

NWS FORM E-5 (11-88) (PRES. by NWS Instruction 10-924)	U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL WEATHER SERVICE	HYDROLOGIC SERVICE AREA (HSA) Tulsa, Oklahoma (TSA)
		REPORT FOR: MONTH March YEAR 2022
MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS		SIGNATURE Steven F. Piltz (Meteorologist-in-Charge)
TO: Hydrometeorological Information Center, W/OH2 NOAA / National Weather Service 1325 East West Highway, Room 7230 Silver Spring, MD 20910-3283		DATE April 11, 2022

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 relatively average March in 2022, with a few rain events that caused rises along area rivers and helped to improve the widespread drought conditions from the end of February. However, no mainstem river flooding occurred. A winter storm brought snow to the region at the beginning of the month, and two tornadoes occurred at the end of the month. Normal precipitation for March ranges from 3.1 inches in Pawnee County to 4.3 inches in Le Flore County. In the Ozark region of northwest Arkansas, the normal precipitation for the month is 4.4 inches. This report, past E-5 reports, and monthly hydrology and climatology summaries can be found at https://www.weather.gov/tsa/climo_summary_e5list.

Monthly Summary

Using the radar-derived estimated observed precipitation from the RFCs (Fig. 1a), rainfall totals for March 2022 ranged from 2" to around 6" across eastern OK and northwest AR, with much of the area receiving 2"-4". These rainfall totals correspond to 50% to 150% of the normal March rainfall (Fig. 1b).

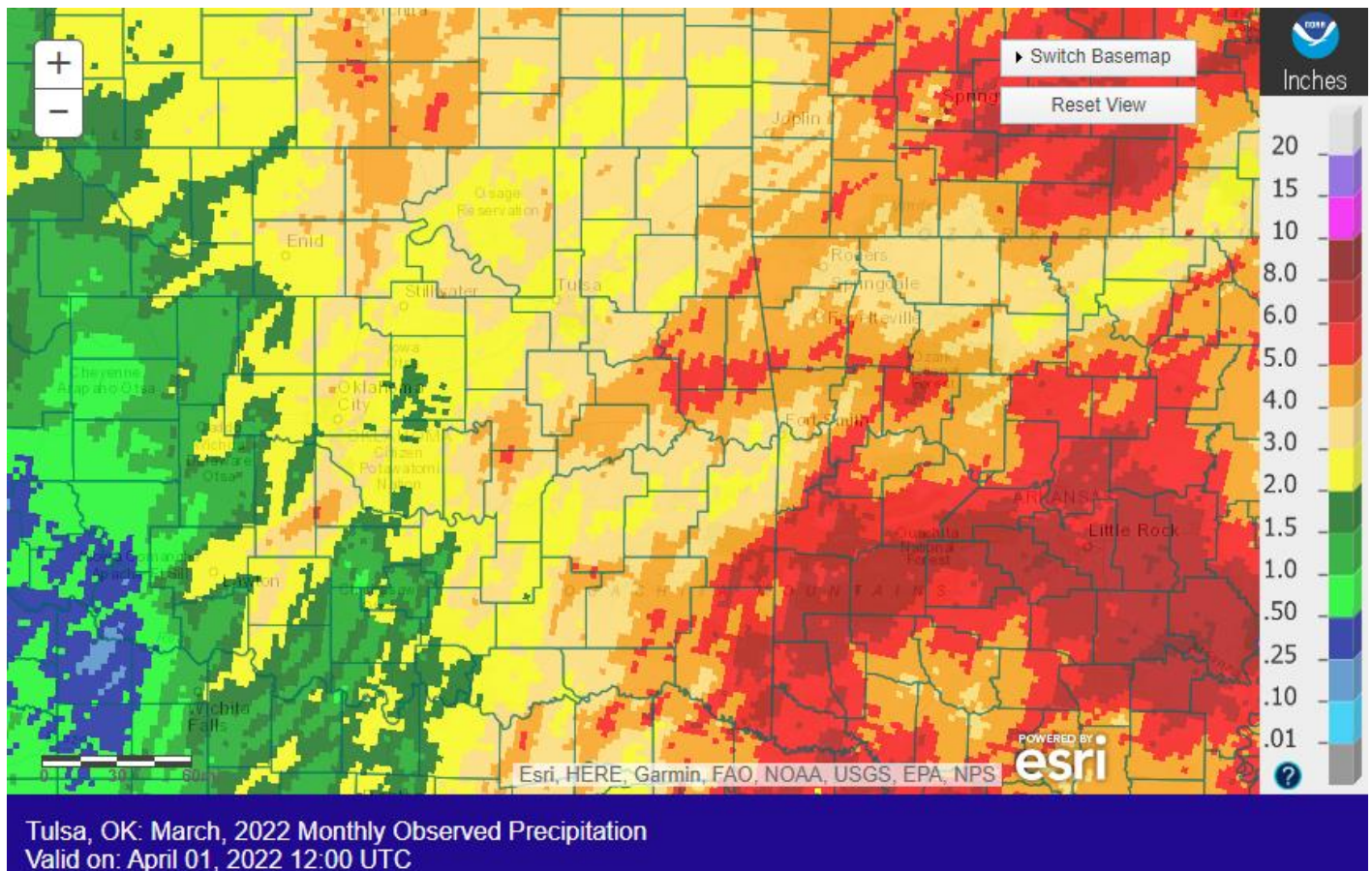
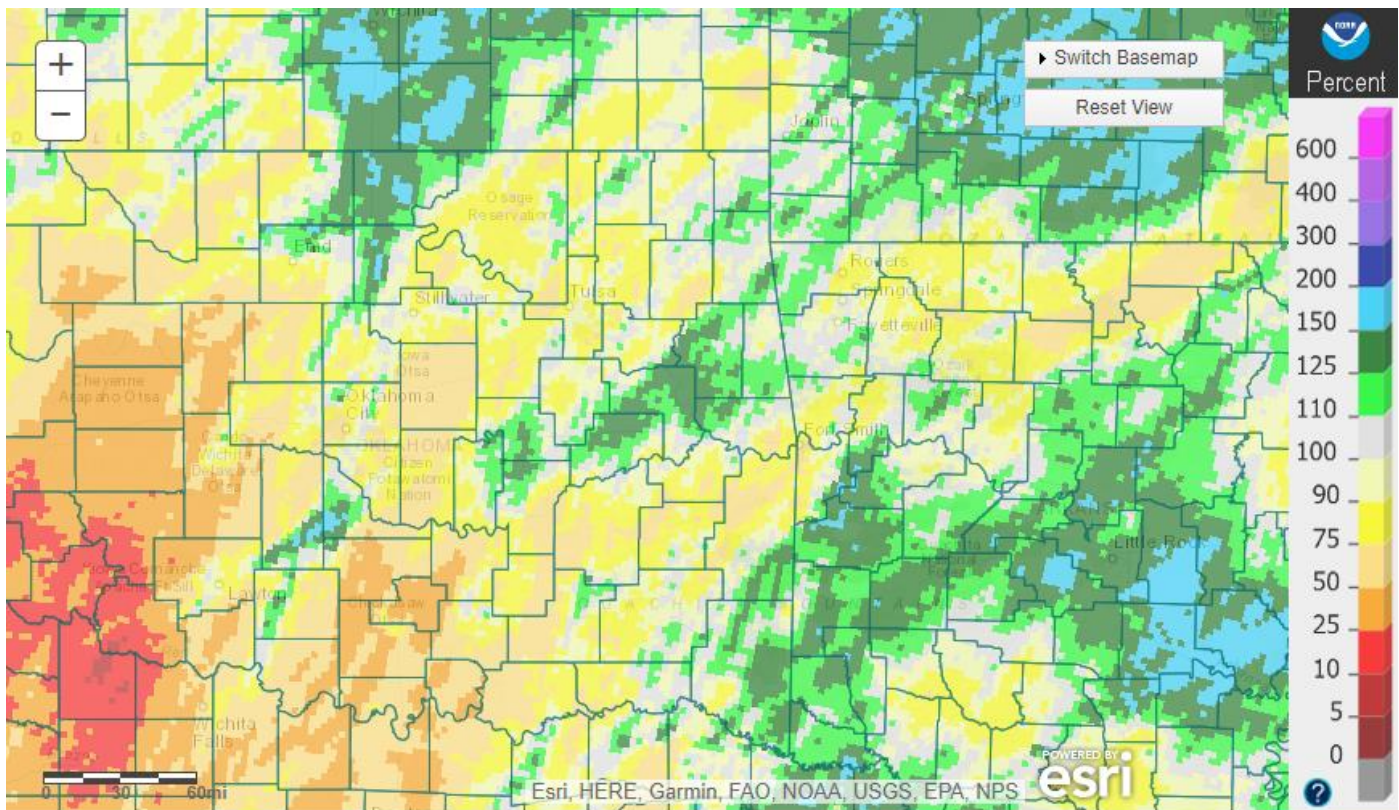


Fig. 1a. Estimated Observed Rainfall for March 2022



Tulsa, OK: March, 2022 Monthly Percent of Normal Precipitation
Valid on: April 01, 2022 12:00 UTC

Fig. 1b. Estimated % of Normal Rainfall for March 2022

In Tulsa, OK, March 2022 ranked as the 58th coldest/59th warmest March (51.4°F, tied 1927, 2008; since records began in 1905), the 60th wettest March (3.04"; since records began in 1888), and the 18th snowiest March (3.2"; since records began in 1900). Fort Smith, AR had the 62nd warmest March (52.6°F, tied 1972; since records began in 1883), the 65th driest March (2.91", tied 1908; since records began in 1883), and the 18th snowiest March (1.5", tied 1932, 1903; since records began in 1884). Fayetteville, AR had the 28th warmest (49.6°F, tied 1972), the 36th driest/38th wettest (3.59"), and the 15th snowiest (2.2") March since records began in 1950.

