

<b>NWS FORM E-5</b> (11-88) (PRES. by NWS Instruction 10-924)	<b>U.S. DEPARTMENT OF COMMERCE</b> NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL WEATHER SERVICE	HYDROLOGIC SERVICE AREA (HSA)	
		<b>Tulsa, Oklahoma (TSA)</b>	
<b>MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS</b>		REPORT FOR:	
		MONTH <b>May</b>	YEAR <b>2020</b>
TO: Hydrometeorological Information Center, W/OH2 NOAA / National Weather Service 1325 East West Highway, Room 7230 Silver Spring, MD 20910-3283		SIGNATURE <b>Steven F. Piltz</b> (Meteorologist-in-Charge)	
		DATE <b>June 17, 2020</b>	

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.

Minor to moderate river flooding, as well as flash flooding, once again occurred during May 2020 due to several heavy rain events across far eastern OK and northwest AR. Normal precipitation values climatologically rank May as the wettest month of the year. These averages range from 5.0 - 5.5 inches across northeast Oklahoma to 5.5 - 6.0 inches across southeast Oklahoma. The Ozark region of northwest Arkansas averages 5.8 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 May 2020 ranged from around 2" to around 15" across eastern OK and northwest AR, with most of the area receiving 6"-10". These rainfall totals correspond to 25%-90% of the normal May rainfall for most of eastern Kay, Osage, Pawnee, Tulsa, Washington (OK), and Creek Counties, and around 110% to around 200% of the normal May rainfall for the remainder of eastern OK and northwest Arkansas (Fig. 1b).

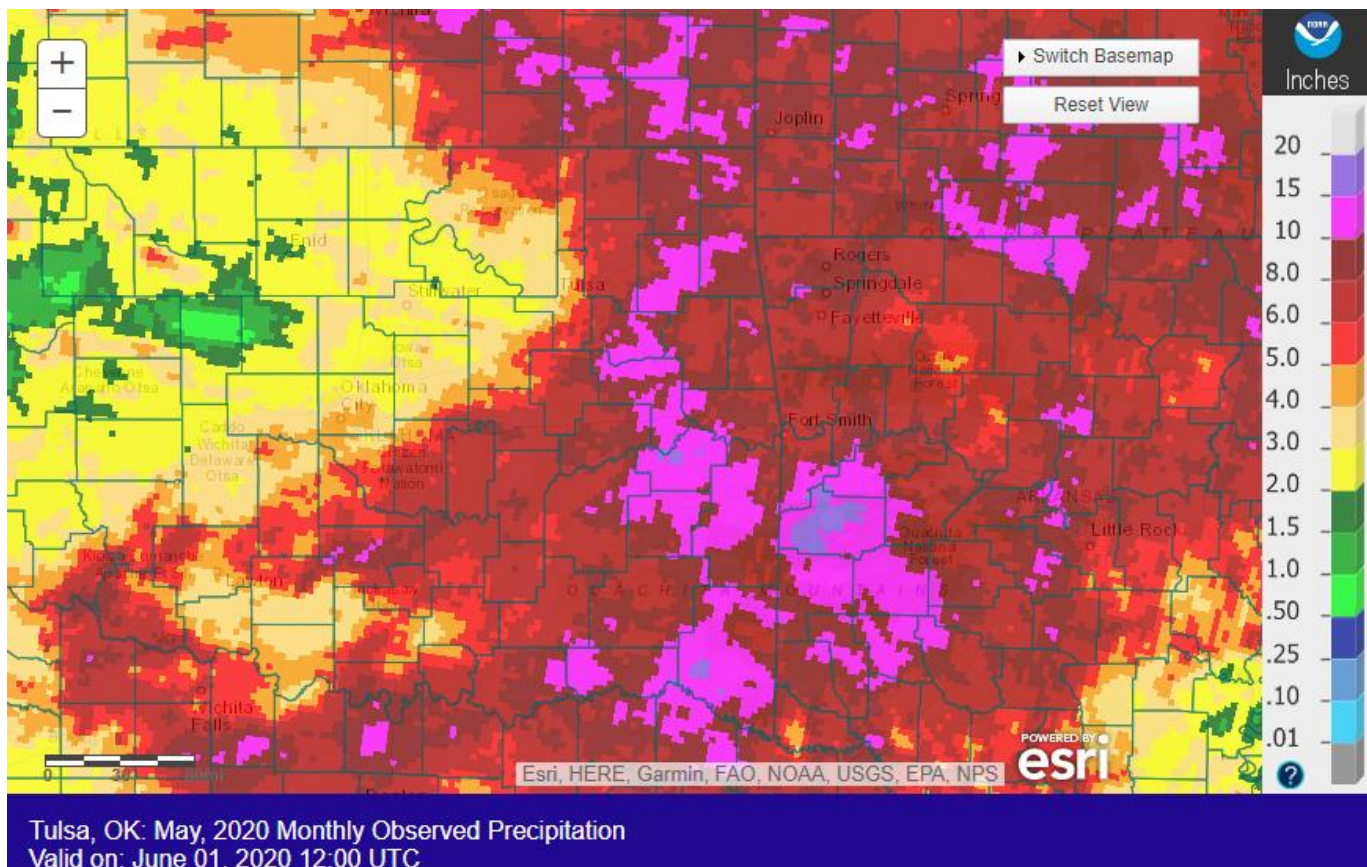


Fig. 1a. Estimated Observed Rainfall for May 2020

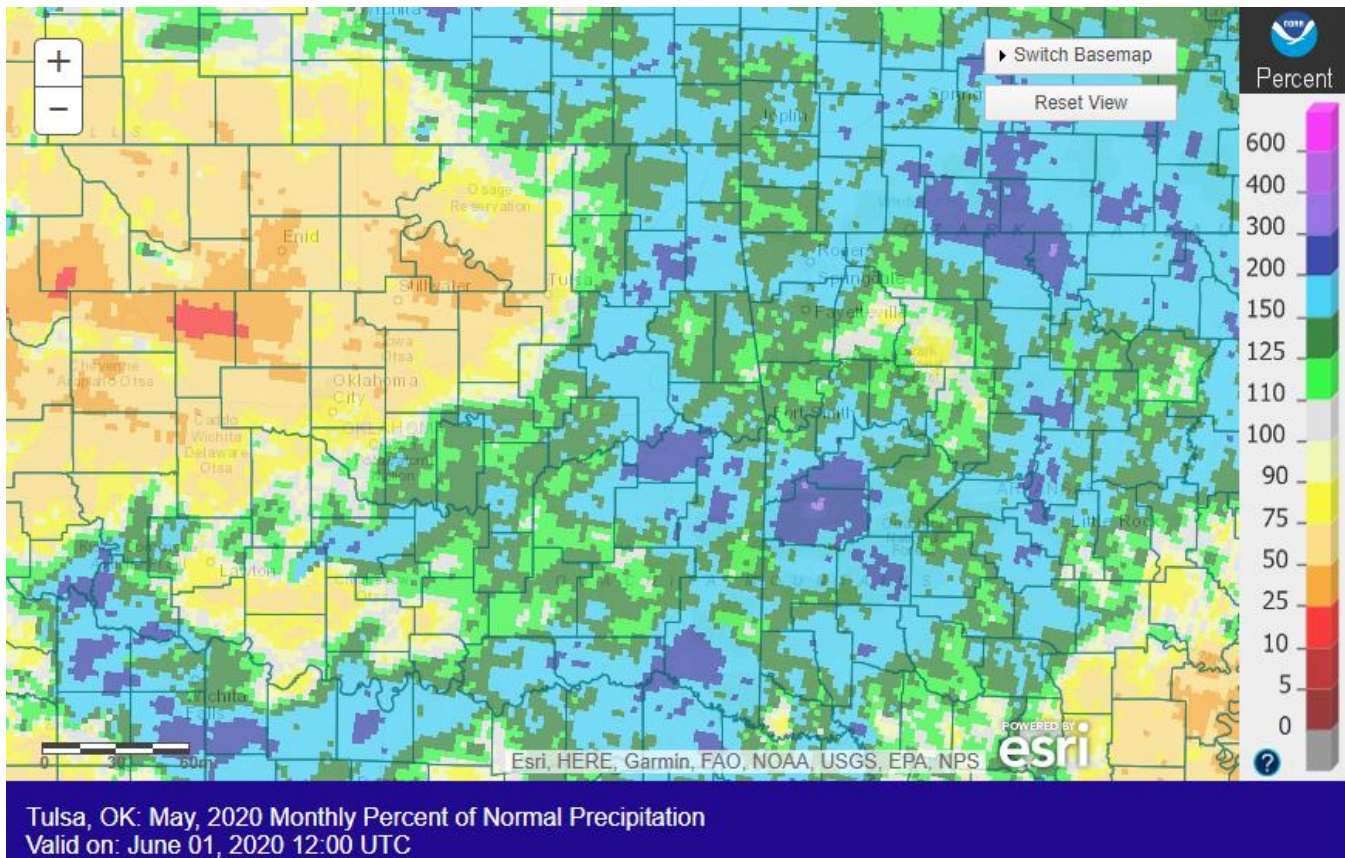


Fig. 1b. Estimated % of Normal Rainfall for May 2020

In Tulsa, OK, May 2020 ranked as the 23<sup>rd</sup> coldest May (66.8°F, tied 2013; since records began in 1905) and the 63<sup>rd</sup> driest May (4.81"; since records began in 1888). Fort Smith, AR had the 42<sup>nd</sup> coldest May (68.3°F, tied 2016, 1966; since records began in 1883) and the 41<sup>st</sup> wettest May (6.23"; since records began in 1883). Fayetteville, AR had the 29<sup>th</sup> coldest (64.7°F, tied 1951) and the 18<sup>th</sup> wettest (7.54") May since records began in 1950.

Some of the larger precipitation reports (in inches) for May 2020 included:

Stigler, OK (meso)	15.06	Spavinaw, OK (coop)	11.87	Wister, OK (meso)	11.69
Jay 3.3NNE, OK (coco)	11.61	Porter, OK (meso)	11.22	Greenwood 1.4W, AR (coco)	11.14
Webbers Falls, OK (meso)	11.05	Haskell, OK (meso)	10.91	Inola, OK (meso)	10.90

Some of the lowest precipitation reports (in inches) for May 2020 included:

Pawnee, OK (coop)	2.26	Terlton 3.7ESE, OK (coco)	2.43	Bristow 2.9WNW, OK (coco)	2.64
Oilton, OK (meso)	2.83	Sperry 6.7WNW, OK (coco)	3.30	Burbank, OK (meso)	3.41
Kingston 5NW, AR (coop)	3.51	Wynona, OK (meso)	3.82	Tulsa, OK (meso)	3.92

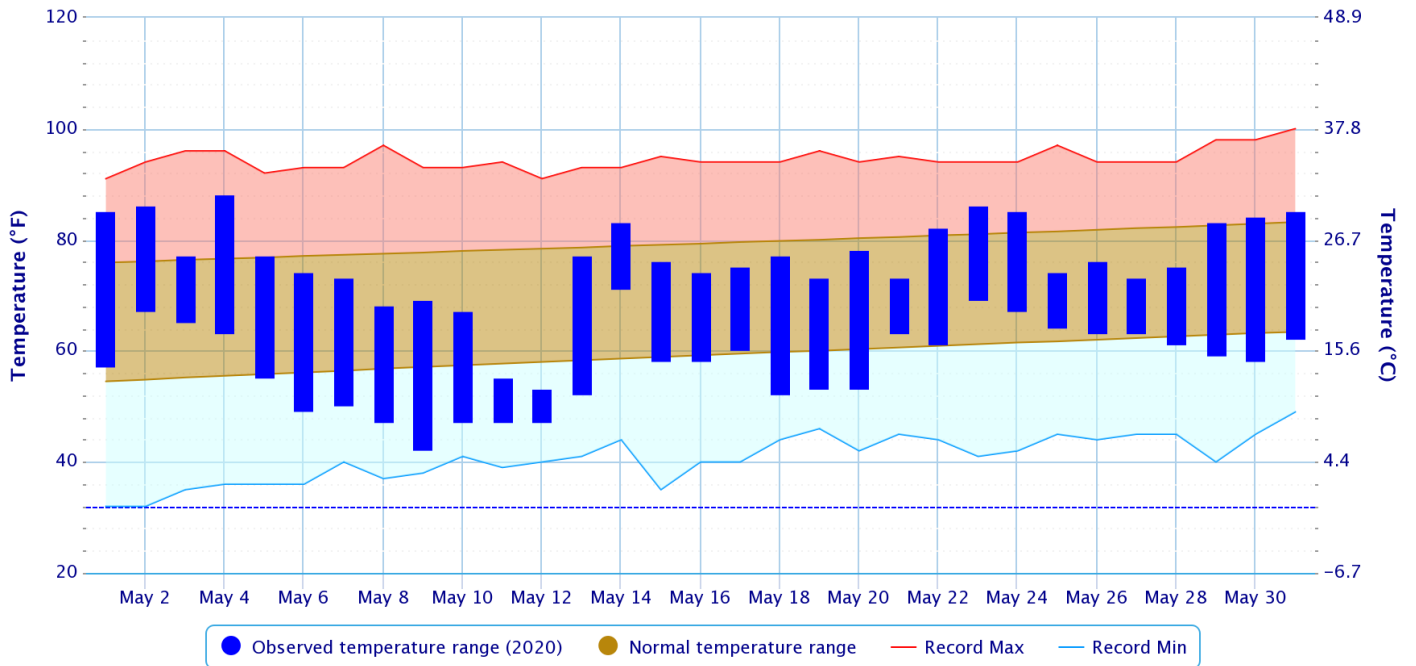
According to statistics from the [Oklahoma Climatological Survey](#) (OCS) Mesonet:

Rank since 1921	Last 30 Days (May 2-31)	Last 60 Days (Apr 2 – May 31)	Spring 2020 (Mar 1 – May 31)	Year-to-Date (Jan 1 – May 31)	Last 180 Days (Dec 4 – May 31)	Water Year-to-Date (Oct 1 – May 31)	Last 365 Days (Jun 2, 2019 – May 31, 2020)
Northeast OK	23 <sup>rd</sup> wettest	24 <sup>th</sup> wettest	14 <sup>th</sup> wettest	11 <sup>th</sup> wettest	12 <sup>th</sup> wettest	7 <sup>th</sup> wettest	2 <sup>nd</sup> wettest
East Central OK	13 <sup>th</sup> wettest	18 <sup>th</sup> wettest	8 <sup>th</sup> wettest	5 <sup>th</sup> wettest	6 <sup>th</sup> wettest	1 <sup>st</sup> wettest	2 <sup>nd</sup> wettest
Southeast OK	11 <sup>th</sup> wettest	12 <sup>th</sup> wettest	8 <sup>th</sup> wettest	6 <sup>th</sup> wettest	10 <sup>th</sup> wettest	2 <sup>nd</sup> wettest	2 <sup>nd</sup> wettest
Statewide	39 <sup>th</sup> wettest	42 <sup>nd</sup> driest	23 <sup>rd</sup> wettest	13 <sup>th</sup> wettest	20 <sup>th</sup> wettest	20 <sup>th</sup> wettest	12 <sup>th</sup> wettest



### Daily Temperature Data - Tulsa Area, OK (ThreadEx)

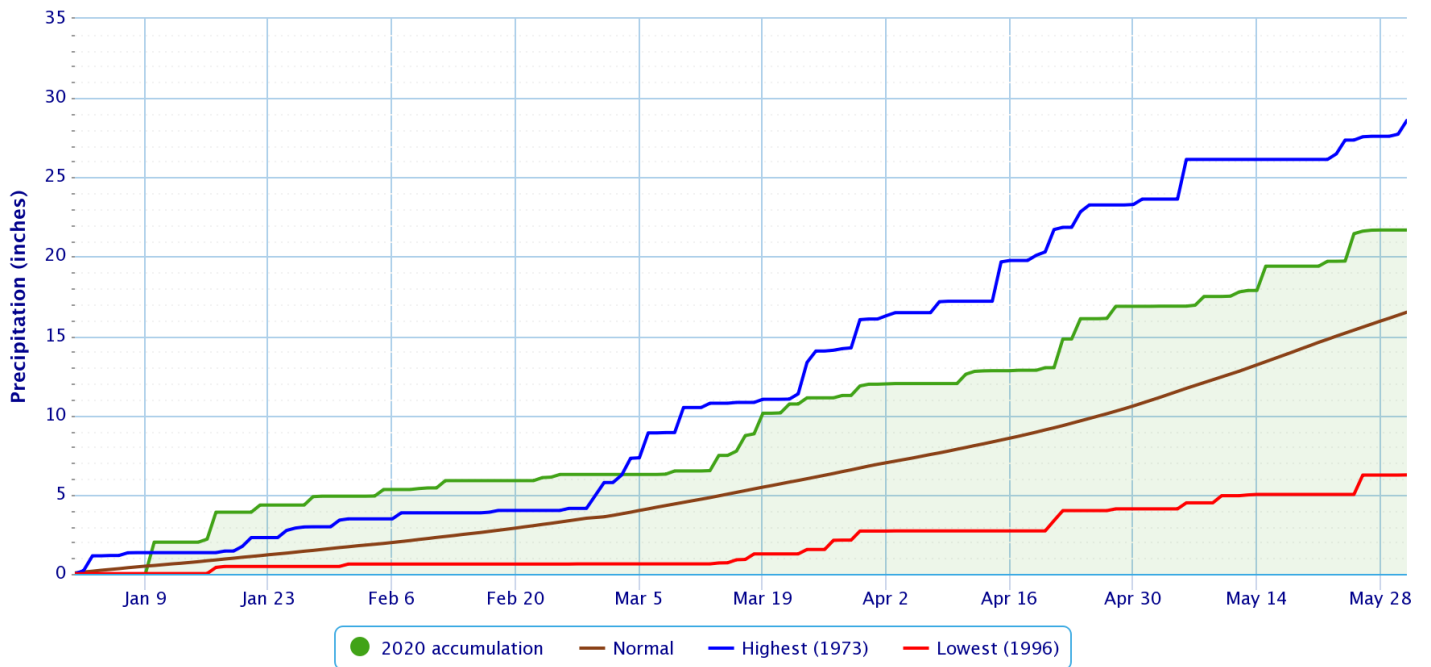
Period of Record - 1905-01-06 to 2020-06-07. Normals period: 1981-2010. Click and drag to zoom chart.



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### Accumulated Precipitation - Tulsa Area, OK (ThreadEx)

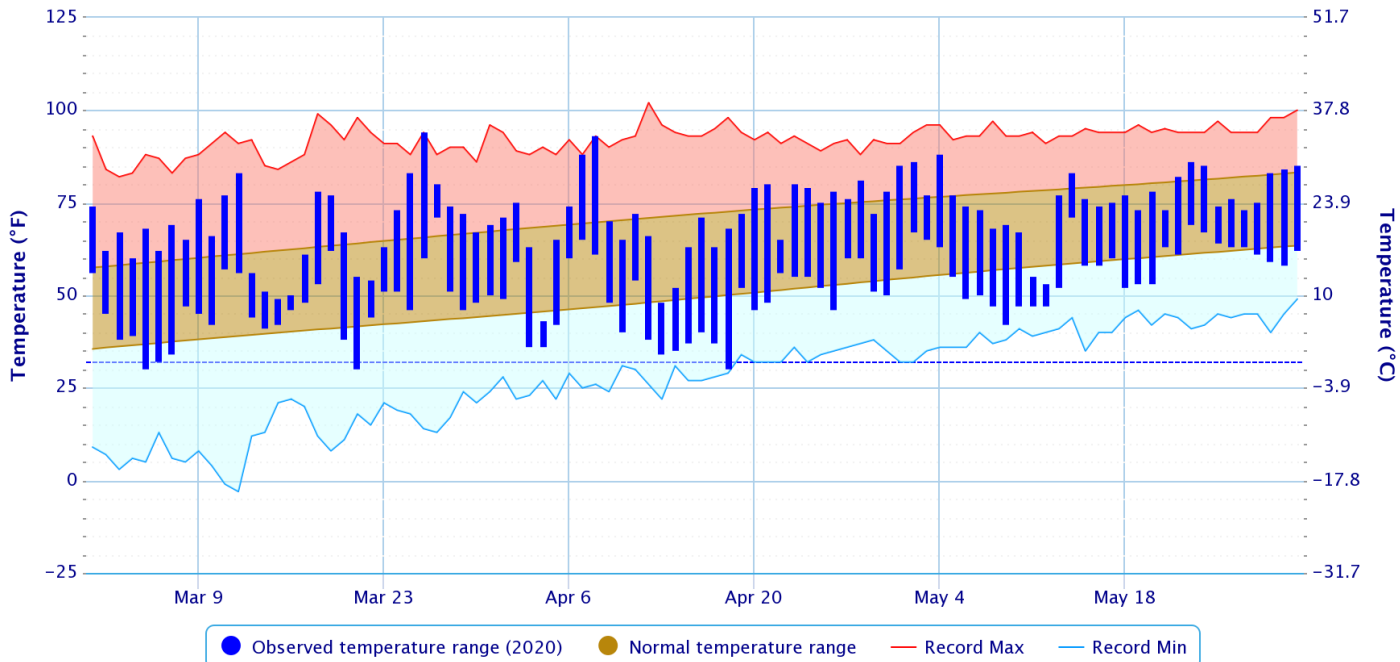
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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### Daily Temperature Data – Tulsa Area, OK (ThreadEx)

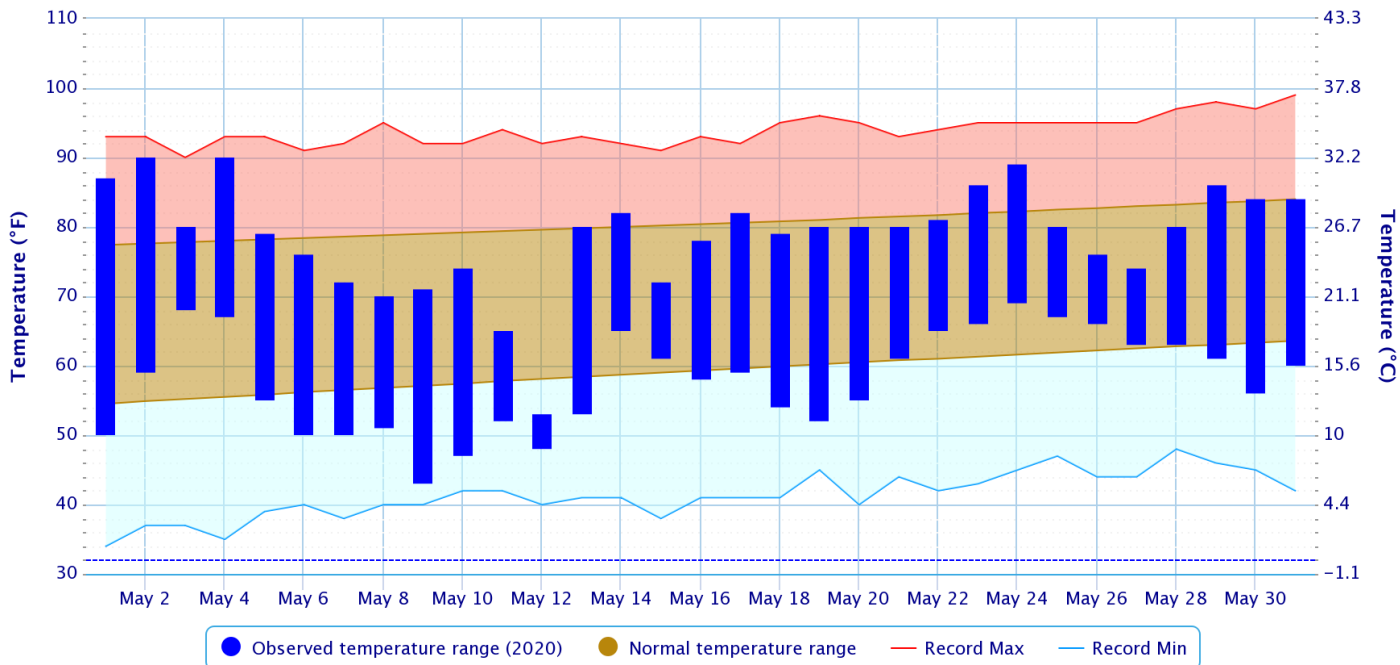
Period of Record – 1905-01-06 to 2020-06-07. Normals period: 1981-2010. Click and drag to zoom chart.



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

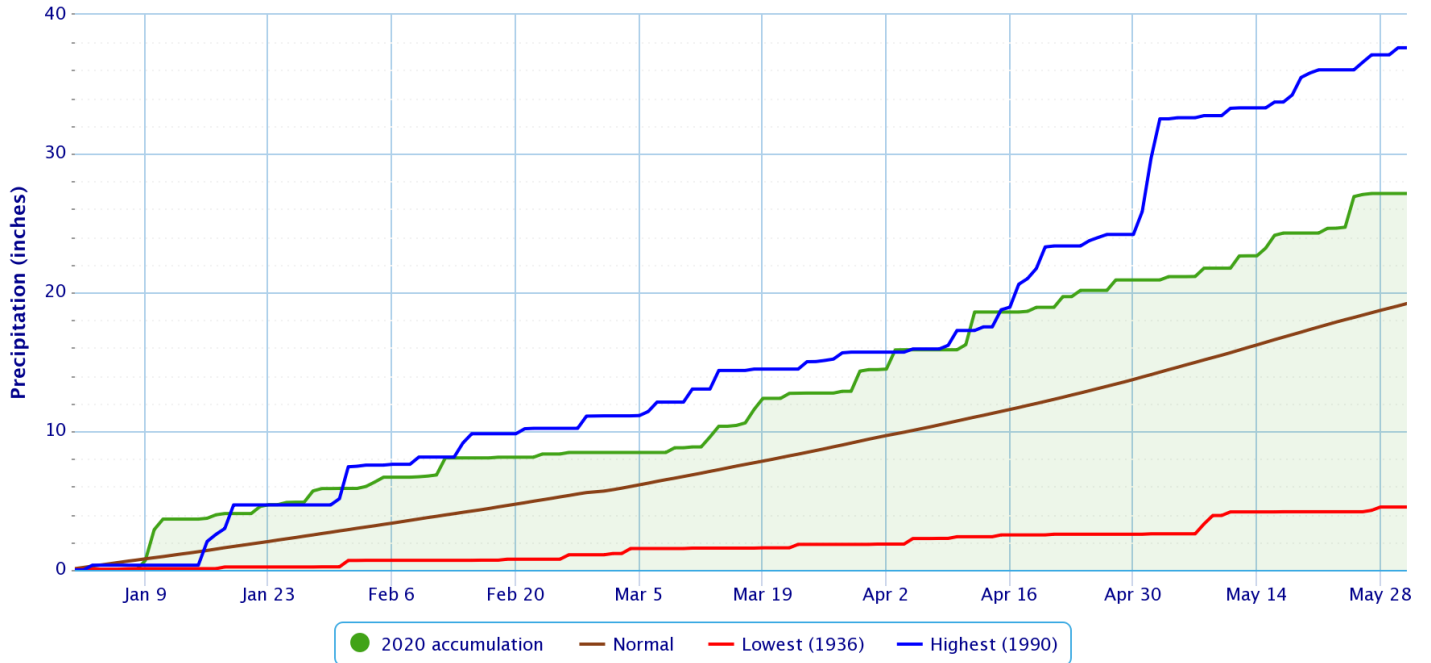
Period of Record – 1882-06-01 to 2020-06-07. Normals period: 1981-2010. Click and drag to zoom chart.



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### Accumulated Precipitation – Fort Smith Area, AR (ThreadEx)

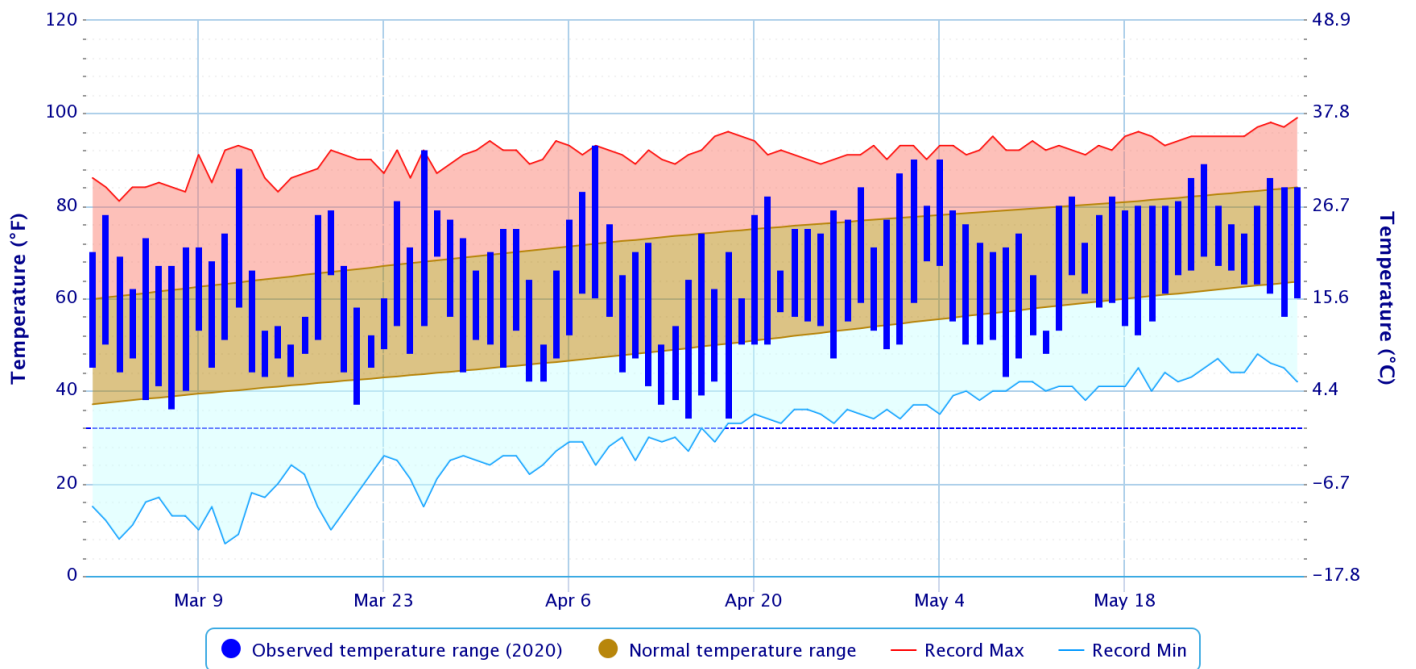
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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

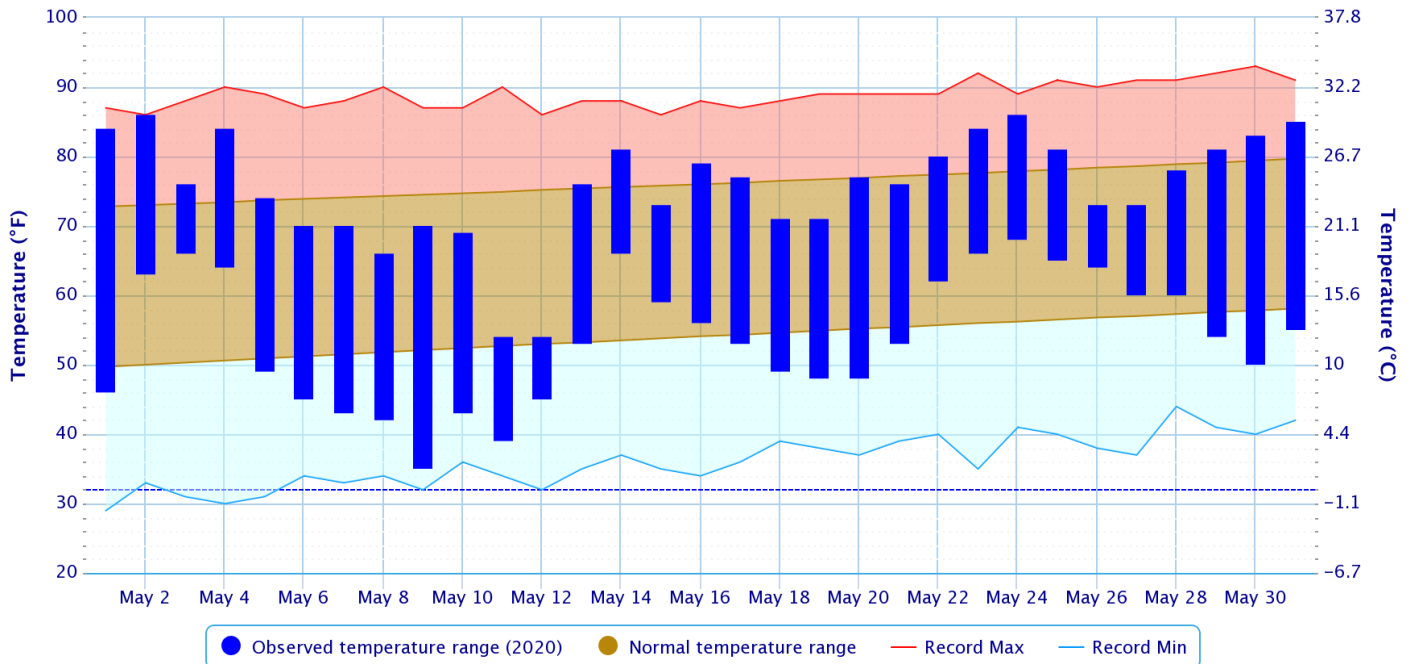
Period of Record – 1882-06-01 to 2020-06-07. Normals period: 1981-2010. Click and drag to zoom chart.



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### Daily Temperature Data – FAYETTEVILLE DRAKE FIELD, AR

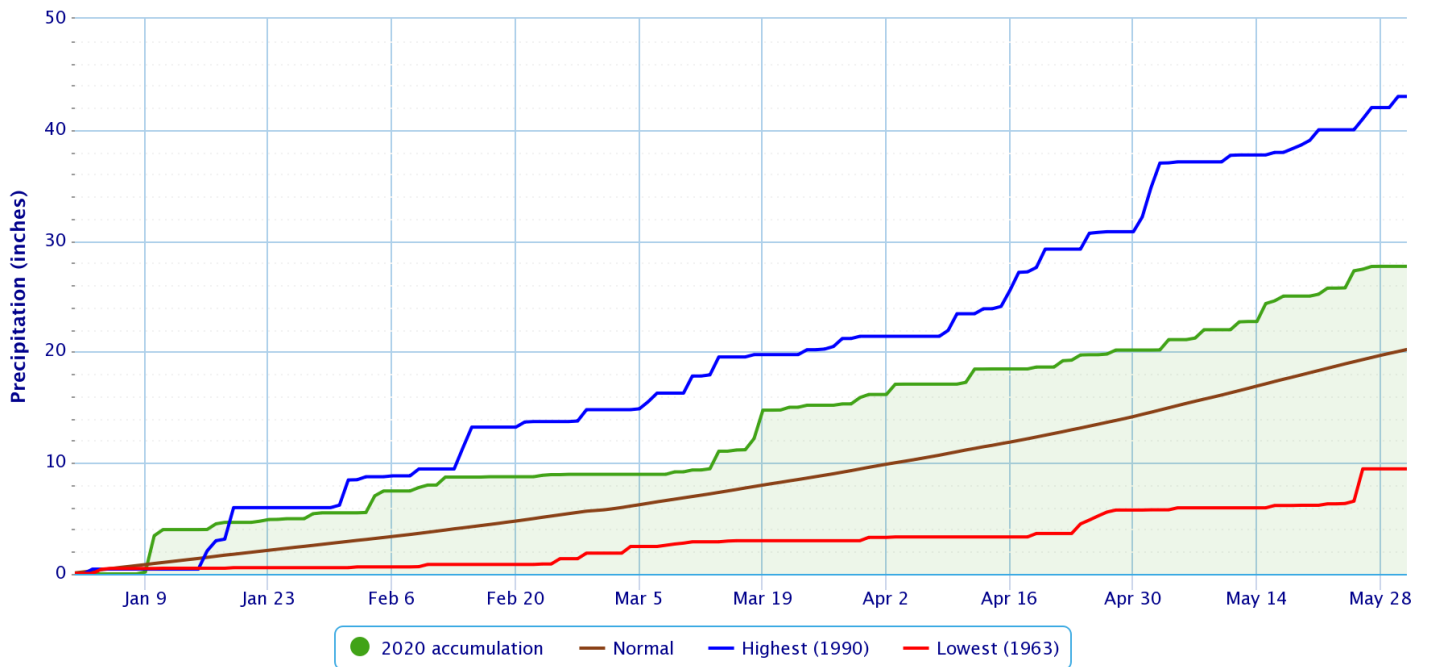
Period of Record – 1949-07-14 to 2020-06-07. Normals period: 1981-2010. Click and drag to zoom chart.



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### Accumulated Precipitation – FAYETTEVILLE DRAKE FIELD, AR

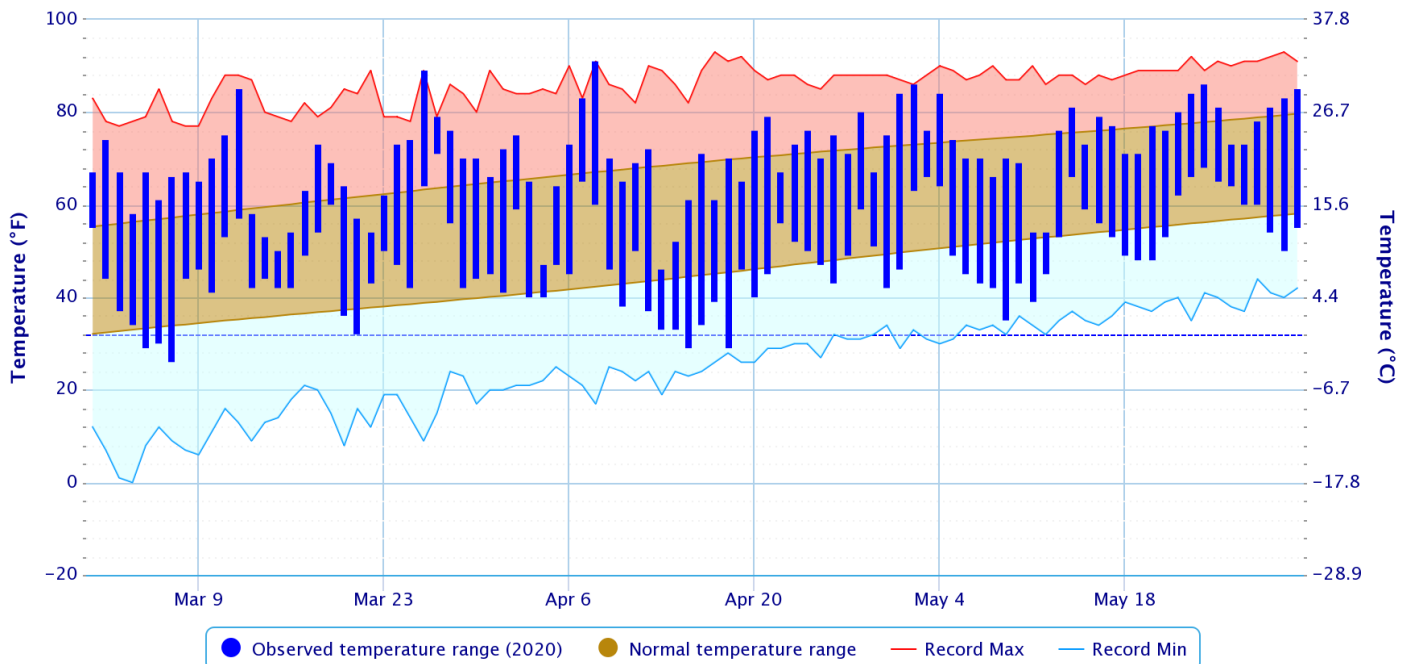
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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## Daily Temperature Data – FAYETTEVILLE DRAKE FIELD, AR

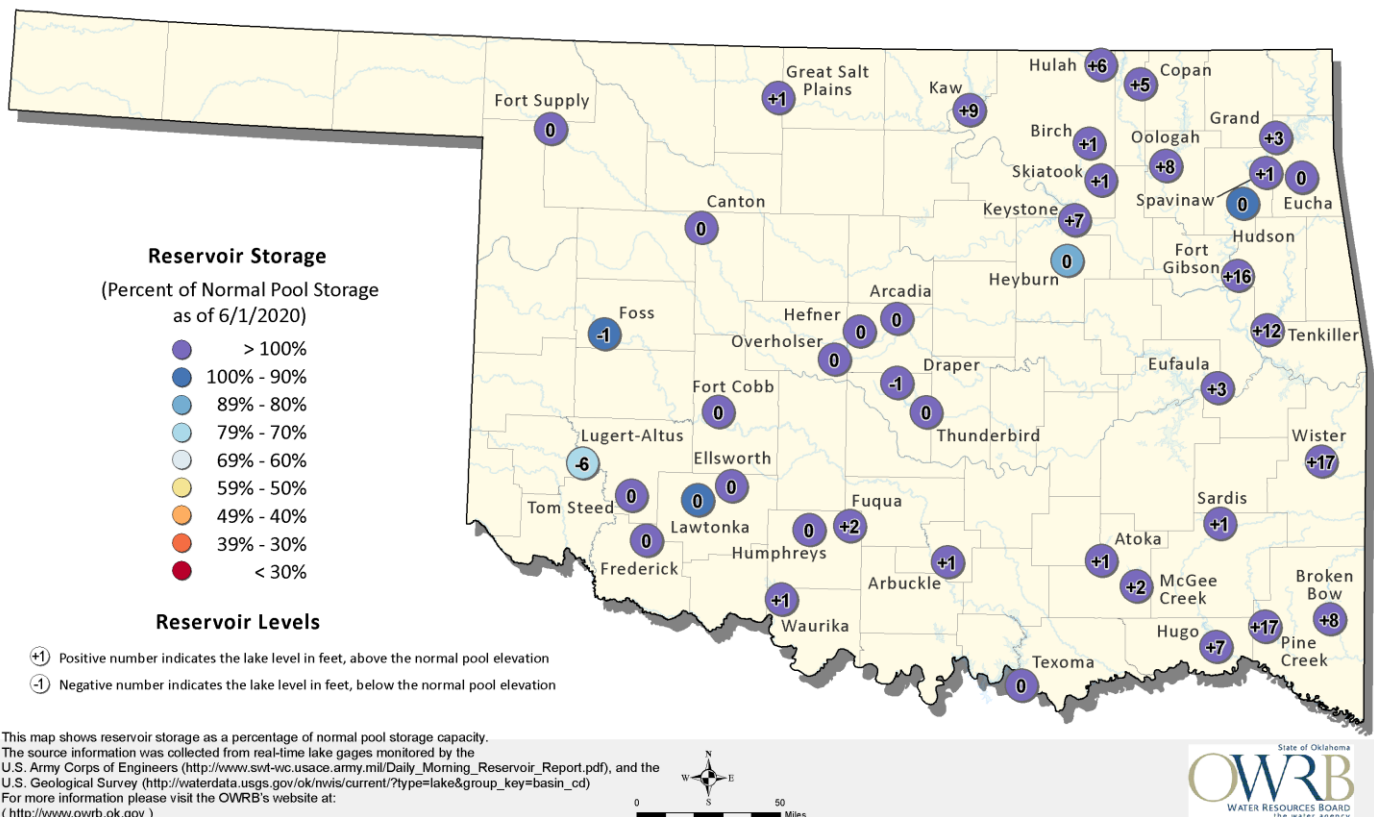
Period of Record – 1949-07-14 to 2020-06-07. Normals period: 1981-2010. Click and drag to zoom chart.



