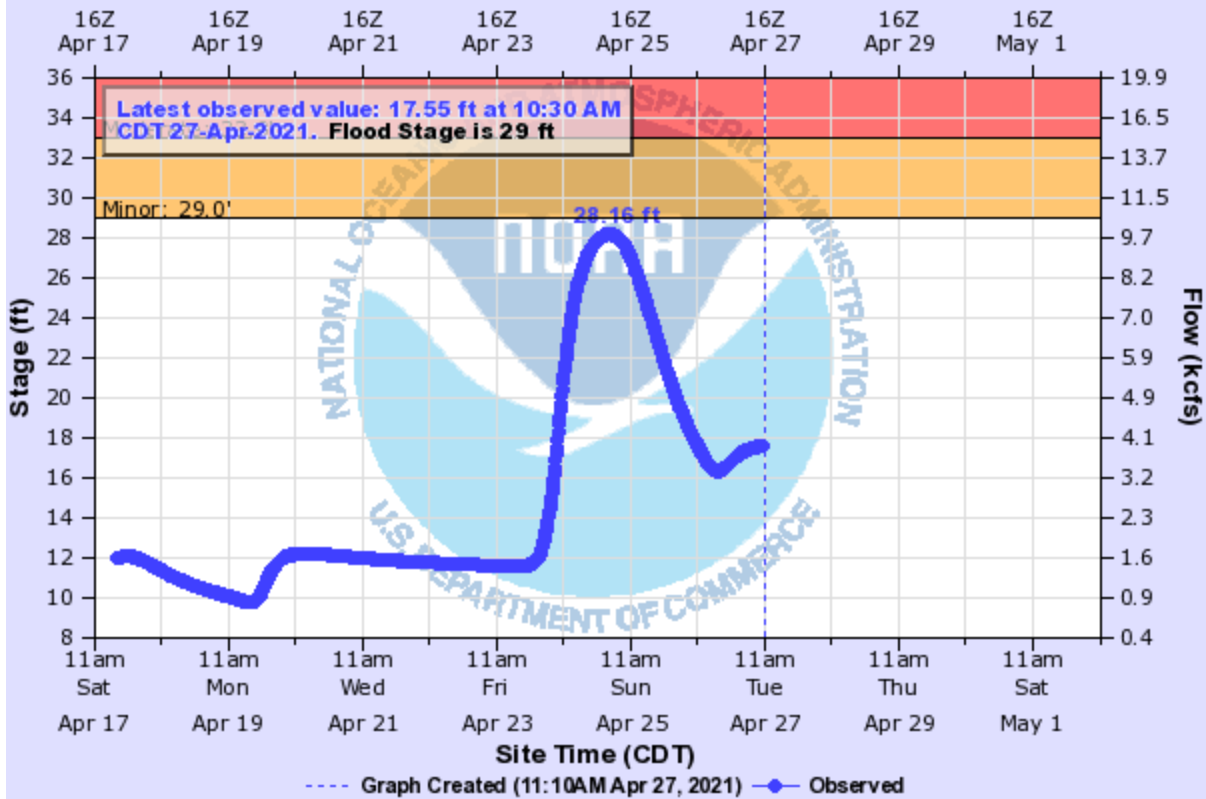


TALO2(plotting HGIRG) "Gage 0" Datum: 664.14'

Observations courtesy of US Geological Survey

POTEAU RIVER NEAR PANAMA

Universal Time (UTC)

