

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 October	YEAR 2020
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 November 16, 2020	

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.

October 2020 was mostly a dry month, until a strong winter storm brought copious amounts of rain over a 4-day period during the final week of the month. This heavy rain resulted in minor flooding along the Poteau River near Panama and areal flooding across northwest AR. Normal rainfall for October ranges from 2.9 inches in Pawnee County to 4.4 inches in Sequoyah County. 3.7 inches is normal across the Ozark region of northwest Arkansas. West central Arkansas averages just under 4 inches, while southeast Oklahoma averages slightly higher amounts of 4.5 inches. 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 October 2020 ranged from around 1" to around 12" across eastern OK and northwest AR, with most of the area receiving 3"-6". Nearly all of this rain occurred during the last week of October. These rainfall totals correspond to 25% to 250% of the normal October rainfall for eastern OK and northwest AR (Fig. 1b).

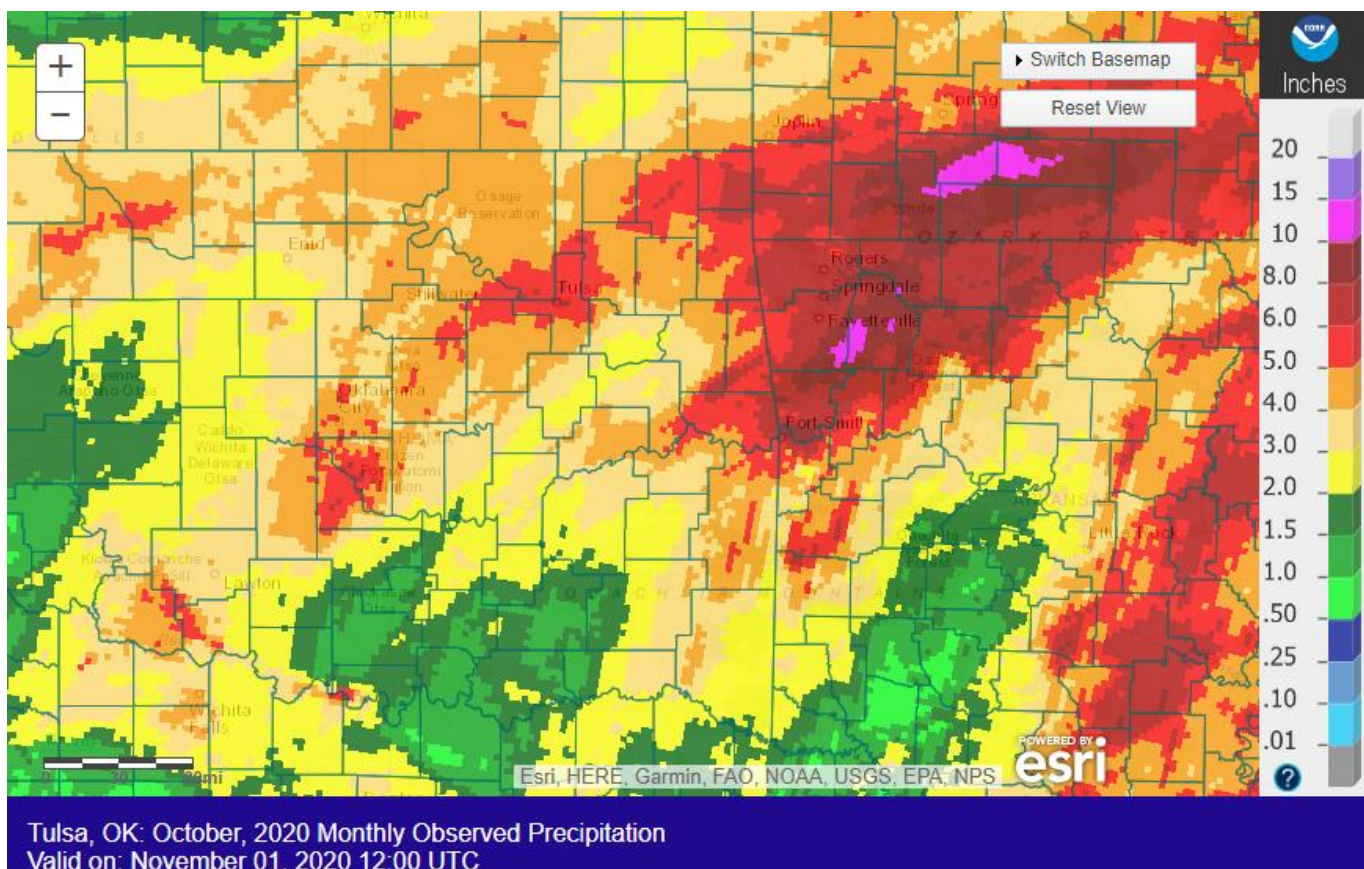


Fig. 1a. Estimated Observed Rainfall for October 2020

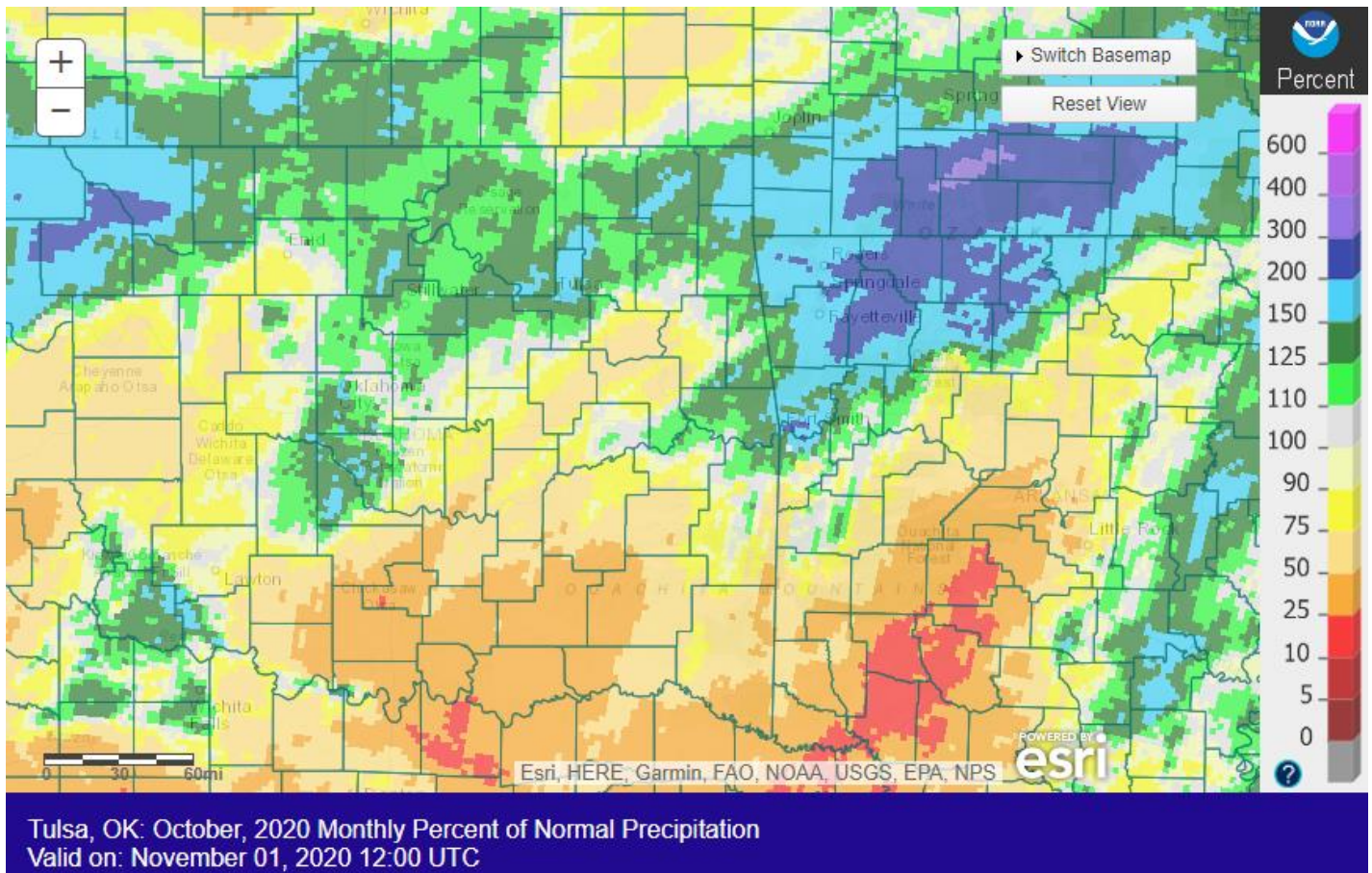


Fig. 1b. Estimated % of Normal Rainfall for October 2020

In Tulsa, OK, October 2020 ranked as the 17th coldest October (59.1°F; since records began in 1905) and the 27th wettest October (5.72", tied 1929; since records began in 1888). Fort Smith, AR had the 38th coldest October (61.5°F, tied 1943, 1930; since records began in 1882) and the 15th wettest October (6.81"; since records began in 1882). Fayetteville, AR had the 15th coldest (56.5°F) and the 9th wettest (6.80") October since records began in 1949.

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

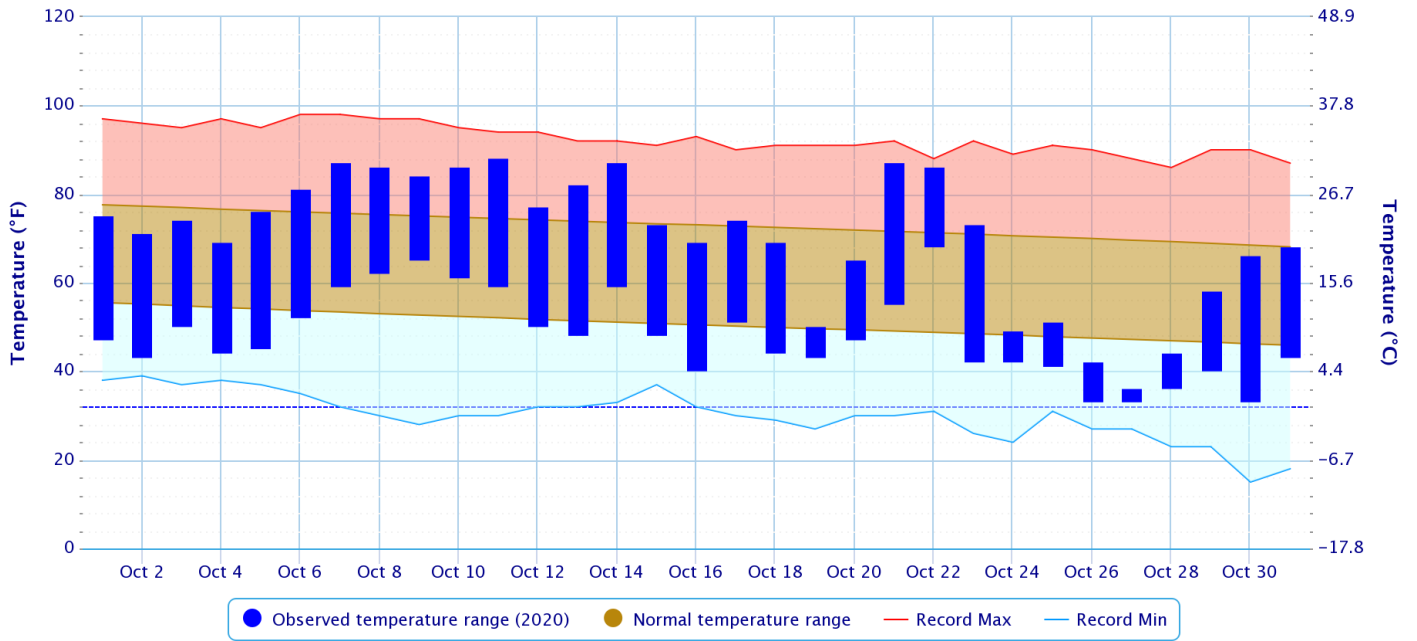
Winslow, AR (coop)	11.02	Elkins 10.6SSE, AR (coco)	10.99	Metalton 3.5W, AR (coco)	9.55
Kingston 2S, AR (coop)	9.34	Springdale 0.6E, AR (coco)	9.13	Springdale 2.3S, AR (coco)	8.95
Kingston 5NW, AR (coop)	8.75	Elkins 1.7SE, AR (coco)	8.74	War Eagle 1.4NNW, AR (coco)	8.64

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

Antlers, OK (meso)	1.44	Antlers 6.3SE, OK (coco)	2.01	Muskogee, OK (ASOS)	2.43
Wilburton, OK (meso)	2.80	Haskell, OK (meso)	2.81	Okmulgee, OK (meso)	2.86
Clayton, OK (meso)	2.95	Hugo, OK (meso)	2.97	Porter, OK (meso)	3.14

Daily Temperature Data – Tulsa Area, OK (ThreadEx)