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## Reservoirs

### Oklahoma Surface Water Resources Reservoir Levels and Storage as of 6/1/2020



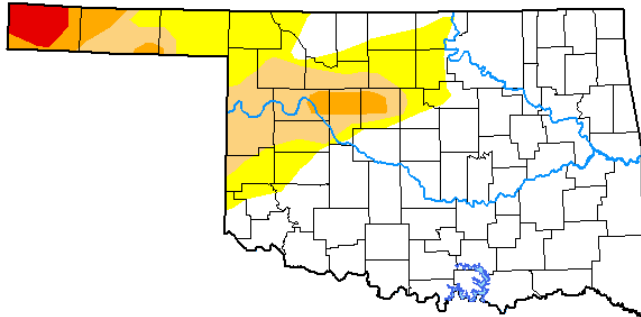
According to the USACE, most of the lakes in the HSA were utilizing a little more than 3% of their flood control pools as of 6/01/2020: Beaver Lake ~86%, Wister Lake 59%, Ft. Gibson Lake 45%, Tenkiller Lake 30%, Oologah Lake 28%, Eufaula Lake 25%, Grand Lake 23%, Kaw Lake 18%, Copan Lake 15%, Keystone Lake 15%, Hugo Lake 14%, Sardis Lake 11%, Hulah Lake 9%, and Skiatook Lake 4%.

**Drought**

According to the [U.S. Drought Monitor](#) (USDM) from June 2, 2020 (Figs. 2, 3), eastern OK and northwest AR were drought free.

**U.S. Drought Monitor  
Oklahoma**

**June 2, 2020**  
(Released Thursday, Jun. 4, 2020)  
Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	70.07	29.93	15.16	5.08	1.72	0.00
<b>Last Week</b> 05-26-2020	73.67	26.33	14.44	3.46	0.00	0.00
<b>3 Months Ago</b> 03-03-2020	85.63	14.37	4.66	0.84	0.00	0.00
<b>Start of Calendar Year</b> 12-31-2019	76.45	23.55	10.47	3.64	0.00	0.00
<b>Start of Water Year</b> 10-01-2019	71.94	28.06	11.08	1.01	0.00	0.00
<b>One Year Ago</b> 06-04-2019	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:

Curtis Riganti  
National Drought Mitigation Center

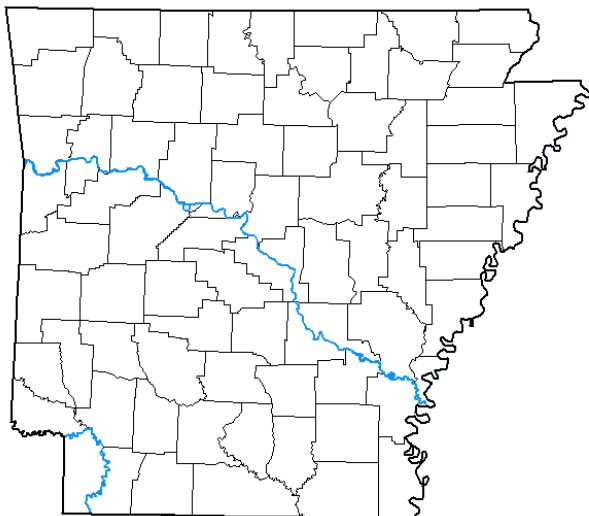


[droughtmonitor.unl.edu](https://droughtmonitor.unl.edu)

Fig. 2. Drought Monitor for Oklahoma

**U.S. Drought Monitor  
Arkansas**

**June 2, 2020**  
(Released Thursday, Jun. 4, 2020)  
Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	100.00	0.00	0.00	0.00	0.00	0.00
<b>Last Week</b> 05-26-2020	100.00	0.00	0.00	0.00	0.00	0.00
<b>3 Months Ago</b> 03-03-2020	100.00	0.00	0.00	0.00	0.00	0.00
<b>Start of Calendar Year</b> 12-31-2019	86.68	13.32	4.35	0.31	0.00	0.00
<b>Start of Water Year</b> 10-01-2019	54.35	45.65	11.77	5.79	0.00	0.00
<b>One Year Ago</b> 06-04-2019	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:

Curtis Riganti  
National Drought Mitigation Center



[droughtmonitor.unl.edu](https://droughtmonitor.unl.edu)

Fig. 3. Drought Monitor for Arkansas



## **Spring (March-April-May 2020)**

In Tulsa, OK, Spring 2020 ranked as the 41<sup>st</sup> warmest Spring (61.1°F, tied 1928; since records began in 1905) and the 31<sup>st</sup> wettest Spring (15.41"; since records began in 1888). Fort Smith, AR had the 36<sup>th</sup> warmest Spring (62.3°F, tied 1994, 1916, 1889; since records began in 1883) and the 18<sup>th</sup> wettest Spring (18.66"; since records began in 1883). Fayetteville, AR had the 9<sup>th</sup> warmest (59.3°F, tied 1985) and the 13<sup>th</sup> wettest (18.73") Spring since records began in 1950.

## **Outlooks**

The [Climate Prediction Center](#) (CPC) outlook for June 2020 (issued May 31, 2020) indicates a greatly enhanced chance for above normal temperatures and an enhanced chance for below median precipitation across eastern OK and northwest AR. This outlook takes into account dynamical model guidance, the weeks 3-4 outlook, and current soil moisture. From CPC, the "June temperature outlook indicates increased probabilities of above normal average temperatures for the month over most of the CONUS under a persistent ridge through at least the first half of the month. Probabilities exceed 60 percent for parts of the Central Plains, where the probabilities of above normal temperatures during weeks 1 and 2 are greatest and predicted to persist in the CPC week 3-4 outlook." This ridging during the first two weeks of the month also results in the enhanced chance for below median precipitation.

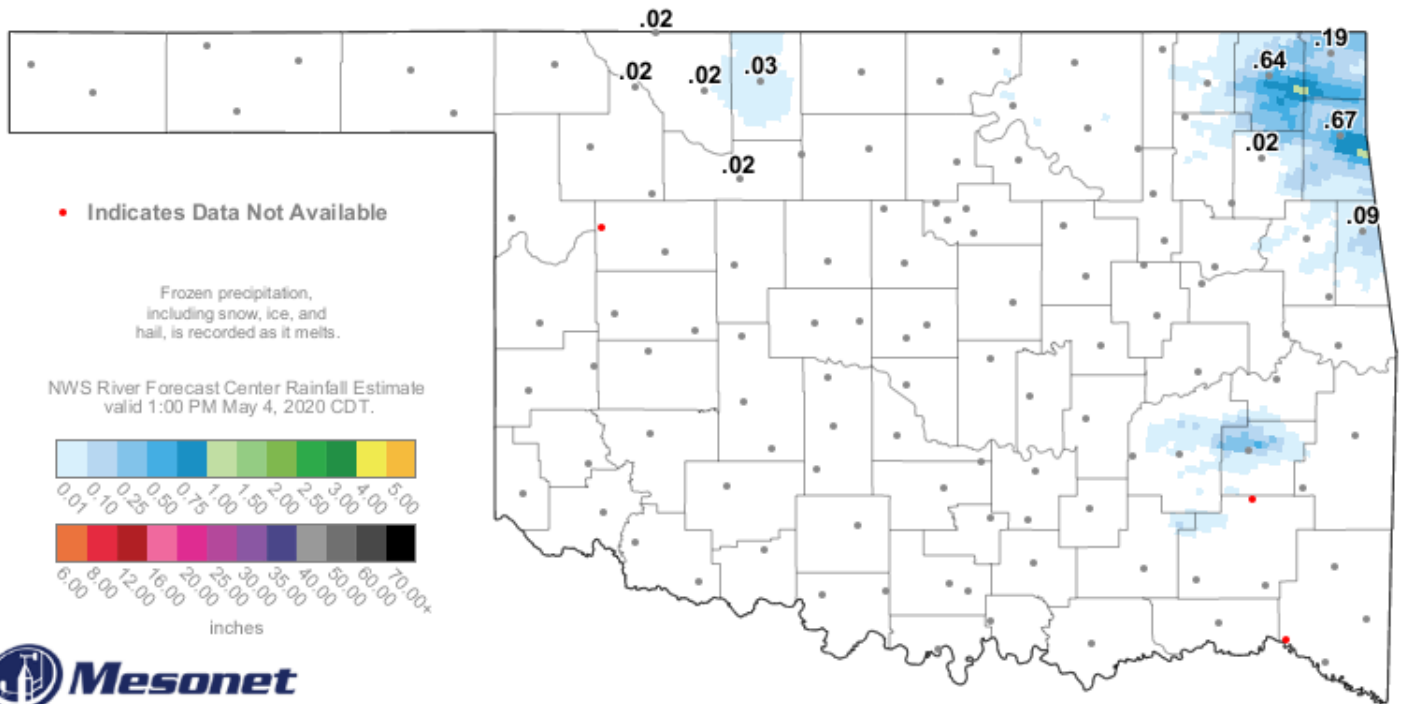
For the 3-month period June-July-August 2020, CPC is forecasting an enhanced chance for above normal temperatures across southeast OK and an equal chance for above, near, and below normal temperatures across the remainder of eastern OK and northwest AR. This outlook also indicates an enhanced chance for above median precipitation across all of northeast OK and northwest AR (outlook issued May 21, 2020). This outlook is based on both statistical and dynamical forecast tools and decadal timescale climate trends. According to CPC, the combined effect of the ocean-atmosphere system is consistent with ENSO neutral conditions. The forecast is for ENSO neutral conditions to continue through Summer and possibly Autumn 2020. The CPC Atlantic Hurricane Outlook predicts a 60% chance of an above-normal season, a 30% chance of a near-normal season and only a 10% chance of a below-normal season. The Atlantic hurricane season runs from June 1 through November 30.

**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](http://water.weather.gov/precip/index.php?location_type=wfo&location_name=tsa)

Soon after sunrise on the 4<sup>th</sup>, thunderstorms developed across northeast OK in a region of warm air advection north of a warm front that was over southeast OK. These storms moved east into far northwest AR and exited the area by noon. The thunderstorms tapped into sufficient elevated instability to become severe, and as a result, produced very large hail of 2"-3.5". 0.10" to near 1" of rain fell in the locations impacted by the storms (Fig. 4). There was a surface low over northwest OK with a dryline that extended southward into western north TX. The dryline surged eastward during the afternoon while a cold front moved south out of KS and into OK. The warm front had also lifted further north and was located from northeast OK into west central AR. By late afternoon, the surface low and triple point were over northeast OK. By mid- to late-afternoon, thunderstorms began to develop just to the northwest of I-44 along the cold front. These storms quickly developed into a broken line of supercells. The supercells moved east through the evening, affecting east central OK and northwest and west central AR. These storms also produced large hail, with several reports of 1.75"-2.5" diameter hail stones. While rotation was noted with several of the supercells, no tornadoes developed. These storms moved east of the area by around midnight. Additional thunderstorms then developed over far southeast OK during the overnight hours and moved south of the Red River shortly after sunrise on the 5<sup>th</sup>. The afternoon through overnight rainfall totals ranged from around 0.10" to 1.5", with isolated spots of around 2" (Fig. 5). The 24-hour rainfall total ranged from 0.10" to around 2.5" (Fig. 6).

Warm air advection over the region on the 7<sup>th</sup> resulted in showers and isolated thunderstorms across northeast OK and northwest AR during the afternoon hours. Additional thunderstorms developed near a cold front in KS and moved southeast into northeast OK during the early evening and continued east through northwest AR. This activity pushed east of the area by late evening. The cold front continued to move south into the area, generating more widespread thunderstorms by midnight. Widespread showers and thunderstorms affected all of eastern OK and northwest AR through the overnight hours, with a line of stronger thunderstorms producing damaging winds in southeast OK. This activity ended from northwest to southeast by sunrise on the 8<sup>th</sup>. Rainfall totals ranged from around 0.25" to around 2" (Figs. 7, 8).

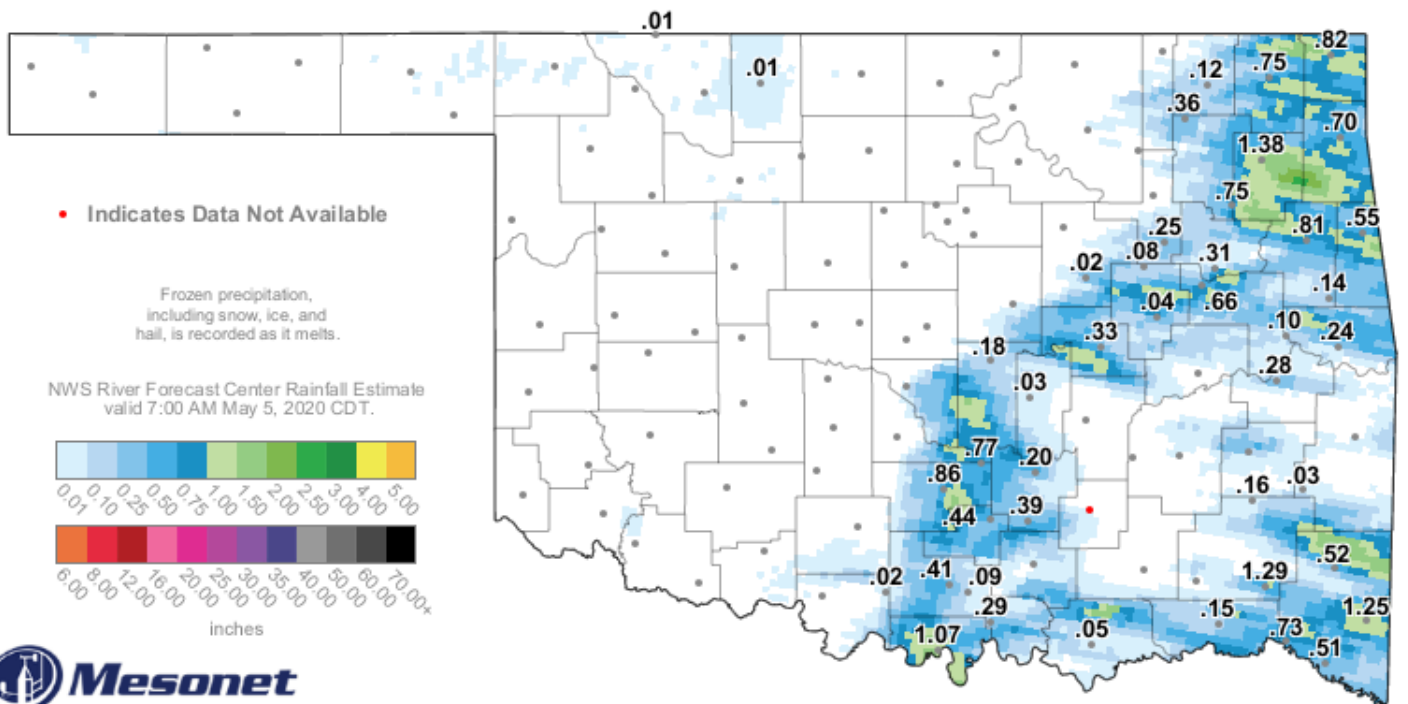


### 12-Hour Rainfall Accumulation (inches)

2:10 PM May 4, 2020 CDT

Created 2:15:55 PM May 4, 2020 CDT. © Copyright 2020

Fig. 4. OK Mesonet (values) and NWS RFC rainfall estimate (image) 12-hour rainfall ending at 2:10 pm CDT 5/04/2020.



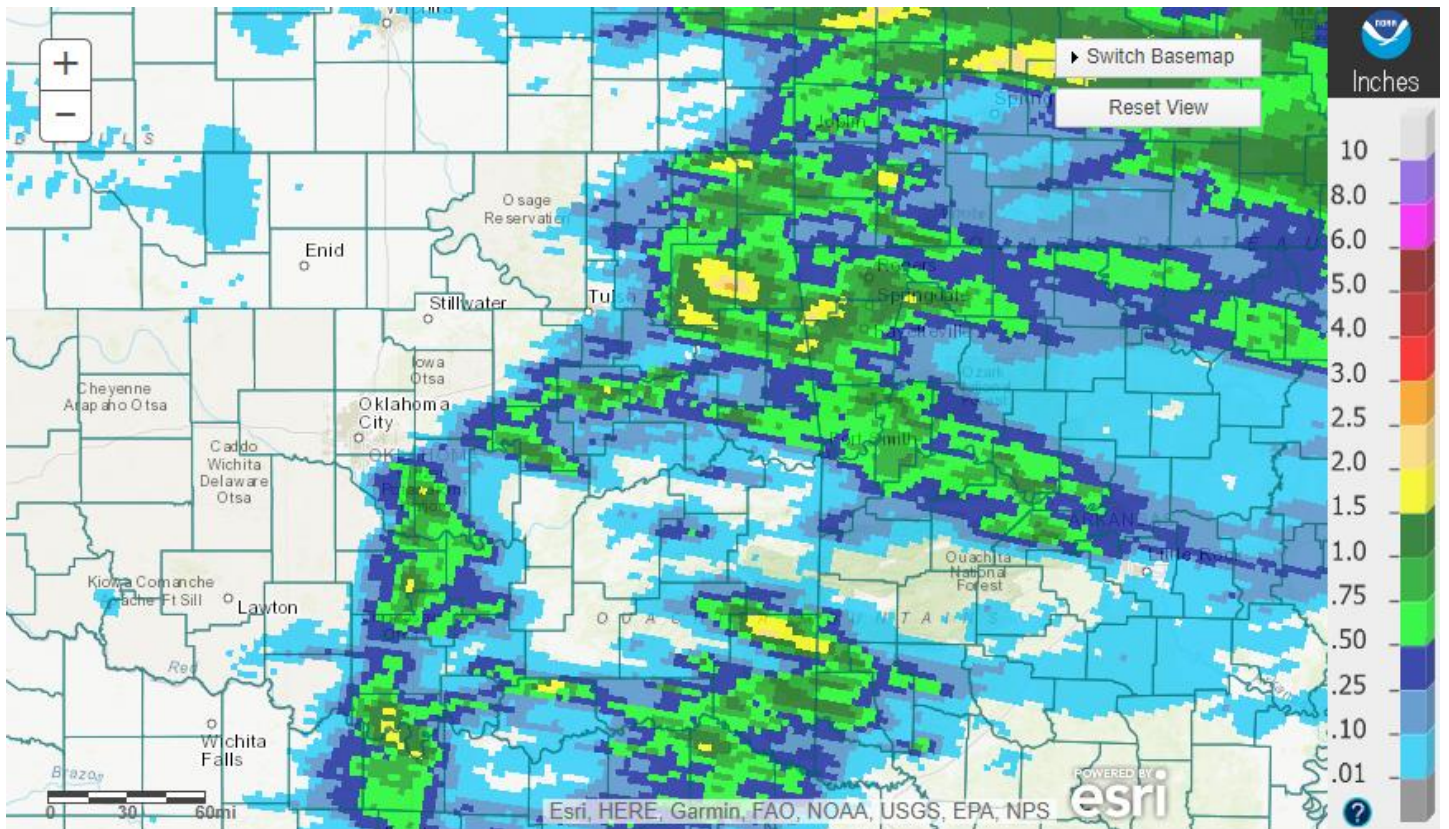
### 24-Hour Rainfall Accumulation (inches)

7:50 AM May 5, 2020 CDT

Created 7:54:12 AM May 5, 2020 CDT. © Copyright 2020

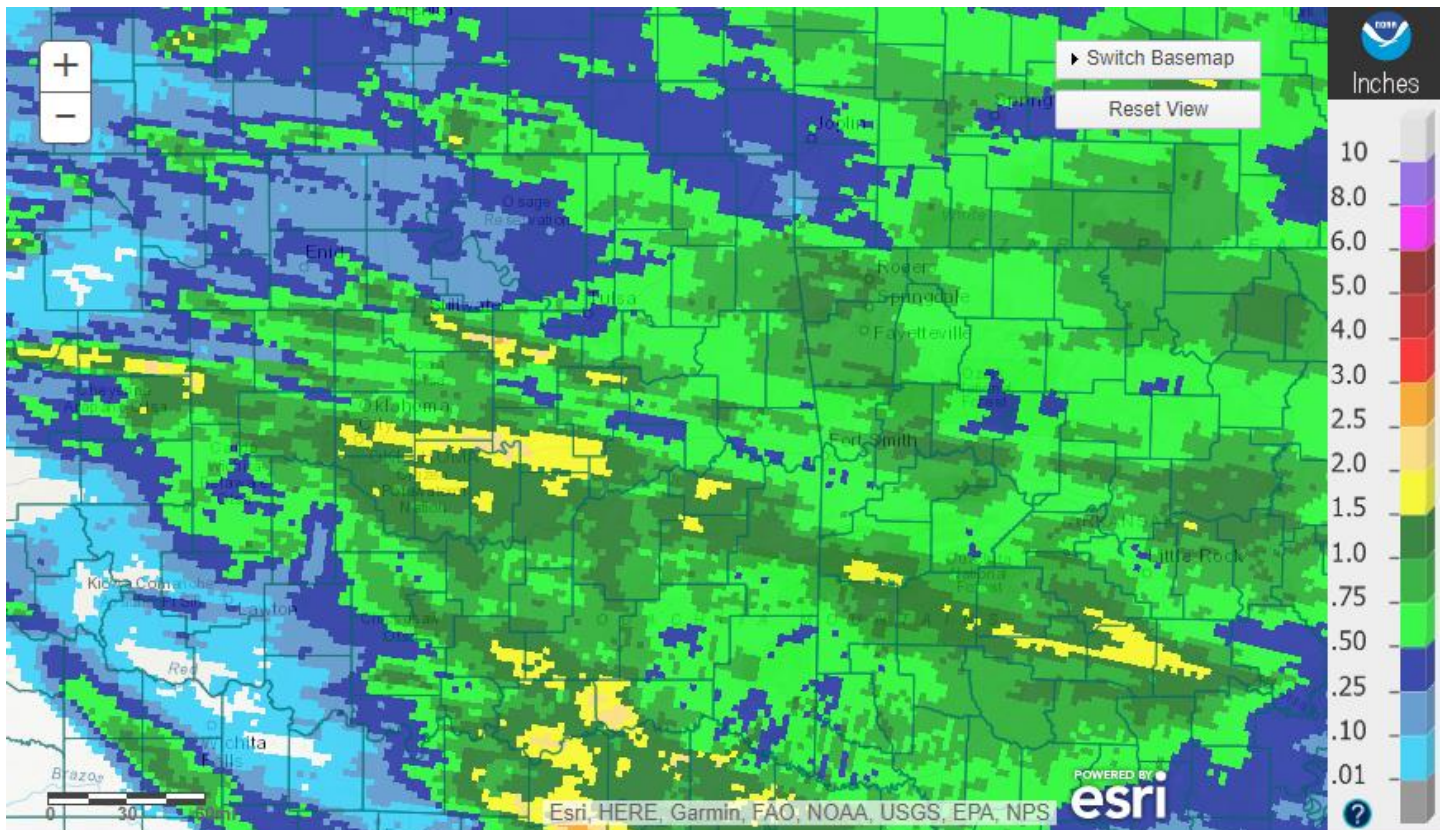
Fig. 5. OK Mesonet (values) and NWS RFC rainfall estimate (image) 24-hour rainfall ending at 7:50 am CDT 5/05/2020.





Tulsa, OK: May 05, 2020 1-Day Observed Precipitation  
Valid on: May 05, 2020 12:00 UTC

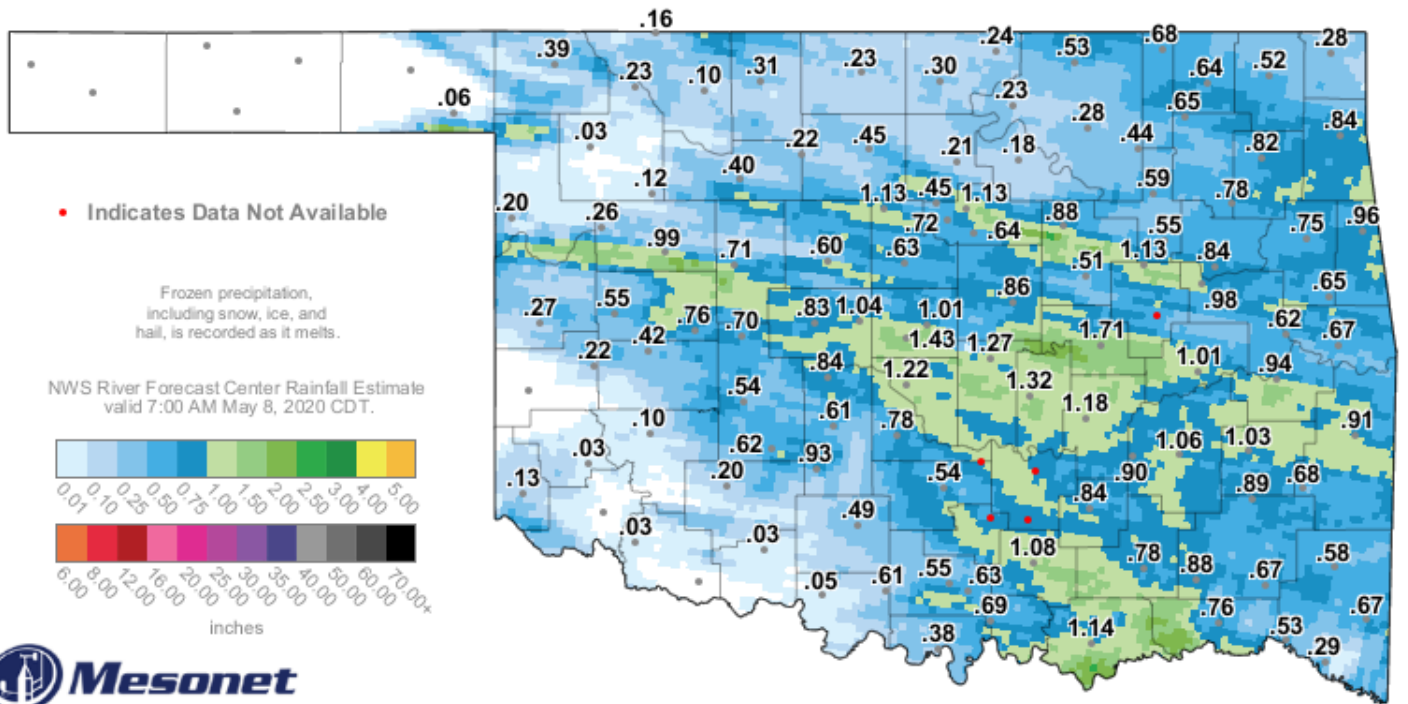
Fig. 6. 24-hour Estimated Observed Rainfall ending at 7am CDT 5/05/2020.



Tulsa, OK: May 08, 2020 1-Day Observed Precipitation  
Valid on: May 08, 2020 12:00 UTC

Fig. 7. 24-hour Estimated Observed Rainfall ending at 7am CDT 5/08/2020.



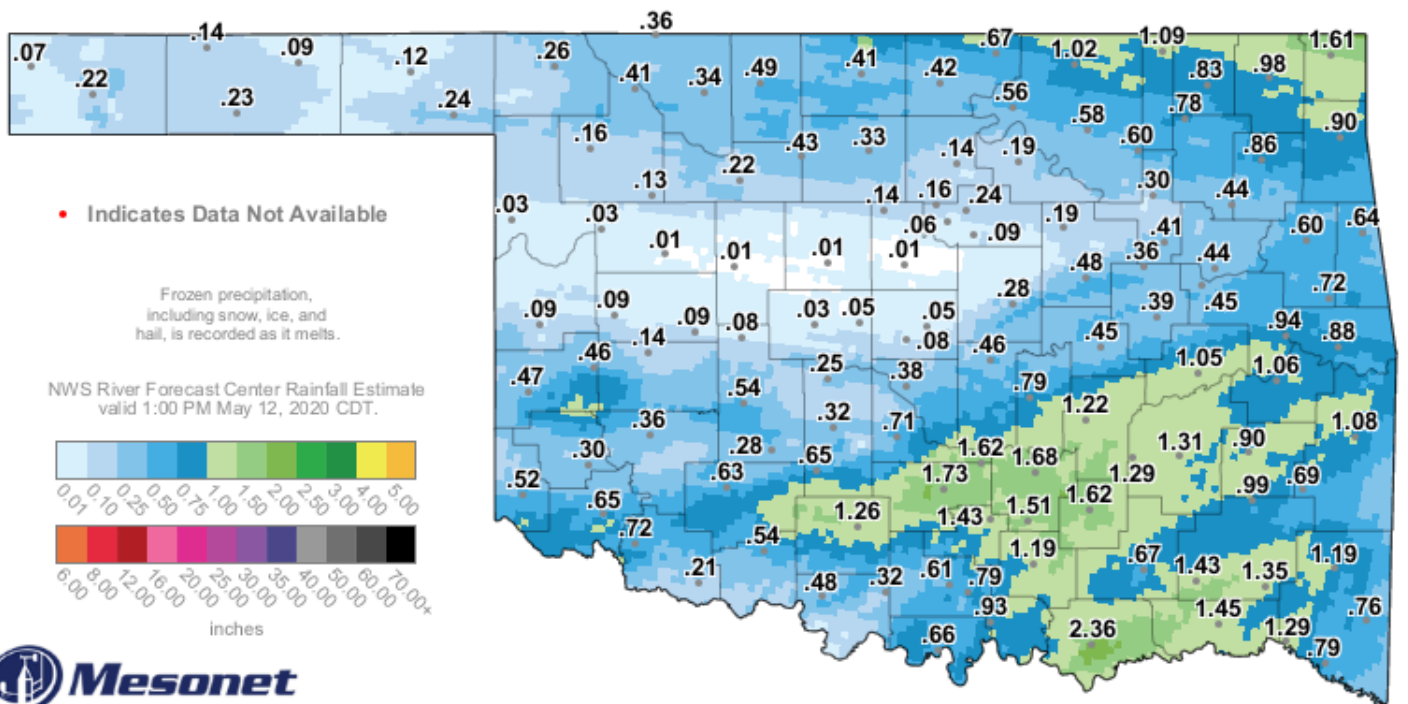


### 24-Hour Rainfall Accumulation (inches)

8:40 AM May 8, 2020 CDT

Created 8:45:08 AM May 8, 2020 CDT. © Copyright 2020

Fig. 8. OK Mesonet (values) and NWS RFC rainfall estimate (image) 24-hour rainfall ending at 8:40 am CDT 5/08/2020.



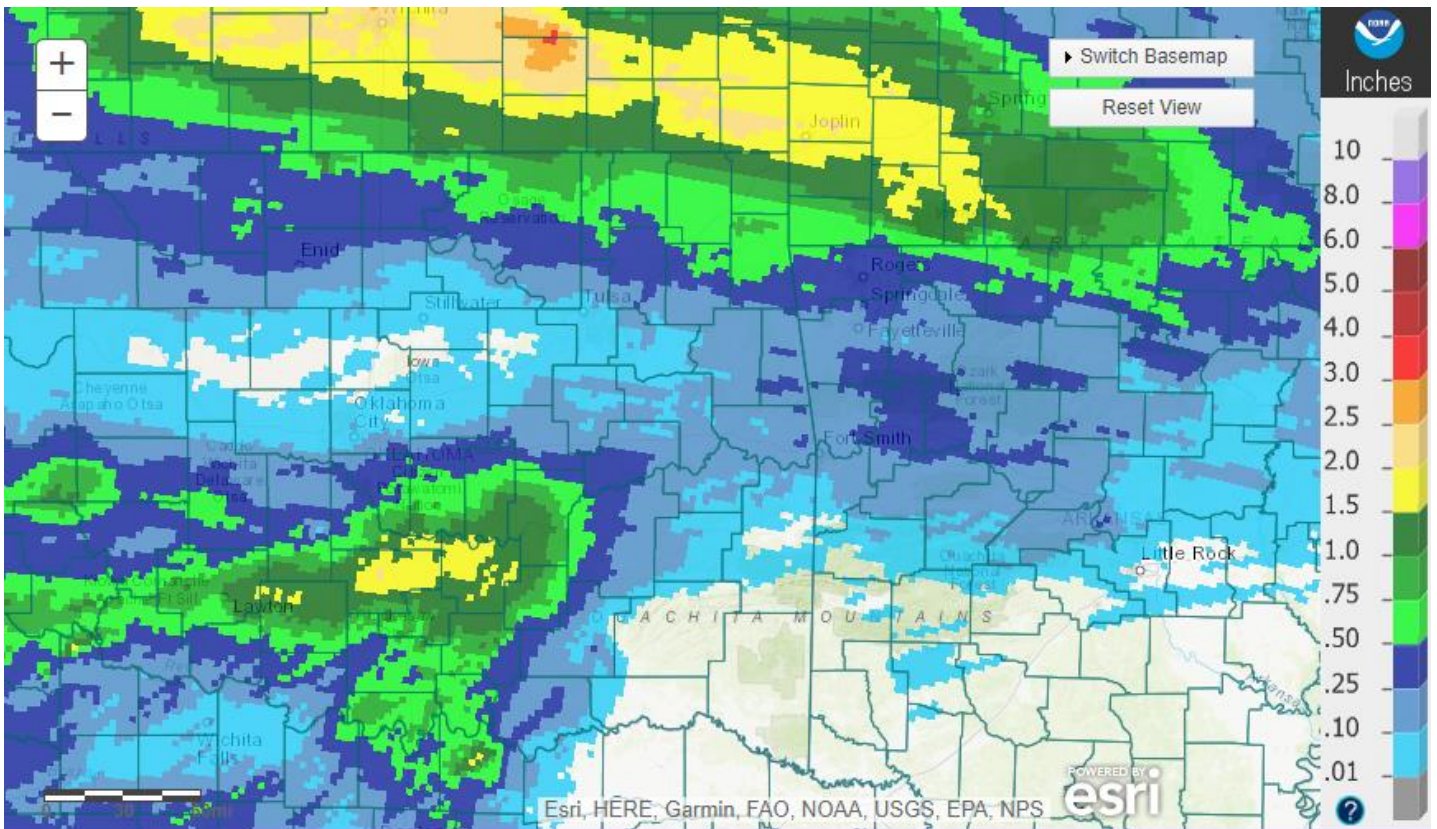
### 2-Day Rainfall Accumulation (inches)

2:40 PM May 12, 2020 CDT

Created 2:44:37 PM May 12, 2020 CDT. © Copyright 2020

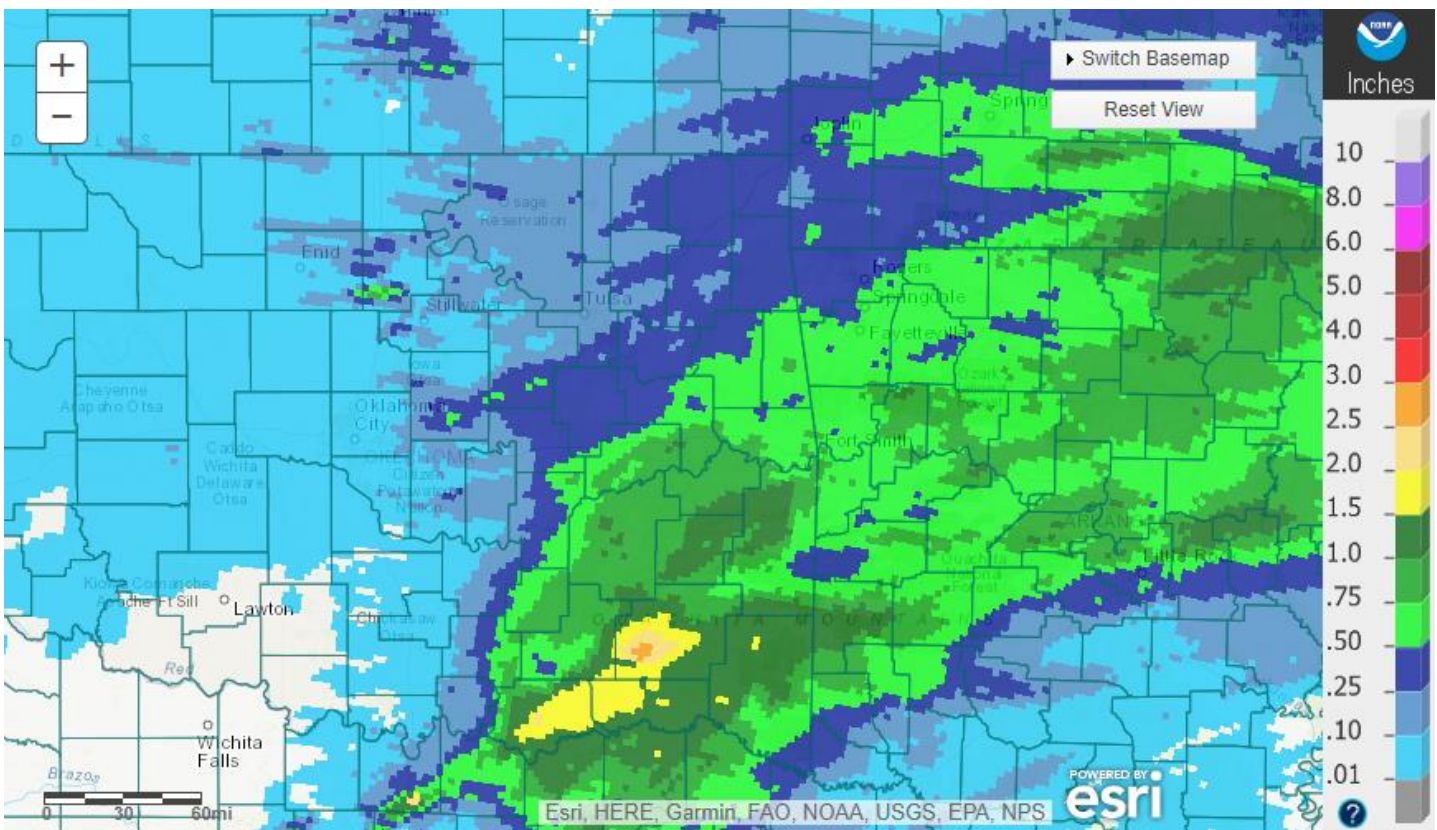
Fig. 9. OK Mesonet (values) and NWS RFC rainfall estimate (image) 2-Day rainfall ending at 2:40 pm CDT 5/12/2020.





Tulsa, OK: May 12, 2020 1-Day Observed Precipitation  
Valid on: May 12, 2020 12:00 UTC

Fig. 10. 24-hour Estimated Observed Rainfall ending at 7am CDT 5/12/2020.



Tulsa, OK: May 13, 2020 1-Day Observed Precipitation  
Valid on: May 13, 2020 12:00 UTC

Fig. 11. 24-hour Estimated Observed Rainfall ending at 7am CDT 5/13/2020.