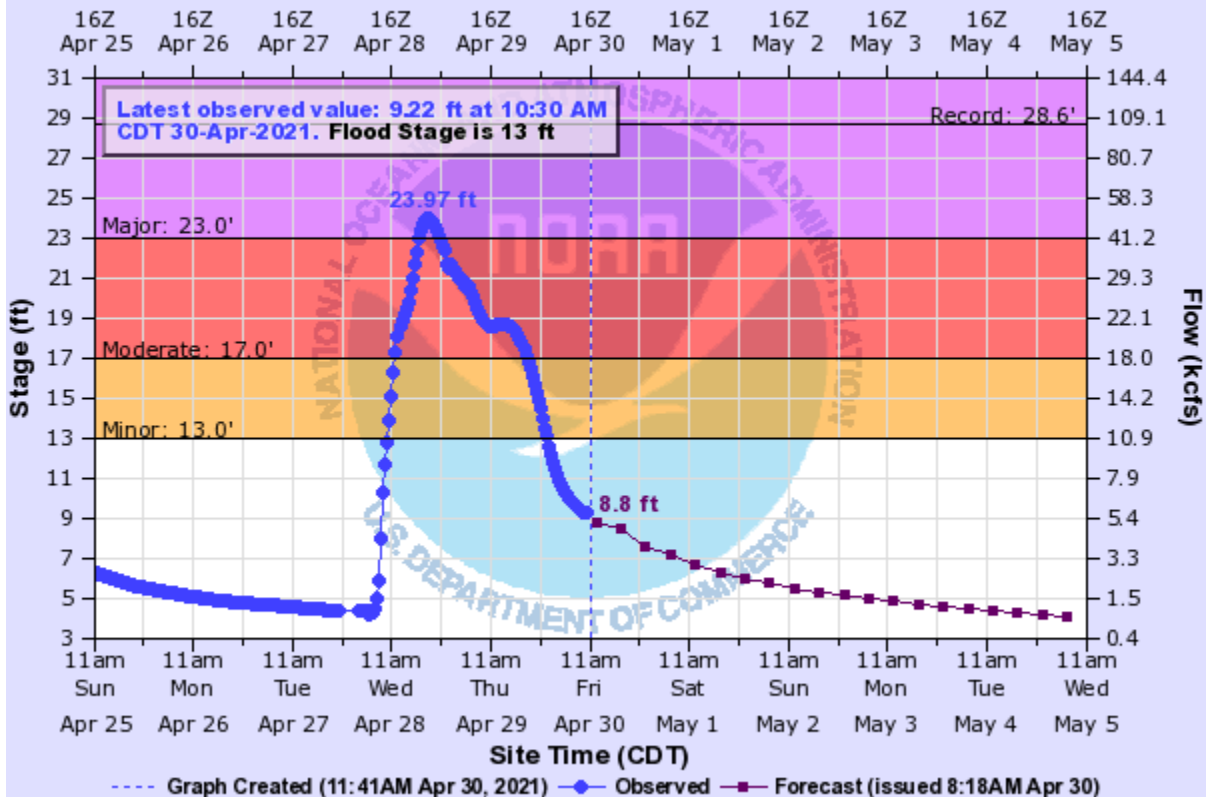


PANO2(plotting HGIRG) "Gage 0" Datum: 387.96'

Observations courtesy of US Geological Survey

ILLINOIS RIVER (AR OK) NEAR WATTS

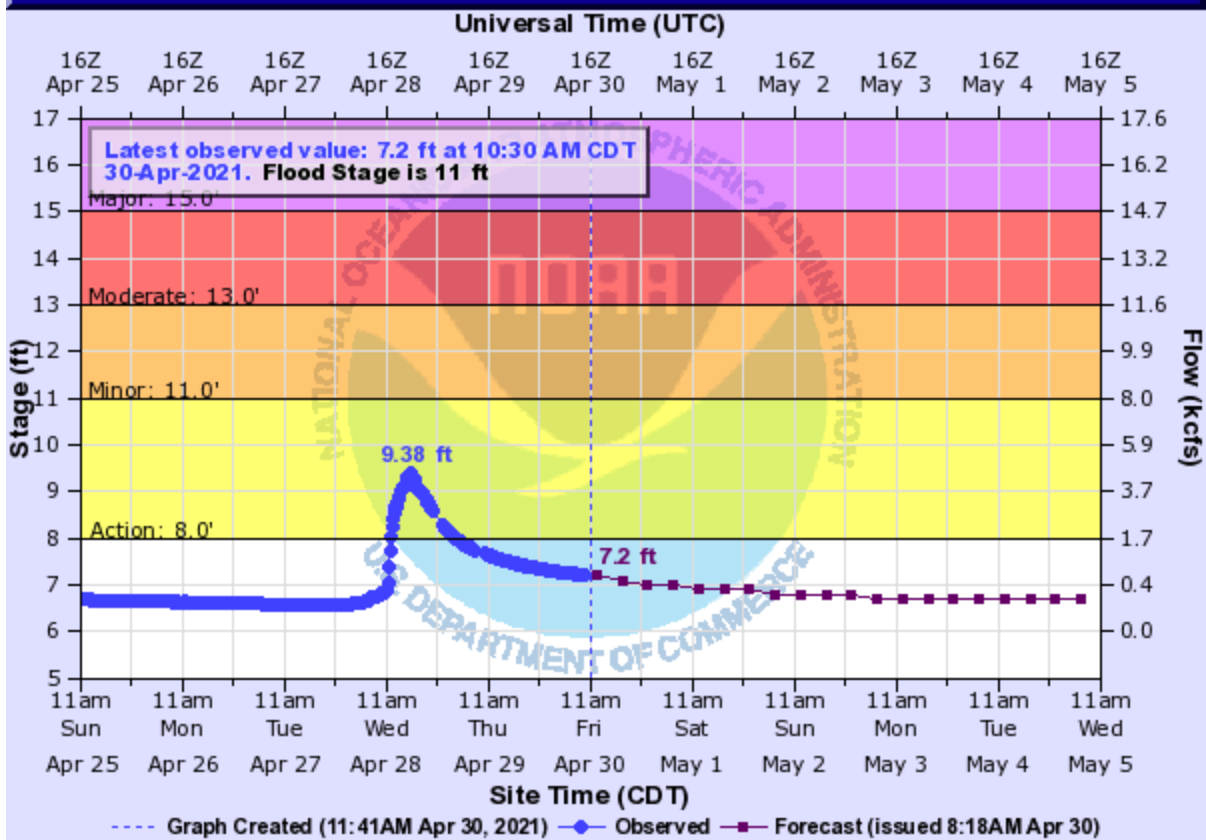
Universal Time (UTC)



WTTO2(plotting HGIRG) "Gage 0" Datum: 893.78'