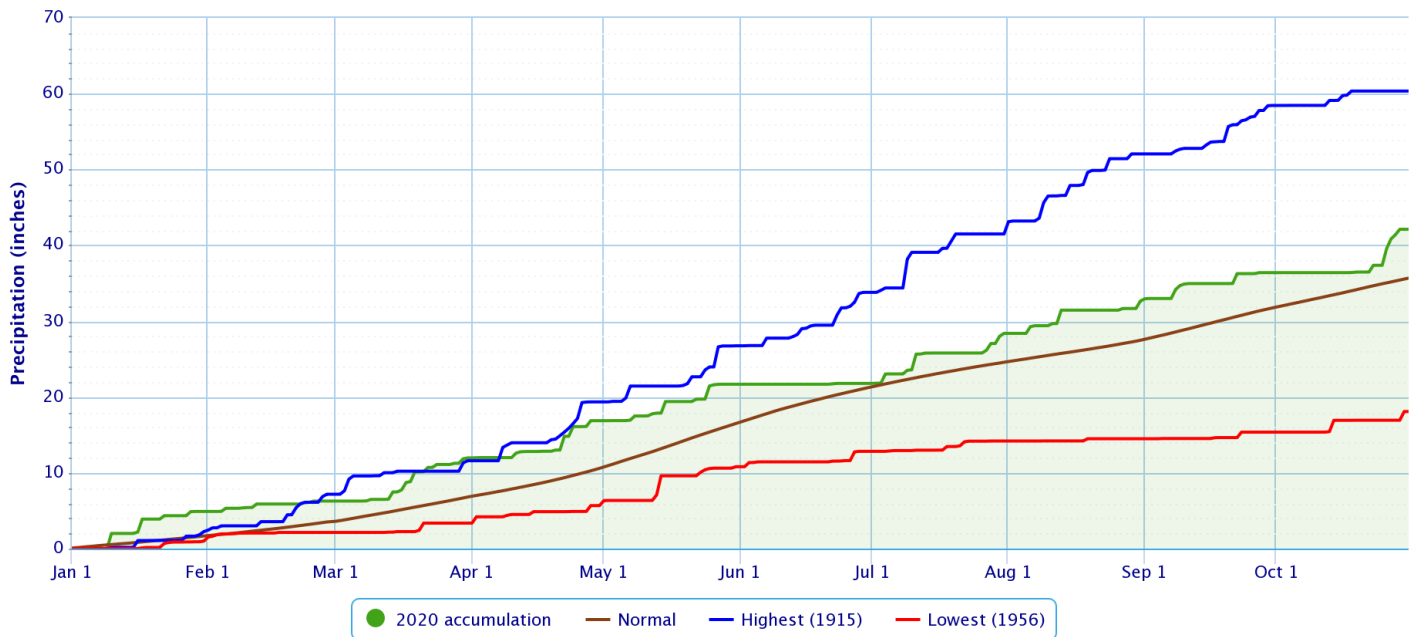
Period of Record – 1905-01-06 to 2020-11-02. Normals period: 1981-2010. Click and drag to zoom chart.



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Accumulated Precipitation – Tulsa Area, OK (ThreadEx)

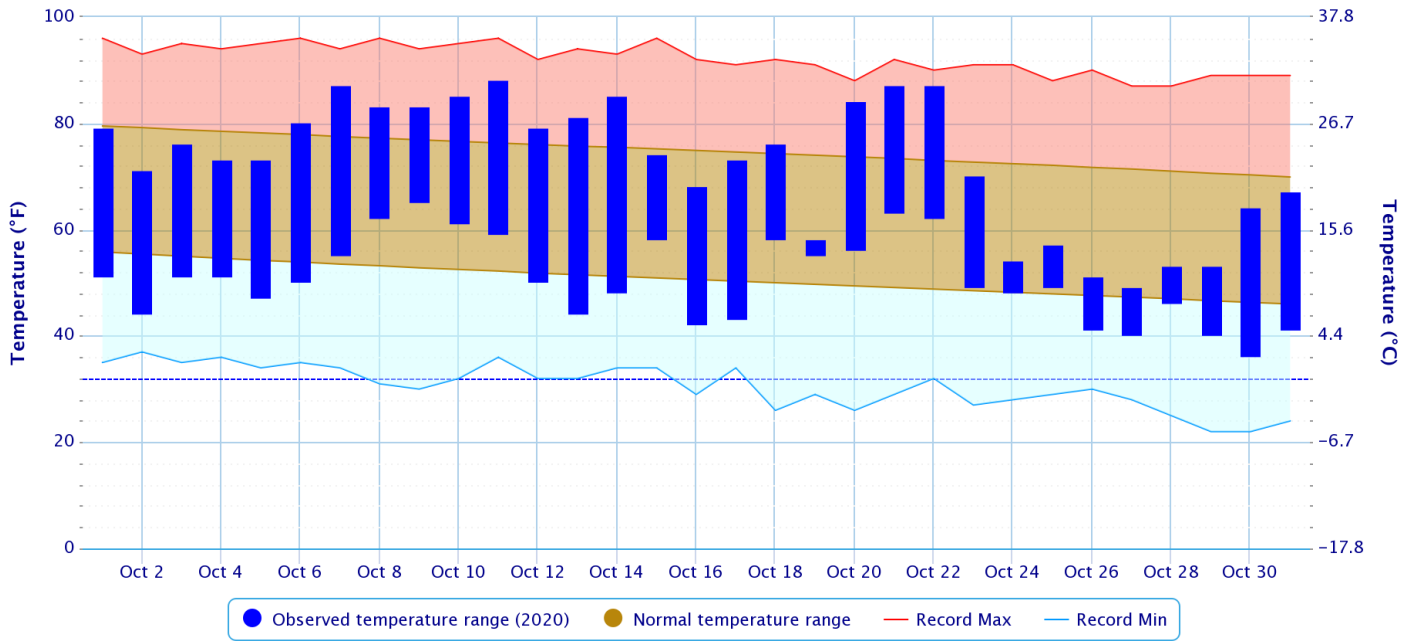
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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

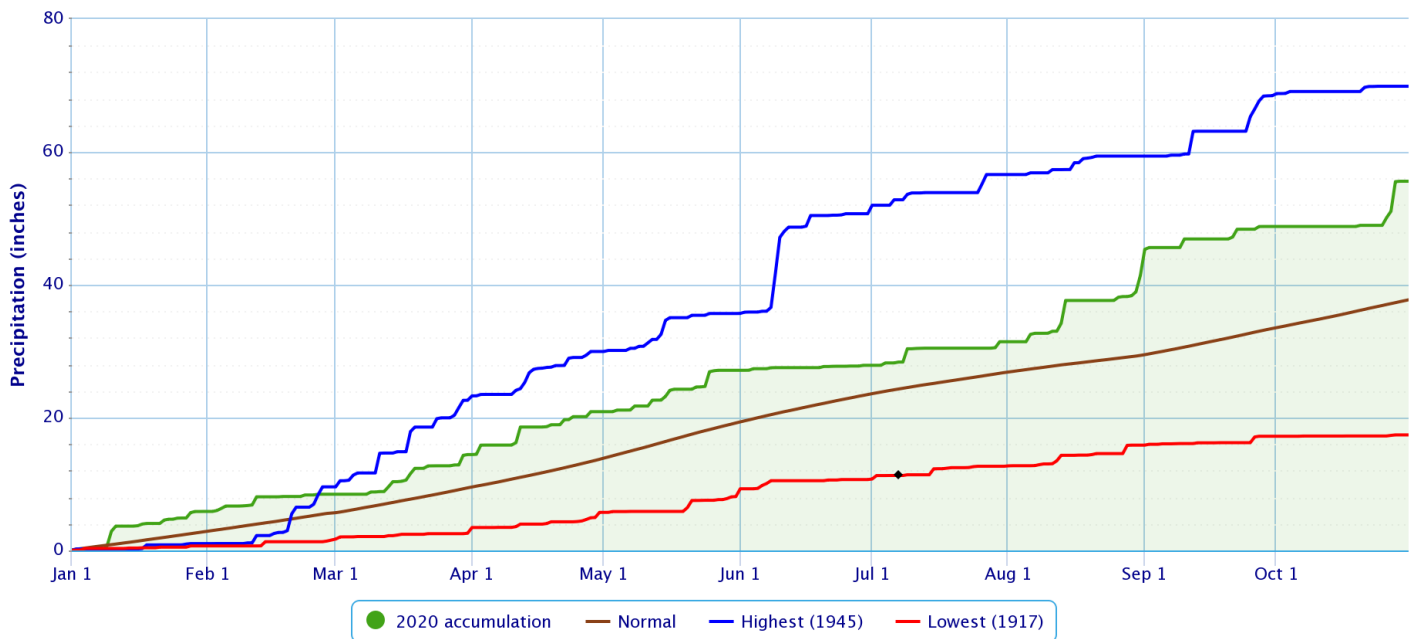
Period of Record – 1882-06-01 to 2020-11-02. Normals period: 1981-2010. Click and drag to zoom chart.



Powered by ACIS

Accumulated Precipitation – Fort Smith Area, AR (ThreadEx)

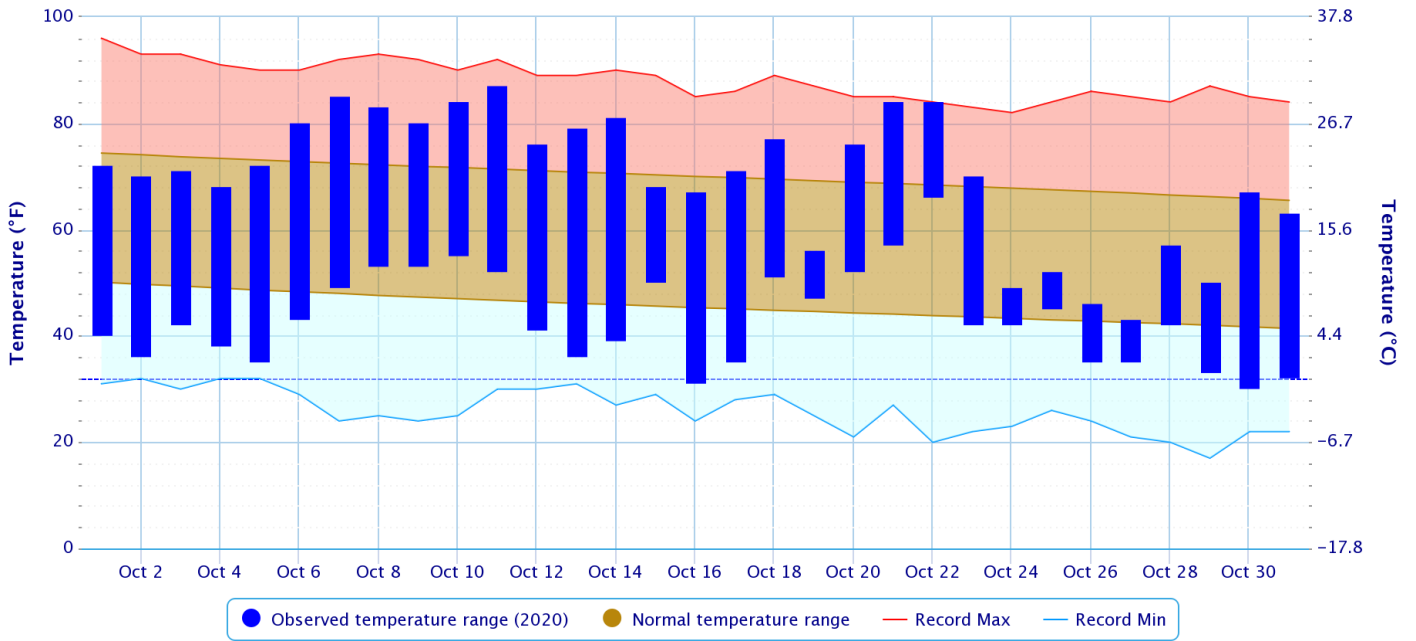
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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Daily Temperature Data – FAYETTEVILLE DRAKE FIELD, AR