Some of the larger precipitation reports (in inches) for March 2022 included:

Kingston 2S, AR (coop)	6.28	Winslow 7NE, AR (coop)	6.02	Cookson, OK (meso)	5.42
Tahlequah, OK (meso)	5.23	Webbers Falls, OK (meso)	5.23	Muskogee, OK (coop)	4.77
Cloudy, OK (meso)	4.51	Hugo, OK (meso)	4.38	NW AR Reg. Airport (ASOS)	4.37

Some of the lowest precipitation reports (in inches) for March 2022 included:

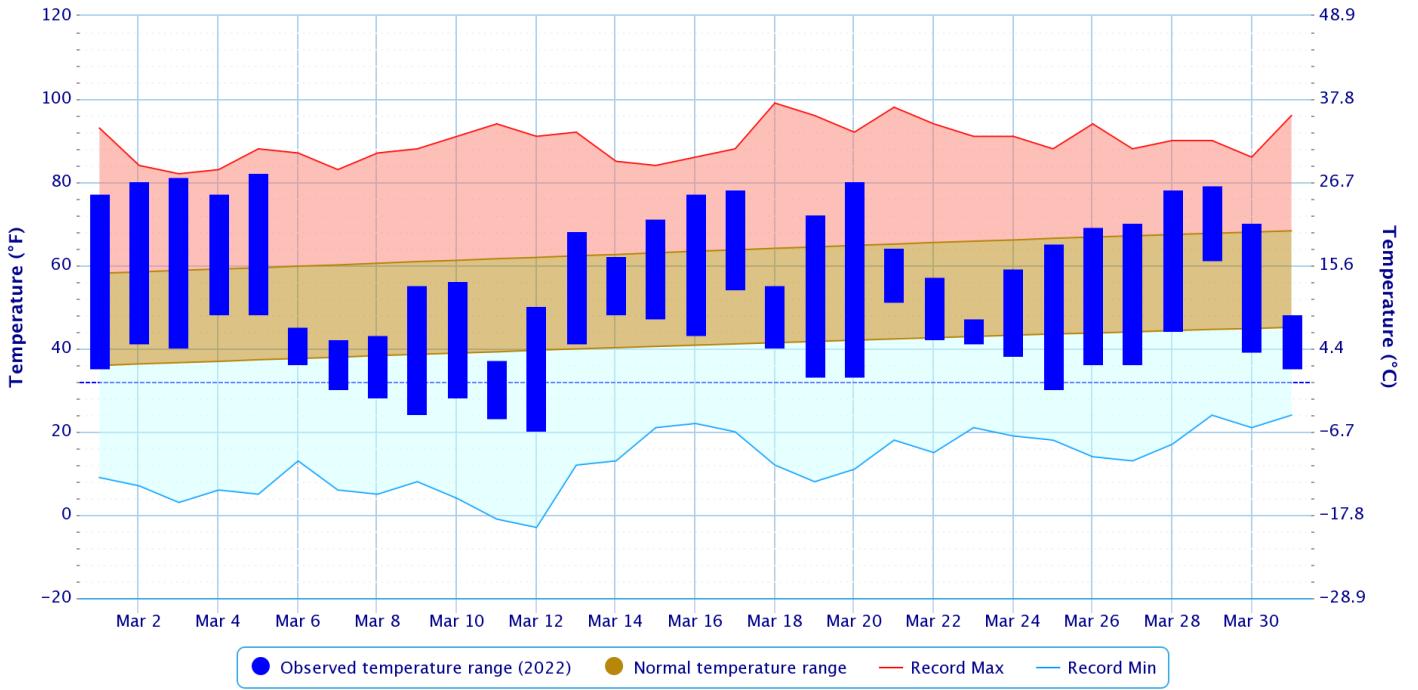
Bristow, OK (meso)	2.56	Bixby, OK (meso)	2.67	Stuart, OK (meso)	2.71
Bartlesville, OK (coop)	2.73	Tulsa, OK (meso)	2.75	Wilburton, OK (meso)	2.90
Fort Smith, AR (ASOS)	2.91	Burbank, OK (meso)	2.94	McAlester, OK (ASOS)	2.94

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

Rank since 1921	March 2022	Year-to-Date (Jan 1 – Mar 31)	Last 60 Days (Jan 31 – Mar 31)	Last 120 Days (Dec 2 – Mar 31)	Water Year-to-Date (Oct 1, 2021 – Mar 31, 2022)	Last 365 Days (Apr 1, 2021 – Mar 31, 2022)
Northeast OK	39 th wettest	37 th driest	43 rd wettest	38 th driest	49 th driest	50 th driest
East Central OK	33 rd wettest	48 th driest	39 th wettest	46 th wettest	43 rd wettest	44 th wettest
Southeast OK	38 th wettest	44 th driest	36 th wettest	36 th driest	29 th driest	45 th wettest
Statewide	49 th driest	33 rd driest	47 th driest	23 rd driest	29 th driest	32 nd driest

Daily Temperature Data – Tulsa Area, OK (ThreadEx)

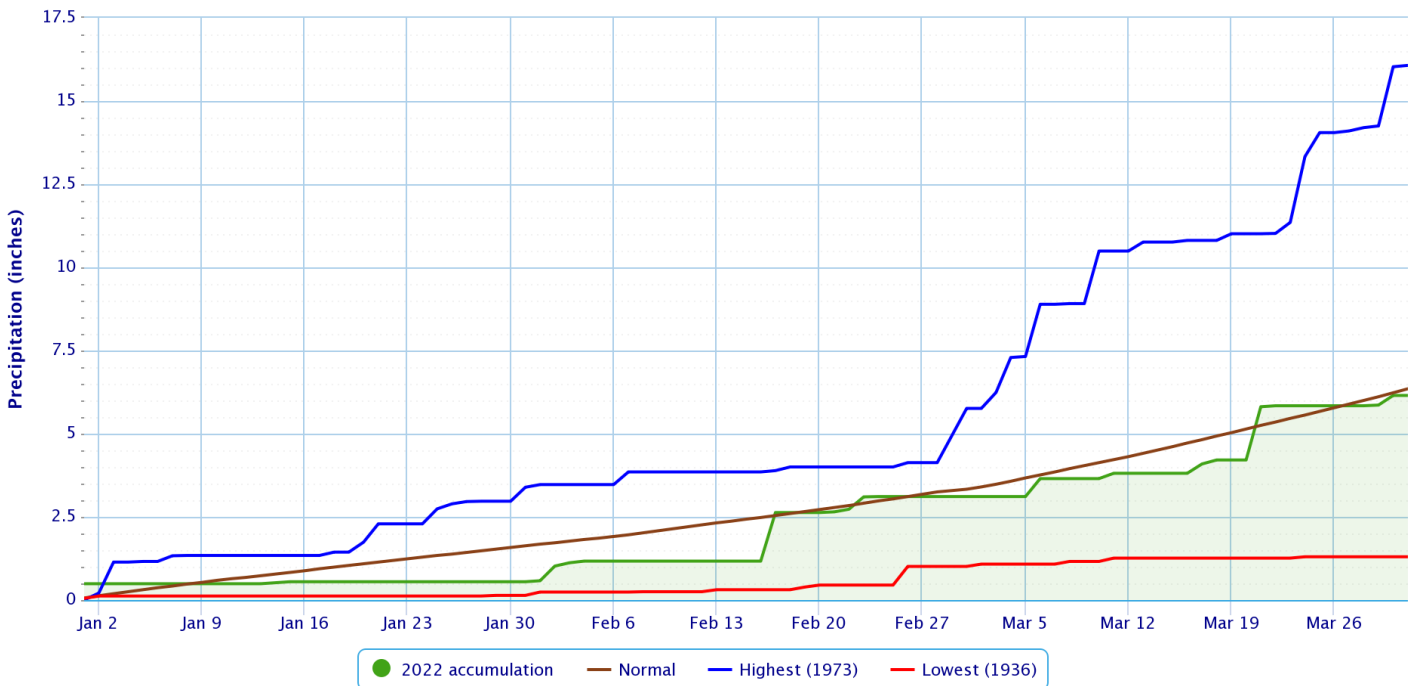
Period of Record – 1905-01-06 to 2022-03-31. Normals period: 1991-2020. Click and drag to zoom chart.



Powered by ACIS

Accumulated Precipitation – Tulsa Area, OK (ThreadEx)

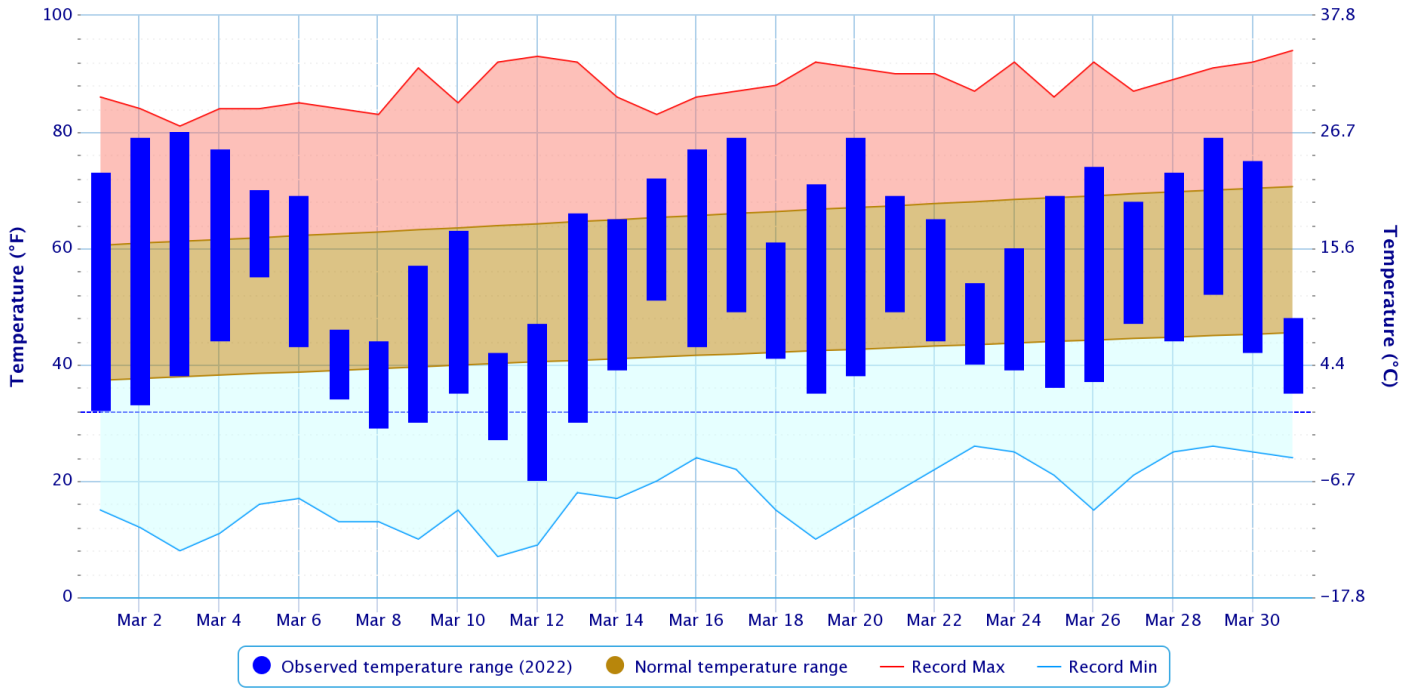
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