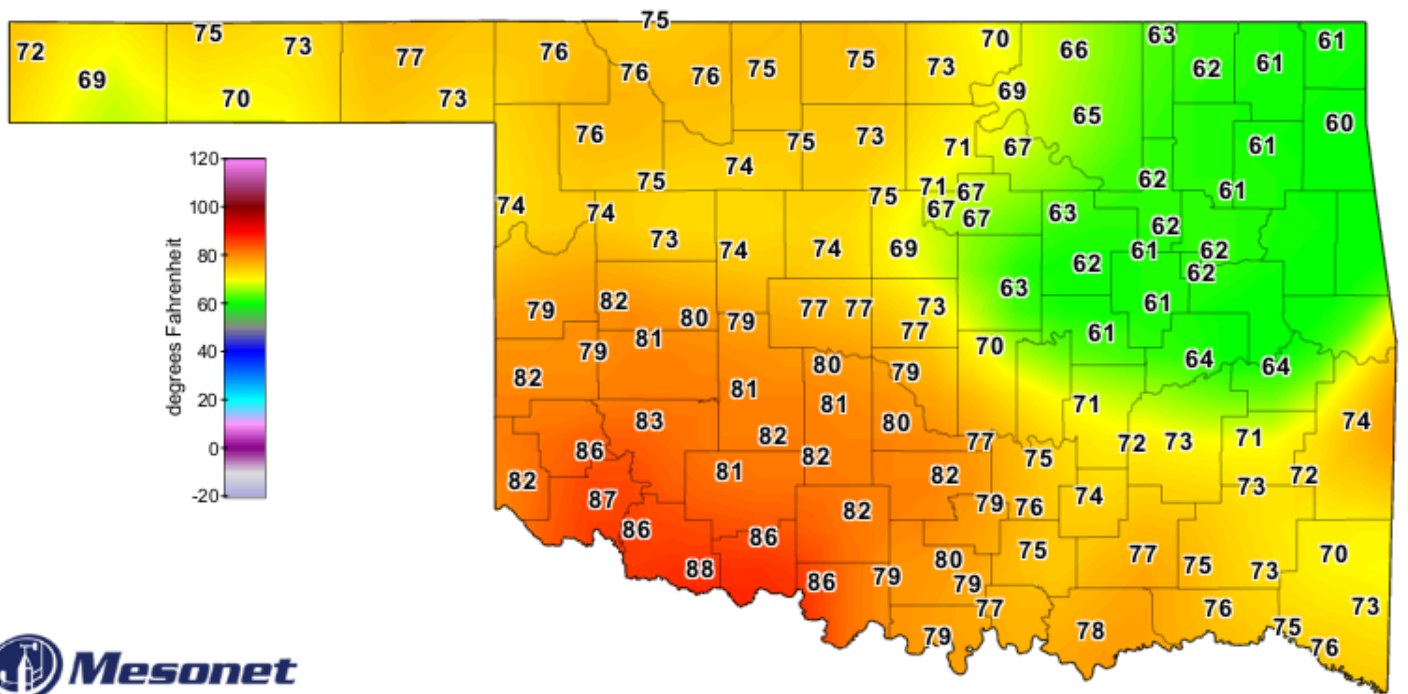
Scattered showers and thunderstorms affected northeast OK and southeast KS during the morning and afternoon hours of the 11<sup>th</sup> due to an increase in mid-level isentropic lift. By evening, these showers and thunderstorms became widespread across southeast KS and the northern OK counties just across the OK/KS state line as an upper-level wave approached the area and low-level frontogenesis increased. This activity continued through the evening and much of the overnight hours before finally shifting south into OK and northwest AR in the pre-dawn hours of the 12<sup>th</sup>. Meanwhile, a second area of showers and thunderstorms within an area of elevated instability over south central OK shifted east into southeast OK during the early morning hours as well. This activity continued to track eastward, bringing rain to southeast and east central OK, as well as northwest and west central AR before moving east of the region by mid-afternoon. Rainfall totals ranged from 0.25" to around 2.50" (Figs. 9-11). The highest totals were across Pushmataha and Choctaw Counties in southeast OK, as well as across southeast KS, where widespread 1"-2.5" of rain fell over the Neosho River Basin. This resulted in minor flooding along the Neosho River near Commerce (see preliminary hydrographs at the end of this report and the E3 Report for details). The Spring River near Quapaw also rose, but remained about 1.5 feet below flood stage.

A line of strong thunderstorms moved south out of KS into northeast OK and northwest AR in the pre-dawn hours of the 15<sup>th</sup>. By late morning, two primary boundaries were across the area. The outflow boundary from the early morning storms was near I-40, with strong to severe thunderstorms continuing to develop in its vicinity (Fig. 12). Further north, a more substantial cold front was near I-44. Between these two boundaries, thunderstorms continued to develop and produced heavy rainfall. The OK Mesonet measured 1.5" to 2.75" of rain in just one hour in east central OK (Figs. 13-16) at mid-day, with 3"-4.5" of rain falling within 3 hours (Figs. 17-19), resulting in multiple areas of flash flooding. As the cold front continued to push south, this convection developed into a mesoscale convective system (MCS), which moved to the southeast across southeast OK and west central AR during the afternoon hours. Both surface and elevated instability out ahead of the MCS allowed for continued strong to severe storms to regenerate along the leading line/surface cold pool boundary. Damaging winds and large hail were reported as deep layer shear values greater than 30 knots ahead of the line. Additional wind damage occurred on the back side of the MCS as a wake low developed. At the same time, moisture pooling along the boundary, with surface dewpoints in the upper 60s to around 70°F being lifted up over the boundary, allowed for continued heavy rainfall and flash flooding (Figs 20-22). The leading edge of the MCS moved south of the area by late afternoon, with the trailing showers and thunderstorms coming to an end by mid-evening. Rainfall totals ranged from 0.25" to 6", with a large portion of northeast and east central OK receiving 1.5"-4" of rain (Figs. 23-24). The highest totals of 3"-6" occurred over portions of Wagoner, Muskogee, McIntosh, Sequoyah, Haskell, and northern Le Flore Counties. Widespread flash flooding occurred, along with rapid rises along area rivers. The Poteau River near Panama rose 10 feet in just 5 hours, while the Verdigris River near Lenapah rose 14 feet in 14 hours. Moderate river flooding occurred along the following rivers from this rainfall: the Verdigris River near Lenapah, the Neosho River near Commerce, and the Poteau River near Panama; and minor river flooding occurred along the Illinois River near Tahlequah (see preliminary hydrographs at the end of this report and the E3 Report for details). In addition to the heavy rain, an EF-1 tornado occurred near Keefeton, OK (for details, see <https://arcg.is/WOfzC0>).

A compact upper-level wave moved through north-central TX and lifted northeast into the ARKLATX region on the 16<sup>th</sup>. Scattered showers and thunderstorms spread from southeast to northwest across southeast and east central OK and parts of northwest AR during the late afternoon and evening hours in response to the low-pressure system. Also wrapping around the low was an ample amount of low-level moisture, with precipitable water (PWAT) values in the 1.5"-2" range. This aided in additional heavy rainfall across parts of southeast OK into west central AR. This activity continued during the overnight hours, slowly shifting eastward with the low-pressure system, before coming to an end soon after sunrise on the 17<sup>th</sup>. Rainfall totals were 0.25" to around 3" for most of southeast OK into northwest AR, though the far southern portion of Sebastian and Franklin Counties received 3"-4" of rain (Fig. 25). This rain, in addition to the heavy rain on the 15<sup>th</sup>, resulted in minor flooding along the Arkansas River at Van Buren and at Ozark Lock and Dam (see preliminary hydrographs at the end of this report and the E3 Report for details).

The 7-day rainfall total, ending on May 18, ranged from 2"-8" across much of eastern OK and northwest AR, with the highest amounts occurring in east central OK (Figs. 26, 27).



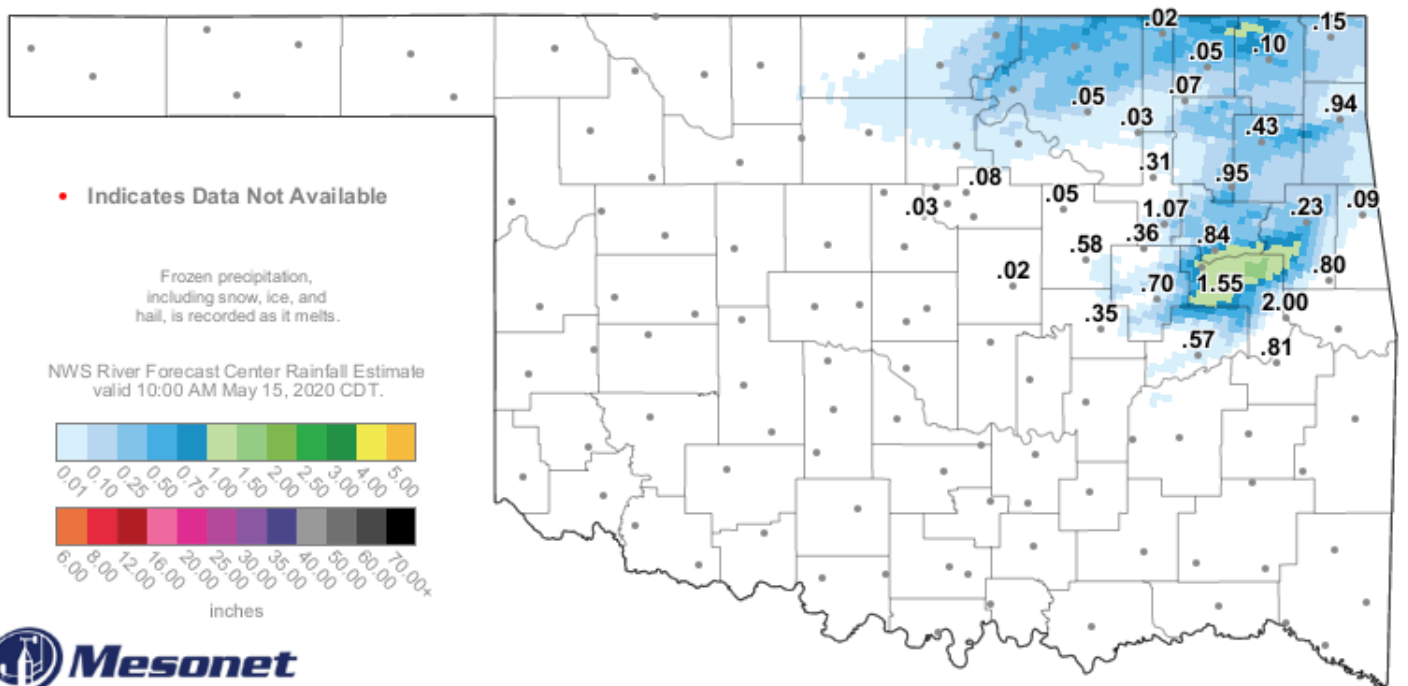


**Mesonet**  
Air Temperature (°F)

12:05 PM May 15, 2020 CDT

Created 12:10:56 PM May 15, 2020 CDT. © Copyright 2020

Fig. 12. OK Mesonet Air Temperature at 12:05 pm CDT 5/15/2020.



**Mesonet**  
1-Hour Rainfall Accumulation (inches)

11:40 AM May 15, 2020 CDT

Created 11:45:58 AM May 15, 2020 CDT. © Copyright 2020

Fig. 13. OK Mesonet (values) and NWS RFC rainfall estimate (image) 1-Hour rainfall ending at 11:40 am CDT 5/15/2020.

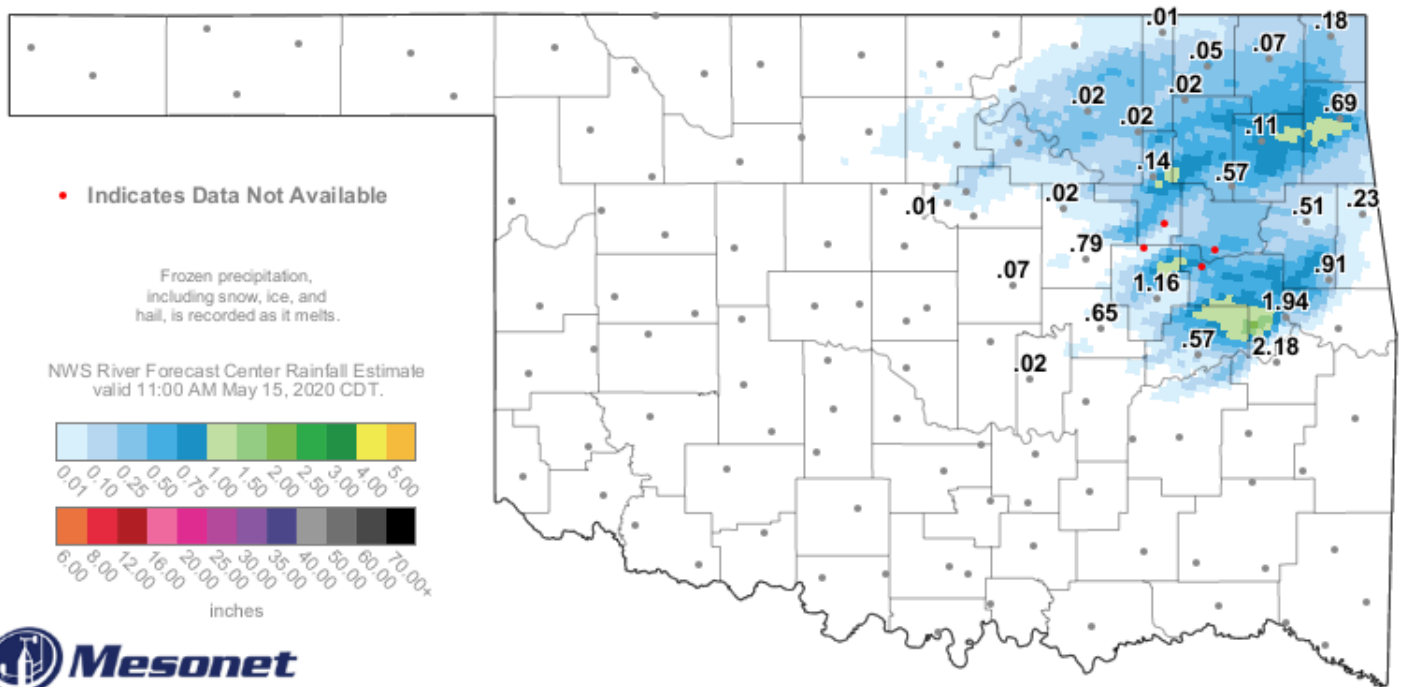


Fig. 14. OK Mesonet (values) and NWS RFC rainfall estimate (image) 1-Hour rainfall ending at 12:00 pm CDT 5/15/2020.

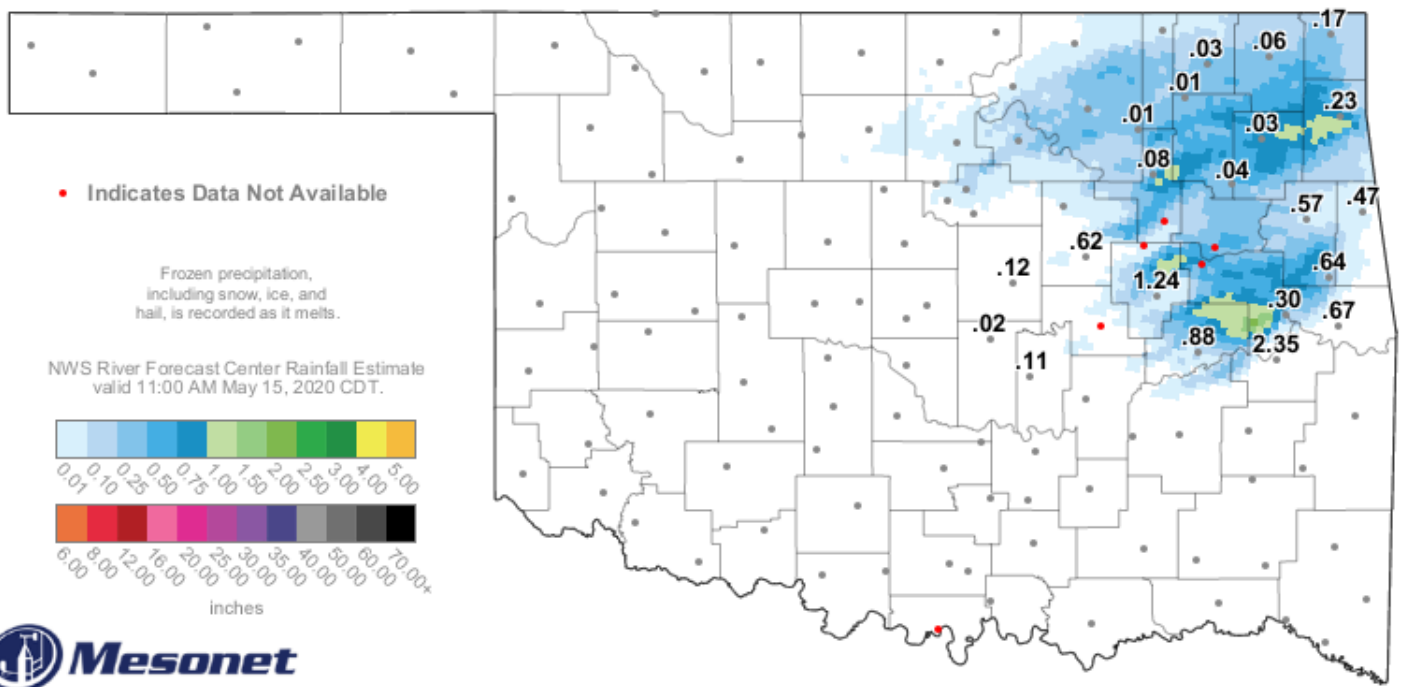
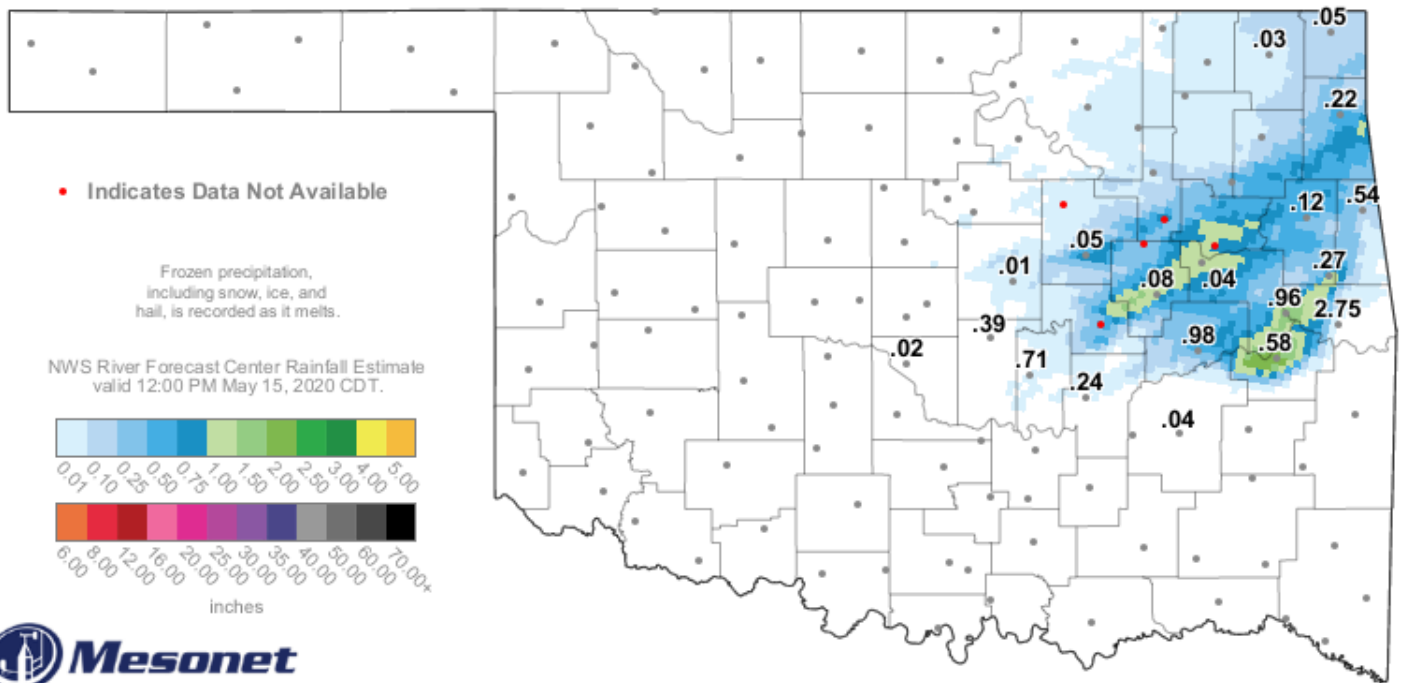


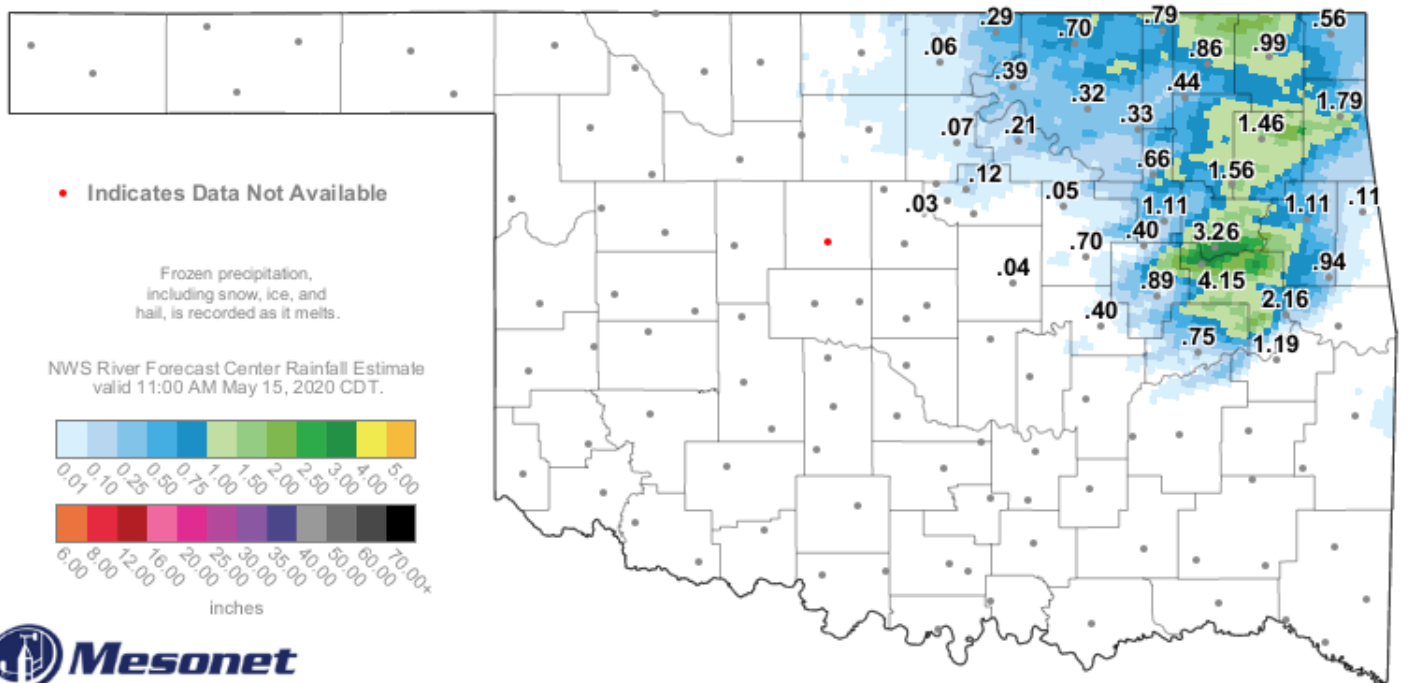
Fig. 15. OK Mesonet (values) and NWS RFC rainfall estimate (image) 1-Hour rainfall ending at 12:25 pm CDT 5/15/2020.





### 1-Hour Rainfall Accumulation (inches)

Fig. 16. OK Mesonet (values) and NWS RFC rainfall estimate (image) 1-Hour rainfall ending at 1:15 pm CDT 5/15/2020.



### 3-Hour Rainfall Accumulation (inches)

Fig. 17. OK Mesonet (values) and NWS RFC rainfall estimate (image) 3-Hour rainfall ending at 11:45 am CDT 5/15/2020.

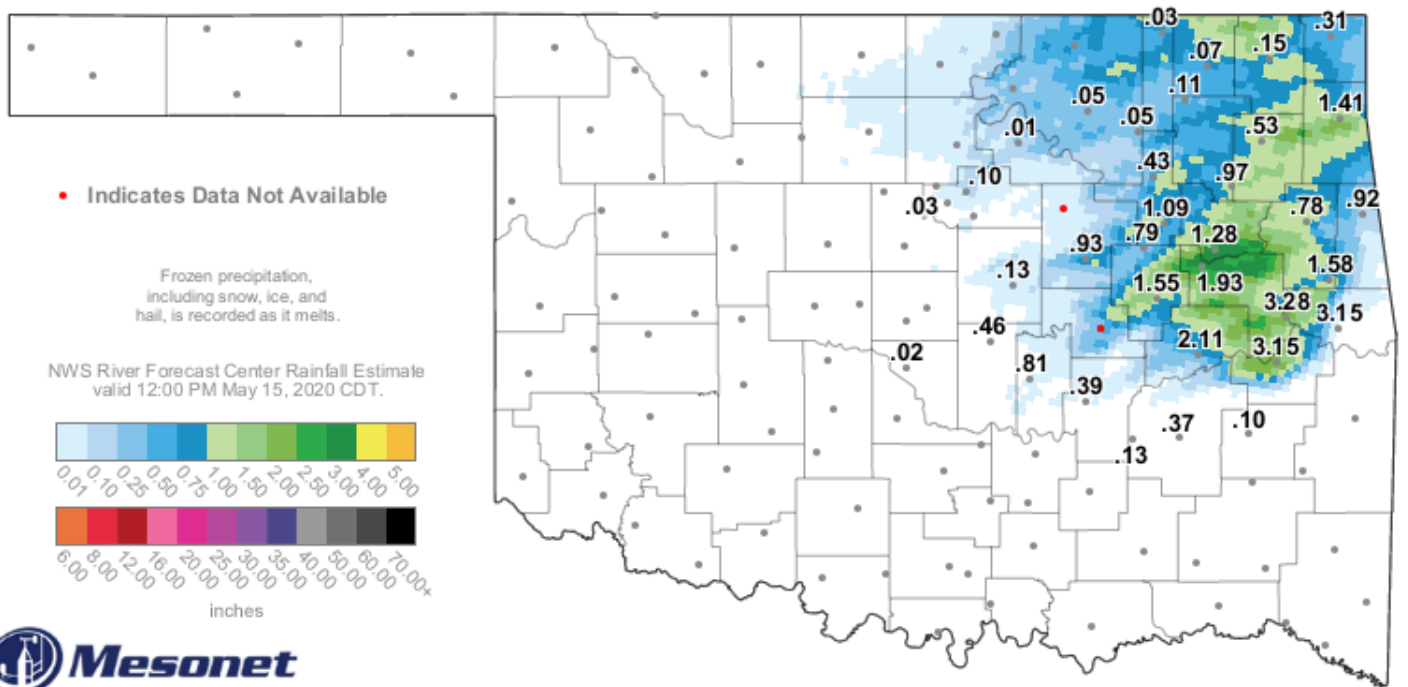


Fig. 18. OK Mesonet (values) and NWS RFC rainfall estimate (image) 3-Hour rainfall ending at 1:35 pm CDT 5/15/2020.

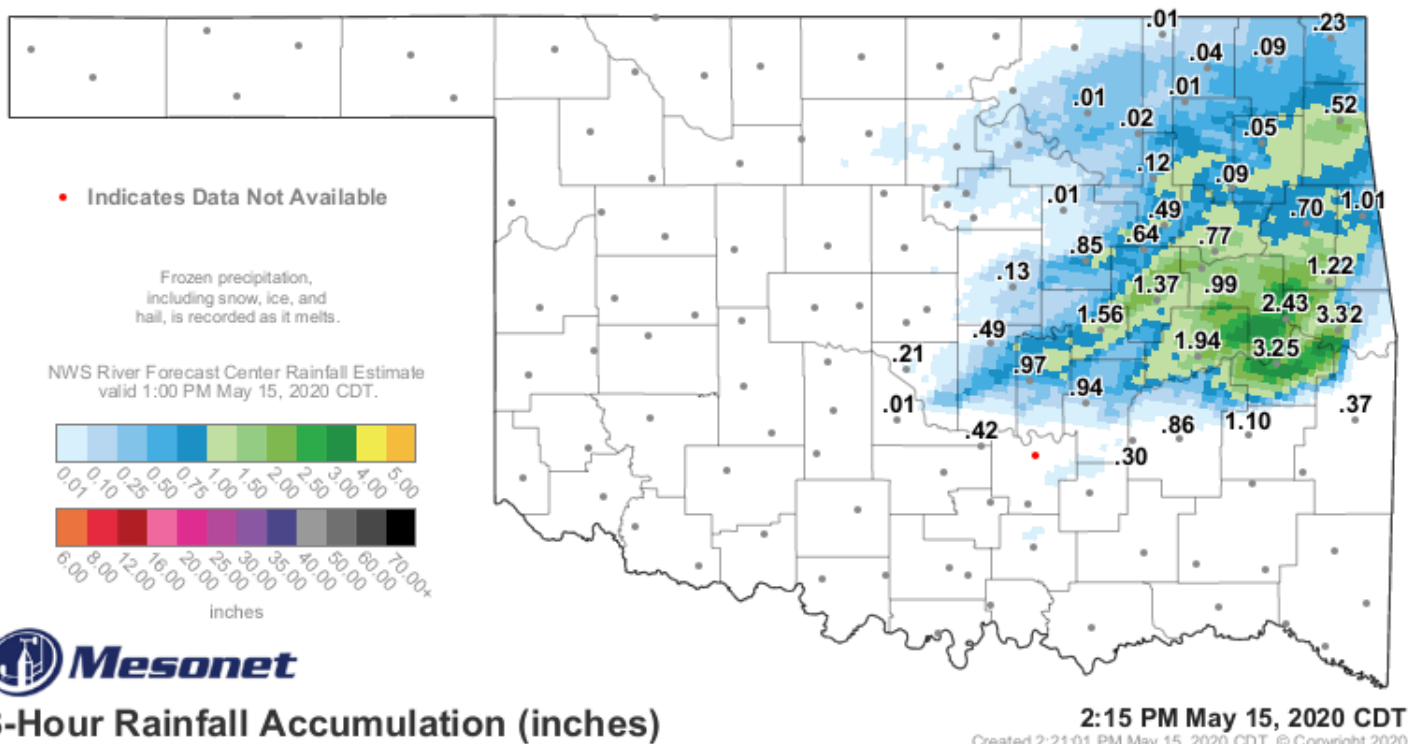
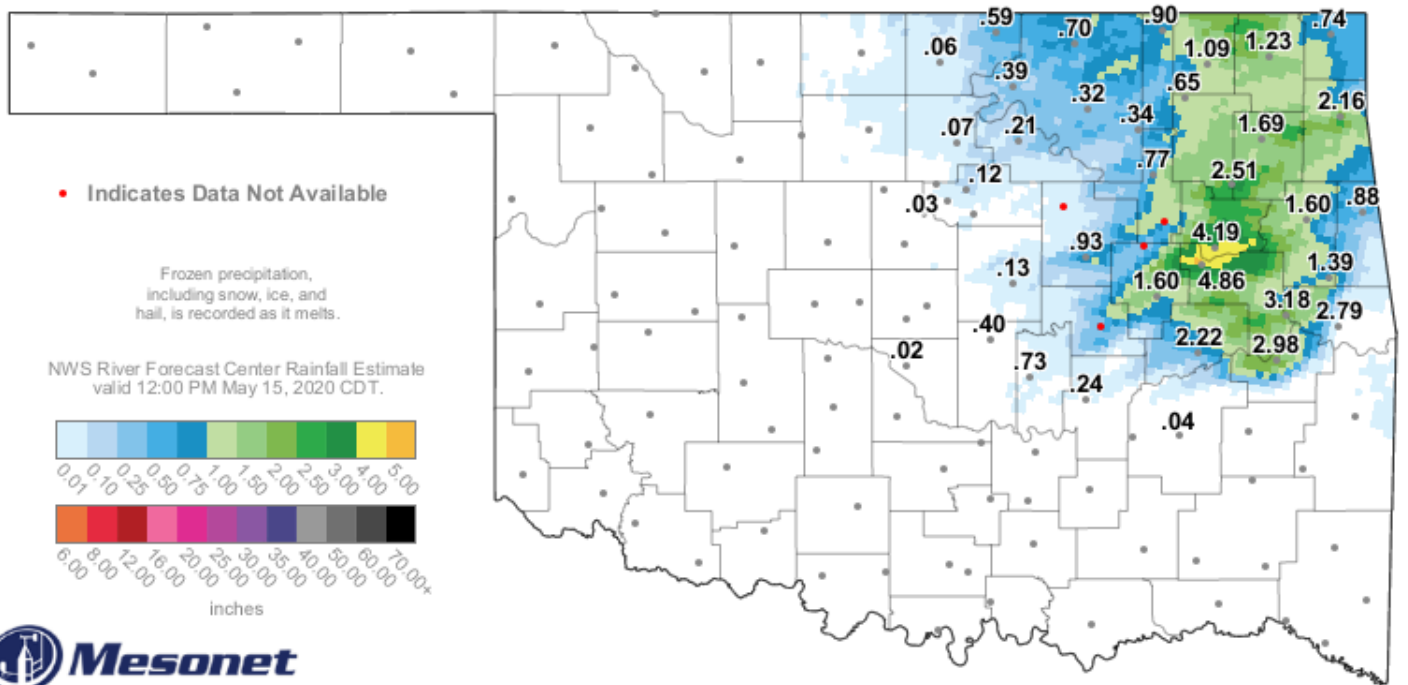


Fig. 19. OK Mesonet (values) and NWS RFC rainfall estimate (image) 3-Hour rainfall ending at 2:15 pm CDT 5/15/2020.

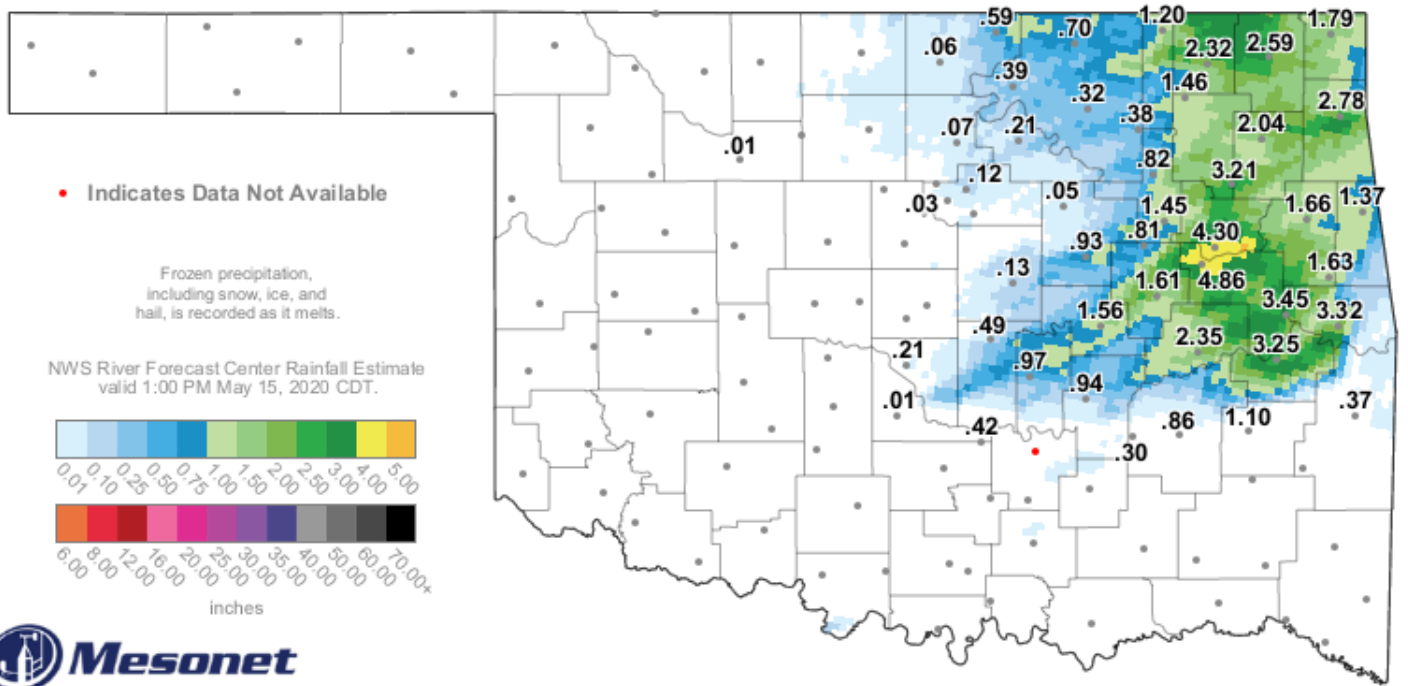


### 6-Hour Rainfall Accumulation (inches)

1:15 PM May 15, 2020 CDT

Created 1:21:04 PM May 15, 2020 CDT. © Copyright 2020

Fig. 20. OK Mesonet (values) and NWS RFC rainfall estimate (image) 6-Hour rainfall ending at 1:15 pm CDT 5/15/2020.

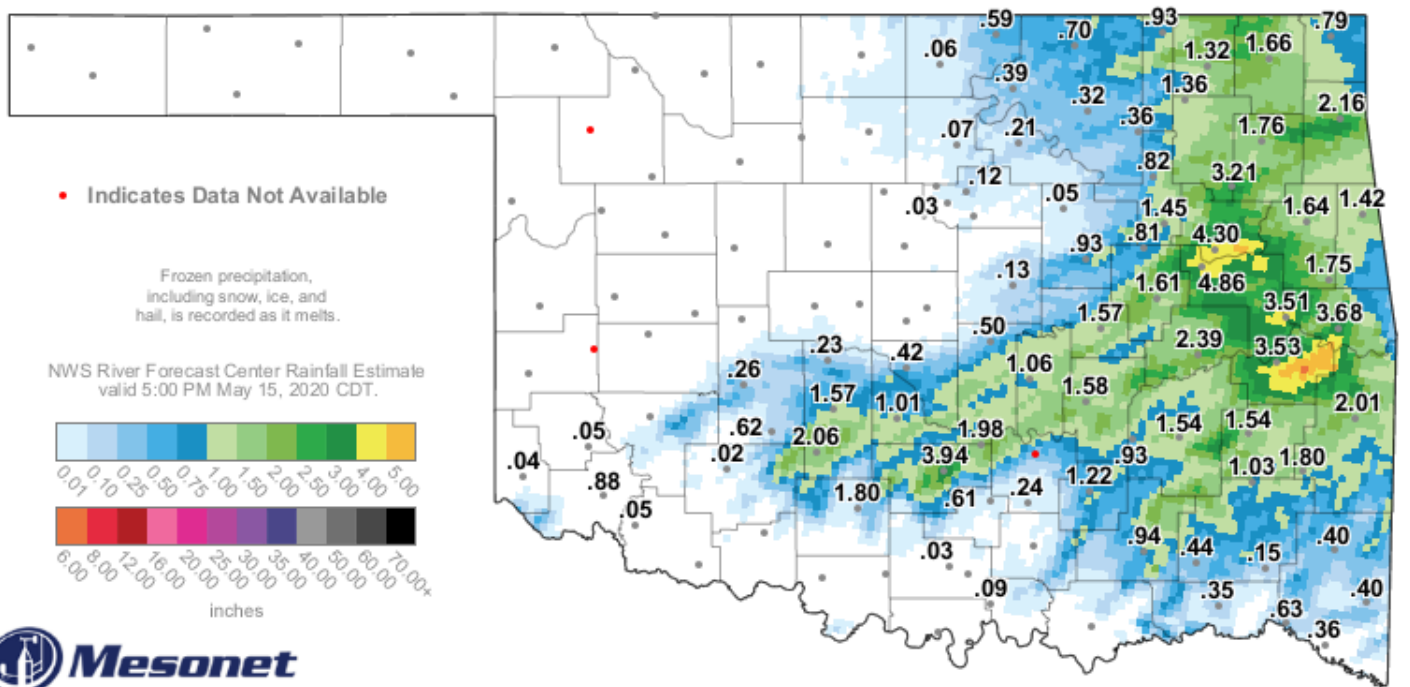


### 12-Hour Rainfall Accumulation (inches)

2:15 PM May 15, 2020 CDT

Created 2:21:01 PM May 15, 2020 CDT. © Copyright 2020

Fig. 21. OK Mesonet (values) and NWS RFC rainfall estimate (image) 12-Hour rainfall ending at 2:15 pm CDT 5/15/2020.

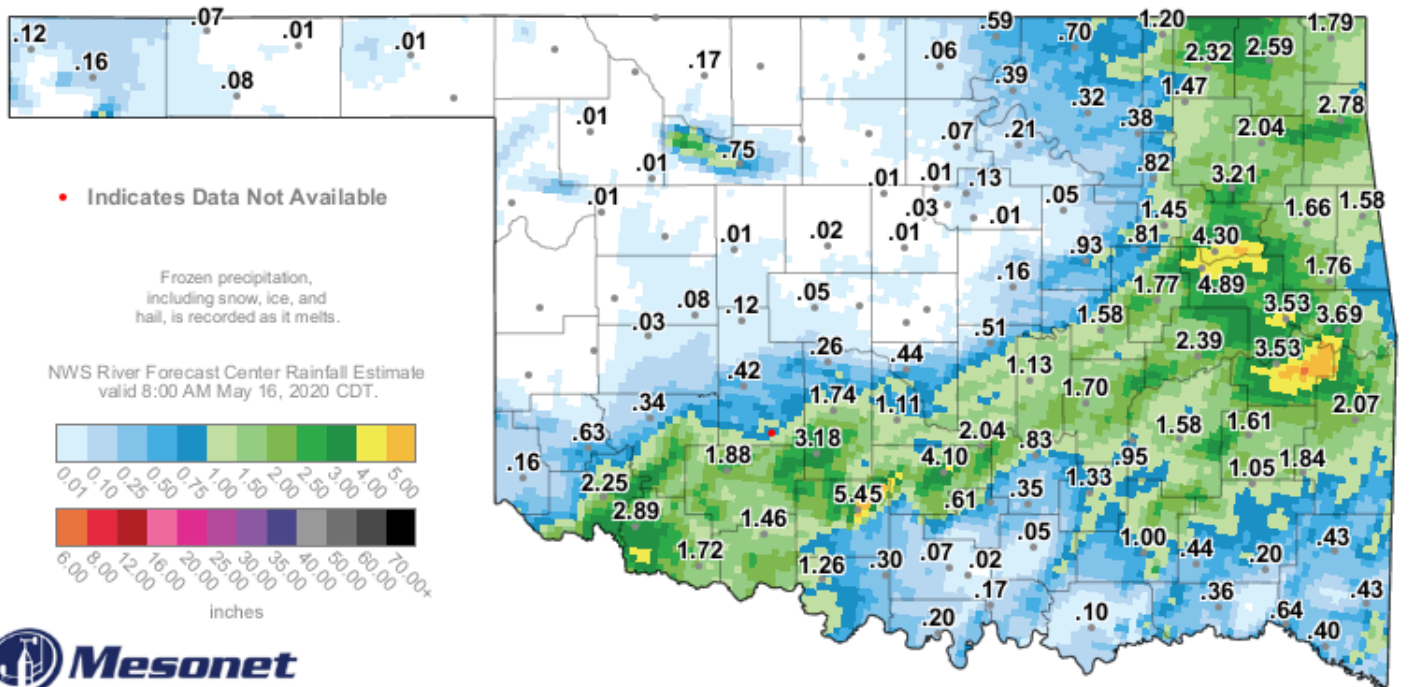


### 12-Hour Rainfall Accumulation (inches)

6:15 PM May 15, 2020 CDT

Created 6:21:02 PM May 15, 2020 CDT. © Copyright 2020

Fig. 22. OK Mesonet (values) and NWS RFC rainfall estimate (image) 12-Hour rainfall ending at 6:15 pm CDT 5/15/2020.