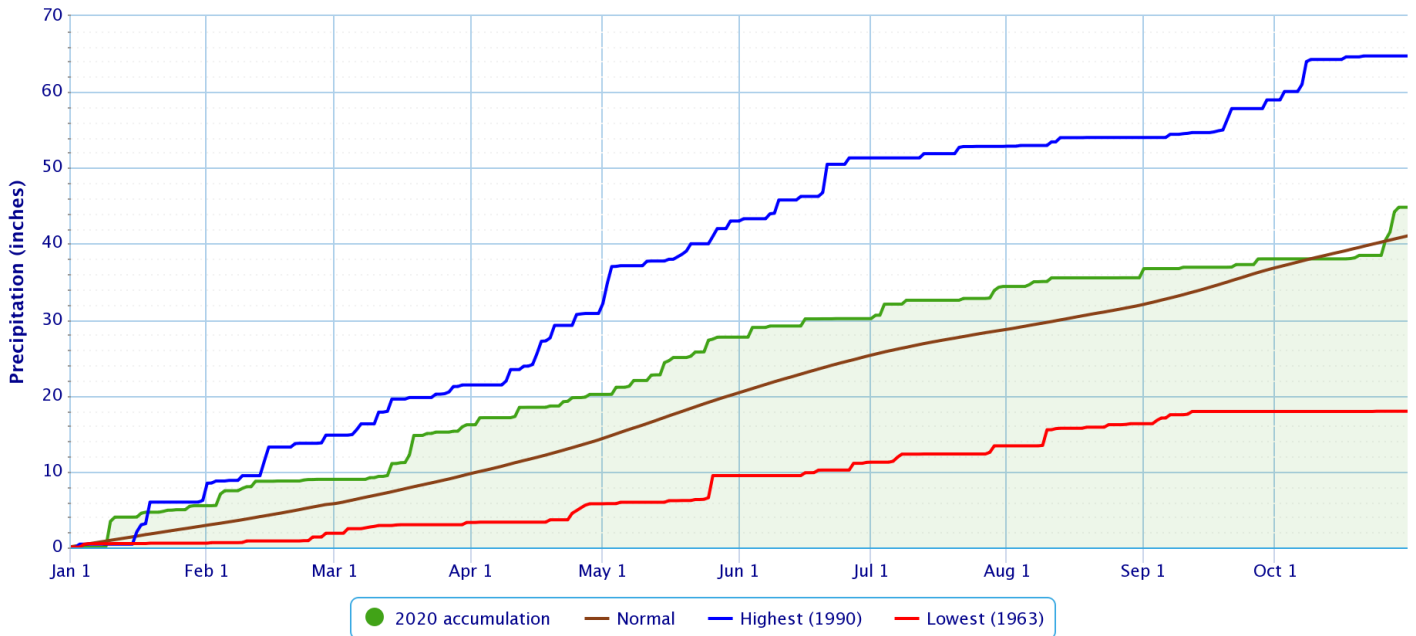
Period of Record – 1949-07-14 to 2020-11-02. Normals period: 1981-2010. Click and drag to zoom chart.



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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

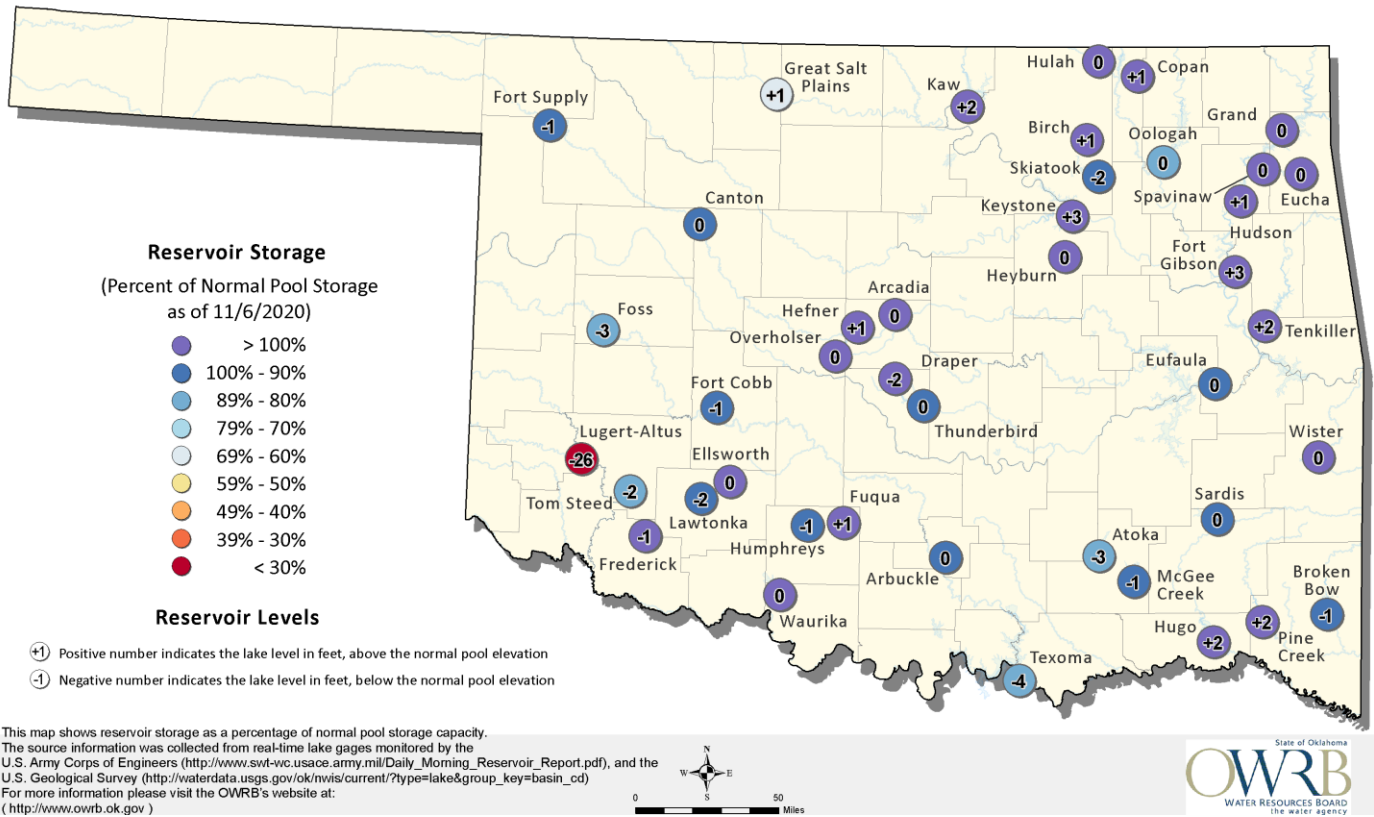


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Reservoirs

Oklahoma Surface Water Resources

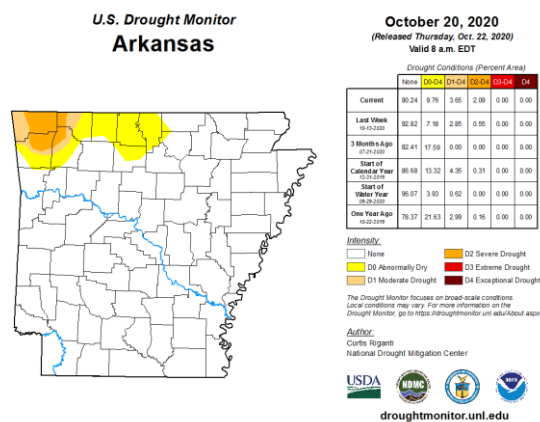
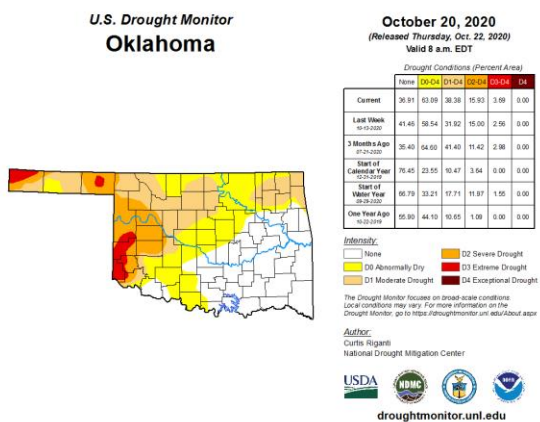
Reservoir Levels and Storage as of 11/6/2020



According to the USACE, most of the lakes in the HSA were within $\pm 3\%$ of top of their conservation pools as of 11/01/2020. However, several lakes were using a higher percentage of their flood control pools: Beaver Lake 20%, Tenkiller Lake 11%, Wister Lake 6%, Fort Gibson Lake 6%, Kaw Lake 5%, Keystone Lake 5%, and Hudson Lake 4%. One lake in northeast OK was operating below 3% of the top of its conservation pool: Skiatook Lake 93%.

Drought

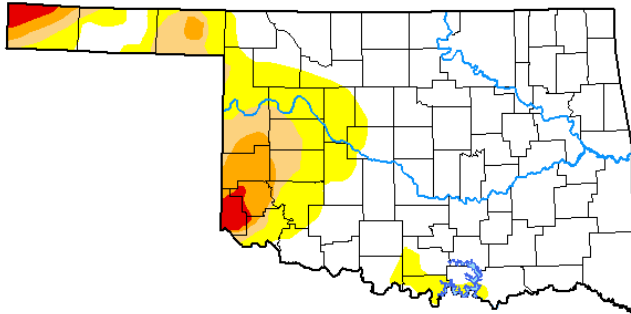
According to the [U.S. Drought Monitor](#) (USDM) from November 3, 2020 (Figs. 3a, b), drought conditions were no longer occurring across eastern OK and northwest AR. A small area of Abnormally Dry (but not in drought) conditions were occurring in a portion of Benton County in northwest AR. However, right before the heavy rain at the end of the month, a large portion of northeast OK and northwest AR was experiencing D1 (Moderate Drought) and D2 (Severe Drought) conditions (Figs. 2a, b).



Figs. 2a, b

U.S. Drought Monitor Oklahoma

November 3, 2020
(Released Thursday, Nov. 5, 2020)
Valid 7 a.m. EST



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	73.87	26.13	10.65	5.19	1.44	0.00
Last Week 10-27-2020	47.94	52.06	32.42	15.58	3.61	0.00
3 Months Ago 08-04-2020	60.23	39.77	21.12	9.56	0.73	0.00
Start of Calendar Year 12-31-2019	76.45	23.55	10.47	3.64	0.00	0.00
Start of Water Year 09-29-2020	66.79	33.21	17.71	11.97	1.55	0.00
One Year Ago 11-05-2019	76.11	23.89	9.41	0.78	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 Miskus
NOAA/NWS/NCEP/CPC

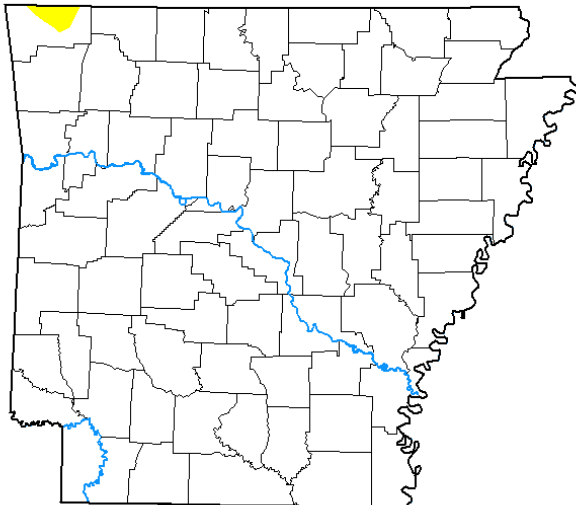


droughtmonitor.unl.edu

Fig. 3a. Drought Monitor for Oklahoma

U.S. Drought Monitor Arkansas

November 3, 2020
(Released Thursday, Nov. 5, 2020)
Valid 7 a.m. EST



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	99.63	0.37	0.00	0.00	0.00	0.00
Last Week 10-27-2020	97.52	2.48	0.44	0.00	0.00	0.00
3 Months Ago 08-04-2020	92.24	7.76	0.00	0.00	0.00	0.00
Start of Calendar Year 12-31-2019	86.68	13.32	4.35	0.31	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 11-05-2019	94.67	5.33	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>

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NOAA/NWS/NCEP/CPC



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Fig. 3b. Drought Monitor for Arkansas

Outlooks

The [Climate Prediction Center](#) (CPC) outlook for November 2020 (issued October 31, 2020) indicates a greatly enhanced chance for above normal temperatures and a greatly enhanced chance for 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.

For the 3-month period November-December-January 2020-21, CPC is forecasting an enhanced chance for above normal temperatures and an enhanced chance for below median precipitation across all of eastern OK and northwest AR (outlook issued October 15, 2020). This outlook is based on La Niña impacts and both statistical and dynamical forecast tools. According to CPC, the combined effect of the ocean-atmosphere system is consistent with La Niña conditions. There is an 85% chance of La Niña continuing through the Northern Hemisphere winter 2020-21 and a 60% chance of La Niña continuing into spring. 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

During the early morning hours of the 26th, warm air advection expanded across the region from southwest to northeast within the mean upper-level low. Meanwhile, a colder airmass was pushing southeast into the region. Showers and isolated thunderstorms spread across northeast OK and northwest AR during the morning hours. Surface temperatures fell below freezing across portions of primarily Osage, Pawnee, and eastern Kaw Counties while a mid-level warm nose kept temperatures above freezing higher up. This resulted in a freezing rain set up. This activity spread further south into east central OK and west central AR during the afternoon, and into southeast OK during the evening. By mid-afternoon, much of eastern OK and northeast AR between I-44 and I-40 had received 1"-2" of rain (Fig.4) and most of eastern Kaw, Osage, Pawnee, and northern Washington Counties were below freezing (Fig. 5). No wind data at the OK Mesonet stations indicate ice accumulation was occurring (anemometers cannot spin due to the ice; Fig. 6). Through the overnight and into the early morning hours of the 27th, scattered showers continued primarily south of I-44. Mainly freezing drizzle occurred in the area north of the freezing line overnight. By 7 am on the 27th, a large portion of eastern OK and northwest AR had received 1.5" to 4" of rain (Figs. 7, 8).