Powered by ACIS

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

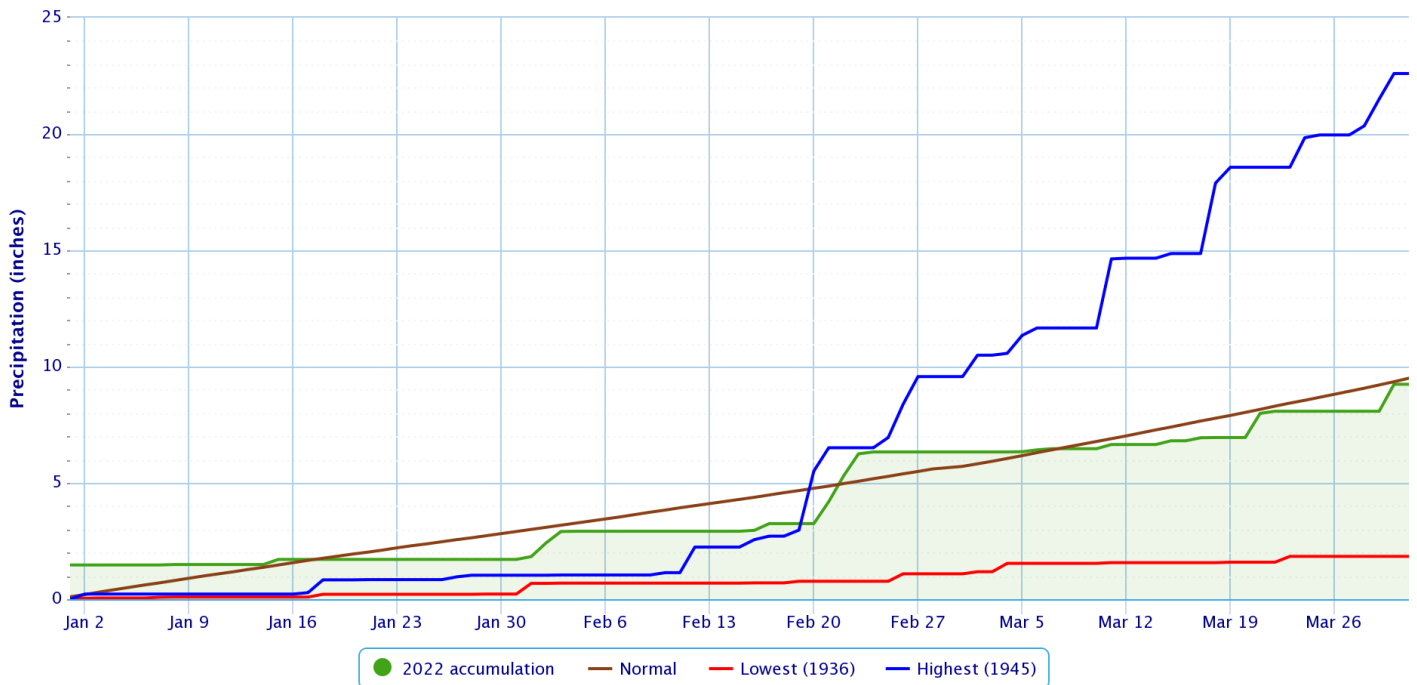
Period of Record – 1882-06-01 to 2022-03-31. Normals period: 1991-2020. Click and drag to zoom chart.



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Accumulated Precipitation – Fort Smith Area, AR (ThreadEx)

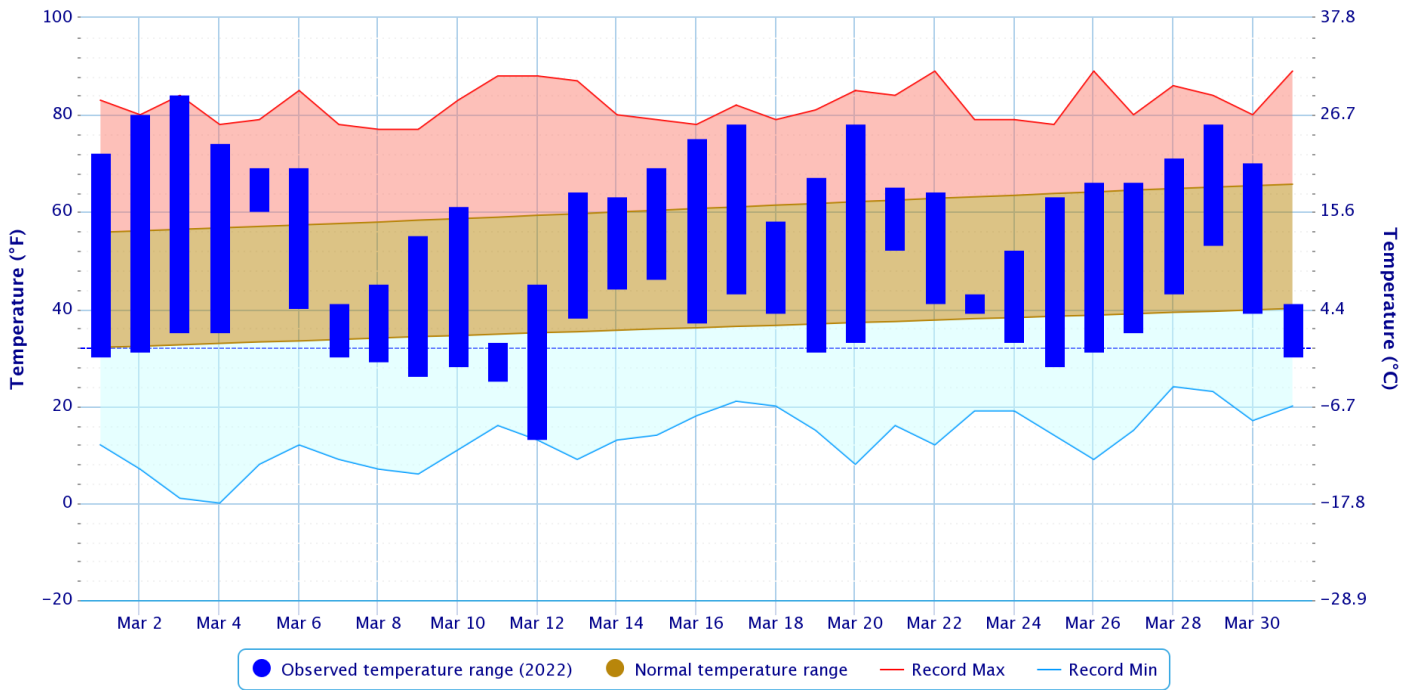
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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Daily Temperature Data – FAYETTEVILLE DRAKE FIELD, AR

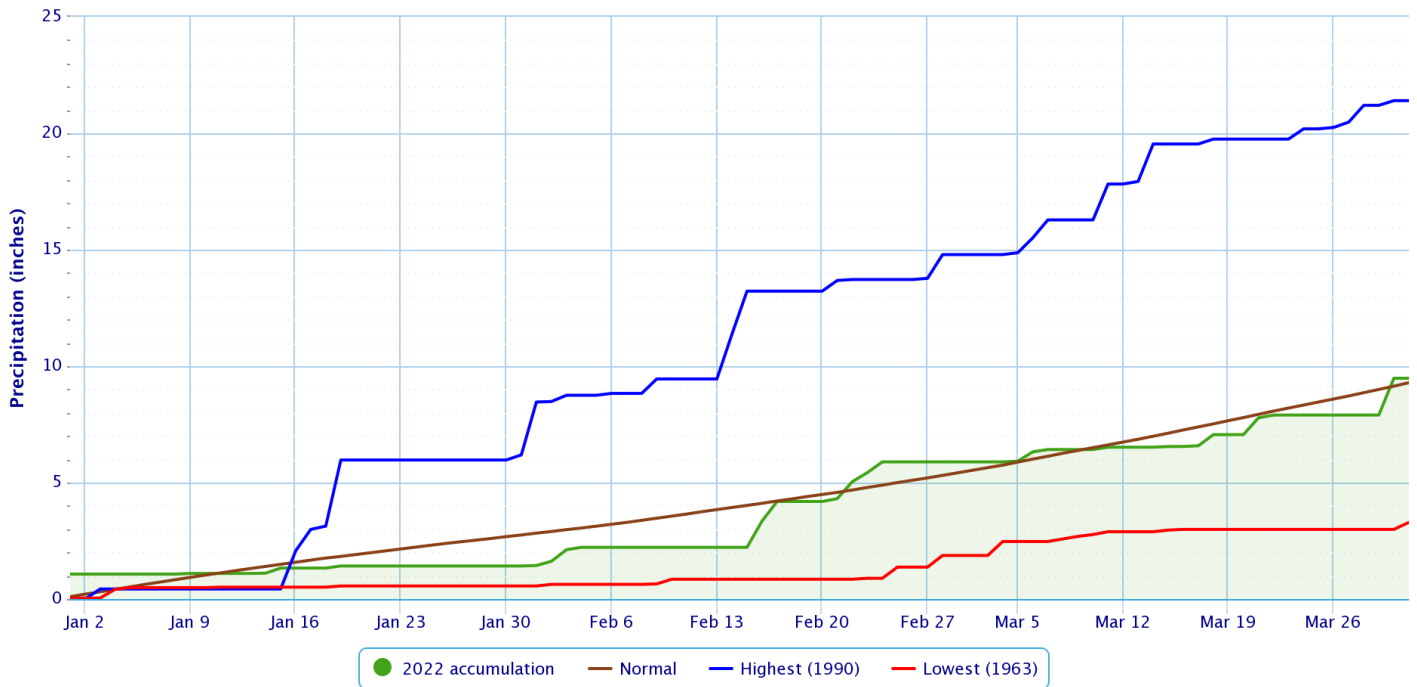
Period of Record – 1949-07-14 to 2022-03-31. Normals period: 1991-2020. Click and drag to zoom chart.



