

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 January	YEAR 2021
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 February 10, 2021	

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

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

Heavy rain at the end of December 2020 resulted in minor flooding along the Poteau River at the start of 2021. A few storm systems brought winter weather, rain, and even tornadoes to eastern OK and northwest AR in January 2021. 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 2021 ranged from 0.50" to near 4" generally from southwest to northeast across eastern OK and northwest AR. These rainfall totals correspond to 125% to 300% of the normal January rainfall for locations along and north of a Pawnee to Jay line and 110% to 125% for portions of Cherokee County through Benton County (Fig. 1b). The remainder of eastern OK and northwest AR received only 25%-90% of the normal January rainfall.

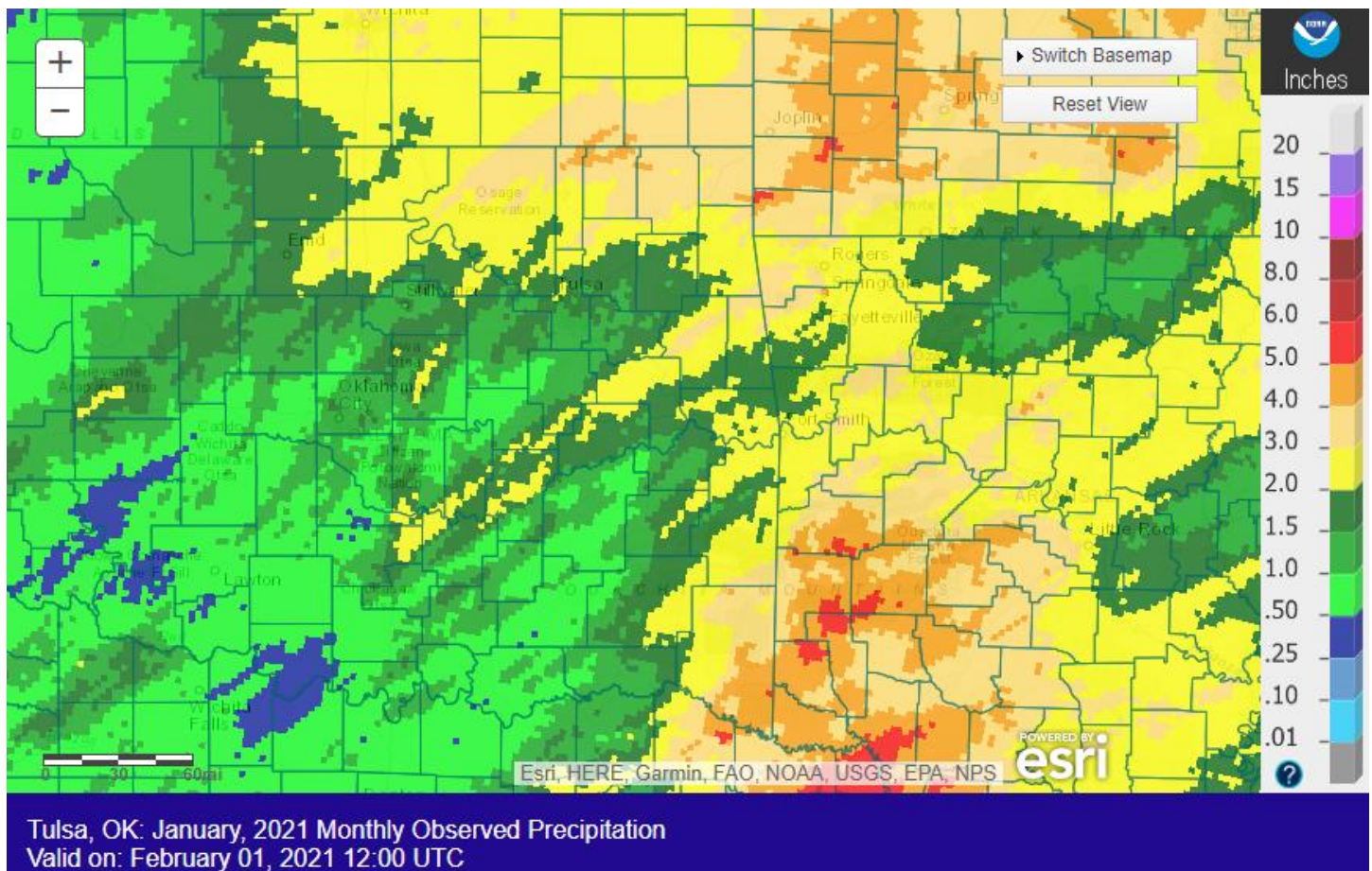
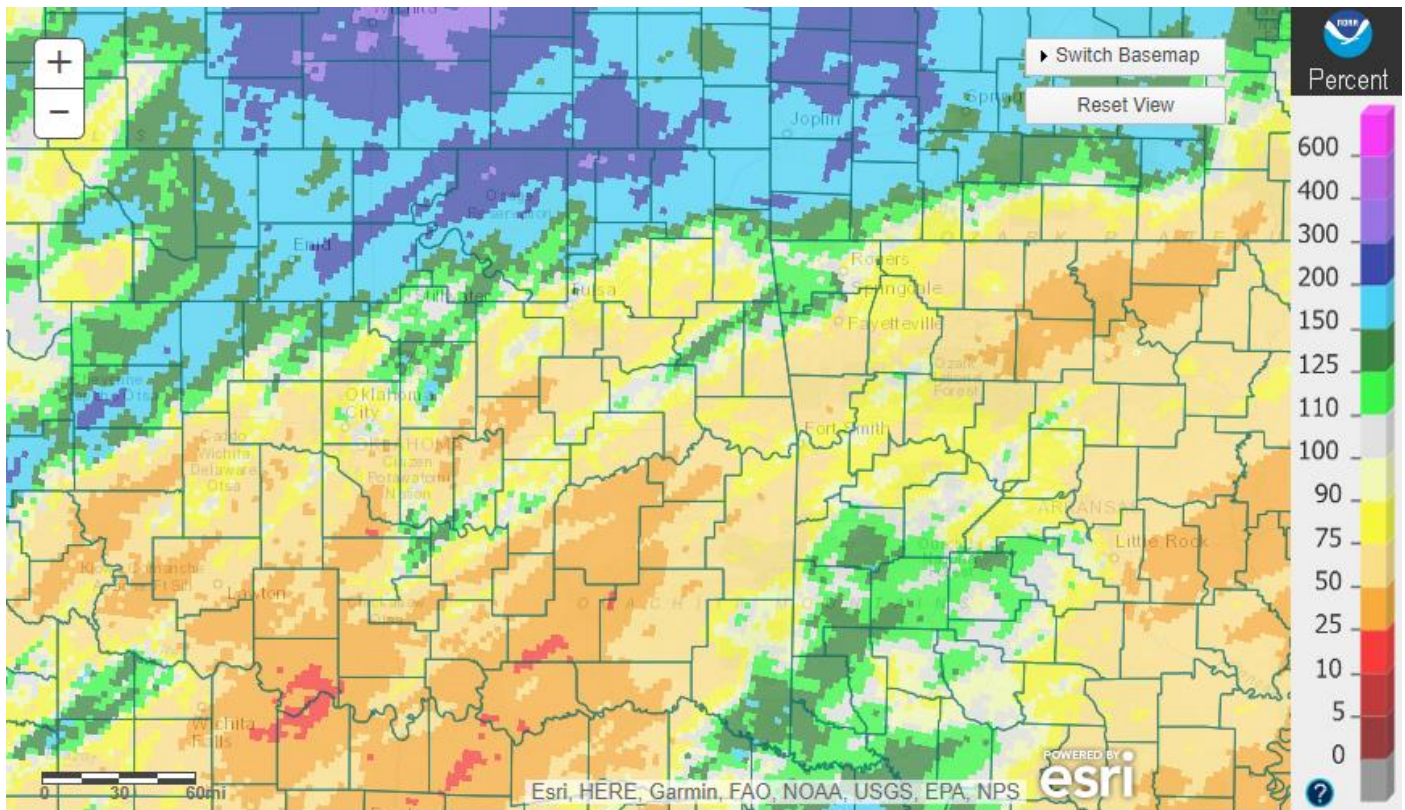


Fig. 1a. Estimated Observed Rainfall for January 2021



Tulsa, OK: January, 2021 Monthly Percent of Normal Precipitation
Valid on: February 01, 2021 12:00 UTC

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

In Tulsa, OK, January 2021 ranked as the 31st warmest January (40.1°F, tied 1998; since records began in 1905), the 29th wettest January (2.41"; since records began in 1888), and the 31st least snowy January (0.1"; since records began in 1900). Fort Smith, AR had the 38th warmest January (41.9°F; since records began in 1883), the 65th wettest January (2.27", tied 1975; since records began in 1883), and the 29th least snowy January (Trace, tied with 19 other years; since records began in 1884). Fayetteville, AR had the 20th warmest (38.3°F), the 33rd wettest (2.30"), and the 32nd least snowy (1.0", tied 2009, 2003, 1989, 1987, 1980) January since records began in 1950.

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

Ozark, AR (coop)	5.84	Copan, OK (meso)	5.58	Bella Vista 2.2E, AR (coco)	5.12
Busch 0.4E, AR (coco)	5.09	Rogers 2.4SSW, AR (coco)	5.06	Ochelata 5.6N, OK (coco)	4.80
Siloam Springs 1.8N, AR (coco)	4.78	Bartlesville, OK (coop)	4.77	Centerton 2.1SE, AR (coco)	4.63

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

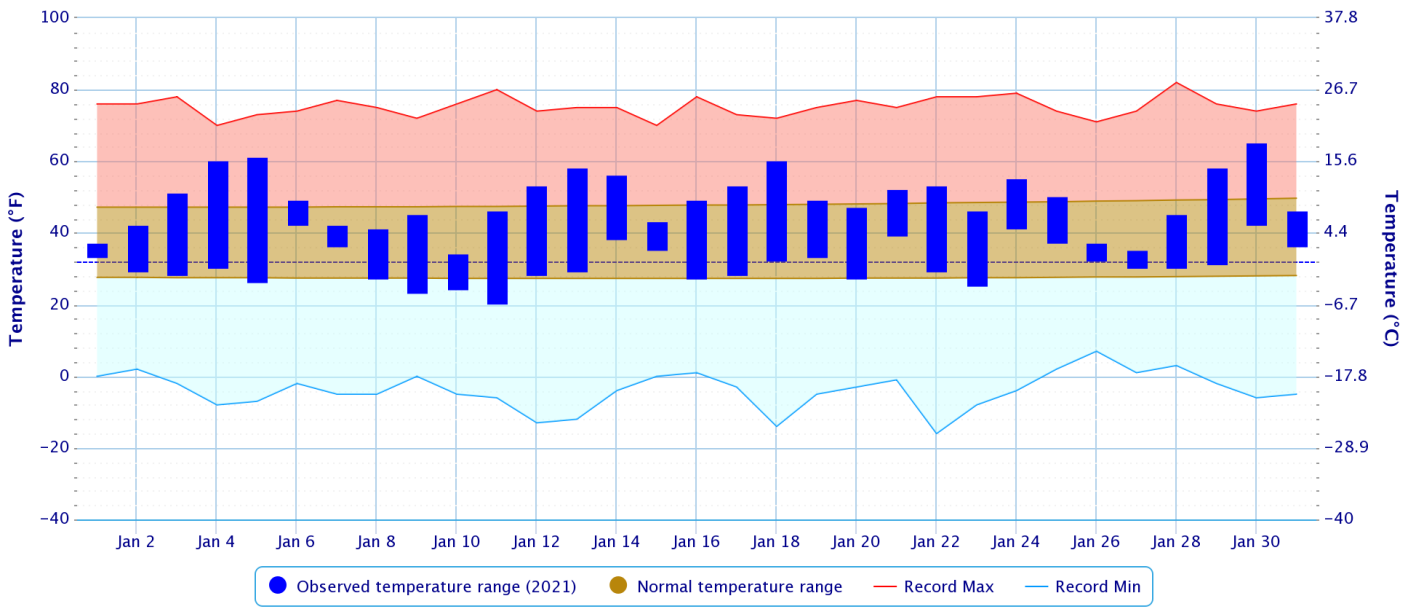
McAlester, OK (ASOS)	1.30	Wister, OK (meso)	1.54	Wilburton, OK (meso)	1.58
Hugo, OK (meso)	1.58	Antlers, OK (meso)	1.59	Hectorville, OK (meso)	1.66
Talihina, OK (meso)	1.70	Bixby, OK (meso)	1.72	Jenks Riverside Arpt, OK (ASOS)	1.76