The second round of rain moved into northeast OK by 8am on the 27th in an area of increasing warm air advection within the warm conveyor ahead of the main upper-level low over the desert southwest. A broad band of liquid precipitation extended from central into northeast OK, but the majority of this precipitation was falling on the cold side of the surface freezing line at mid-morning. The freezing line was generally just to the northwest of I-44, and additional ice accumulations were reported. Of note, the high temperature in Tulsa, OK on October 27 was only 36°F, shattering the previous record cold maximum temperature for this date of 46°F in 1936. This also set the new record coldest maximum temperature recorded in the month of October, besting the previous record of 37°F set on 10/29/1925 (records began in 1905). Likewise, McAlester, OK set a new record for coldest maximum temperature in October with 40°F on the 27th (previous record 41°F 10/30/1993). Precipitation continued for most of the afternoon and evening across northeast OK. There was a lull in precipitation from midnight until 4 am on the 28th and temperatures began to slowly rise. Then, showers from TX spread quickly across southeast OK into northwest AR during the early morning hours. By 7 am on the 28th, liquid precipitation totals ranged from 0.50" to near 2" across northeast OK (Fig. 9). Southeast OK had also received 0.50" to near 2" from the early morning activity (Fig. 9). Over the two-day period, 1" to 5" of rain fell across eastern OK and northwest AR (Fig. 10). This rainfall on the 26th-27th helped to saturate the ground, which had been very dry from weeks of little to no rainfall prior to this event. Ice accumulation ranged from around 0.1" to around 0.5" (Fig. 11).

Showers and isolated thunderstorms continued across eastern OK and northwest AR for most of the day on the 28th within the warm conveyor ahead of the upper-level low that was approaching the region. The most persistent rainfall occurred across west central AR and neighboring portions of eastern OK, where an 850mb frontal zone existed and was interacting with the northwestern fringe of a plume of deep tropical moisture. 2.88" of rain was measured in Fort Smith, AR in just the 6-hour period from 7 am to 1 pm, with 2"-3" falling in 6 hours across far east central OK and west central AR (Fig. 12). Since the soil had been saturated by the previous days' rains, most of the rain on the 28th became run off and resulted in rises along most rivers in eastern OK and northwest AR. The White River near Fayetteville rose 13.5 feet in 8 hours (and a total of 16.9

feet in 11 hours). The Poteau River near Panama rose 21.3 feet in 12 hours and then continued to rise to just below moderate flood stage (see preliminary hydrographs at the end of this report and the E3 Report for details). The Illinois River near Tahlequah and the Mulberry River near Mulberry both rose above action stage, but remained below flood stage. This activity then ended from southwest to northeast through the evening hours as the zone of forcing gradually shifted north. However, by midnight on the 29th, additional rain moved into northeast OK in the comma head of the low-pressure system, continuing through sunrise. By 7 am on the 29th, northeast OK, far eastern OK and western AR had 24-hour rainfall totals of 1.5" to around 6", with a large area of 4"-6" in west central AR (Fig. 13). The wrap around rain continued through the morning hours of the 29th, shifting east into northwest AR and affecting locations along and north of I-40. All of the rain finally moved east of the region during the early afternoon. This last round of showers brought an additional 0.10" to 0.75" of rain (Fig. 14).

This storm system brought a total of 2"-10" of rain to eastern OK and western AR from October 26-29, with widespread 5"-10" across far east central OK and northwest and west central AR (Figs. 15-18).

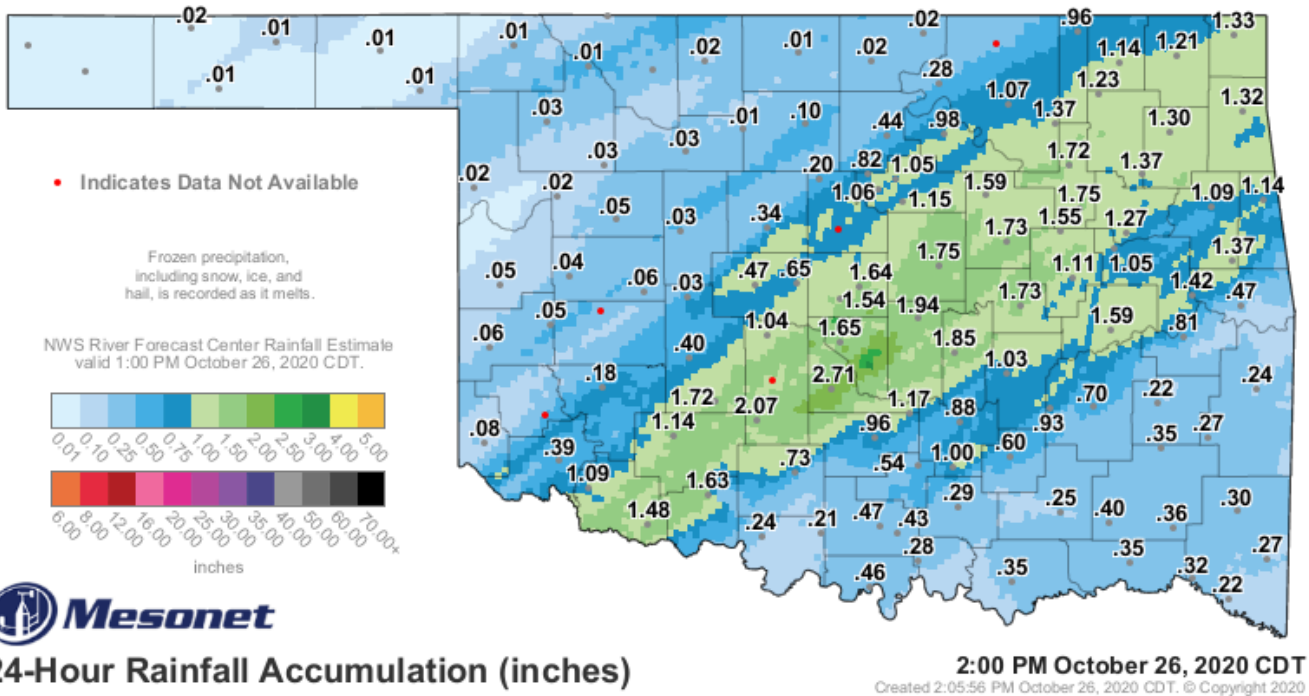


Fig. 4. OK Mesonet (values) and NWS RFC rainfall estimate (image) 24-hour rainfall ending at 2:00 pm CDT 10/26/2020.

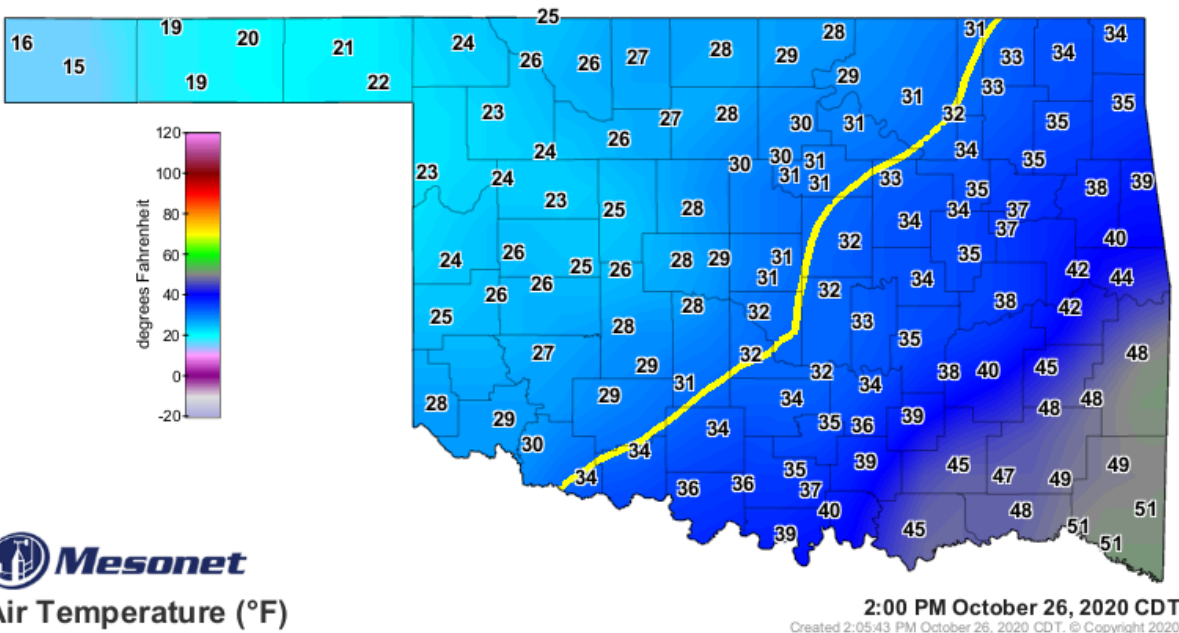


Fig. 5. OK Mesonet air temperature and freezing line (yellow line) at 2:00 pm CDT 10/26/2020.

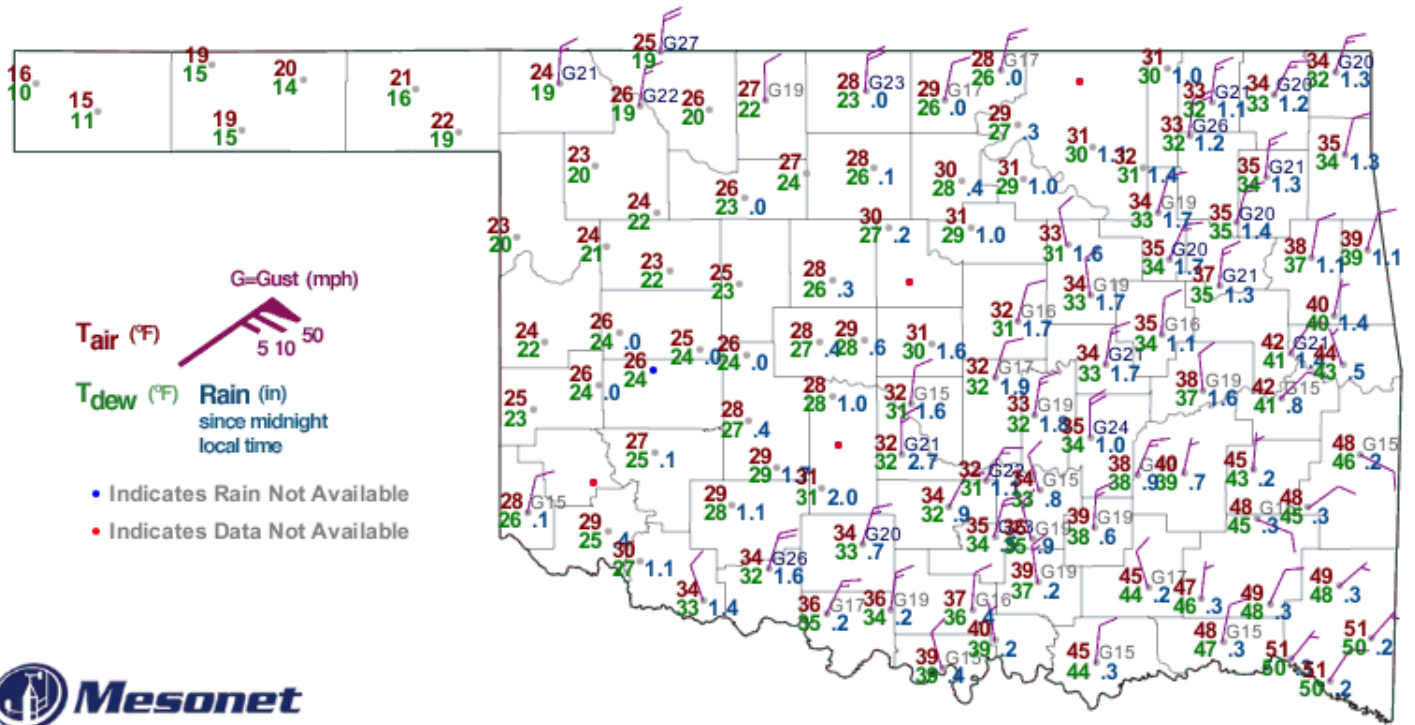
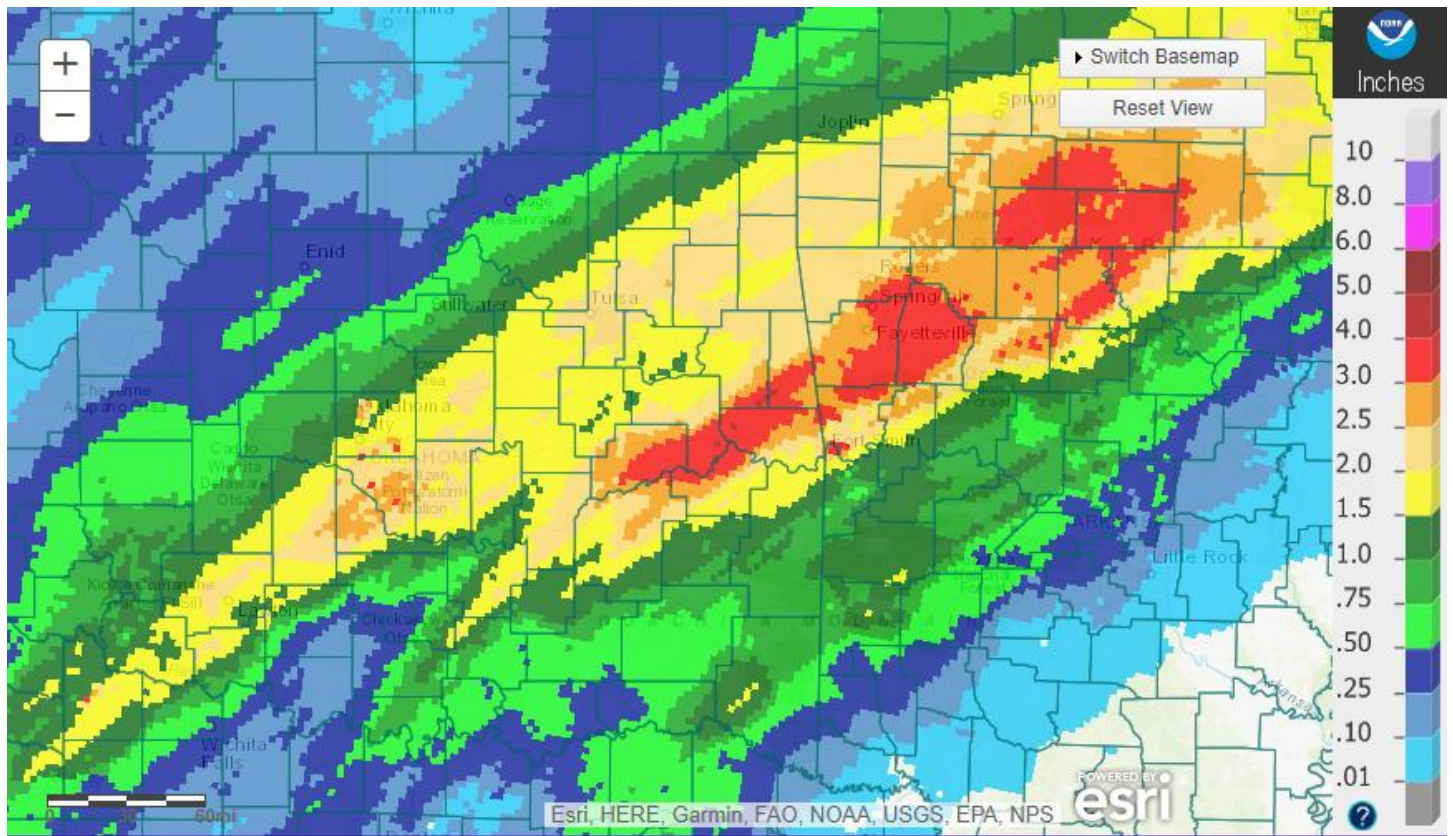