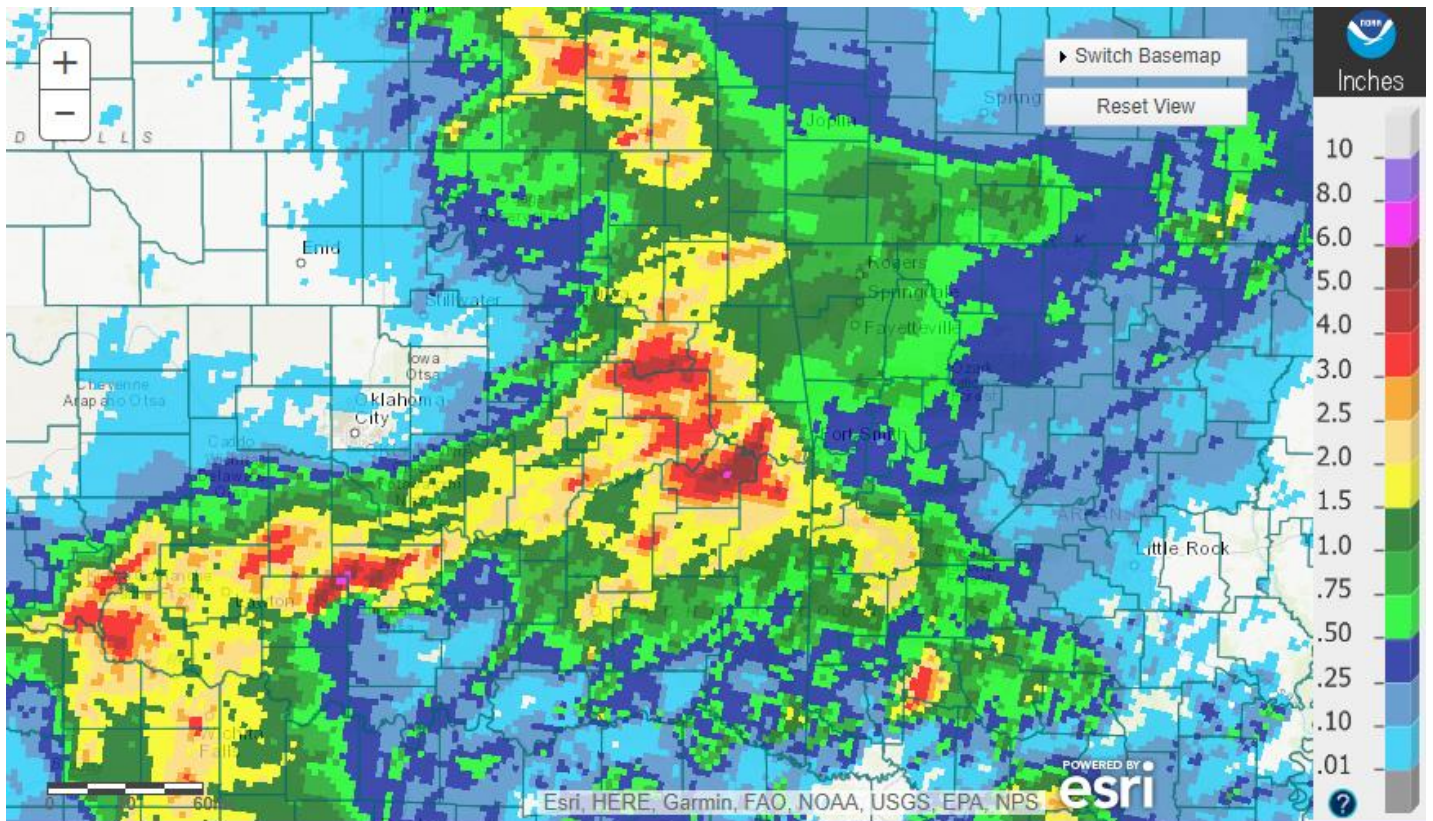
### 2-Day Rainfall Accumulation (inches)

9:15 AM May 16, 2020 CDT

Created 9:20:56 AM May 16, 2020 CDT. © Copyright 2020

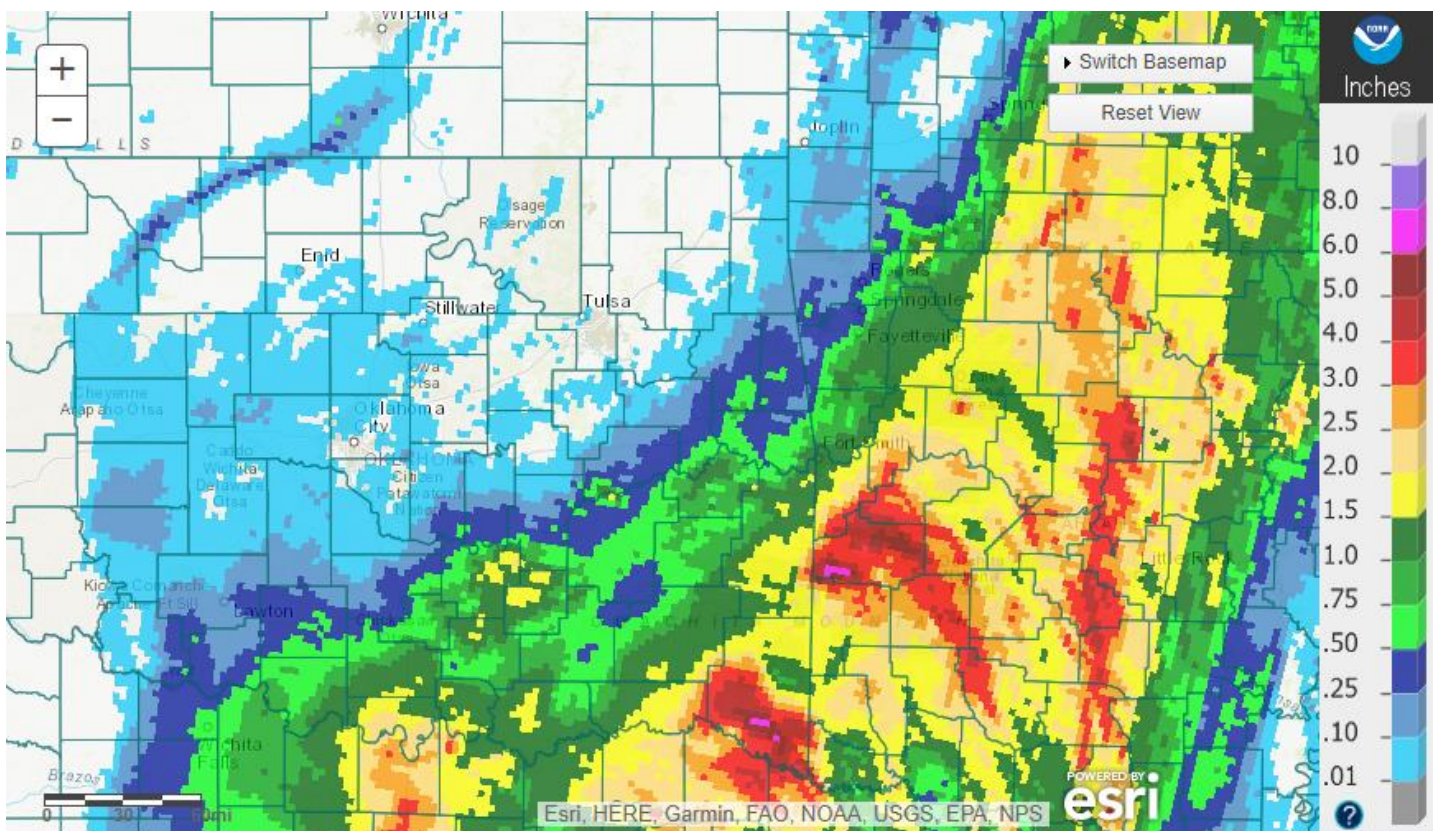
Fig. 23. OK Mesonet (values) and NWS RFC rainfall estimate (image) 2-Day rainfall ending at 9:15 am CDT 5/16/2020.





Tulsa, OK: May 16, 2020 1-Day Observed Precipitation  
Valid on: May 16, 2020 12:00 UTC

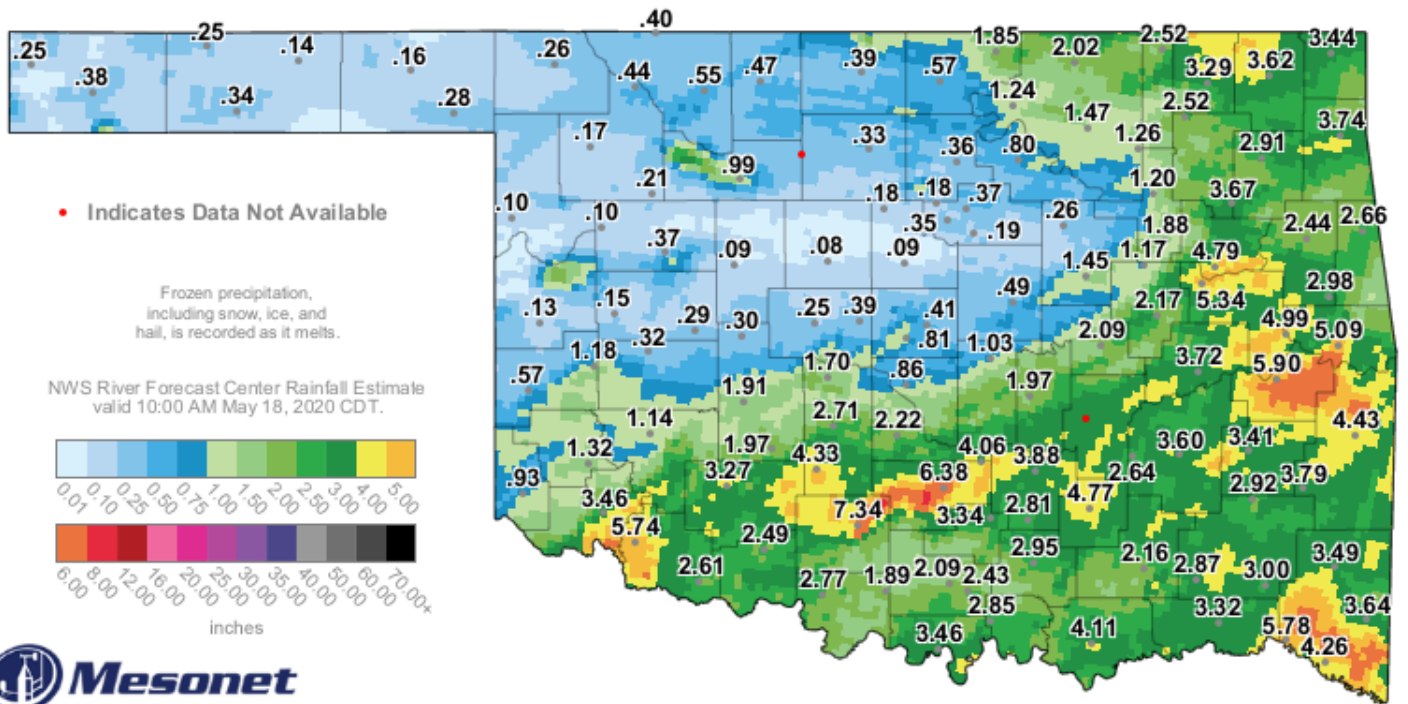
Fig. 24. 24-hour Estimated Observed Rainfall ending at 7am CDT 5/16/2020.



Tulsa, OK: May 17, 2020 1-Day Observed Precipitation  
Valid on: May 17, 2020 12:00 UTC

Fig. 25. 24-hour Estimated Observed Rainfall ending at 7am CDT 5/17/2020.



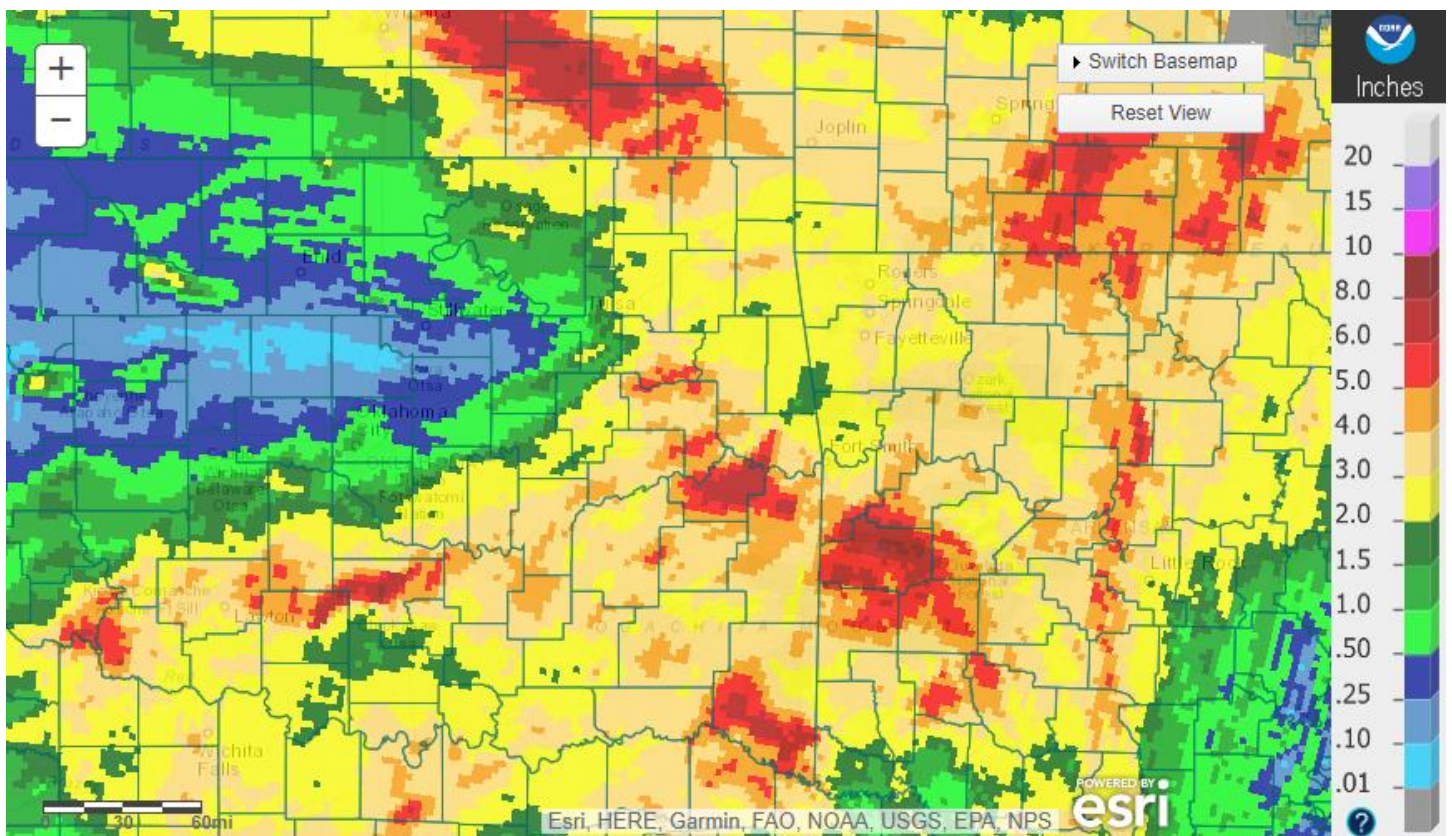


## 7-Day Rainfall Accumulation (inches)

11:25 AM May 18, 2020 CDT

Created 11:29:20 AM May 18, 2020 CDT. © Copyright 2020

Fig. 26. OK Mesonet (values) and NWS RFC rainfall estimate (image) 7-Day rainfall ending at 11:25 am CDT 5/18/2020.



Tulsa, OK: Last 7-Day Observed Precipitation  
Valid on: May 18, 2020 12:00 UTC

Fig. 27. 7-Day Estimated Observed Rainfall ending at 7am CDT 5/18/2020.

An MCS moved out of KS and into northern OK around sunrise on the 22<sup>nd</sup> and swept eastward across most of eastern OK and northwest AR through noon. Additional showers and thunderstorms developed during the evening across southeast OK and west central AR where dew points in the low- to mid-70s persisted and most-stable CAPE values were 3000-4000 J/kg near and south of the Red River. This activity lingered through the overnight hours, ending around sunrise on the 23<sup>rd</sup>. Rainfall totals from both rounds of rain ranged from around 0.50" to around 3.5" (Figs. 28, 29). The widespread 2.5"-3.5" of rain over Le Flore County resulted in minor flooding along the Poteau River near Poteau and near Panama (see preliminary hydrographs at the end of this report and the E3 Report for details). Three tornadoes also occurred in Le Flore County during this event (for details, see <https://arcg.is/WOfzC0>).

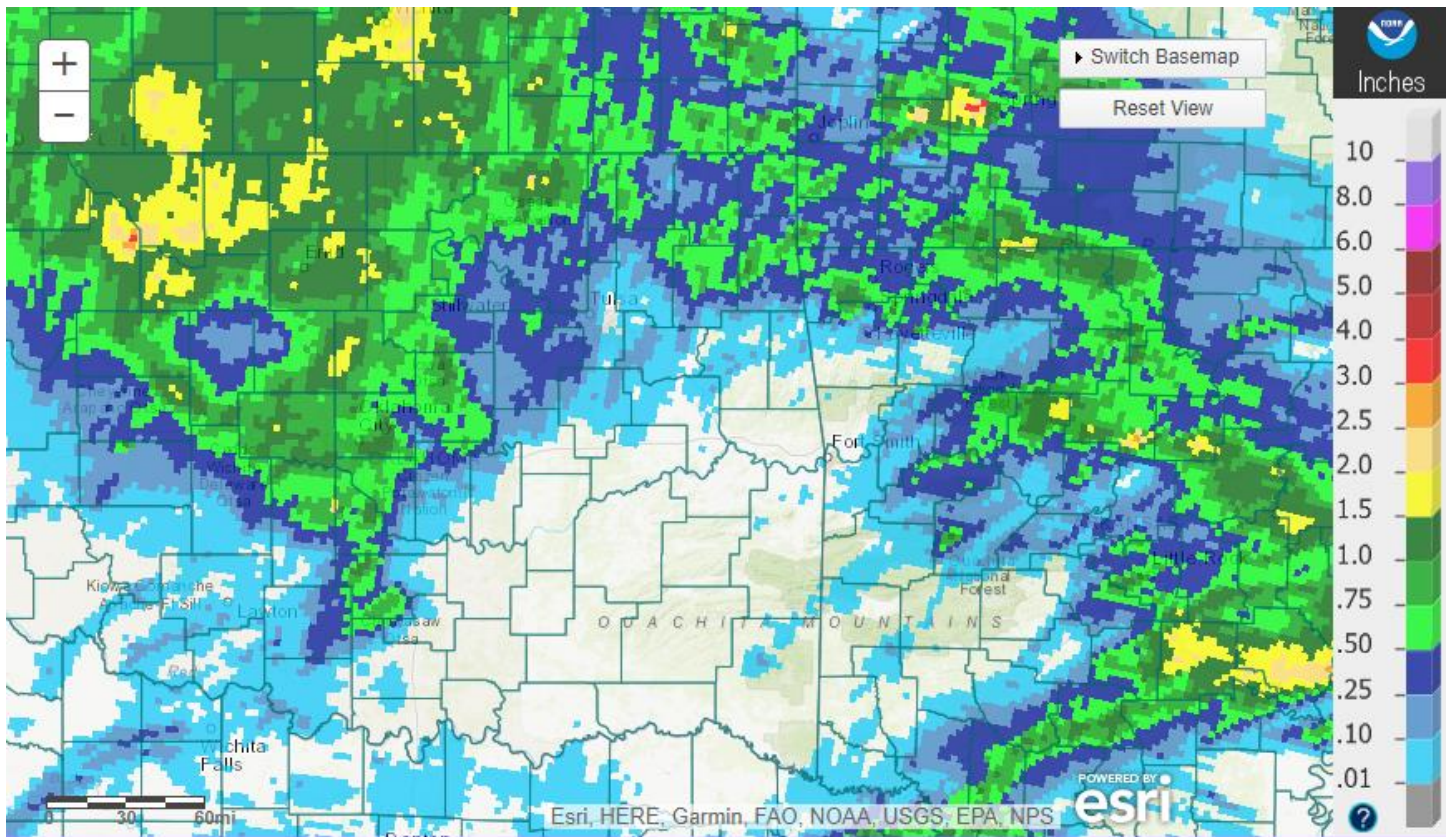
Deep-layer southerly flow was in place across the area as an upper-level trough approached the Southern Plains. Scattered showers and thunderstorms developed within an uncapped atmosphere during the afternoon of the 24<sup>th</sup> in west central AR and moved north through northwest AR. By evening, more storms had developed across southeast OK. These storms waned after sunset. As the lead impulse within the upper-level trough moved overhead, new storms developed during the overnight hours across eastern OK and northwest AR. While most locations received around 1.5" or less of rain, parts of Choctaw County had 1.5" to around 3" (Fig. 30).

A mesoscale convective vortex (MCV) formed over north central TX on the northern fringe of a storm complex that was forced from a mid-level wave. The MCV lifted northeast into OK during the afternoon, resulting in an increase in convection and heavy rain across eastern OK and western AR. As the MCV moved northward across eastern OK during the evening, strong to severe thunderstorms developed, and 5 tornadoes occurred (for details, see <https://arcg.is/WOfzC0>). The storms and rain ended from south to north during the overnight hours as the MCV continued to move north out of the area. With a tropical airmass in place, rainfall totals ranged from around 0.50" to 4" (Figs. 31, 32), leading to additional flooding. Moderate flooding occurred along the Neosho River near Commerce and the Poteau River near Panama. Minor flooding occurred along the Illinois River near Watts and near Tahlequah, the Arkansas River at Van Buren and at Ozark Lock and Dam, and the Poteau River near Poteau. See preliminary hydrographs at the end of this report and the E3 Report for details. The 5-day rainfall total ending at 7 am May 26 ranged from around 1.5" to 8" across eastern OK and northwest AR (Fig. 33).

A cut-off upper-level low slowly drifted eastward from central into eastern OK on the 27<sup>th</sup>. Isolated to scattered showers and thunderstorms rotated around the low for much of the day and through the morning of the 28<sup>th</sup>. Rainfall from this activity ranged from just a few hundredths to around 3" (Fig. 34). This additional rainfall caused the Illinois River to rise, but remain below flood stage, and resulted in slower falls along rivers that were still high from the previous rainfall event.

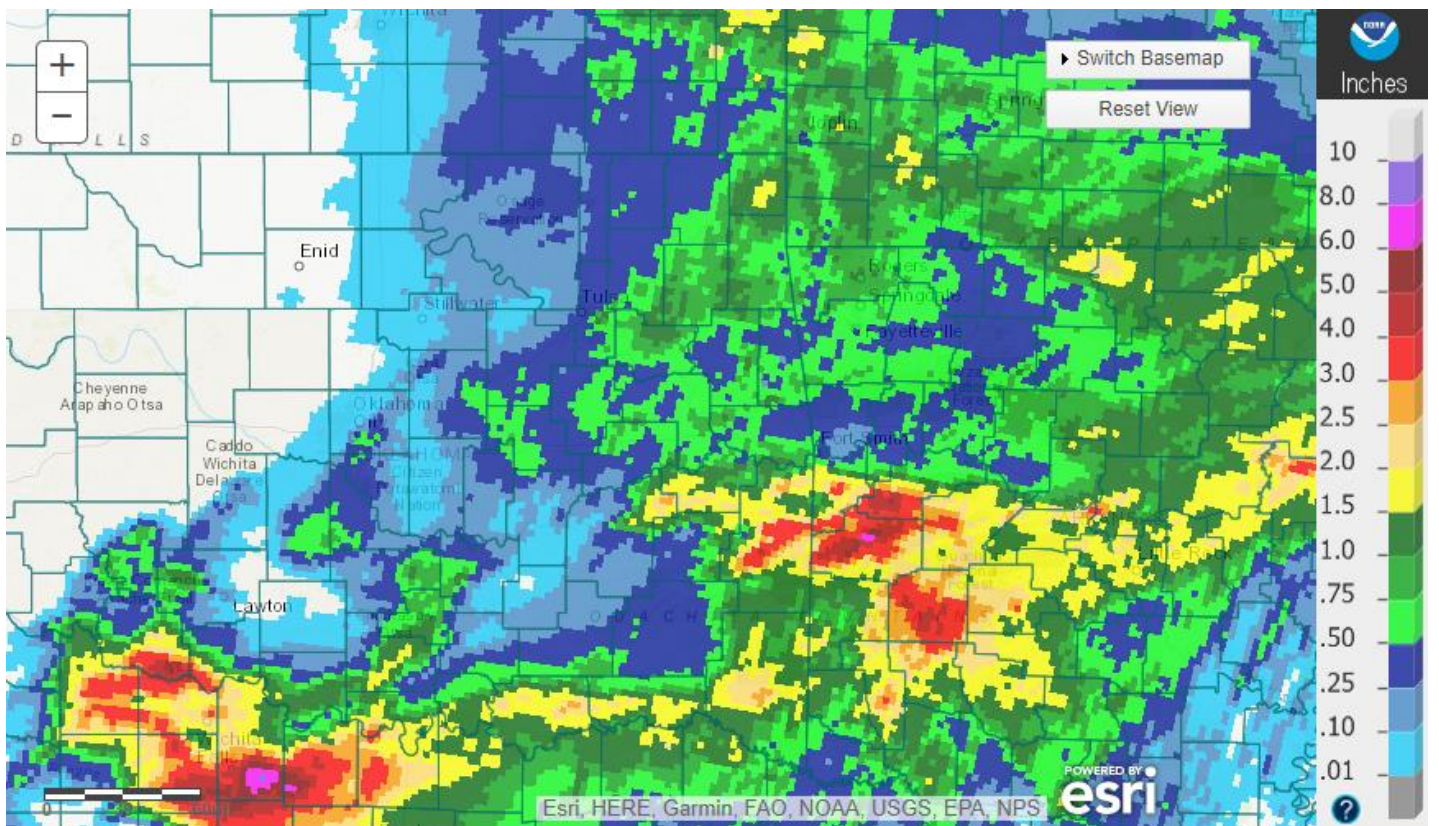
The 7-day rainfall total by the morning of the 29<sup>th</sup> was 3"-8" across most of far eastern OK and western AR (Figs. 35, 36).





Tulsa, OK: May 22, 2020 1-Day Observed Precipitation  
Valid on: May 22, 2020 12:00 UTC

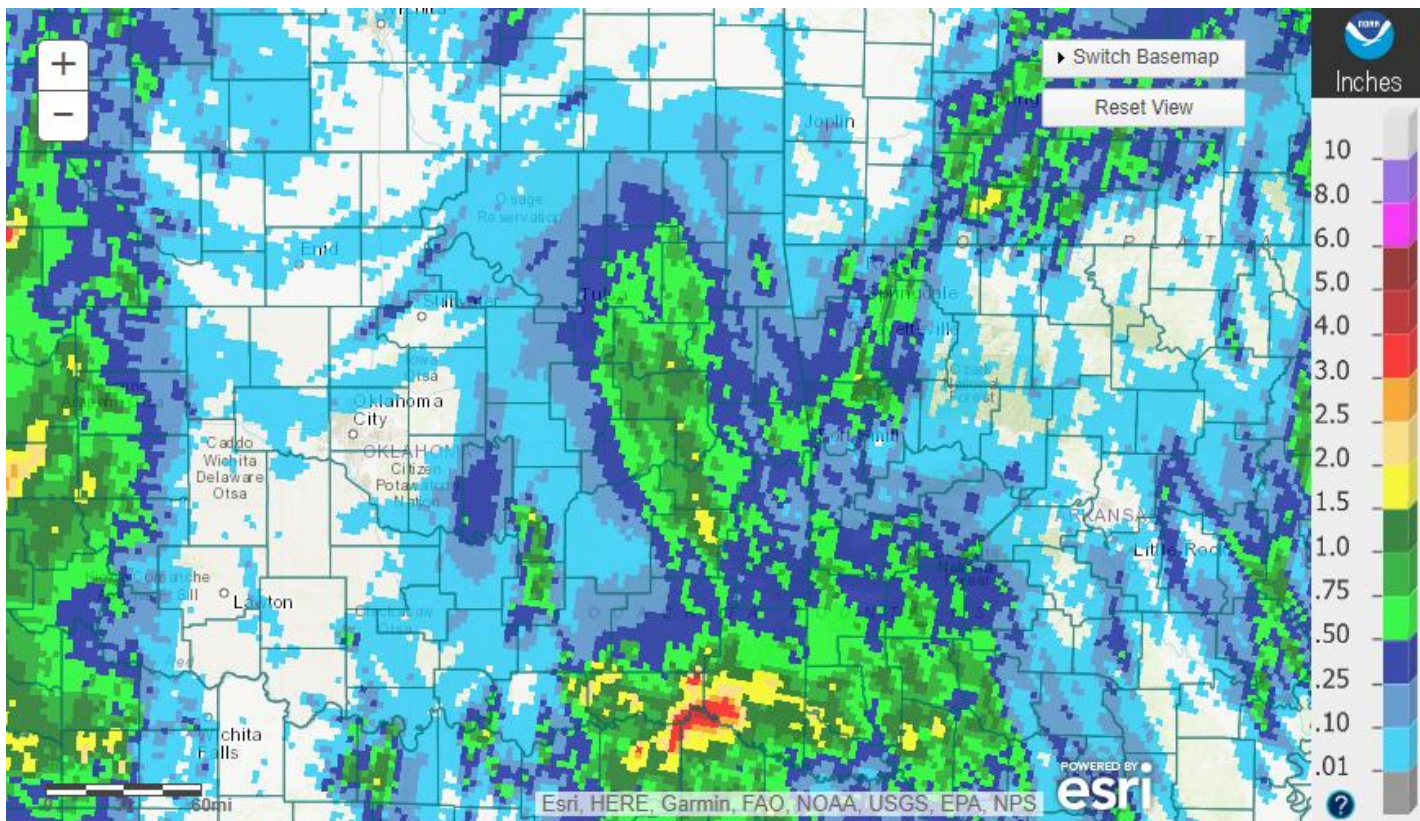
Fig. 28. 24-hour Estimated Observed Rainfall ending at 7am CDT 5/22/2020.



Tulsa, OK: May 23, 2020 1-Day Observed Precipitation  
Valid on: May 23, 2020 12:00 UTC

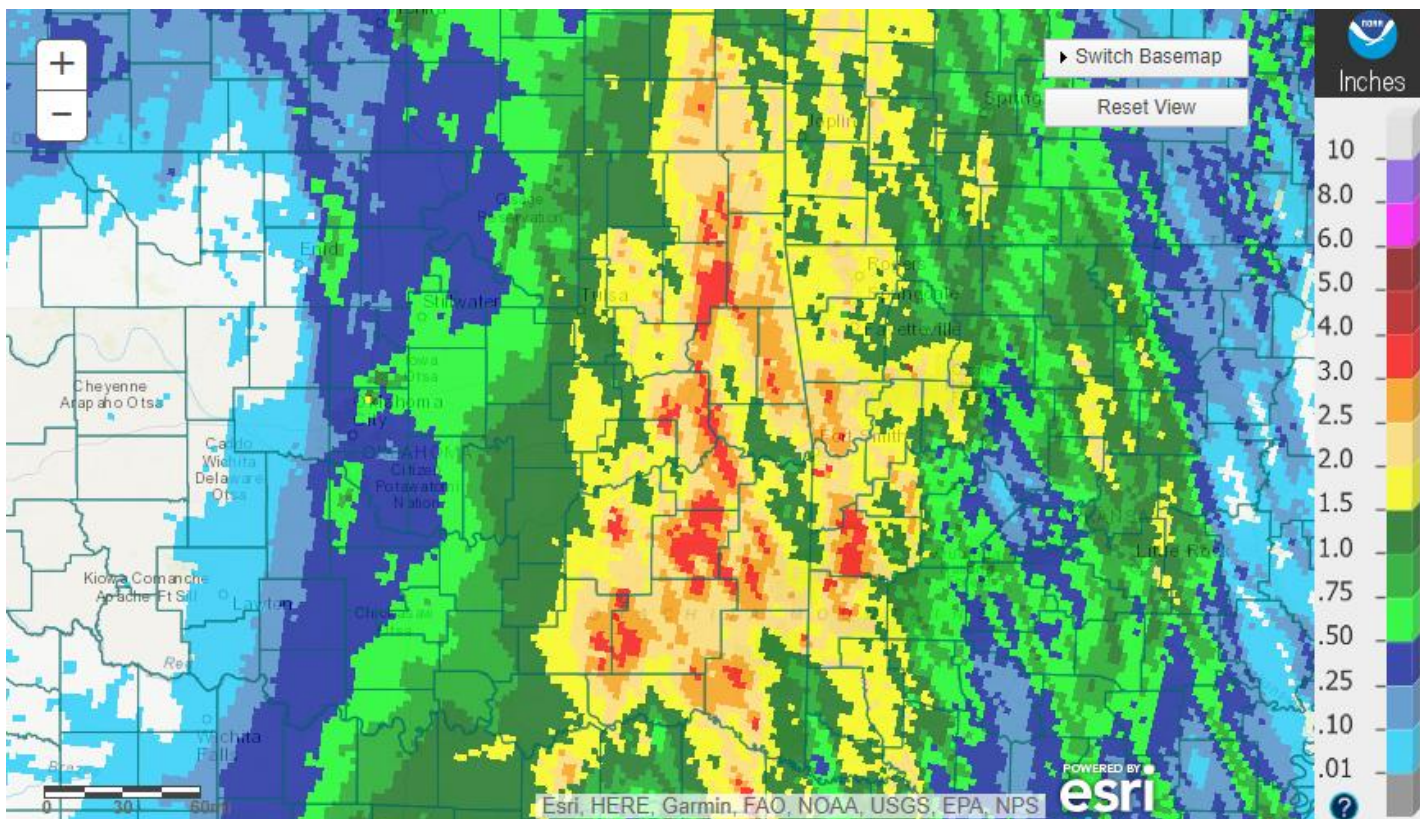
Fig. 29. 24-hour Estimated Observed Rainfall ending at 7am CDT 5/23/2020.





Tulsa, OK: May 25, 2020 1-Day Observed Precipitation  
Valid on: May 25, 2020 12:00 UTC

Fig. 30. 24-hour Estimated Observed Rainfall ending at 7am CDT 5/25/2020.



Tulsa, OK: May 26, 2020 1-Day Observed Precipitation  
Valid on: May 26, 2020 12:00 UTC

Fig. 31. 24-hour Estimated Observed Rainfall ending at 7am CDT 5/26/2020.



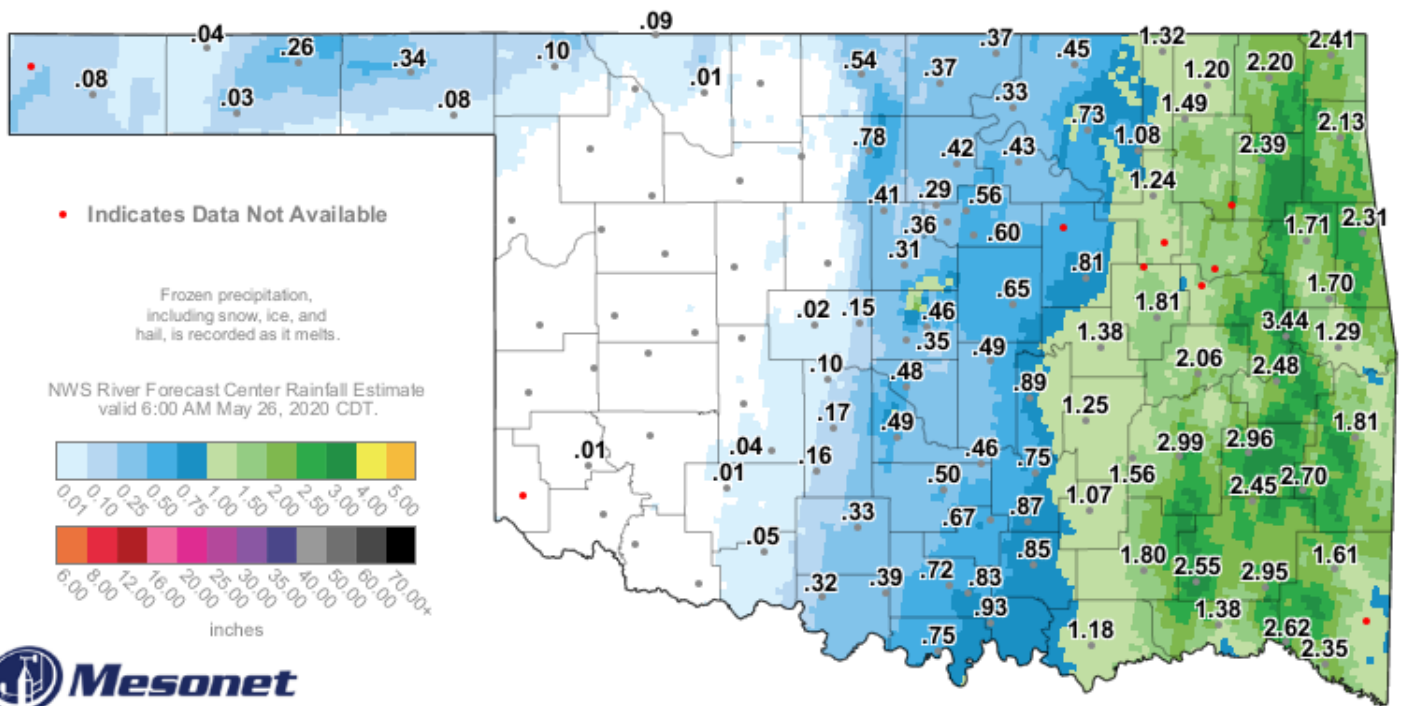


Fig. 32. OK Mesonet (values) and NWS RFC rainfall estimate (image) 24-Hour rainfall ending at 7:35 am CDT 5/26/2020.