Observations courtesy of US Geological Survey

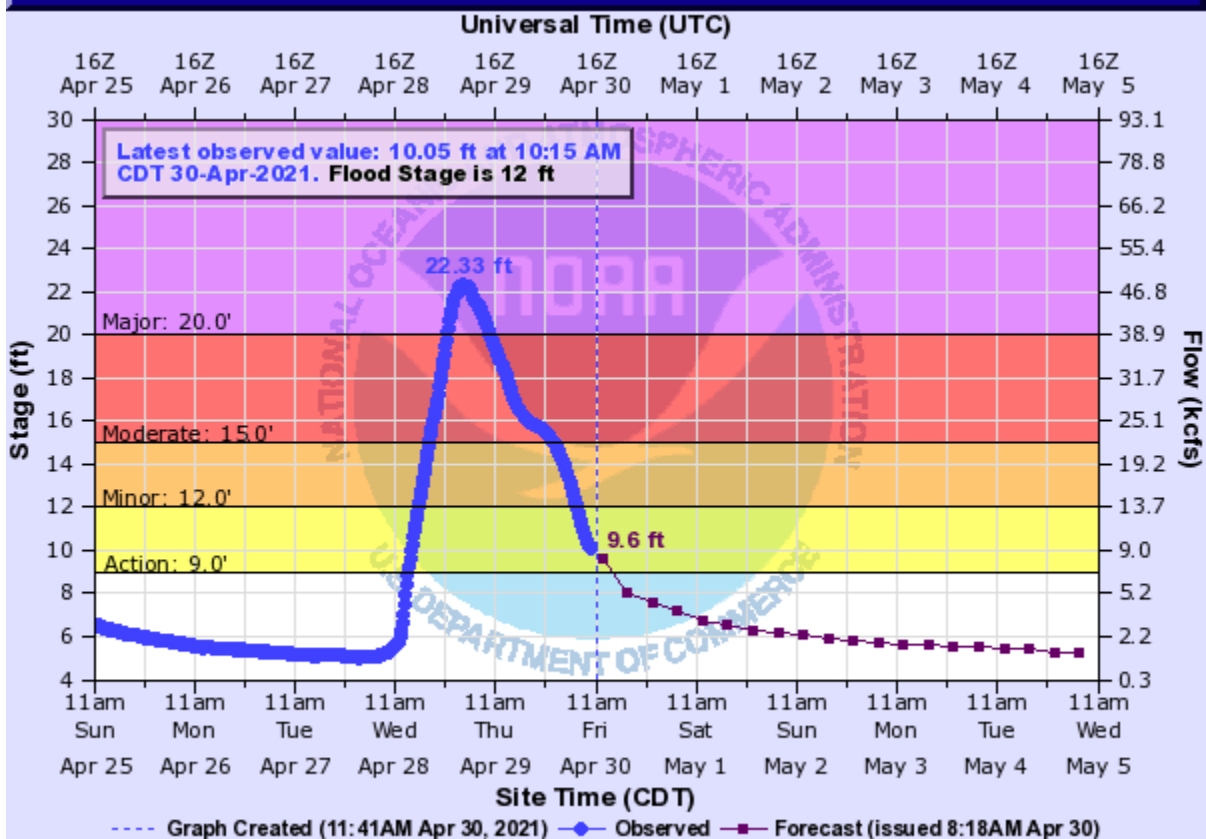
FLINT CREEK (OK) NEAR KANSAS



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

Observations courtesy of US Geological Survey

ILLINOIS RIVER (AR OK) AT CHEWEY

