

<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>
		REPORT FOR: MONTH <b>January</b> YEAR <b>2020</b>
<b>MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS</b>		SIGNATURE <b>Steven F. Piltz</b> (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 <b>February 6, 2020</b>

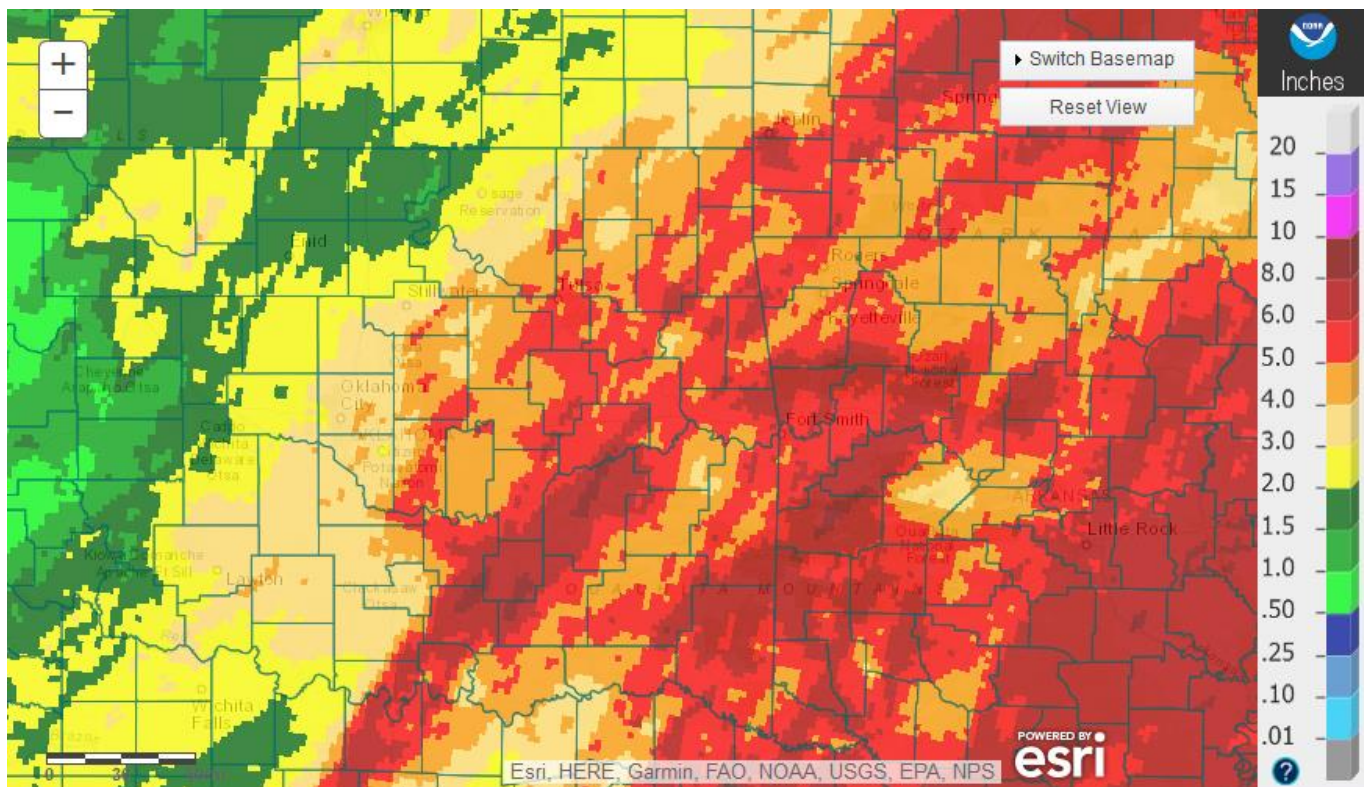
When no flooding occurs, include miscellaneous river conditions, such as significant rises, record low stages, ice conditions, snow cover, droughts, and hydrologic products issued (NWS Instruction 10-924)

An "X" in the box indicates no flood stages were reached in this Hydrologic Service Area (HSA) during the month above.

It was a wet and very warm January 2020, with average temperatures 4°-8° above normal, flash flooding, minor to moderate river flooding, and tornadoes this month. Normal precipitation for January ranges from 1.2 inches in Pawnee County to 2.2 inches in Haskell County. In the Ozark region of northwest Arkansas, precipitation averages 2.2 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>.

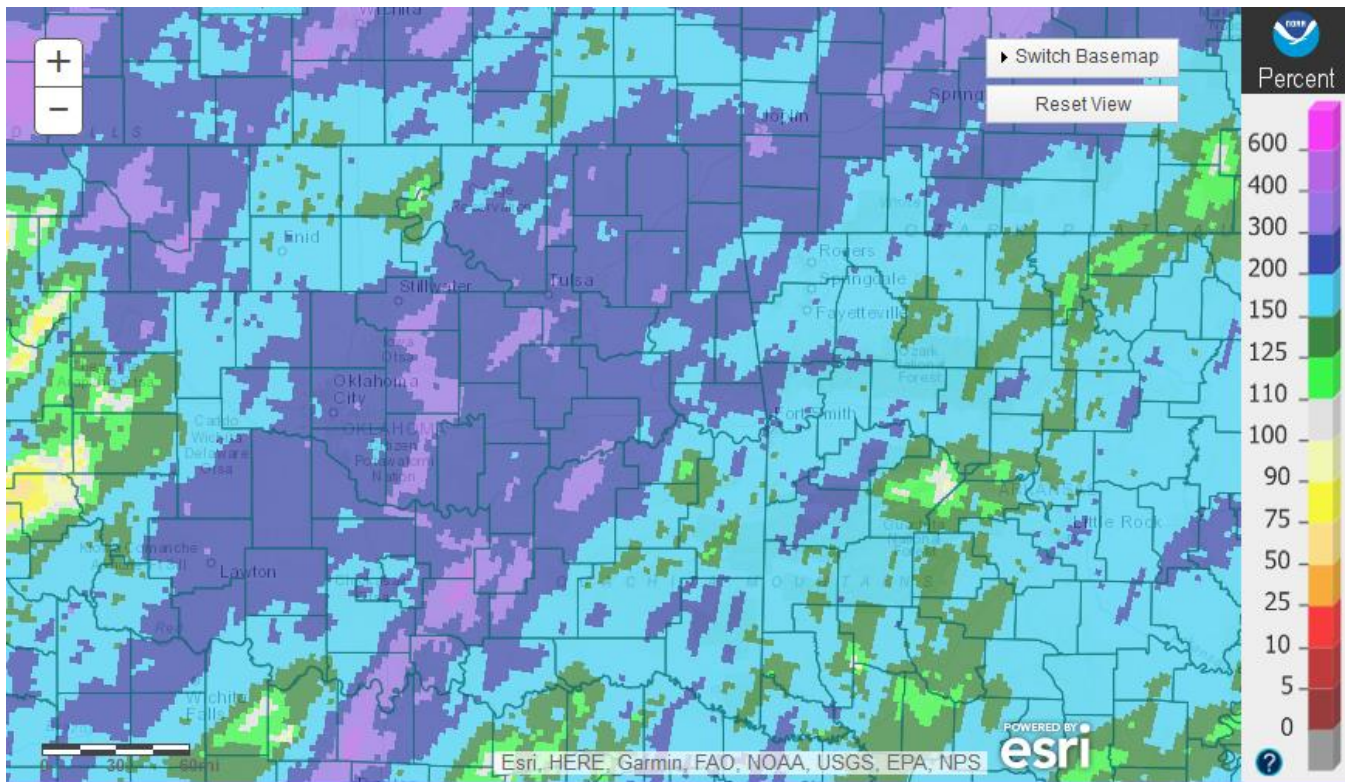
**Monthly Summary**

Using the radar-derived estimated observed precipitation from the RFCs (Fig. 1a), rainfall totals for January 2020 ranged from around 1.50" to around 8" across eastern OK and northwest AR, with most of the area receiving 4"-6". These rainfall totals correspond to 150% to around 300% of the normal January rainfall across the majority of eastern OK and northwest Arkansas (Fig. 1b).



Tulsa, OK: January, 2020 Monthly Observed Precipitation  
 Valid on: February 01, 2020 12:00 UTC

Fig. 1a. Estimated Observed Rainfall for January 2020



Tulsa, OK: January, 2020 Monthly Percent of Normal Precipitation  
Valid on: February 01, 2020 12:00 UTC

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

In Tulsa, OK, January 2020 ranked as the 15<sup>th</sup> warmest January (42.5°F; since records began in 1905), the 4<sup>th</sup> wettest January (4.90"; since records began in 1888), and the 43<sup>rd</sup> least snowy January (0.6", tied 1963, 1968; since records began in 1900). Fort Smith, AR had the 19<sup>th</sup> warmest January (44.2°F; since records began in 1883), the 6<sup>th</sup> wettest January (5.87"; since records began in 1883), and the 63<sup>rd</sup> least snowy January (0.5", tied 1989, 1950, 1924, 1903, 1891; since records began in 1884). Fayetteville, AR had the 4<sup>th</sup> warmest (42.3°F), the 6<sup>th</sup> wettest (5.50"), and the 30<sup>th</sup> least snowy (0.3") January since records began in 1950.

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

Tahlequah 3.5SSW, OK (coco)	9.23	Cloudy, OK (meso)	8.08	Ozark, AR (coop)	7.87
Krebs 0.3WNW, OK (coco)	7.61	Winslow 7NE, AR (coop)	7.54	St. Paul 1E, AR (coop)	7.41
McAlester, OK (meso)	7.23	Westville 0.2ENE, OK (coco)	6.90	Van Buren 2.1NNW, AR (coco)	6.86

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

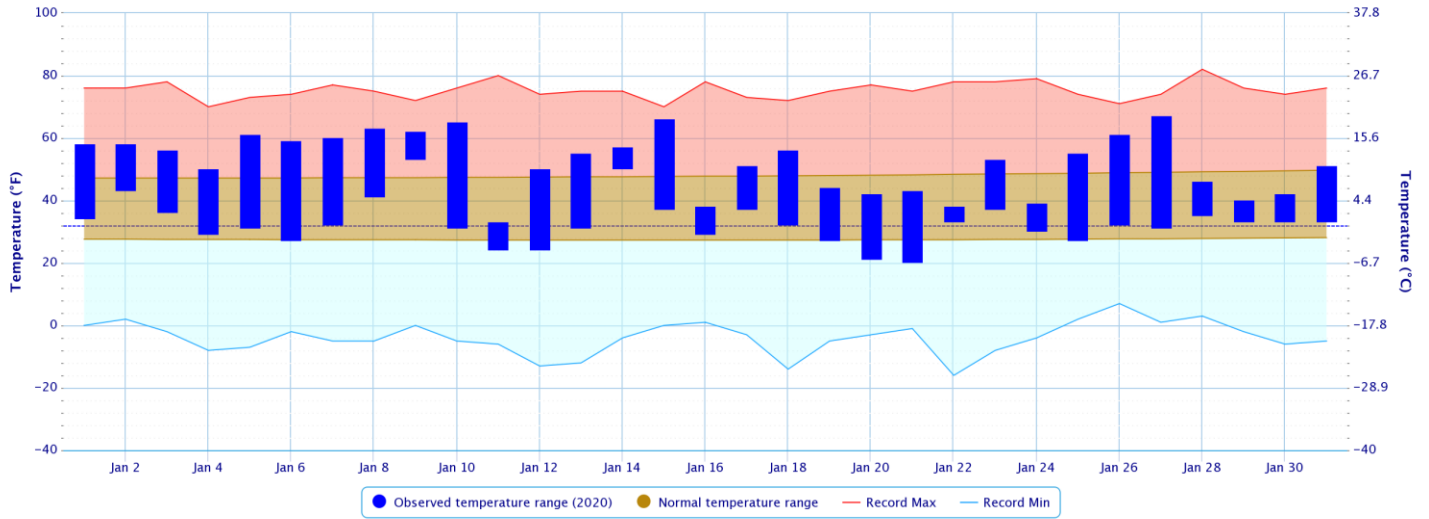
Burbank, OK (meso)	2.48	Foraker, OK (meso)	2.74	Bartlesville, OK (ASOS)	3.26
Wynona, OK (meso)	3.51	Pawnee, OK (meso)	3.53	Ochelata 5.6N, OK (coco)	3.61
Drumright 0.6SW, OK (coco)	3.79	Copan, OK (meso)	3.79	Oilton, OK (meso)	3.97

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

Rank since 1921	January 2020	Winter-to-Date (Dec 1 – Jan 31)	Last 90 Days (Nov 3 – Jan 31)	Water Year-to-Date (Oct 1 – Jan 31)	Cool Growing Season (Sep 1 – Jan 31)	Last 180 Days (Aug 5 – Jan 31)	Last 365 Days (Feb 1, 2019 – Jan 31, 2020)
Northeast OK	<b>5<sup>th</sup> wettest</b>	16 <sup>th</sup> wettest	14 <sup>th</sup> wettest	<b>9<sup>th</sup> wettest</b>	<b>8<sup>th</sup> wettest</b>	<b>4<sup>th</sup> wettest</b>	<b>1<sup>st</sup> wettest</b>
East Central OK	<b>3<sup>rd</sup> wettest</b>	14 <sup>th</sup> wettest	14 <sup>th</sup> wettest	<b>3<sup>rd</sup> wettest</b>	<b>4<sup>th</sup> wettest</b>	<b>1<sup>st</sup> wettest</b>	<b>4<sup>th</sup> wettest</b>
Southeast OK	<b>10<sup>th</sup> wettest</b>	40 <sup>th</sup> wettest	30 <sup>th</sup> wettest	17 <sup>th</sup> wettest	<b>9<sup>th</sup> wettest</b>	11 <sup>th</sup> wettest	<b>9<sup>th</sup> wettest</b>
Statewide	<b>5<sup>th</sup> wettest</b>	17 <sup>th</sup> wettest	20 <sup>th</sup> wettest	19 <sup>th</sup> wettest	21 <sup>st</sup> wettest	<b>10<sup>th</sup> wettest</b>	<b>3<sup>rd</sup> wettest</b>

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

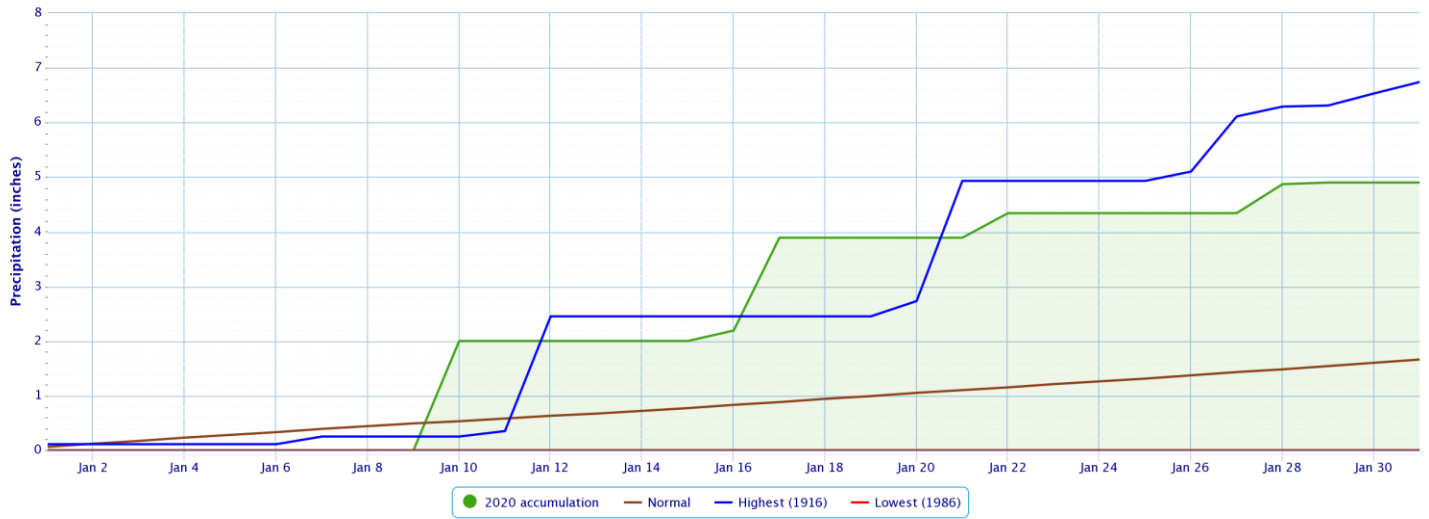
Period of Record – 1905-01-06 to 2020-02-03. Normals period: 1981-2010. Click and drag to zoom chart.



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

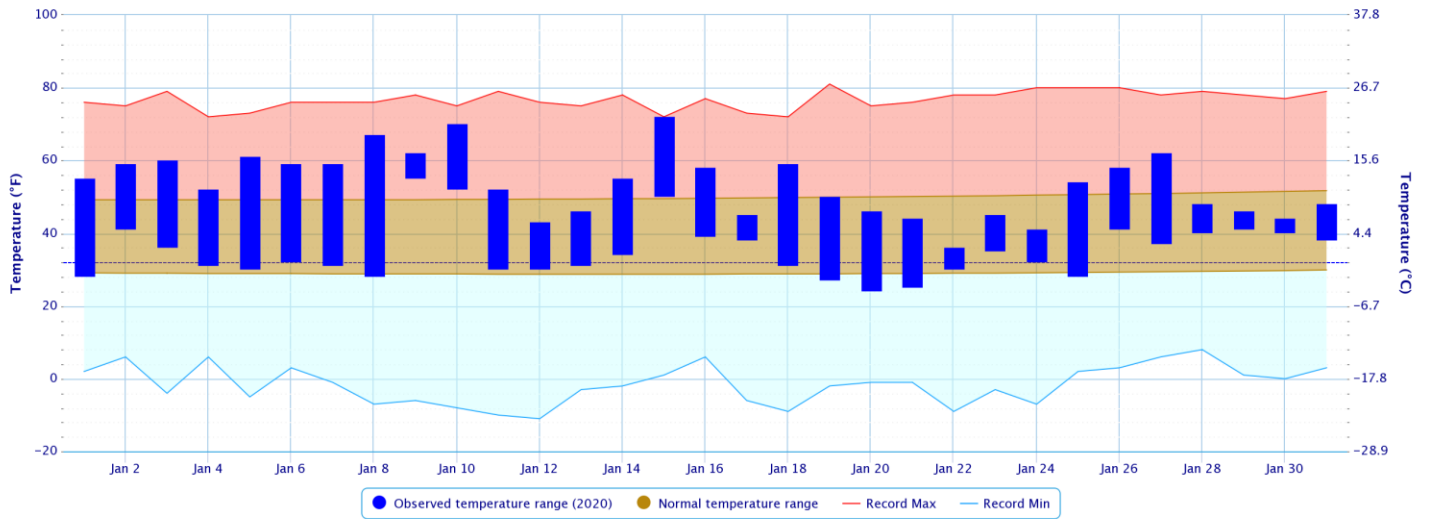
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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

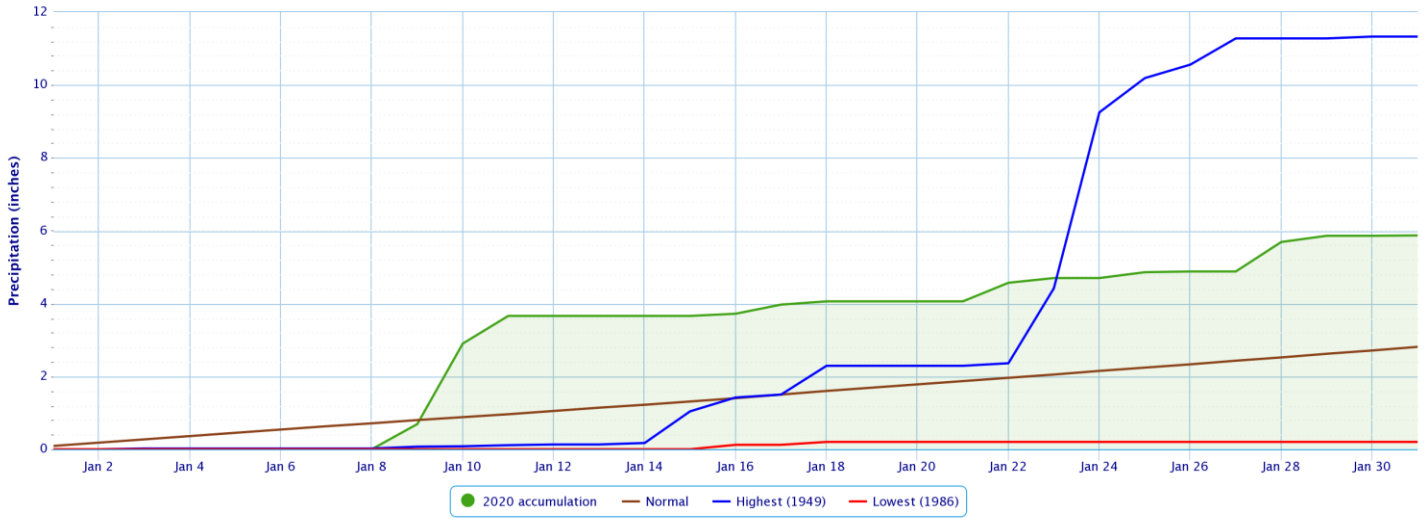
Period of Record – 1882-06-01 to 2020-02-03. Normals period: 1981-2010. Click and drag to zoom chart.



