

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 December	YEAR 2018
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 January 11, 2019	

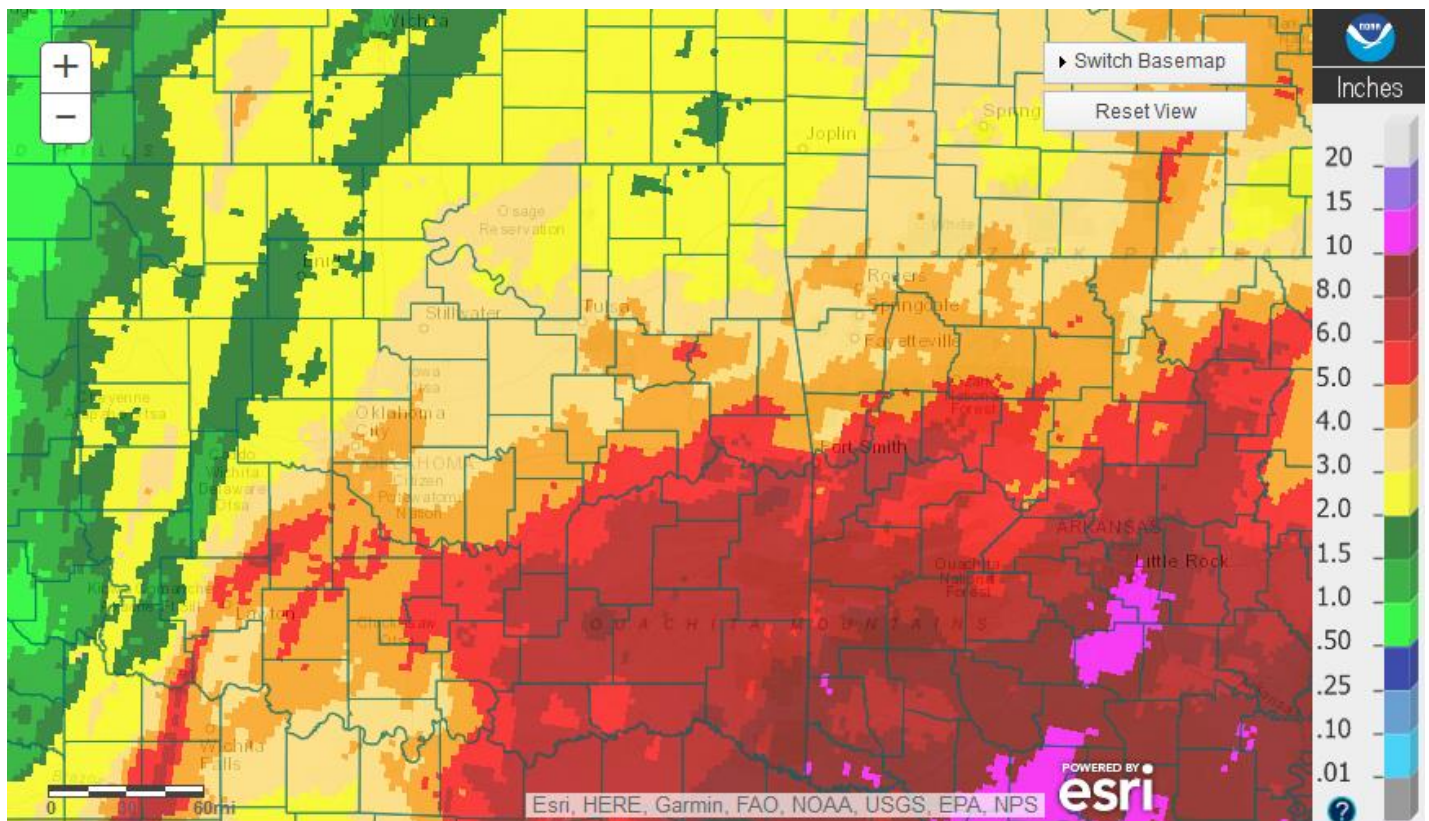
When no flooding occurs, include miscellaneous river conditions, such as significant rises, record low stages, ice conditions, snow cover, droughts, and hydrologic products issued (NWS Instruction 10-924)

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

All but far northeast OK received above normal rainfall this month, resulting in minor to moderate flooding along some mainstem rivers. Normal precipitation for December ranges from 1.5 inches in Pawnee County to 3.2 inches in Haskell County. Normal precipitation for the Ozark region of northwest Arkansas averages 3.2 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>.