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

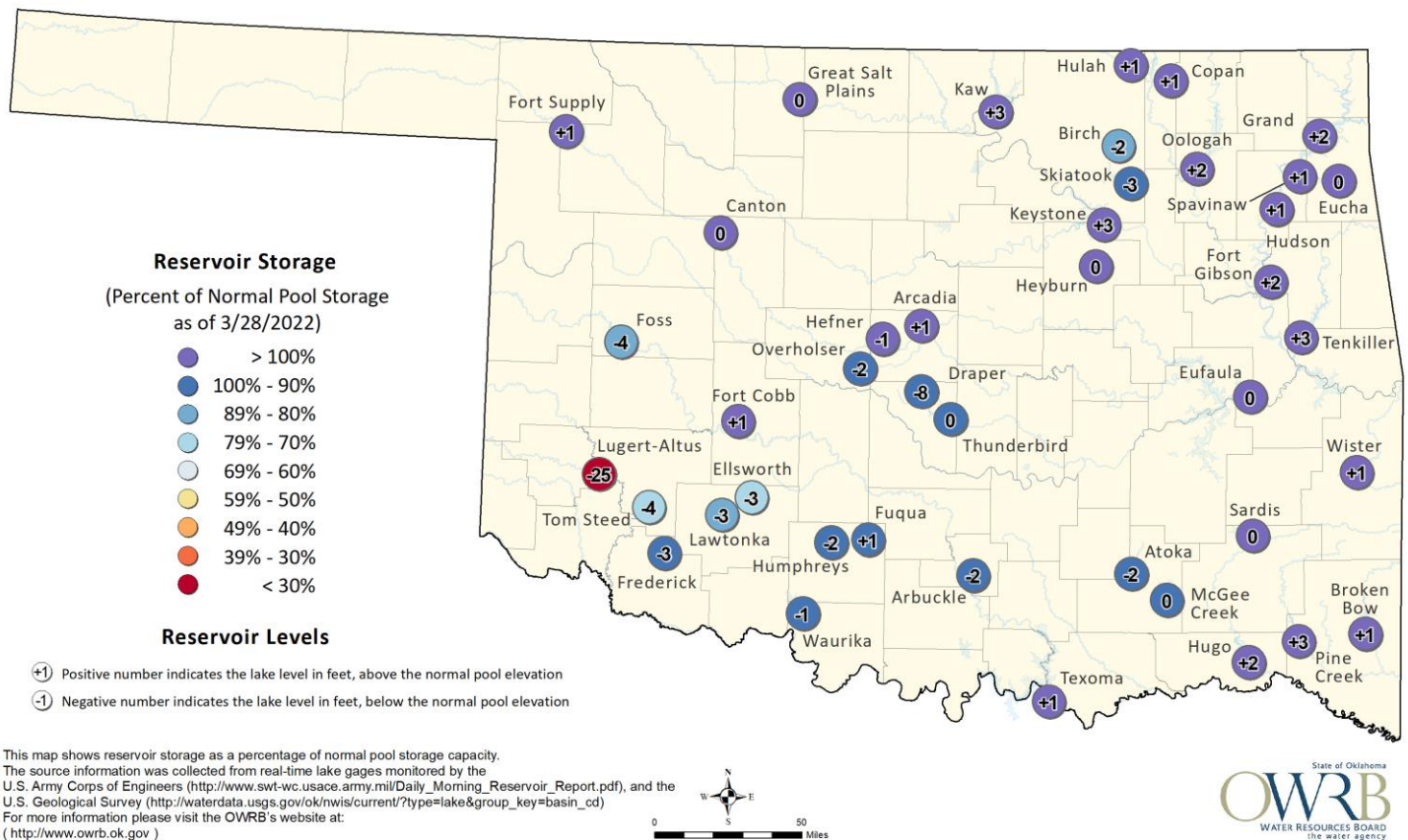


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Reservoirs

Oklahoma Surface Water Resources

Reservoir Levels and Storage as of 3/28/2022



According to the USACE, several lakes in the HSA were above 3% of top of their conservation pools as of 4/01/2022: Grand Lake 11%, Lake Tenkiller 9%, Wister Lake 9%, Lake Eufaula 6%, Hudson Lake 6%, Kaw Lake 4%, Oologah Lake 4%, Ft. Gibson Lake 4%, and Keystone 4%. A couple of lakes were more than 3% below the top of their conservation pools: Birch Lake 90% and Skiatook Lake 92%.

Drought

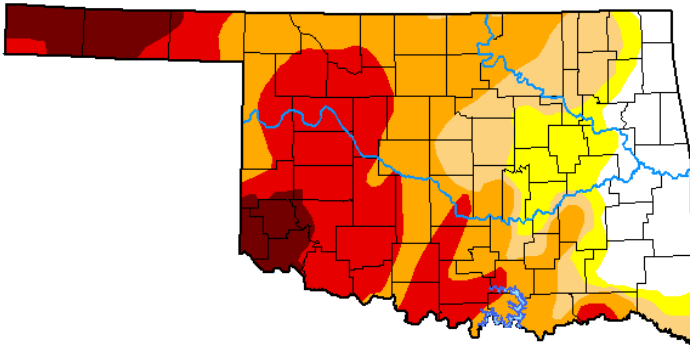
According to the [U.S. Drought Monitor](#) (USDM) from March 29, 2022 (Figs. 2, 3), drought conditions were still present but had improved across a large portion of eastern OK. Extreme (D3) Drought conditions continued across a portion of Choctaw County in eastern OK. Severe (D2) Drought conditions were present over parts of Osage, Pawnee, eastern Kay, Choctaw, and Pittsburg Counties in eastern OK. Moderate (D1) Drought conditions were occurring across portions of Osage, Pawnee, Washington, Nowata, Creek, Rogers, Tulsa, Craig, Mayes, Wagoner, McIntosh, Pittsburg, and Pushmataha Counties in eastern OK. Abnormally Dry (but not in drought) (D0) conditions were present over portions of Craig, Mayes, Rogers, Wagoner, Muskogee, Okmulgee, Tulsa, Creek, Okfuskee, McIntosh, Pittsburg, Pushmataha, and Choctaw Counties in eastern OK. No drought or abnormally dry conditions were occurring in northwest AR.

U.S. Drought Monitor Oklahoma

March 29, 2022
(Released Thursday, Mar. 31, 2022)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	13.76	86.24	76.49	63.34	33.90	8.32
Last Week 03-22-2022	12.94	87.06	77.01	64.10	33.90	7.81
3 Months Ago 12-28-2021	4.92	95.08	90.17	72.51	22.62	0.00
Start of Calendar Year 01-04-2022	5.02	94.98	88.14	72.26	40.44	0.00
Start of Water Year 09-28-2021	6.45	93.55	73.23	23.72	2.65	0.00
One Year Ago 03-30-2021	63.05	36.95	10.71	3.42	0.08	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:

Deborah Bathke
National Drought Mitigation Center



droughtmonitor.unl.edu

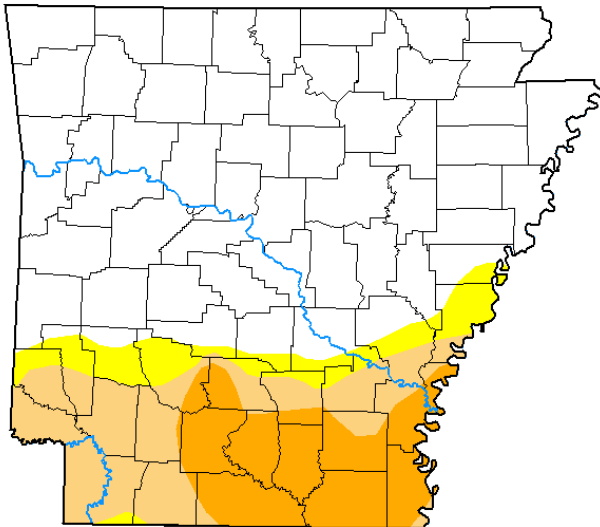
Fig. 2. Drought Monitor for Oklahoma

U.S. Drought Monitor Arkansas

March 29, 2022
(Released Thursday, Mar. 31, 2022)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	69.31	30.69	24.61	12.04	0.00	0.00
Last Week 03-22-2022	64.93	35.07	26.84	13.90	3.27	0.00
3 Months Ago 12-28-2021	23.76	76.24	29.83	2.67	0.00	0.00
Start of Calendar Year 01-04-2022	39.91	60.09	28.99	14.24	0.41	0.00
Start of Water Year 09-28-2021	51.41	48.59	5.17	0.00	0.00	0.00
One Year Ago 03-30-2021	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:

Deborah Bathke
National Drought Mitigation Center



droughtmonitor.unl.edu

Fig. 3. Drought Monitor for Arkansas

Outlooks

The [Climate Prediction Center](#) (CPC) outlook for April 2022 (issued March 31, 2022) indicates an enhanced chance for above normal temperatures and equal chances for above, near, and below median precipitation across all of eastern OK and northwest AR. This outlook was largely based on dynamical model output and La Niña impacts.