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

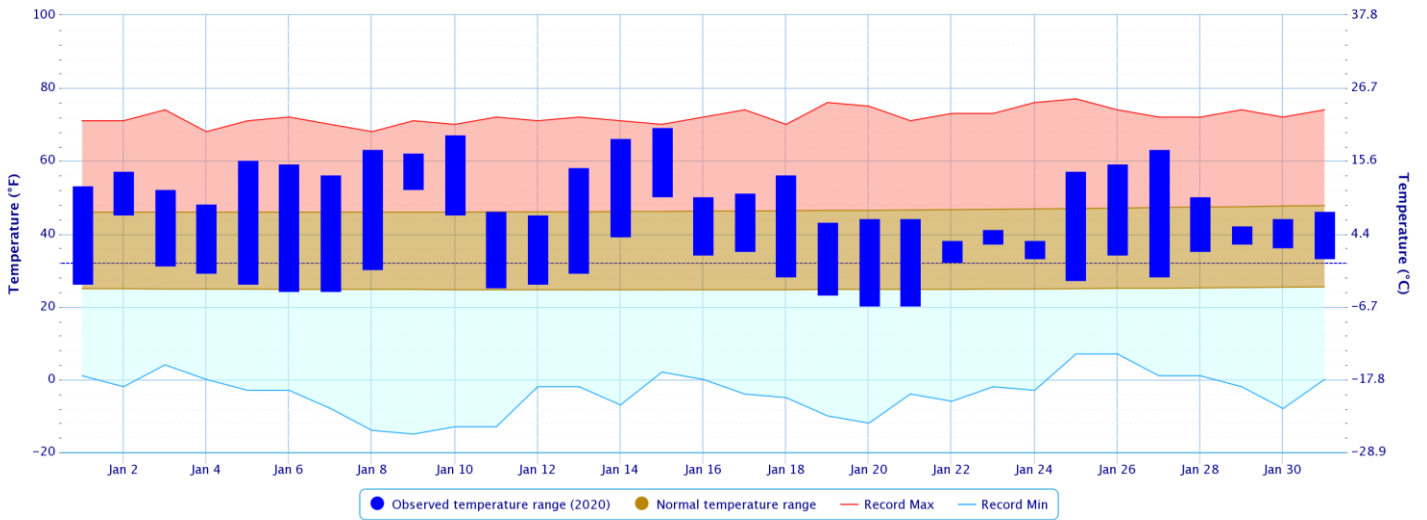
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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

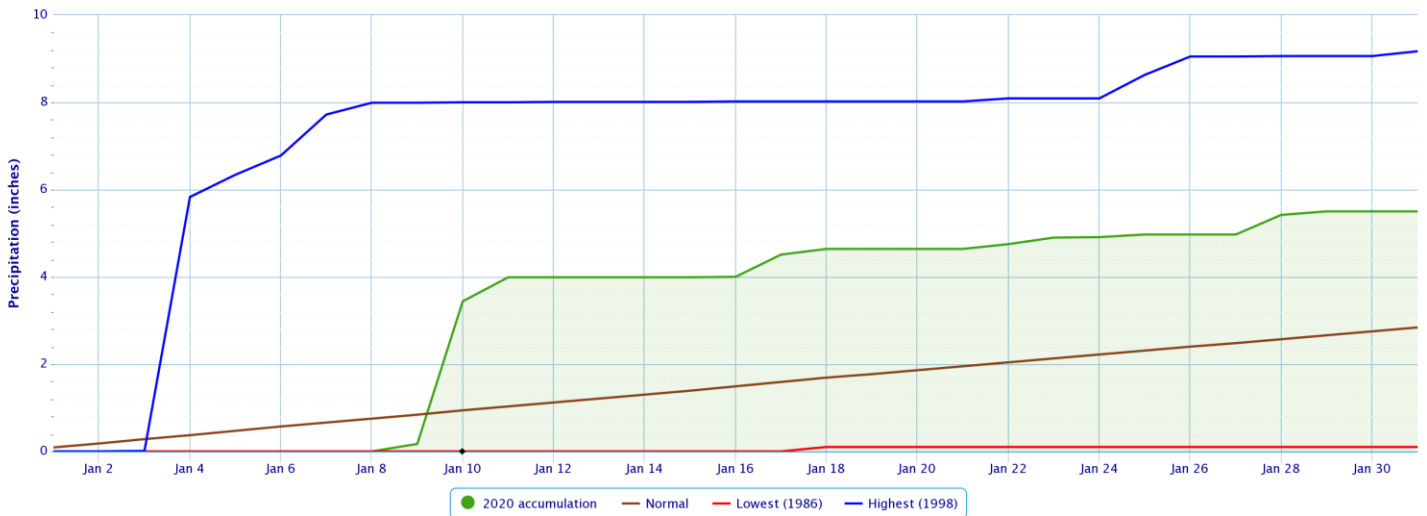
Period of Record – 1949-07-14 to 2020-02-03. Normals period: 1981-2010. Click and drag to zoom chart.



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### Accumulated Precipitation – FAYETTEVILLE DRAKE FIELD, AR

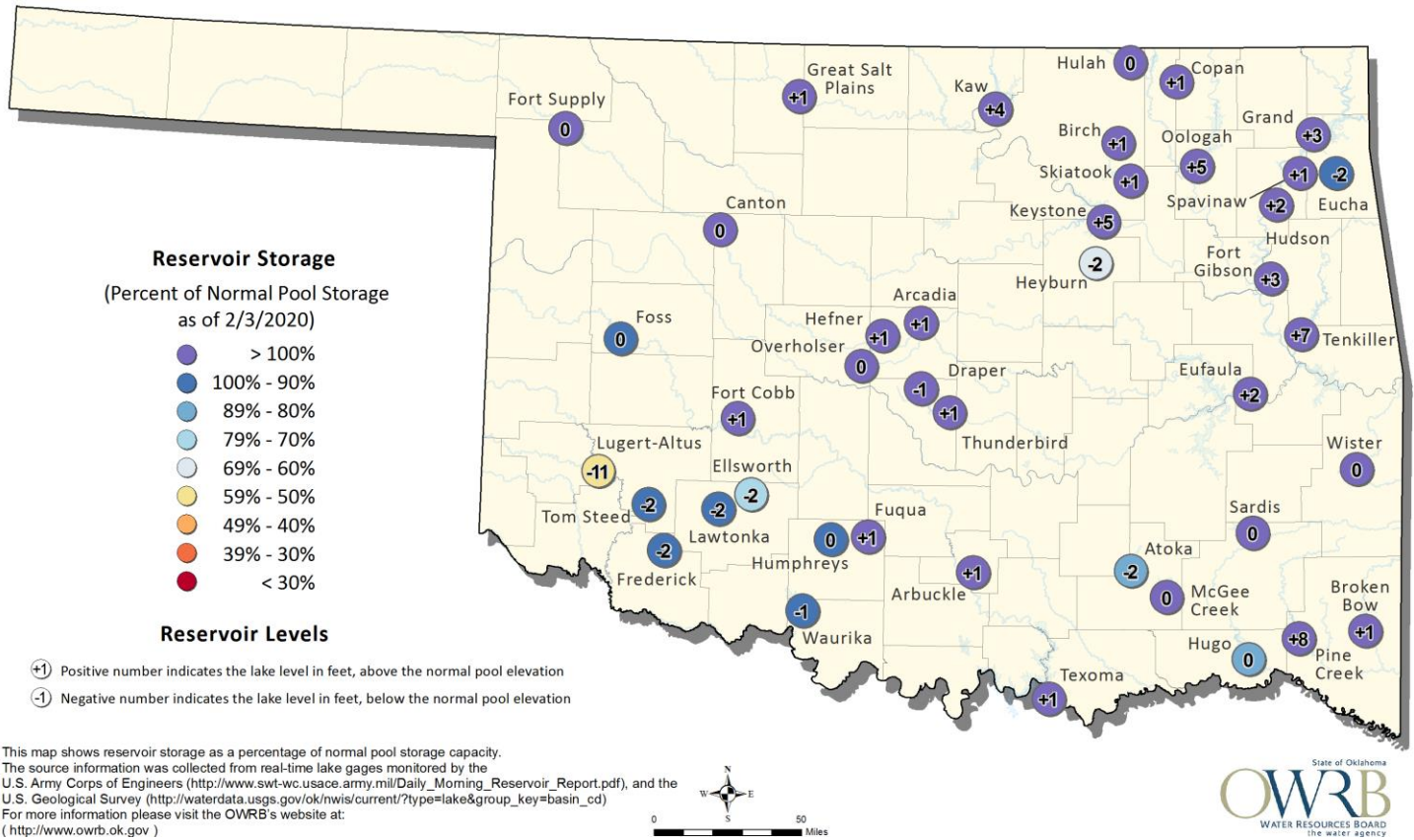
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



Powered by ACIS

**Reservoirs**

**Oklahoma Surface Water Resources**  
**Reservoir Levels and Storage as of 2/3/2020**



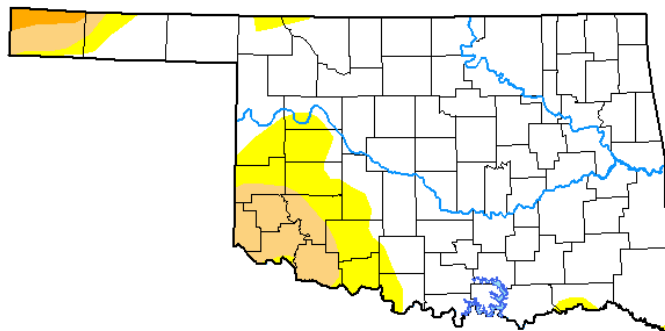
According to the USACE, several of the lakes in the HSA were utilizing more than 3% of their flood control pools as of 2/04/2020: Beaver Lake 76%, Grand Lake 18%, Tenkiller Lake 16%, Oologah Lake 16%, Eufaula Lake 12%, Keystone Lake 11%, Hudson Lake 9%, Ft. Gibson Lake 8%, Kaw Lake 7%, Skiatook Lake 5%, and Sardis Lake 4%.

**Drought**

According to the [U.S. Drought Monitor](#) (USDM) from January 28, 2020 (Figs. 2, 3), eastern OK and northwest AR were drought free. However, D0 (Abnormally Dry) conditions were present across southern Choctaw County in southeast OK.

# U.S. Drought Monitor Oklahoma

**January 28, 2020**  
(Released Thursday, Jan. 30, 2020)  
Valid 7 a.m. EST



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	81.34	18.66	8.03	0.85	0.00	0.00
<b>Last Week</b> 01-21-2020	80.50	19.50	9.04	2.52	0.00	0.00
<b>3 Months Ago</b> 10-29-2019	75.22	24.78	7.62	0.78	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> 01-29-2019	99.22	0.78	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:

Richard Heim  
NCEI/NOAA

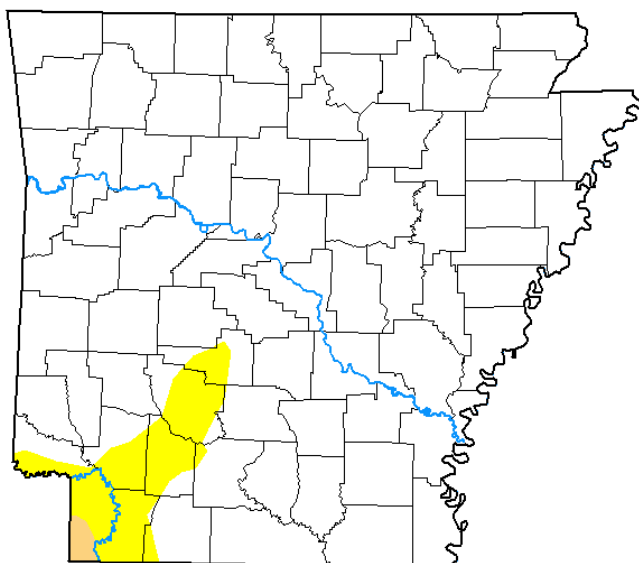


[droughtmonitor.unl.edu](https://droughtmonitor.unl.edu)

Fig. 2. Drought Monitor for Oklahoma

# U.S. Drought Monitor Arkansas

**January 28, 2020**  
(Released Thursday, Jan. 30, 2020)  
Valid 7 a.m. EST



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	93.87	6.13	0.37	0.00	0.00	0.00
<b>Last Week</b> 01-21-2020	92.68	7.32	1.46	0.00	0.00	0.00
<b>3 Months Ago</b> 10-29-2019	89.30	10.70	2.53	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> 01-29-2019	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:

Richard Heim  
NCEI/NOAA



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

Fig. 3. Drought Monitor for Arkansas

## **Outlooks**

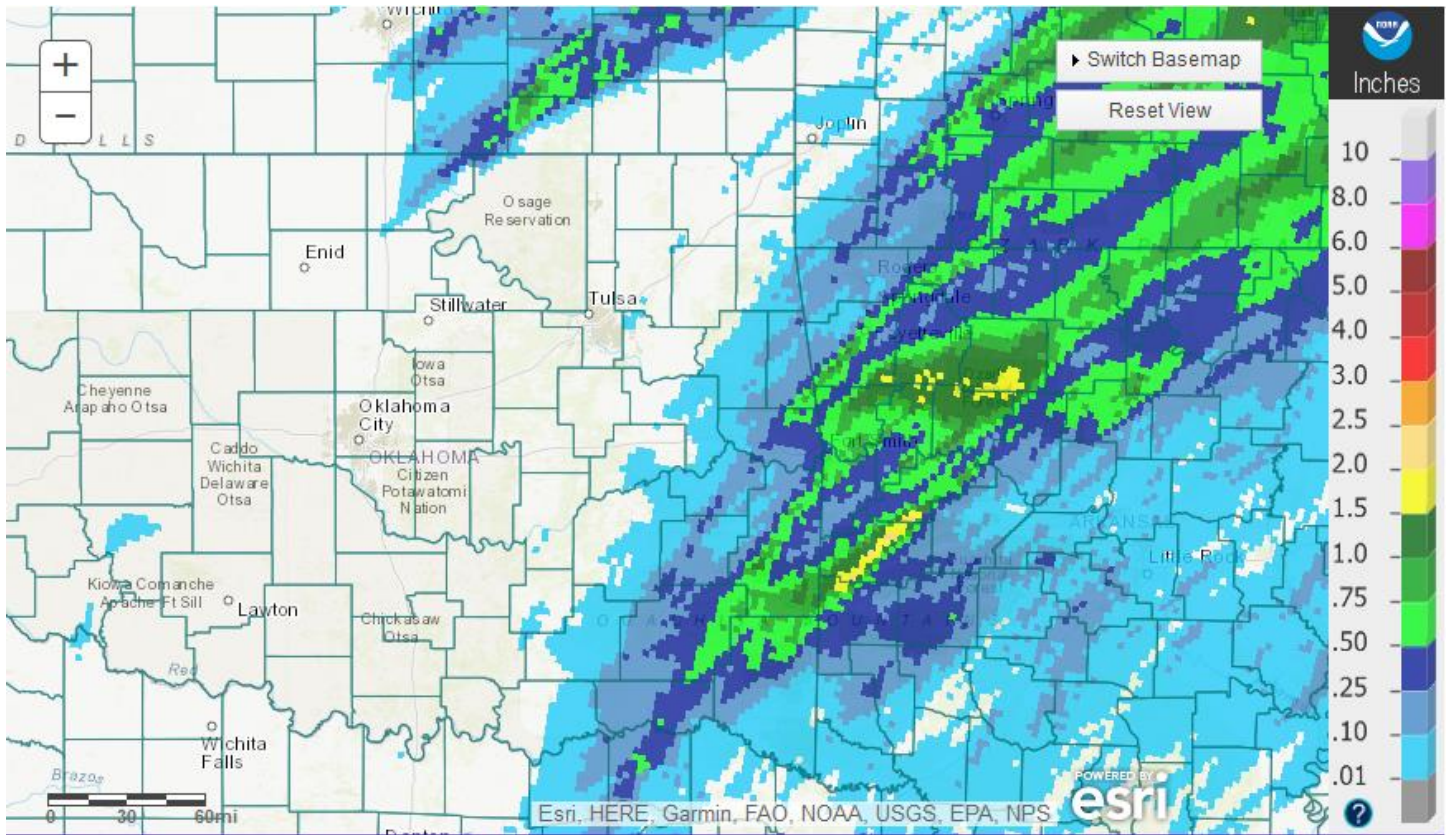
The [Climate Prediction Center](#) (CPC) outlook for February 2020 (issued January 31, 2020) indicates an equal chance for above, near, and below normal temperatures across all of eastern OK and northwest AR. This outlook also indicates an enhanced chance for below median precipitation across east central and northeast OK and far northwest AR, and equal chances for above, near, and below median precipitation across southeast OK and west central AR. This outlook takes into account dynamical model guidance and the weeks 3-4 outlook. The first, third, and fourth weeks of February have increased odds for below median rainfall, with the second week having increased odds for above median rainfall.