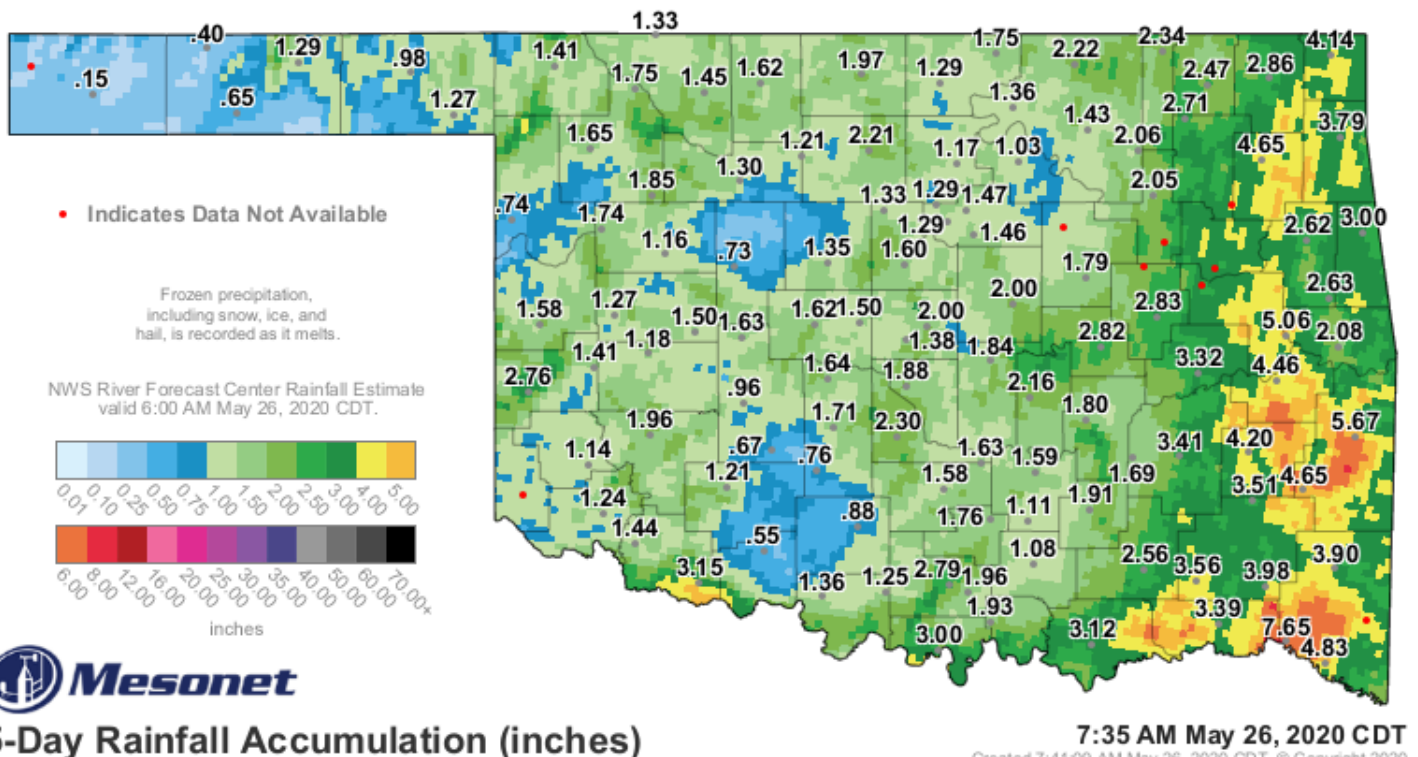
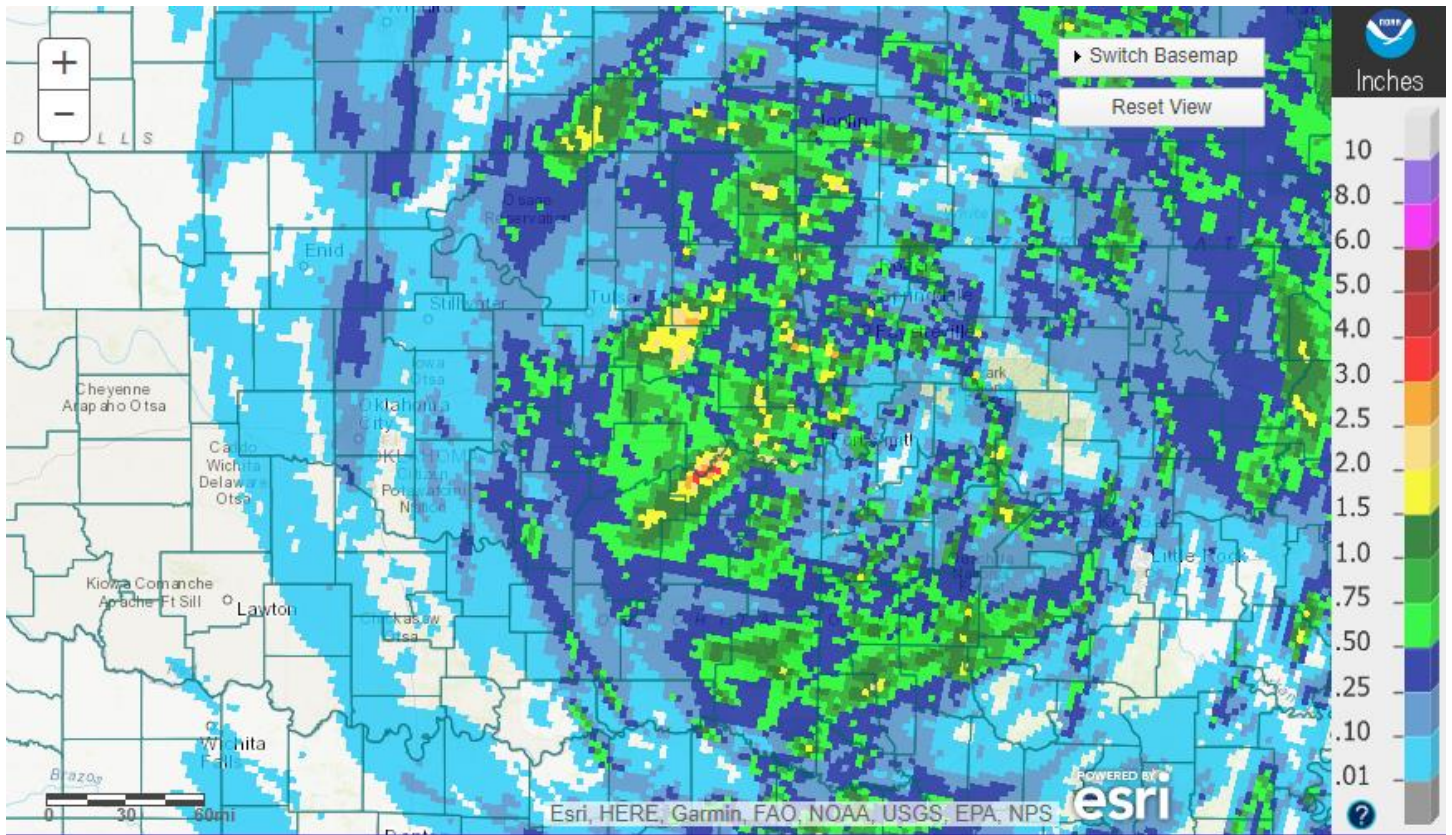
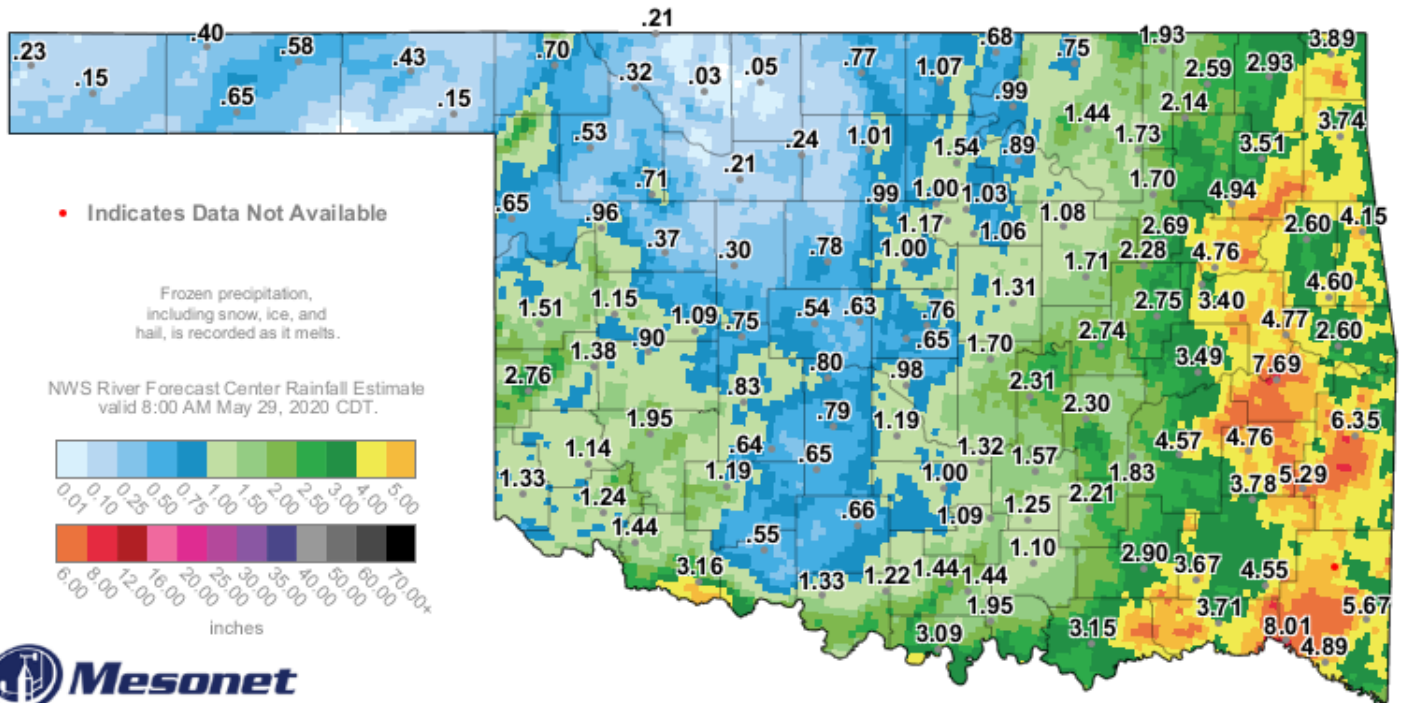


Fig. 33. OK Mesonet (values) and NWS RFC rainfall estimate (image) 5-Day rainfall ending at 7:35 am CDT 5/26/2020.



Tulsa, OK: May 28, 2020 1-Day Observed Precipitation  
Valid on: May 28, 2020 12:00 UTC

Fig. 34. 24-hour Estimated Observed Rainfall ending at 7am CDT 5/28/2020.



7-Day Rainfall Accumulation (inches)

9:00 AM May 29, 2020 CDT

Created 9:05:53 AM May 29, 2020 CDT. © Copyright 2020

Fig. 35. OK Mesonet (values) and NWS RFC rainfall estimate (image) 7-Day rainfall ending at 9:00 am CDT 5/29/2020.



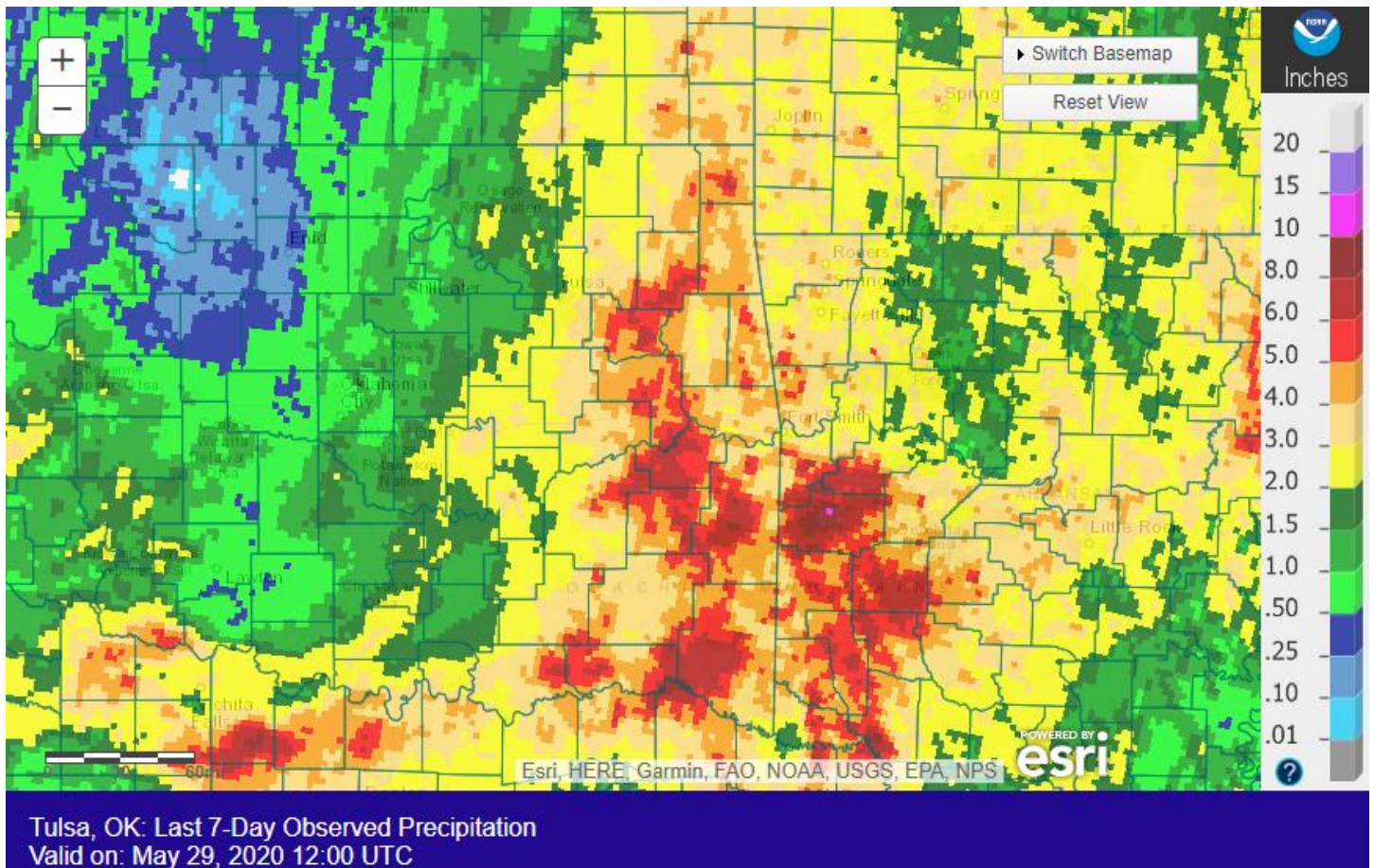


Fig. 36. 7-Day Estimated Observed Rainfall ending at 7am CDT 5/29/2020.

Written by:

Nicole McGavock  
Service Hydrologist  
WFO Tulsa

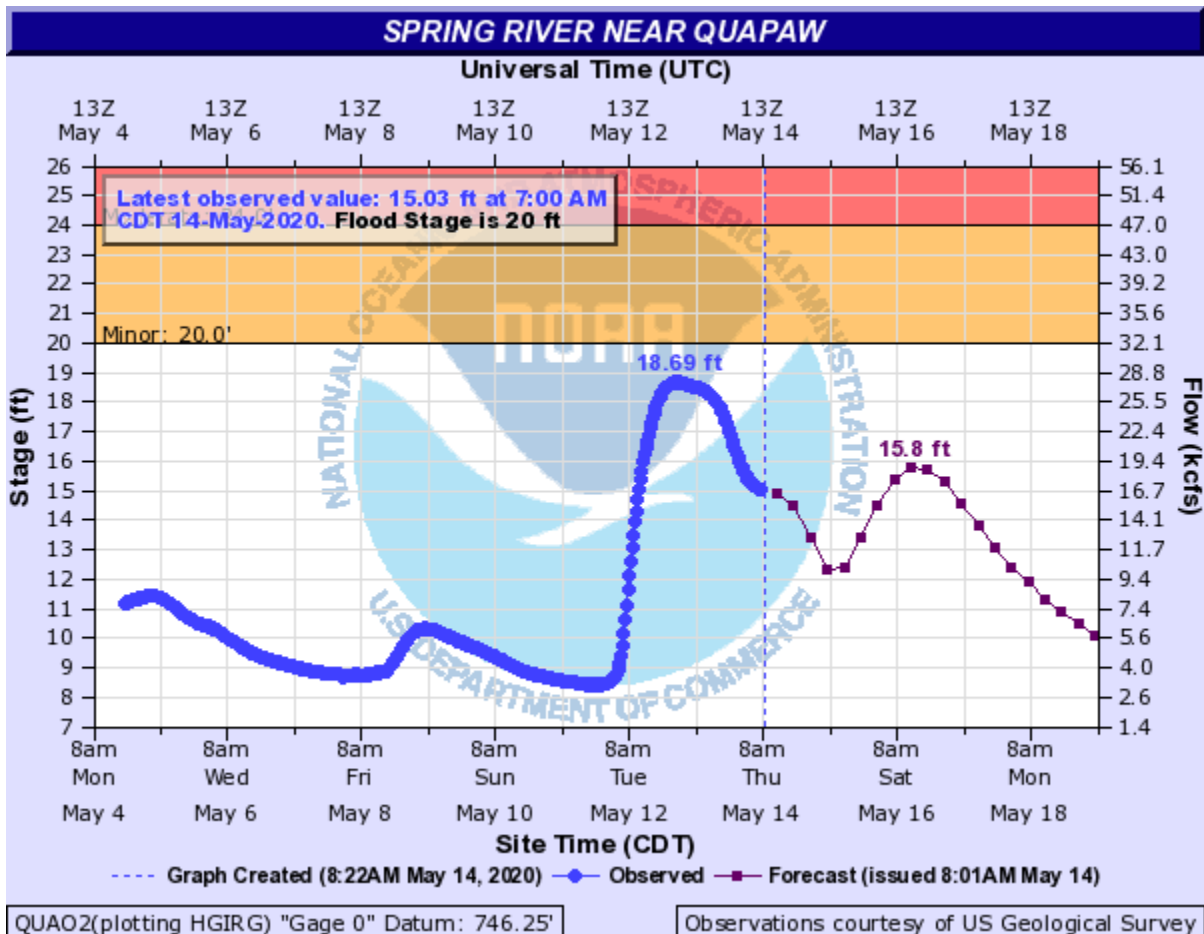
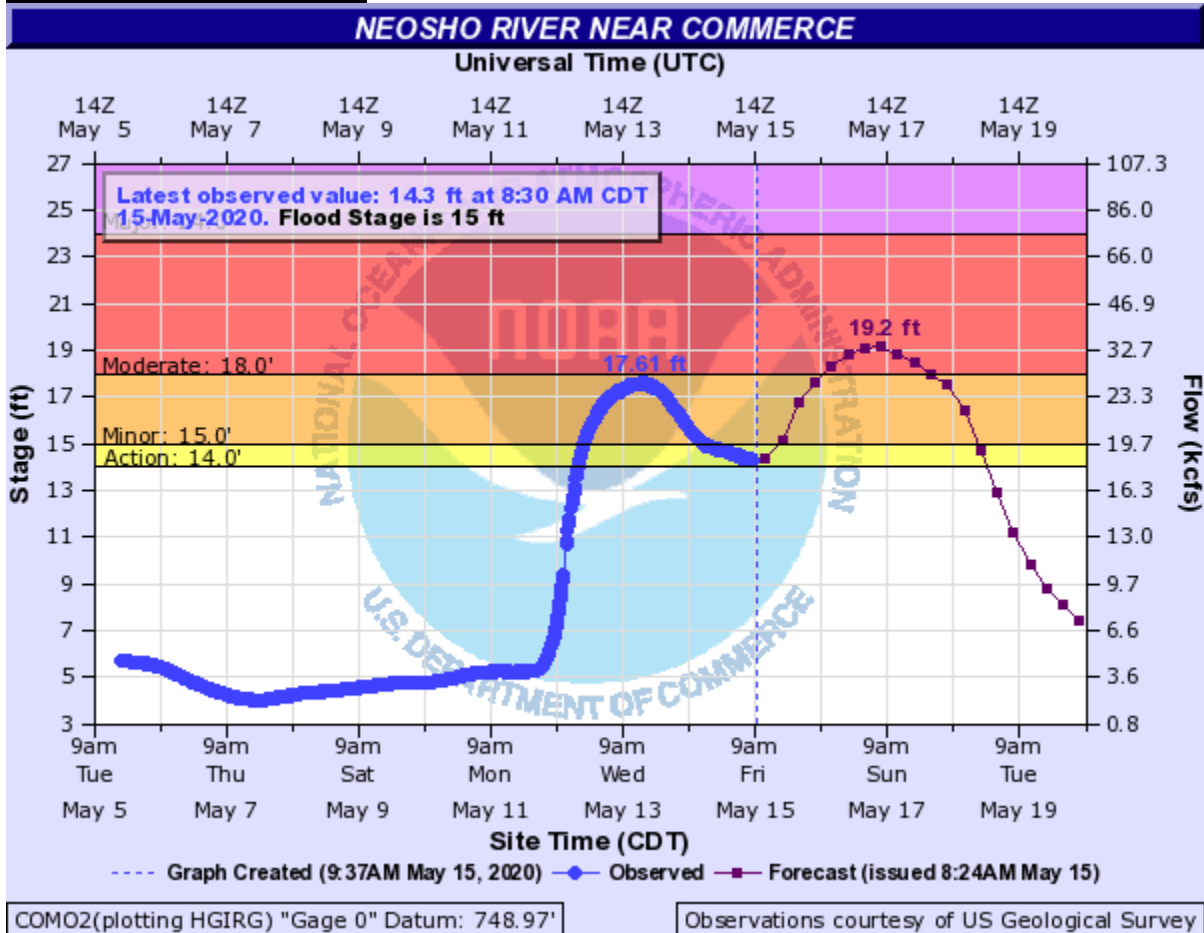
**Products issued in May 2020:**

- \*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)
- 6 Flash Flood Statements (FFS)
- 3 Flash/Areal Flood Watches (FFA) (11 Watch FFA CON/EXT/EXA/EXB/CAN)
- 28 Urban and Small Stream Advisories (FLS)
- 11 Areal Flood Warnings (FLW)
- 1 Areal Flood Statements (FLS)
- 24 River Flood Warnings (FLW) (includes category increases)
- 184 River Flood Statements (FLS)
- 14 River Flood Advisories (FLS) (47 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)

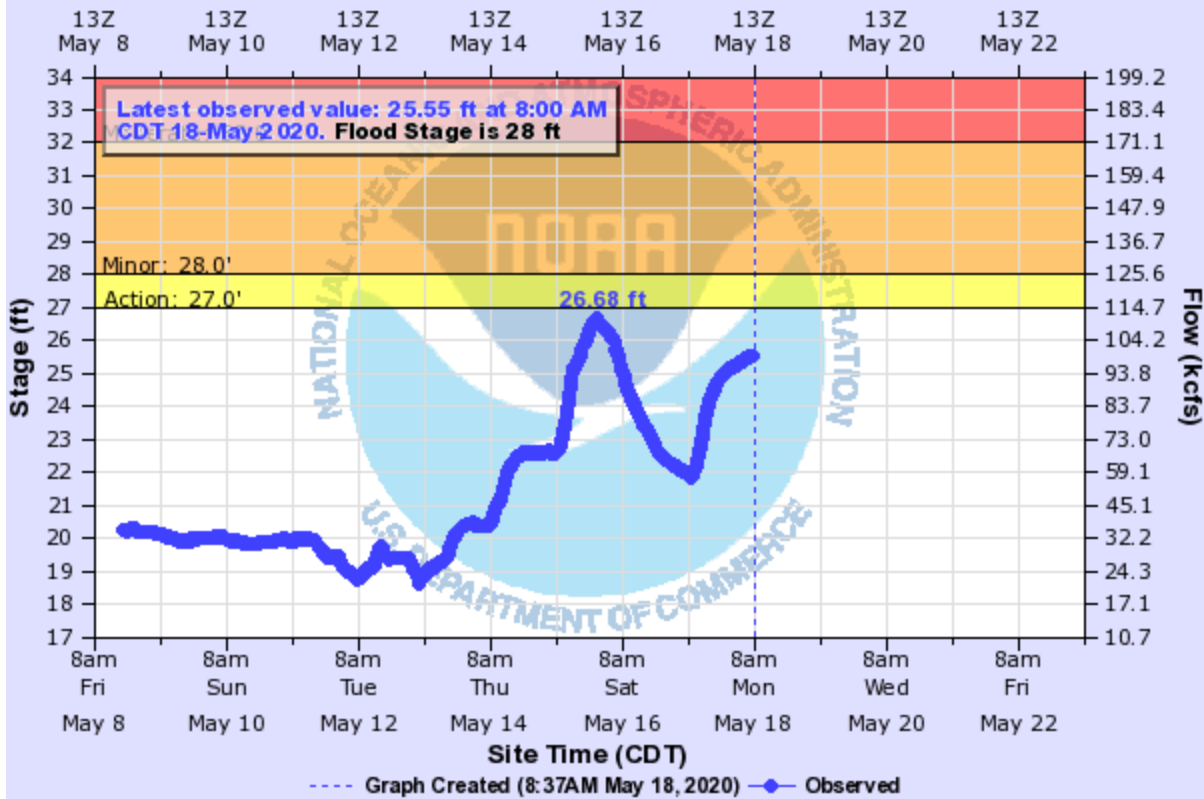


**Preliminary Hydrographs:**



## ARKANSAS RIVER NEAR MUSKOGEE

Universal Time (UTC)

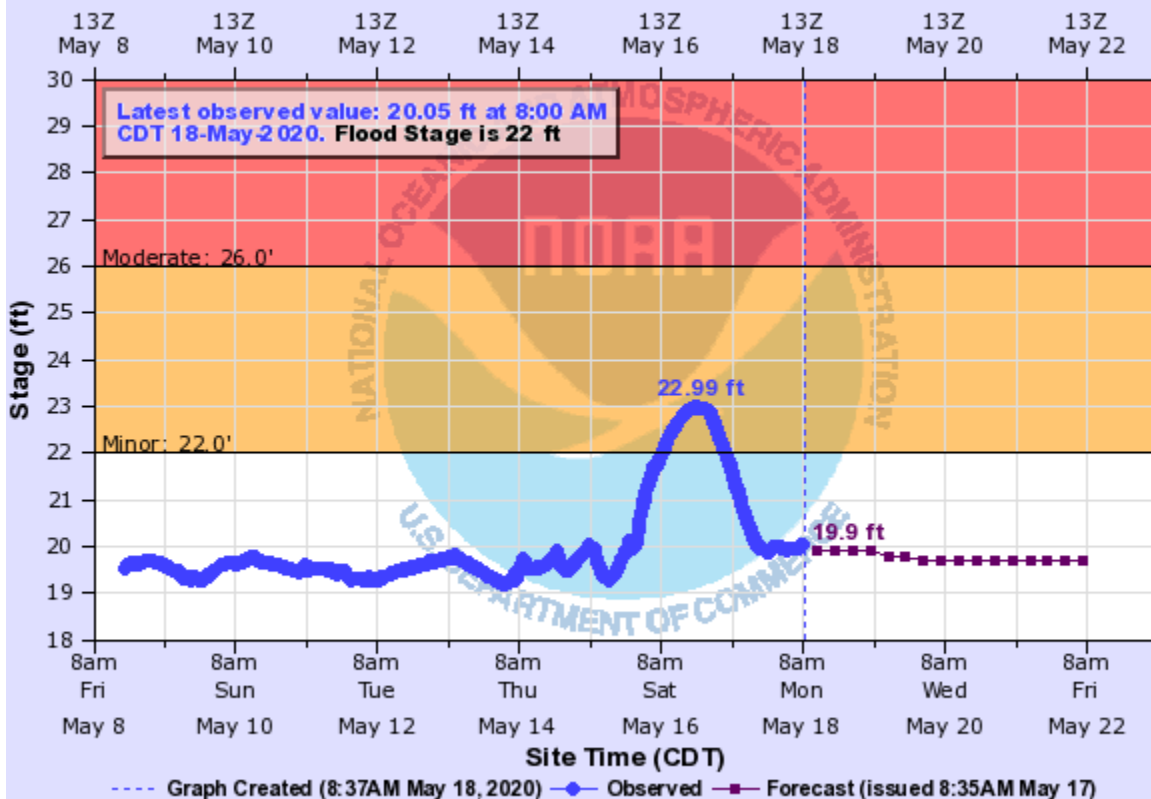


MKGO2(plotting HGIRG) "Gage 0" Datum: 471.38'

Observations courtesy of US Geological Survey

## ARKANSAS RIVER AT VAN BUREN

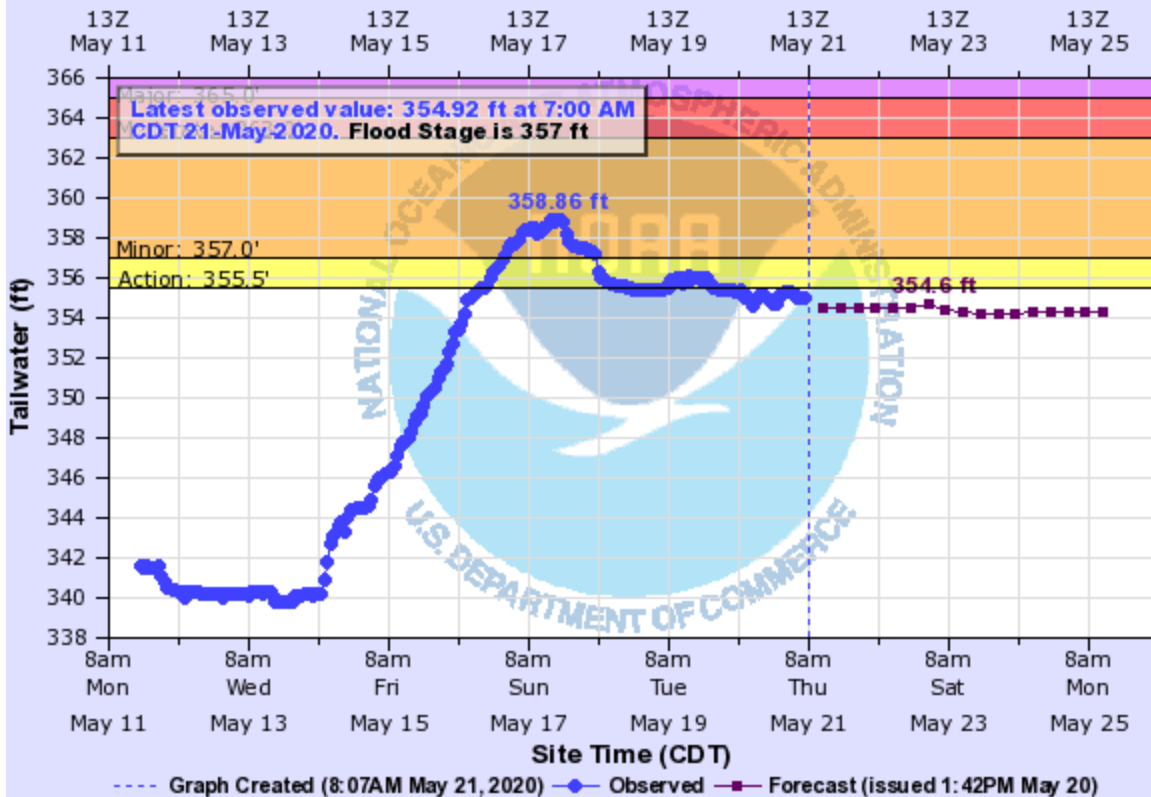
Universal Time (UTC)



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

## ARKANSAS RIVER AT OZARK L/D TAILWATER

Universal Time (UTC)

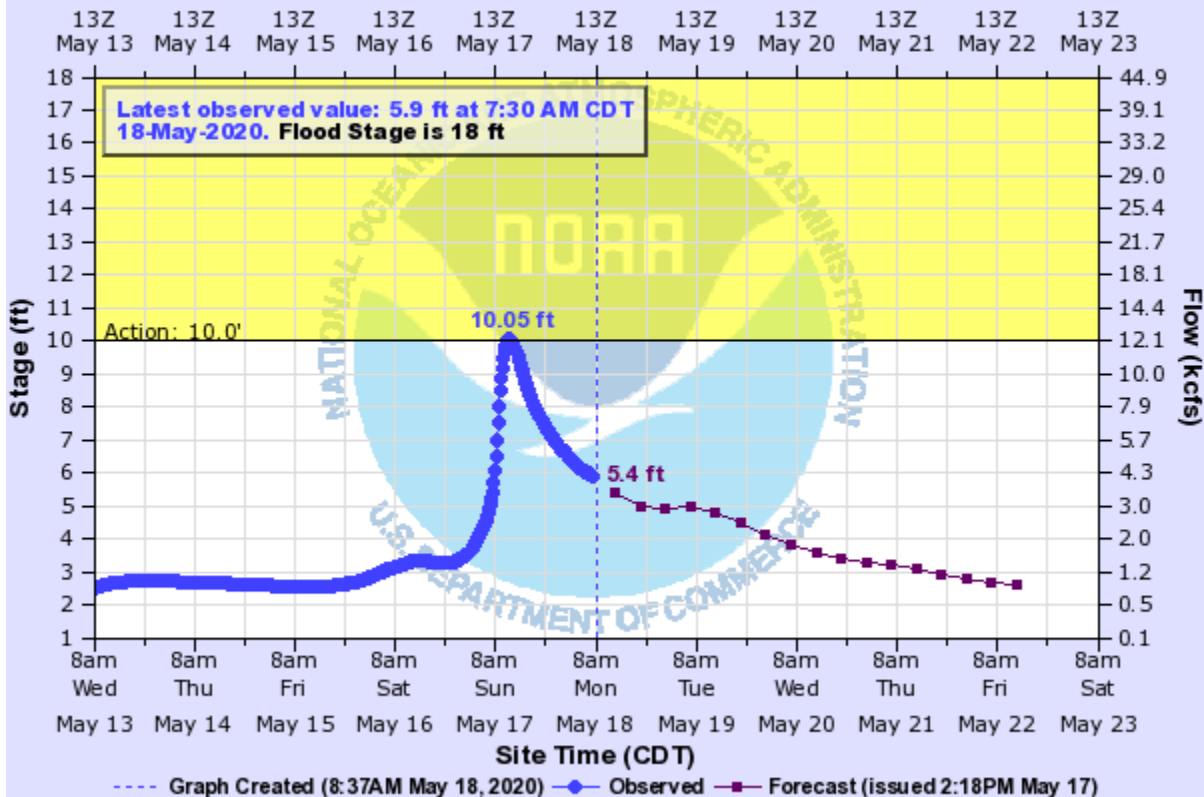


0ZGA4(plotting HTIRG) "Gage 0" Datum: 0'

Observations courtesy of US Army Corps of Engineers - LRD

## MULBERRY RIVER (AR) NEAR MULBERRY

Universal Time (UTC)



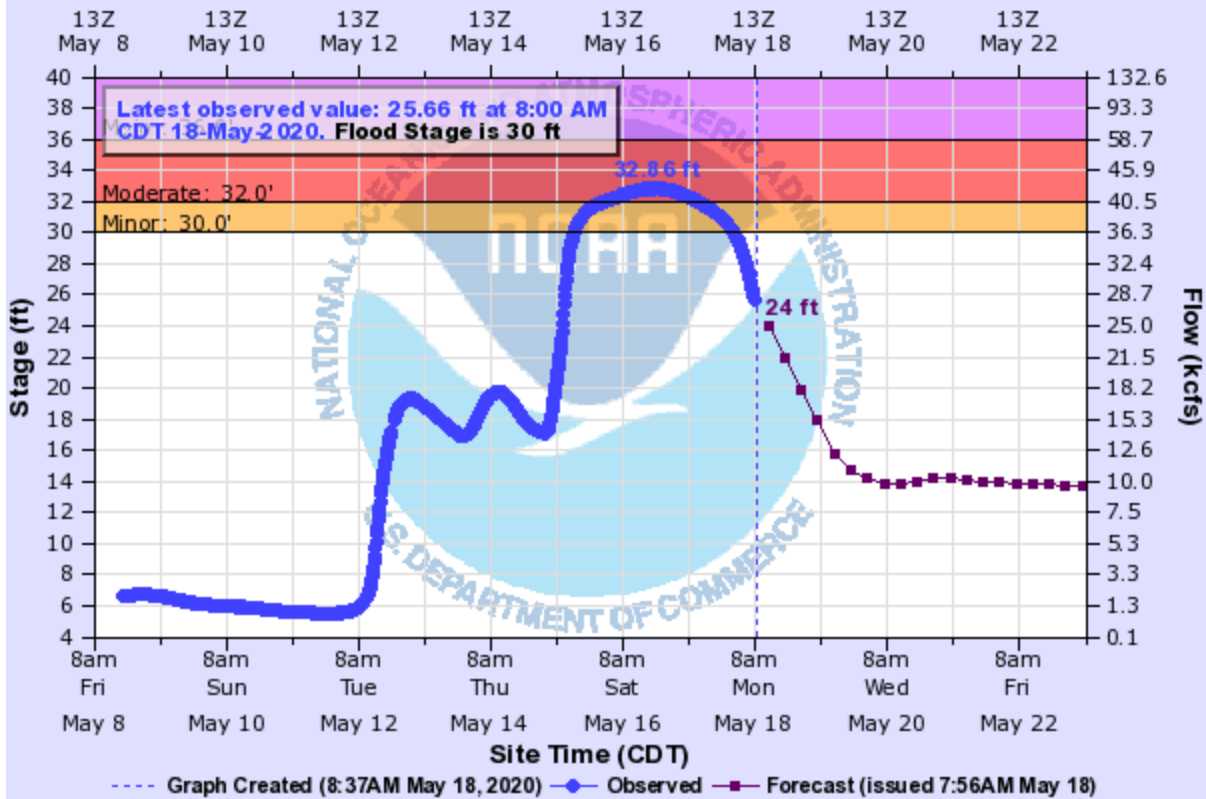
MLBA4(plotting HGIRG) "Gage 0" Datum: 432.75'

Observations courtesy of USGS/USACE/ADEQ



## VERDIGRIS RIVER NEAR LENAPAH

Universal Time (UTC)

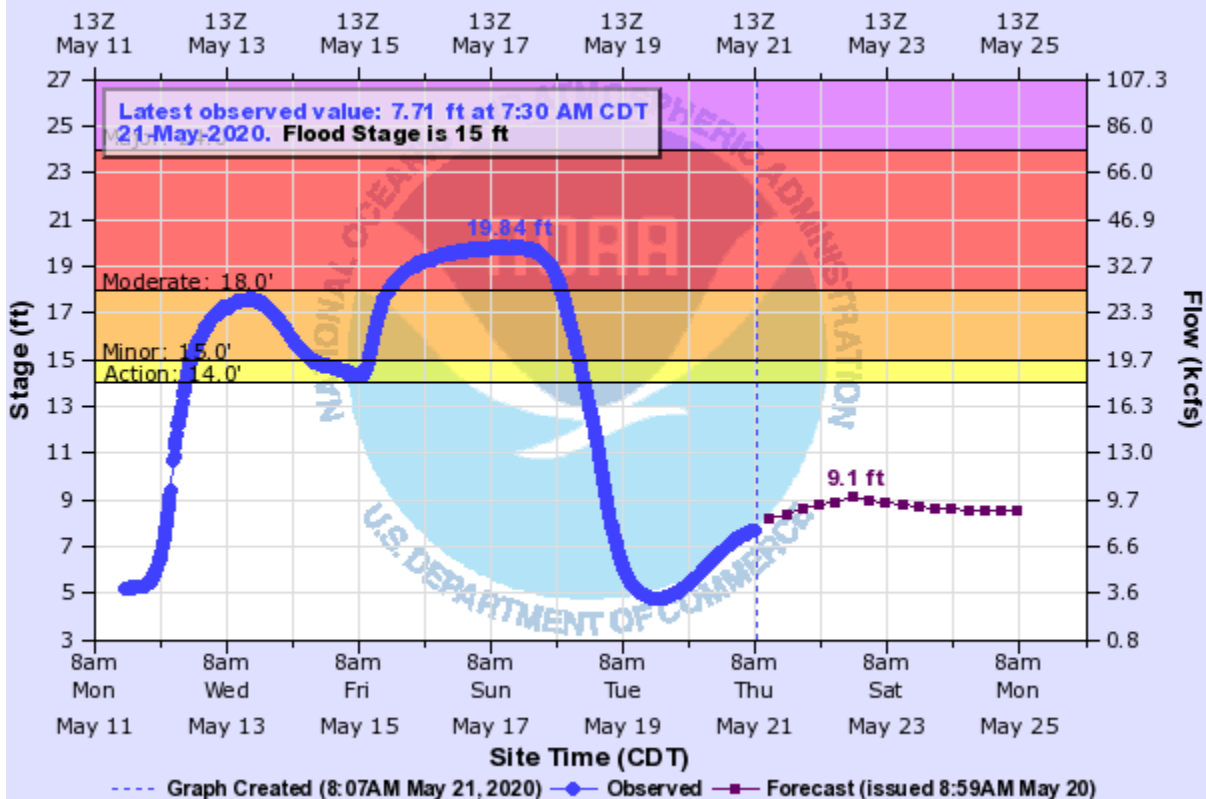


LEPO2(plotting HGIRG) "Gage 0" Datum: 644.9'

Observations courtesy of US Geological Survey

## NEOSHO RIVER NEAR COMMERCE

Universal Time (UTC)

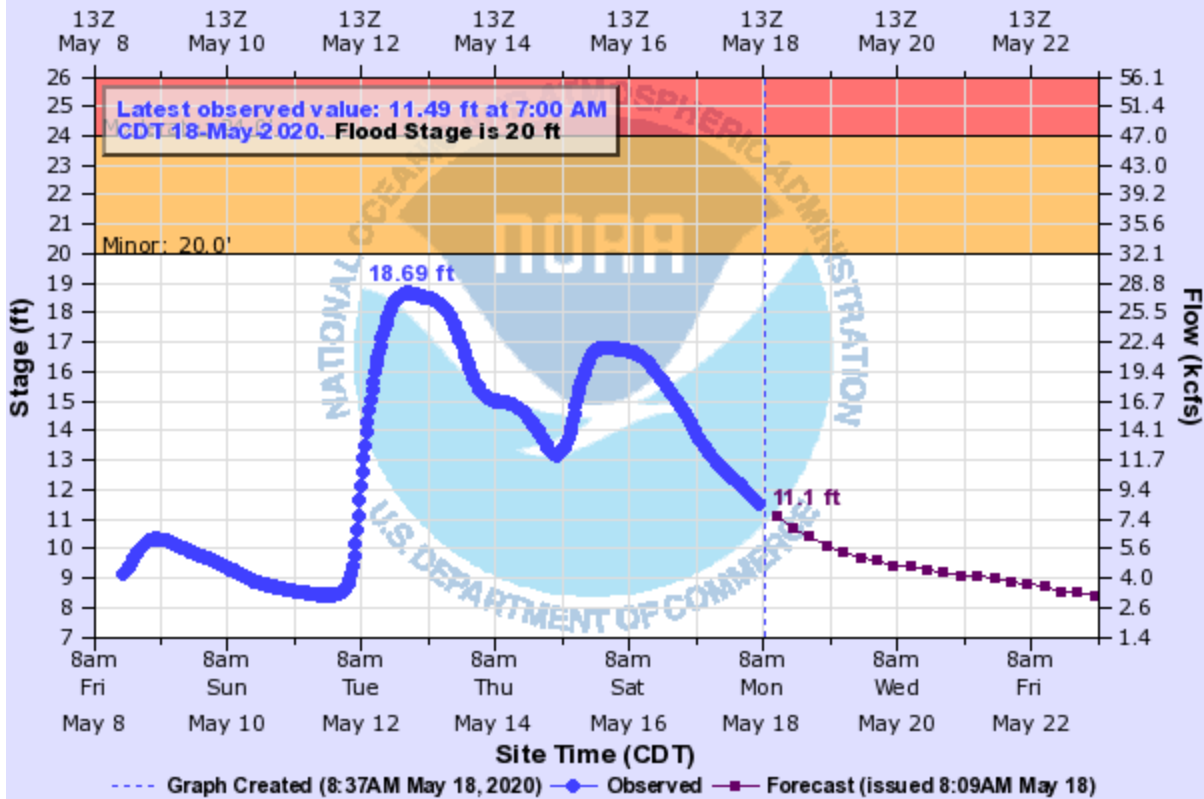


COMO2(plotting HGIRG) "Gage 0" Datum: 748.97'

Observations courtesy of US Geological Survey

## SPRING RIVER NEAR QUAPAW

Universal Time (UTC)