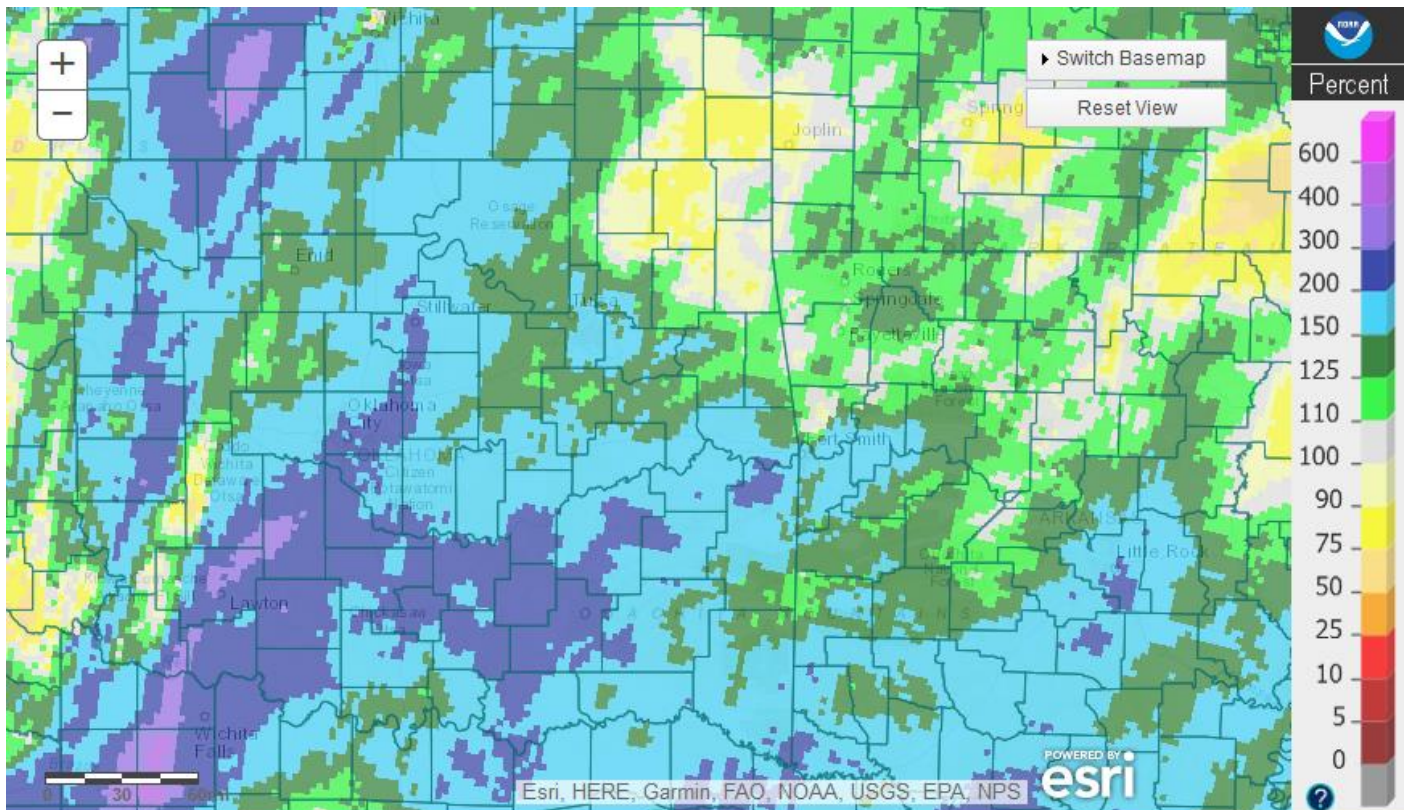
Monthly Summary

Using the radar-derived estimated observed precipitation from the RFCs (Fig. 1a), rainfall totals for December 2018 ranged from 1.50" to near 9" from north to south across eastern OK and northwest AR. This corresponds to 110% to around 200% of the normal December rainfall across the area (Fig. 1b), with only the far northeast corner of OK receiving 75%-100% of the normal rainfall this month.