For the 3-month period February-March-April 2020, CPC is forecasting a slightly enhanced chance for above normal temperatures along the Red River in southern OK, and equal chances for above, near, or below normal temperatures across most of eastern OK and northwest AR. This outlook also calls for a slightly enhanced chance for above median rainfall in west central AR, and an equal chance for above, near, or below median rainfall across all of eastern OK and far northwest AR (outlook issued January 16, 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 consensus forecast is for ENSO neutral conditions to be the most likely through the spring (~60% chance) and the upcoming summer (~50% chance). With ENSO-neutral favored to persist through the remainder of winter and into the spring, the odds of other sub-seasonal factors, such as the Arctic Oscillation (AO), will play a larger role in the temperature pattern.

**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)

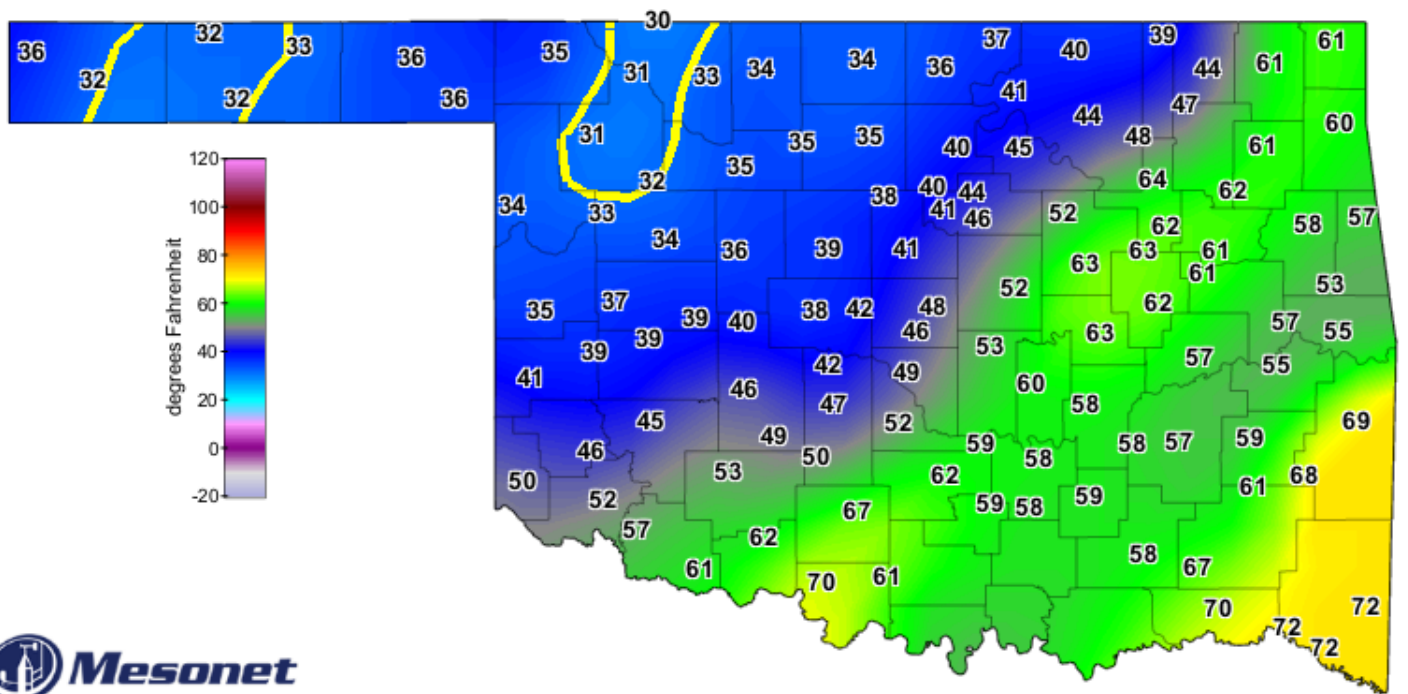
Moisture dramatically increased across eastern OK and northwest AR on the 9<sup>th</sup> ahead of a strong storm system. Scattered showers and thunderstorms developed across southeast OK into northwest AR during the afternoon within an area of expanding warm advection, ahead of a nearly stationary front located from the TX Panhandle through western OK and into eastern KS. This activity continued through the overnight hours, and dissipated just before sunrise on the 10<sup>th</sup>. Rainfall totals ranged from 0.10" to 1", with isolated pockets of 1"-2" (Fig. 4).

Precipitable water values of 1"-1.5", well above the January normal and near to above the record value, were in place over the area on the 10<sup>th</sup>, with dewpoints climbing into the 60°F range ahead of the front. Thunderstorms developed across eastern OK during the mid-morning hours, ahead of the strong storm system, which was approaching the Southern Plains from the Southern Rockies. The unseasonably warm and moist air resulted in weak instability across a large portion of eastern OK and northwest AR. Strong wind fields and very strong wind shear, both deep-layer and low-level, combined with this instability to produce supercells during the afternoon. These storms produced hail to the size of golf balls, damaging wind, and an EF-1 tornado in Cherokee Co. By late afternoon (Figs. 5, 6), the wind shear became parallel to the front and the storms then evolved into a squall line that moved across far eastern OK and western AR through the evening hours. As the squall line moved through west central AR, it produced damaging winds and an EF-1 tornado in Franklin Co. (for more information on the tornadoes, refer to <https://arcg.is/WOfzC0>). Winds parallel to the slow-moving cold front, combined with the high moisture content of the atmosphere, resulted in training, efficient rain producing storms. Widespread rain persisted for several hours during the evening across nearly all of eastern OK and northwest AR, before slowly ending from west to east through the early morning hours of the 11<sup>th</sup>. Rainfall totals were around 1.5" to 3" across most of eastern OK and northwest AR, with pockets of 3"-5" (Figs. 7, 8). Much of Pittsburg County received 3"-6" of rain. This was within one heavy rain axis that stretched from Centrahoma, through McAlester, to the OK/AR/MO border. A second heavy rain axis impacted locations from far southeast OK into west central AR. This heavy rain resulted in both flash flooding and mainstem river flooding. Unfortunately, a 58-year old man from Wardville, OK drove into flood waters and drowned in far southwest Pittsburg Co. Moderate river flooding occurred along the Illinois River and on the Poteau River near Panama. Minor river flooding occurred along the Poteau River near Poteau, the lower Arkansas River at Van Buren and Ozark Lock and Dam, Lee Creek near Van Buren, the Neosho River near Commerce, and the Spring River near Quapaw (see preliminary hydrographs at the end of this report; see E3 Report for details). Numerous other rises saw significant rises, but remain within banks. The rainfall totals from the 9<sup>th</sup>-10<sup>th</sup> were 2"-4" for much of the area along and southeast of I-44, with smaller areas receiving 4"-6" (Fig. 9).



Tulsa, OK: January 10, 2020 1-Day Observed Precipitation  
 Valid on: January 10, 2020 12:00 UTC

Fig. 4. 24-hour Estimated Observed Rainfall ending at 6am CST 1/10/2020.

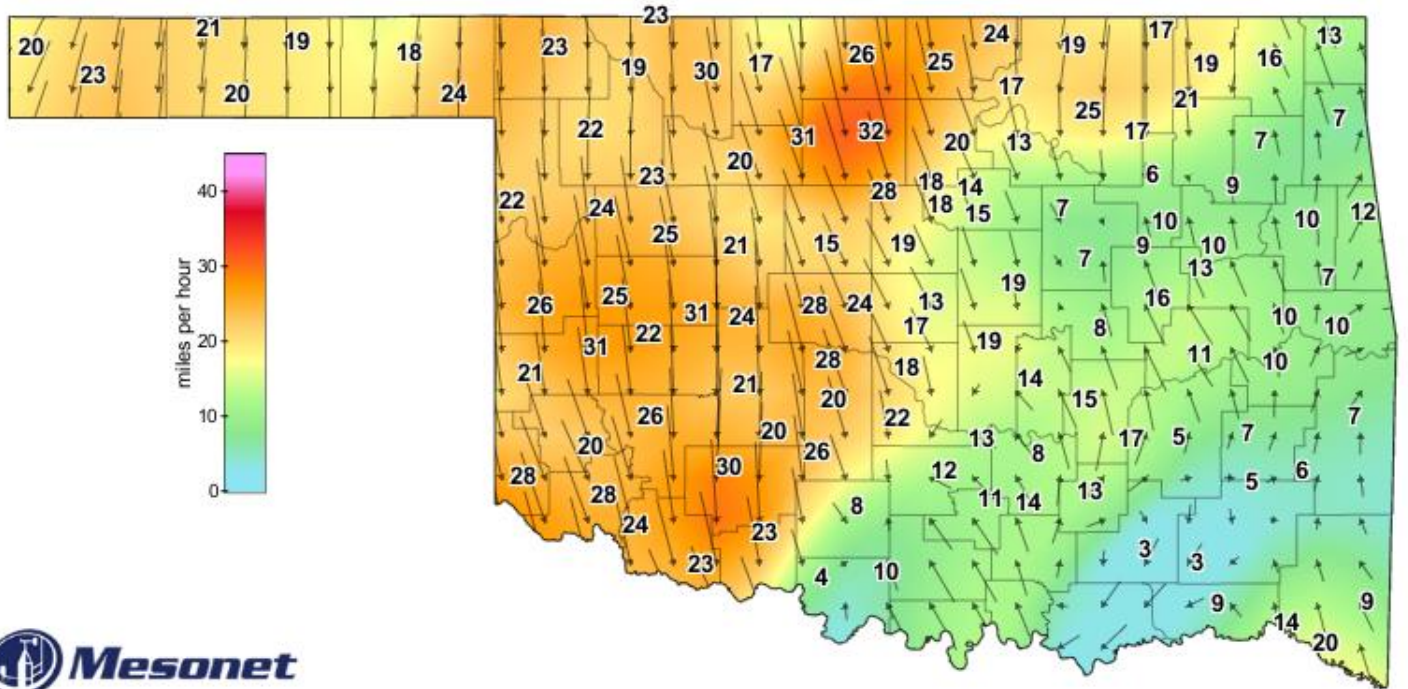


**Mesonet**  
 Air Temperature (°F)

4:15 PM January 10, 2020 CST  
 Created 4:20:41 PM January 10, 2020 CST. © Copyright 2020

Fig. 5. Surface Air Temperature as measured by the Oklahoma Mesonet stations showing the cold front at 4:15 pm CST 1/10/2020.



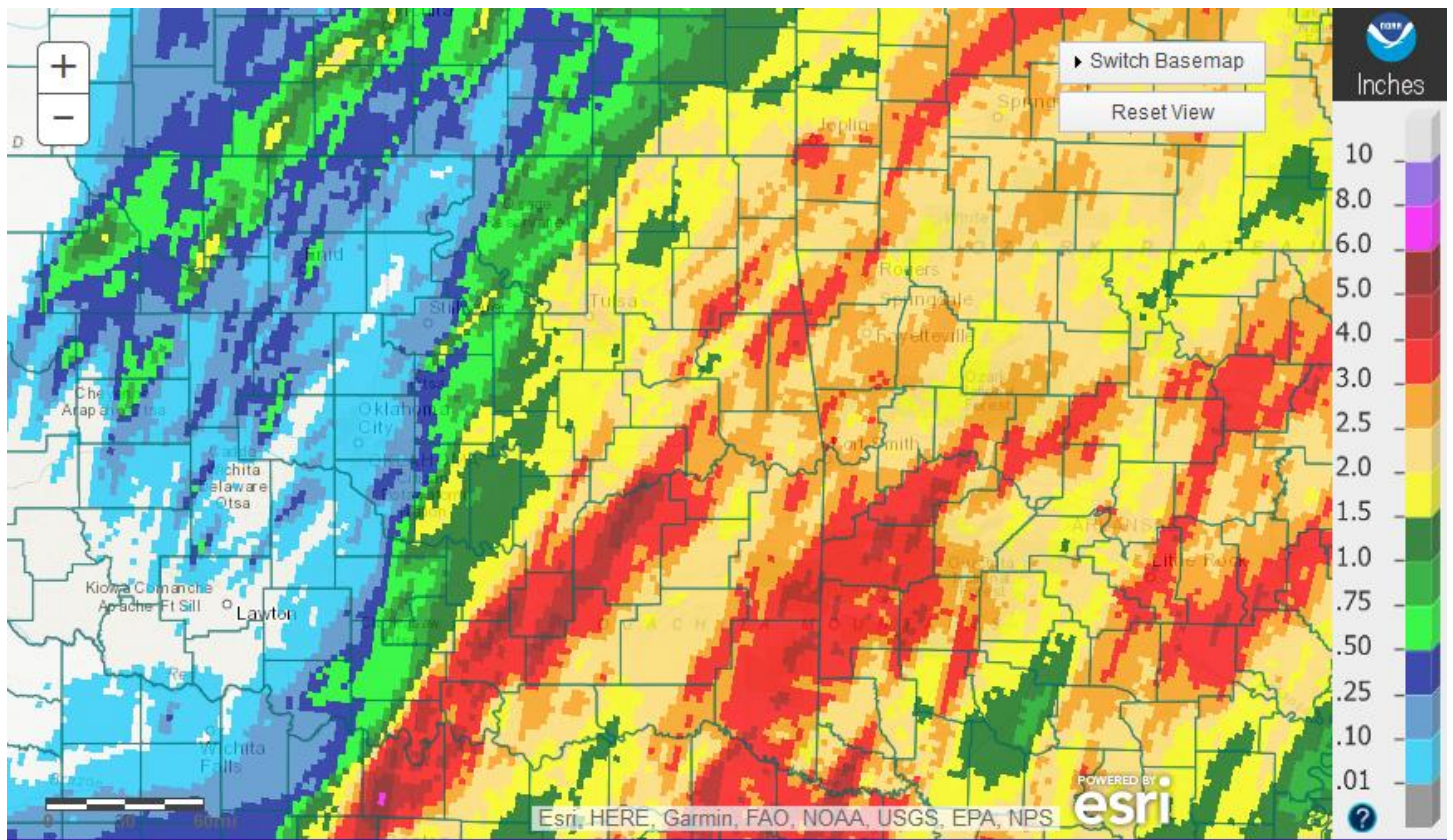


**Wind Speed and Direction**

4:15 PM January 10, 2020 CST

Created 4:20:43 PM January 10, 2020 CST. © Copyright 2020

Fig. 6. Surface Wind Speed and Direction as measured by the Oklahoma Mesonet stations at 4:15 pm CST 1/10/2020.



Tulsa, OK: January 11, 2020 1-Day Observed Precipitation  
Valid on: January 11, 2020 12:00 UTC

Fig. 7. 24-hour Estimated Observed Rainfall ending at 6am CST 1/11/2020.

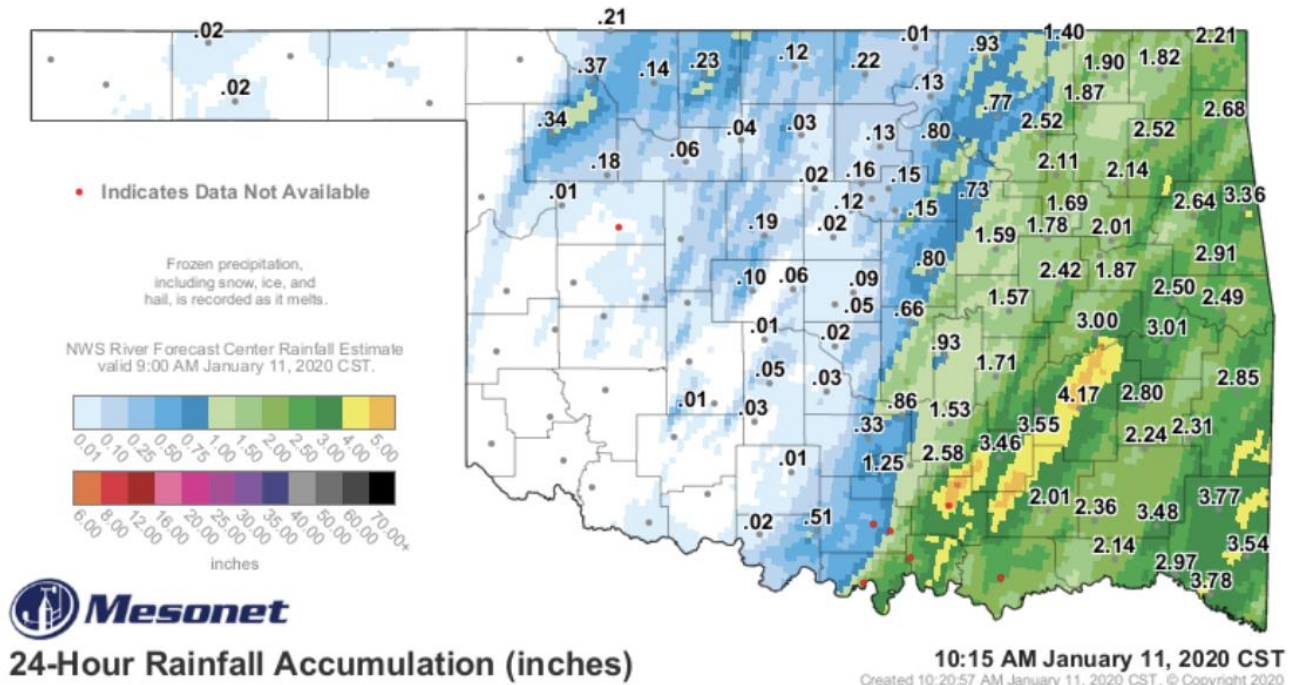


Fig. 8. OK Mesonet (values) and NWS RFC rainfall estimate (image) 24-hour rainfall ending at 10:15 am CDT 1/11/2020.