Fig. 6. OK Mesonet station plot at 2:00 pm CDT 10/26/2020. Missing wind data from western OK into northeast OK indicate ice accumulation.



Tulsa, OK: October 27, 2020 1-Day Observed Precipitation
 Valid on: October 27, 2020 12:00 UTC
 Fig. 7. 24-hour Estimated Observed Rainfall ending at 7am CDT 10/27/2020.

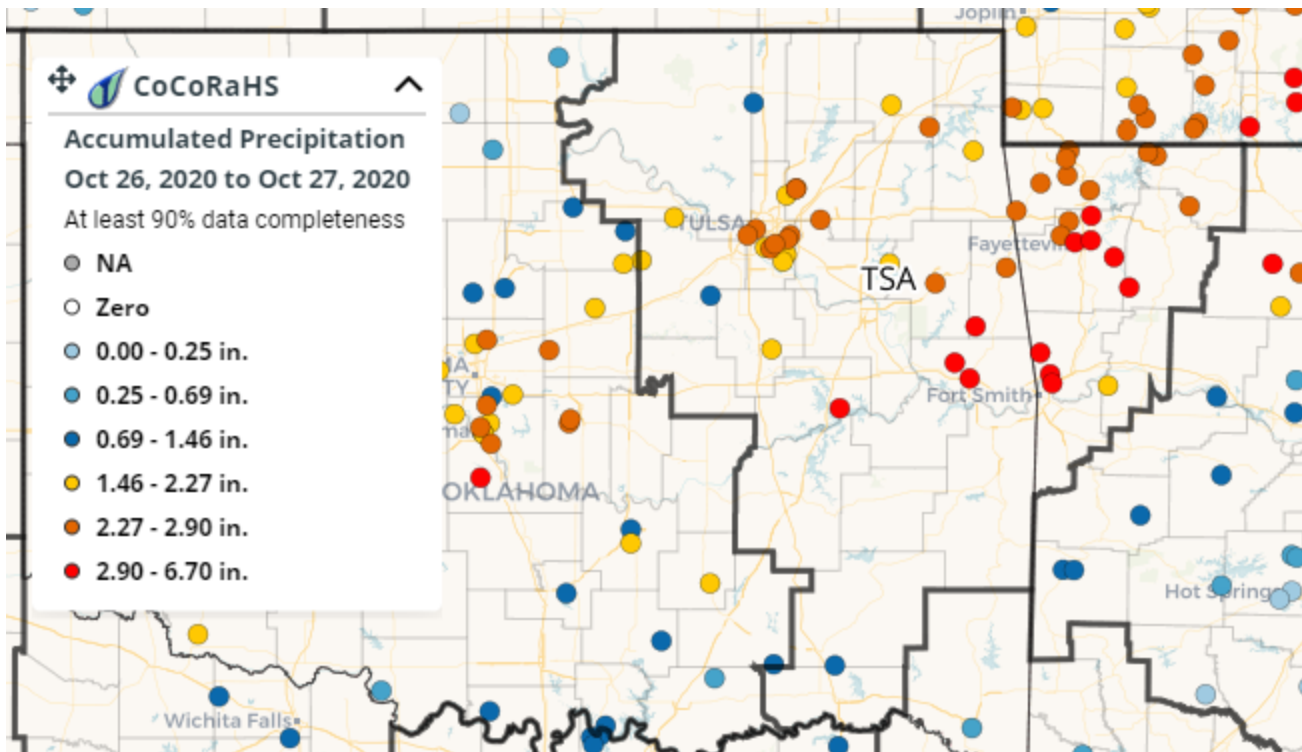
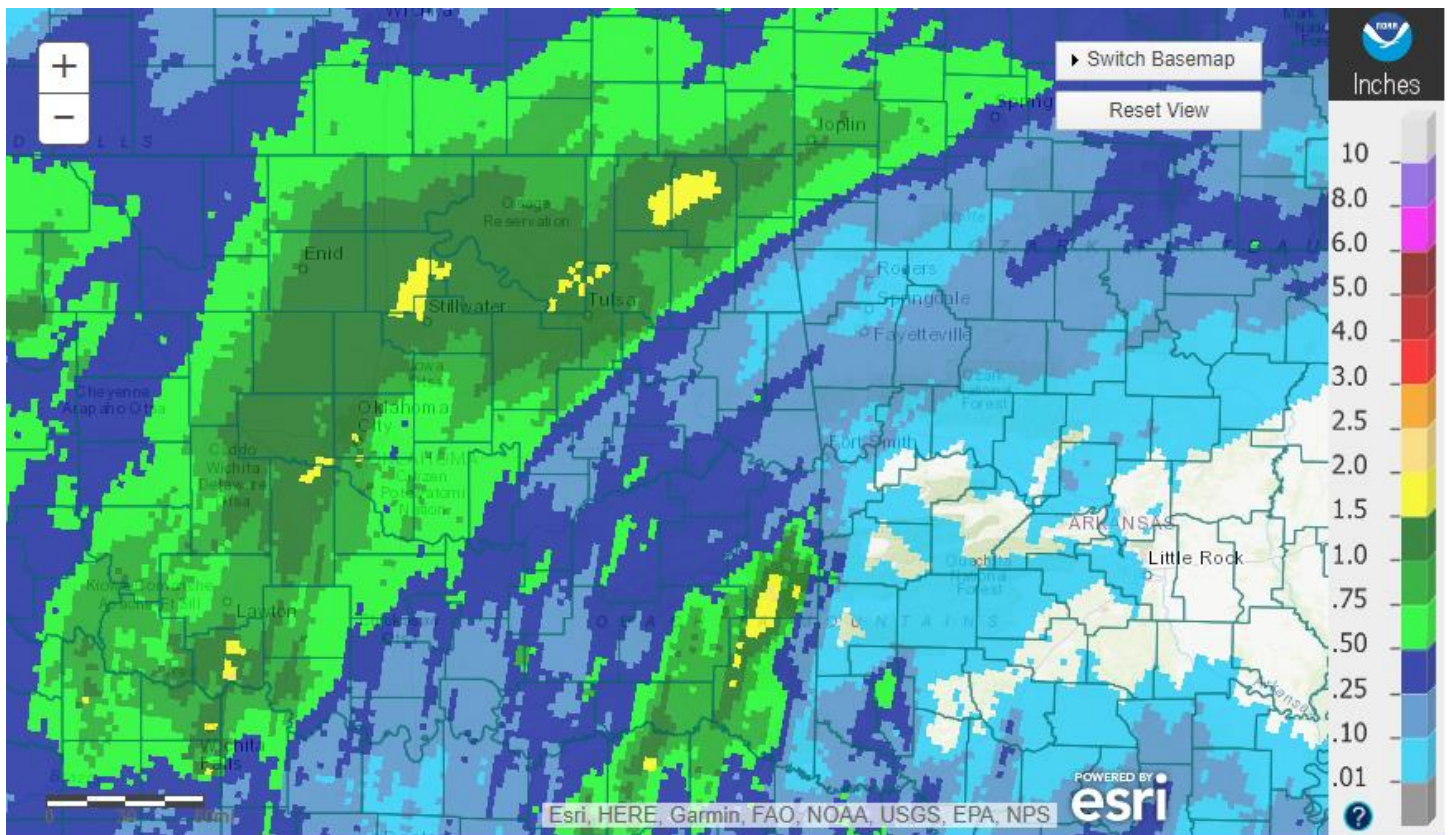
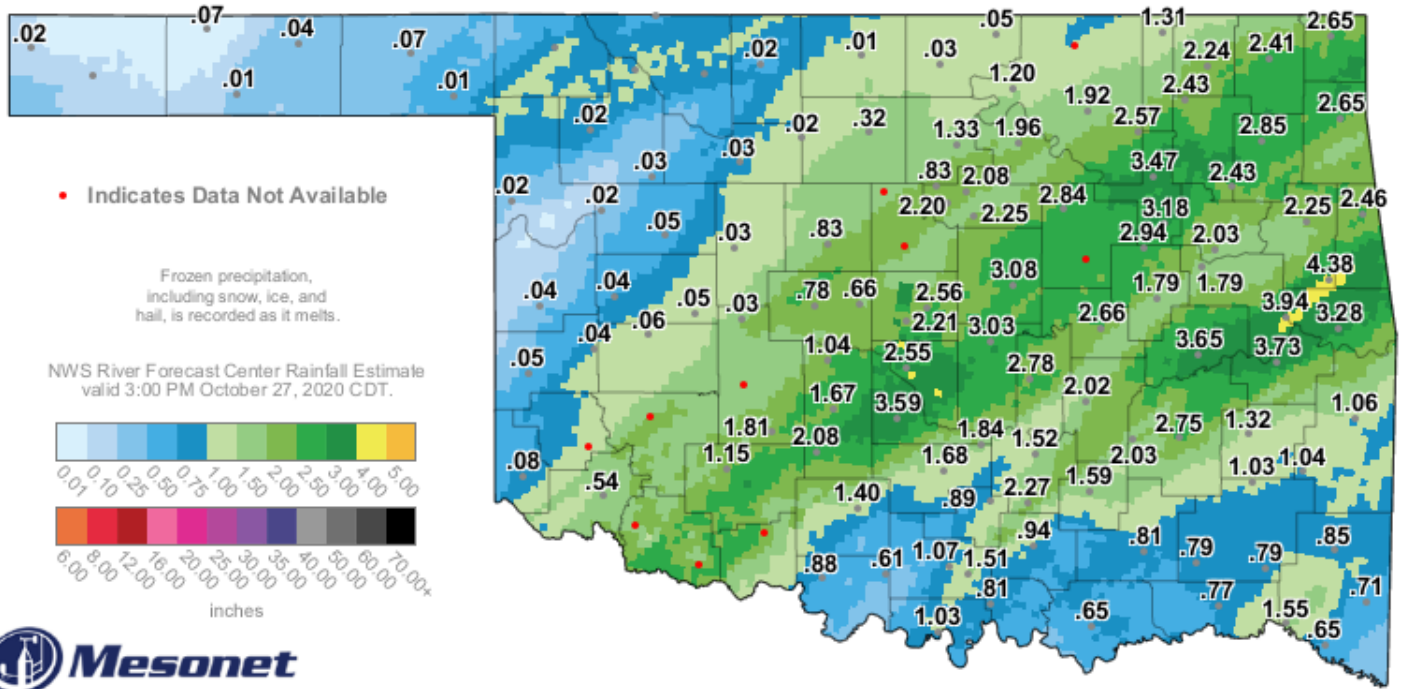


Fig. 8. 48-hour CoCoRaHS measured rainfall ending around 7am CDT 10/27/2020.