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

Rank since 1921	January 2021	Winter 2020-21 (Dec 1 – Jan 31)	Last 90 Days (Nov 3 – Jan 31)	Water Year-to-Date (Oct 1, 2020 – Jan 31, 2021)	Cool Season (Sep 1 – Jan 31)	Last 180 Days (Aug 5 – Jan 31)	Last 365 Days (Feb 2, 2020 – Jan 31, 2021)
Northeast OK	12 th wettest	11 th wettest	21 st wettest	17 th wettest	30 th wettest	36 th wettest	25 th wettest
East Central OK	39 th wettest	29 th wettest	49 th wettest	47 th driest	42 nd wettest	32 nd wettest	11 th wettest
Southeast OK	43 rd driest	33 rd wettest	48 th driest	32 nd driest	40 th Wettest	25 th wettest	12 th wettest
Statewide	37 th wettest	15 th wettest	40 th wettest	37 th wettest	42 nd wettest	34 th wettest	34 th wettest

Daily Temperature Data – Tulsa Area, OK (ThreadEx)

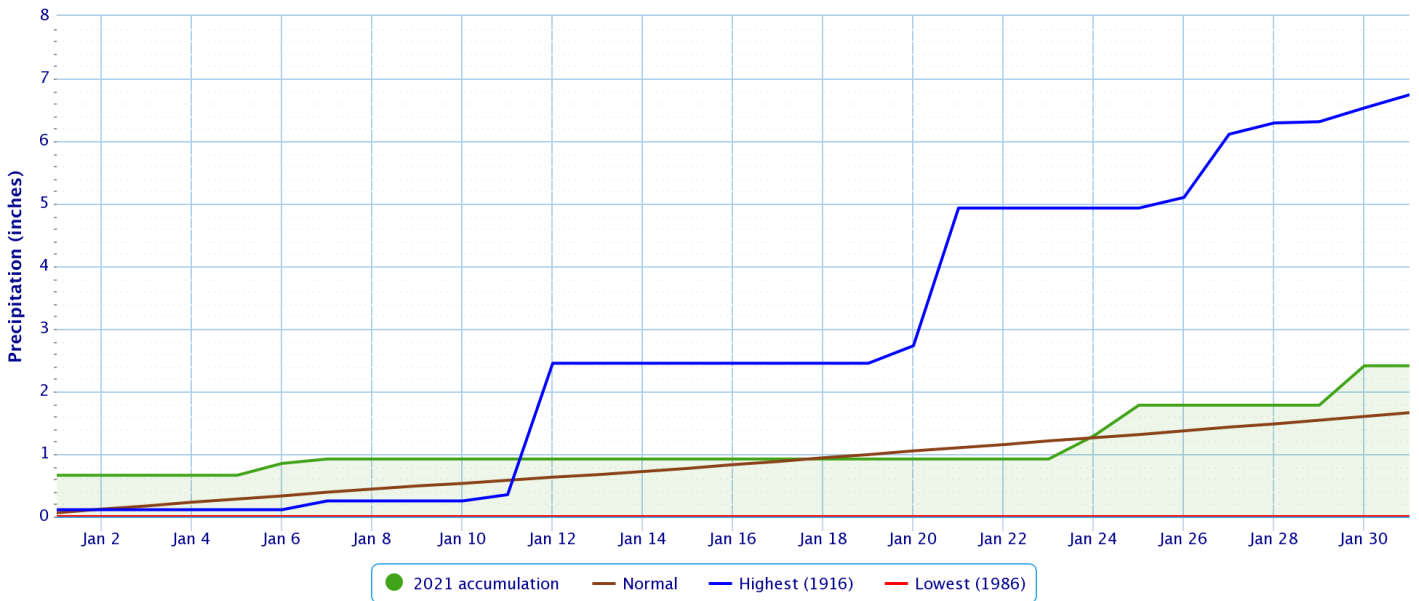
Period of Record – 1905-01-06 to 2021-02-01. Normals period: 1981-2010. Click and drag to zoom chart.



Powered by ACIS

Accumulated Precipitation – Tulsa Area, OK (ThreadEx)

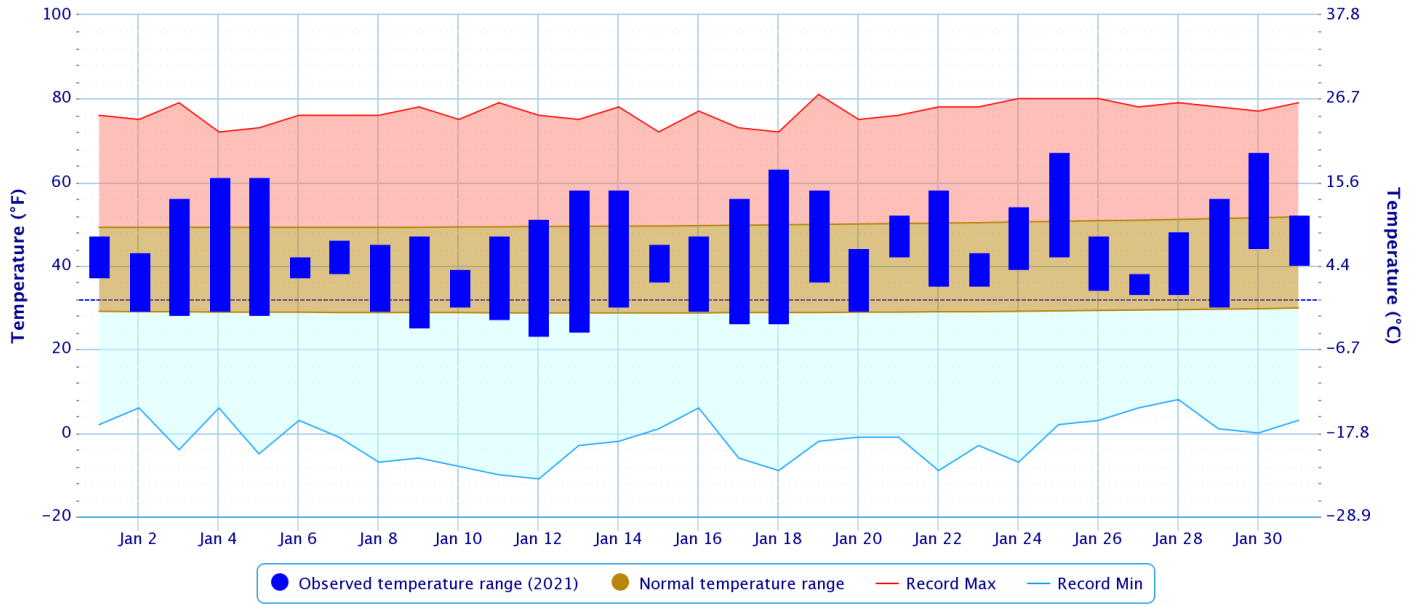
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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

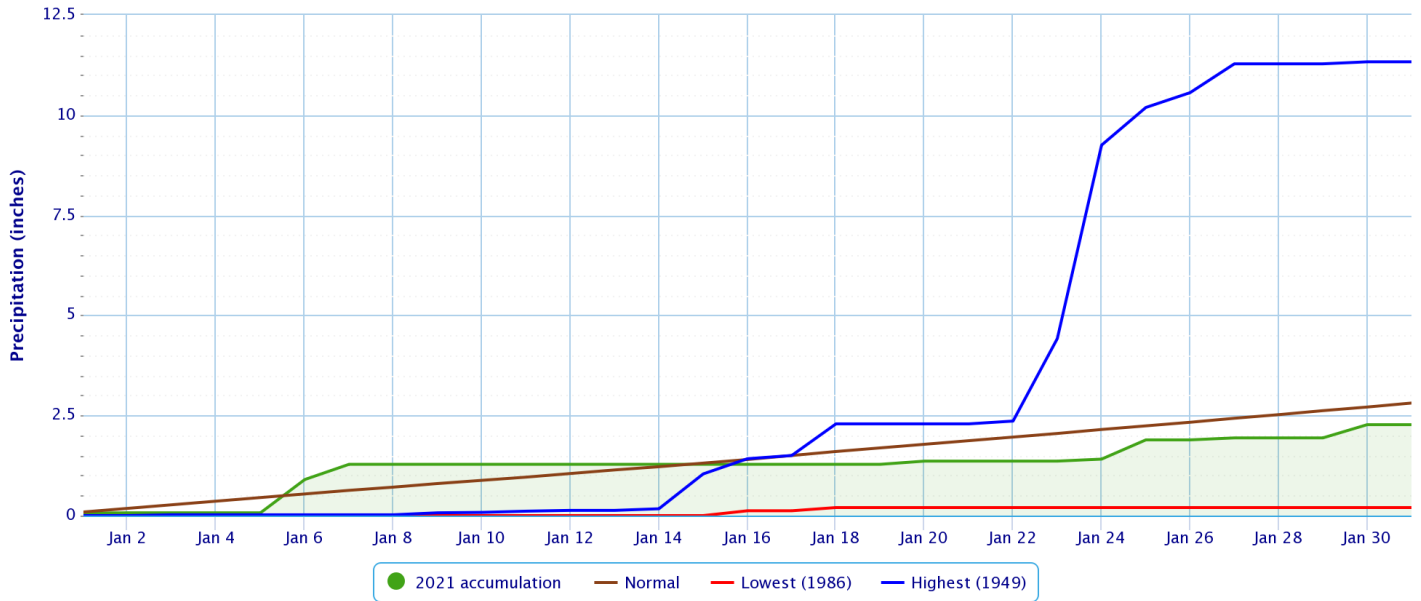
Period of Record – 1882-06-01 to 2021-02-01. Normals period: 1981-2010. Click and drag to zoom chart.