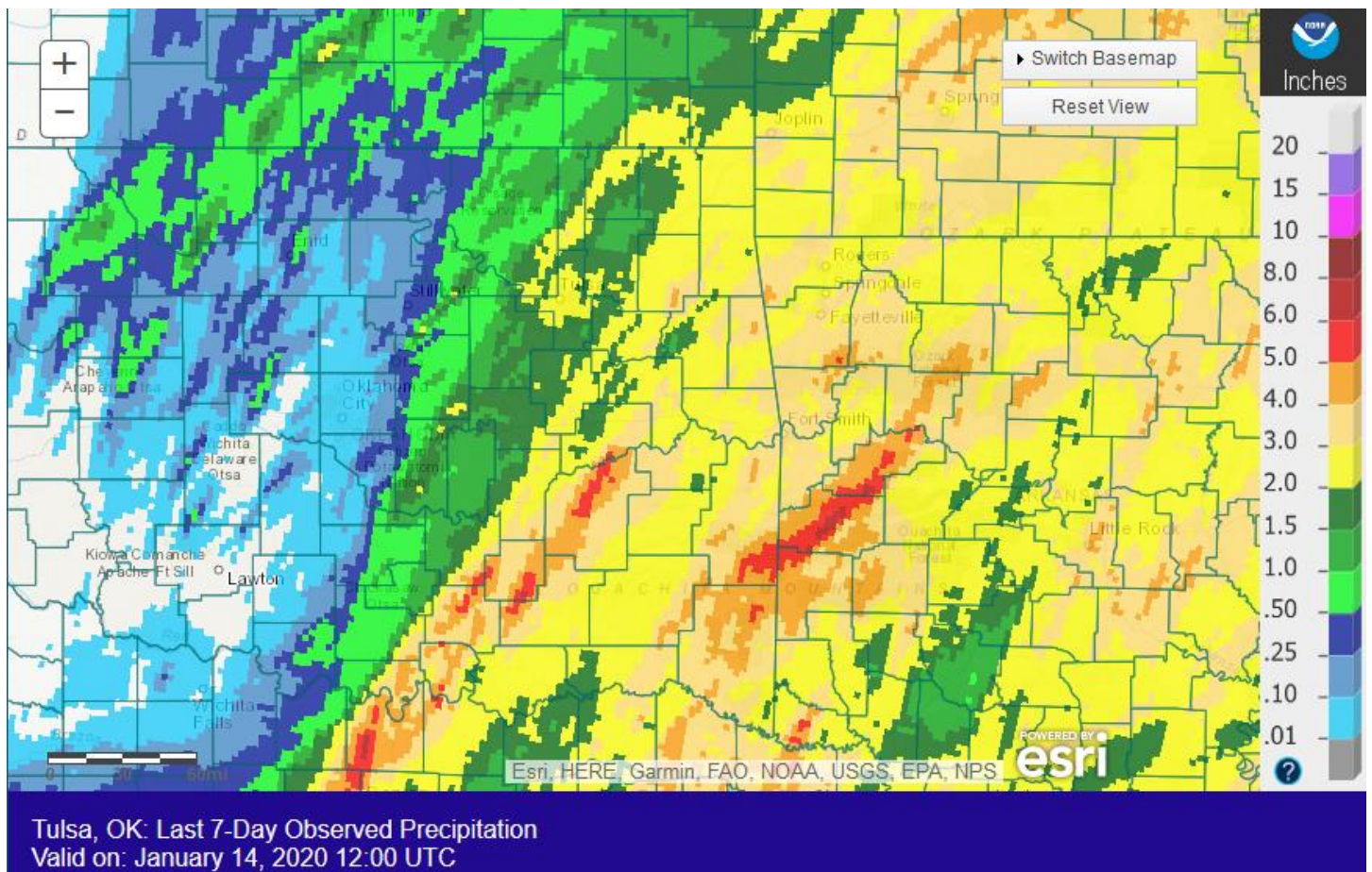
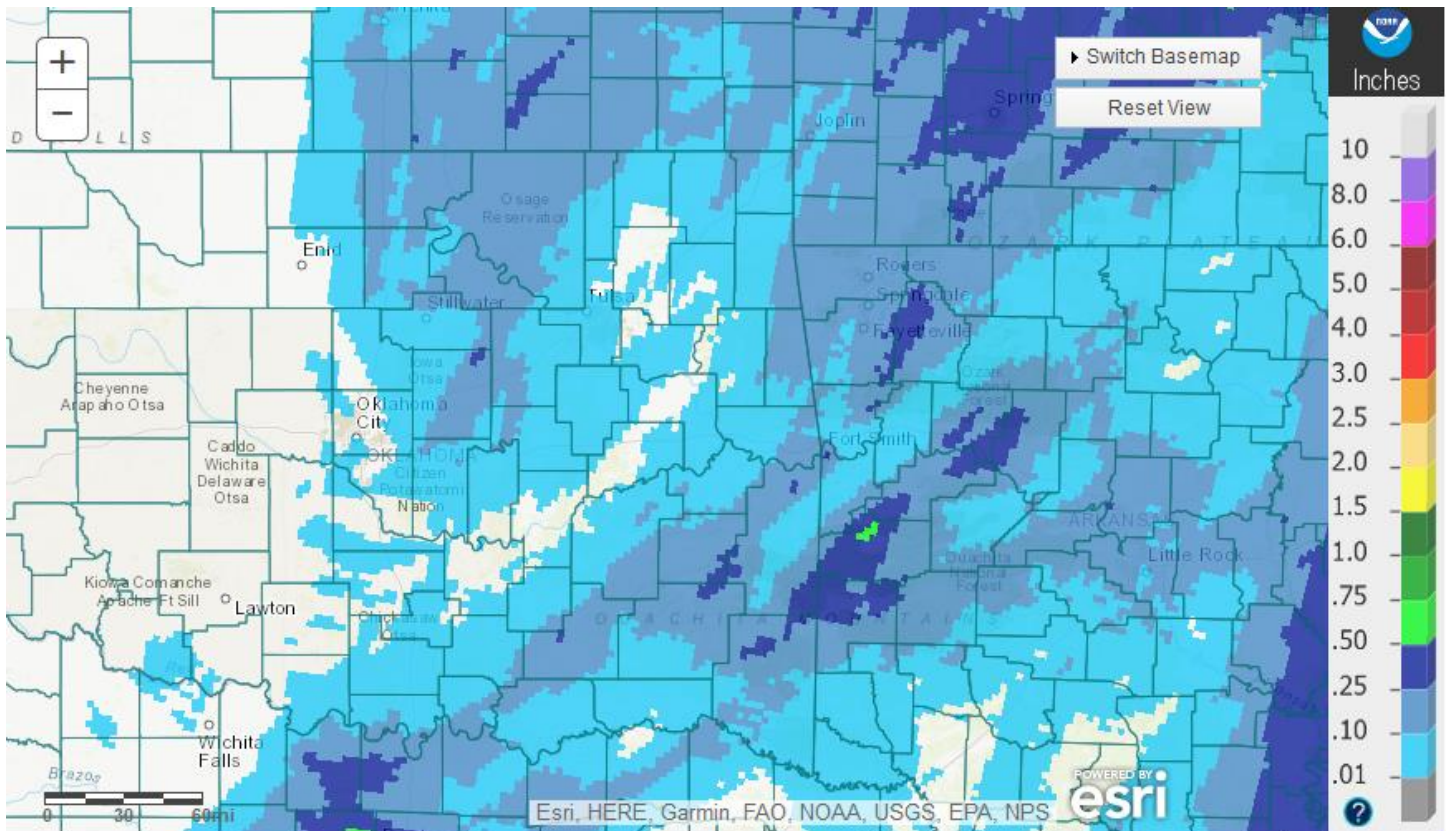


Fig. 9. 7-day Estimated Observed Rainfall ending at 6am CST 1/14/2020.



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

Fig. 10. 24-hour Estimated Observed Rainfall ending at 6am CST 1/12/2020.

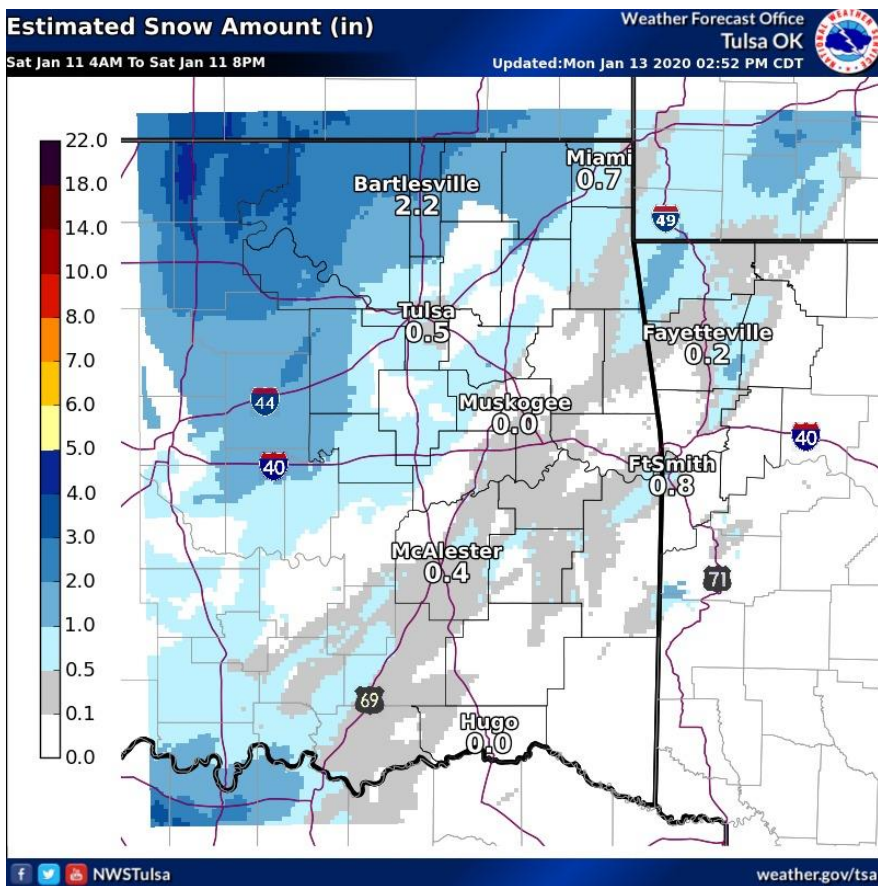


Fig. 11. Estimated sleet/snow accumulation for 1/11/2020.

Much colder air filtered in behind the cold front, with temperatures continuing to fall on the 11<sup>th</sup> as the upper-level low moved northeast across the area. By the morning of the 11<sup>th</sup>, sub-freezing surface temperatures were present across a large portion of eastern OK and northwest AR, resulting in a wintry mix of freezing rain, sleet, and snow. As the precipitation wrapped around the upper-level low, the entire column of air cooled to below freezing and it became all snow. The upper-level low and associated precipitation moved east of the area by mid-afternoon. A glaze of ice occurred in the areas affected by freezing rain, and sleet/snow accumulations ranged from a trace to 3" (Fig. 11). The rain/liquid equivalent totals were a trace to around 0.25" (Fig. 10).

Showers increased from the south and west during the afternoon and evening hours of the 16<sup>th</sup> as warm air advection increased ahead of a shortwave trough. Precipitation increased through the evening hours, becoming more widespread as a cold front and upper-level trough approached the region. The precipitation continued through the overnight and morning hours of the 17<sup>th</sup> across much of eastern OK and northwest AR. With temperatures near freezing, some pockets of sleet occurred, as well as some light icing on elevated surfaces, across far northeast OK and the higher elevations of northwest AR. The rain continued, but became more scattered, during the daylight hours. Scattered activity continued through the evening, finally coming to an end from west to east as the cold front moved through the region overnight. The front and associated rain ended by sunrise on the 18<sup>th</sup>. Rainfall totals over the two days were generally 0.25" to 2" across eastern OK and northwest AR (Figs. 12-14). This rainfall led to rises on area rivers, especially across northeast OK. However, only the Neosho River near Commerce neared flood stage (see preliminary hydrographs at the end of this report).

Just before midnight on the 22<sup>nd</sup>, a large area of precipitation moved east across the southern Plains and into eastern OK within an area of warm air advection and strong low-level jet. This activity continued to progress eastward overnight, reaching western AR by 4 am. Temperature profiles supported a mix of wintry precipitation during the overnight and morning hours, with rain, snow, sleet, and freezing rain reported. A trace to 2" of snow/sleet and a glazing of ice occurred across eastern OK and northwest AR (Figs. 15, 16). Most of the precipitation had moved east of the area by mid-day, through scattered precipitation lingered through the afternoon and early evening in northwest AR. During the evening, a band of showers developed over eastern OK along a weak cold front and continued eastward through the overnight hours. The precipitation finally came to an end shortly after sunrise on the 23<sup>rd</sup>. Rainfall and liquid equivalent totals were 0.30" to around 0.75" across eastern OK and northwest AR (Figs. 17, 18).

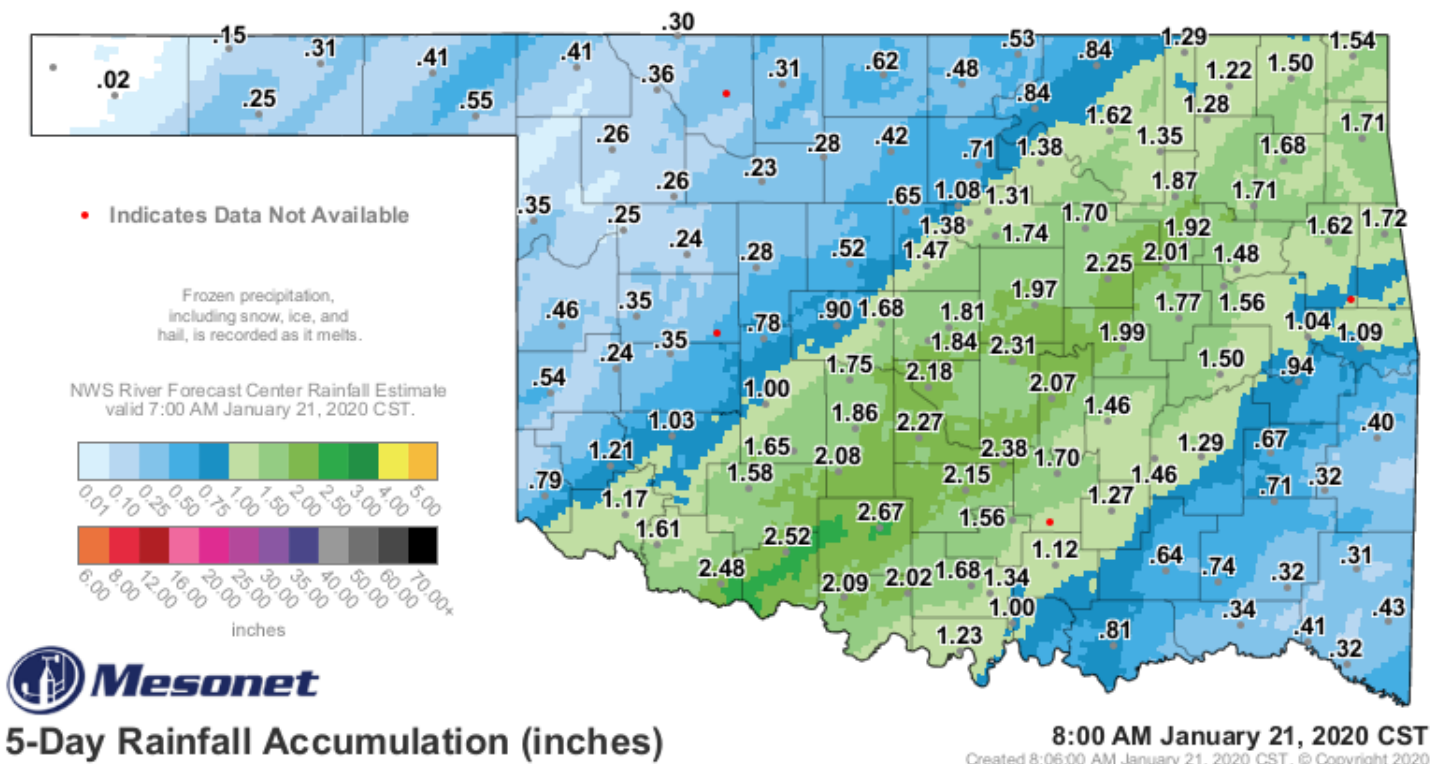
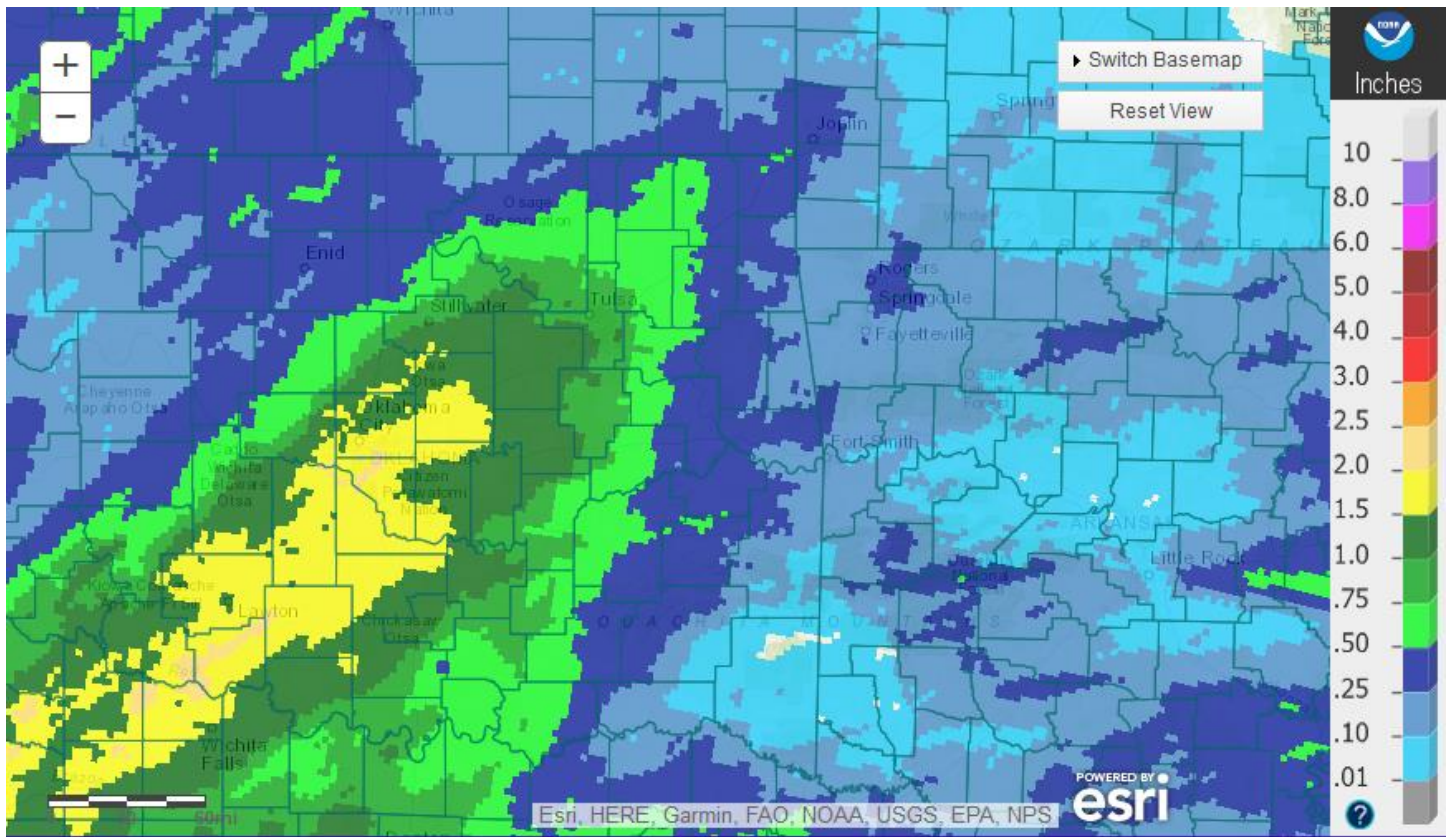
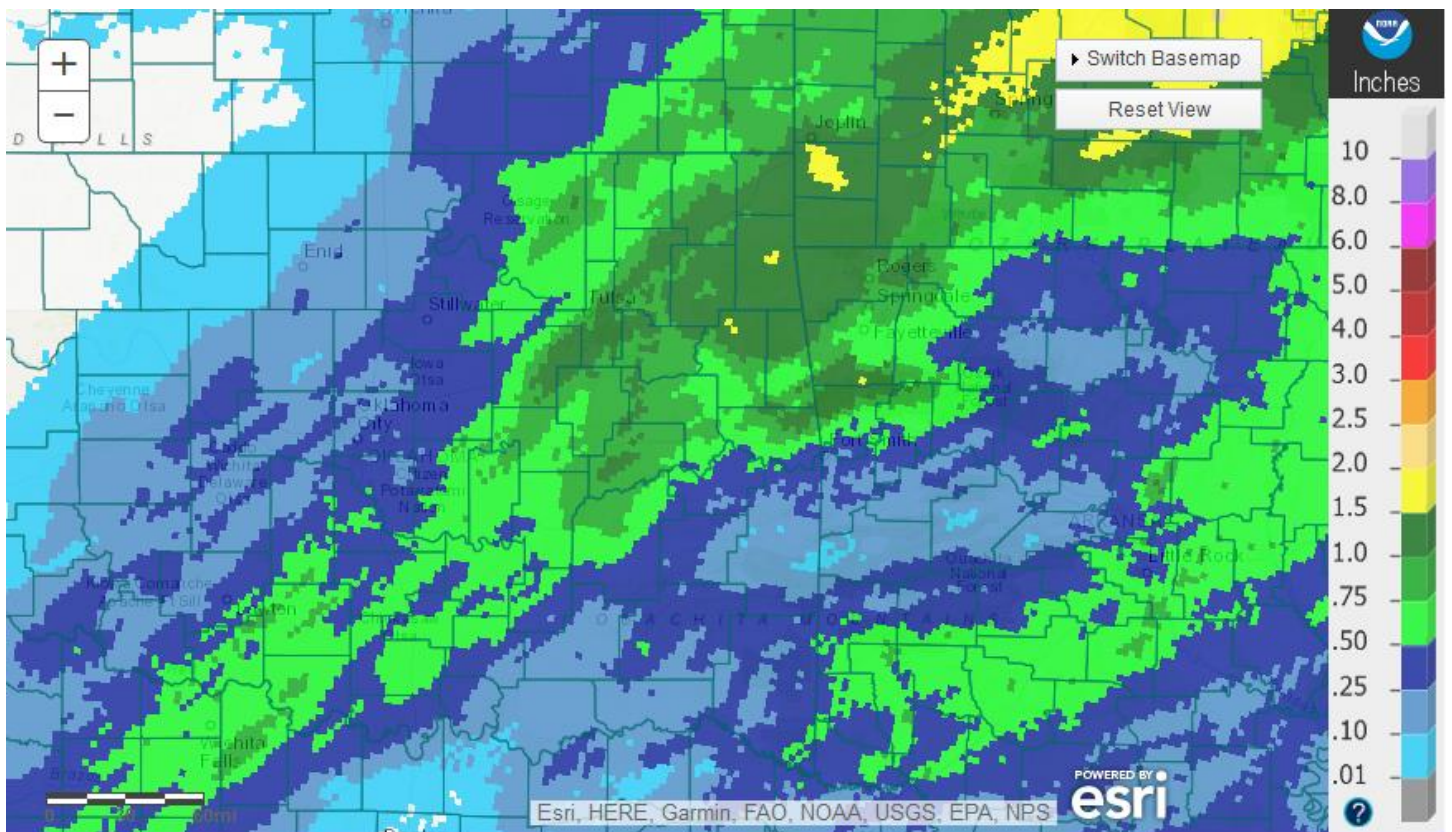