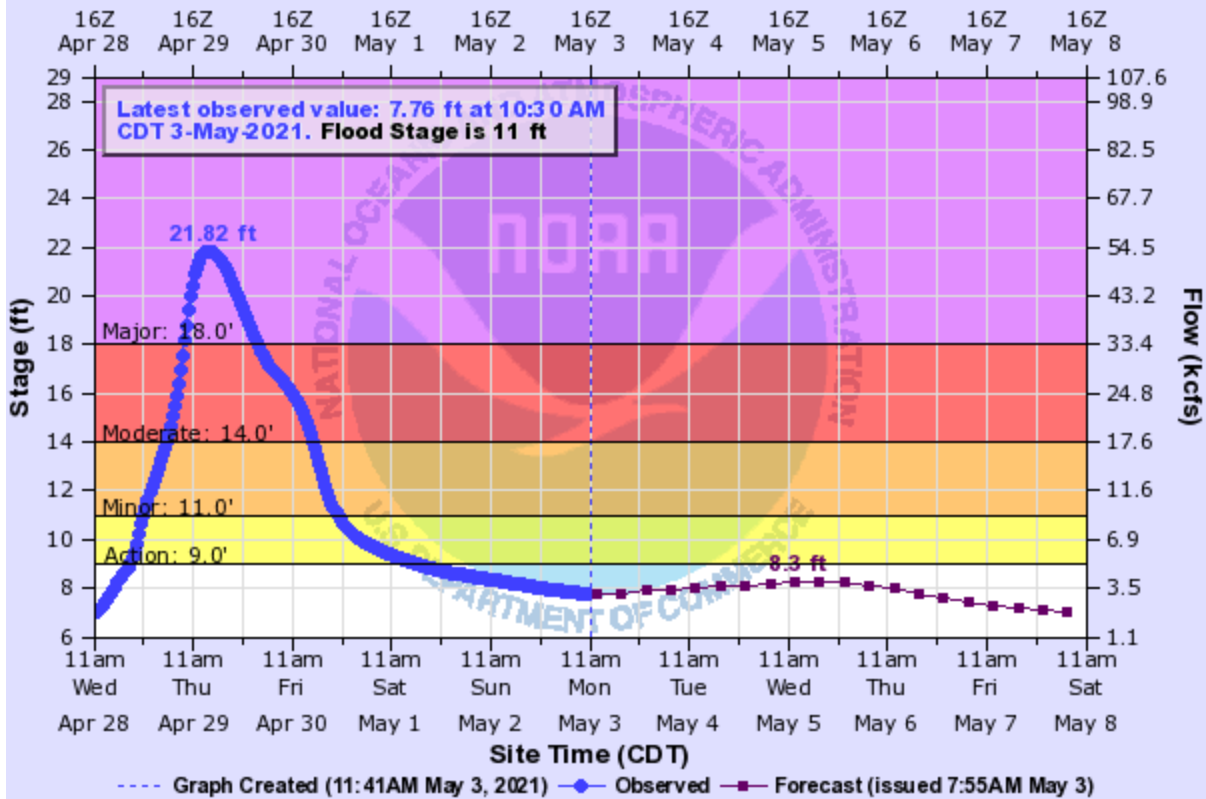


CWYO2(plotting HGIRG) "Gage 0" Datum: 800.88'

Observations courtesy of US Geological Survey

ILLINOIS RIVER (AR OK) NEAR TAHLEQUAH

Universal Time (UTC)

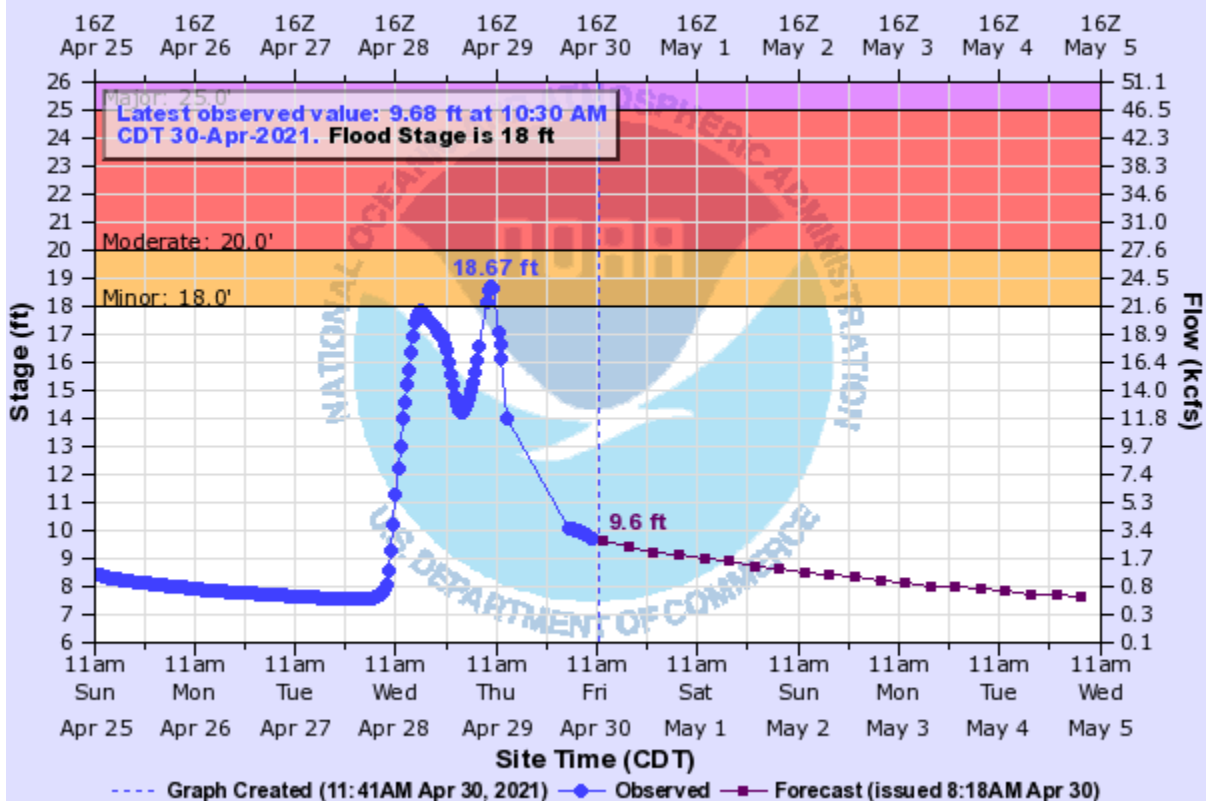


TALO2(plotting HGIRG) "Gage 0" Datum: 664.14'