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Accumulated Precipitation – Fort Smith Area, AR (ThreadEx)

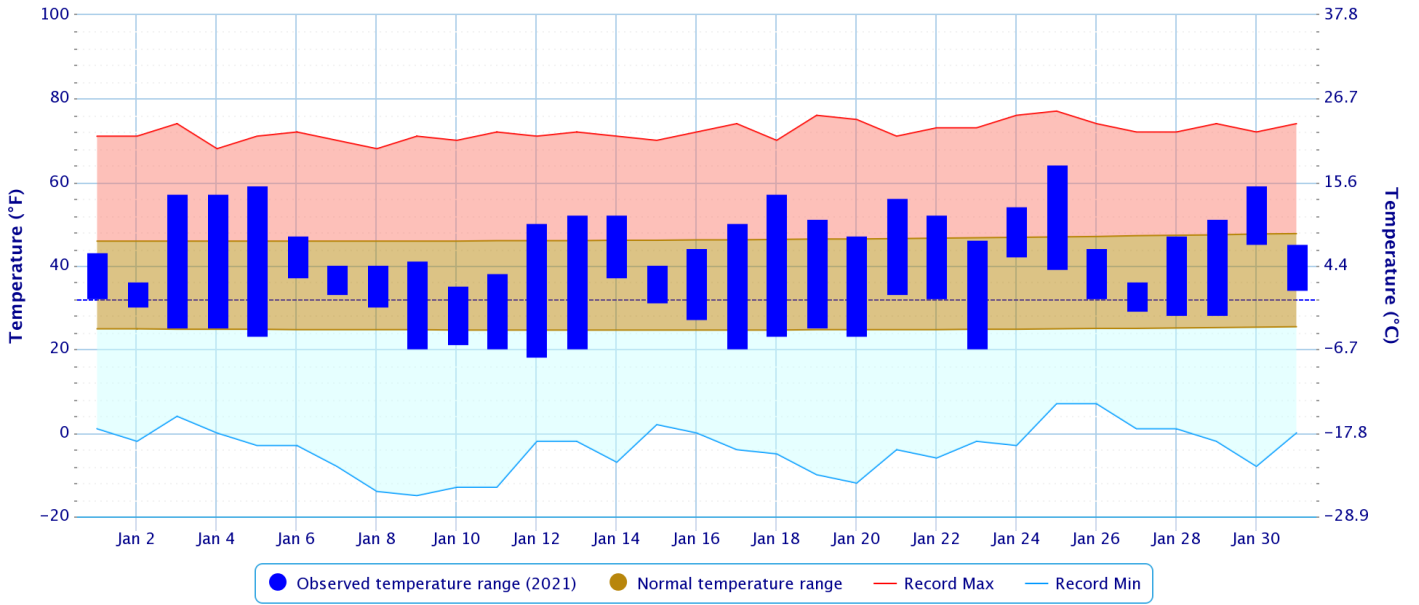
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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Daily Temperature Data – FAYETTEVILLE DRAKE FIELD, AR

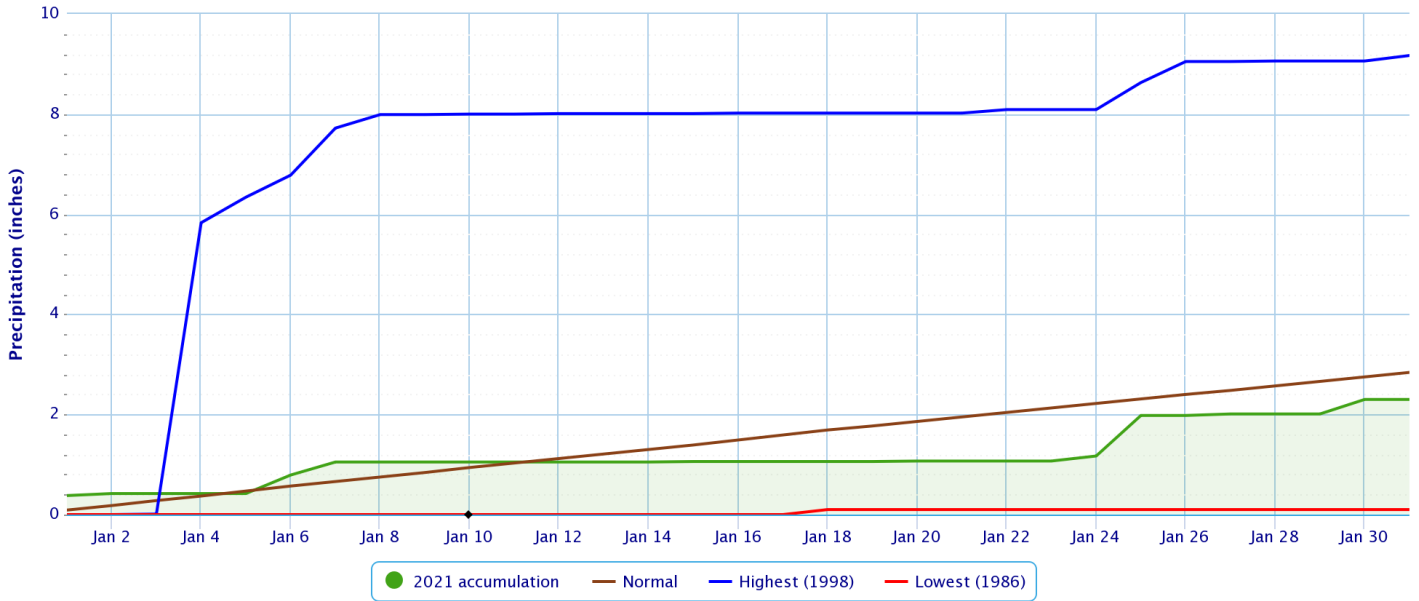
Period of Record – 1949-07-14 to 2021-02-01. Normals period: 1981-2010. Click and drag to zoom chart.



Powered by ACIS

Accumulated Precipitation – FAYETTEVILLE DRAKE FIELD, AR

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

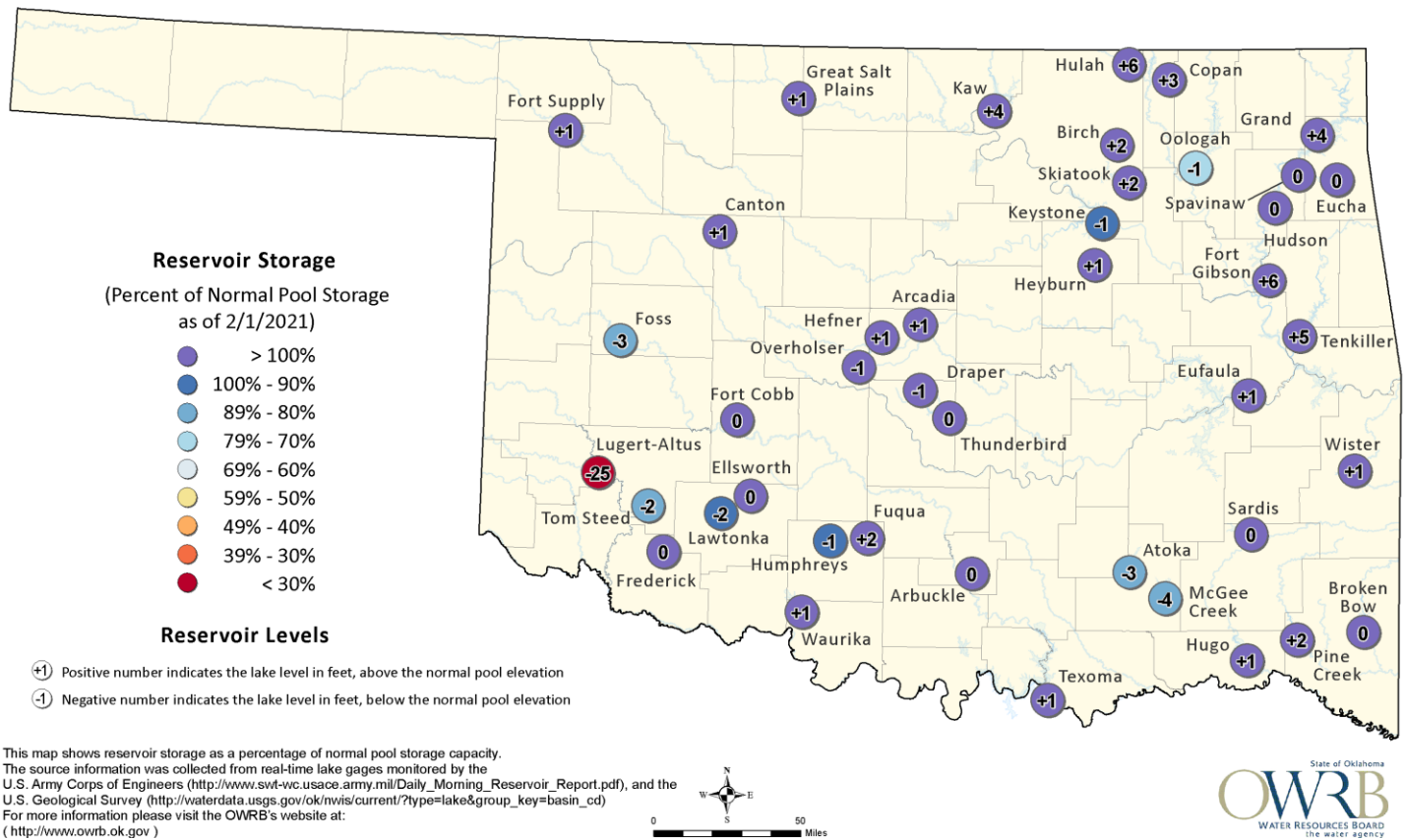


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Reservoirs

Oklahoma Surface Water Resources

Reservoir Levels and Storage as of 2/1/2021



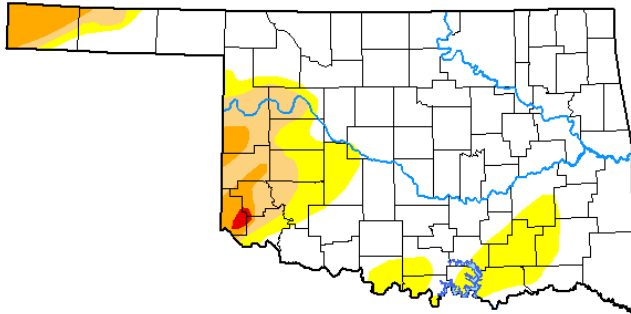
According to the USACE, several of the lakes in the HSA were within $\pm 3\%$ of top of their conservation pools as of 2/01/2021. However, many lakes were using a higher percentage of their flood control pools: Grand Lake 26%, Ft. Gibson Lake 15%, Tenkiller Lake 13%, Skiatook Lake 9%, Kaw Lake 8%, Hulah Lake 8%, Copan Lake 7%, Lake Eufaula 6%, and Birch Lake 5%. Two lakes were operating below 3% of the top of their conservation pools: Keystone Lake 90% (for maintenance/survey) and Oologah Lake 94%.

Drought

According to the [U.S. Drought Monitor](#) (USDM) from February 2, 2021 (Figs. 3a, 3b), no drought conditions were occurring in eastern OK and northwest AR. However, Abnormally Dry (but not in drought) conditions were occurring in a portion of Pittsburg, Latimer, Pushmataha, and Choctaw Counties in eastern OK.