Fig. 12. OK Mesonet (values) and NWS RFC rainfall estimate (image) 5-day rainfall ending at 8:00 am CDT 1/21/2020.



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

Fig. 13. 24-hour Estimated Observed Rainfall ending at 6am CST 1/17/2020.



Tulsa, OK: January 18, 2020 1-Day Observed Precipitation  
Valid on: January 18, 2020 12:00 UTC

Fig. 14. 24-hour Estimated Observed Rainfall ending at 6am CST 1/18/2020.

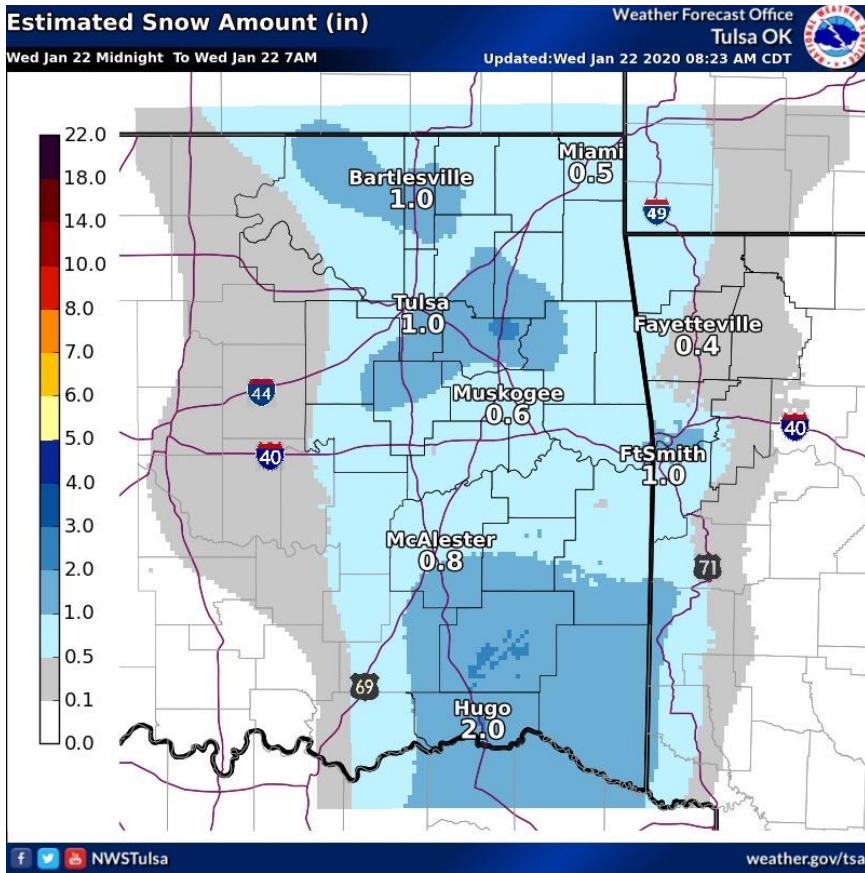


Fig. 15. Estimated sleet/snow accumulation for 1/22/2020.

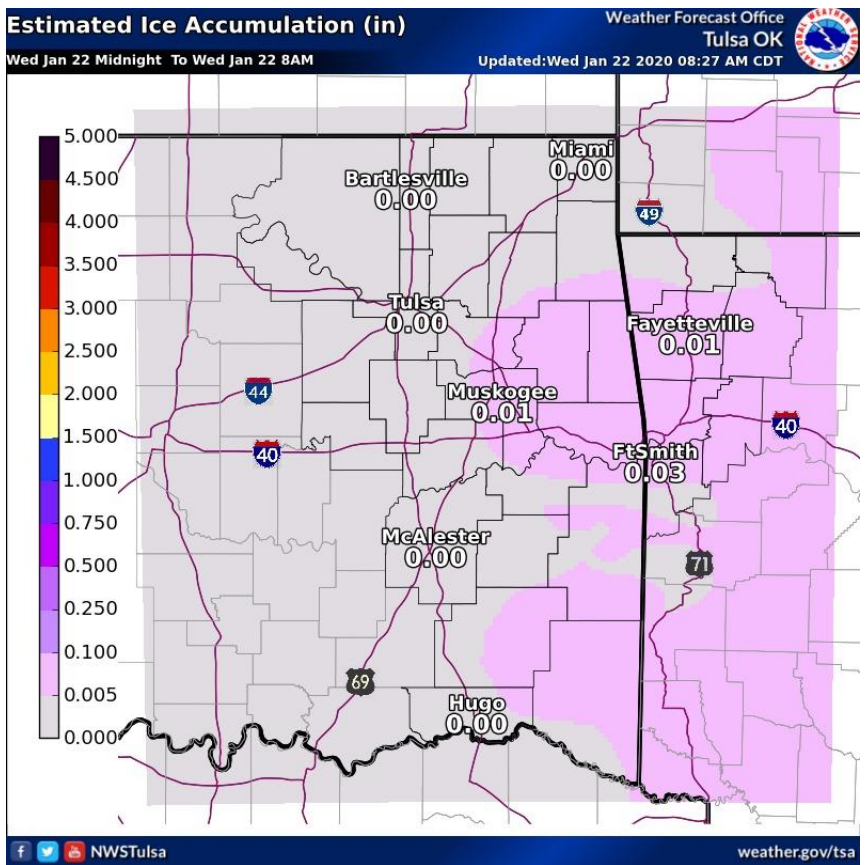
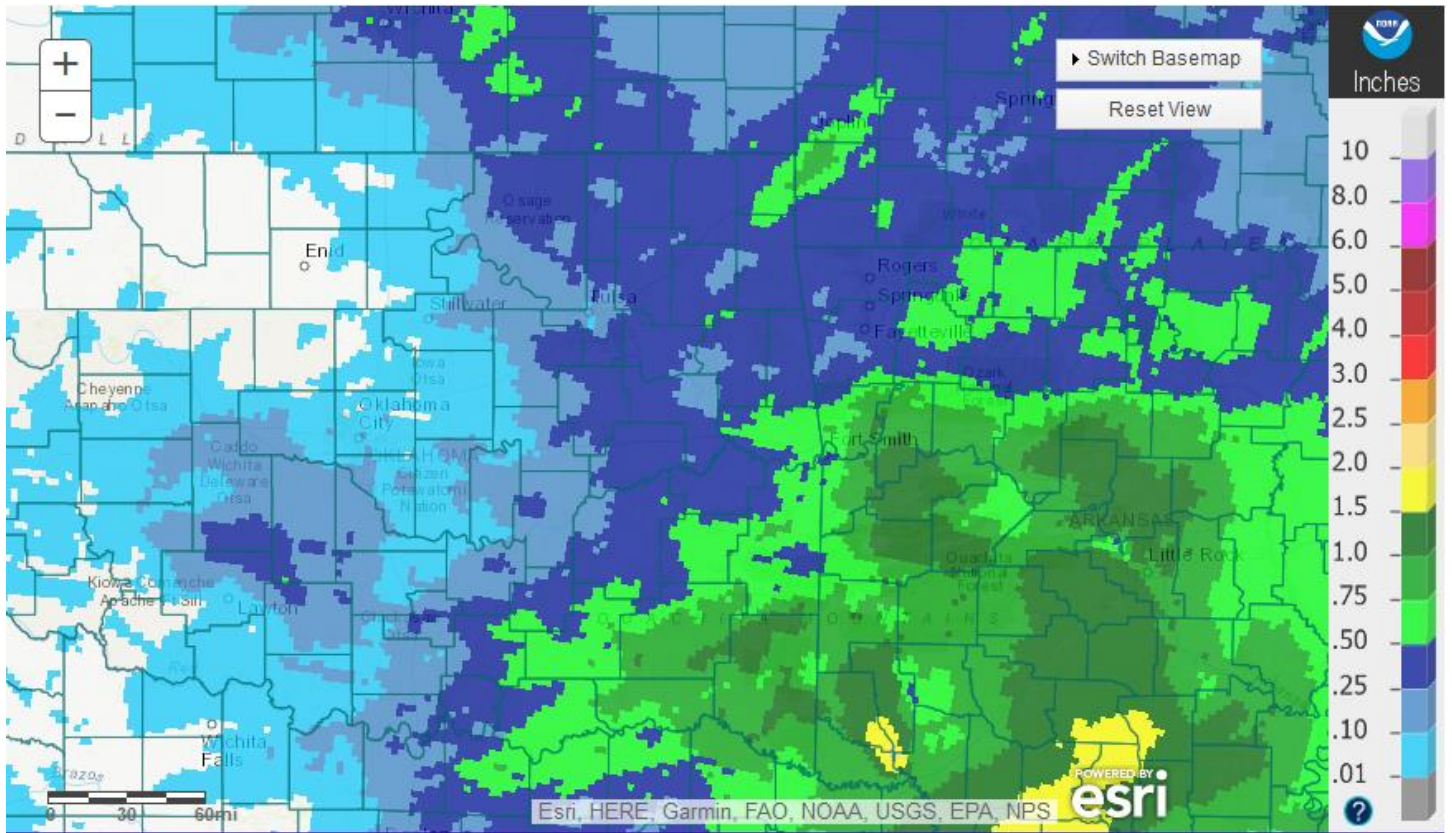


Fig. 16. Estimated ice accumulation for 1/22/2020.



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

Fig. 17. 24-hour Estimated Observed Rainfall ending at 6am CST 1/23/2020.

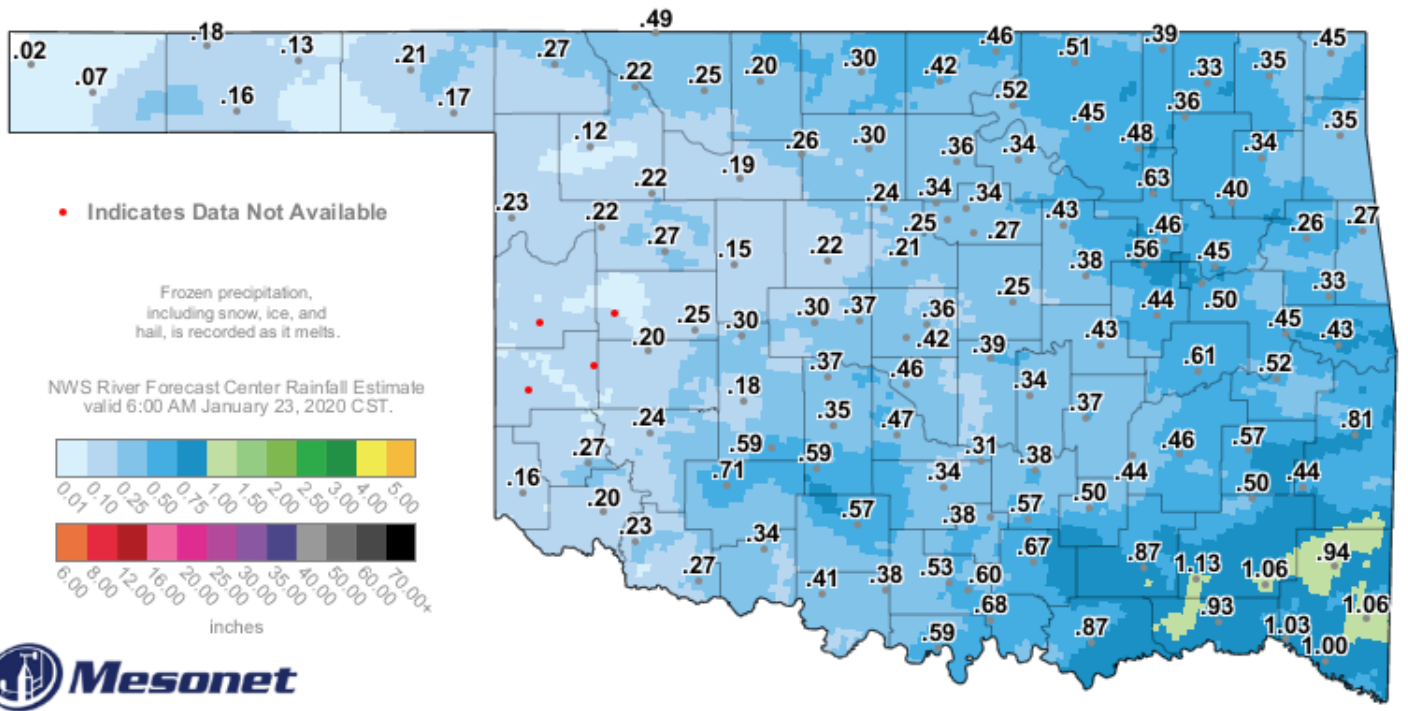


Fig. 18. OK Mesonet (values) and NWS RFC rainfall estimate (image) 2-day rainfall ending at 7:05 am CDT 1/23/2020.

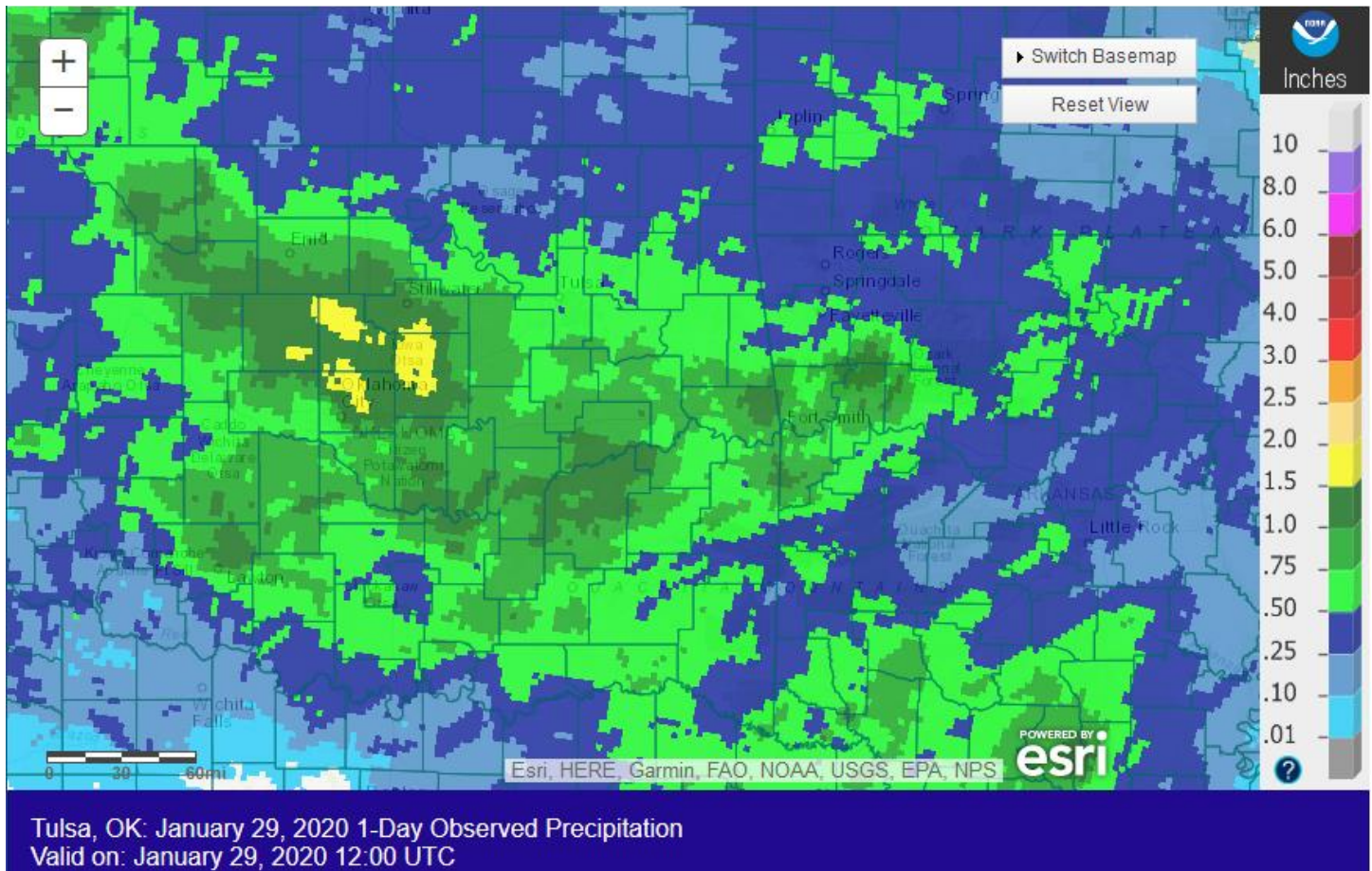


Fig. 19. 24-hour Estimated Observed Rainfall ending at 6am CST 1/29/2020.