Observations courtesy of US Geological Survey

BARON FORK AT ELDON

Universal Time (UTC)

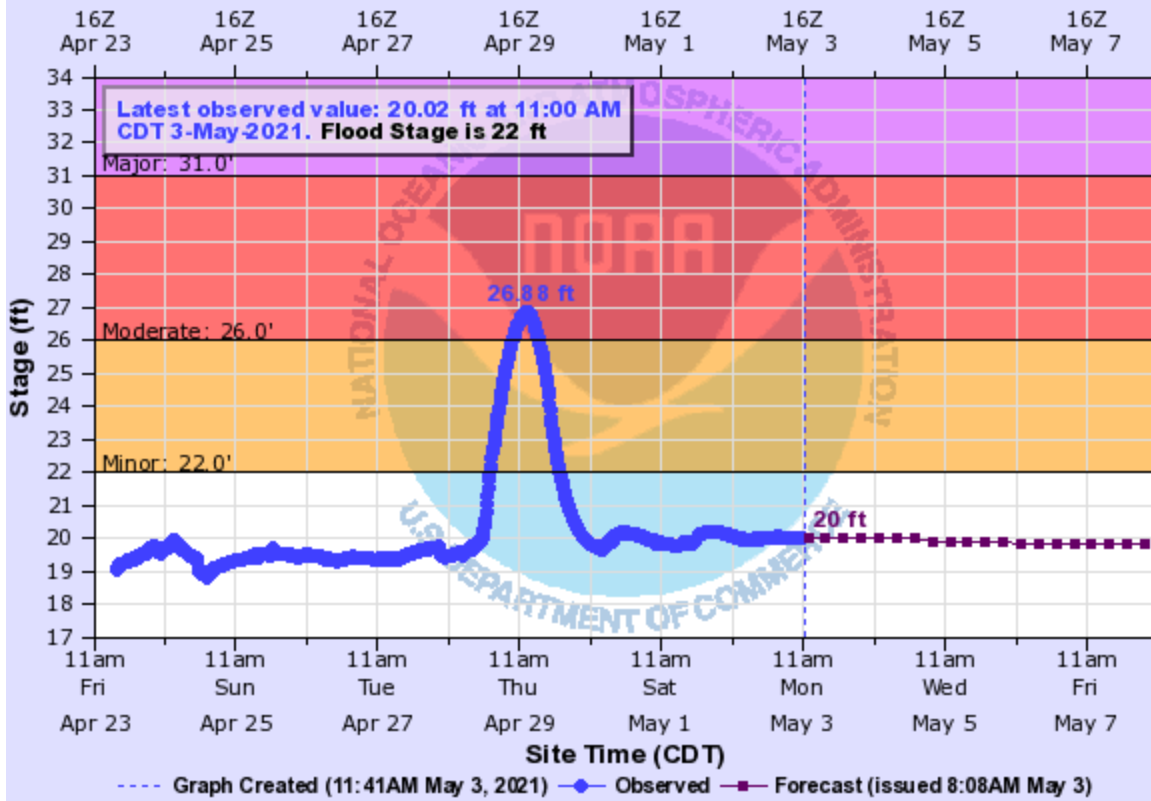


ELDO2(plotting HGIRG) "Gage 0" Datum: 701.14'

Observations courtesy of US Geological Survey

ARKANSAS RIVER AT VAN BUREN

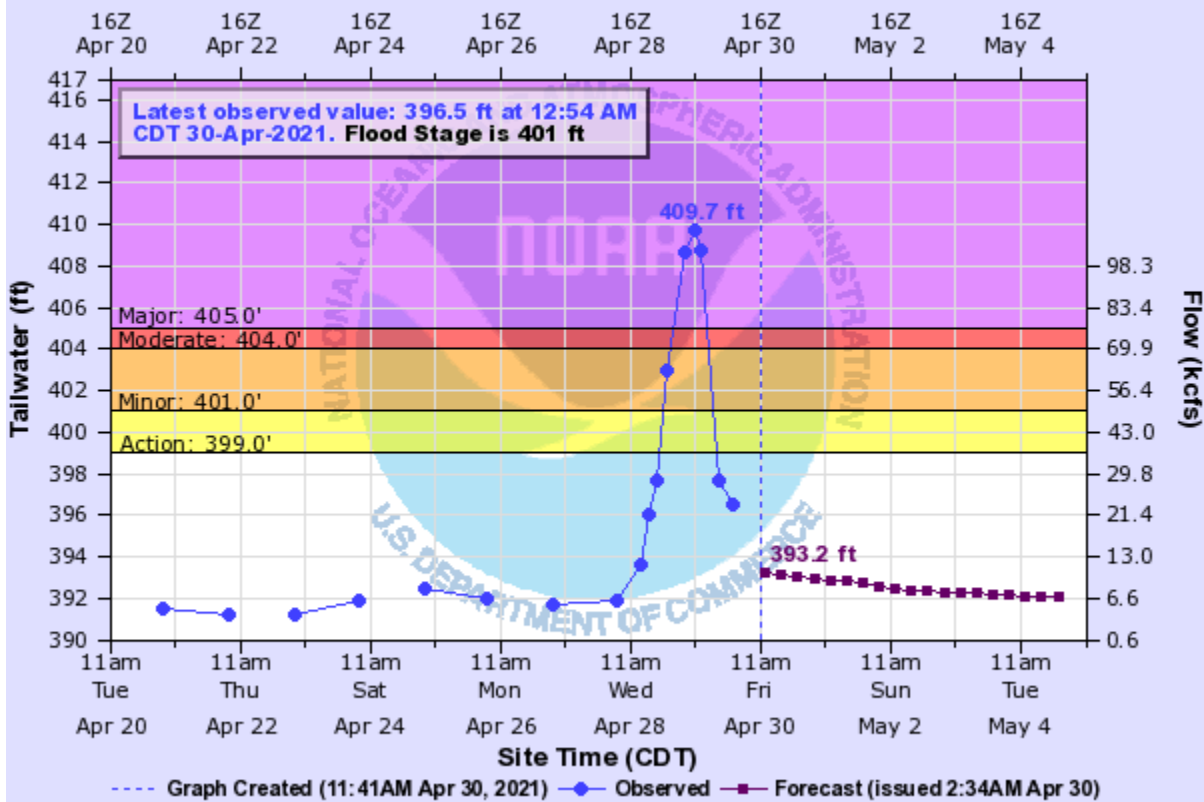
Universal Time (UTC)