Tulsa, OK: December, 2018 Monthly Observed Precipitation
 Valid on: January 01, 2019 12:00 UTC

Fig. 1a. Estimated Observed Rainfall for December 2018



Tulsa, OK: December, 2018 Monthly Percent of Normal Precipitation
Valid on: January 01, 2019 12:00 UTC

Fig. 1b. Estimated % of Normal Rainfall for December 2018

In Tulsa, OK, December 2018 ranked as the 52nd warmest December (41.3°F; since records began in 1905), the 21st wettest December (3.58"; since records began in 1888), and the 28th least snowy December (Trace, tied 26 other years; since records began in 1900). Fort Smith, AR had the 34th warmest December (44.6°F; since records began in 1882) and the 15th wettest December (5.51"; since records began in 1882). Fayetteville, AR had the 28th warmest (37.7°F, tied 1954, 1951), the 21st wettest (3.66"), and the 15th least snowy (Trace, tied 20 other years) November since records began in 1949.

Some of the larger precipitation reports (in inches) for December 2018 included:

Antlers, OK (coop)	8.65	Ozark, AR (coop)	8.41	Greenwood 1.4W, AR (coco)	8.38
Wilburton 9.4N, OK (coco)	8.17	Clayton, OK (meso)	8.03	Riverdale 4.2E, AR (coco)	8.02
Krebs 0.3WNW, OK (coco)	7.68	Antlers, OK (meso)	7.65	Wilburton, OK (meso)	7.64

Some of the lowest precipitation reports (in inches) for December 2018 included:

Nowata, OK (meso)	2.17	Vinita, OK (meso)	2.22	Talala, OK (meso)	2.26
Bartlesville, OK (coop)	2.32	Bartlesville, OK (ASOS)	2.55	Pawnee, OK (coop)	2.79
Miami, OK (meso)	2.85	Pryor, OK (meso)	2.92	Ochelata 5.6N, OK (coco)	2.95
				Copan, OK (meso)	2.95

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

Rank since 1921	December 2018	Water Year-to-Date (Oct 1 – Dec 31)	Cool Season 2018 (Sep 1 – Dec 31)	Last 60 Days (Nov 2 – Dec 31)	Last 180 Days (Jul 5 – Dec 31)	2018 (Jan 1 – Dec 31)
Northeast OK	15 th wettest	34 th wettest	48 th wettest	46 th wettest	36 th wettest	40 th driest
East Central OK	13 th wettest	31 st wettest	30 th wettest	30 th wettest	23 rd wettest	14 th wettest
Southeast OK	6 th wettest	13 th wettest	7 th wettest	24 th wettest	5 th wettest	10 th wettest
Statewide	10 th wettest	9 th wettest	7 th wettest	33 rd wettest	8 th wettest	16 th wettest

Annual Summary for 2018

Using the radar-derived estimated observed precipitation from the RFCs (Fig. 2a), rainfall totals for 2018 ranged from 25" to near 80" across eastern OK and northwest AR. Most of the area received 35"-60". This corresponds to 110% to near 175% of the normal annual rainfall along and south of I-40, and 50% to 110% of the normal annual rainfall north of I-40 (Fig. 2b).

In Tulsa, OK, 2018 ranked as the 42nd warmest Year (61.2°F, tied 2010; since records began in 1905), the 47th driest Year (34.08"; since records began in 1888), and the 14th least snowy Year (1.7", tied 2012, 1991, 1974, 1936, 1904; since records began in 1900). Fort Smith, AR had the 23rd warmest Year (62.8°F, tied 2007, 1927, 1925; since records began in 1883), the 14th wettest Year (54.17"; since records began in 1882), and the 4th least snowy Year (Trace, tied 2016, 2005, 2002, 1998, 1992, 1991, 1957; since records began in 1884). Fayetteville, AR had the 23rd warmest (57.7°F, tied 2010, 2001, 1981, 1973, 1964, 1962, 1955), the 31st wettest (46.63"), and the 4th least snowy (0.3", tied 2016) Year since records began in 1950.