For the 3-month period April-May-June 2022, CPC is forecasting a greatly enhanced chance for above normal temperatures and an enhanced chance for below median precipitation across all of eastern OK and northwest AR (outlook issued March 17, 2022). This outlook is based on long-term trends, La Niña impacts, and incorporates both statistical and dynamical forecast tools. From CPC, “the greatest odds for above-normal temperatures is for the Southwest and southern Plains due to the combination of factors including overwhelmingly consistent dynamical model guidance, low soil moisture conditions, long-term positive temperature trends and other statistical forecast tools.” According to CPC, the combined effect of the ocean-atmosphere system remains consistent with La Niña conditions. La Niña conditions are expected to continue through summer 2022 with generally equal odds of La Niña or ENSO-neutral thereafter. 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 cold front moved across the region on the 10th. Around midnight on the 11th, post-frontal precipitation began to move into northeast OK. With the cold air in place, this precipitation was a wintery mix that quickly transitioned to primarily snow as it continued to spread southeast. During the morning hours, moderate to occasionally heavy snow fell from just south of I-44 into northwest AR within a band of mid-level frontogenesis, and snowfall rates of around 1” per hour were observed. The precipitation continued to move southeast through the day, exiting the area by mid-evening. Snow and sleet totals ranged from around 0.25” to 4” across eastern OK and northwest AR (Fig. 4). Liquid equivalent totals were a few hundredths of an inch to near 0.50”.

Warm advection and strong forcing from an approaching upper-level low allowed for widespread showers and scattered thunderstorm development starting around sunrise of the 21st. By mid-afternoon, this activity was affecting nearly all of eastern OK and northwest AR. Widespread showers and thunderstorms continued through the evening, before ending from west to east. The rain pushed east of the area shortly after midnight on the 22nd. Precipitable water (PWAT) values of 1”-1.5”, indicating a moist atmosphere, resulted in rainfall totals of 0.50” to near 3” (Figs. 5, 6). This rainfall was welcome relief from ongoing drought conditions. Area rivers responded to this rainfall, but no flooding occurred. Flint Creek near Kansas, the Illinois River near Tahlequah, and the Neosho River near Commerce exceeded action stage, but remained below flood stage (see preliminary hydrographs at the end of this report).

Just before midnight of the 30th, a band of showers and thunderstorms, which had developed along a dry line, moved into eastern OK from the west. This wide band of convection continued to move slowly eastward across eastern OK and into northwest AR during the overnight and morning hours under the influence of stronger synoptic forcing. During the pre-dawn hours, line segments formed and a couple of QLCS (quasi-linear convective system) tornadoes developed within the favorable wind fields. One tornado was rated EF3 in Washington County, AR and the other was rated EF0 in Pittsburg County, OK (for more information visit <https://arcg.is/1eT4580>). Lighter rain lingered across far eastern OK and western Arkansas from late morning through early afternoon before the main precipitation area shifted east as a cold front moved across the area. Light, wrap-around showers continued during the afternoon and early evening hours as the main upper-level low passed overhead. PWATs were once again above normal for this time of year, resulting in rainfall totals of 0.50”-3” primarily south of I-44 in eastern OK and northwest AR (Figs. 7-9). While the heaviest rain remained just south of the Illinois River basin, enough rain fell across the basin to result in a rise above action stage near Tahlequah. However, the river remained below flood stage (see preliminary hydrographs at the end of this report).

Estimated Snow and Sleet Accumulation

Weather Forecast Office
Tulsa, OK



Valid 11 PM Thu Mar 10, 2022 through 4 PM Fri Mar 11, 2022 CST

Issued Mar 11, 2022 4:56 PM CST

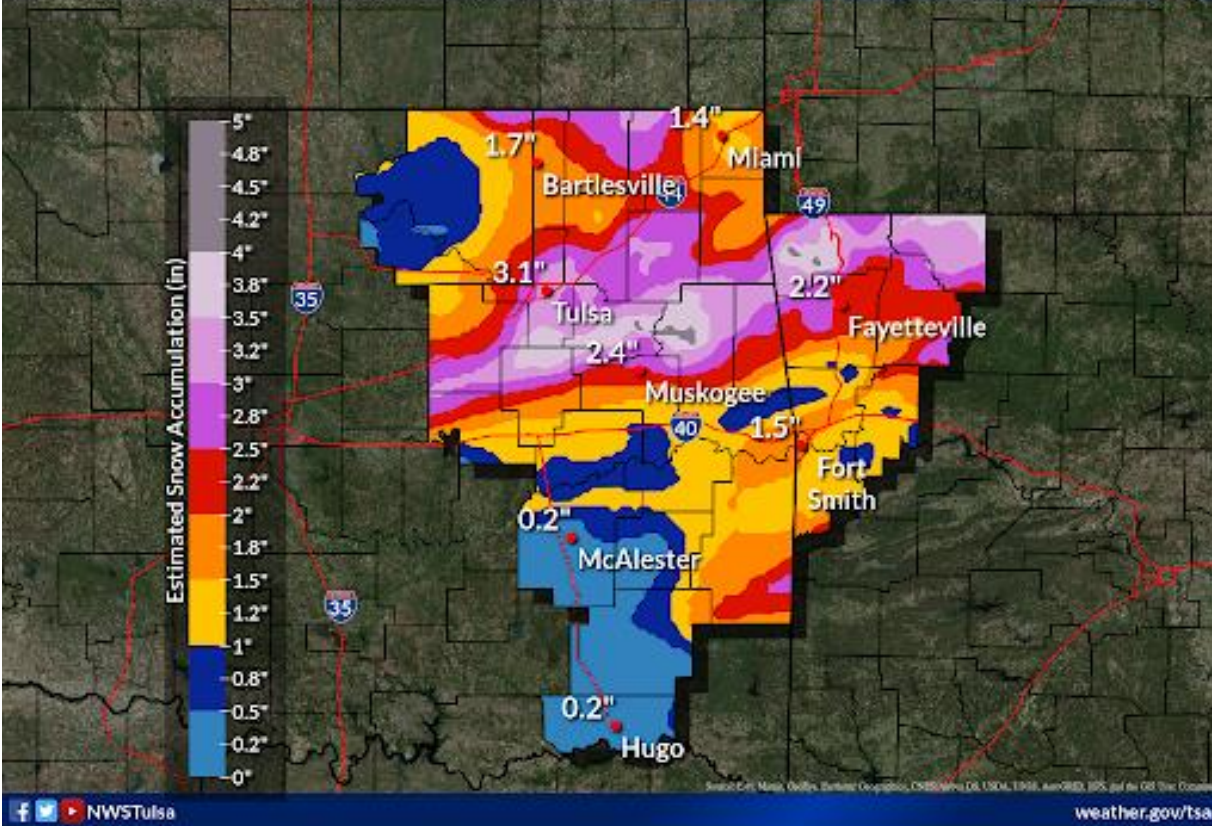


Fig. 4. Estimated snow and sleet totals from 11pm CST March 10, 2022 through 4pm CST March 11, 2022.