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

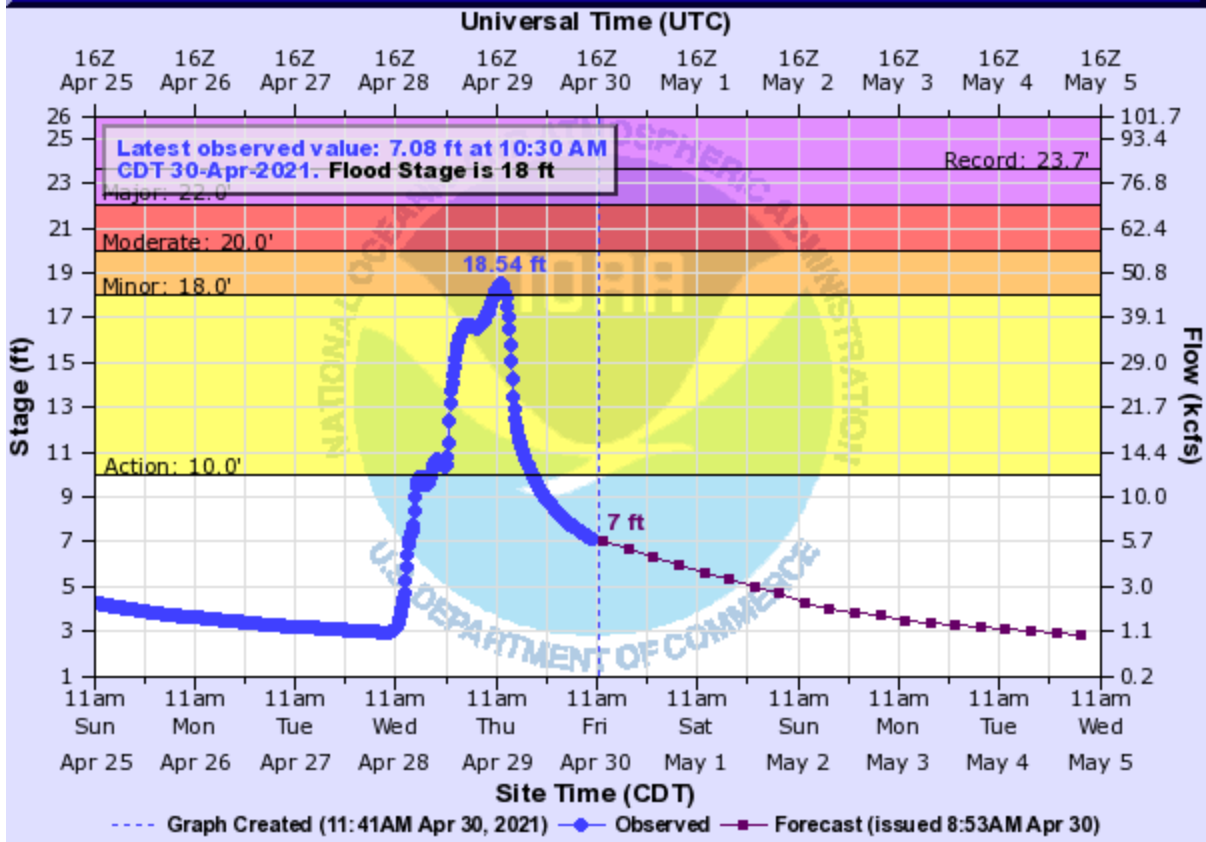
LEE CREEK NEAR VAN BUREN LCR

Universal Time (UTC)



VBRA4(plotting HTIRZ) "Gage 0" Datum: 0'