Showers expanding across eastern OK from the southeast during the pre-dawn hours of the 28<sup>th</sup> as an upper-level storm system tracked east along the Red River. The widespread rain continued for much of the day across eastern OK and northwest AR, becoming more scattered by the evening hours. Most of the rain moved east of the area shortly after midnight on the 29<sup>th</sup>, though patches of light rain, some snow flurries, and drizzle lingered through the morning hours. Rainfall totals were 0.25"-1" across eastern OK and northwest AR (Fig. 19).

Written by:  
Nicole McGavock  
Service Hydrologist  
WFO Tulsa

**Products issued in January 2020:**

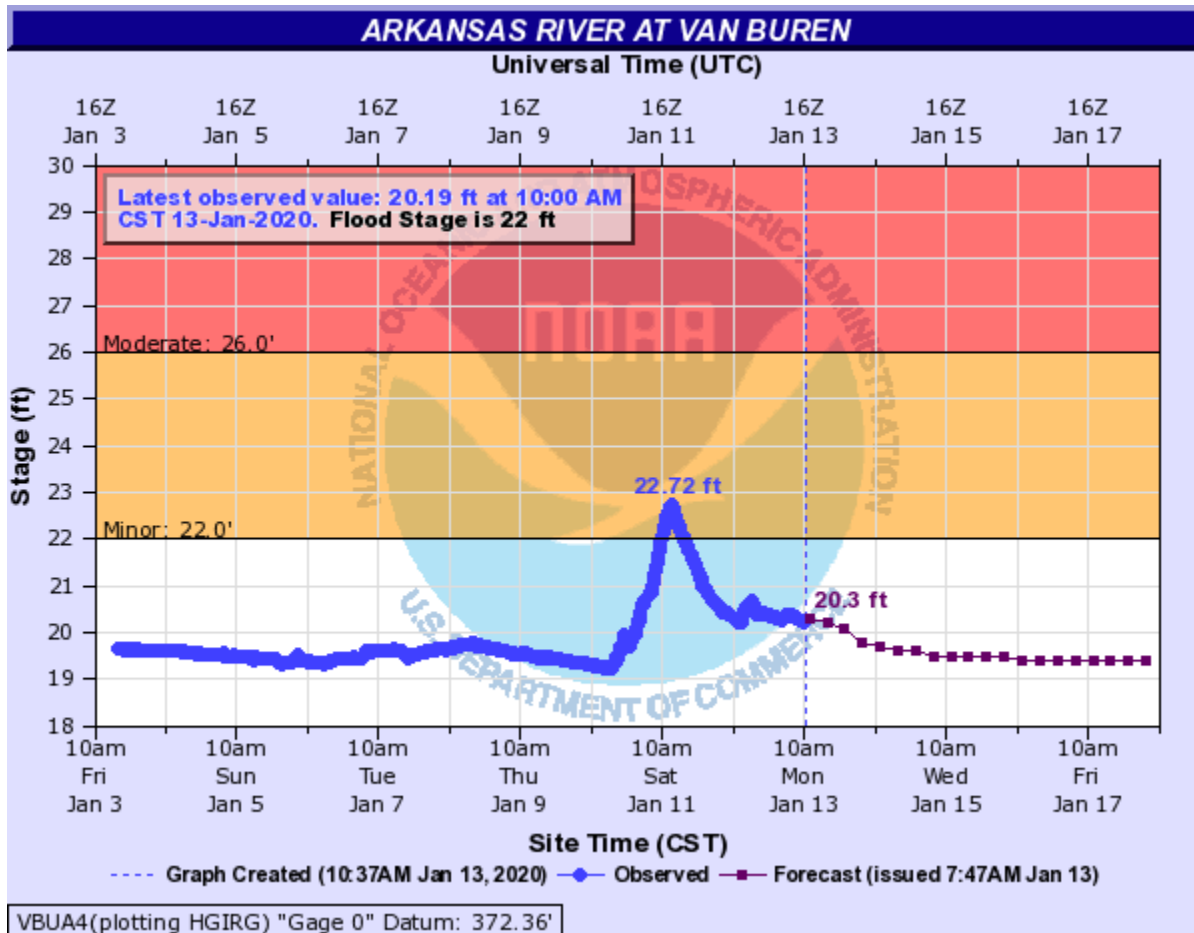
- \*CWYO2 became a daily river forecast point September 7, 2016
- \*MLBA4 and OZGA4 transferred to NWS Tulsa HSA February 5, 2014
- \*Mixed case River Flood products began July 31, 2013

- 3 Flash Flood Warnings (FFW)
- 3 Flash Flood Statements (FFS)
- 1 Flash/Areal Flood Watches (FFA) (3 Watch FFA CON/EXT/EXA/EXB/CAN)
- 5 Urban and Small Stream Advisories (FLS)
- 3 Areal Flood Warnings (FLW)
- 0 Areal Flood Statements (FLS)



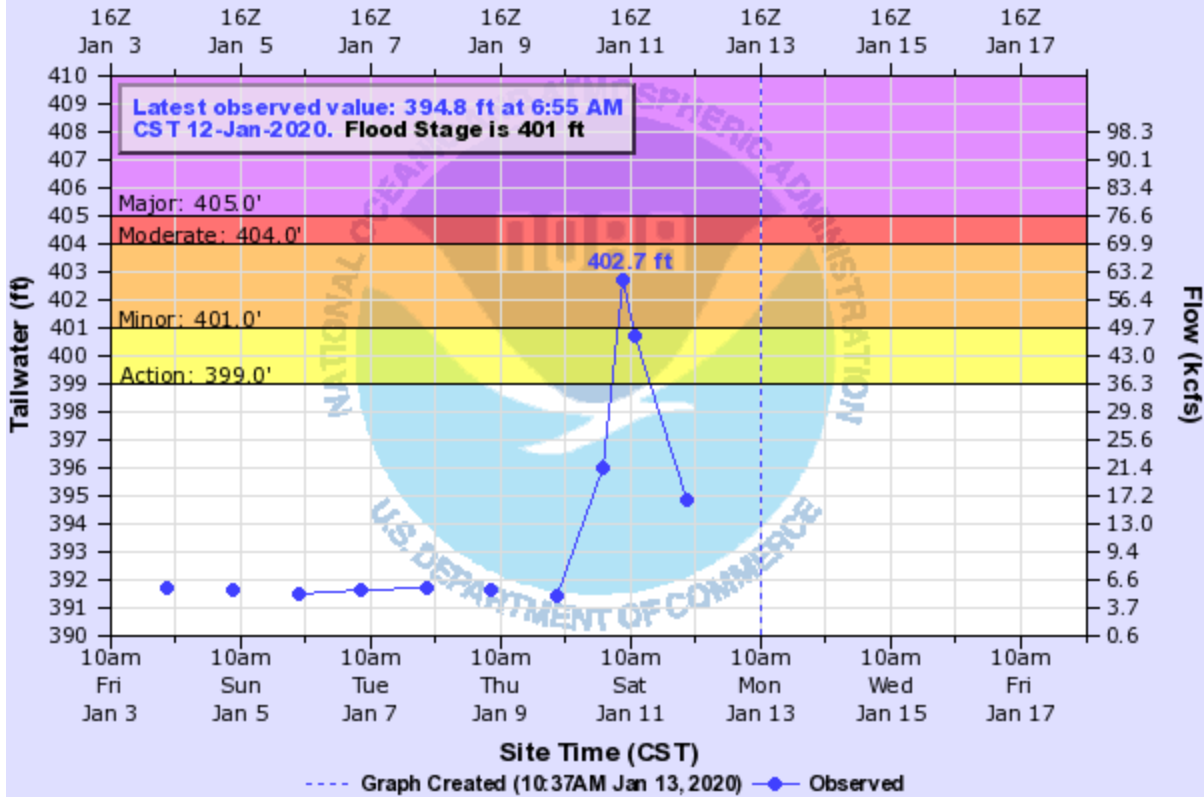
- 19 River Flood Warnings (FLW) (includes category increases)
- 138 River Flood Statements (FLS)
- 6 River Flood Advisories (FLS) (38 Advisory FLS CON/EXT/CAN)
- 1 River Flood Watches (FFA) (2 Watch FFA CON/EXT/CAN)
- 0 River Statements (RVS)
- 0 Hydrologic Outlooks (ESF)
- 0 Drought Information Statements (DGT)

**Preliminary Hydrographs:**



## LEE CREEK NEAR VAN BUREN LCR

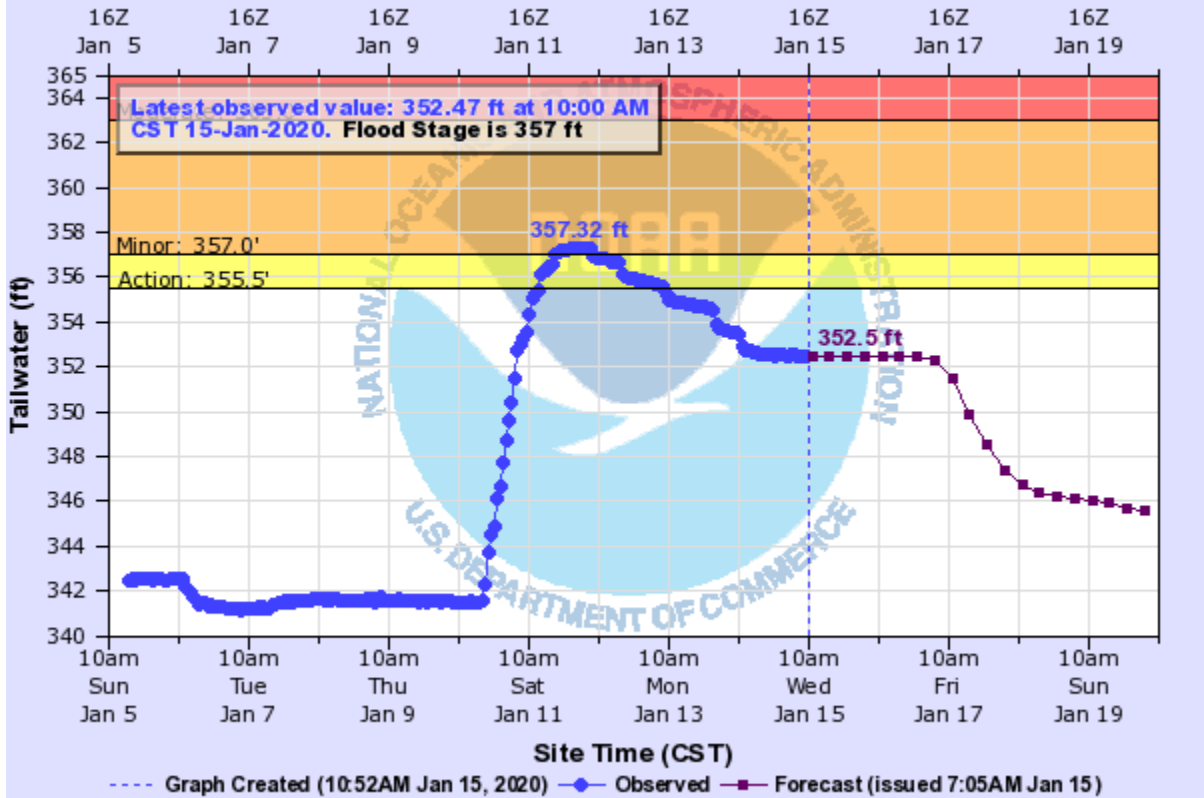
Universal Time (UTC)



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

## ARKANSAS RIVER AT OZARK L/D TAILWATER

Universal Time (UTC)

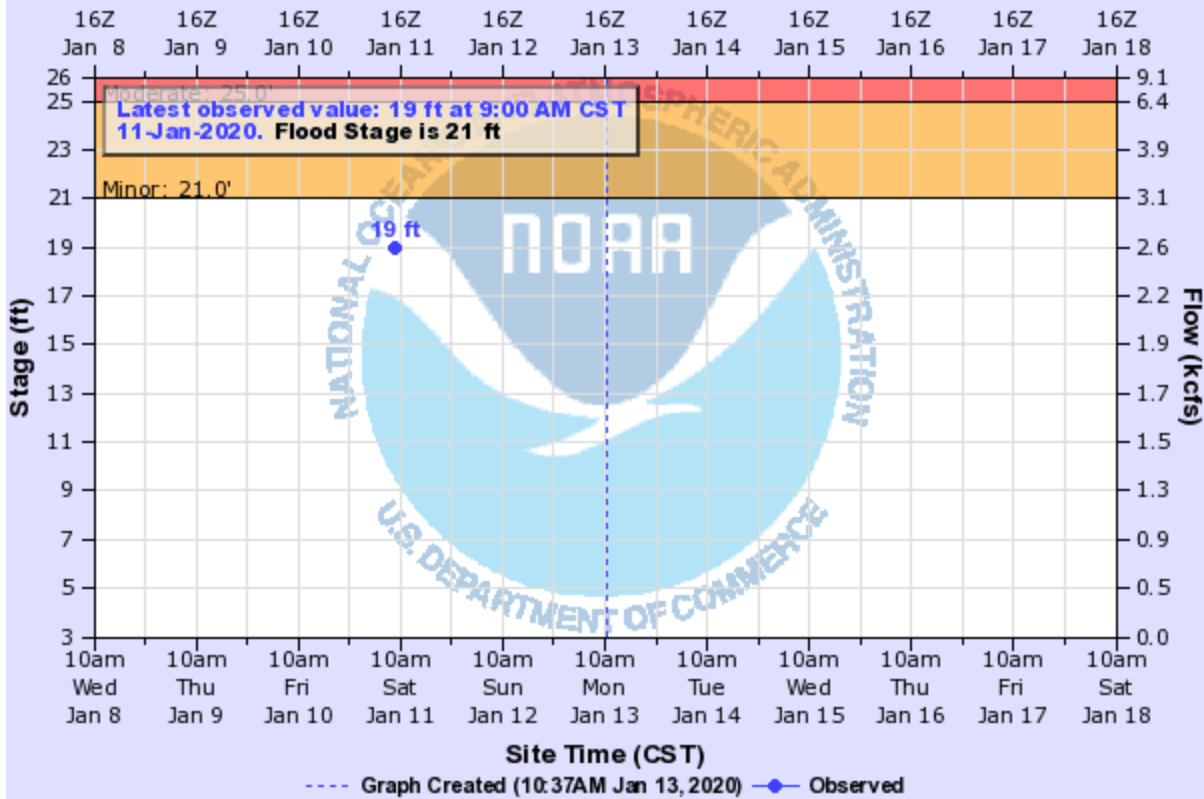


OZGA4(plotting HTIRG) "Gage 0" Datum: 0'

Observations courtesy of US Army Corps of Engineers - LRD

### POLECAT CREEK NEAR SAPULPA

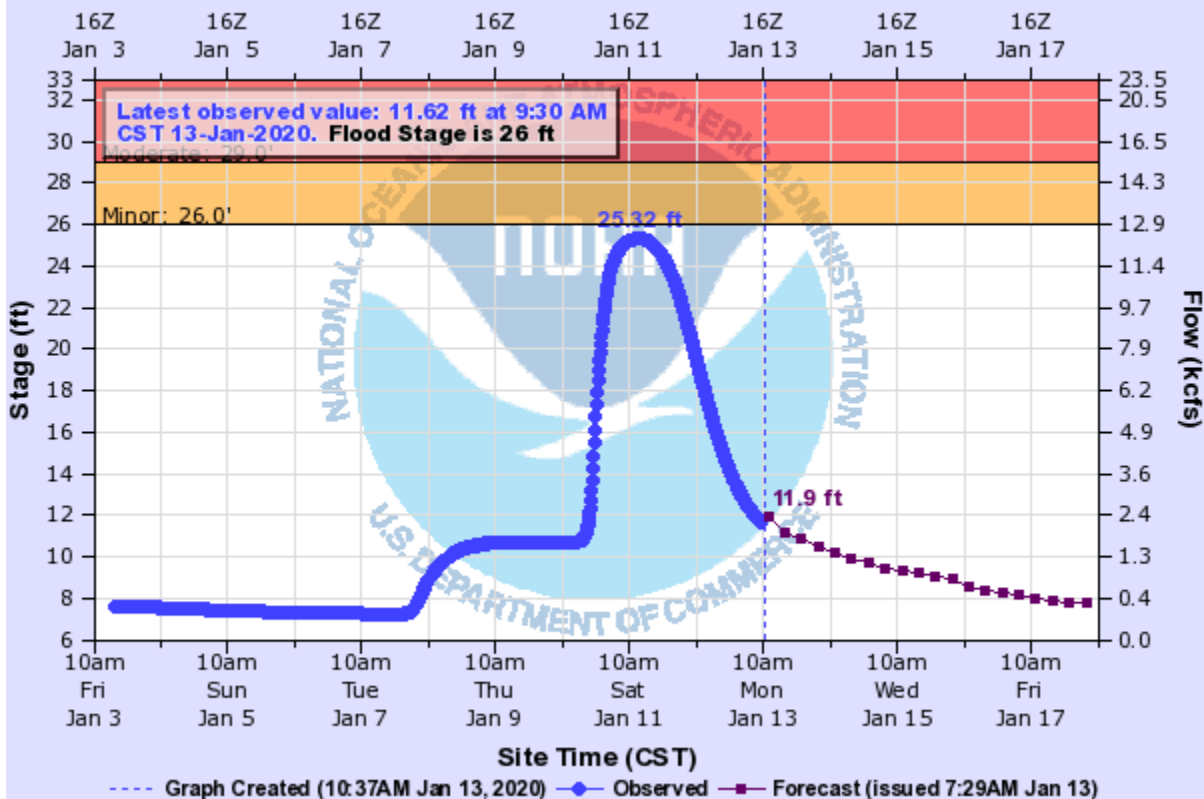
Universal Time (UTC)