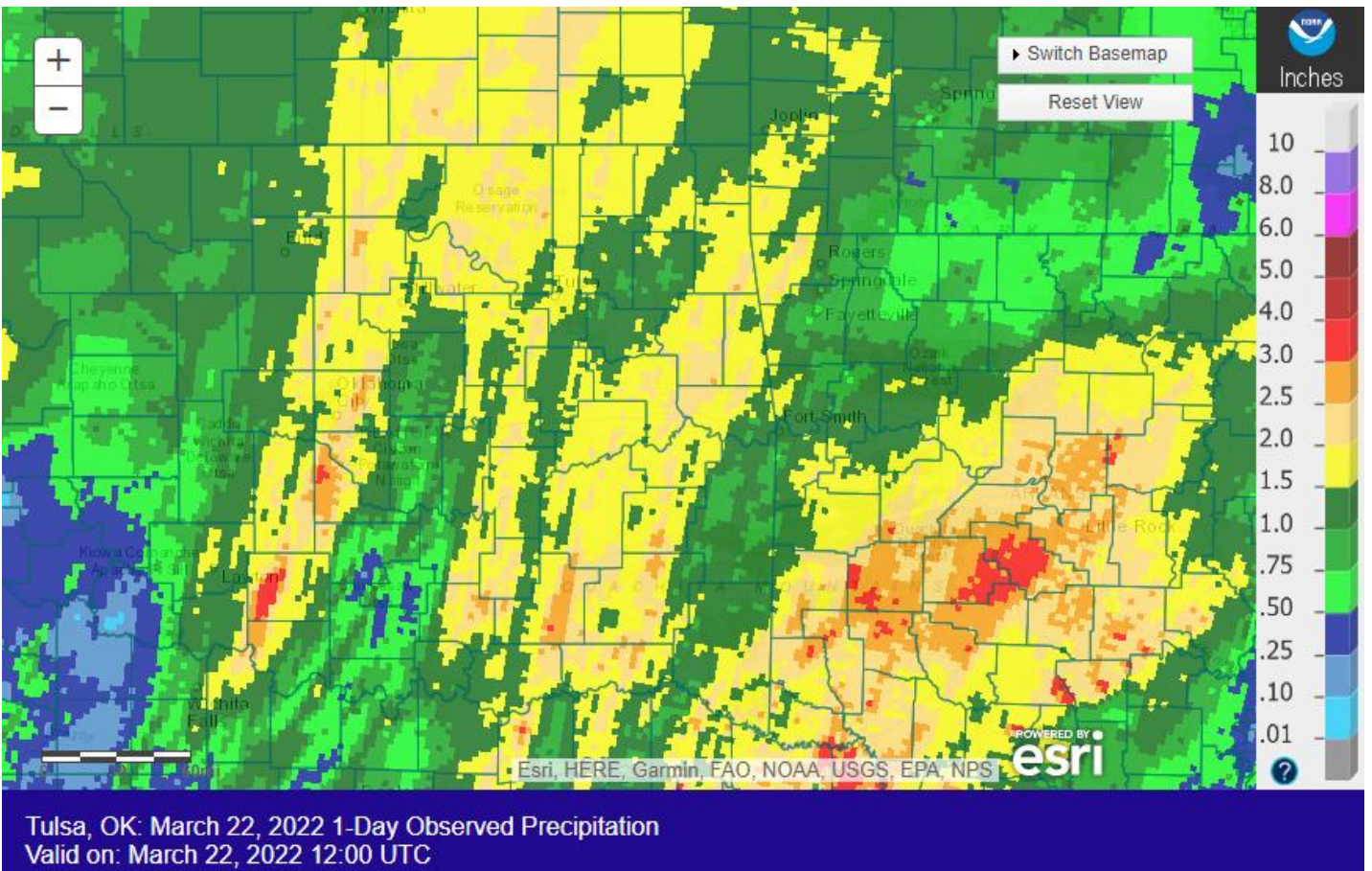
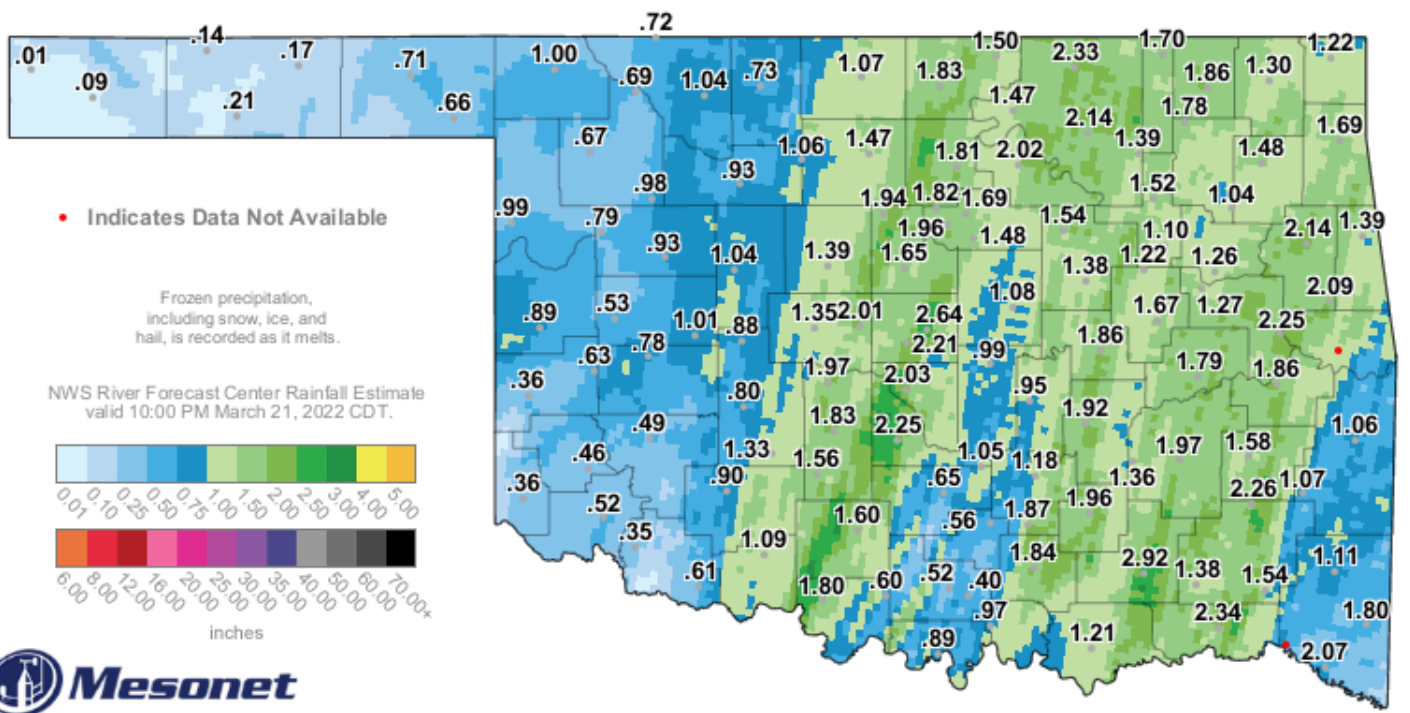


Fig. 5. 24-hour Estimated Observed Rainfall ending at 7am CDT 3/22/2022.



Today's Rainfall (inches)

11:10 PM March 21, 2022 CDT

Created 11:15:58 PM March 21, 2022 CDT. © Copyright 2022

Fig. 6. OK Mesonet (values) and NWS RFC rainfall estimate (image) March 21, 2022 rainfall ending at 11:10 pm CDT.

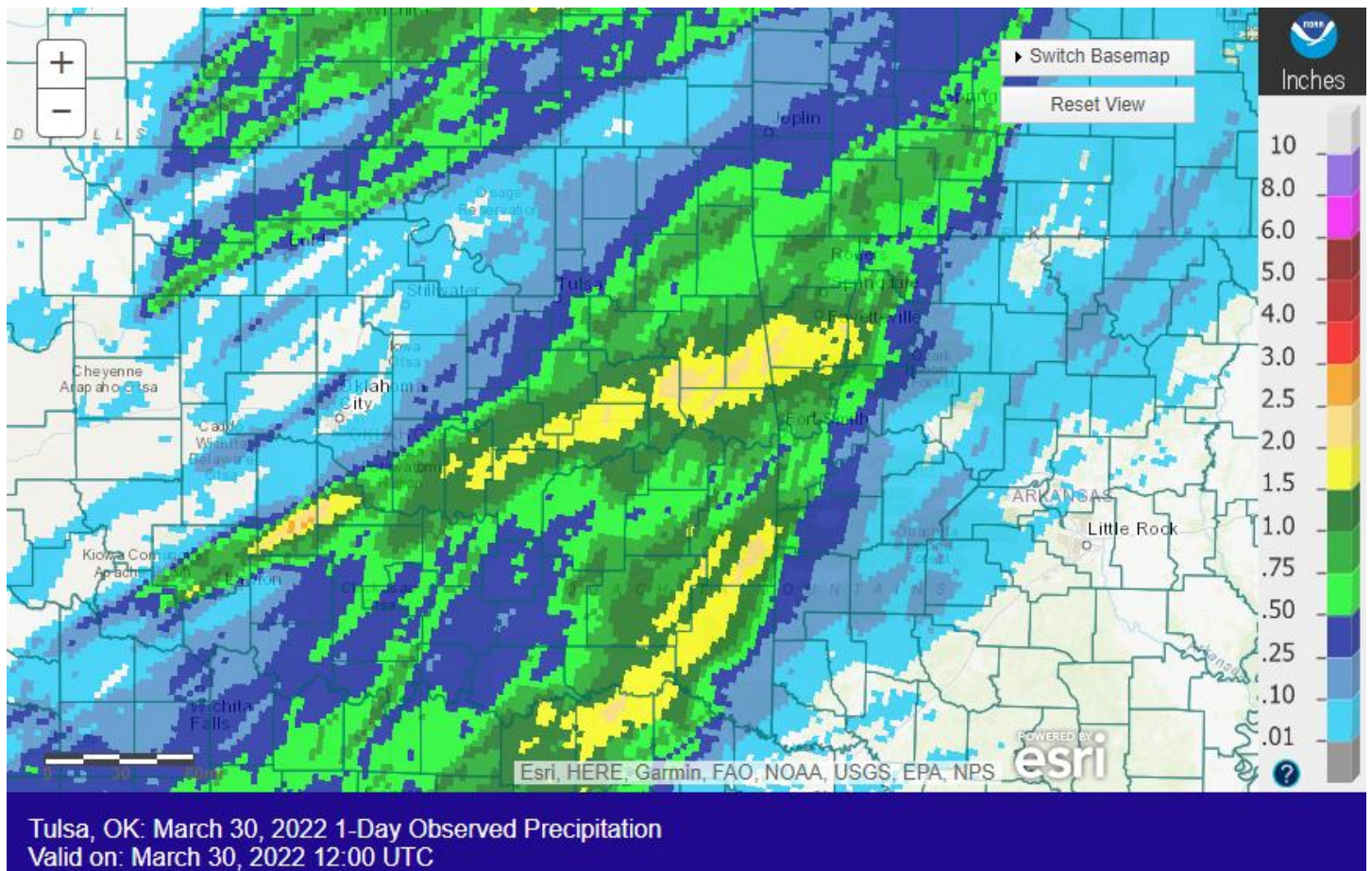
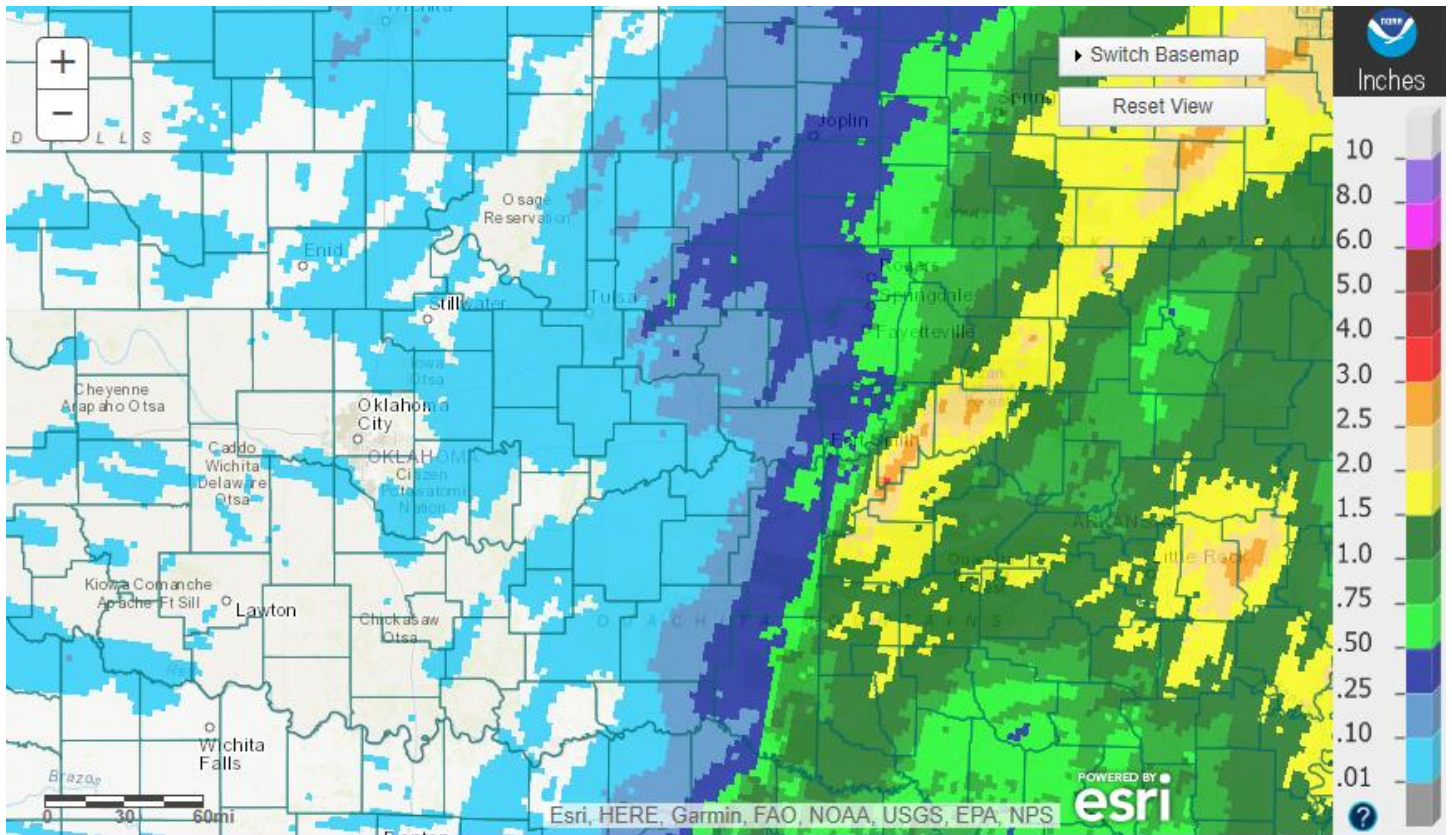
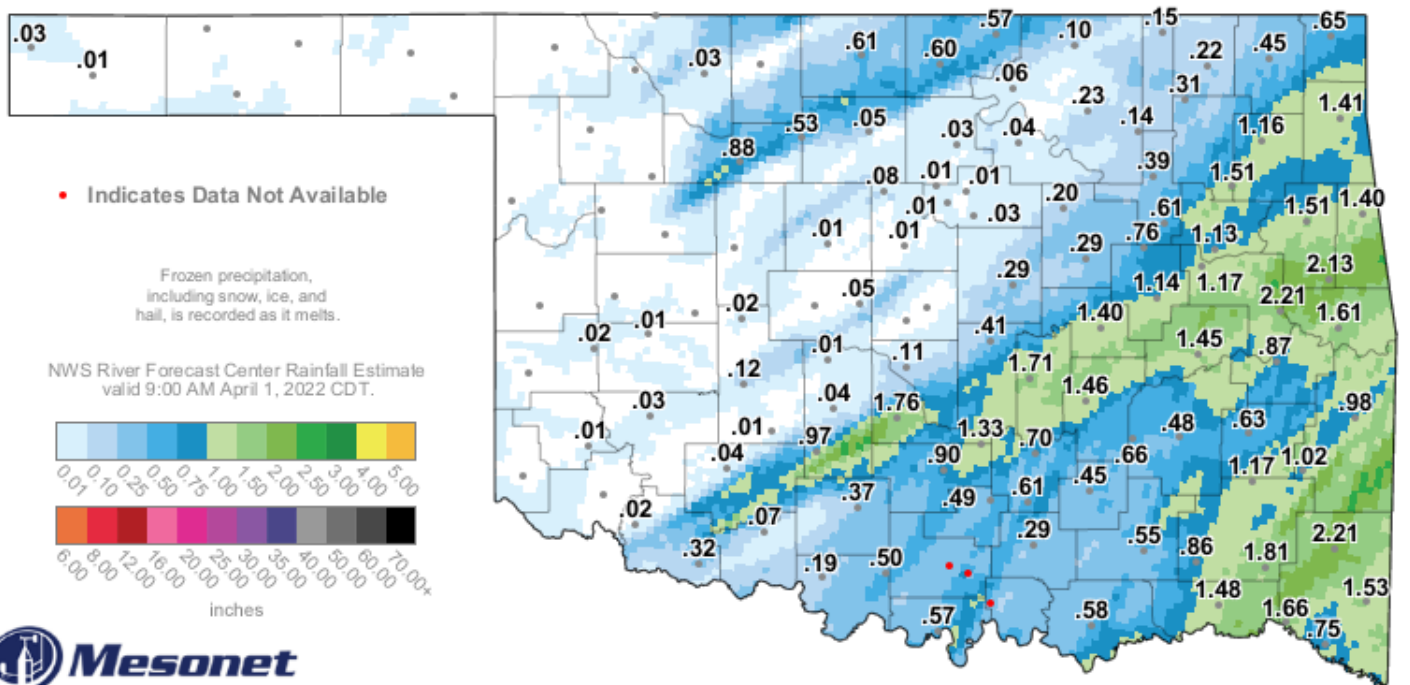