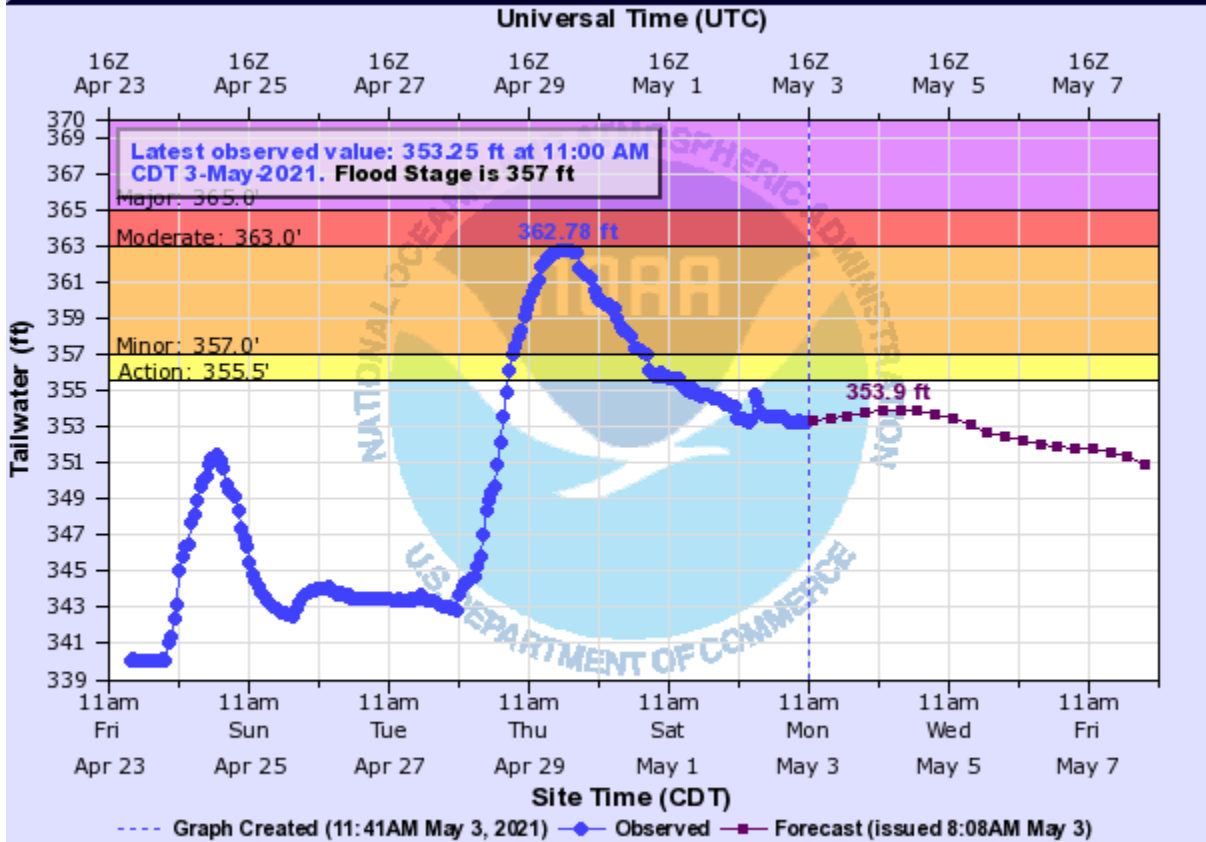
MULBERRY RIVER (AR) NEAR MULBERRY



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

Observations courtesy of USGS/USACE/ADEQ

ARKANSAS RIVER AT OZARK L/D TAILWATER

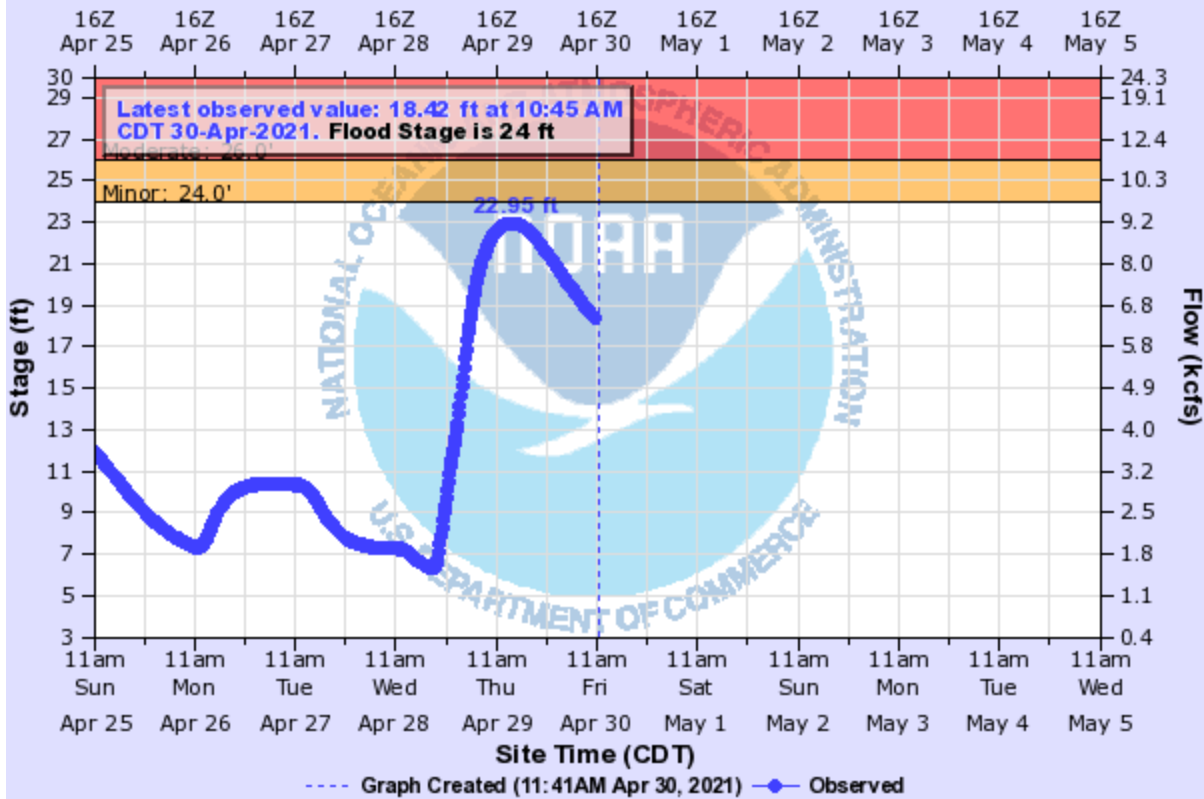


OZGA4(plotting HTIRG) "Gage 0" Datum: 0'