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

### CANEY RIVER NEAR COLLINSVILLE

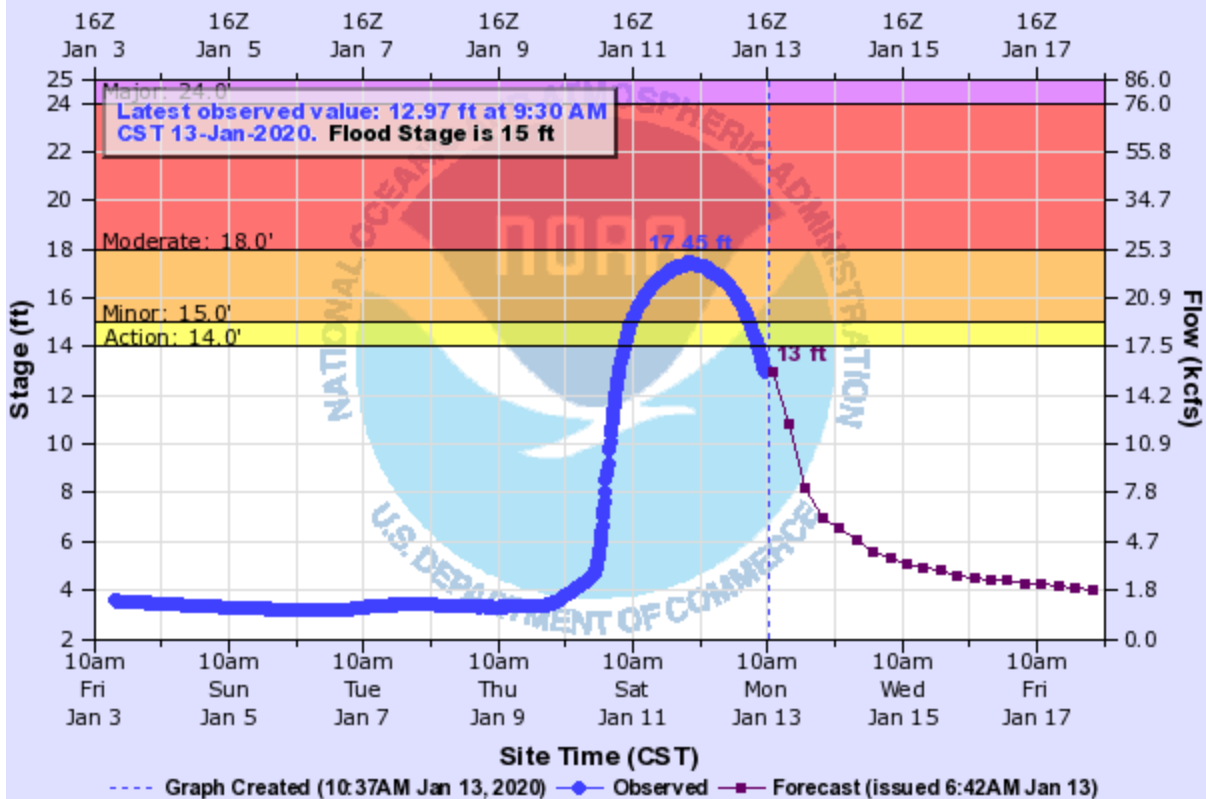
Universal Time (UTC)



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

## NEOSHO RIVER NEAR COMMERCE

Universal Time (UTC)

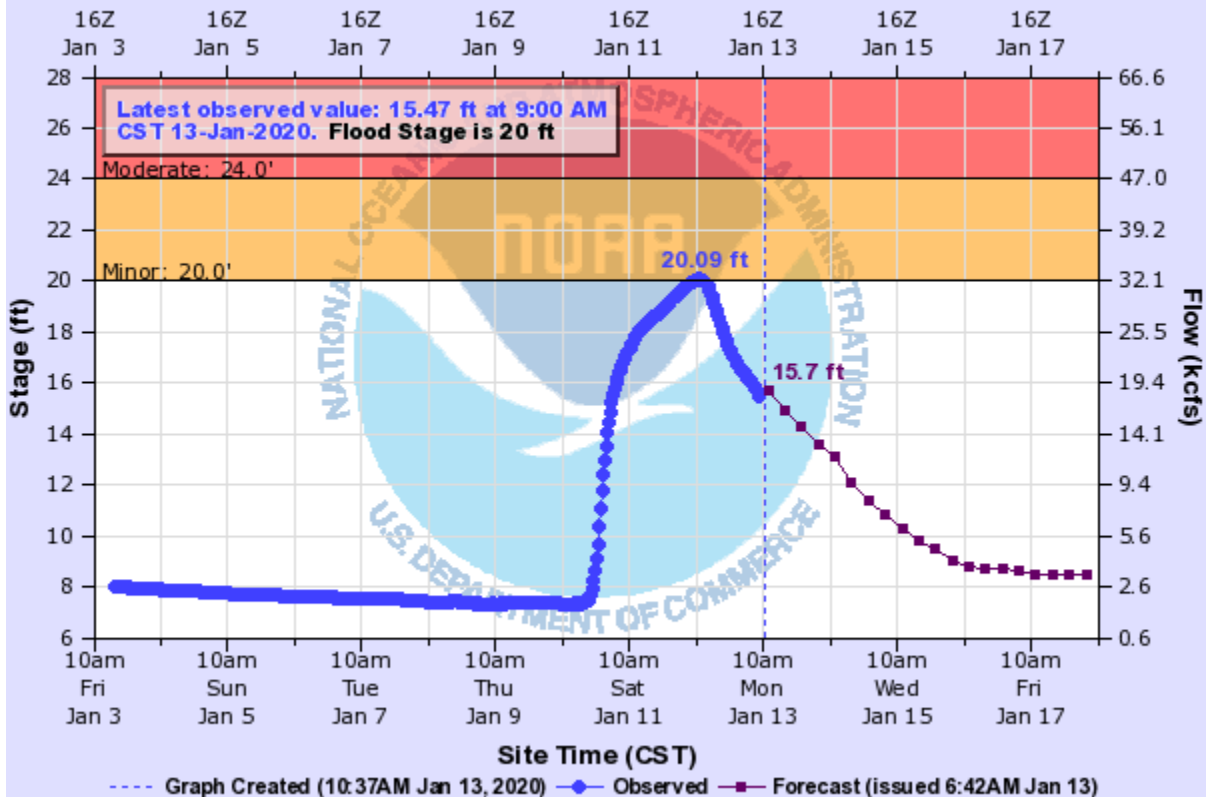


COMO2(plotting HGIRG) "Gage 0" Datum: 748.97'

Observations courtesy of US Geological Survey

## SPRING RIVER NEAR QUAPAW

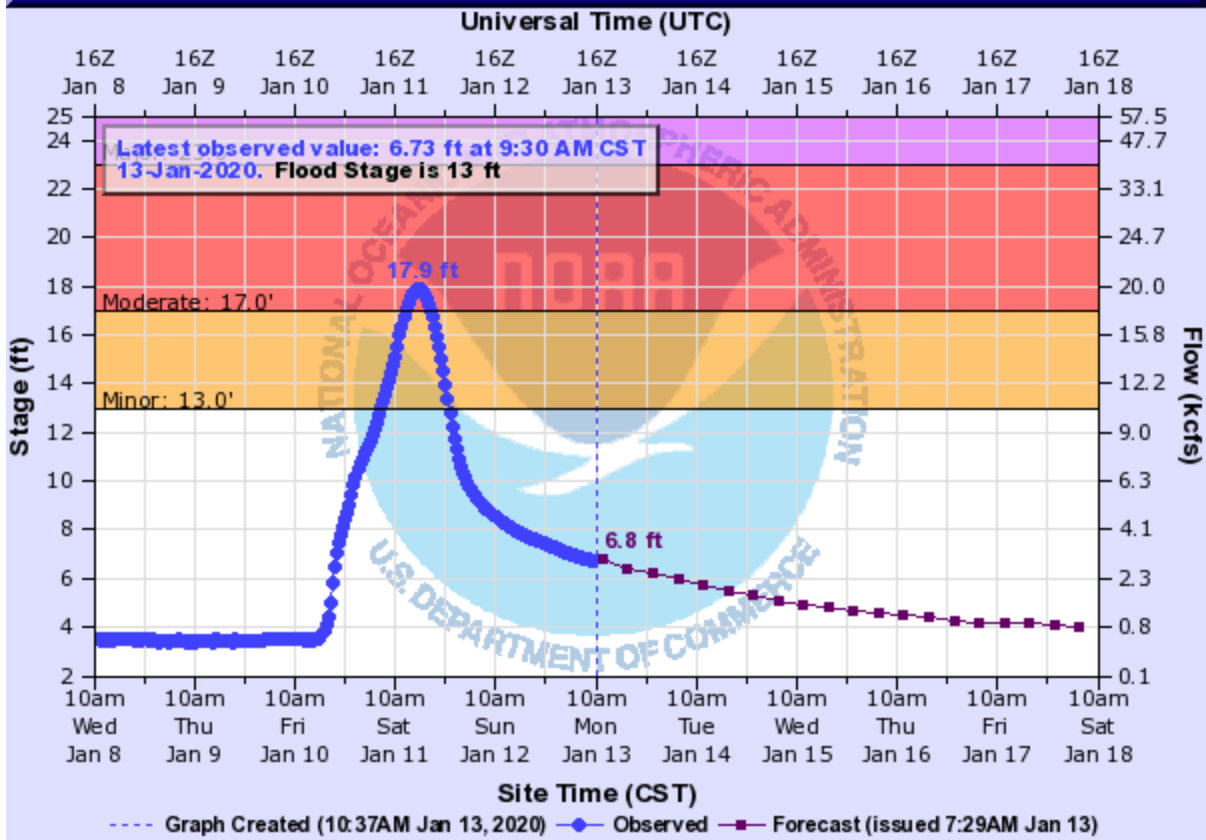
Universal Time (UTC)



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

Observations courtesy of US Geological Survey

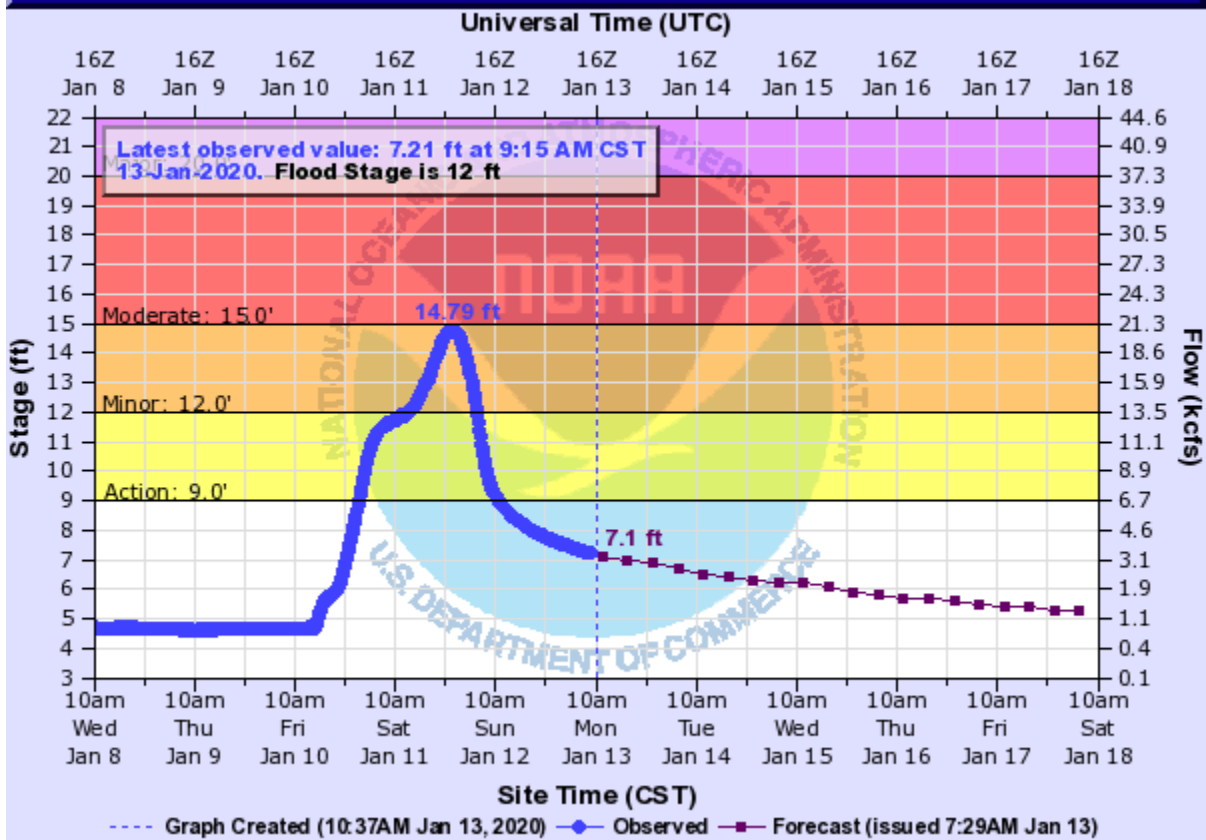
## ILLINOIS RIVER (AR OK) NEAR WATTS



WT02(plotting HGIRG) "Gage 0" Datum: 893.78'

Observations courtesy of US Geological Survey

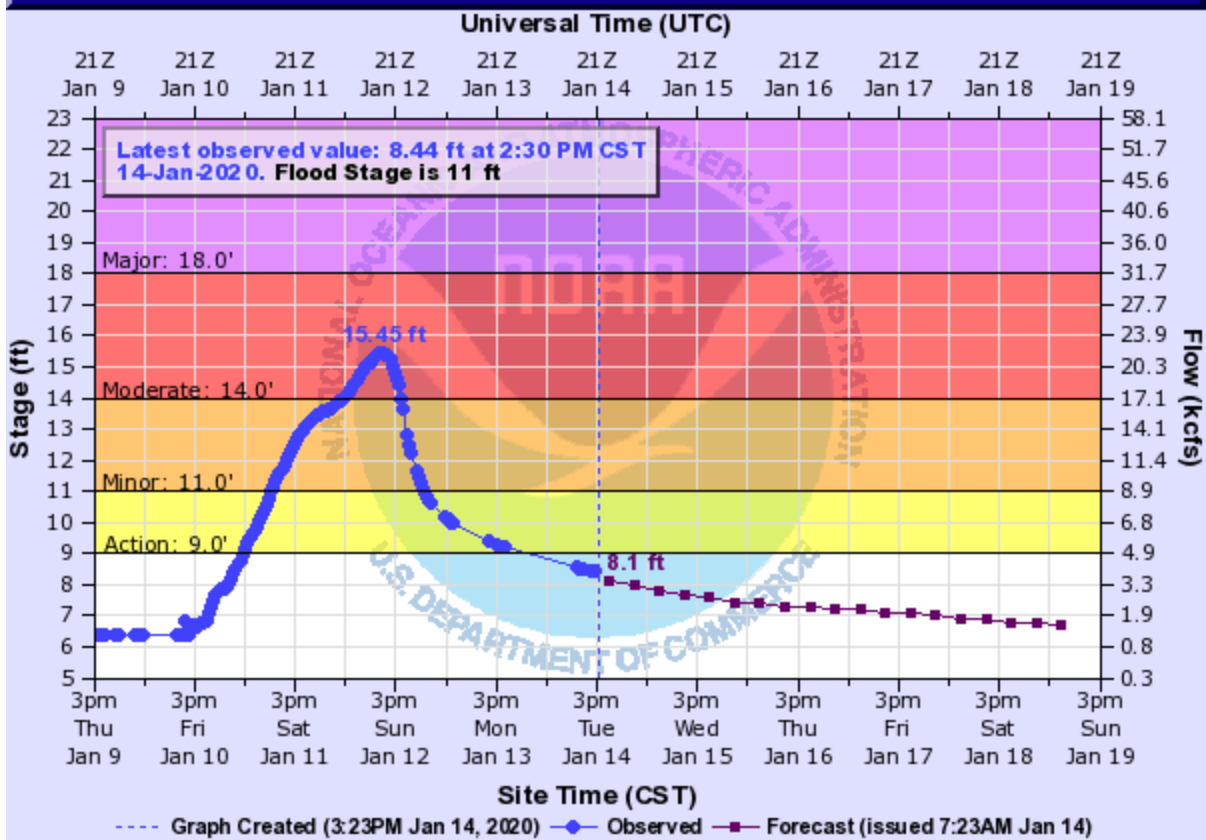
## ILLINOIS RIVER (AR OK) AT CHEWEY



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

Observations courtesy of US Geological Survey

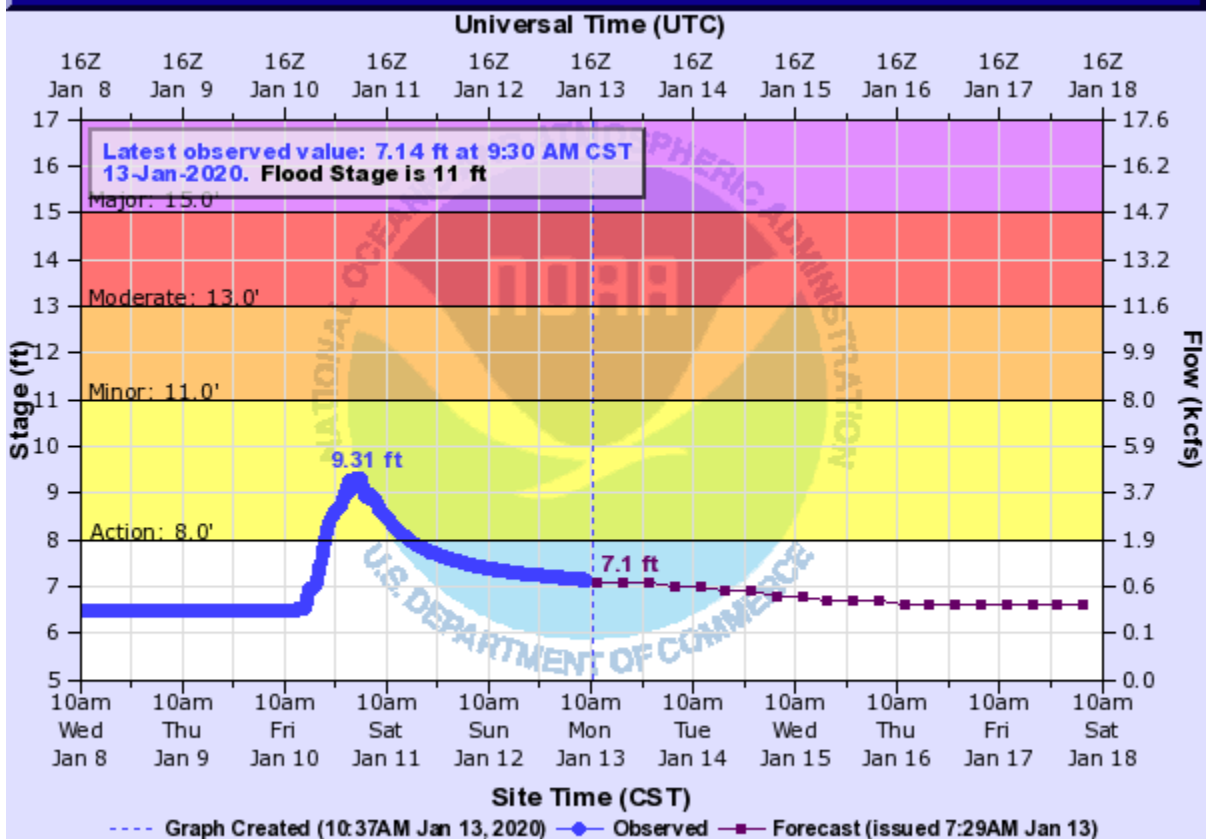
## ILLINOIS RIVER (AR OK) NEAR TAHLEQUAH