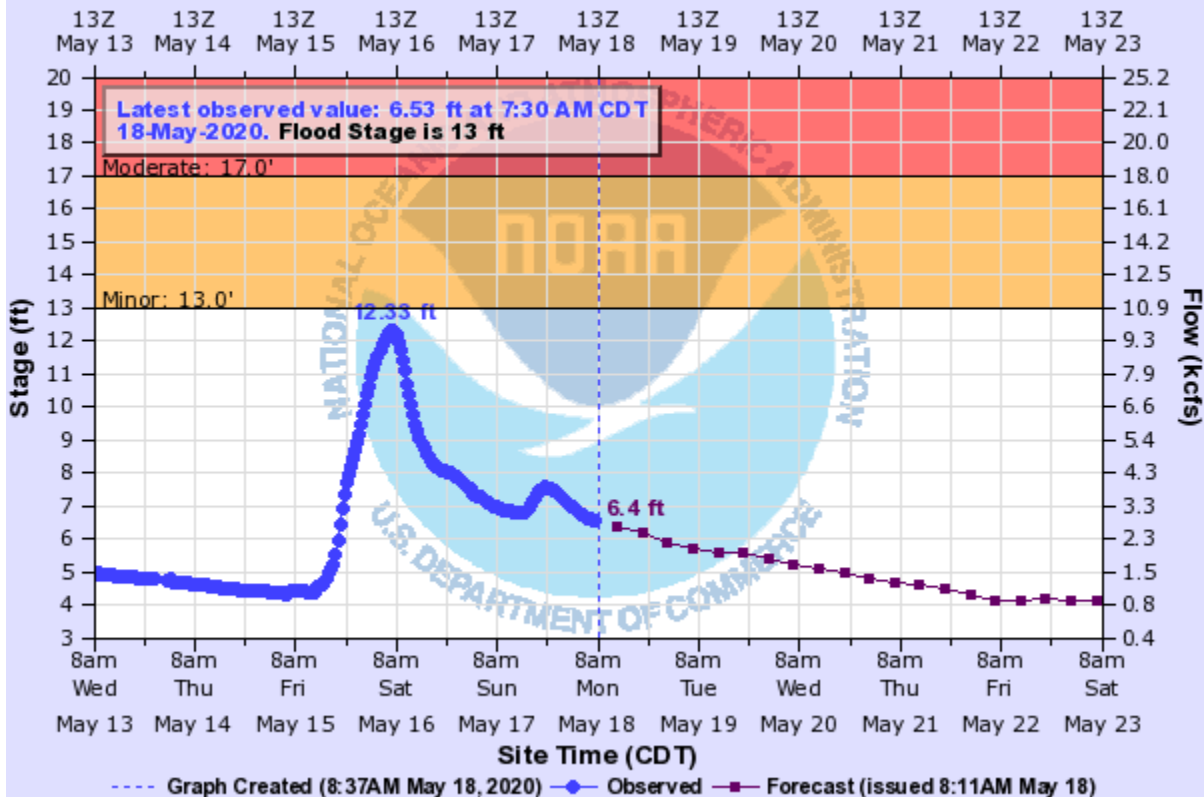


QUAO2(plotting HGIRG) "Gage 0" Datum: 746.25'

Observations courtesy of US Geological Survey

## ILLINOIS RIVER (AR OK) NEAR WATTS

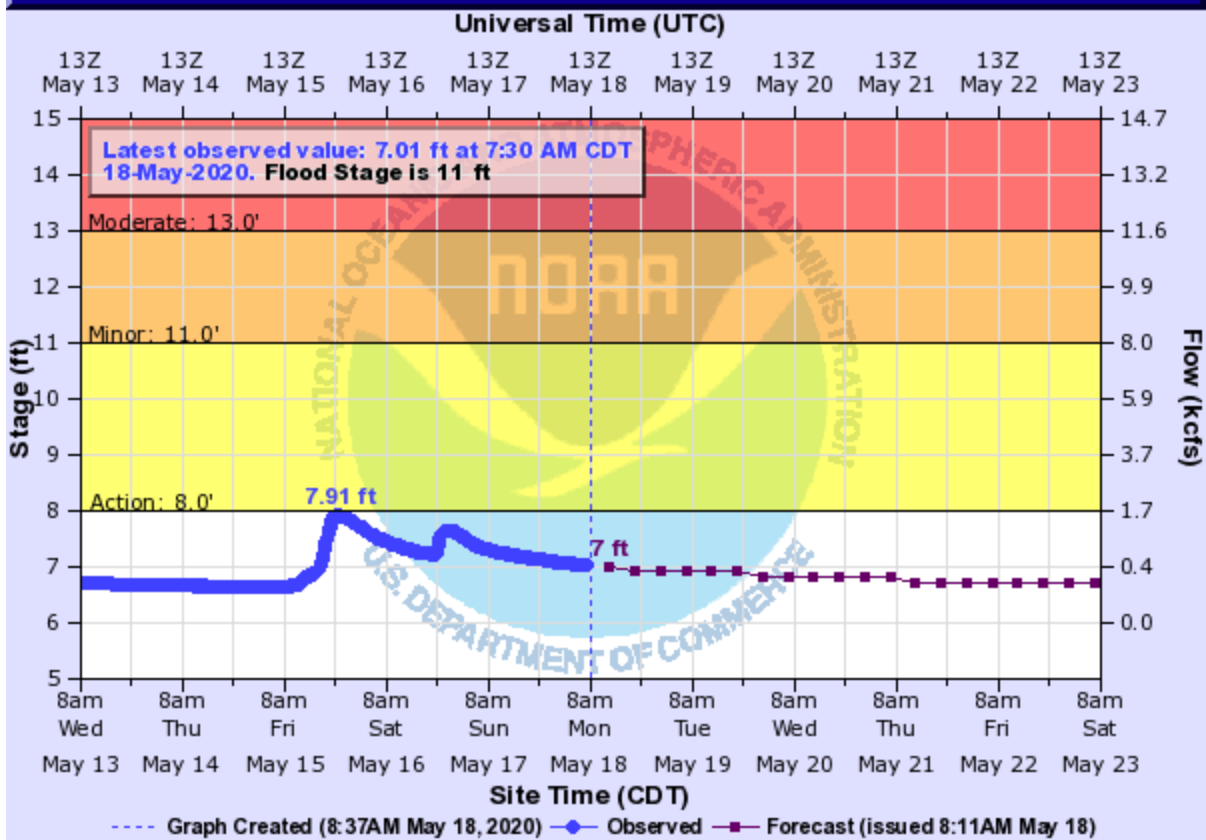
Universal Time (UTC)



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

Observations courtesy of US Geological Survey

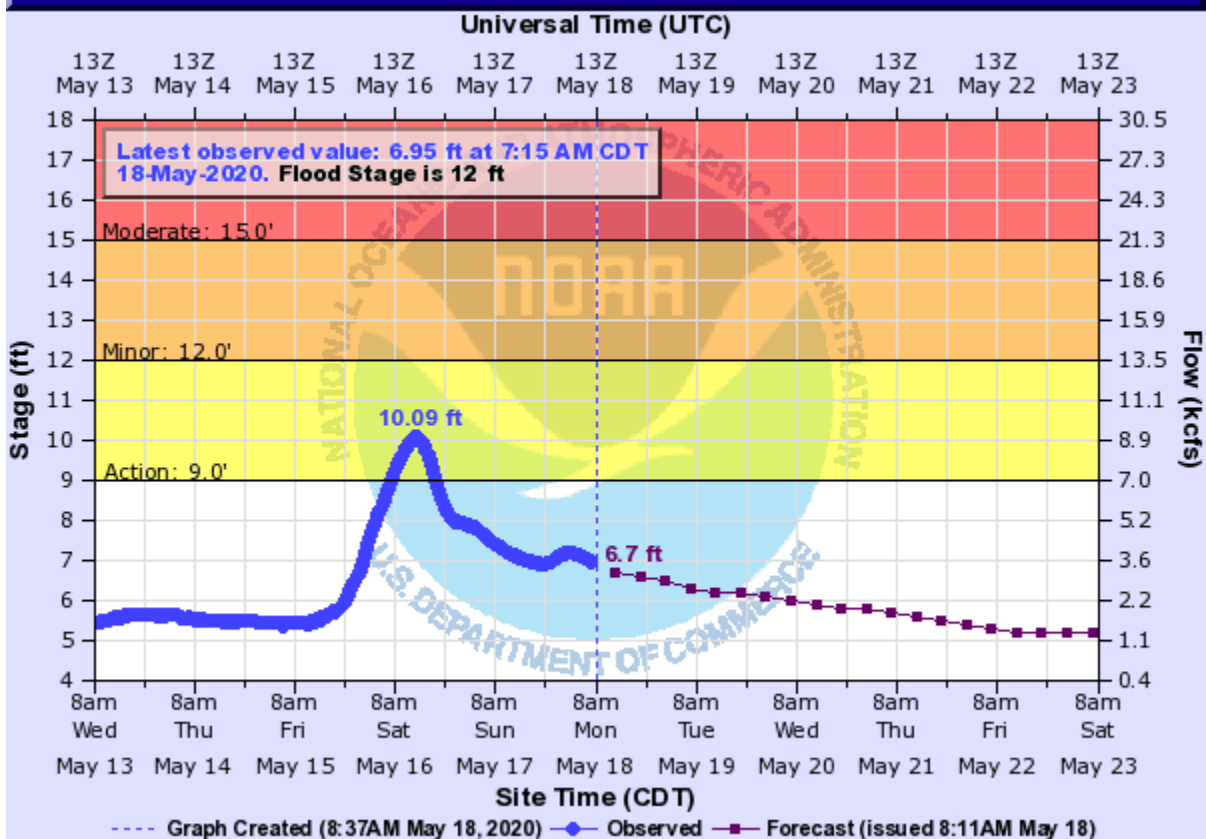
## FLINT CREEK (OK) NEAR KANSAS



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

Observations courtesy of US Geological Survey

## ILLINOIS RIVER (AR OK) AT CHEWEY

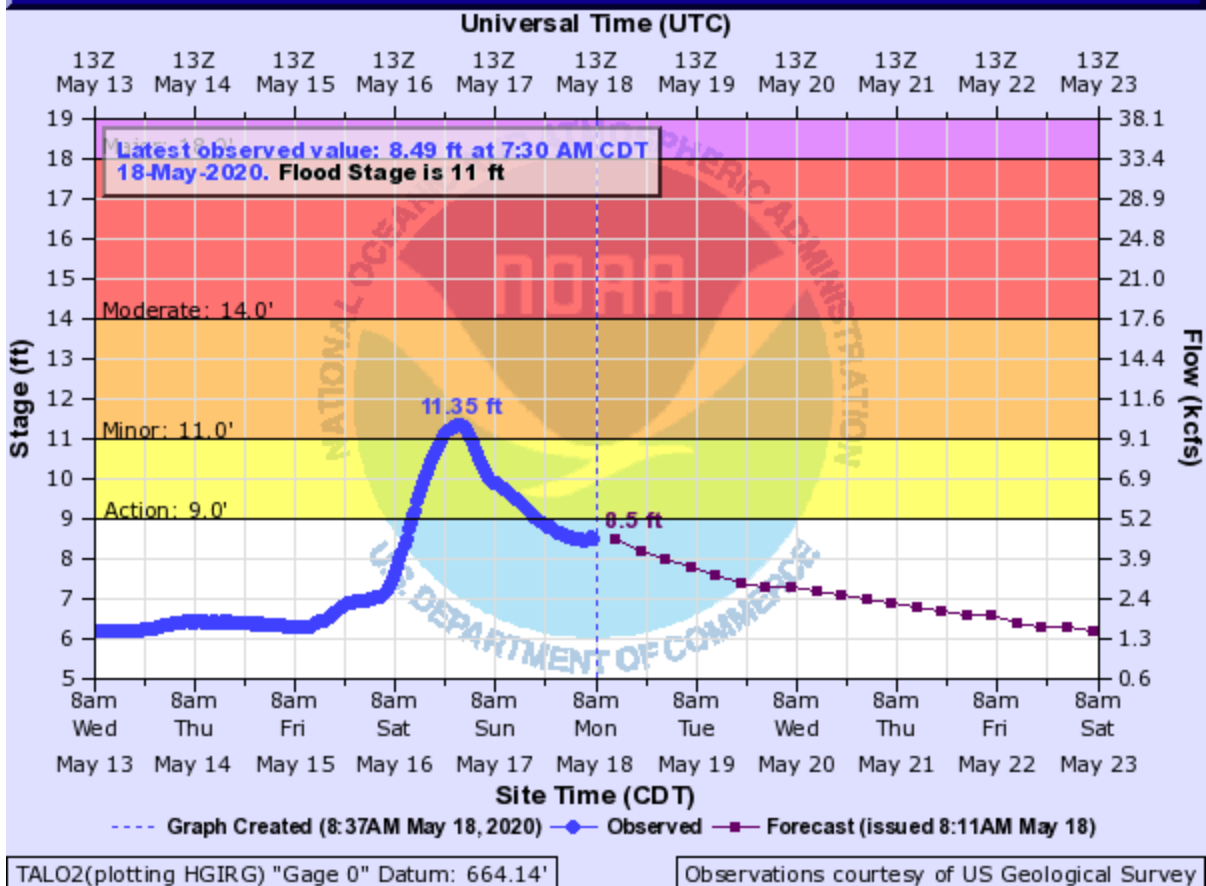


CWYO2(plotting HGIRG) "Gage 0" Datum: 800.88'

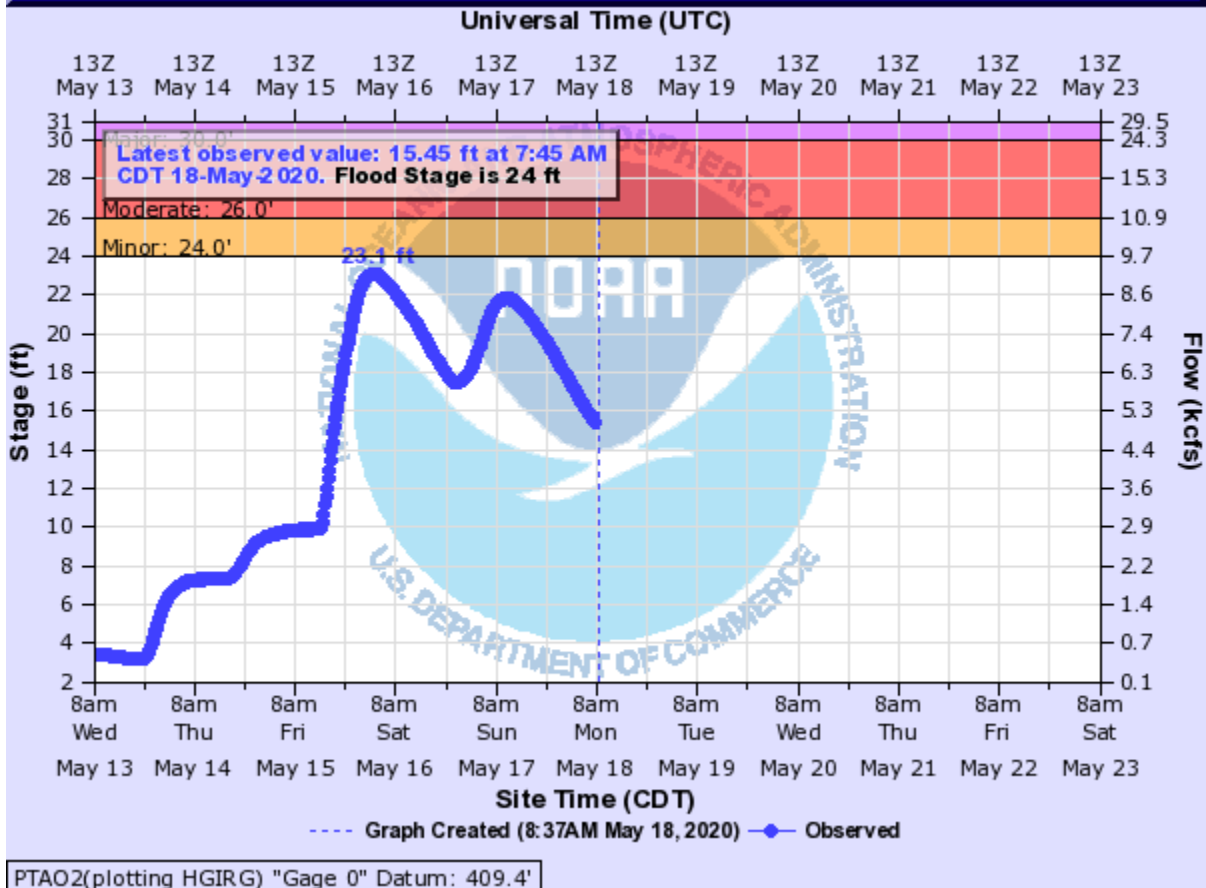
Observations courtesy of US Geological Survey



## ILLINOIS RIVER (AR OK) NEAR TAHLEQUAH

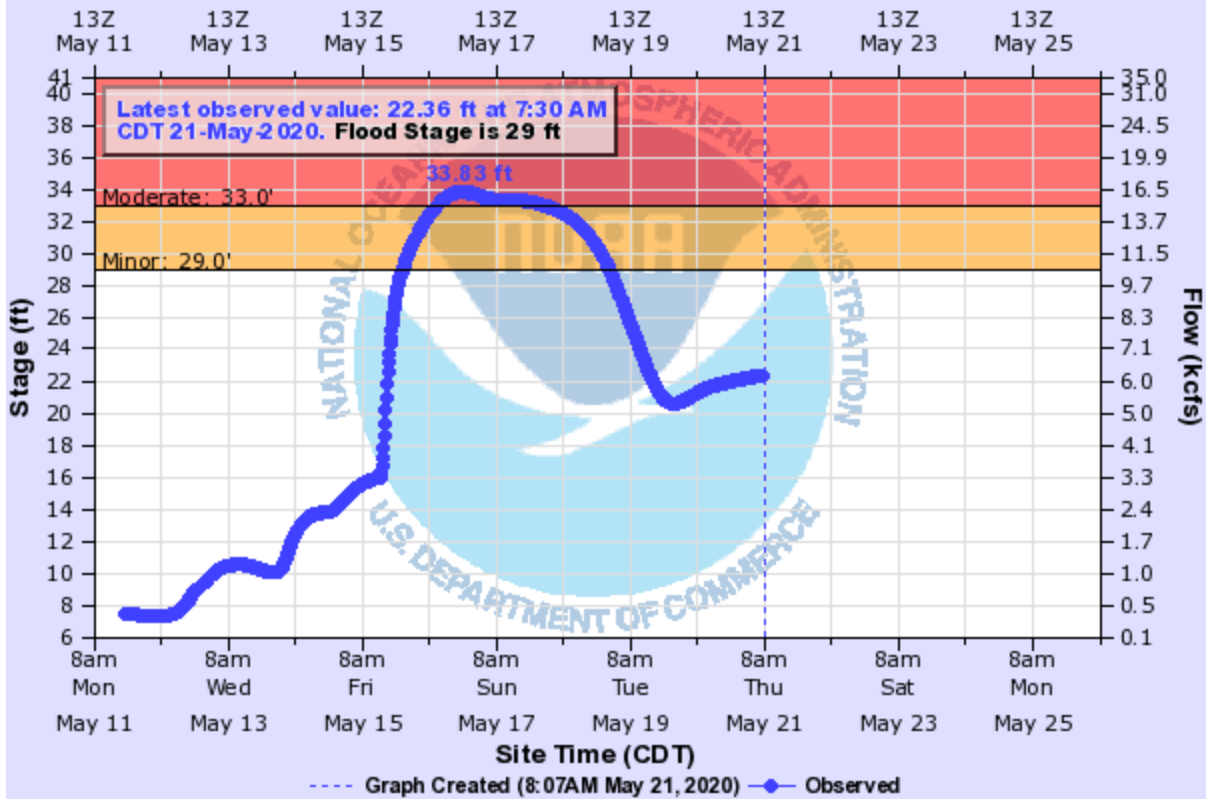


## POTEAU RIVER NEAR POTEAU



## POTEAU RIVER NEAR PANAMA

Universal Time (UTC)

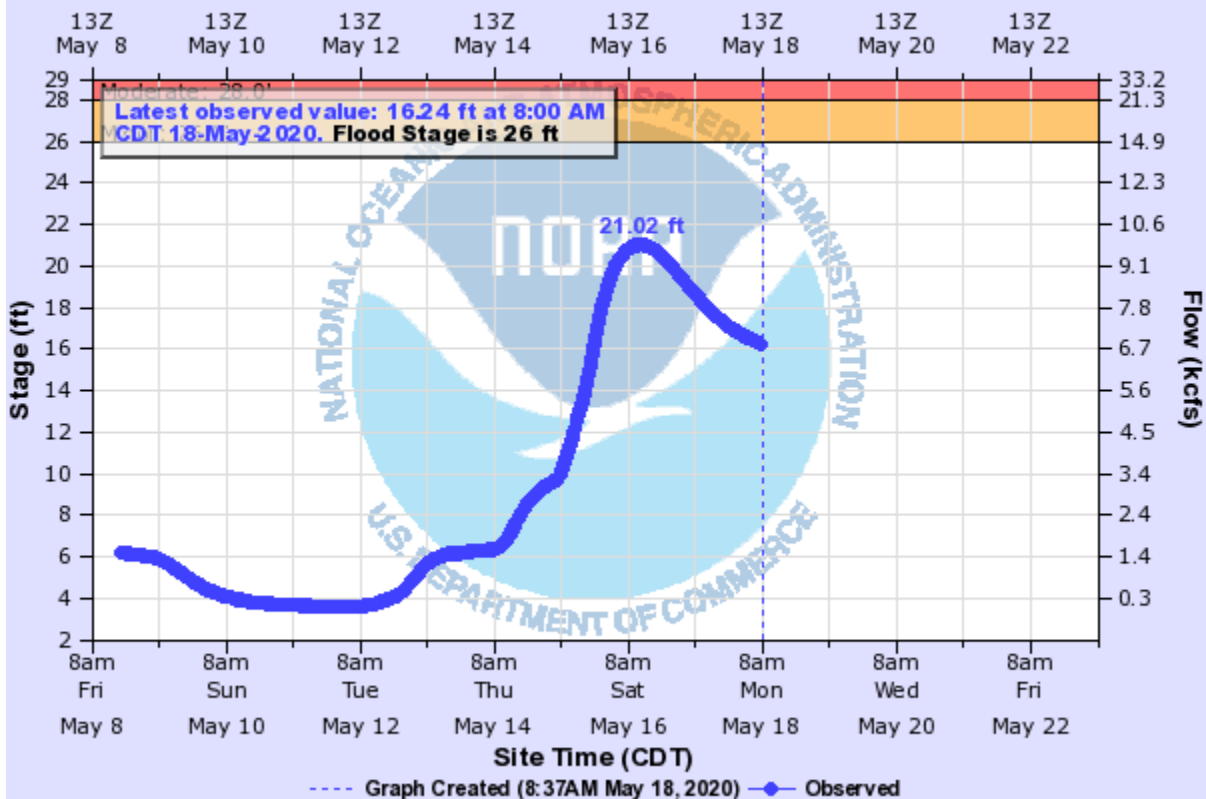


PANO2(plotting HGIRG) "Gage 0" Datum: 387.96'

Observations courtesy of US Geological Survey

## CANEY RIVER NEAR RAMONA

Universal Time (UTC)

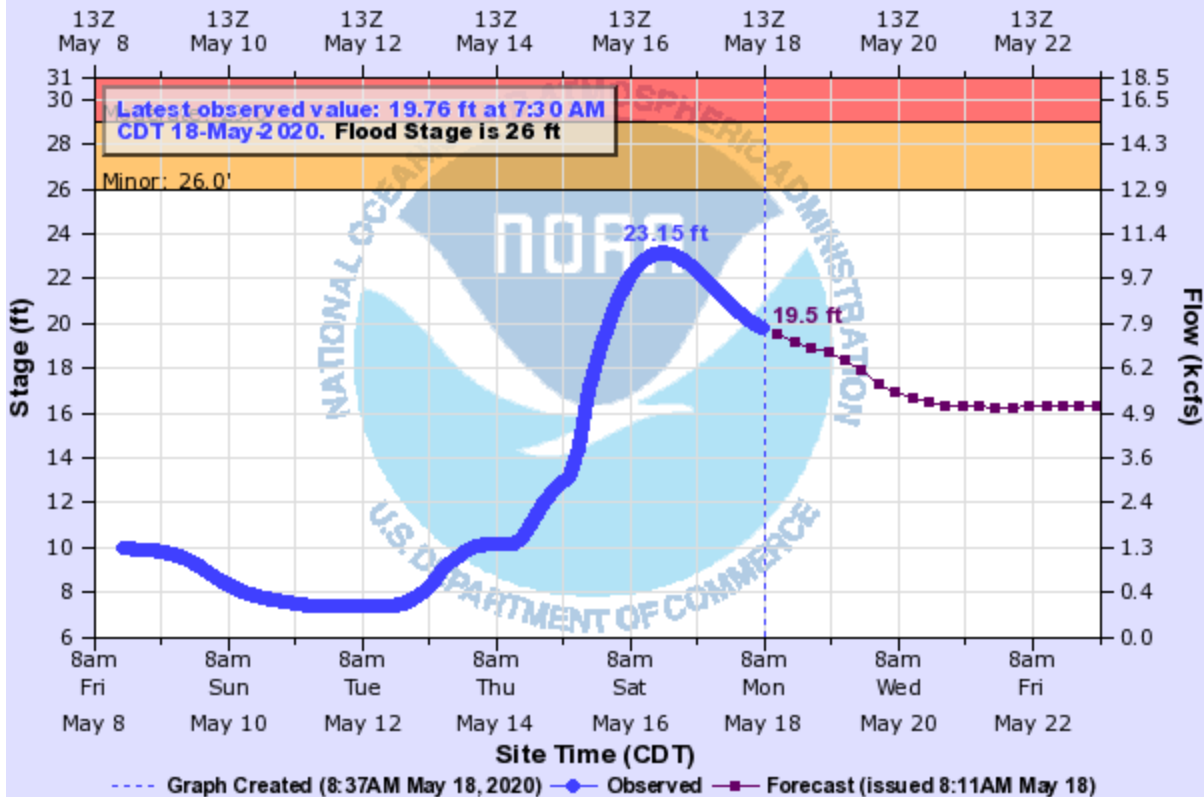


RAMO2(plotting HGIRG) "Gage 0" Datum: 586.43'

Observations courtesy of US Geological Survey

## CANEY RIVER NEAR COLLINSVILLE

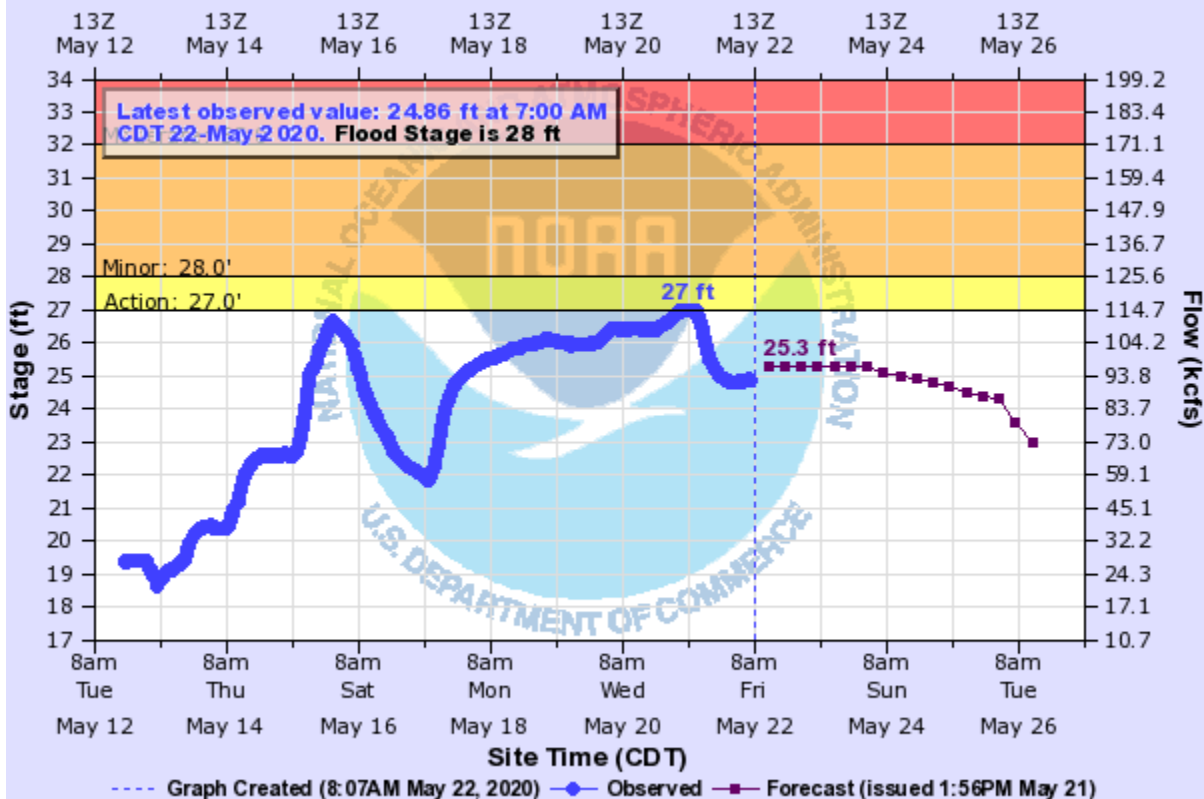
Universal Time (UTC)



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

## ARKANSAS RIVER NEAR MUSKOGEE

Universal Time (UTC)



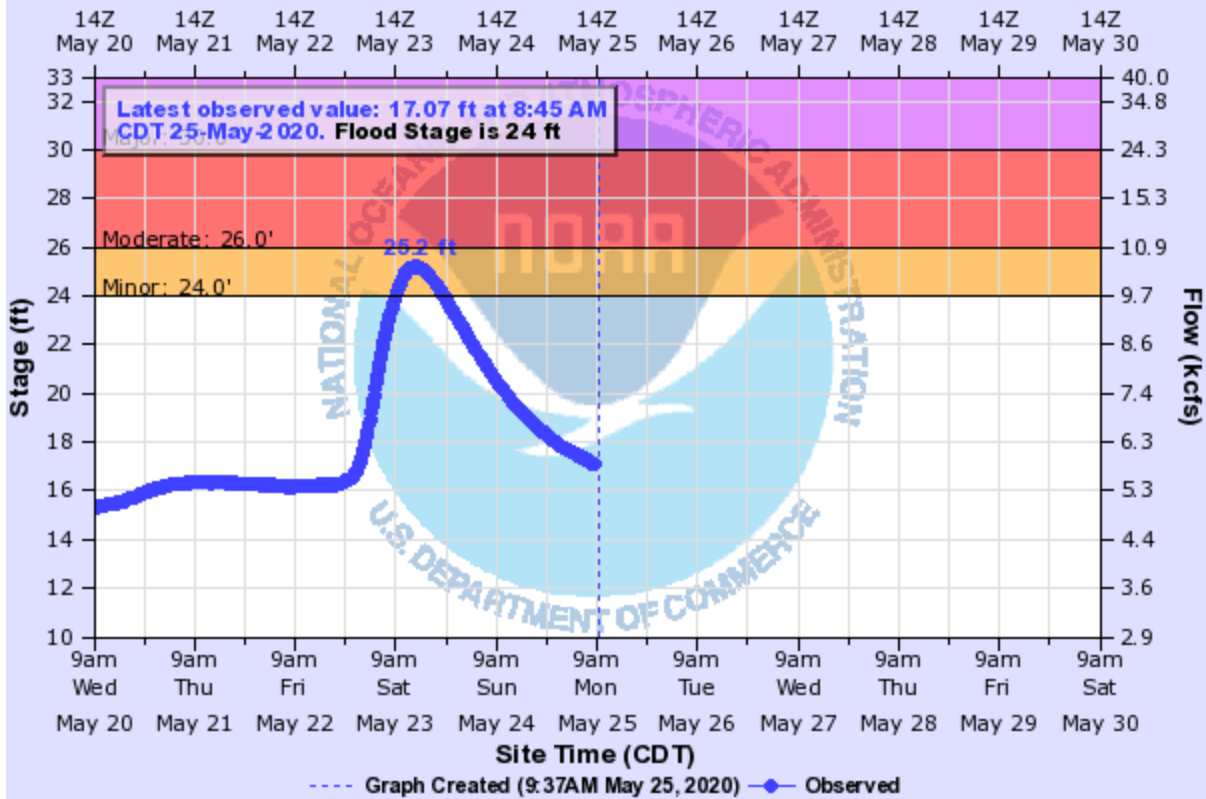
MKGO2(plotting HGIRG) "Gage 0" Datum: 471.38'

Observations courtesy of US Geological Survey



## POTEAU RIVER NEAR POTEAU

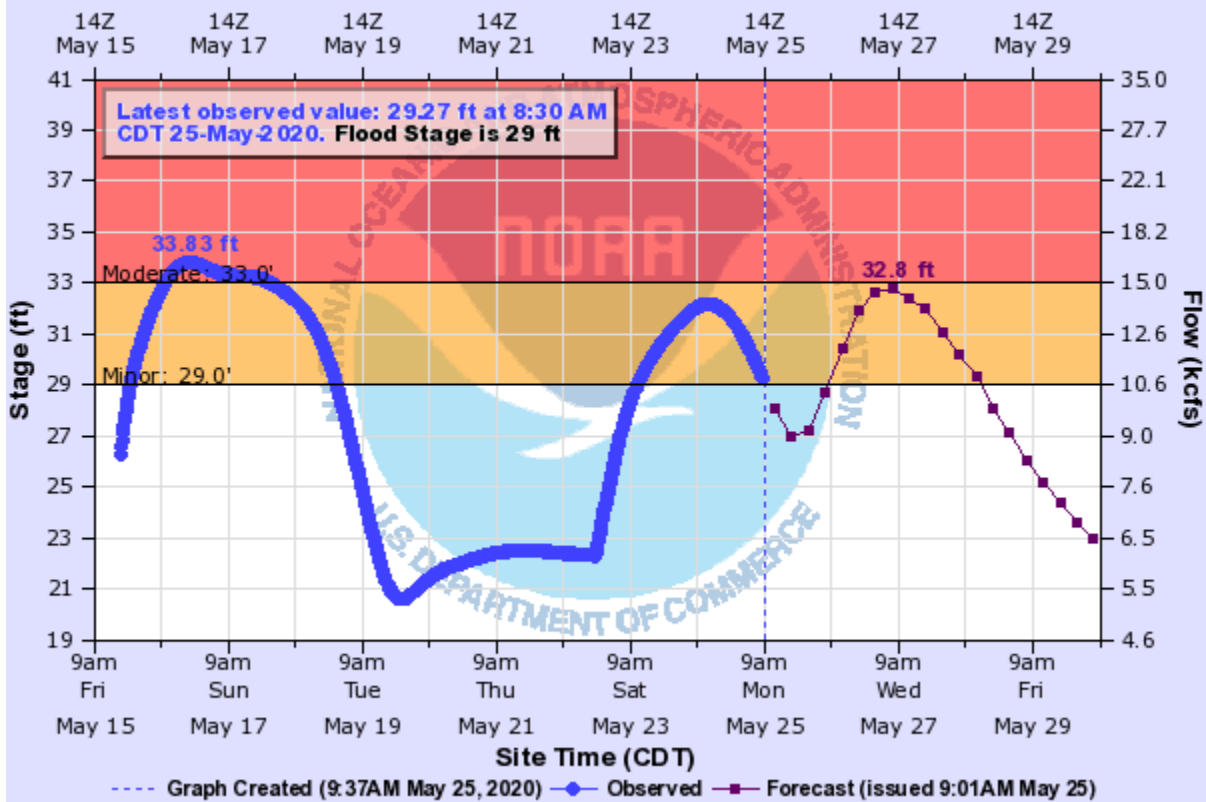
Universal Time (UTC)



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

## POTEAU RIVER NEAR PANAMA

Universal Time (UTC)

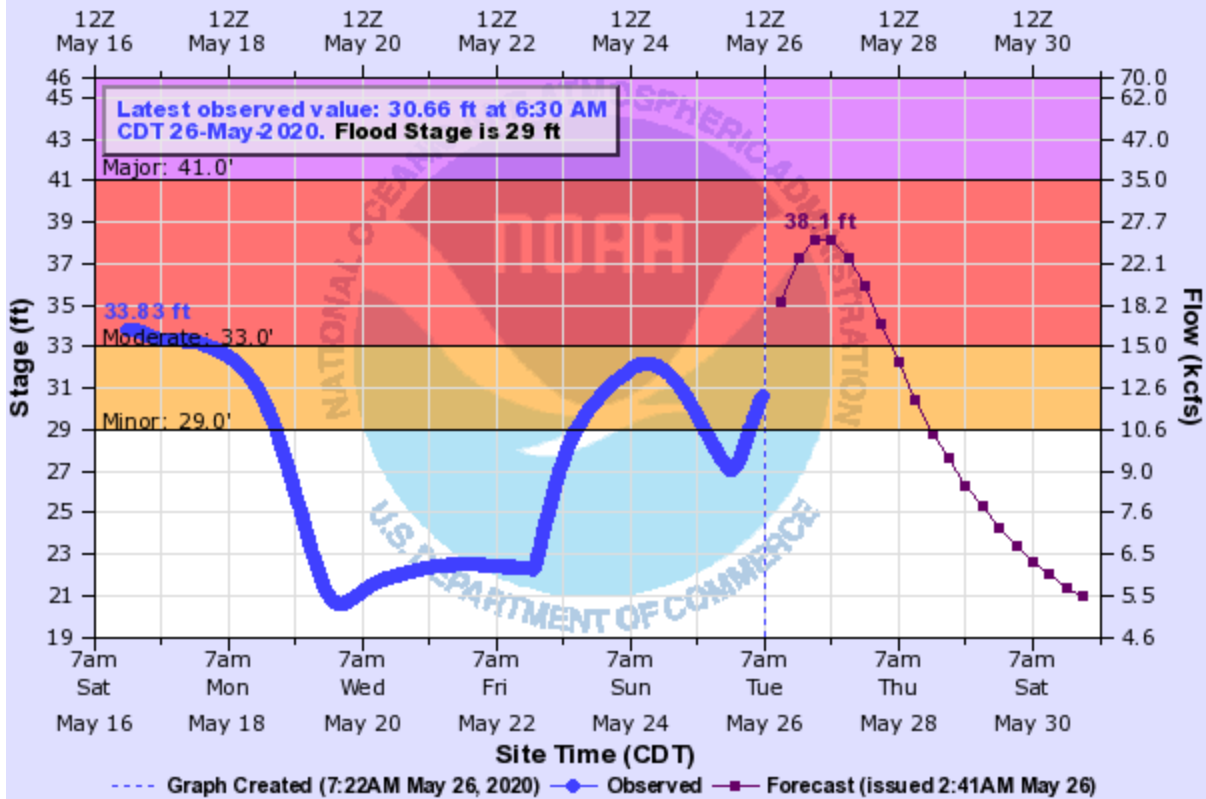


PANO2(plotting HGIRG) "Gage 0" Datum: 387.96'

Observations courtesy of US Geological Survey

## POTEAU RIVER NEAR PANAMA

Universal Time (UTC)

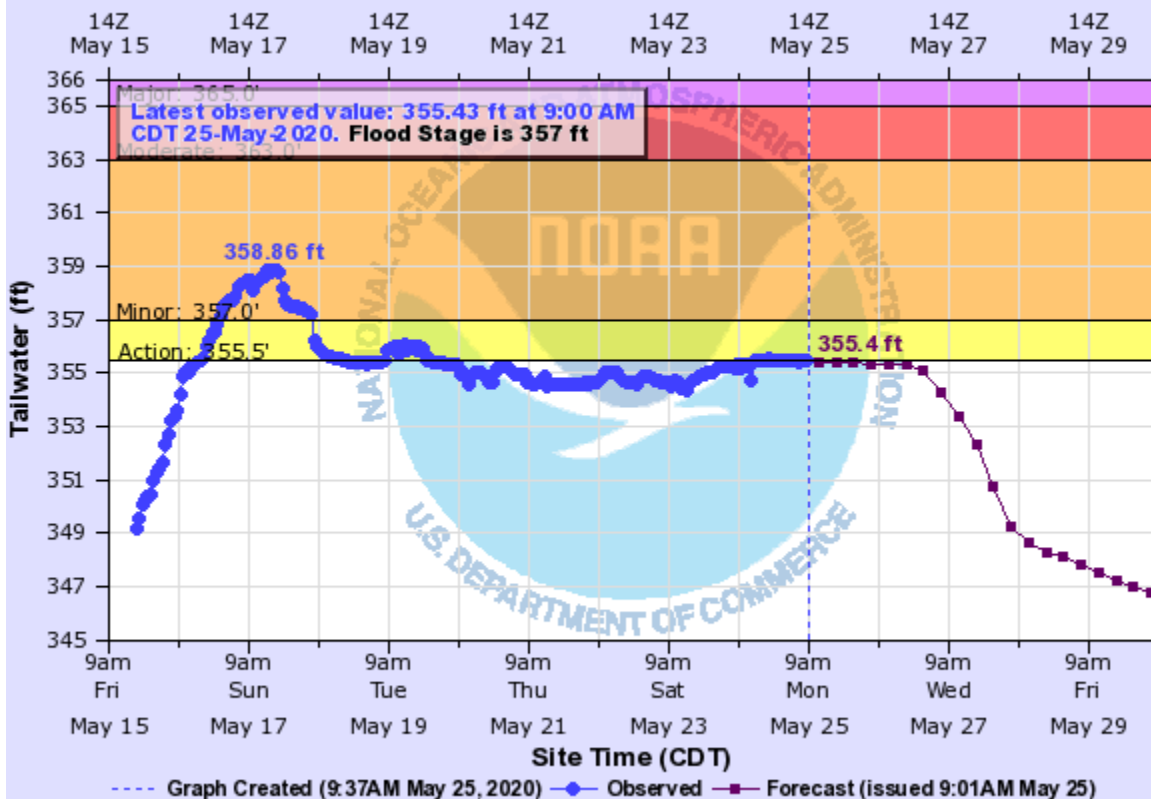


PANO2(plotting HGIRG) "Gage 0" Datum: 387.96'

Observations courtesy of US Geological Survey

## ARKANSAS RIVER AT OZARK L/D TAILWATER

Universal Time (UTC)