U.S. Drought Monitor Oklahoma

February 2, 2021
(Released Thursday, Feb. 4, 2021)
Valid 7 a.m. EST



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	75.76	24.24	10.93	4.05	0.23	0.00
Last Week 01-26-2021	75.15	24.85	10.93	4.05	0.23	0.00
3 Months Ago 11-03-2020	73.87	26.13	10.65	5.19	1.44	0.00
Start of Calendar Year 12-29-2020	56.83	43.17	25.21	7.75	1.45	0.00
Start of Water Year 09-29-2020	66.79	33.21	17.71	11.97	1.55	0.00
One Year Ago 02-04-2020	83.33	16.67	7.51	0.85	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:

Brad Rippey
U.S. Department of Agriculture

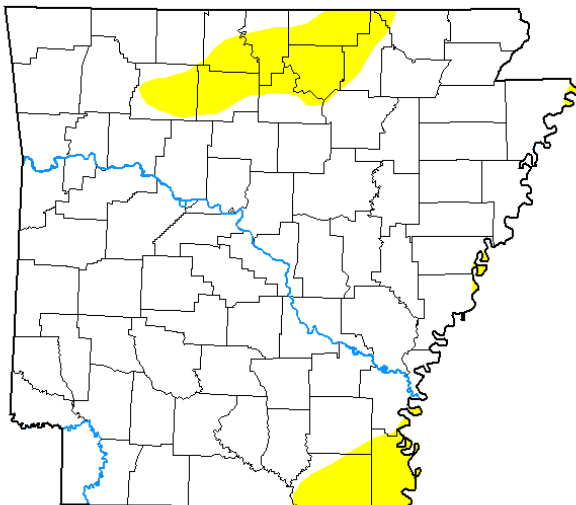


droughtmonitor.unl.edu

Fig. 3a. Drought Monitor for Oklahoma

U.S. Drought Monitor Arkansas

February 2, 2021
(Released Thursday, Feb. 4, 2021)
Valid 7 a.m. EST



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	90.44	9.56	0.00	0.00	0.00	0.00
Last Week 01-26-2021	93.77	6.23	0.00	0.00	0.00	0.00
3 Months Ago 11-03-2020	99.63	0.37	0.00	0.00	0.00	0.00
Start of Calendar Year 12-29-2020	16.45	83.55	6.87	0.00	0.00	0.00
Start of Water Year 09-29-2020	96.07	3.93	0.62	0.00	0.00	0.00
One Year Ago 02-04-2020	94.30	5.70	0.34	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:

Brad Rippey
U.S. Department of Agriculture



droughtmonitor.unl.edu

Fig. 3b. Drought Monitor for Arkansas

Outlooks

The [Climate Prediction Center](#) (CPC) outlook for February 2021 (issued January 31, 2021) indicates a slightly enhanced chance for below normal temperatures along and north of I-40 in eastern OK and northwest AR and an equal chance for above, near, and below normal temperatures south of I-40. This outlook also indicates a slightly enhanced chance for above 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. According to CPC, “the amplitude of the Madden-Julian Oscillation (MJO) increased during late January, as it shifted eastward to the West Pacific. A continued eastward propagation of the MJO would favor anomalously cold temperatures across parts of the central and eastern U.S. during February. In addition, residual effects related to the recent Sudden Stratospheric Warming (SSW) may help to reinforce this MJO cold signal. The large coverage with enhanced probabilities of below normal temperatures is due to a high amplitude longwave pattern favorable for anomalous cold during early to mid-February. Above normal precipitation remains favored for a majority of the central and eastern CONUS which is likely to be downstream of an amplified 500-hPa trough axis through at least mid-February.”

For the 3-month period February-March-April 2021, CPC is forecasting an enhanced chance for above normal temperatures across all of eastern OK and northwest AR, a slightly enhanced chance for below median precipitation west of Hwy 75 in northeast OK, and an equal chance for above, near, and below median precipitation across the remainder of eastern OK and northwest AR (outlook issued January 21, 2021). This outlook is based strongly on La Niña impacts, as well as incorporating both statistical and dynamical forecast tools. According to CPC, the combined effect of the ocean-atmosphere system is consistent with moderate La Niña conditions. There is a 95% chance of La Niña continuing through the Northern Hemisphere winter 2020-21 and a 55% chance of transitioning to ENSO-neutral during the 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

A strong upper-level low lifted northeast from northern Mexico across TX on the 31st, resulting in rainfall spreading north out of TX into southeast OK by late morning. This area of showers continued to expand northward through the afternoon and evening, with precipitation occurring across all of eastern OK and western AR by mid-evening. By late evening, the freezing line was near to just north of I-44 and sub-freezing temperatures were also occurring across the higher terrain areas of northwest AR, allowing for some ice accumulation of a trace to 0.2” (Fig. 5). Far southeast Madison County received around 0.25” of ice. As the upper-low moved across OK, the precipitation continued to shift north, coming to an end from south to north around midnight through the mid-morning hours of the 1st. The upper-low also helped to cool the atmosphere aloft, allowing for a change over to snow across portions of northeast OK. 1” to 2” of snow, with isolated areas of 2”-5” of snow, occurred north of I-44 (Fig. 4). 1”-2” of rain/liquid equivalent fell across nearly all of eastern OK and northwest AR, with the highest totals across southeast OK (Figs. 6, 7). The 3-day rainfall total ranged from 1.5” to 3.5” across eastern OK and northwest AR (Fig. 8). This heavy rain resulted in rises across area streams and rivers. Minor flooding occurred along the Poteau River near Panama (see preliminary hydrographs at the end of this report and the E3 Report for details), but the other rivers remained within their banks.

Warm advection overspread the area on the 6th ahead of an incoming low pressure center, resulting in scattered showers developing across eastern OK and western AR during the morning hours. Showers and isolated thunderstorms continued for much of the afternoon and evening primarily across southeast OK into northwest AR. After midnight on the 7th, showers increased over northeast OK, while continuing across western AR, as the low tracked near the Red River. This activity persisted through the overnight hours and finally dissipated during the morning. Colder air entrained by the low pressure system led to a changeover to snow in the higher elevations of northwest AR, with a trace to around 4” of snow reported (Fig. 9). Rainfall/liquid equivalent totals ranged from around 0.10” in north central OK to around 2” in southeast OK and west central AR (Fig. 10).

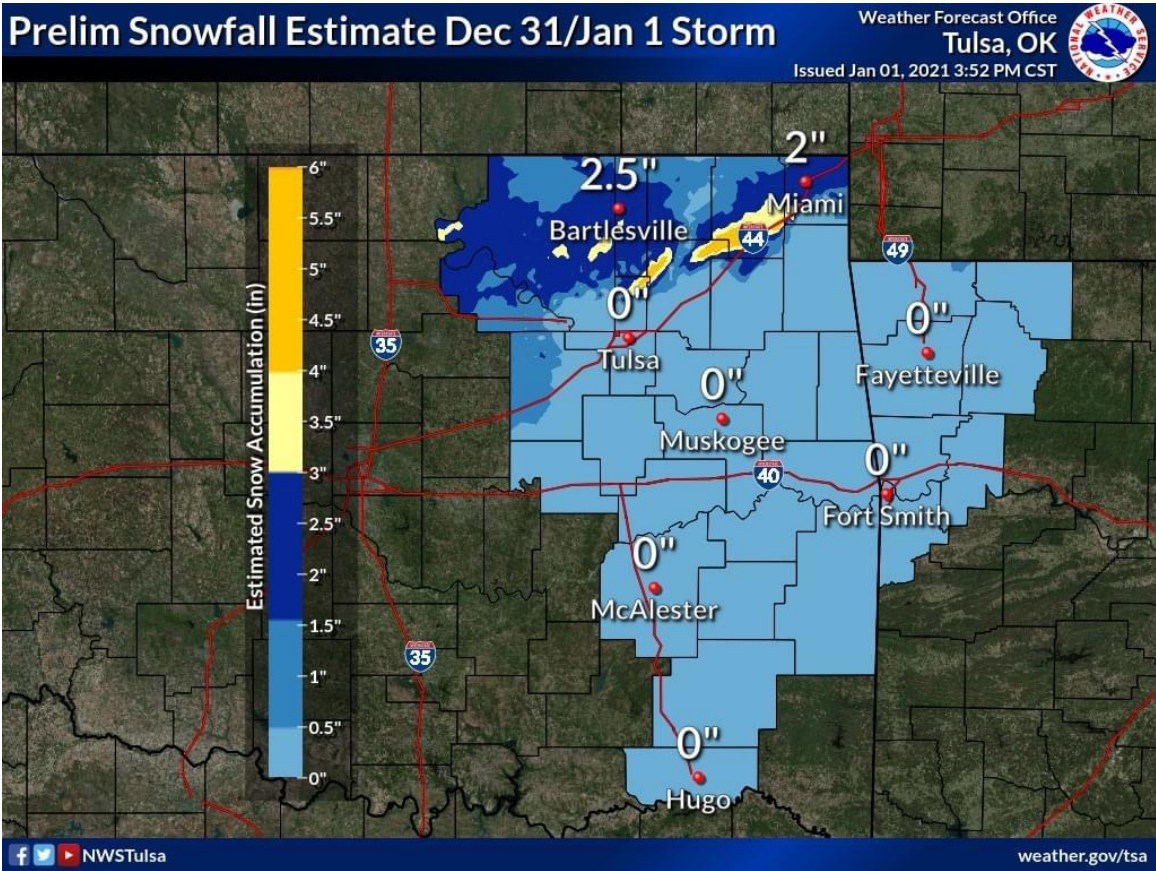


Fig. 4. Estimated snowfall totals for December 31, 2020-January 1, 2021.