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

Fig. 9. 24-hour Estimated Observed Rainfall ending at 7am CDT 10/28/2020.



2-Day Rainfall Accumulation (inches)

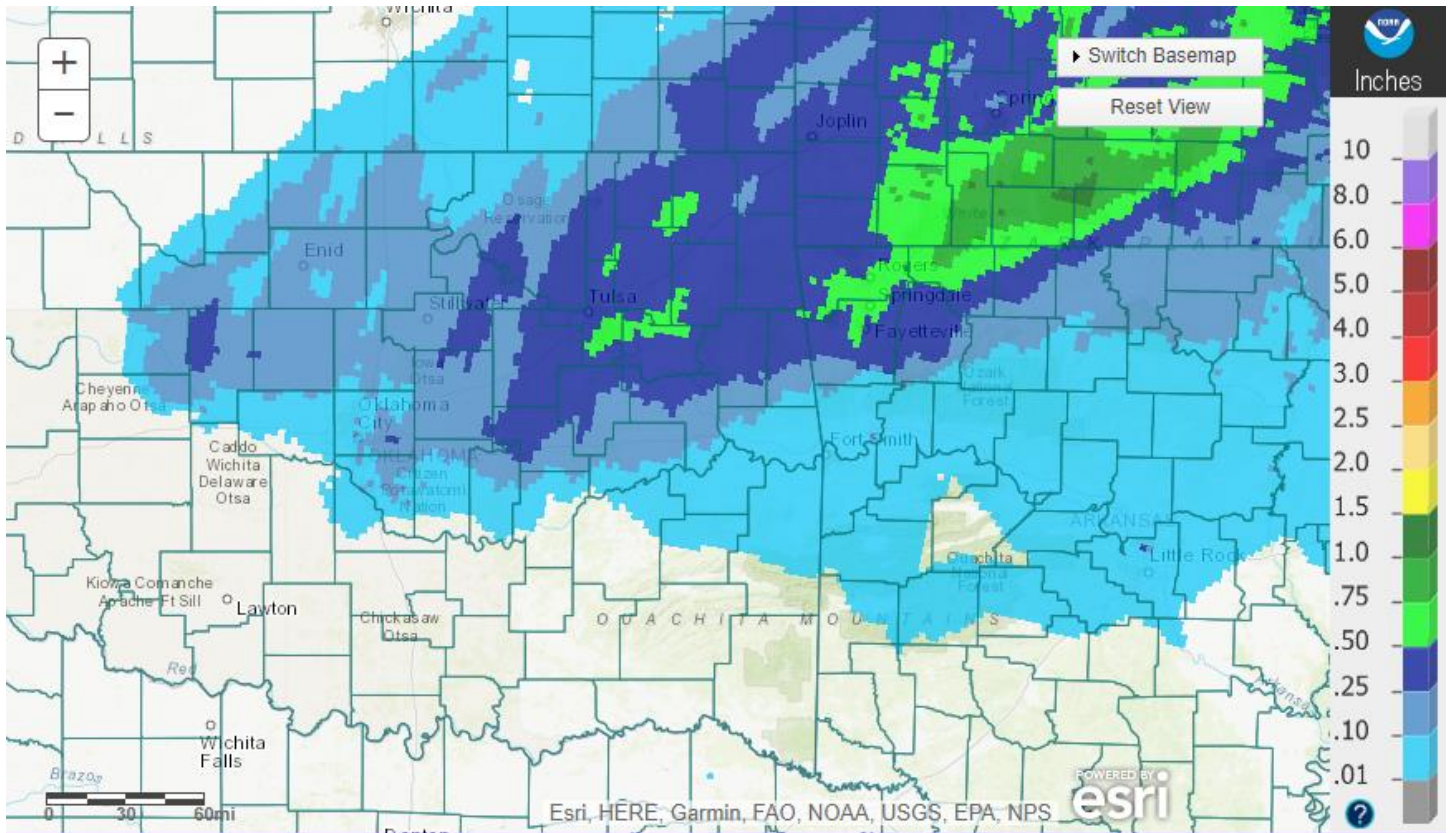
3:50 PM October 27, 2020 CDT

Created 3:56:23 PM October 27, 2020 CDT. © Copyright 2020

Fig. 10. OK Mesonet (values) and NWS RFC rainfall estimate (image) 2-Day rainfall ending at 3:50 pm CDT 10/27/2020.

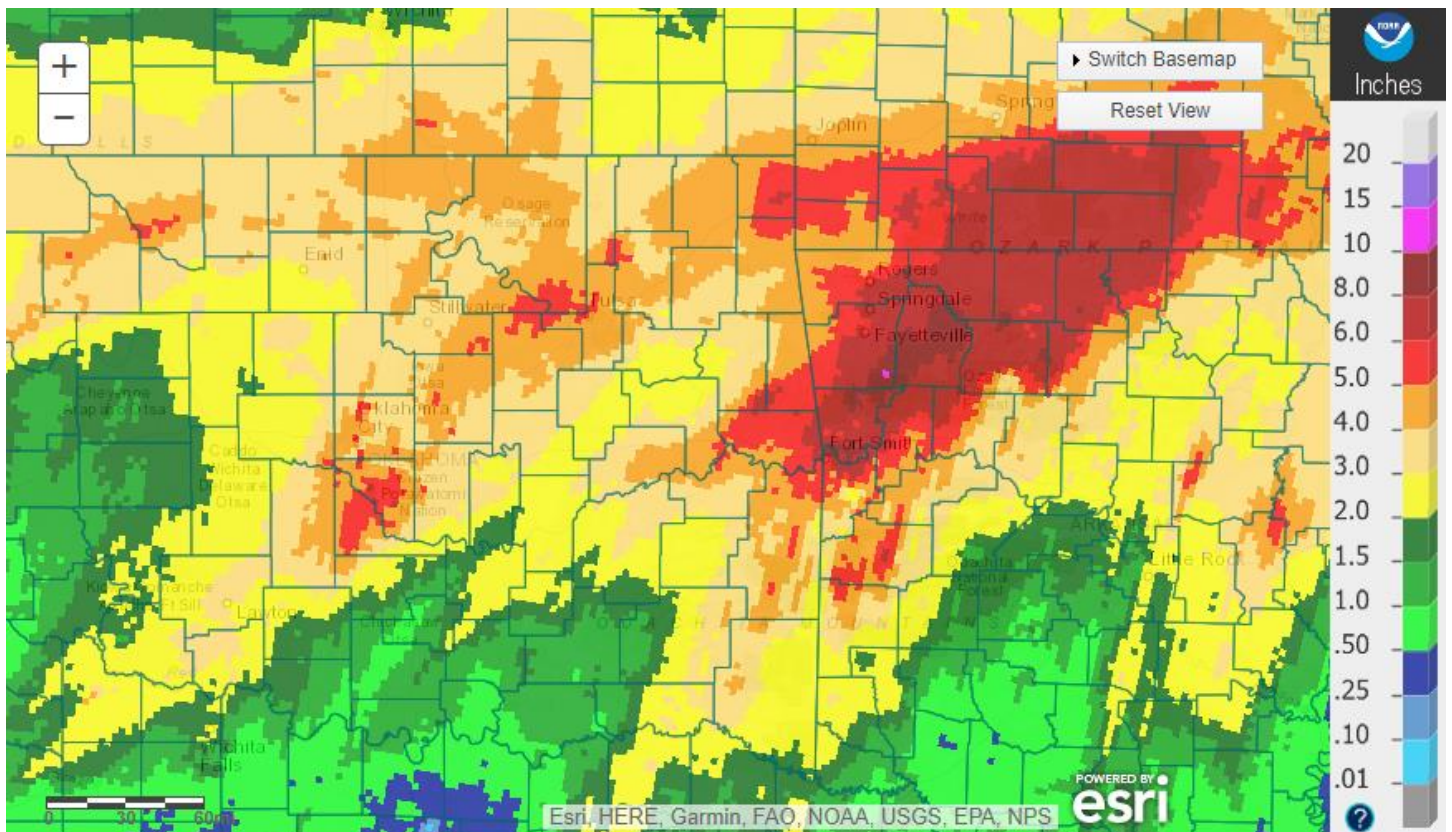


Fig. 11. Ice storm accumulation estimates and measurements for October 26-28, 2020.



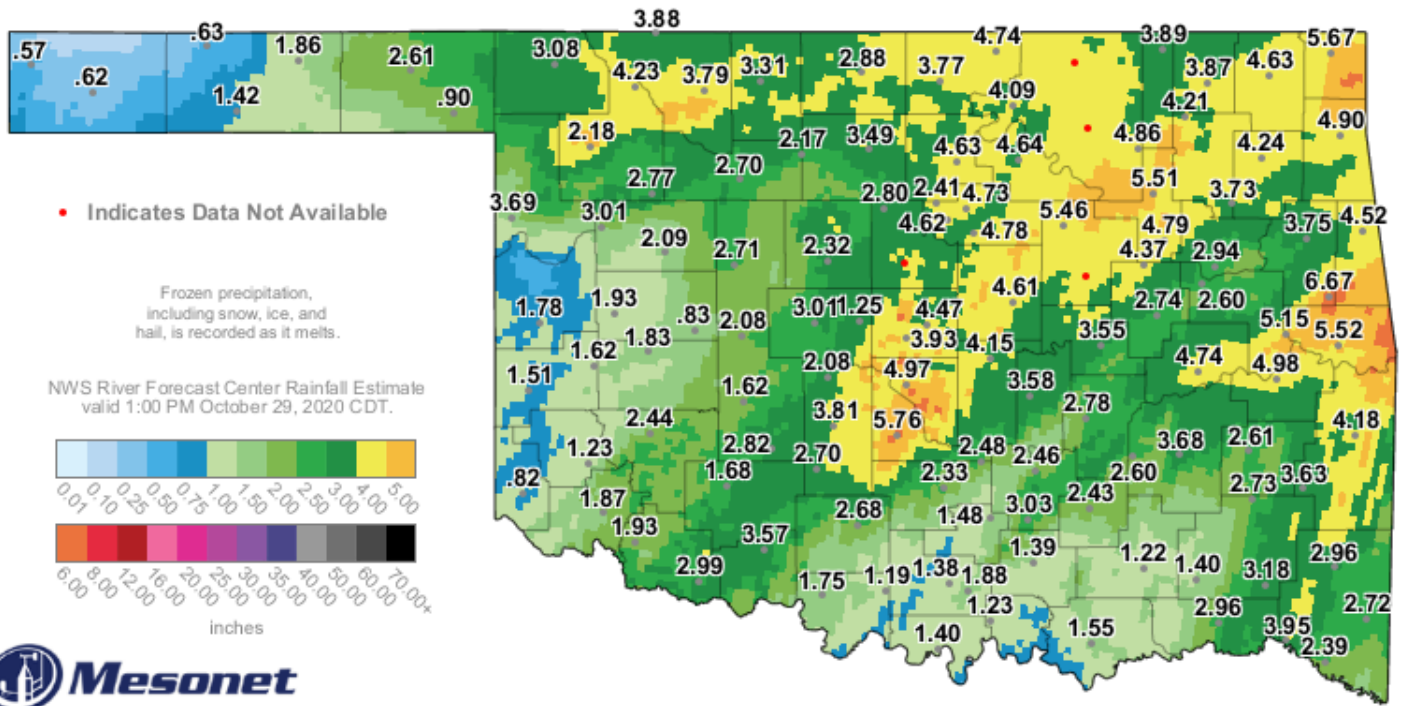
Tulsa, OK: October 30, 2020 1-Day Observed Precipitation
Valid on: October 30, 2020 12:00 UTC

Fig. 14. 24-hour Estimated Observed Rainfall ending at 7am CDT 10/30/2020.



Tulsa, OK: Last 7-Day Observed Precipitation
Valid on: November 02, 2020 12:00 UTC

Fig. 15. 7-Day Estimated Observed Rainfall ending at 6am CST 11/02/2020.