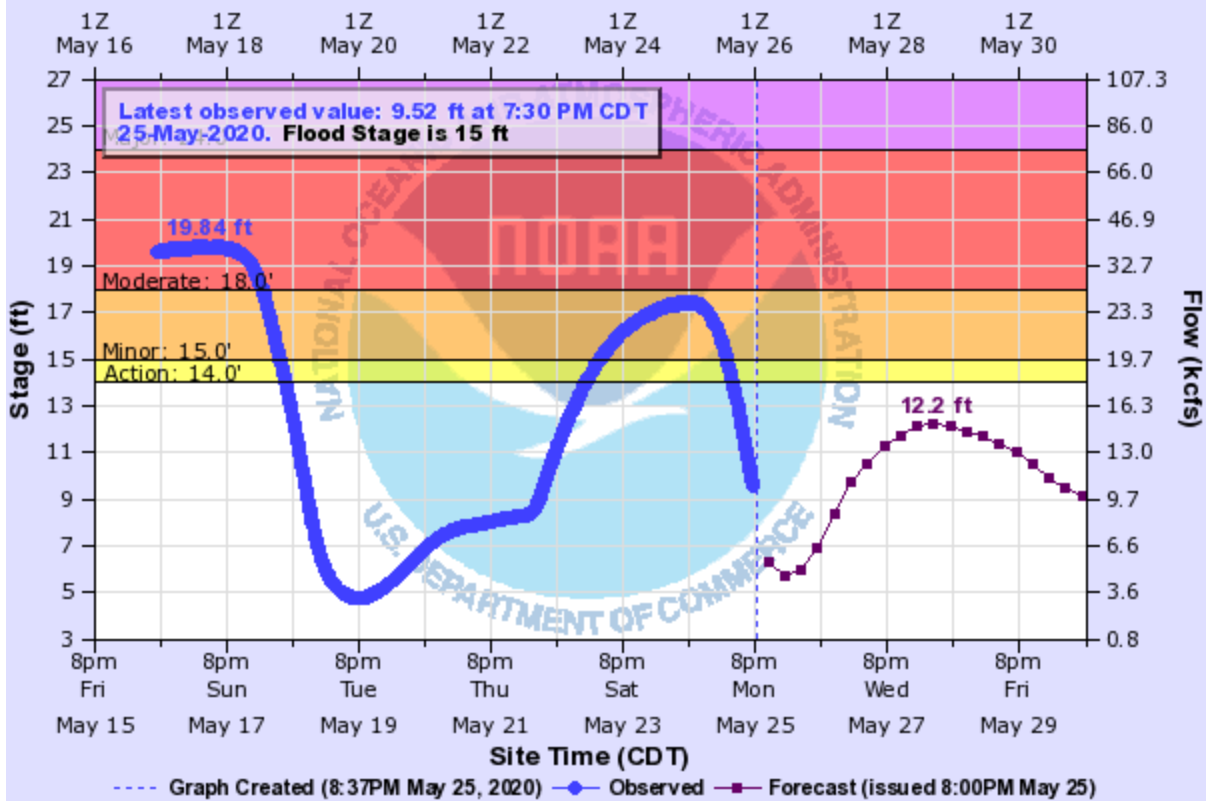


OZGA4(plotting HTIRG) "Gage 0" Datum: 0'

Observations courtesy of US Army Corps of Engineers - LRD

## NEOSHO RIVER NEAR COMMERCE

Universal Time (UTC)

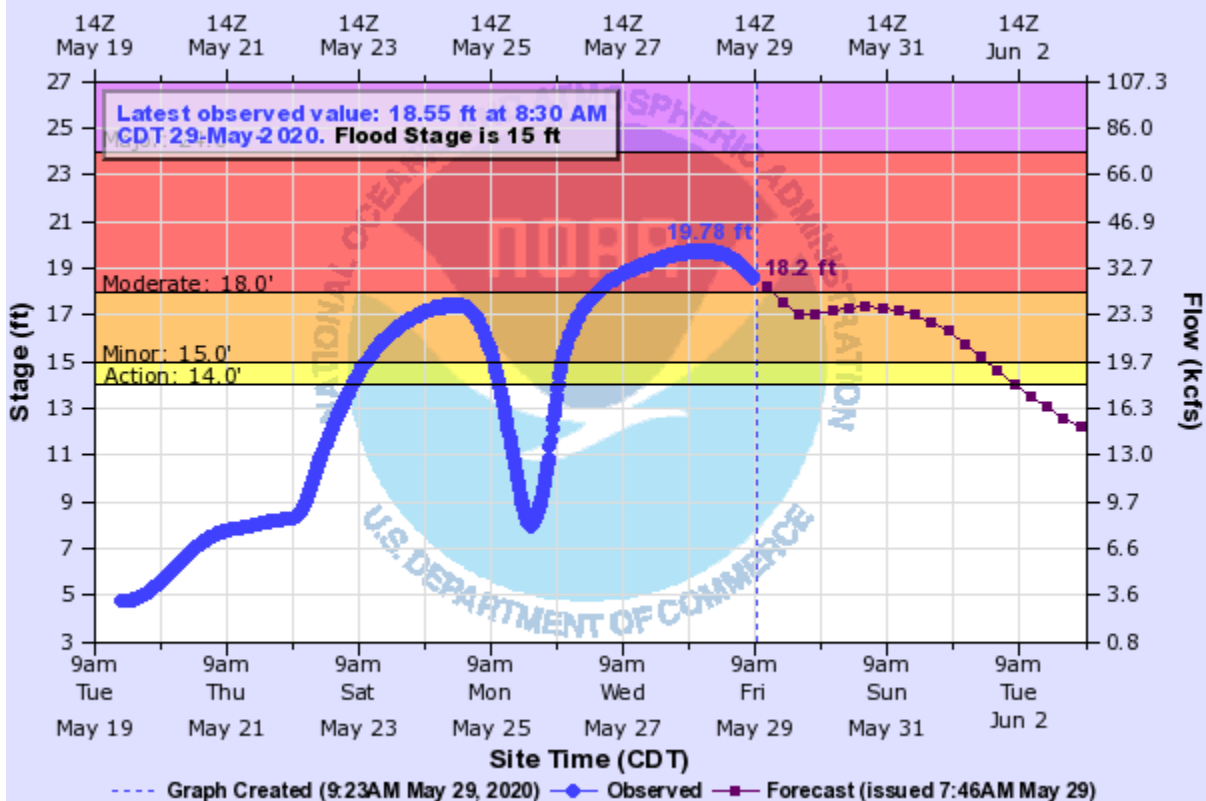


COMO2(plotting HGIRG) "Gage 0" Datum: 748.97'

Observations courtesy of US Geological Survey

## NEOSHO RIVER NEAR COMMERCE

Universal Time (UTC)



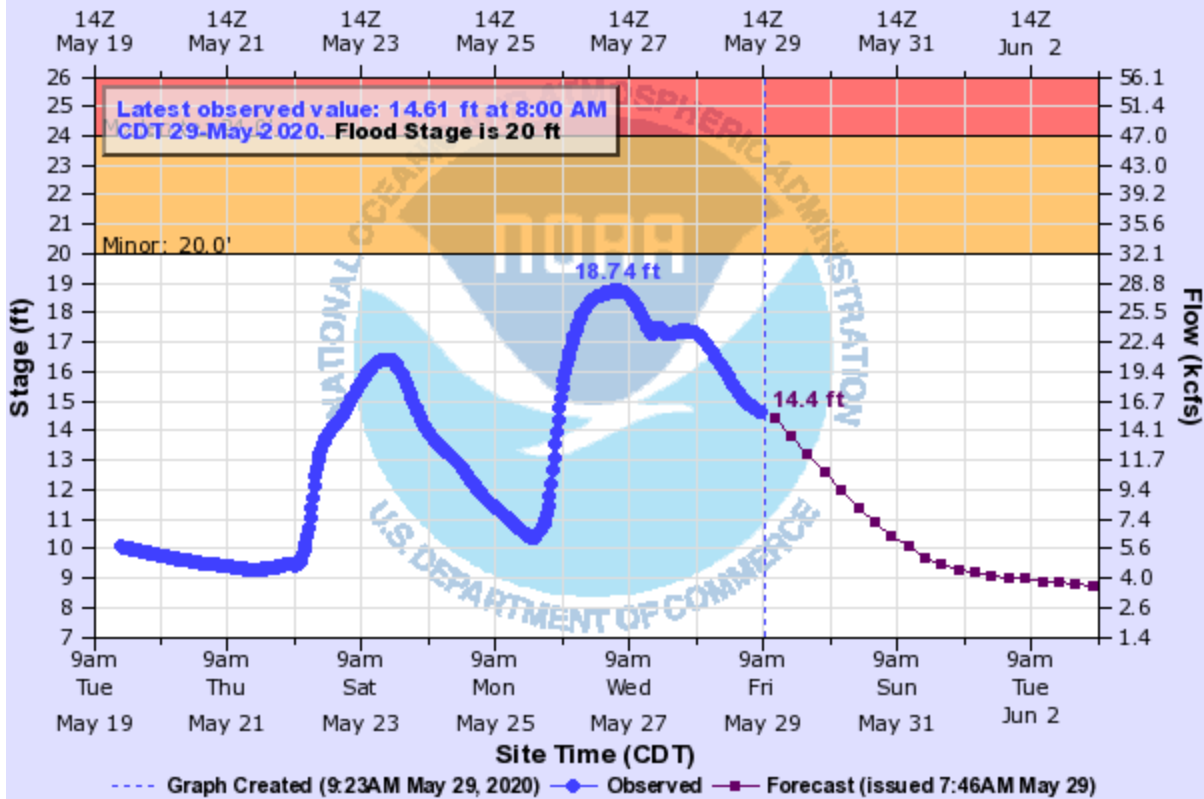
COMO2(plotting HGIRG) "Gage 0" Datum: 748.97'

Observations courtesy of US Geological Survey



## SPRING RIVER NEAR QUAPAW

Universal Time (UTC)

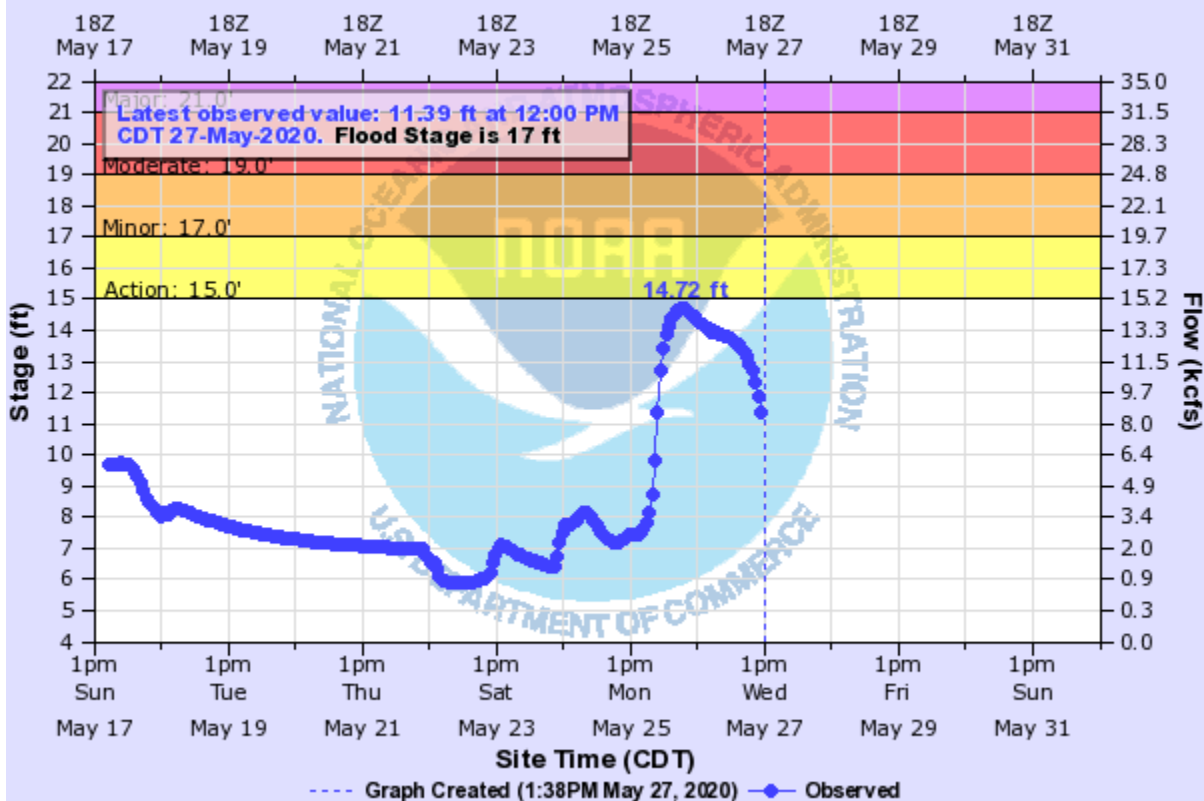


QUAO2(plotting HGIRG) "Gage 0" Datum: 746.25'

Observations courtesy of US Geological Survey

## KIAMICHI RIVER NEAR CLAYTON

Universal Time (UTC)

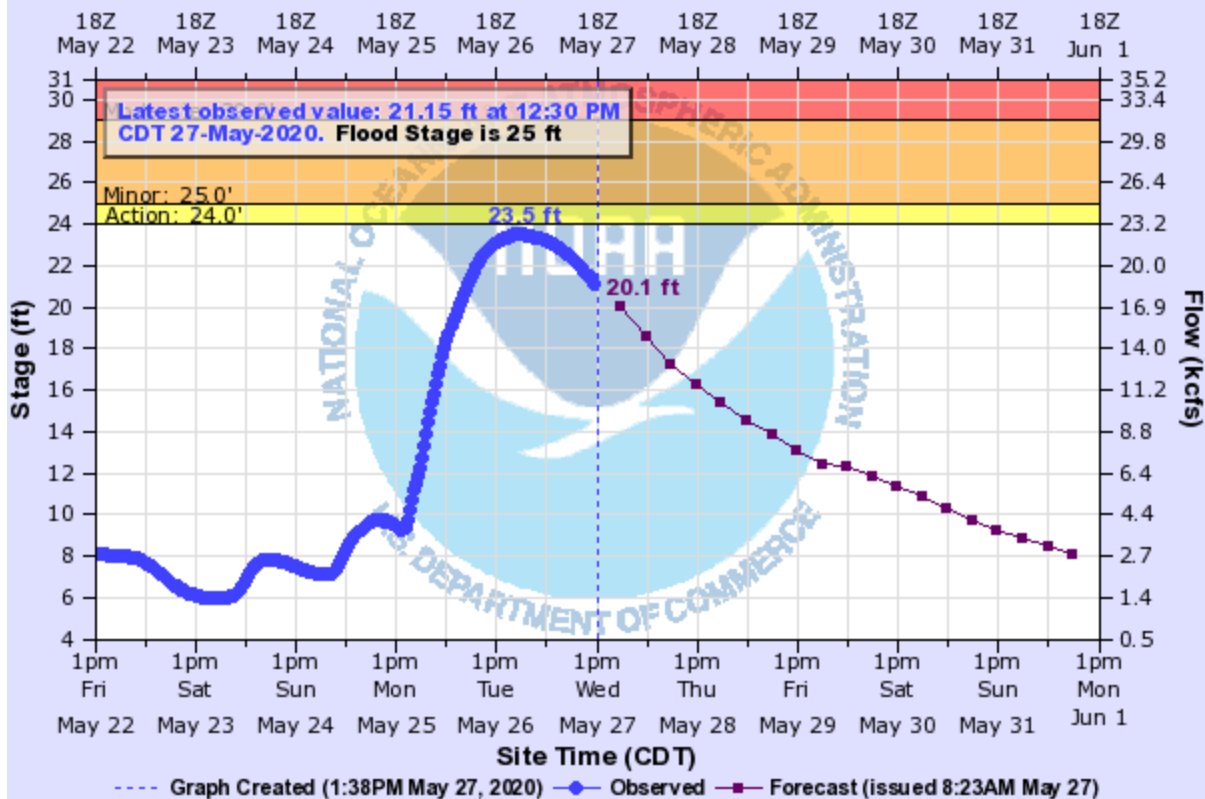


CLTO2(plotting HGIRG) "Gage 0" Datum: 520'

Observations courtesy of US Geological Survey

### KIAMICHI RIVER NEAR ANTLERS

Universal Time (UTC)

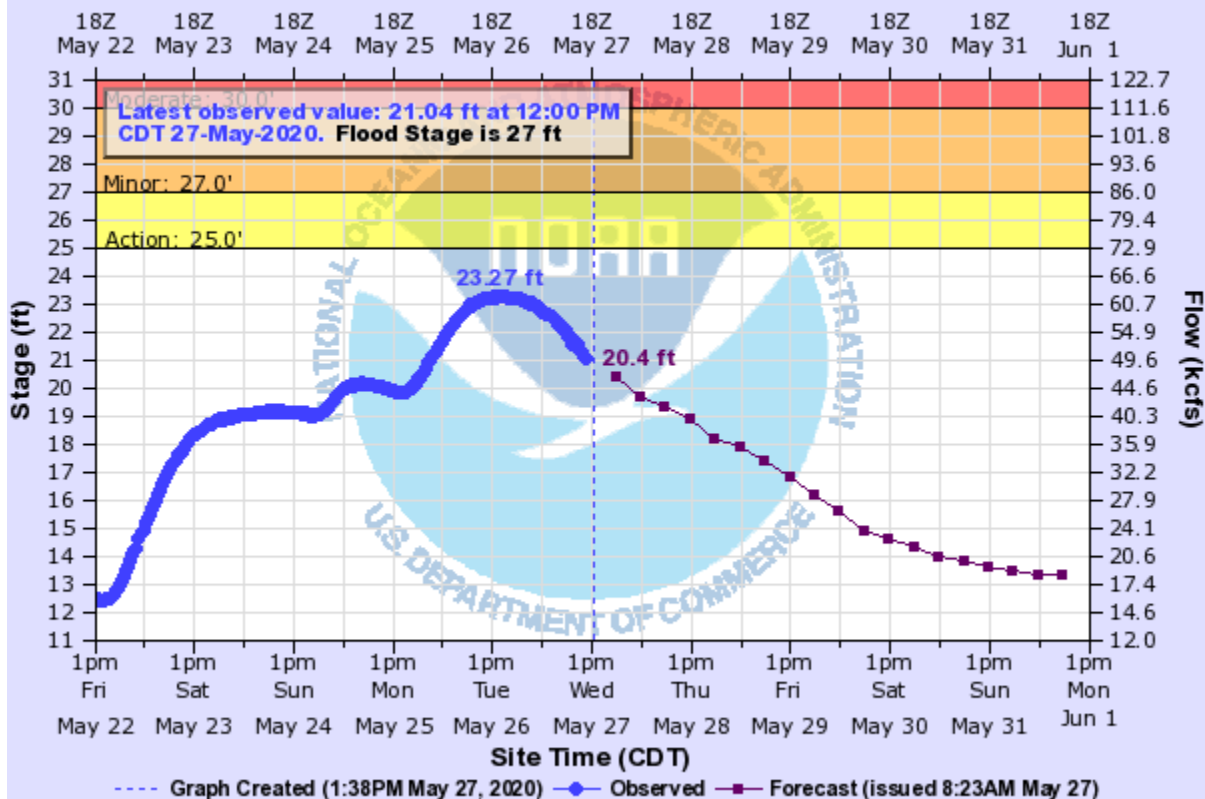


ANTO2(plotting HGIRG) "Gage 0" Datum: 419.82'

Observations courtesy of US Geological Survey

### RED RIVER AT ARTHUR CITY

Universal Time (UTC)

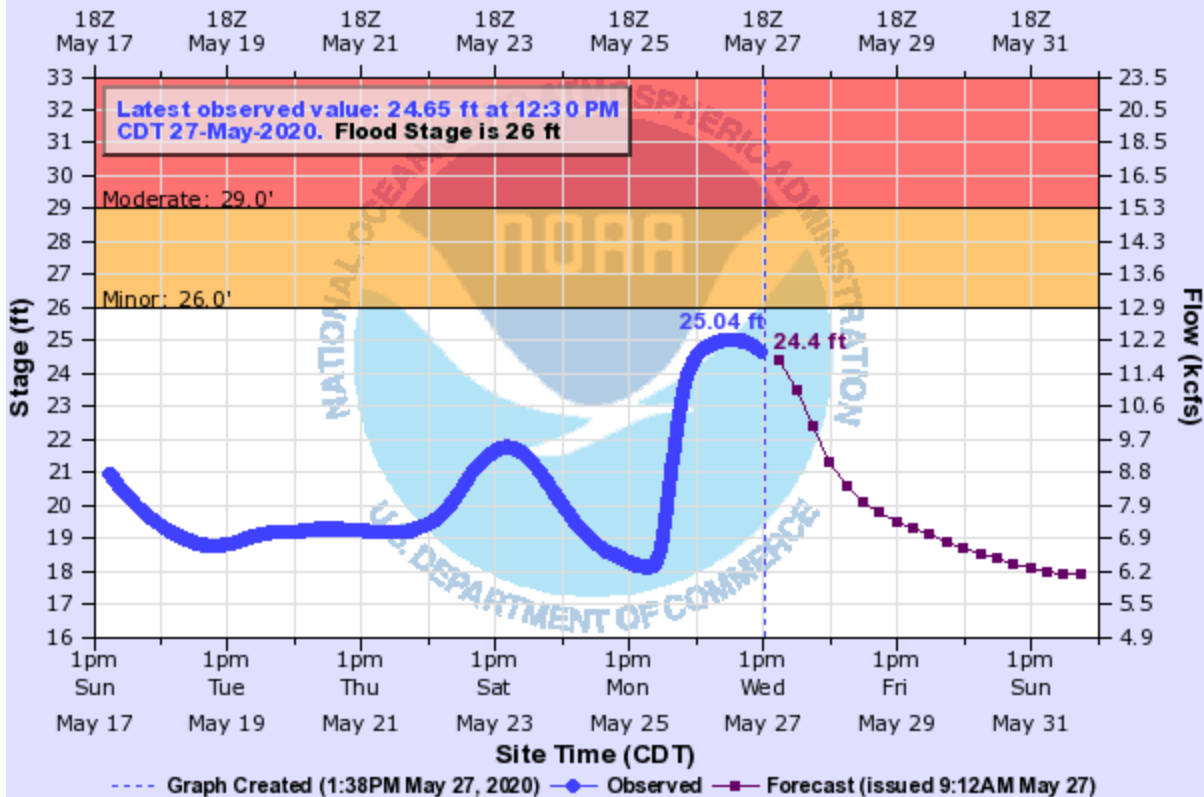


ARCT2(plotting HGIRG) "Gage 0" Datum: 375.07'

Observations courtesy of US Geological Survey

## CANEY RIVER NEAR COLLINSVILLE

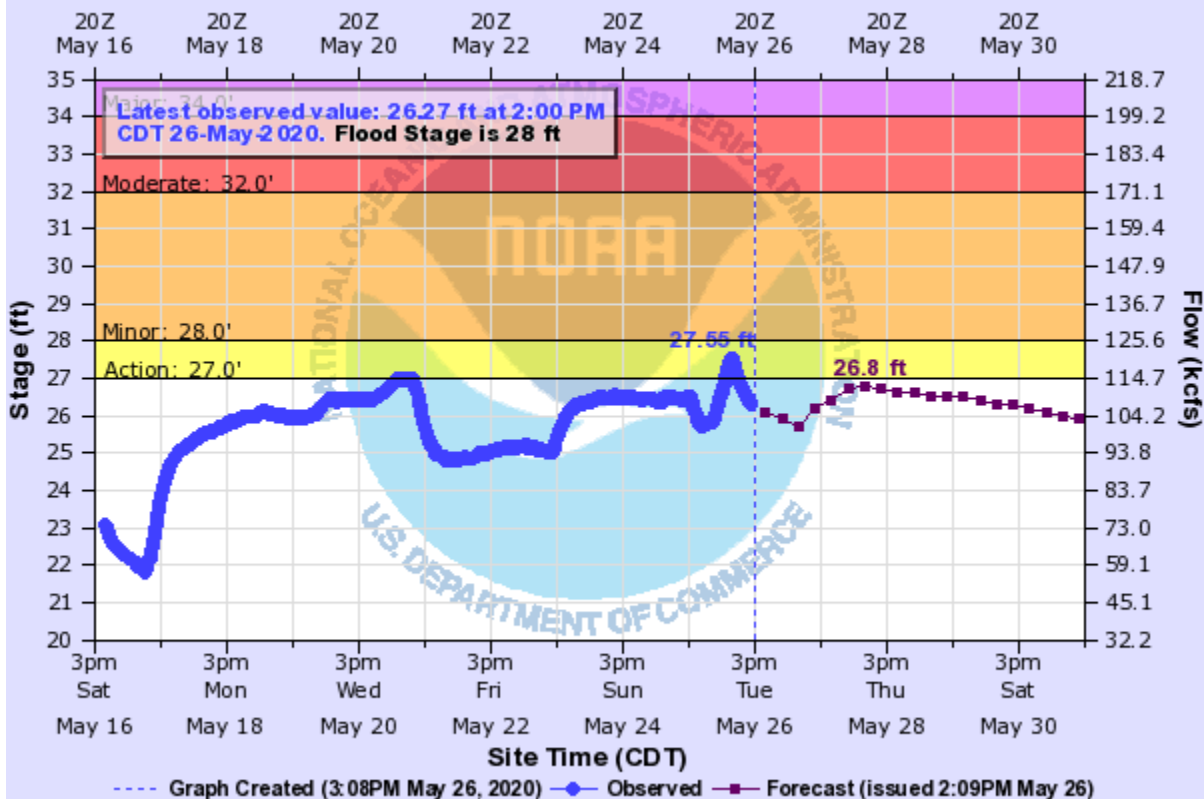
Universal Time (UTC)



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

## ARKANSAS RIVER NEAR MUSKOGEE

Universal Time (UTC)



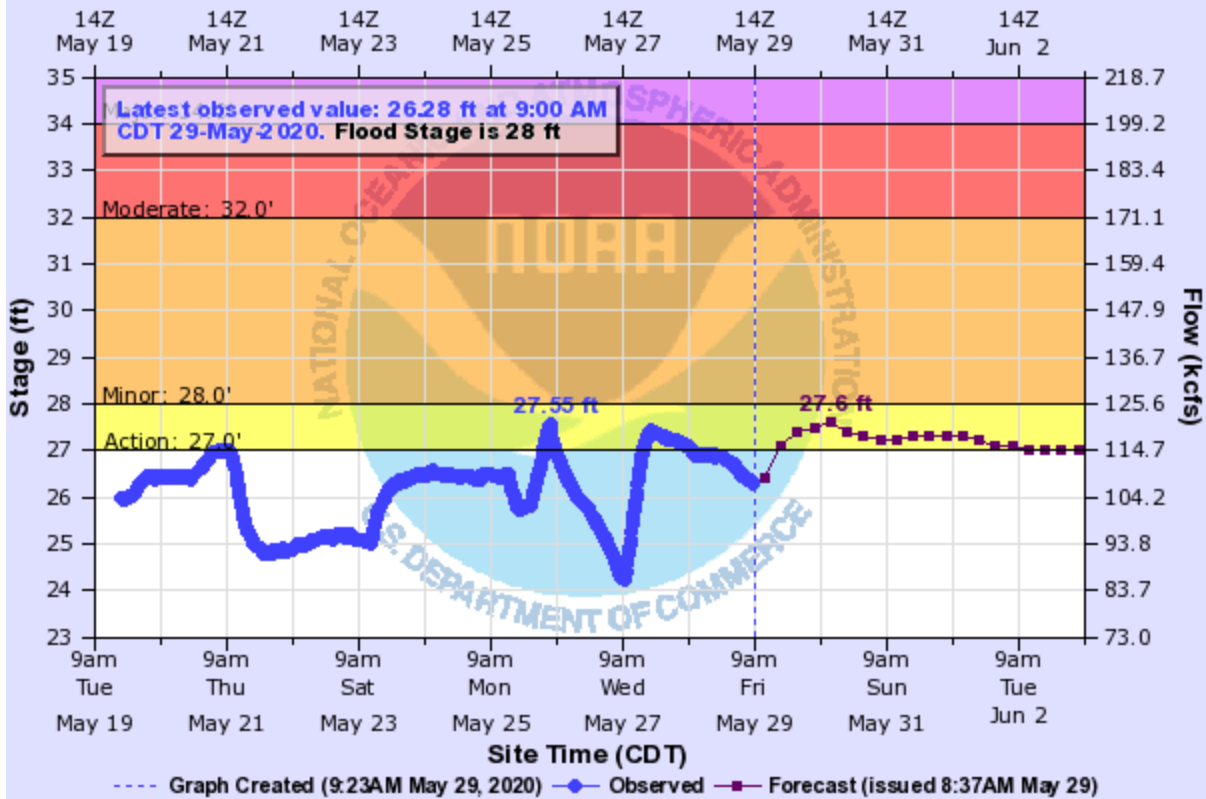
MKGO2(plotting HGIRG) "Gage 0" Datum: 471.38'

Observations courtesy of US Geological Survey



## ARKANSAS RIVER NEAR MUSKOGEE

Universal Time (UTC)

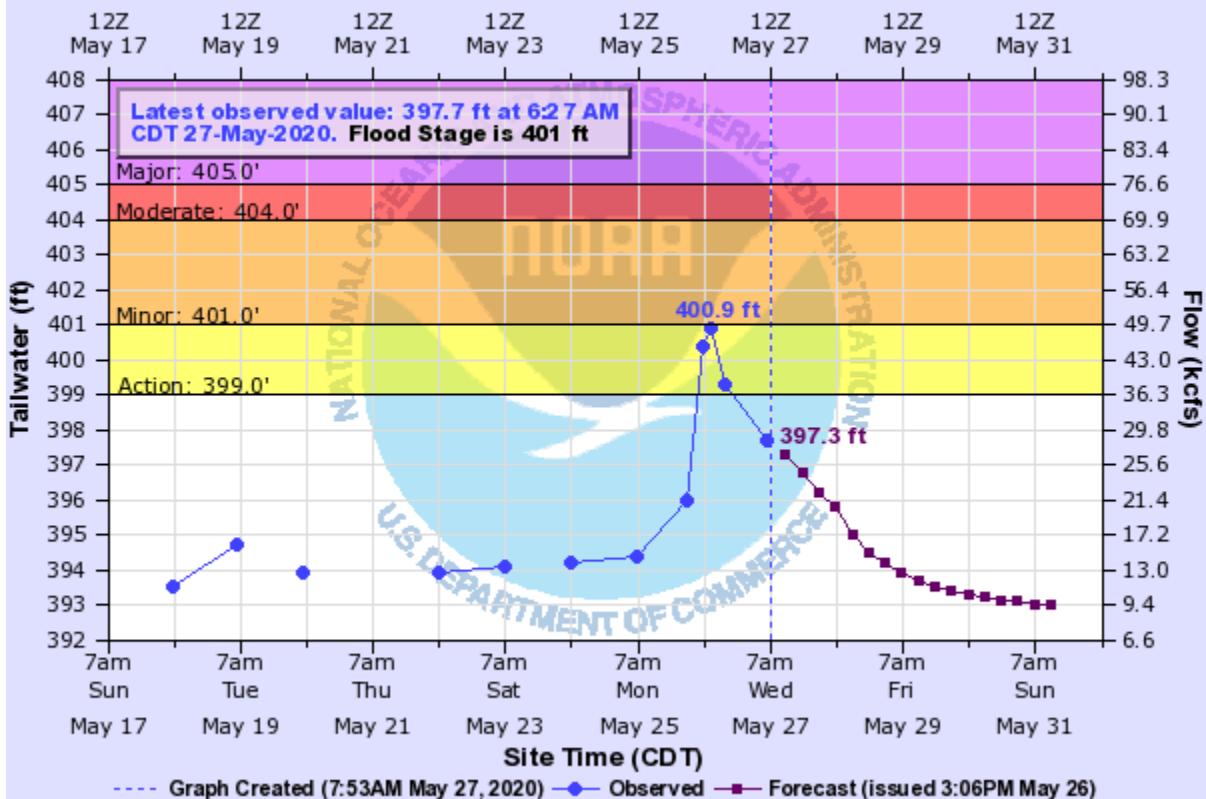


MKGO2(plotting HGIRG) "Gage 0" Datum: 471.38'

Observations courtesy of US Geological Survey

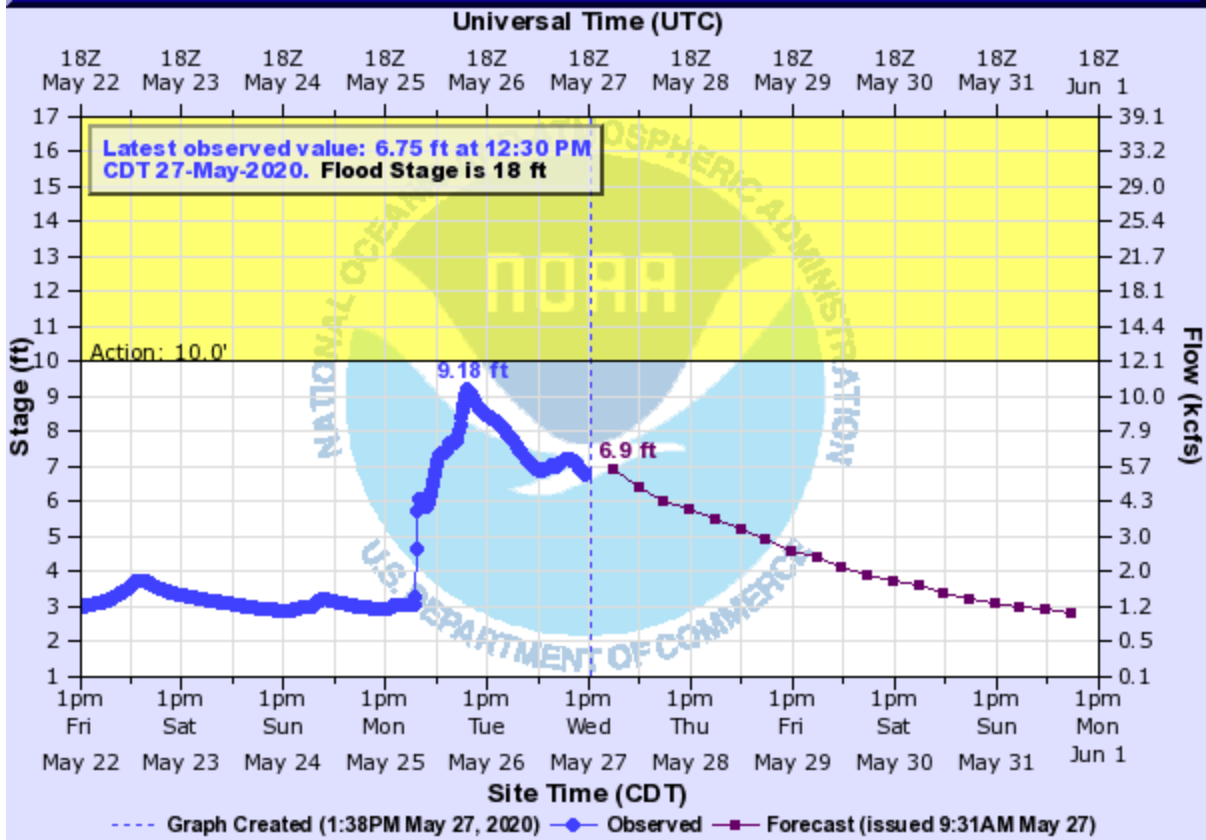
## LEE CREEK NEAR VAN BUREN LCR

Universal Time (UTC)



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

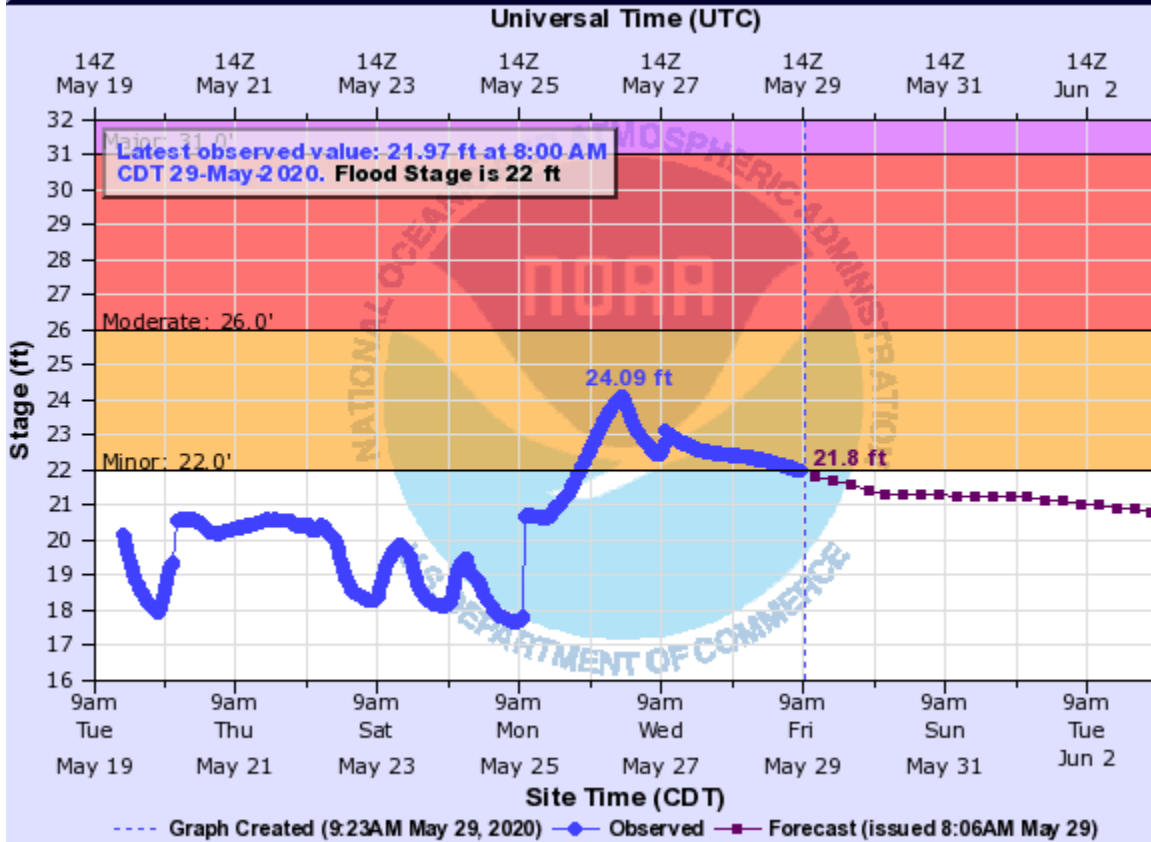
## MULBERRY RIVER (AR) NEAR MULBERRY



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

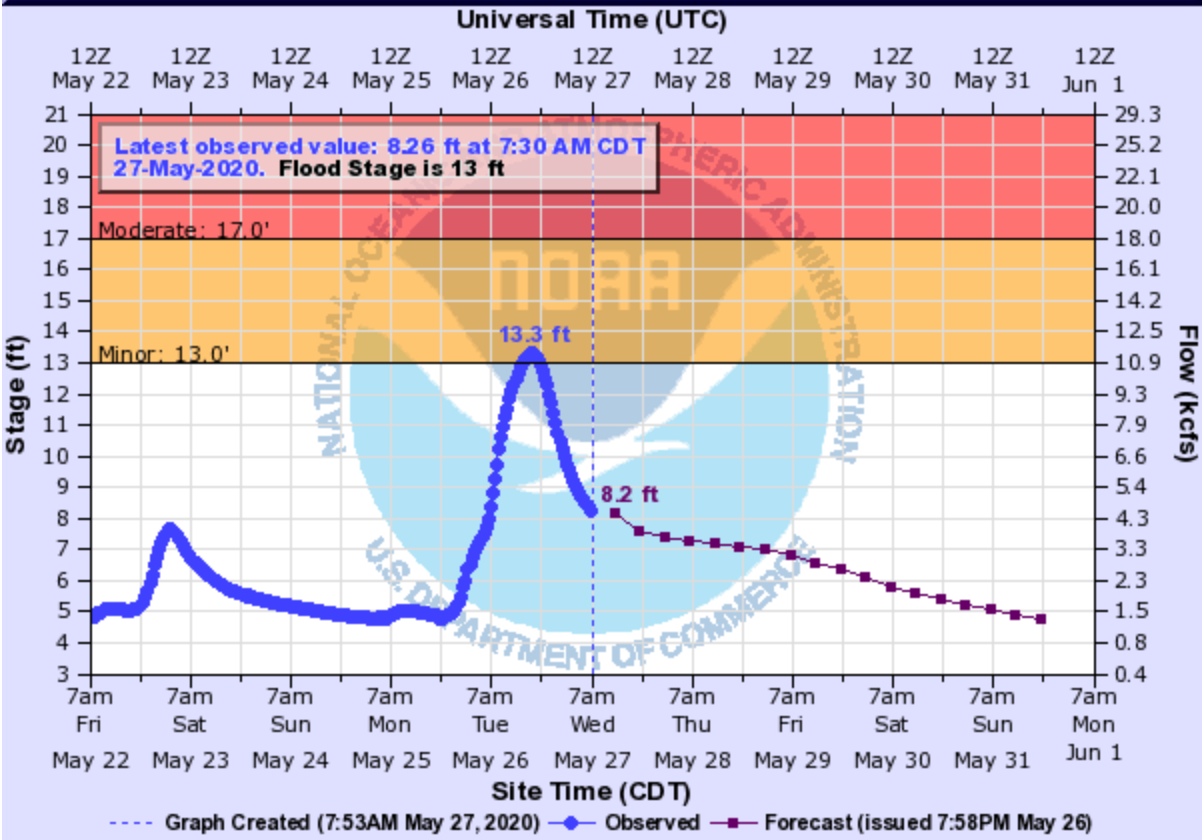
Observations courtesy of USGS/USACE/ADEQ