Fig. 7. 24-hour Estimated Observed Rainfall ending at 7am CDT 3/30/2022.



Tulsa, OK: March 31, 2022 1-Day Observed Precipitation
Valid on: March 31, 2022 12:00 UTC

Fig. 8. 24-hour Estimated Observed Rainfall ending at 7am CDT 3/31/2022.



Mesonet 3-Day Rainfall Accumulation (inches)

9:50 AM April 1, 2022 CDT

Created 9:54:30 AM April 1, 2022 CDT. © Copyright 2022

Fig. 9. OK Mesonet (values) and NWS RFC rainfall estimate (image) 3-day rainfall ending at 09:50 am CDT 4/01/2022.

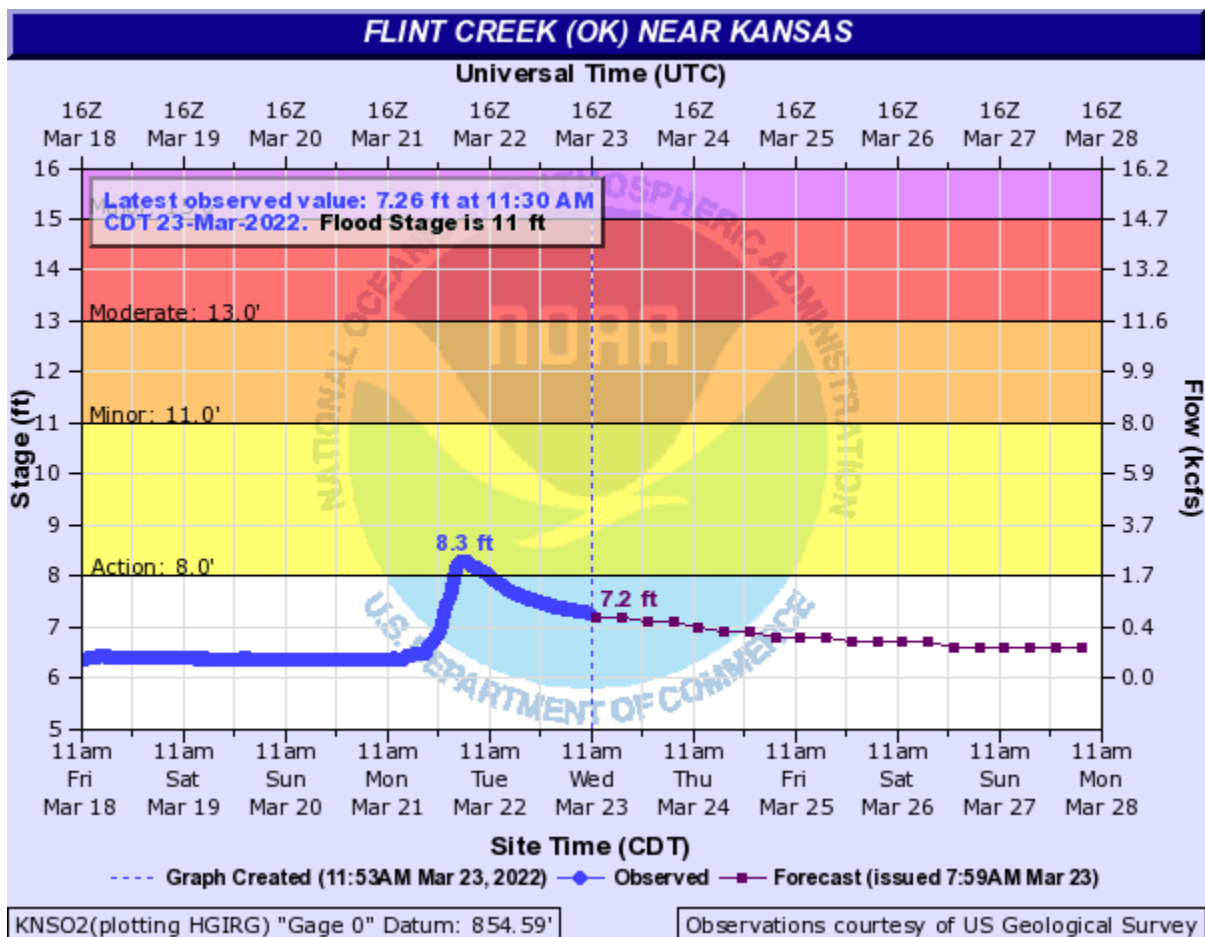
Written by:
 Nicole McGavock
 Service Hydrologist
 WFO Tulsa

Products issued in March 2022:

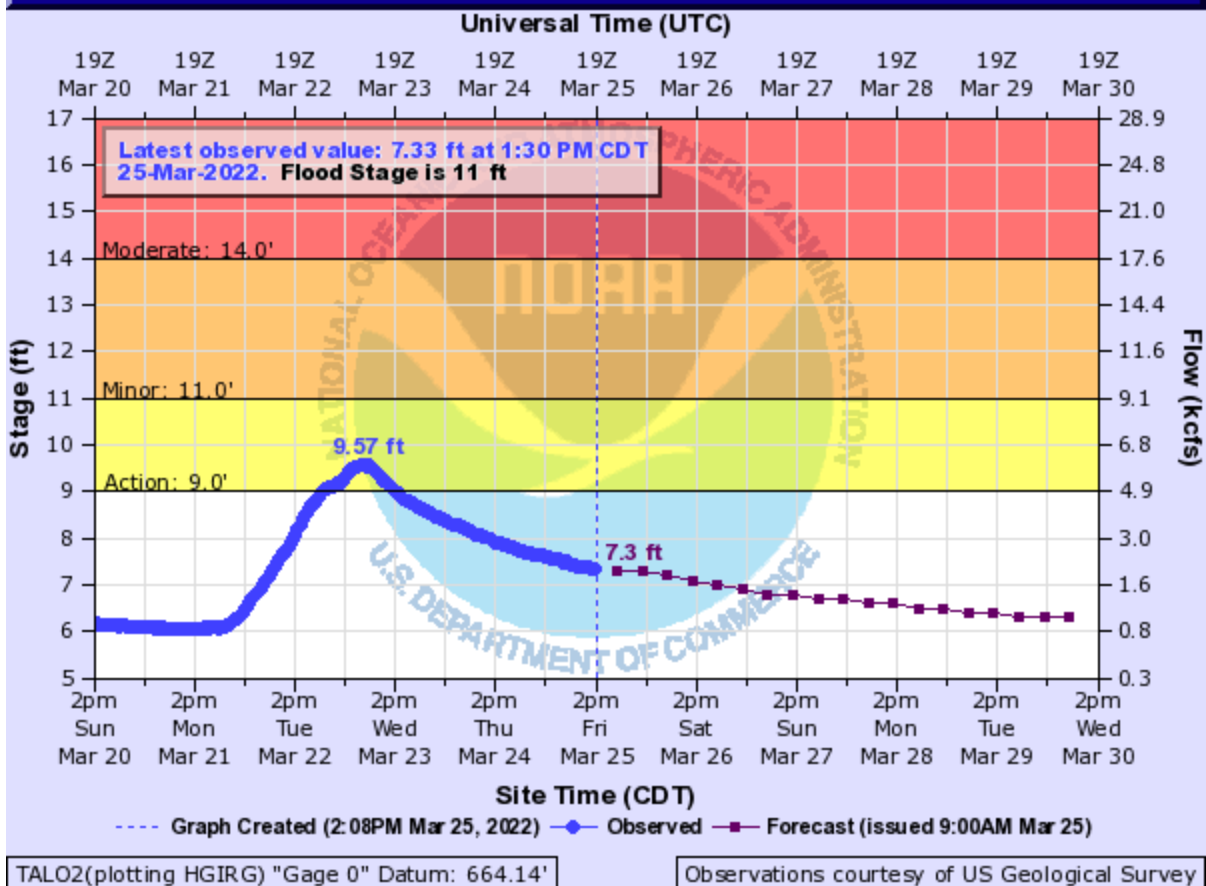
- *CWYO2 became a daily river forecast point September 7, 2016
- *MLBA4 and OZGA4 transferred to NWS Tulsa HSA February 5, 2014
- *Mixed case River Flood products began July 31, 2013

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

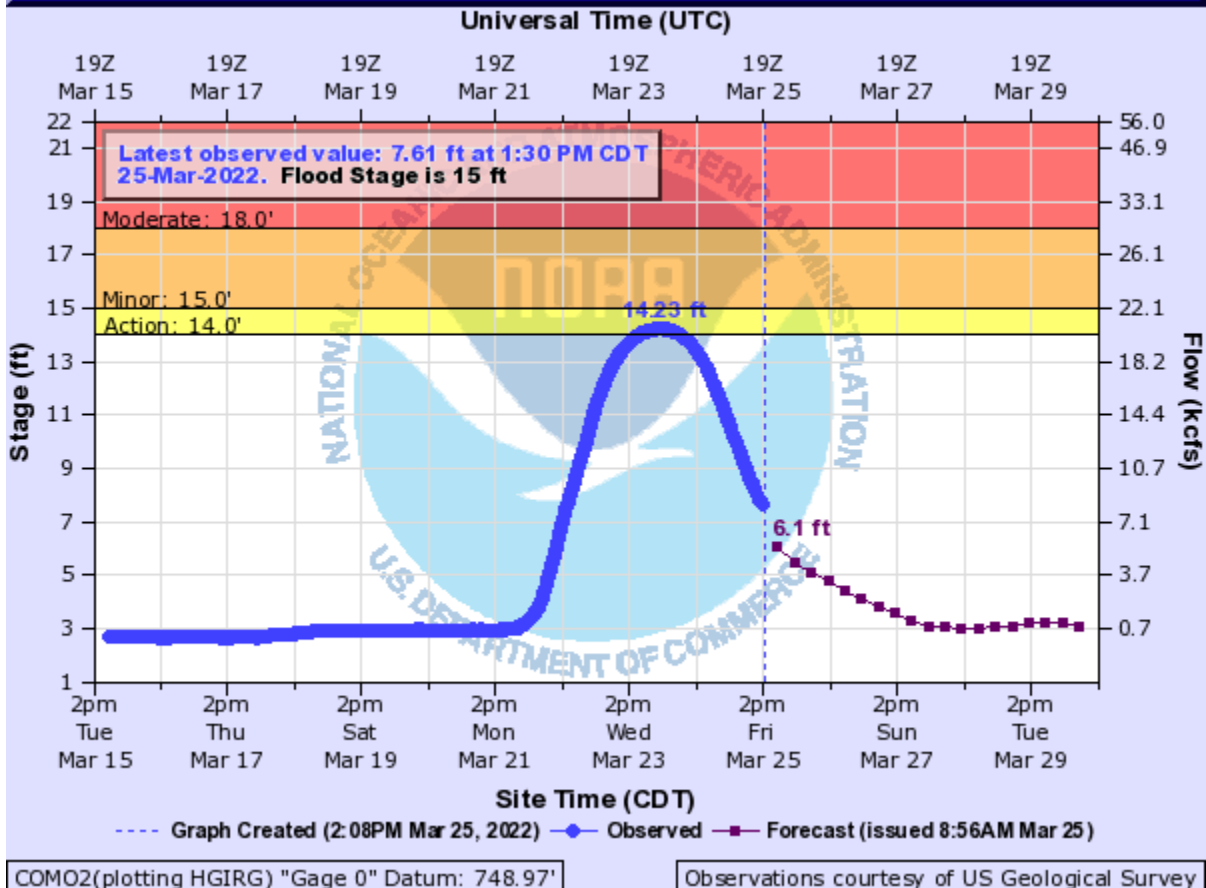
Preliminary Hydrographs:



ILLINOIS RIVER (AR OK) NEAR TAHLEQUAH

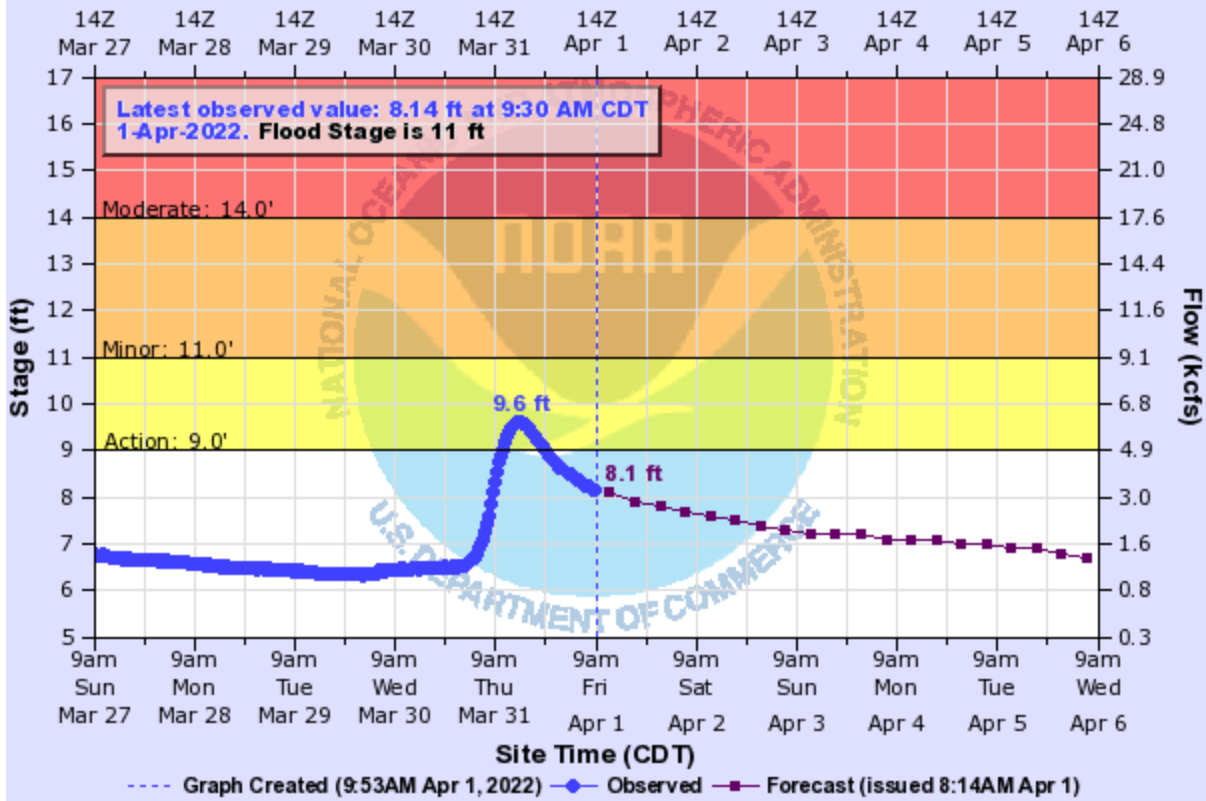


NEOSHO RIVER NEAR COMMERCE



ILLINOIS RIVER (AR OK) NEAR TAHLEQUAH

Universal Time (UTC)



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

Observations courtesy of US Geological Survey