4-Day Rainfall Accumulation (inches)

2:10 PM October 29, 2020 CDT

Created 2:16:20 PM October 29, 2020 CDT. © Copyright 2020

Fig. 16. OK Mesonet (values) and NWS RFC rainfall estimate (image) 4-Day rainfall ending at 2:10 pm CDT 10/29/2020.

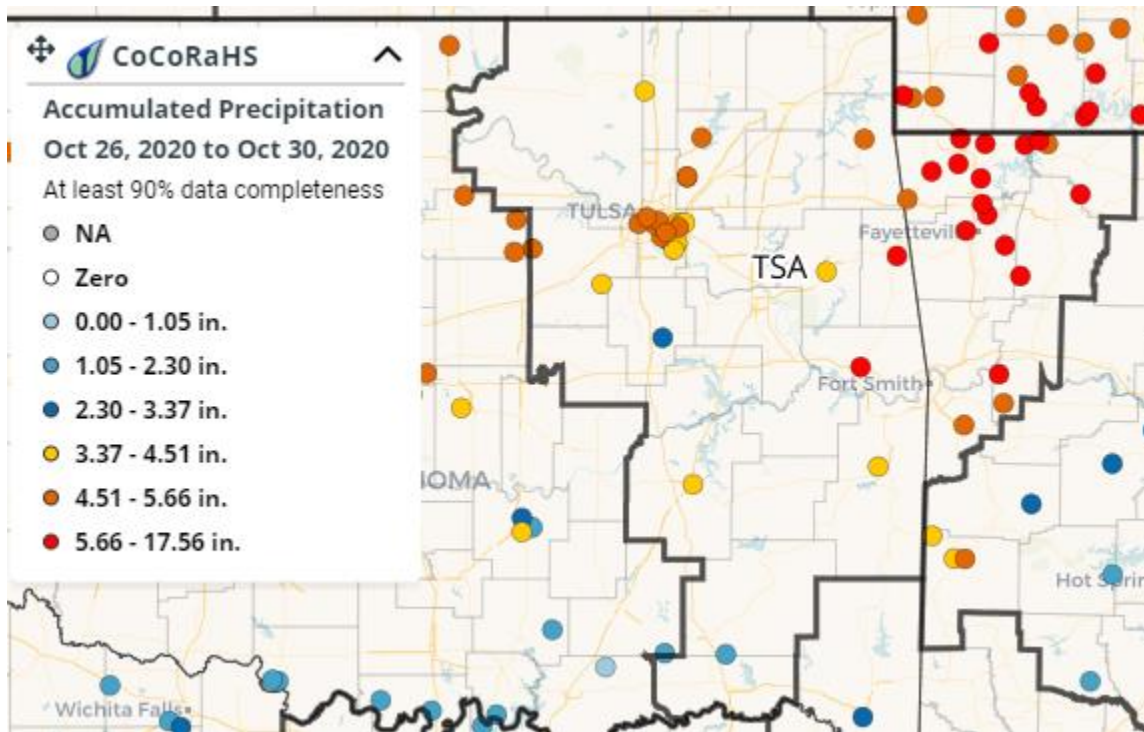
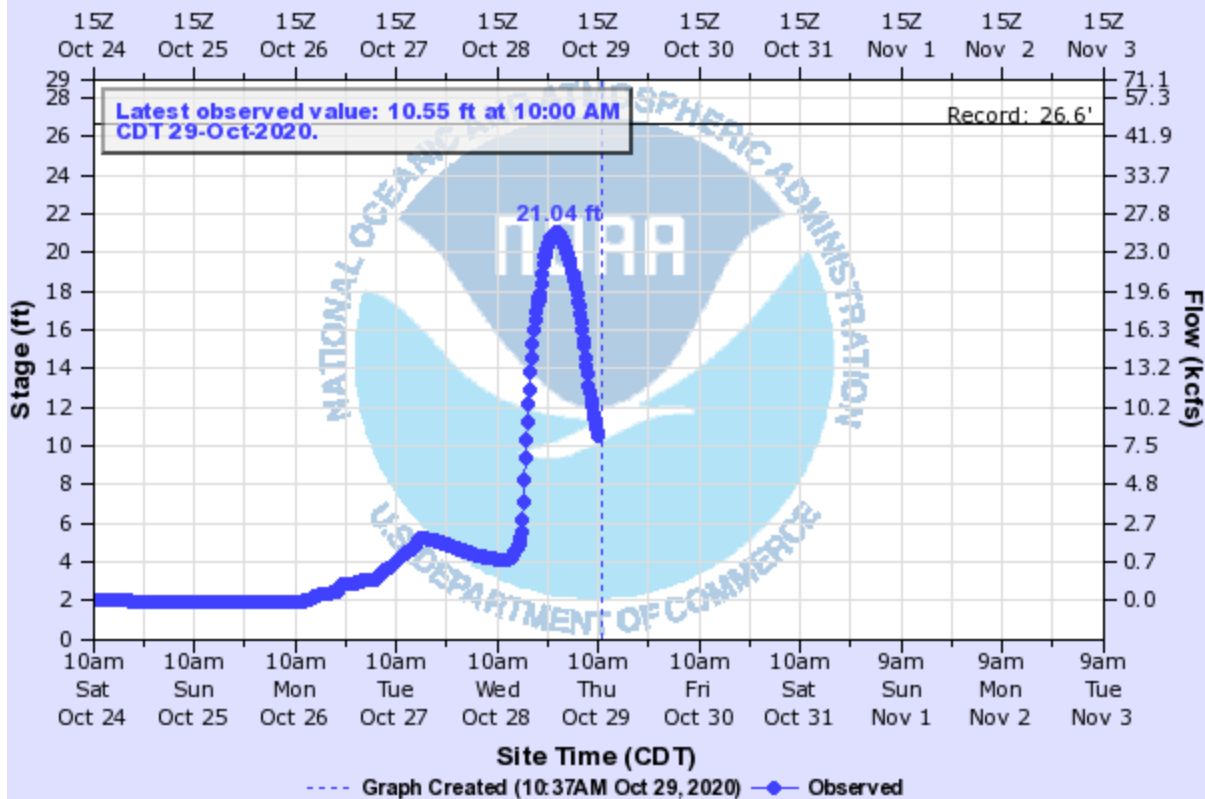


Fig. 17. CoCoRaHS rainfall measurements for October 26-30, 2020.

WHITE RIVER NEAR FAYETTEVILLE

Universal Time (UTC)

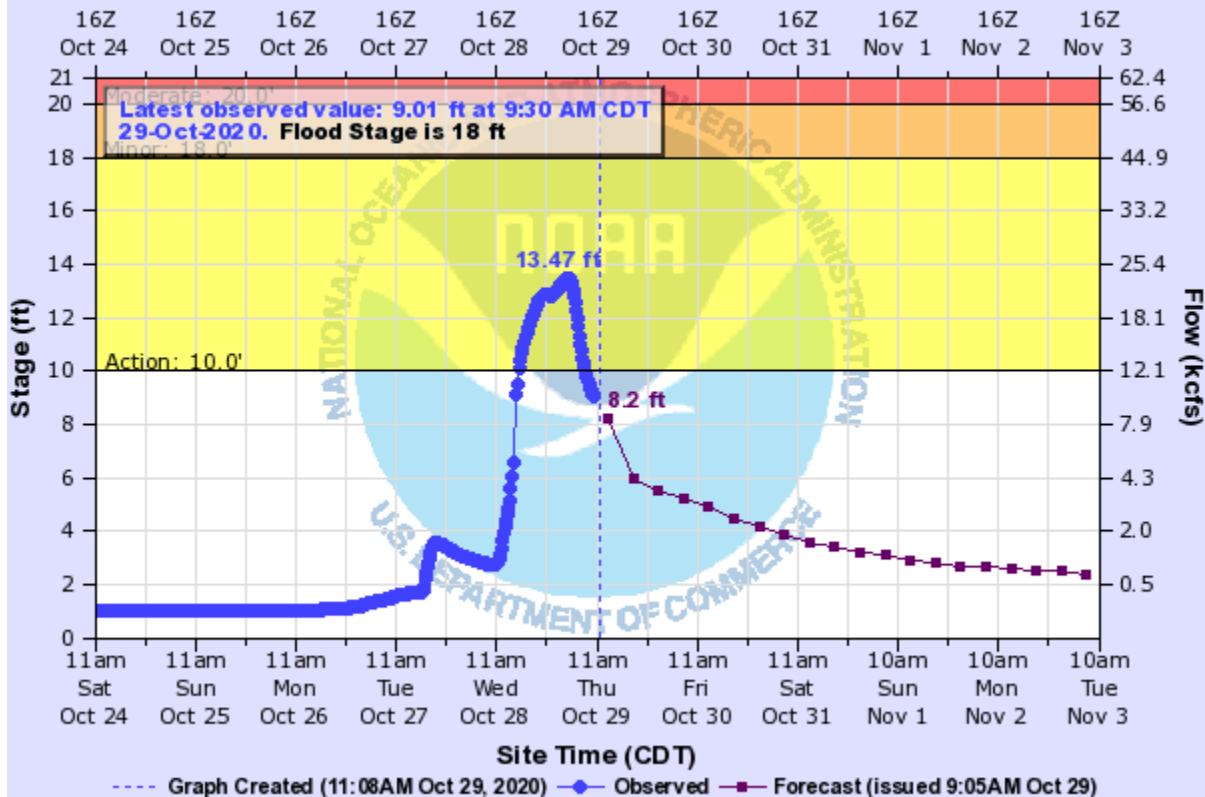


FYGA4(plotting HGIRG) "Gage 0" Datum: 1138.25'

Observations courtesy of US Geological Survey

MULBERRY RIVER (AR) NEAR MULBERRY

Universal Time (UTC)

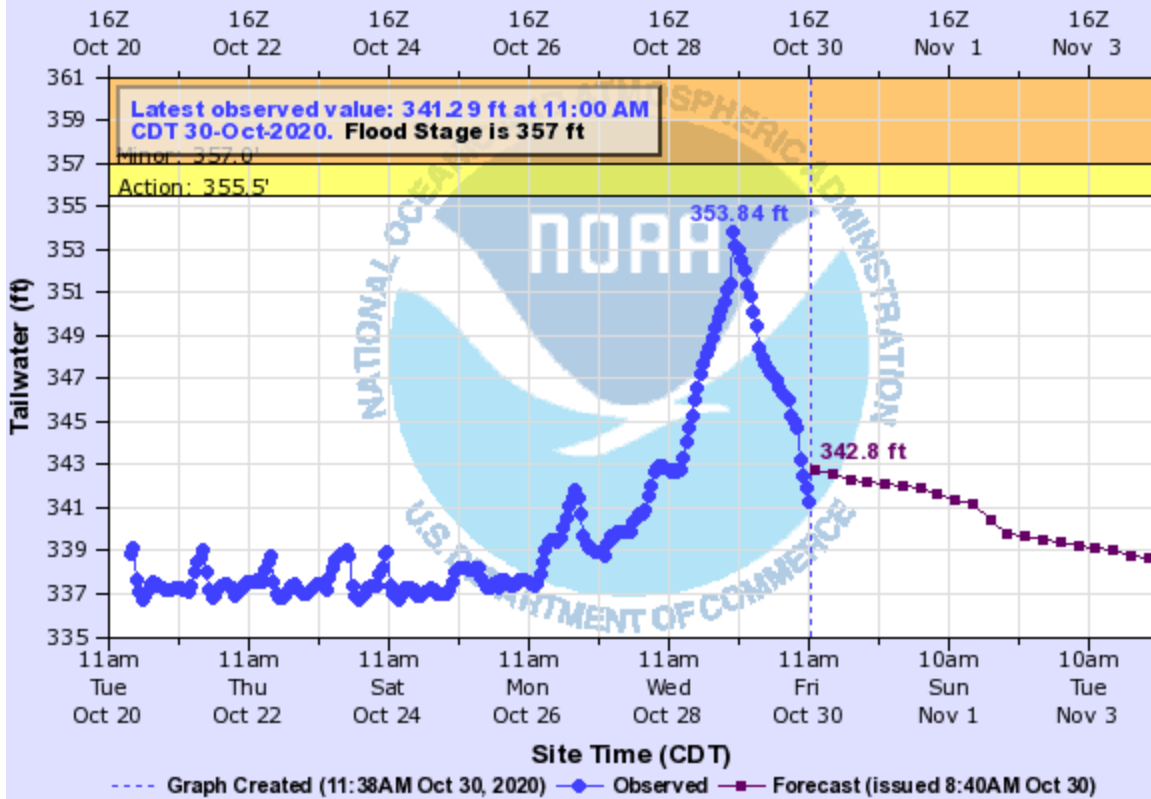


MLBA4(plotting HGIRG) "Gage 0" Datum: 432.75'

Observations courtesy of USGS/USACE/ADEQ

ARKANSAS RIVER AT OZARK L/D TAILWATER

Universal Time (UTC)