## ARKANSAS RIVER AT VAN BUREN



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

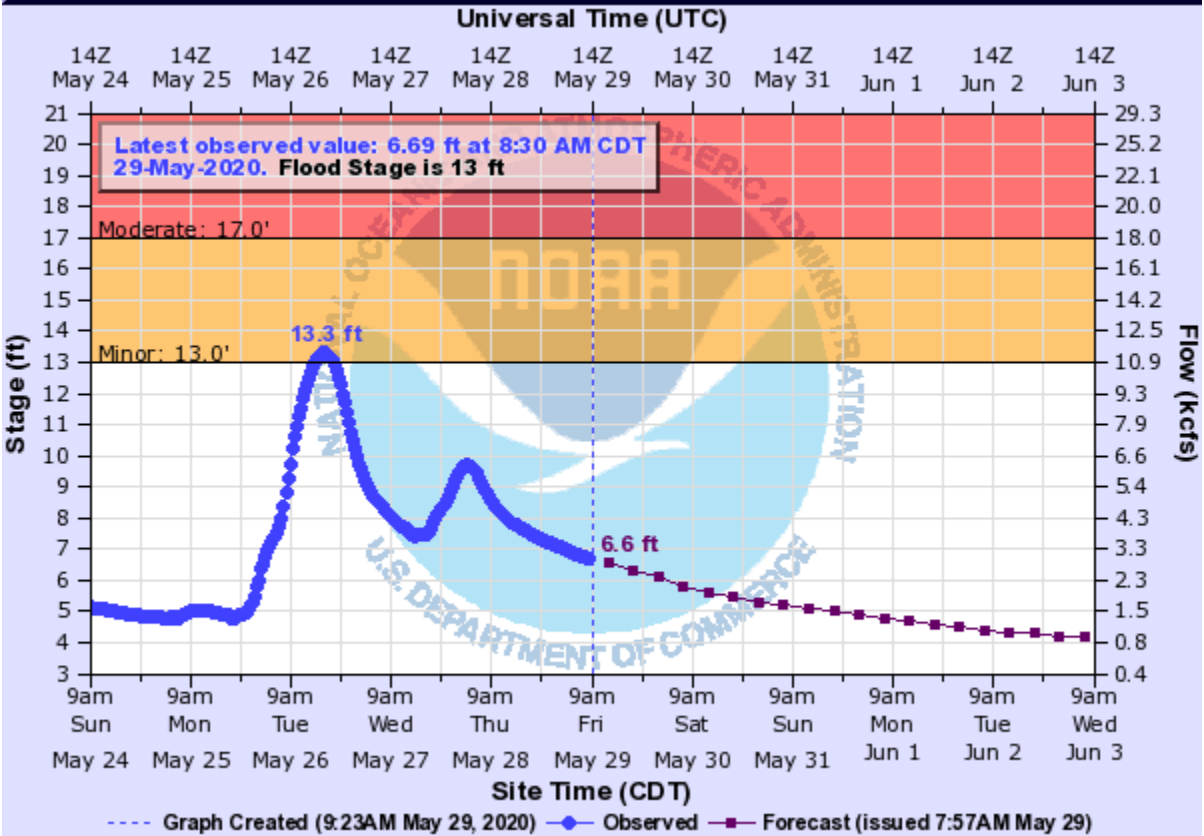
## ILLINOIS RIVER (AR OK) NEAR WATTS



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

Observations courtesy of US Geological Survey

## ILLINOIS RIVER (AR OK) NEAR WATTS

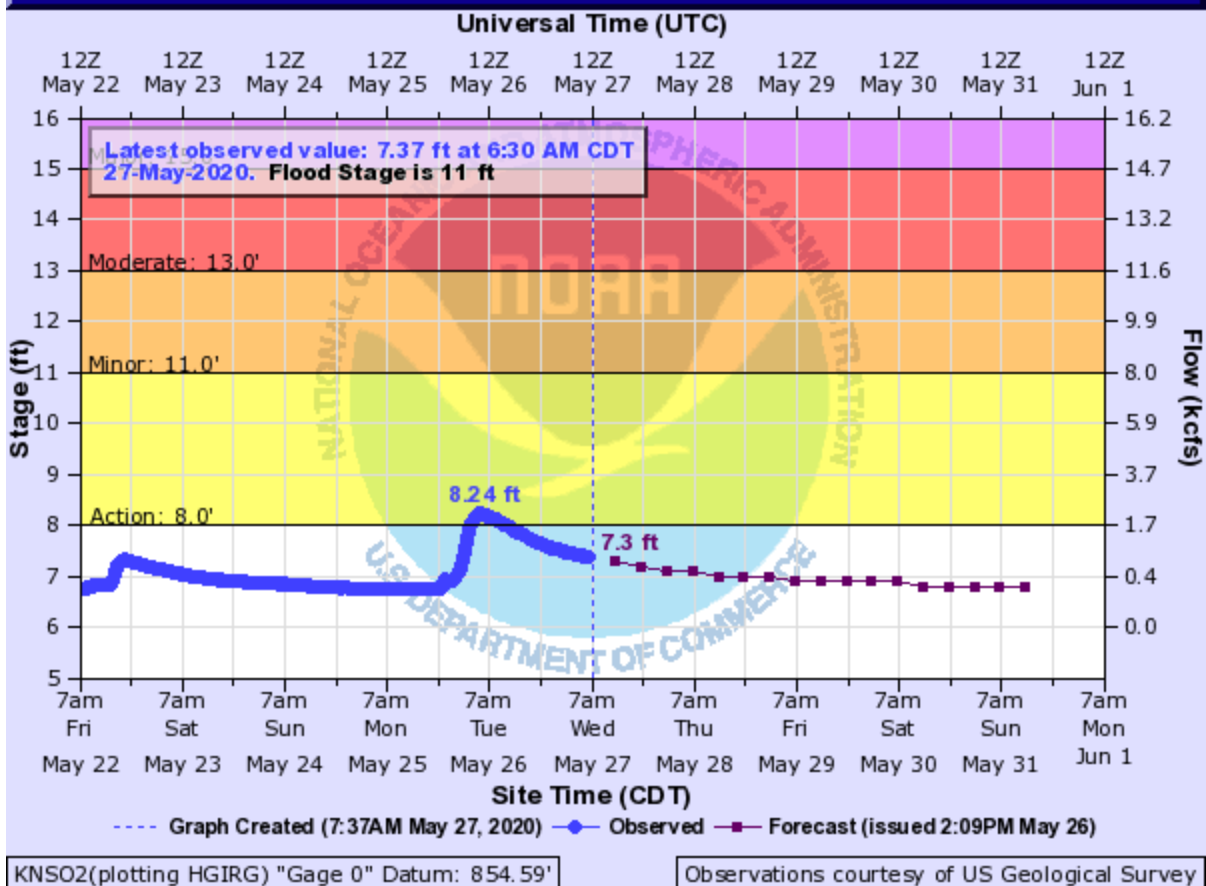


WTTO2(plotting HGIRG) "Gage 0" Datum: 893.78'

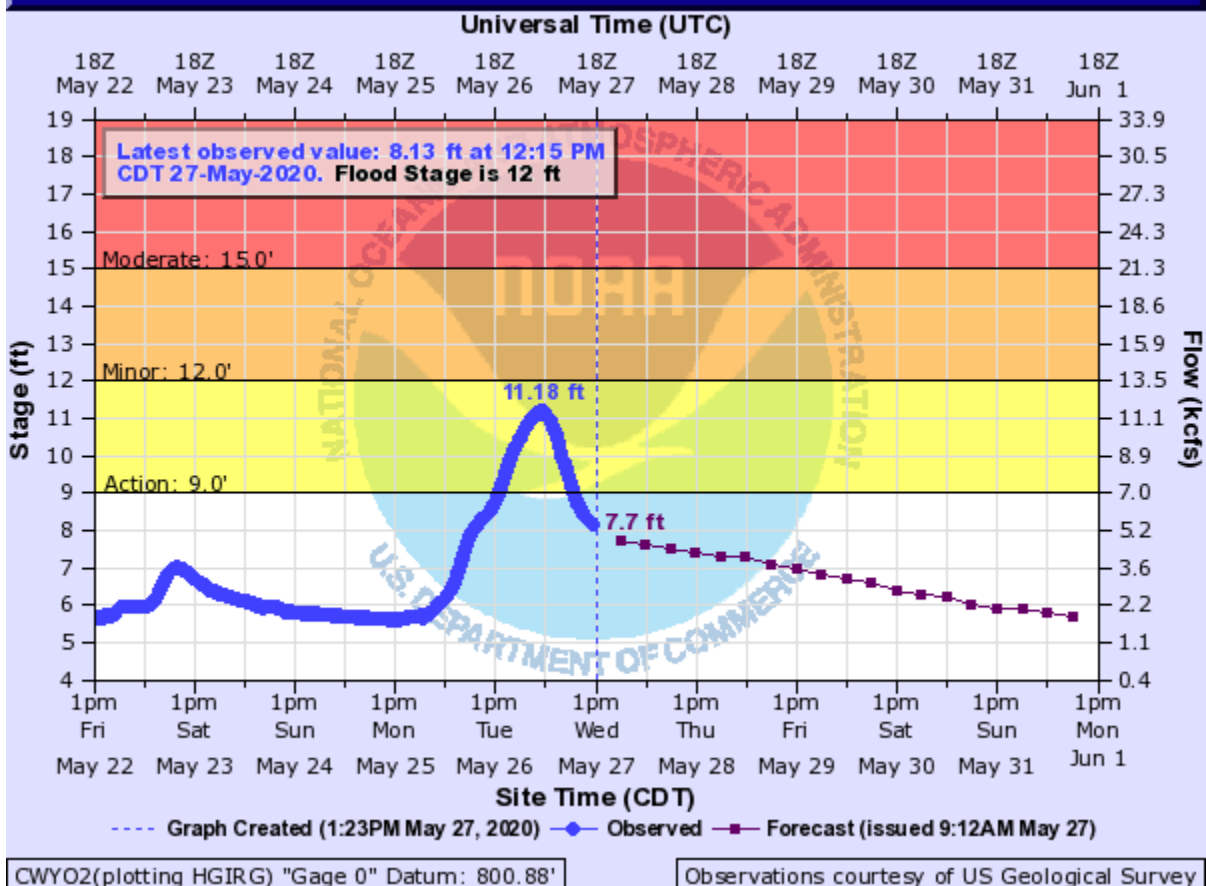
Observations courtesy of US Geological Survey



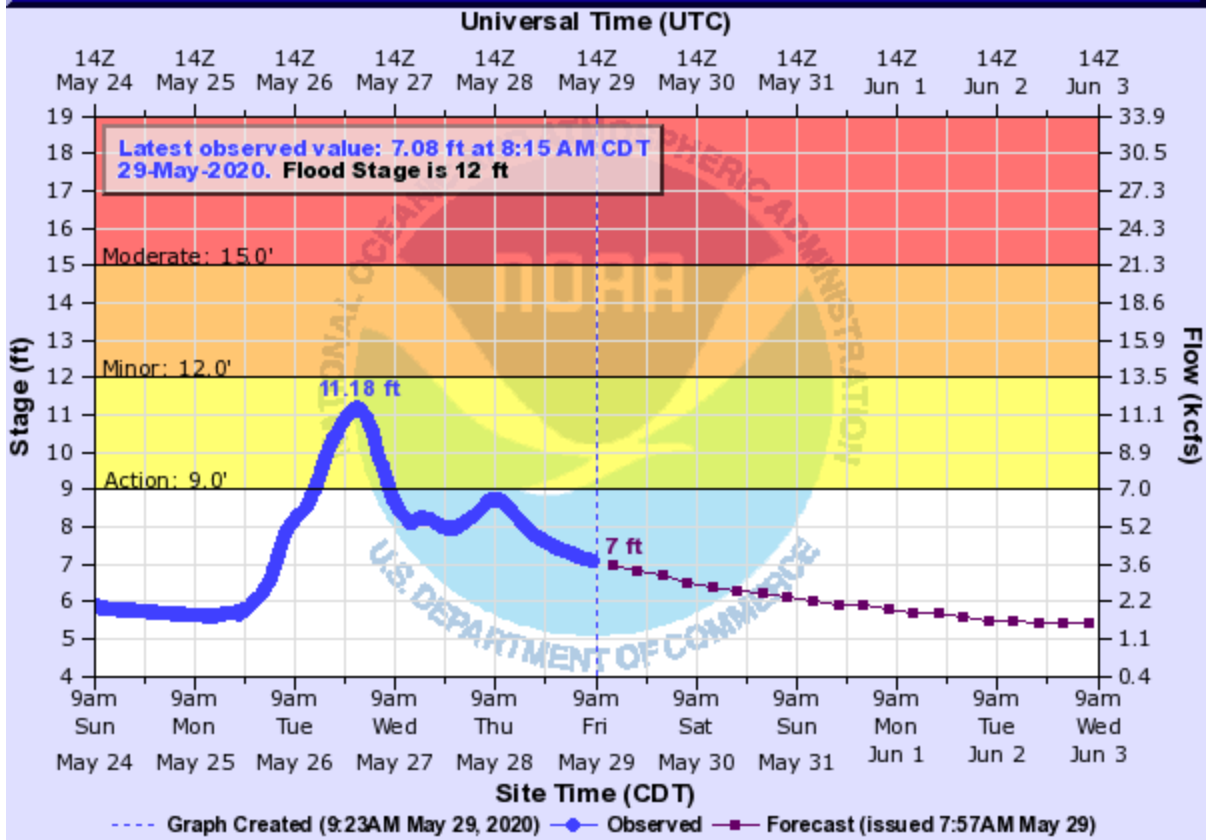
## FLINT CREEK (OK) NEAR KANSAS



## ILLINOIS RIVER (AR OK) AT CHEWEY



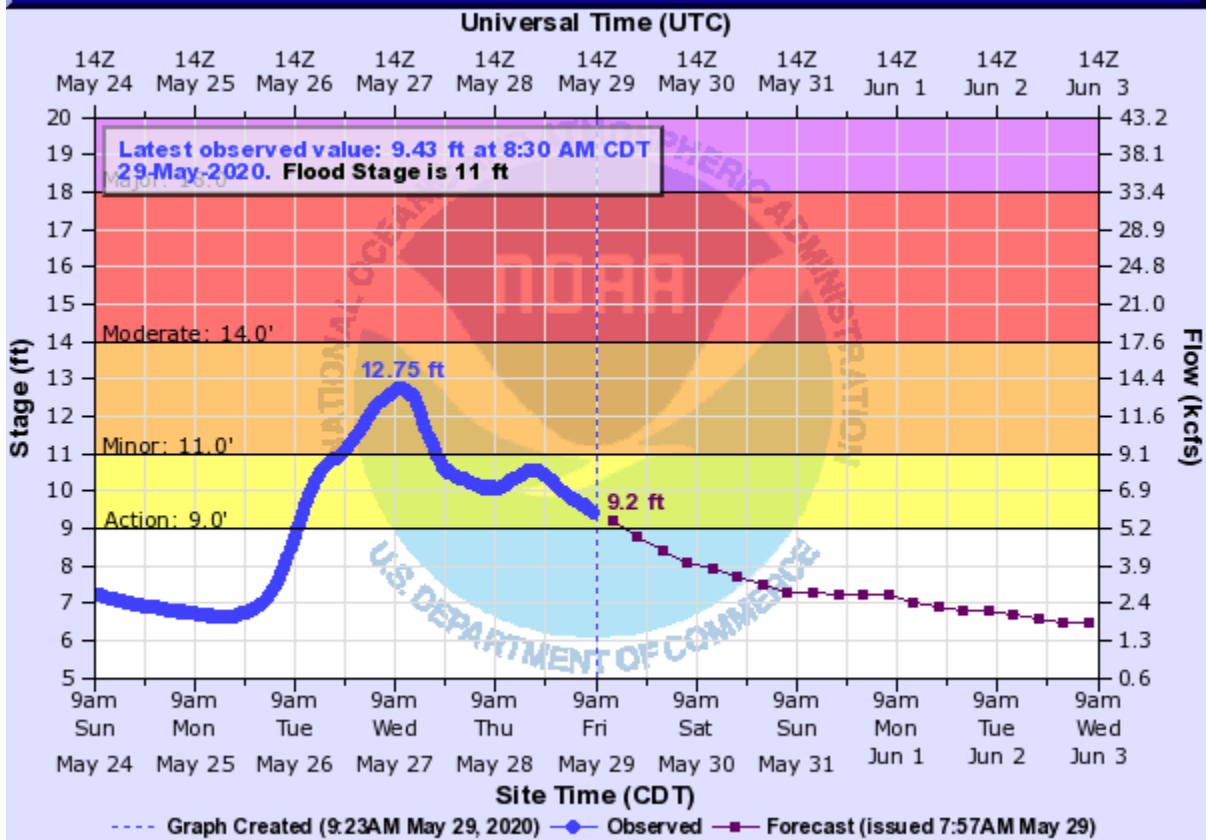
## ILLINOIS RIVER (AR OK) AT CHEWEY



CWY02(plotting HGIRG) "Gage 0" Datum: 800.88'

Observations courtesy of US Geological Survey

## ILLINOIS RIVER (AR OK) NEAR TAHLEQUAH

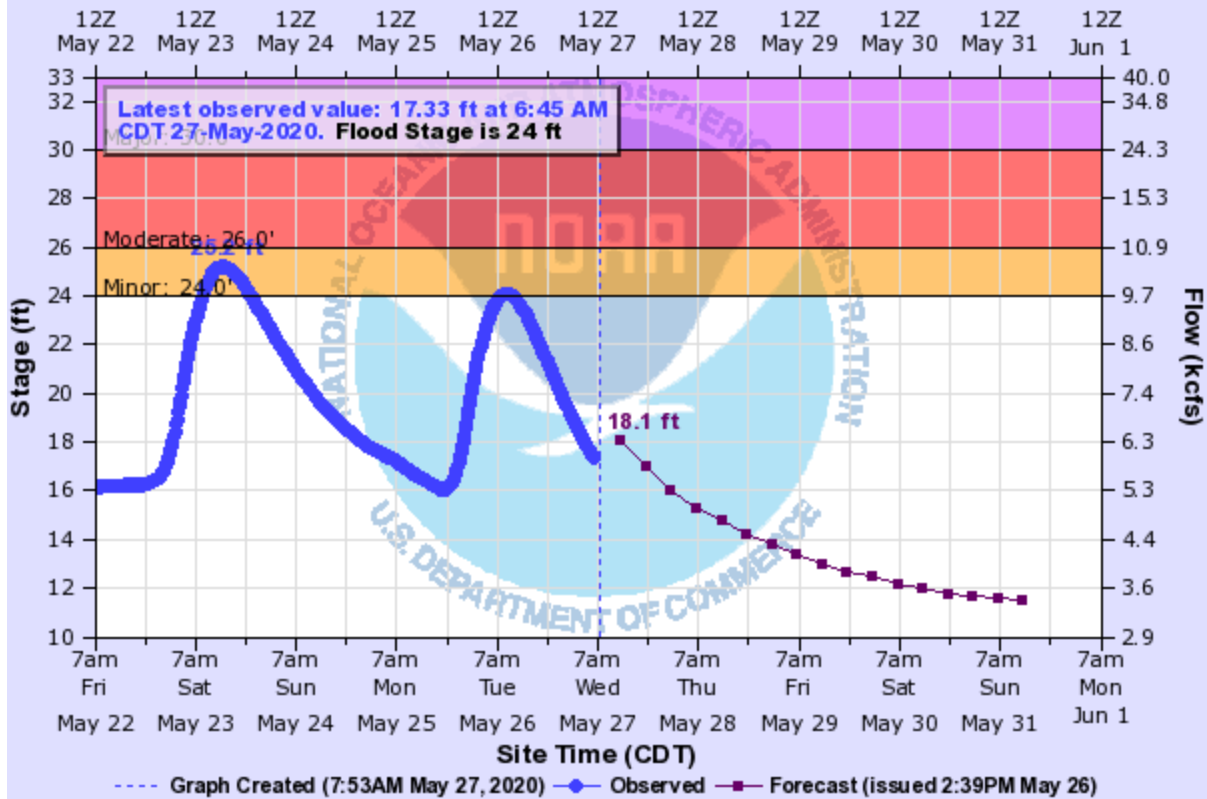


TAL02(plotting HGIRG) "Gage 0" Datum: 664.14'

Observations courtesy of US Geological Survey

### POTEAU RIVER NEAR POTEAU

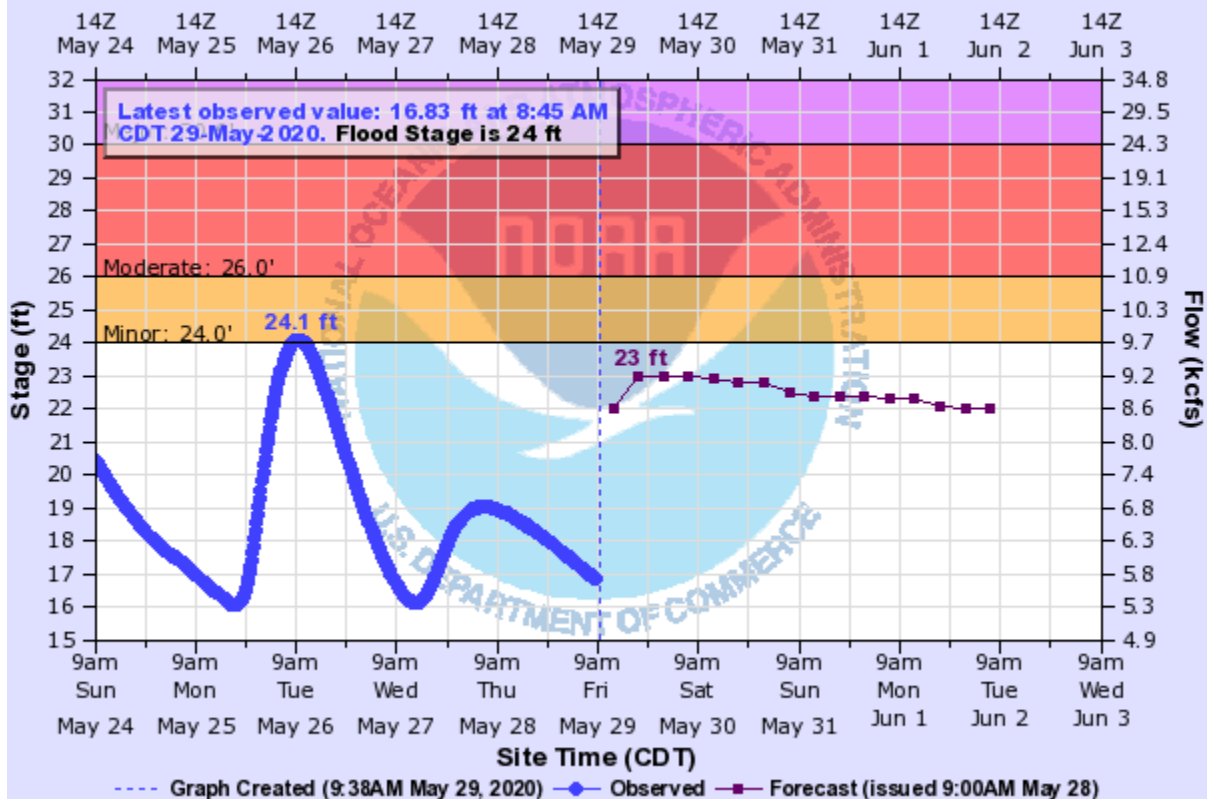
Universal Time (UTC)



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

### POTEAU RIVER NEAR POTEAU

Universal Time (UTC)

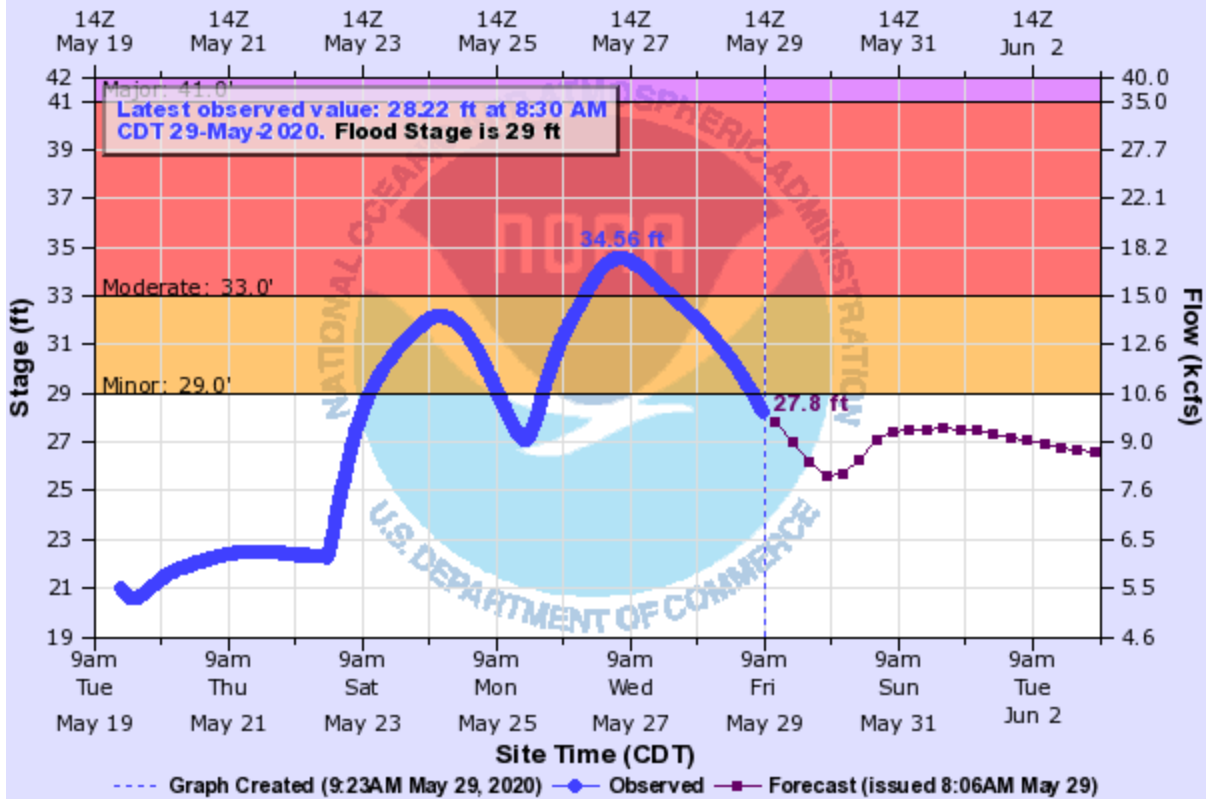


PTAO2(plotting HGIRG) "Gage 0" Datum: 409.4'



## POTEAU RIVER NEAR PANAMA

Universal Time (UTC)

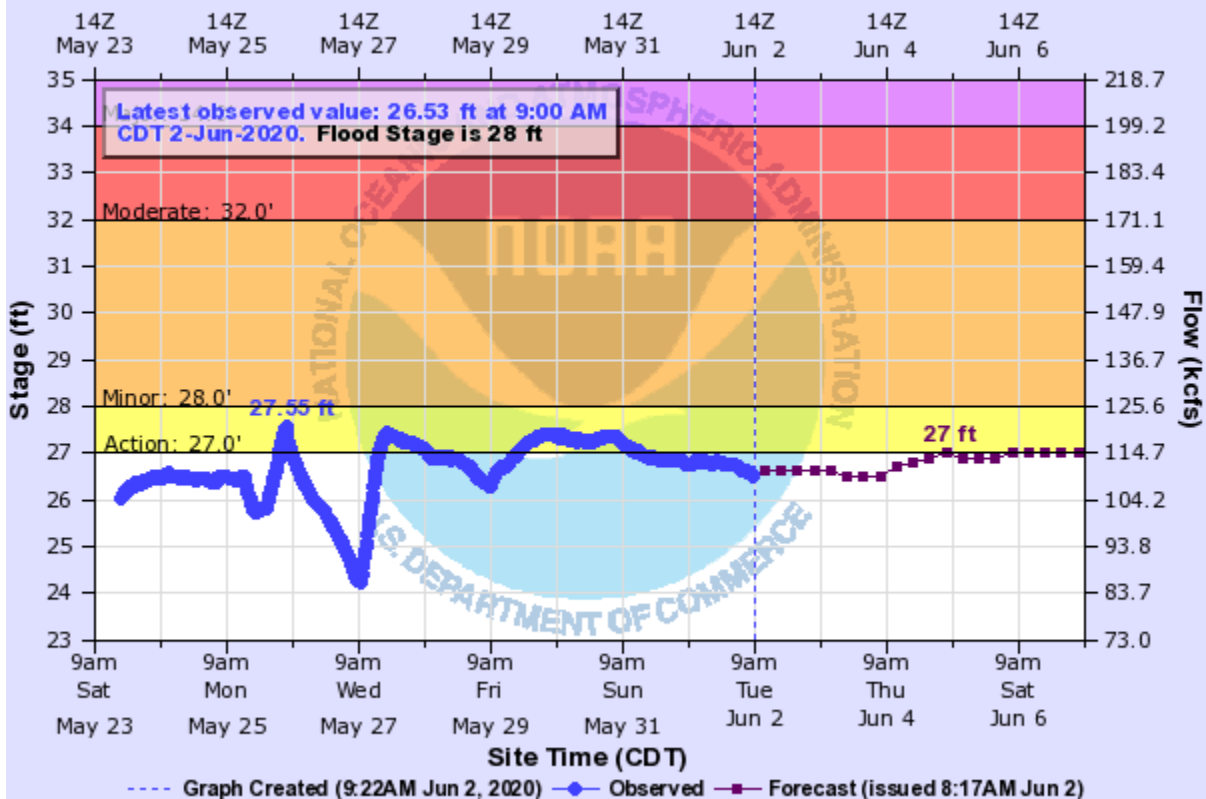


PANO2(plotting HGIRG) "Gage 0" Datum: 387.96'

Observations courtesy of US Geological Survey

## ARKANSAS RIVER NEAR MUSKOGEE

Universal Time (UTC)

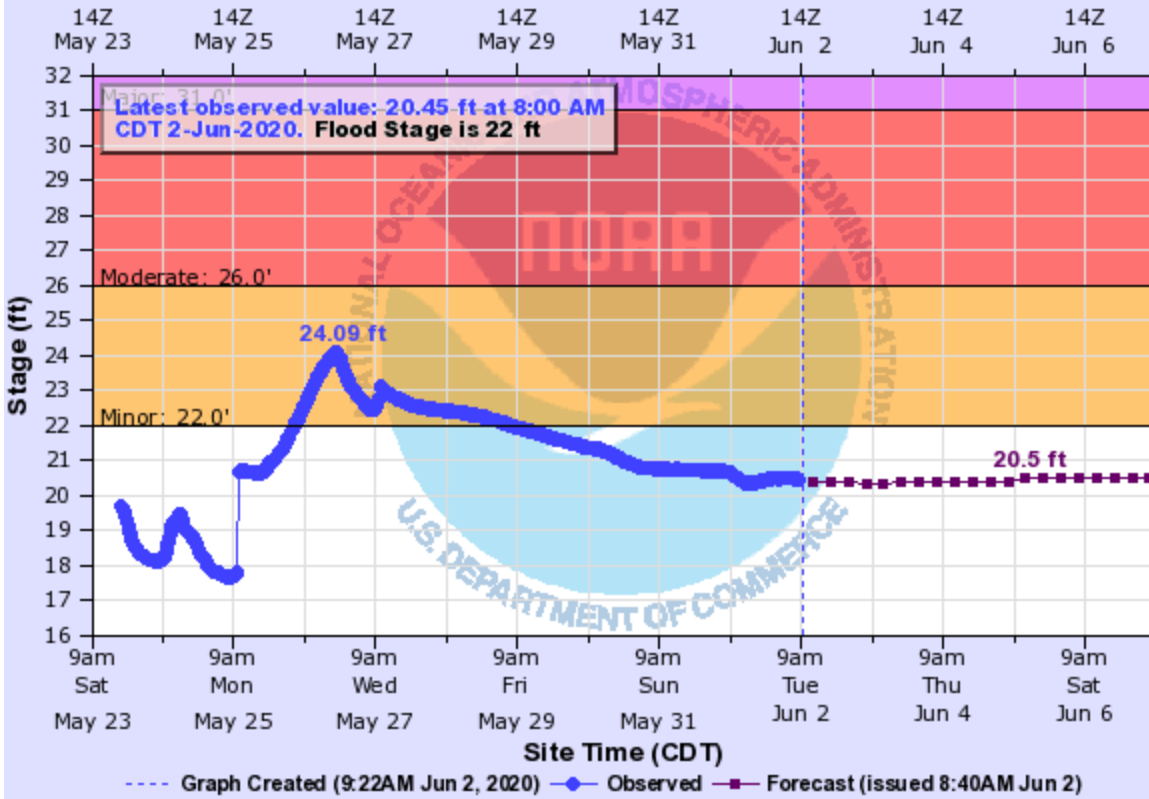


MKGO2(plotting HGIRG) "Gage 0" Datum: 471.38'

Observations courtesy of US Geological Survey

## ARKANSAS RIVER AT VAN BUREN

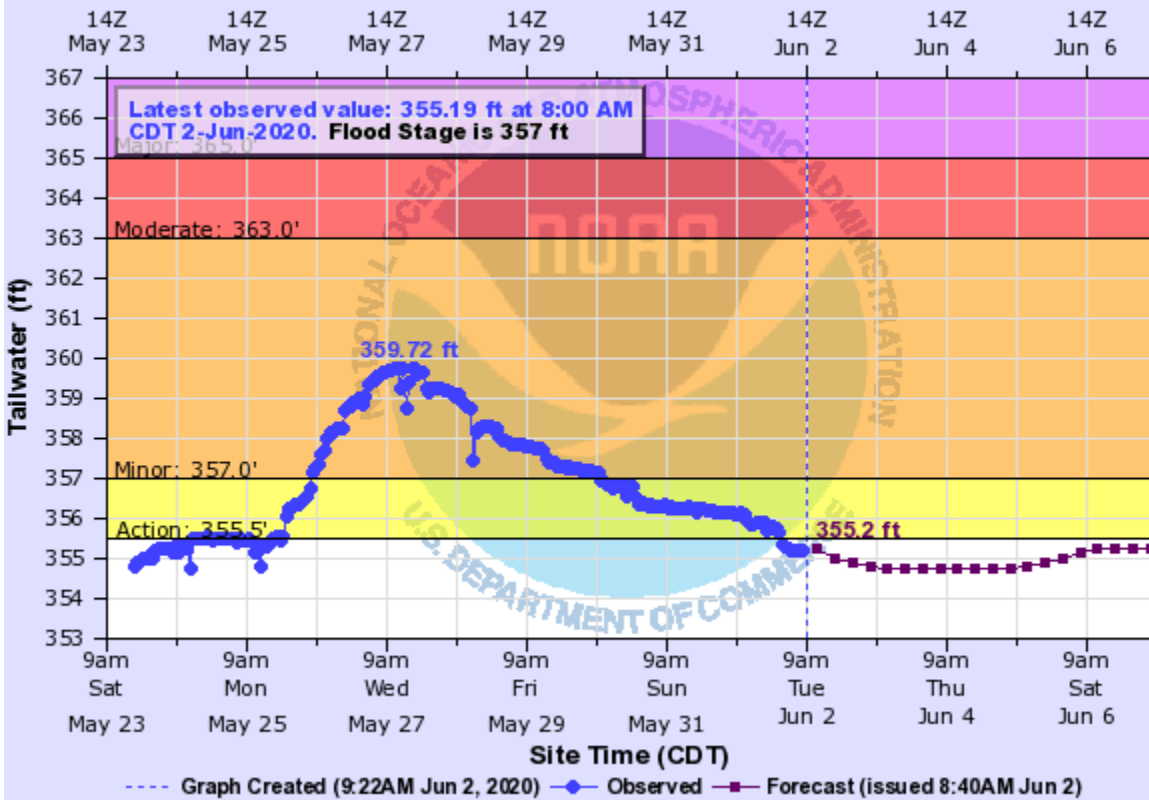
Universal Time (UTC)



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

## ARKANSAS RIVER AT OZARK L/D TAILWATER

Universal Time (UTC)

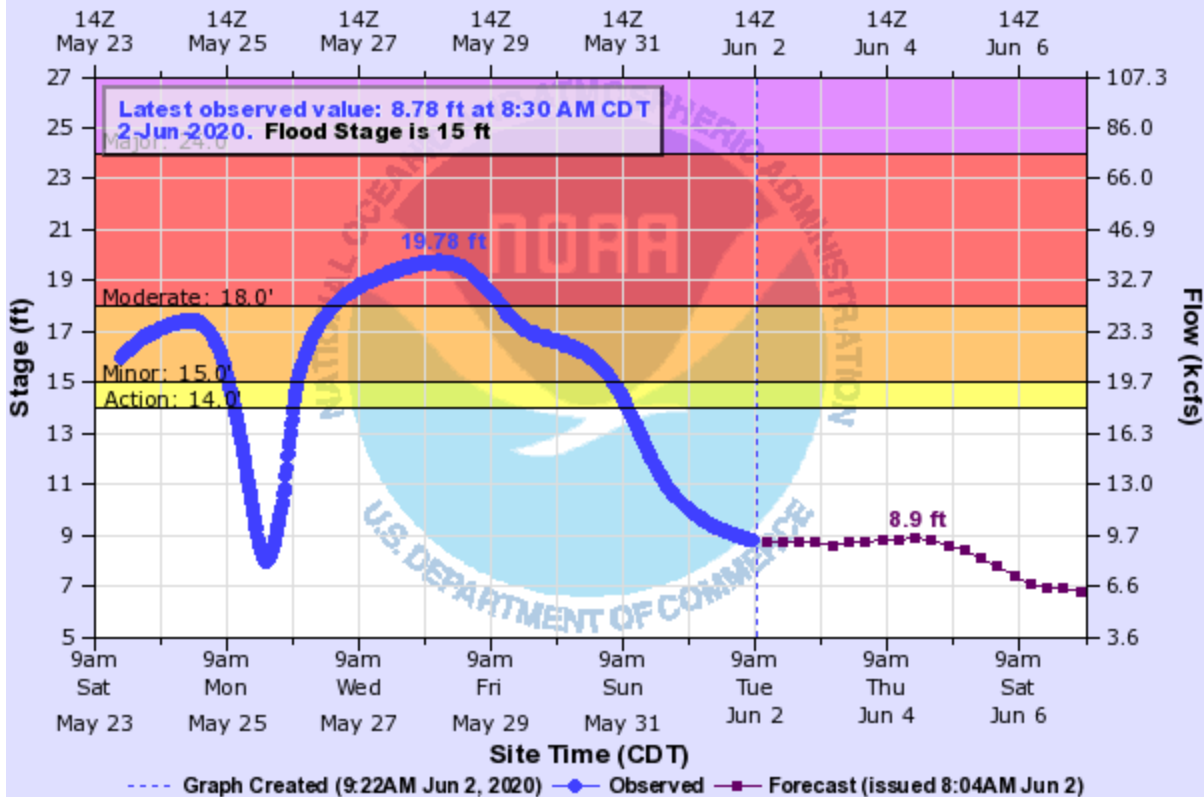


OZGA4(plotting HTIRG) "Gage 0" Datum: 0'

Observations courtesy of US Army Corps of Engineers - LRD

## NEOSHO RIVER NEAR COMMERCE

Universal Time (UTC)

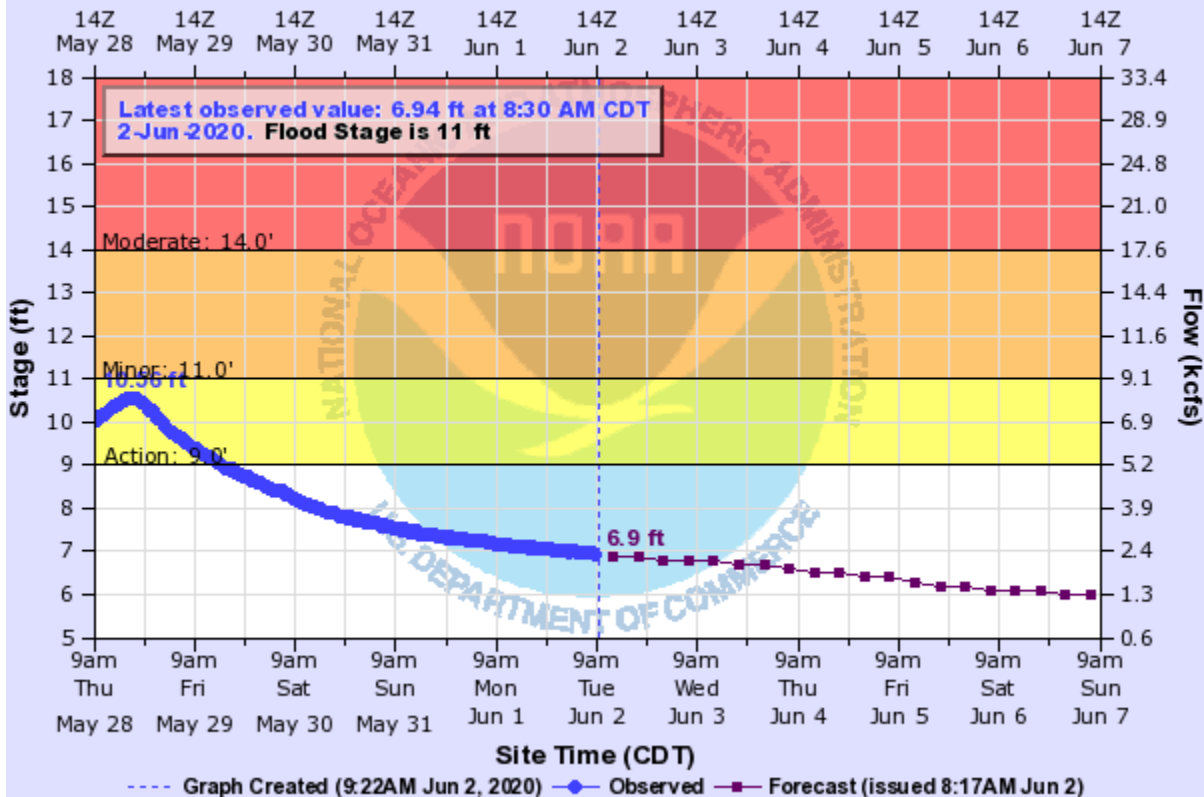


COMO2(plotting HGIRG) "Gage 0" Datum: 748.97'

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