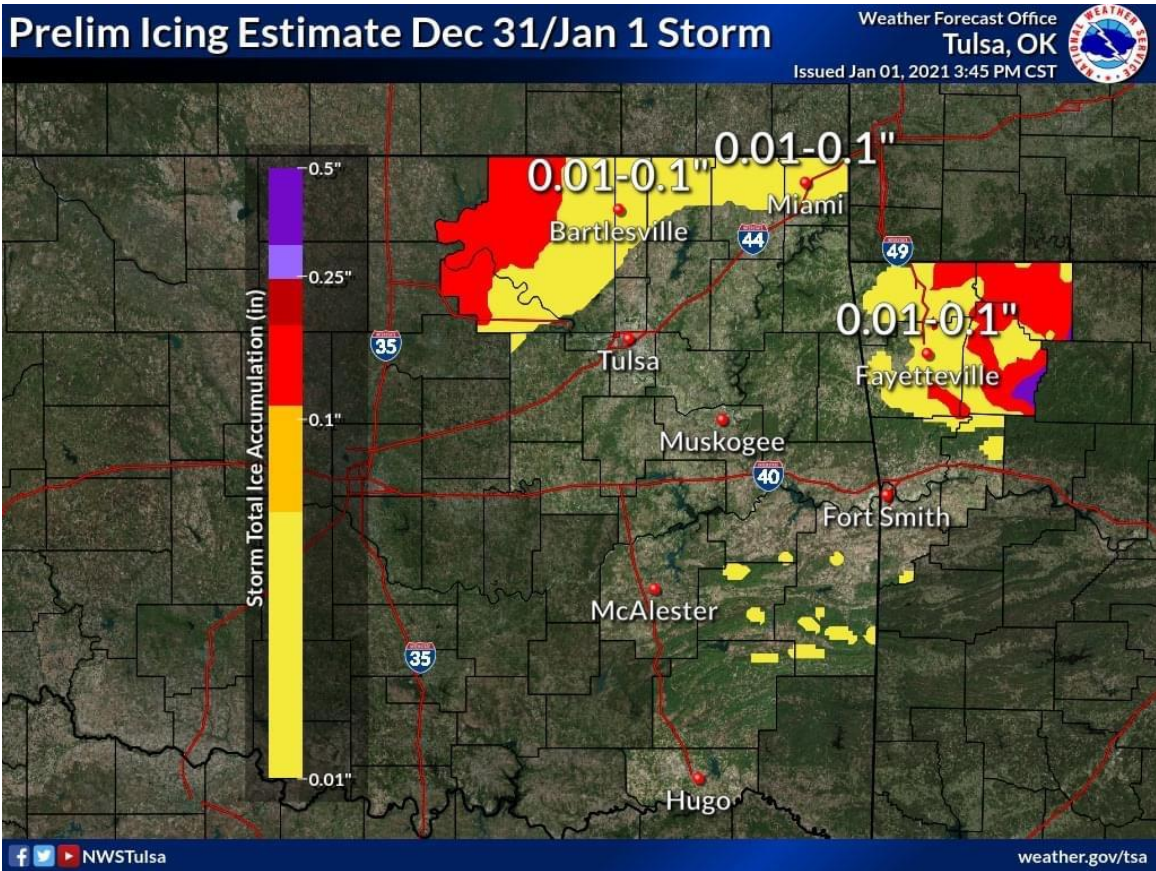
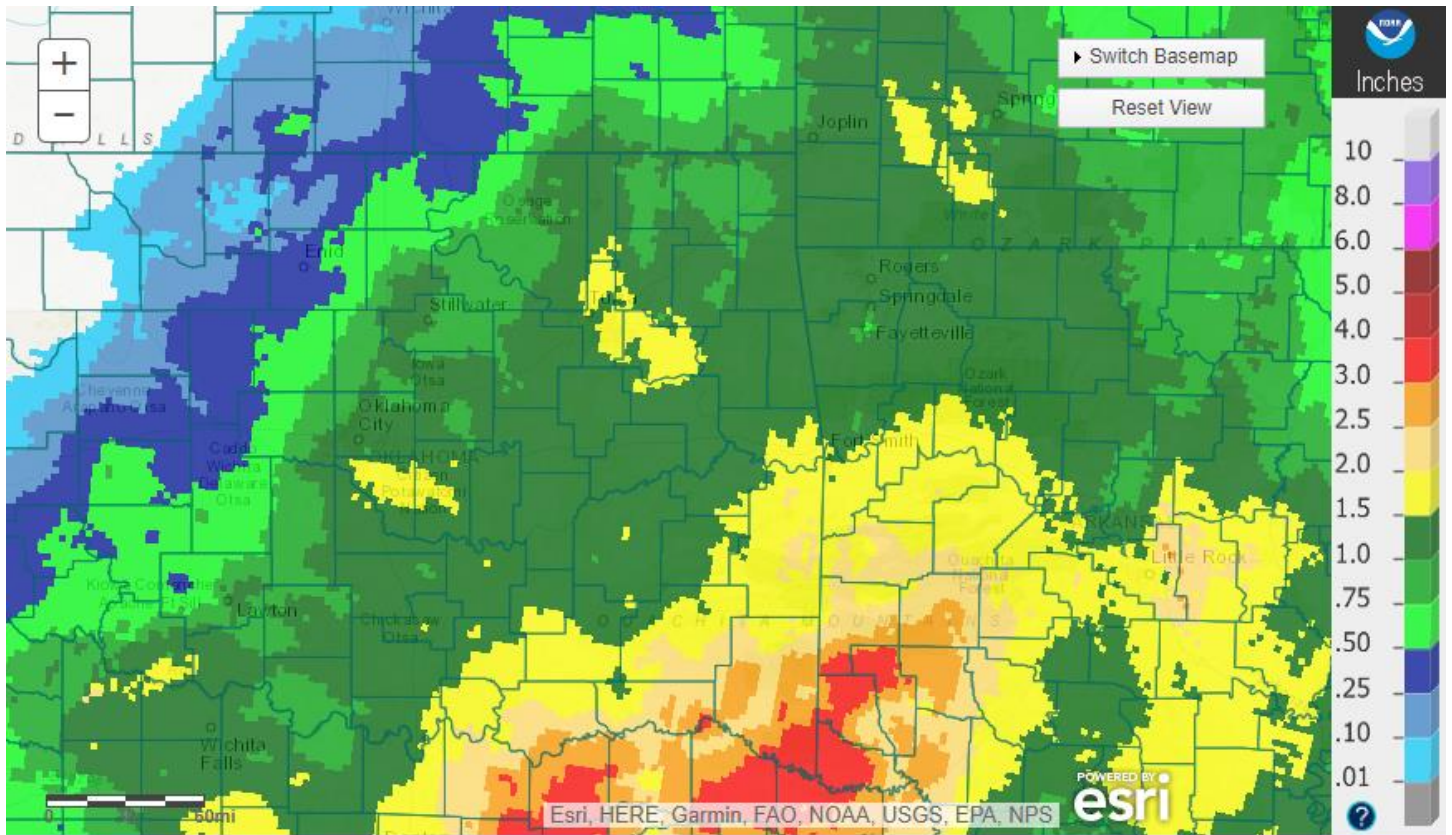
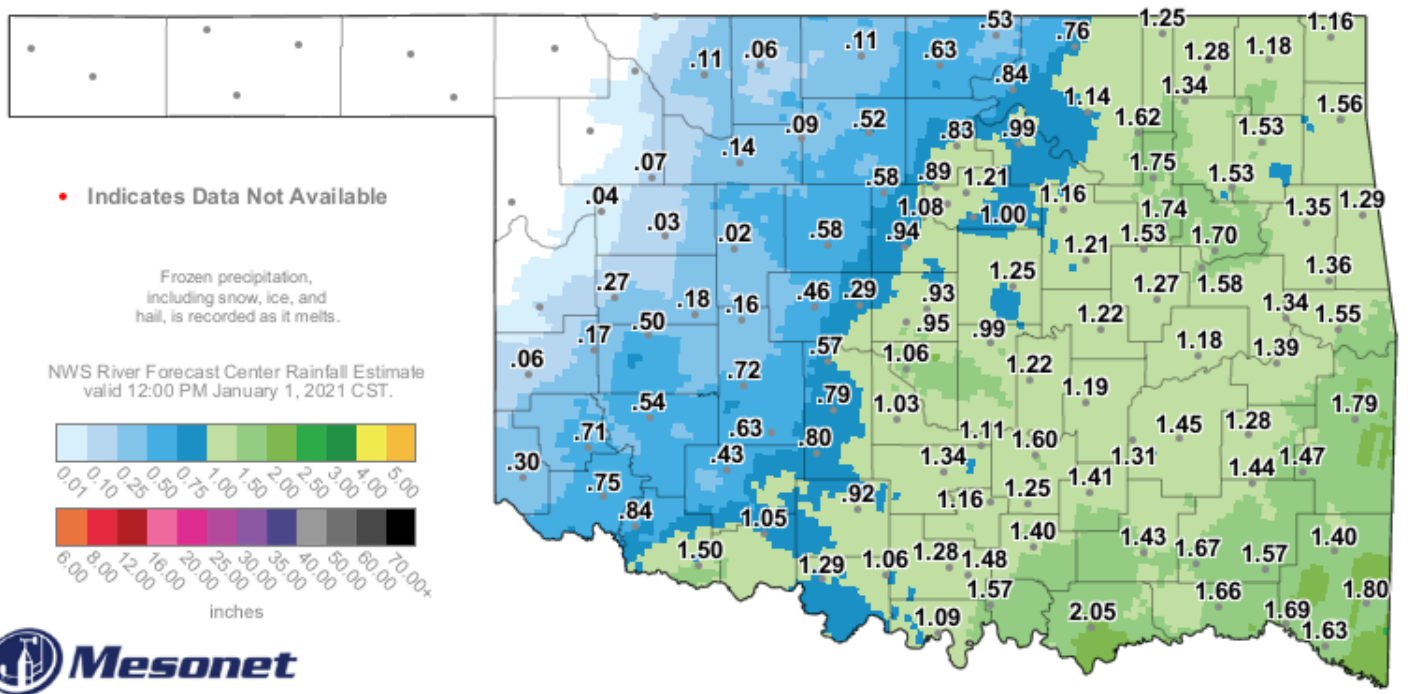


Fig. 5. Estimated ice accumulation totals for December 31, 2020-January 1, 2021.



Tulsa, OK: January 01, 2021 1-Day Observed Precipitation
 Valid on: January 01, 2021 12:00 UTC

Fig. 6. 24-hour Estimated Observed Rainfall ending at 6am CST 01/01/2021.



Mesonet
 24-Hour Rainfall Accumulation (inches)

1:05 PM January 1, 2021 CST

Created 1:09:45 PM January 1, 2021 CST. © Copyright 2021

Fig. 7. OK Mesonet (values) and NWS RFC rainfall estimate (image) 24-hour rainfall ending at 1:05 pm CST 01/01/2021.

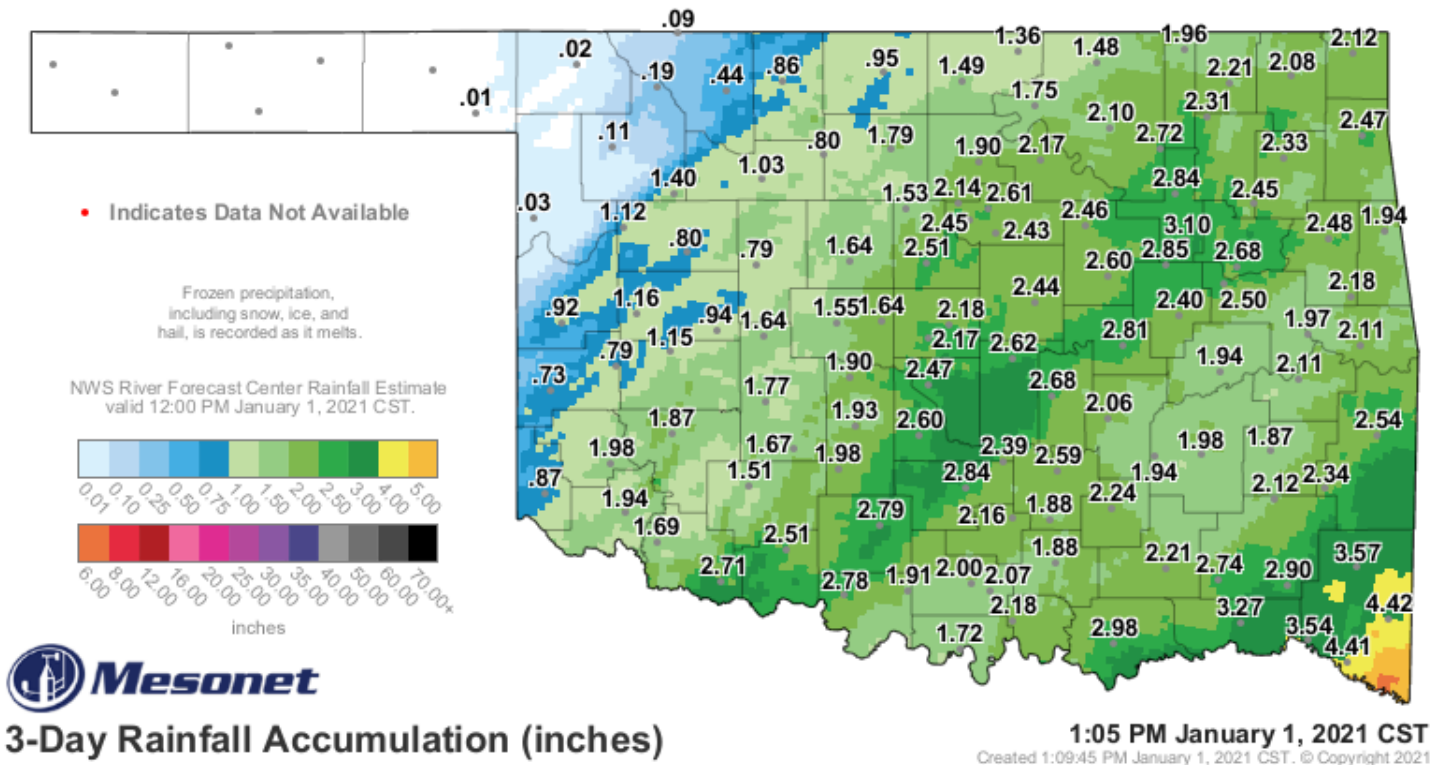


Fig. 8. OK Mesonet (values) and NWS RFC rainfall estimate (image) 3-Day rainfall ending at 1:05 pm CST 01/01/2021.

An initial round of warm conveyor showers and thunderstorms increased in coverage during the evening of the 24th. Stronger elevated storm activity moved from west to east after midnight through the morning of the 25th as the main upper-level wave ejected into the Plains and a surface low moved along a boundary draped across the area. Storms were more widespread across northeast OK and northwest AR, with a line of storms stretching south impacting southeast OK and west central AR. Rainfall totals ranged from around 0.10" to around 2.5" (Figs. 11, 12). A narrow axis of the heavier rain fell over the Illinois River basin, resulting in rises along the Illinois River and Flint Creek. Points along these rivers exceeded action stage, but remained below flood stage (see preliminary hydrographs at the end of this report).