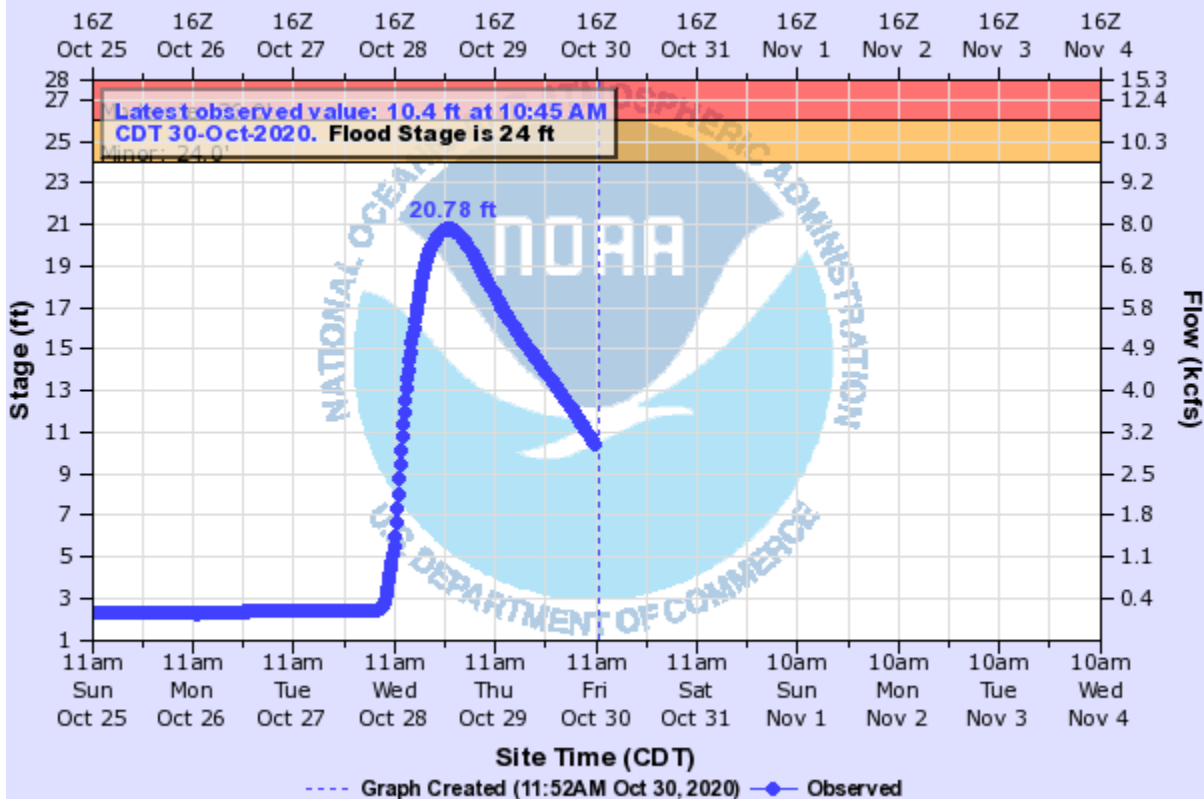


OZGA4(plotting HTIRG) "Gage 0" Datum: 0'

Observations courtesy of US Army Corps of Engineers - LRD

POTEAU RIVER NEAR POTEAU

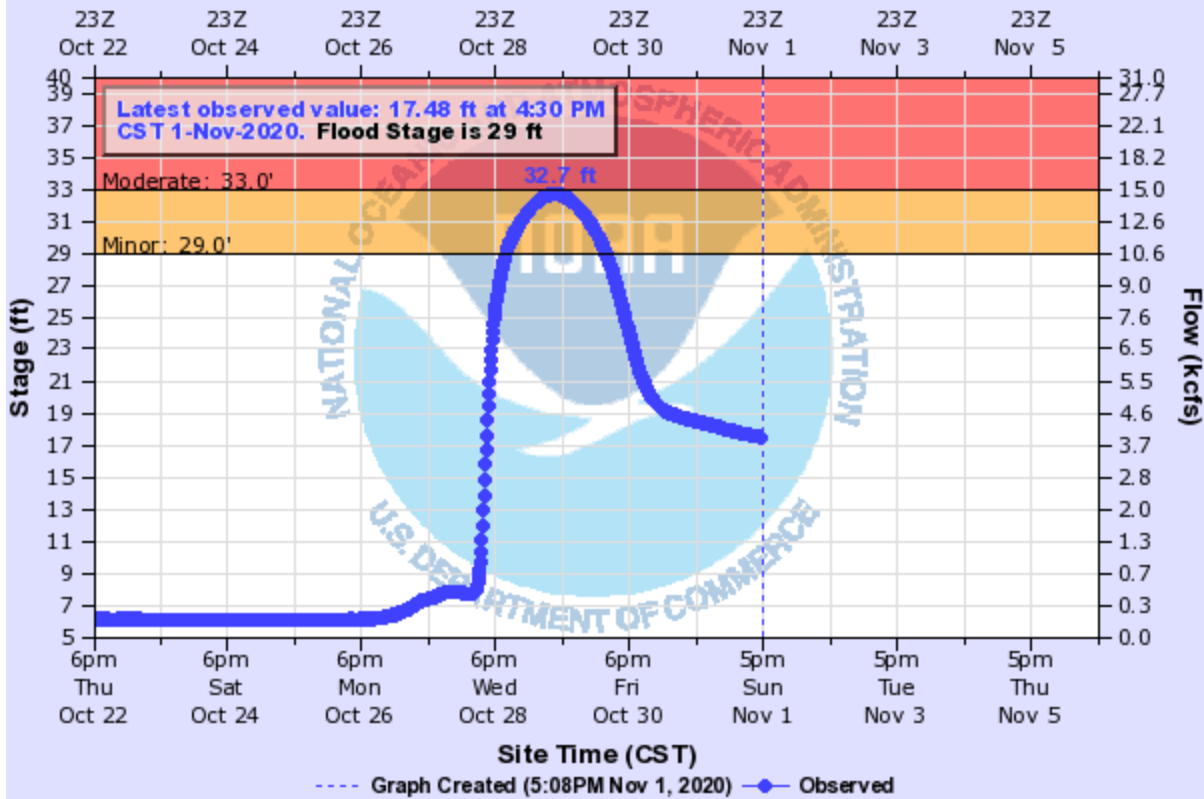
Universal Time (UTC)



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

POTEAU RIVER NEAR PANAMA

Universal Time (UTC)

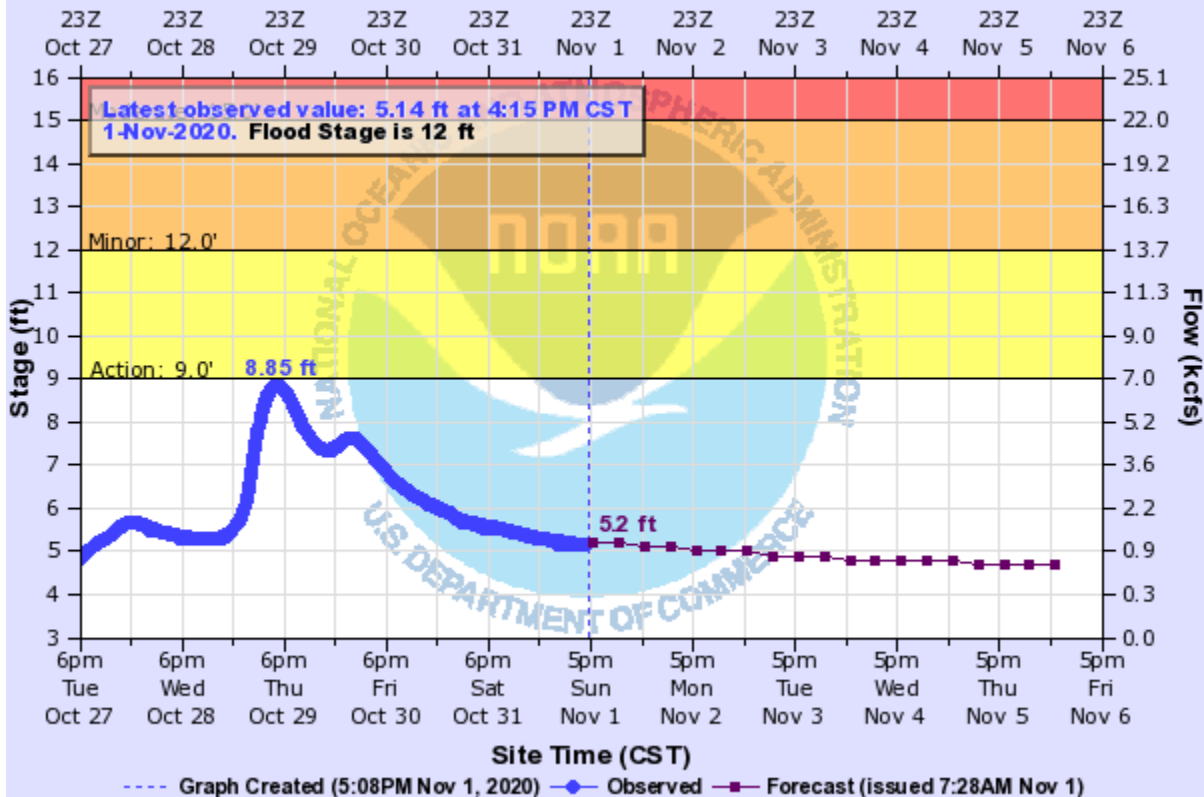


PANO2(plotting HGIRG) "Gage 0" Datum: 387.96'

Observations courtesy of US Geological Survey

ILLINOIS RIVER (AR OK) AT CHEWEY

Universal Time (UTC)

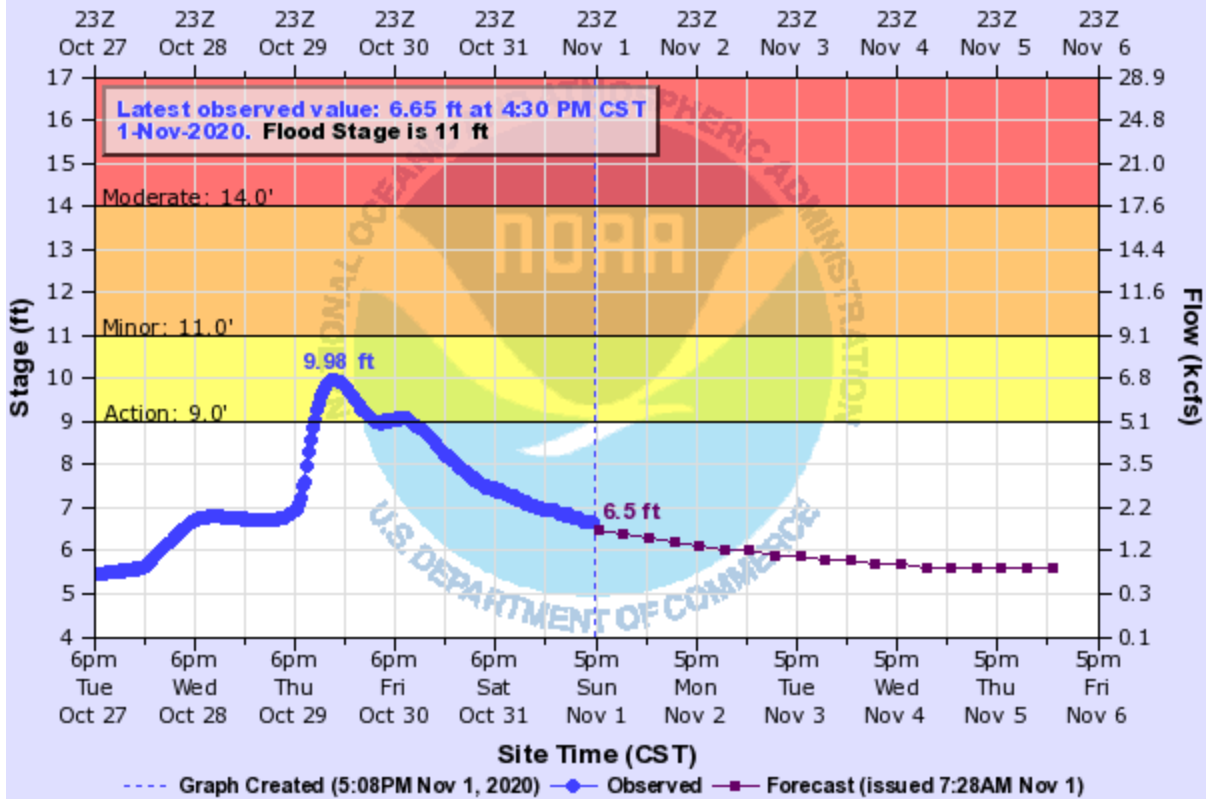


CWYO2(plotting HGIRG) "Gage 0" Datum: 800.88'

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