Observations courtesy of US Army Corps of Engineers - LRD

POTEAU RIVER NEAR POTEAU

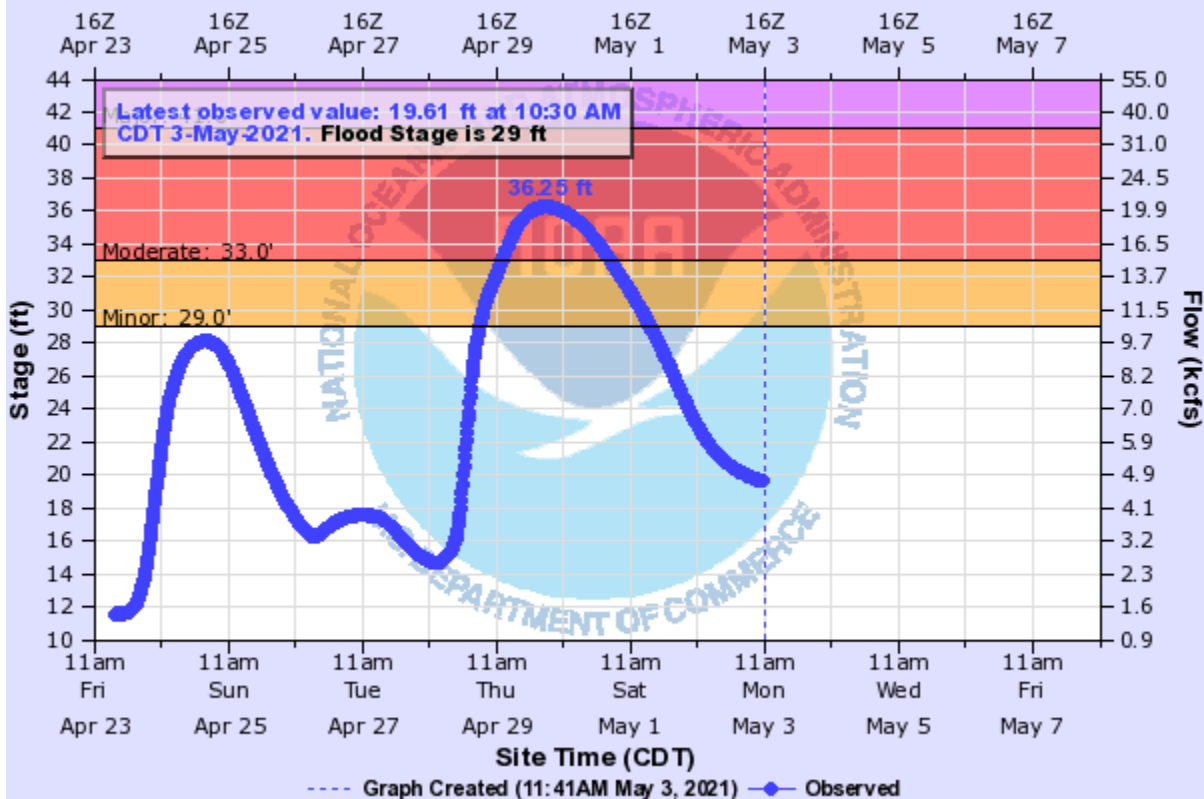
Universal Time (UTC)



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

POTEAU RIVER NEAR PANAMA

Universal Time (UTC)



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

Observations courtesy of US Geological Survey