Showers and isolated thunderstorms developed during the early morning hours of the 30th and quickly expanded across all of eastern OK and northwest AR as a strong upper-level wave approached the region. Most of this activity moved out of the area by noon. However, a narrow axis of moisture and instability developed over portions of eastern OK during the early afternoon, ahead of an approaching dry line. Wind fields and wind shear strengthened across the area during the afternoon, with the approach of the strong upper-level disturbance. Thunderstorms developed along the dry line during the early afternoon, and moved east-northeast across northeast OK. Weak instability and very strong low-level wind shear combined to support the evolution of some of the thunderstorms into supercells. One such storm produced four tornadoes, all rated EF-Unknown due to them occurring over open country (more information can be found at <https://arcg.is/8WXi1>). Hail up to penny size was also reported by some of these thunderstorms. The thunderstorm activity moved east of the region by late afternoon. Rainfall totals were 0.10" to near 0.75" across most of eastern OK and northwest AR, with higher totals of 0.50" to near 2" along the OK/KS state line (Fig. 13).

January 7th, 2021 Estimated Snowfall

Weather Forecast Office
Tulsa, OK

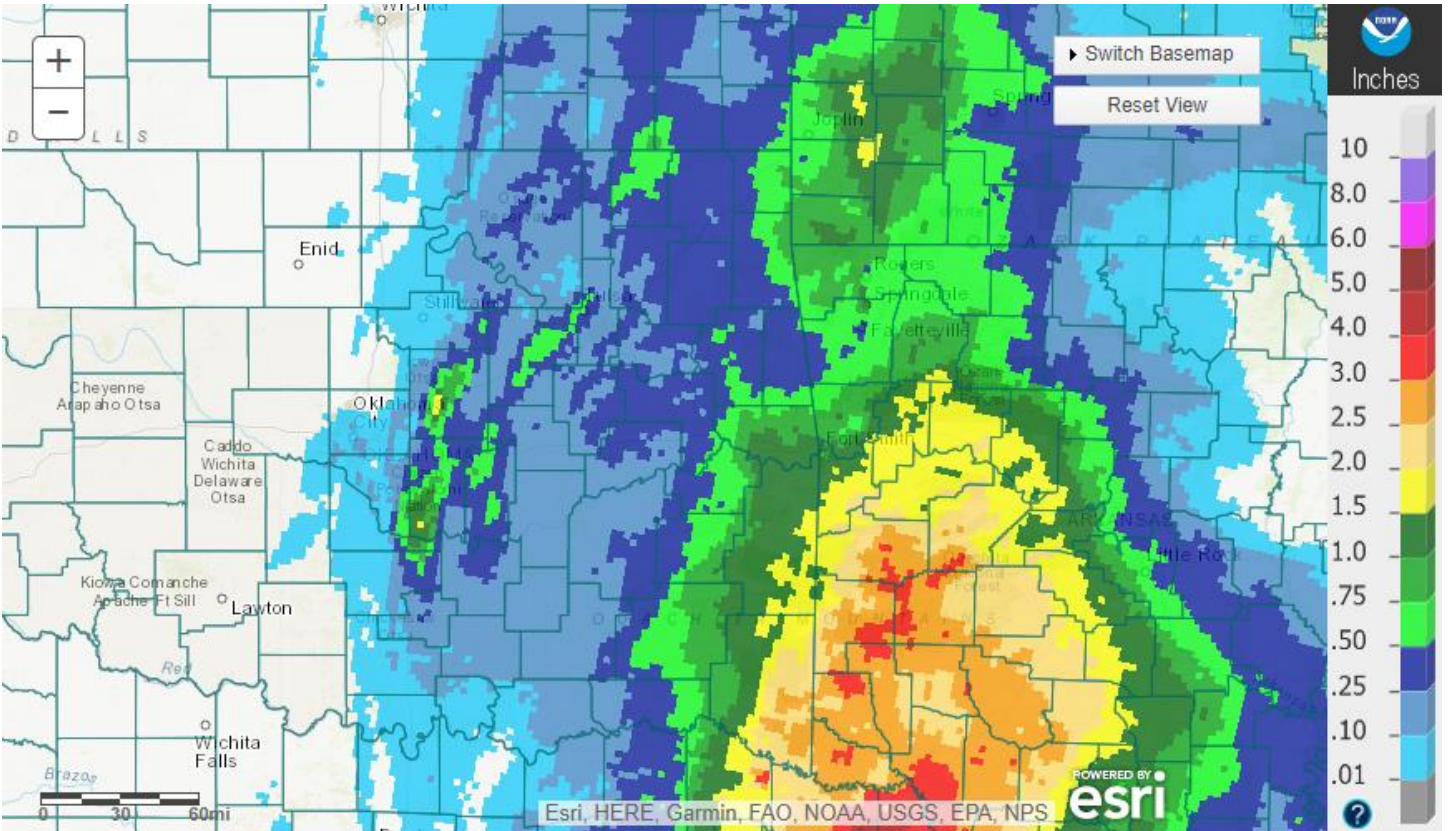


Amounts Determined By Reports And Radar Estimates

Issued Jan 07, 2021 6:22 PM CST

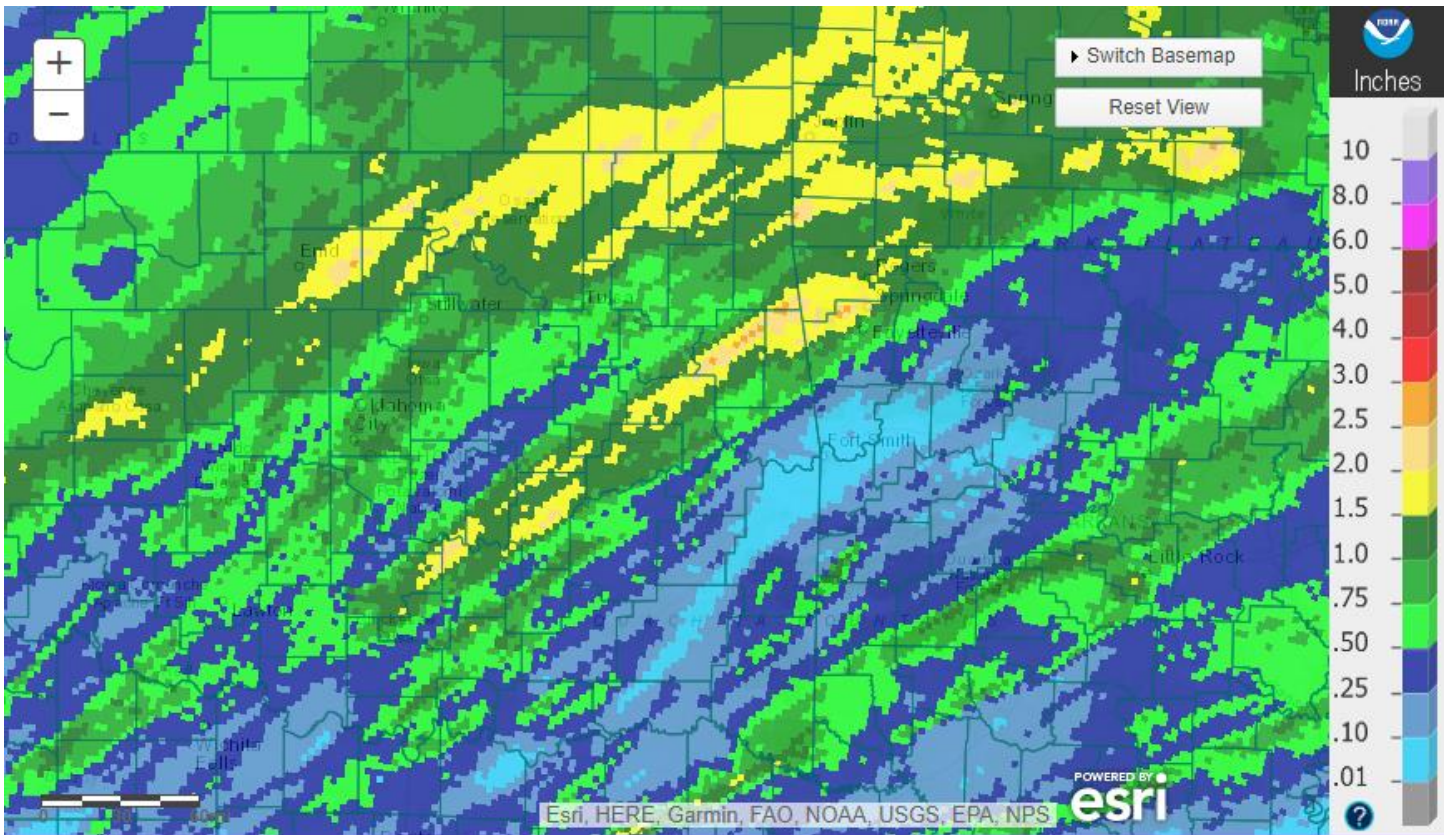


Fig. 9. Estimated snowfall totals for January 7, 2021.



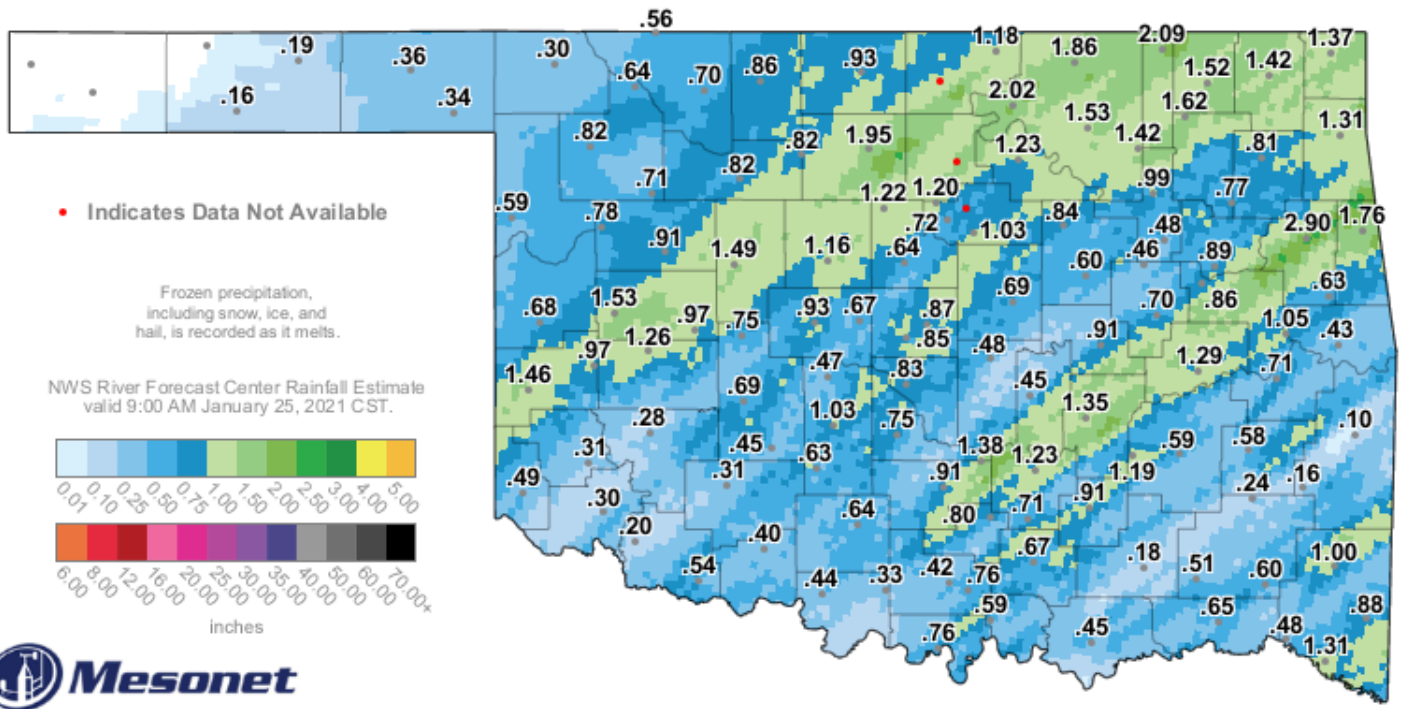
Tulsa, OK: January 07, 2021 1-Day Observed Precipitation
Valid on: January 07, 2021 12:00 UTC

Fig. 10. 24-hour Estimated Observed Rainfall ending at 6am CST 01/07/2021.