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

Observations courtesy of US Geological Survey

## FLINT CREEK (OK) NEAR KANSAS

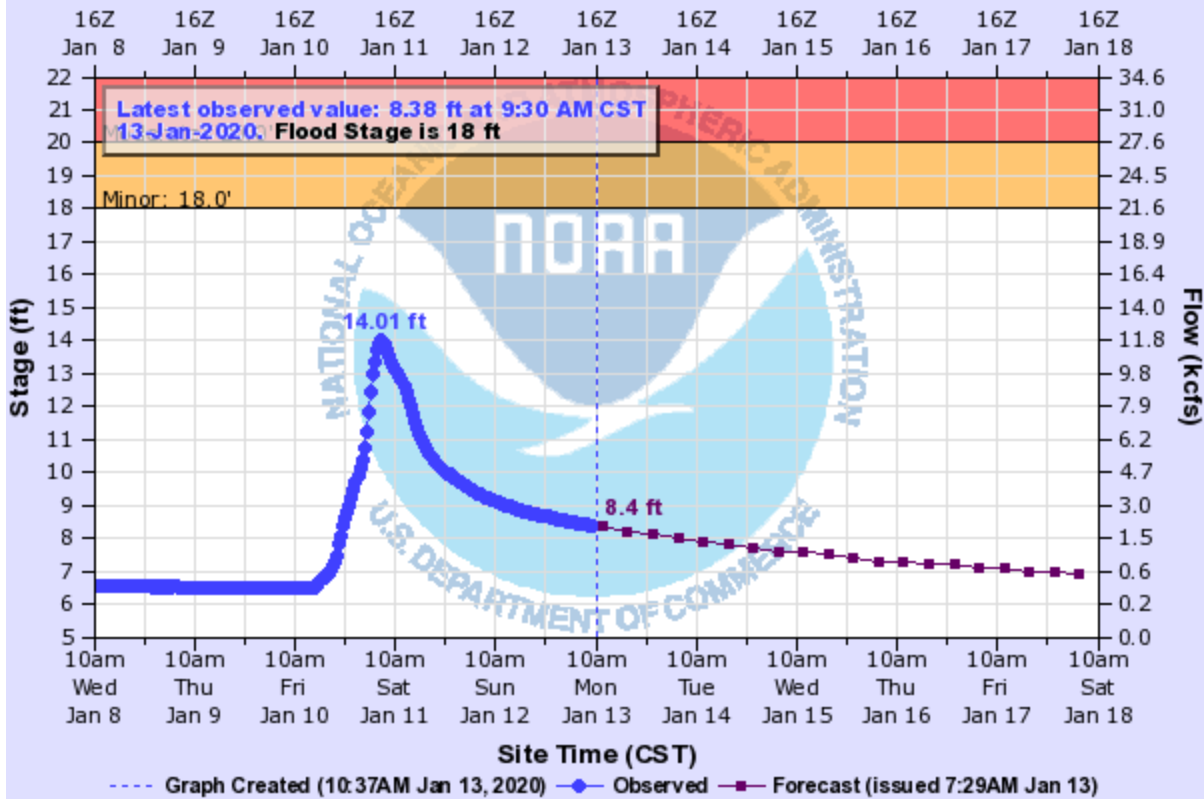


KNSO2(plotting HGIRG) "Gage 0" Datum: 854.59'

Observations courtesy of US Geological Survey

## BARON FORK AT ELDON

Universal Time (UTC)

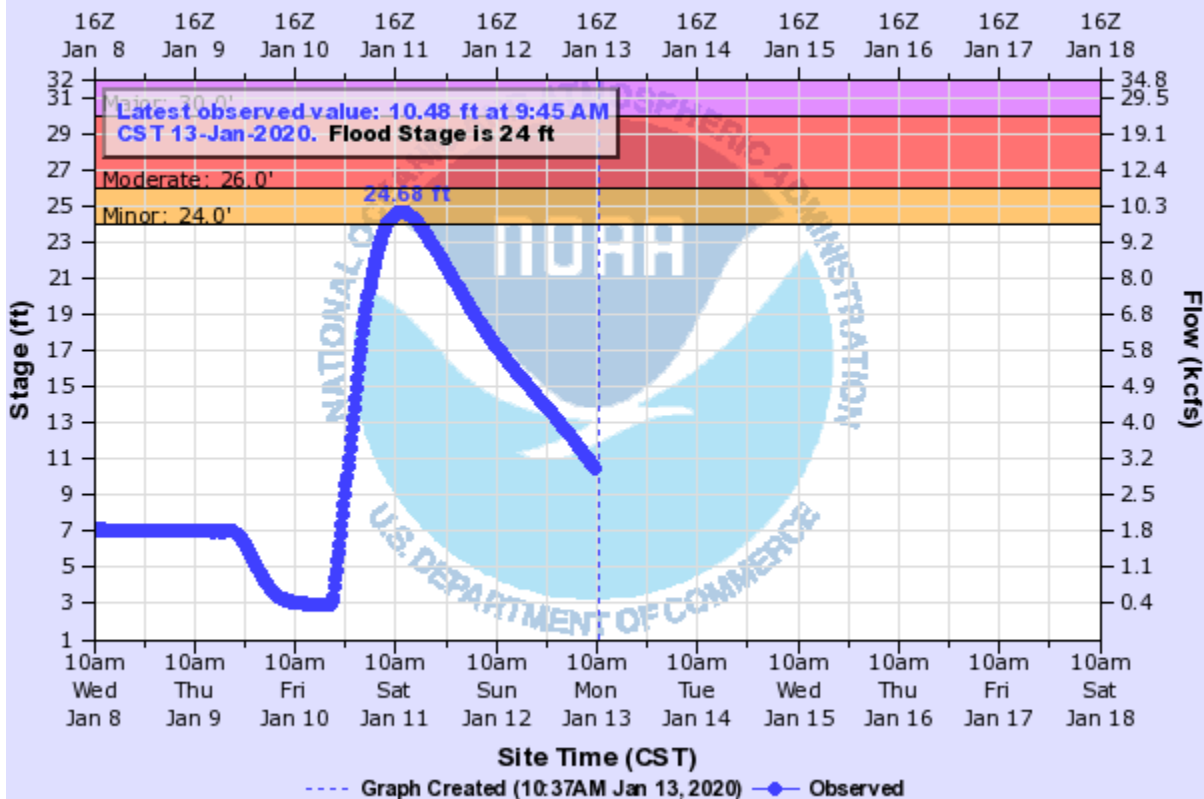


ELDO2(plotting HGIRG) "Gage 0" Datum: 701.14'

Observations courtesy of US Geological Survey

## POTEAU RIVER NEAR POTEAU

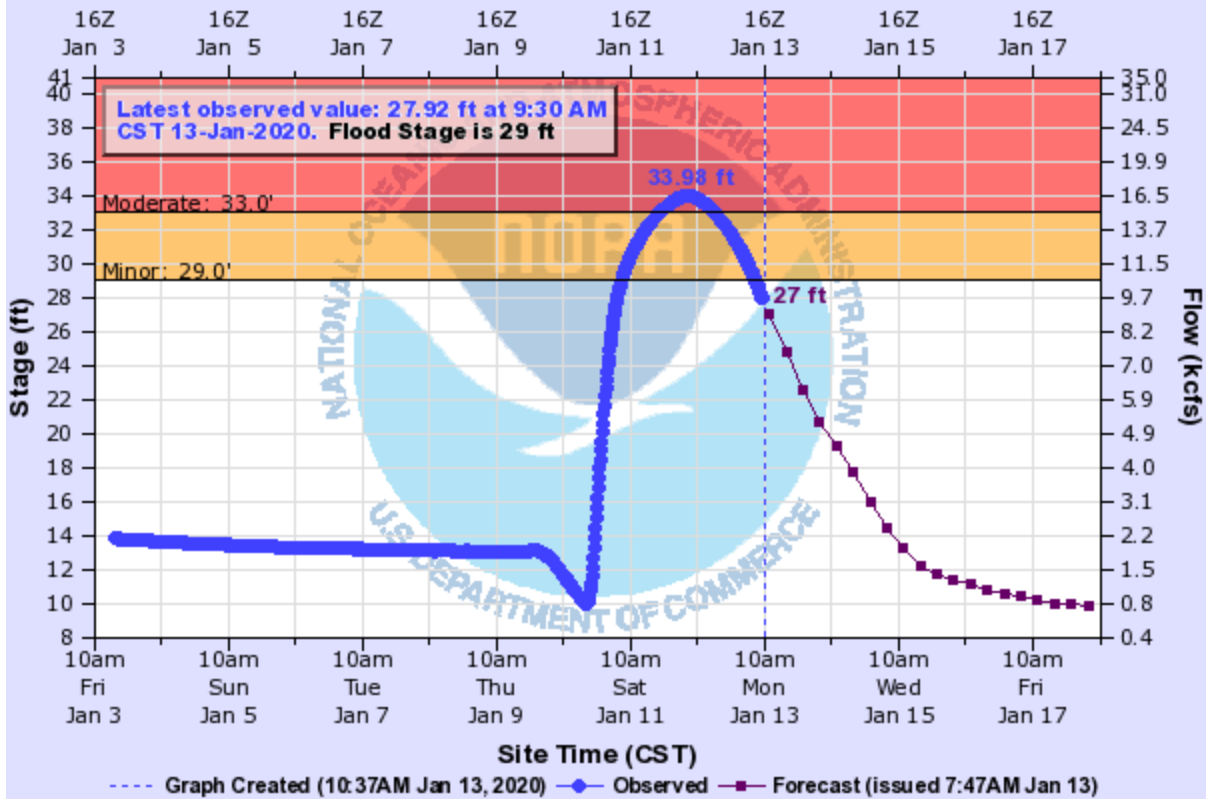
Universal Time (UTC)



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

## POTEAU RIVER NEAR PANAMA

Universal Time (UTC)

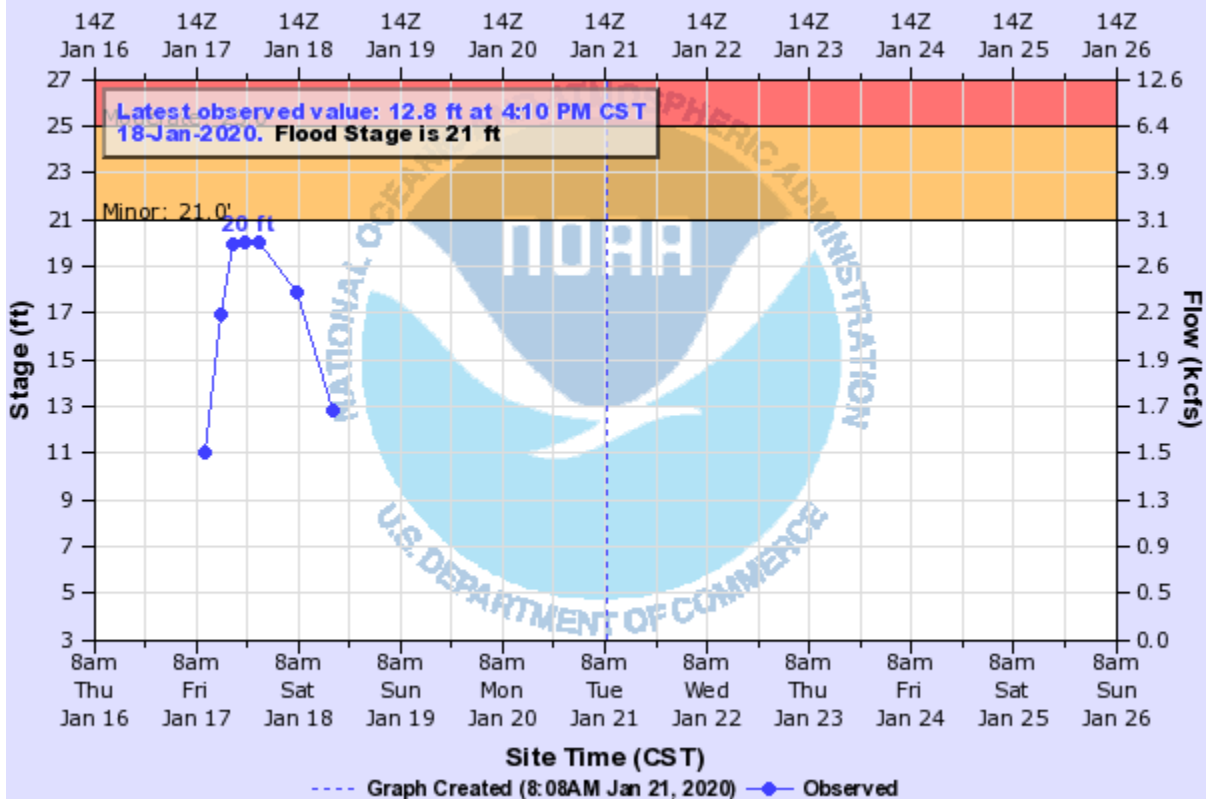


PANO2(plotting HGIRG) "Gage 0" Datum: 387.96'

Observations courtesy of US Geological Survey

## POLECAT CREEK NEAR SAPULPA

Universal Time (UTC)

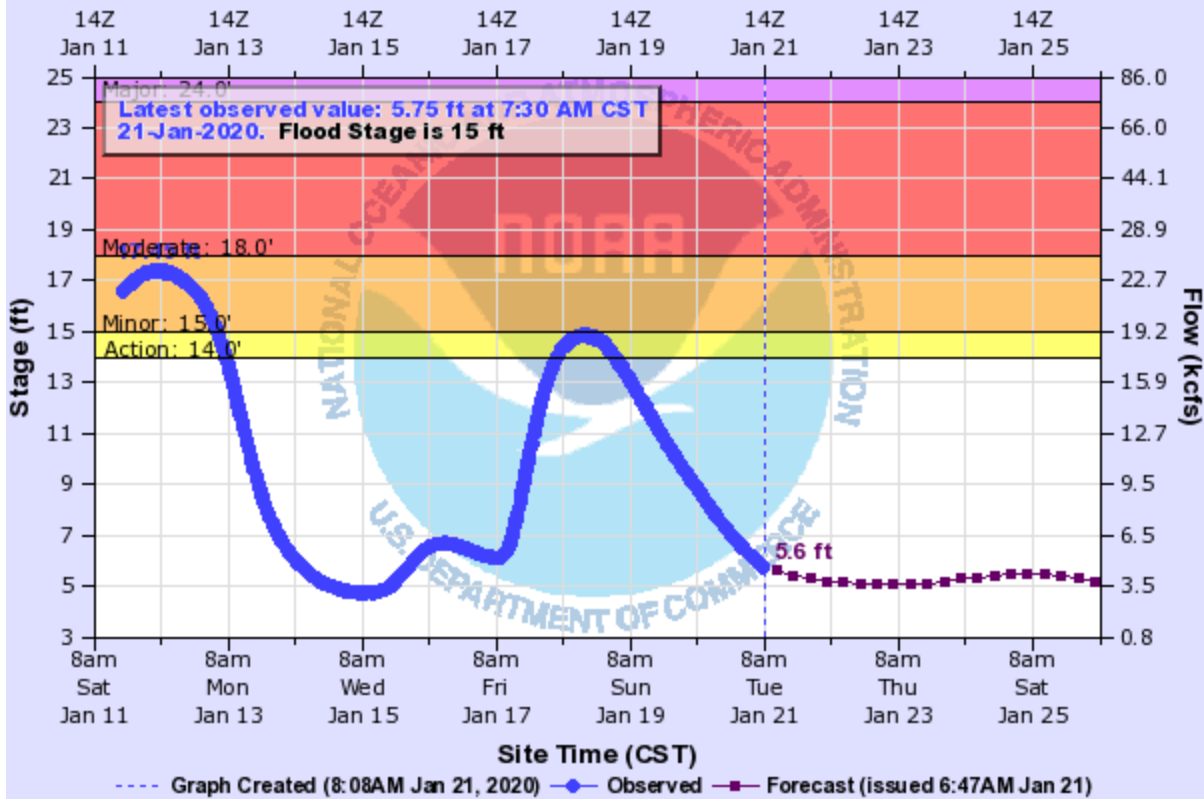


SPCO2(plotting HGIRZ) "Gage 0" Datum: 626.2'



## NEOSHO RIVER NEAR COMMERCE

Universal Time (UTC)

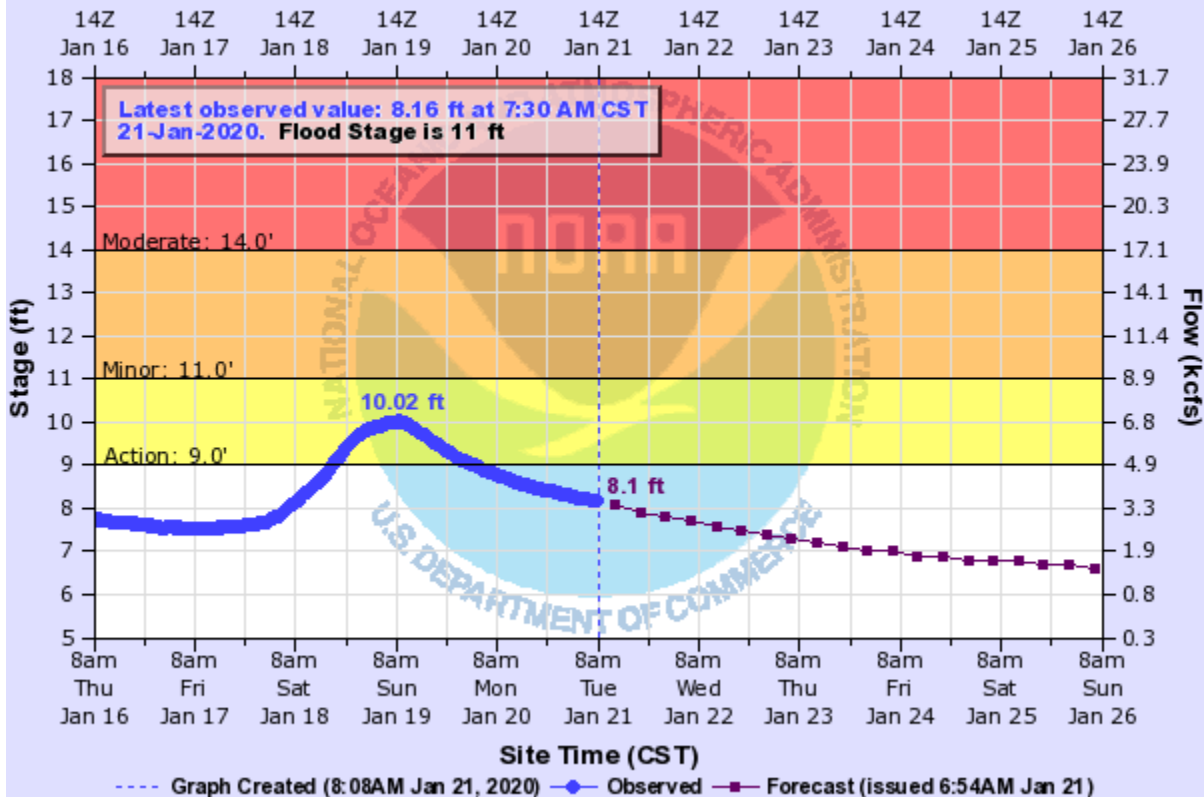


COMO2(plotting HGIRG) "Gage 0" Datum: 748.97'

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