Tulsa, OK: January 25, 2021 1-Day Observed Precipitation
 Valid on: January 25, 2021 12:00 UTC

Fig. 11. 24-hour Estimated Observed Rainfall ending at 6am CST 01/25/2021.



24-Hour Rainfall Accumulation (inches)

10:15 AM January 25, 2021 CST

Created 10:20:59 AM January 25, 2021 CST. © Copyright 2021

Fig. 12. OK Mesonet (values) and NWS RFC rainfall estimate (image) 24-Hour rainfall ending at 10:15 am CST 01/25/2021.

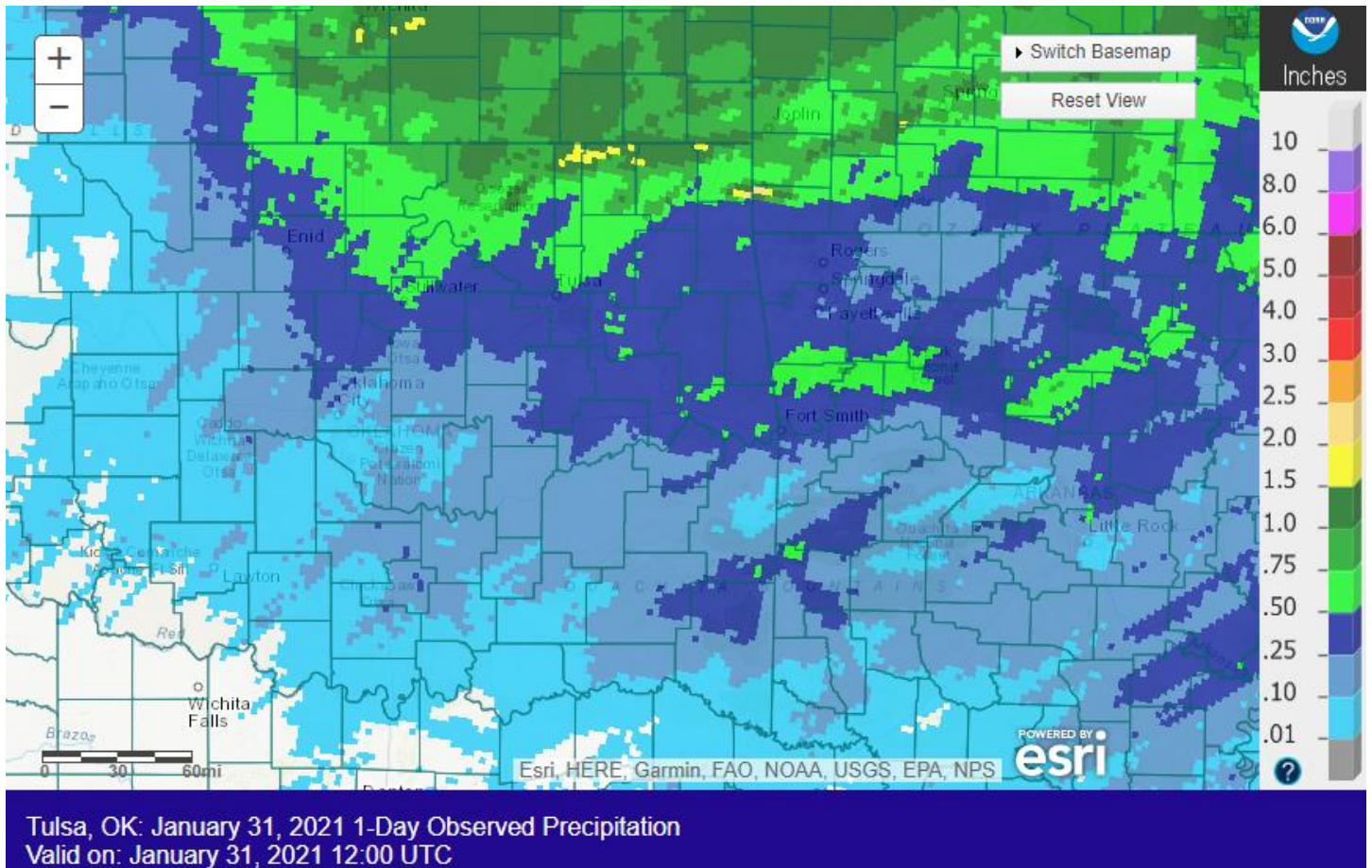


Fig. 13. 24-hour Estimated Observed Rainfall ending at 6am CST 01/31/2021.

Written by:

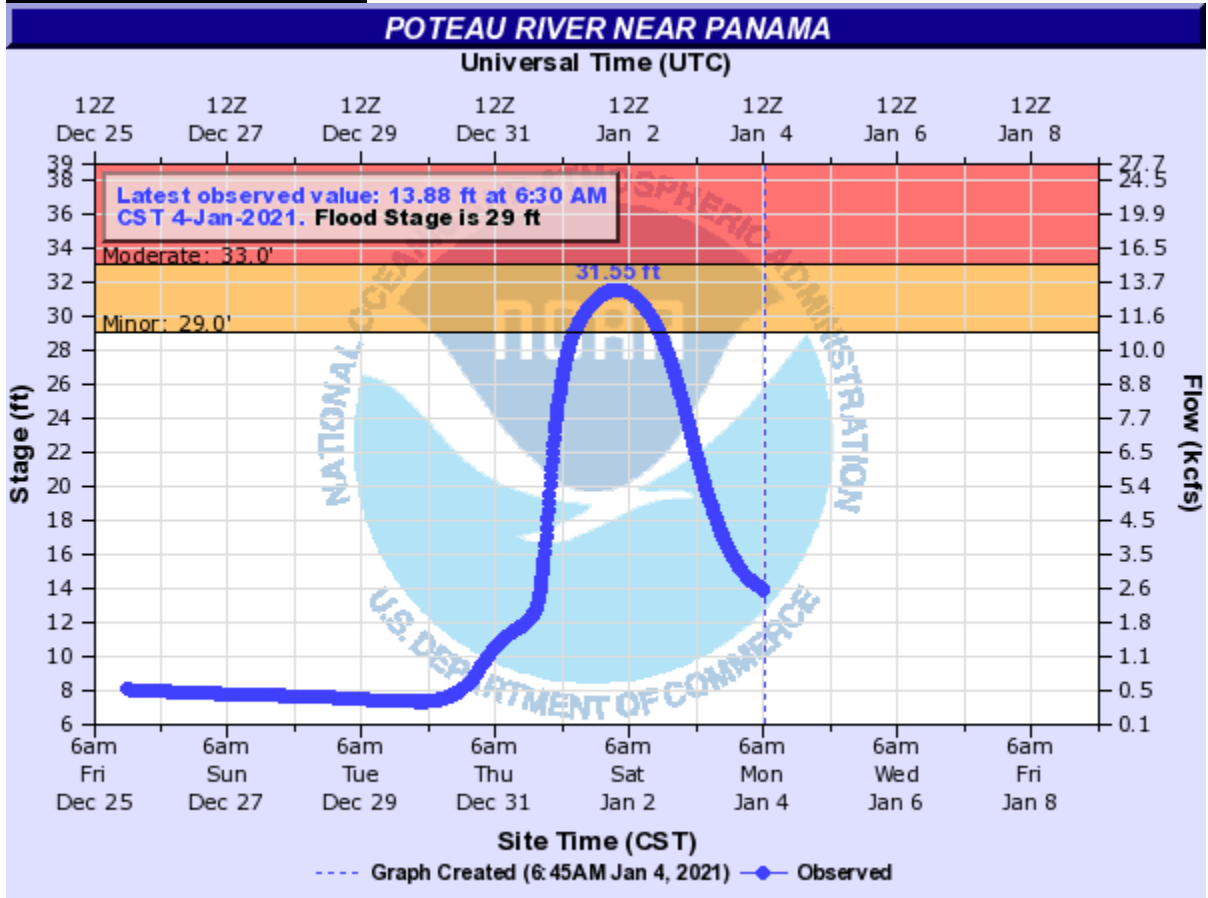
Nicole McGavock
Service Hydrologist
WFO Tulsa

Products issued in January 2021:

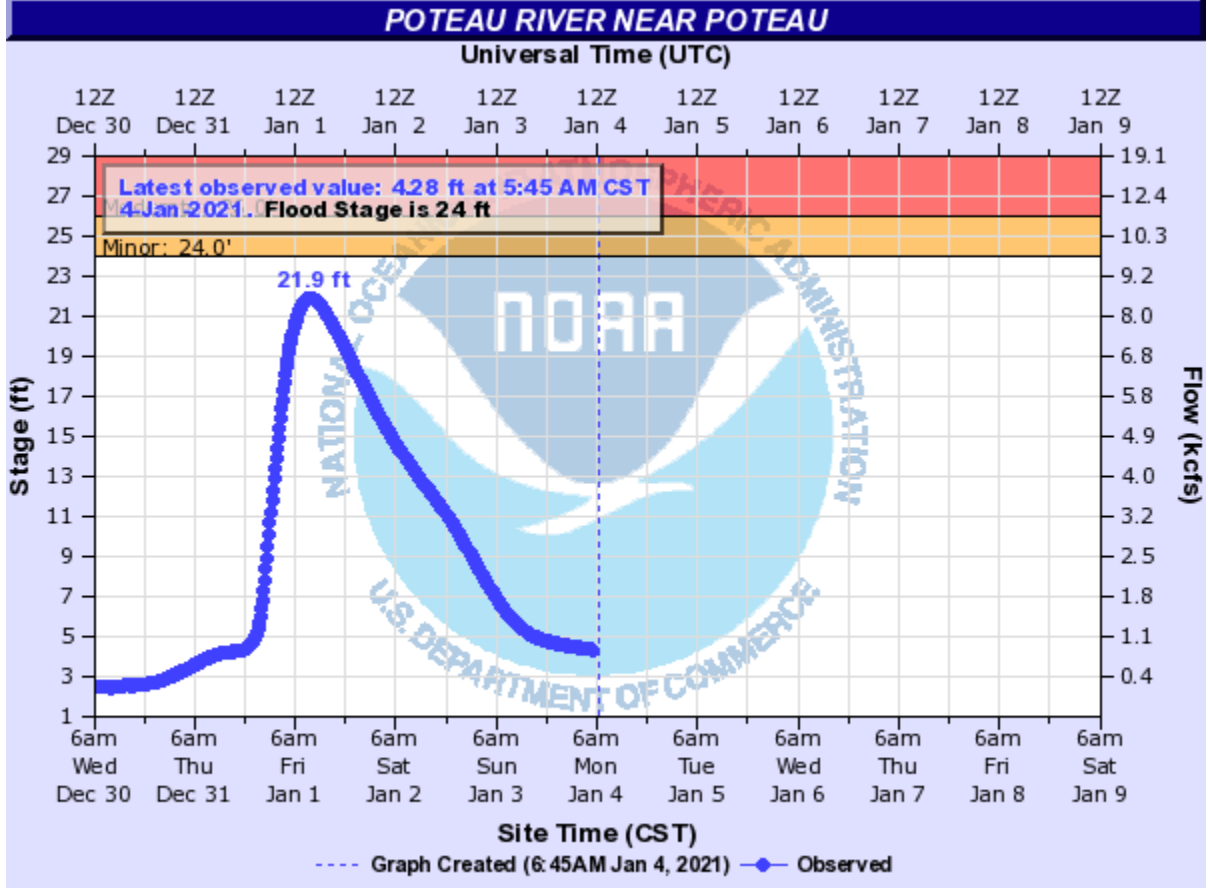
- *CWYO2 became a daily river forecast point September 7, 2016
- *MLBA4 and OZGA4 transferred to NWS Tulsa HSA February 5, 2014
- *Mixed case River Flood products began July 31, 2013

- 0 Flash Flood Warnings (FFW)
- 0 Flash Flood Statements (FFS)
- 0 Flash/Areal Flood Watches (FFA) (1 Watch FFA CON/EXT/EXA/EXB/CAN)
- 3 Urban and Small Stream Advisories (FLS)
- 0 Areal Flood Warnings (FLW)
- 0 Areal Flood Statements (FLS)
- 2 River Flood Warnings (FLW) (includes category increases)
- 12 River Flood Statements (FLS)
- 5 River Flood Advisories (FLS) (14 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:

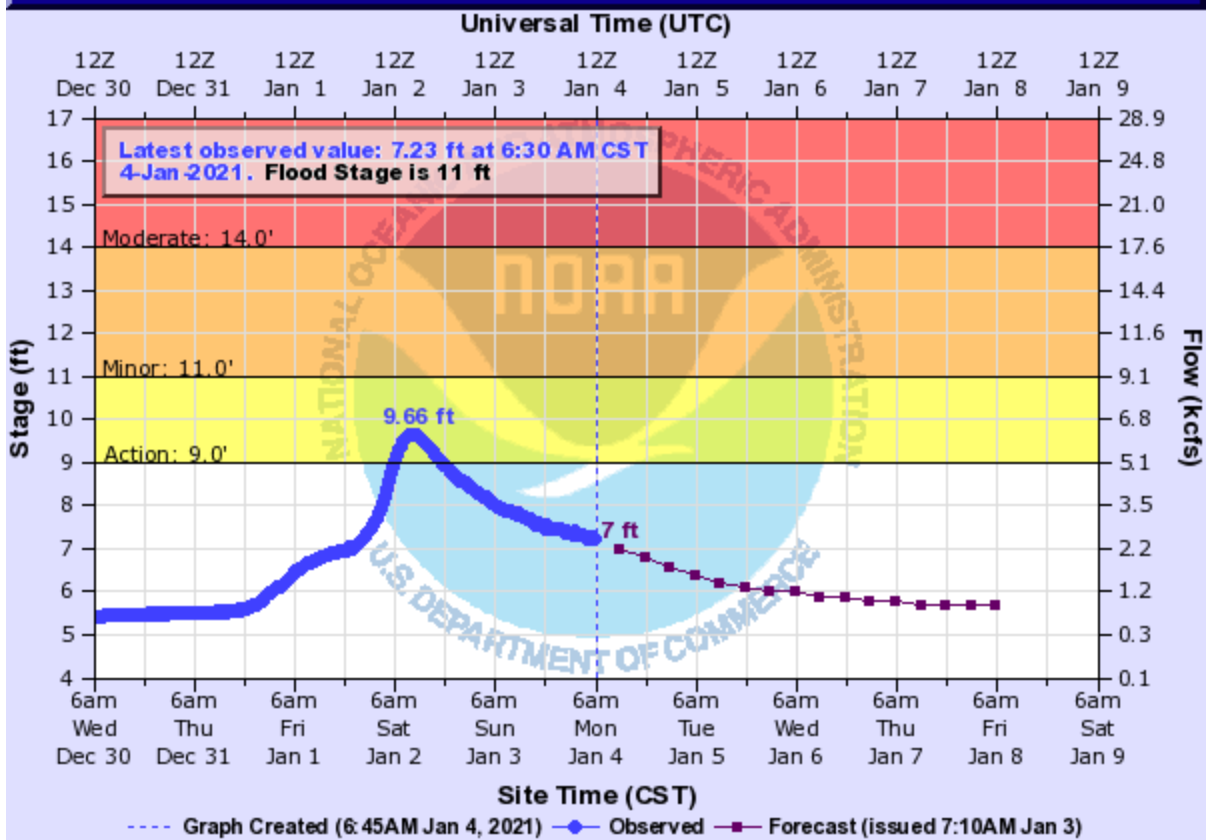


PANO2(plotting HGIRG) "Gage 0" Datum: 387.96' | Observations courtesy of US Geological Survey



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

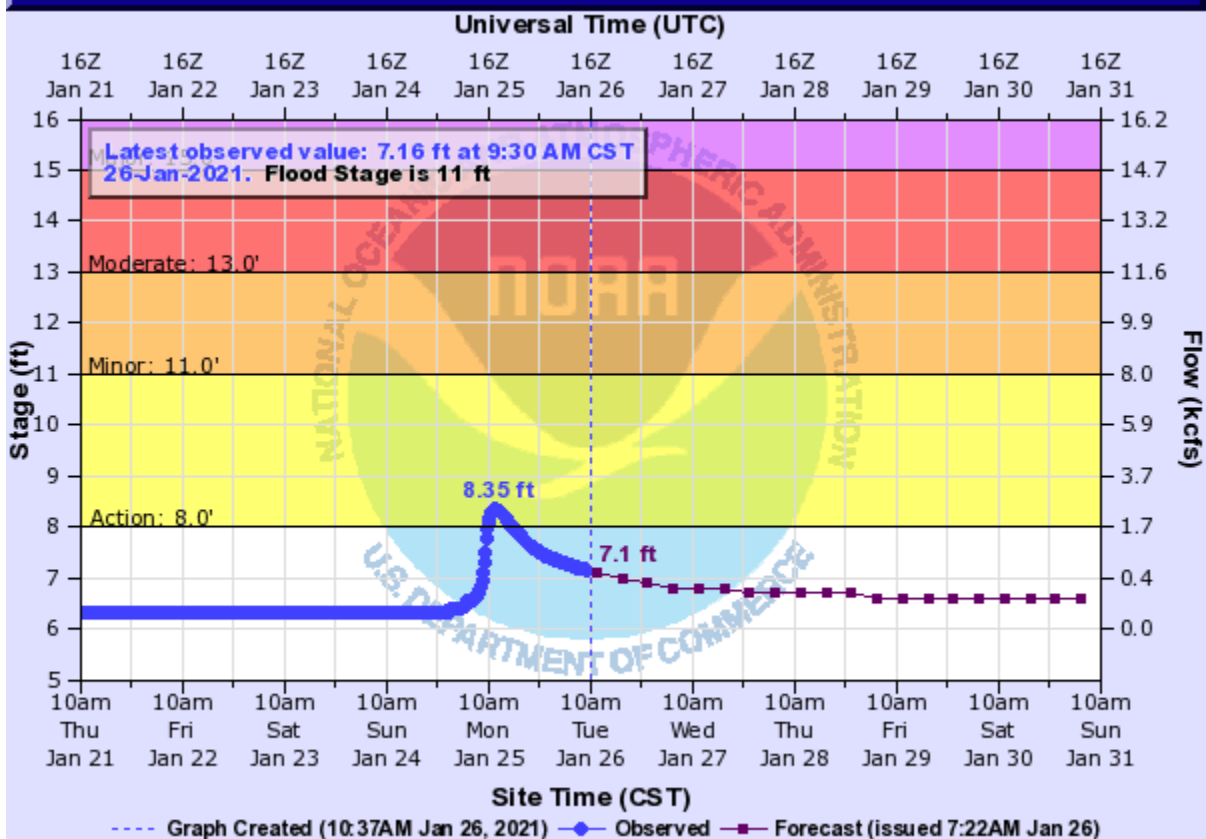
ILLINOIS RIVER (AR OK) NEAR TAHLEQUAH



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

Observations courtesy of US Geological Survey

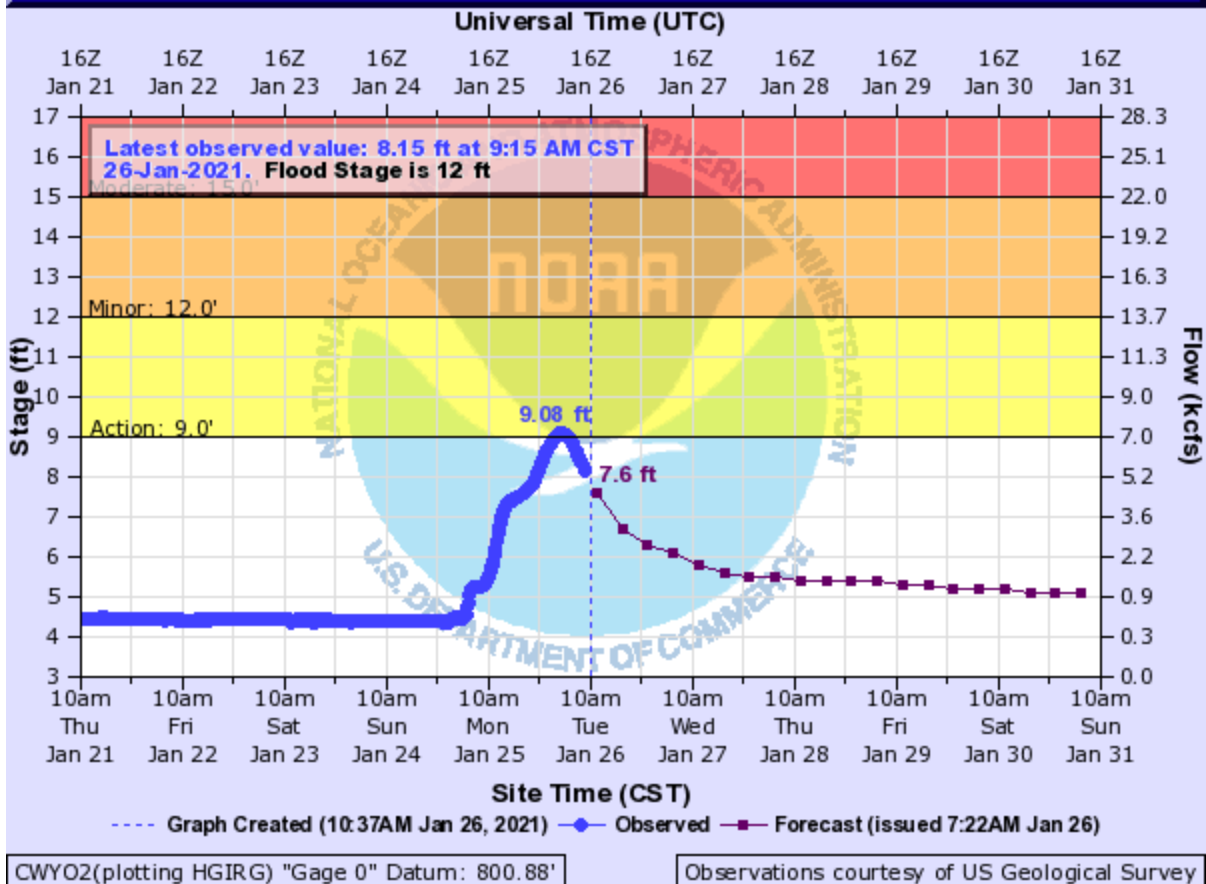
FLINT CREEK (OK) NEAR KANSAS



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

Observations courtesy of US Geological Survey

ILLINOIS RIVER (AR OK) AT CHEWEY



ILLINOIS RIVER (AR OK) NEAR TAHLEQUAH