Some of the larger precipitation reports (in inches) for 2018 included:

Greenwood 1.4W, AR (coco)	67.79	Talihina, OK (meso)	67.43	Wister, OK (meso)	66.87
Clayton, OK (meso)	65.64	Ozark, AR (coop)	63.88	St. Paul, AR (coop)	63.05
Greenwood 1.9WNW, AR (coco)	62.95	Eufaula, OK (meso)	62.62	Eufaula 4.6ENE, OK (coco)	62.43

Some of the lowest precipitation reports (in inches) for 2018 included:

Pawnee, OK (coop)	27.24	Sperry 6.7WNW, OK (coco)	29.33	Pawnee, OK (meso)	30.12
Wynona, OK (meso)	30.27	Talala, OK (meso)	30.27	Skiatook, OK (meso)	30.87
Bartlesville, OK (coop)	33.96	Bartlesville, OK (ASOS)	34.03	Tulsa, OK (ASOS)	34.08

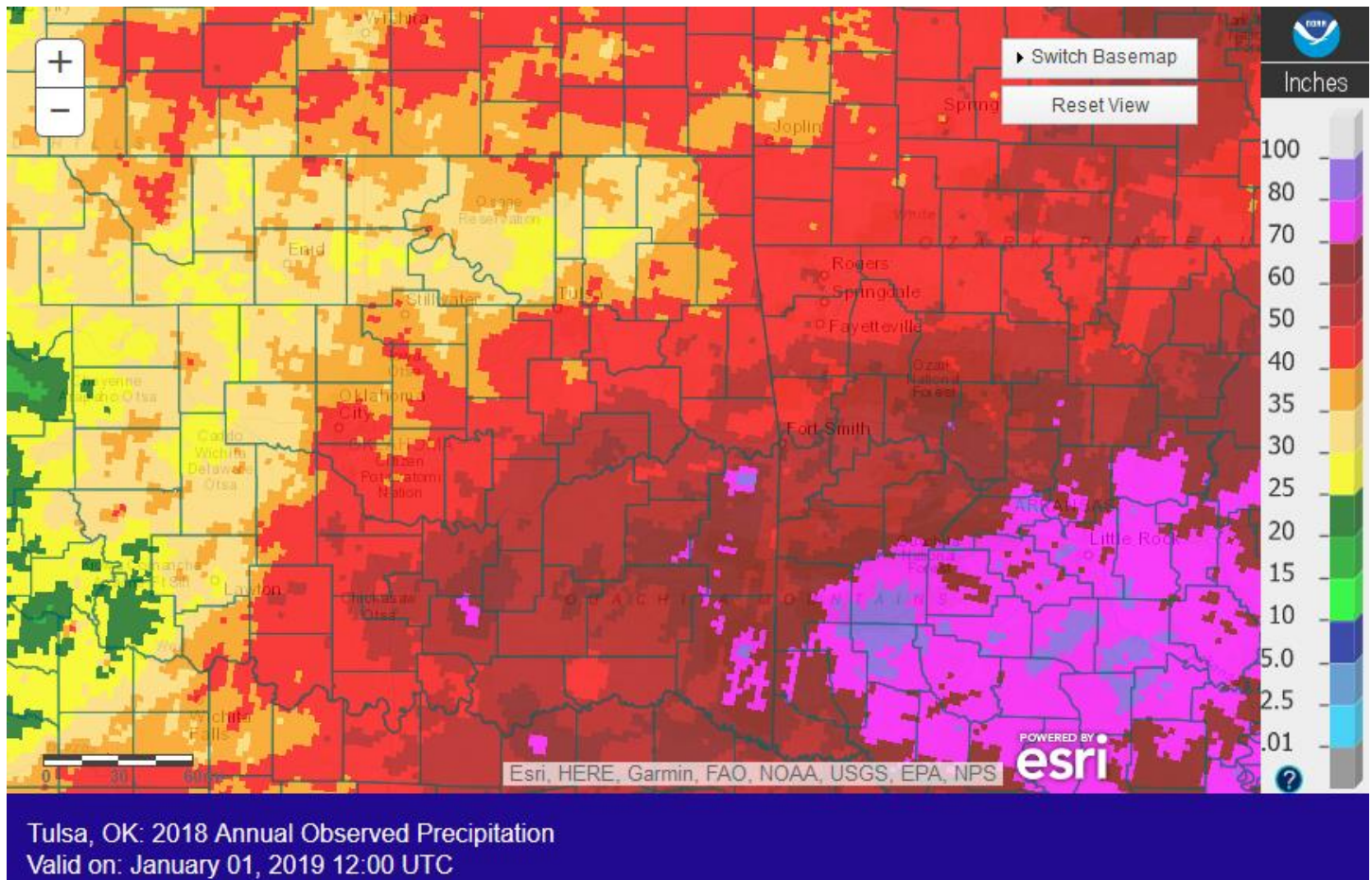


Fig. 2a. Estimated Observed Rainfall for 2018

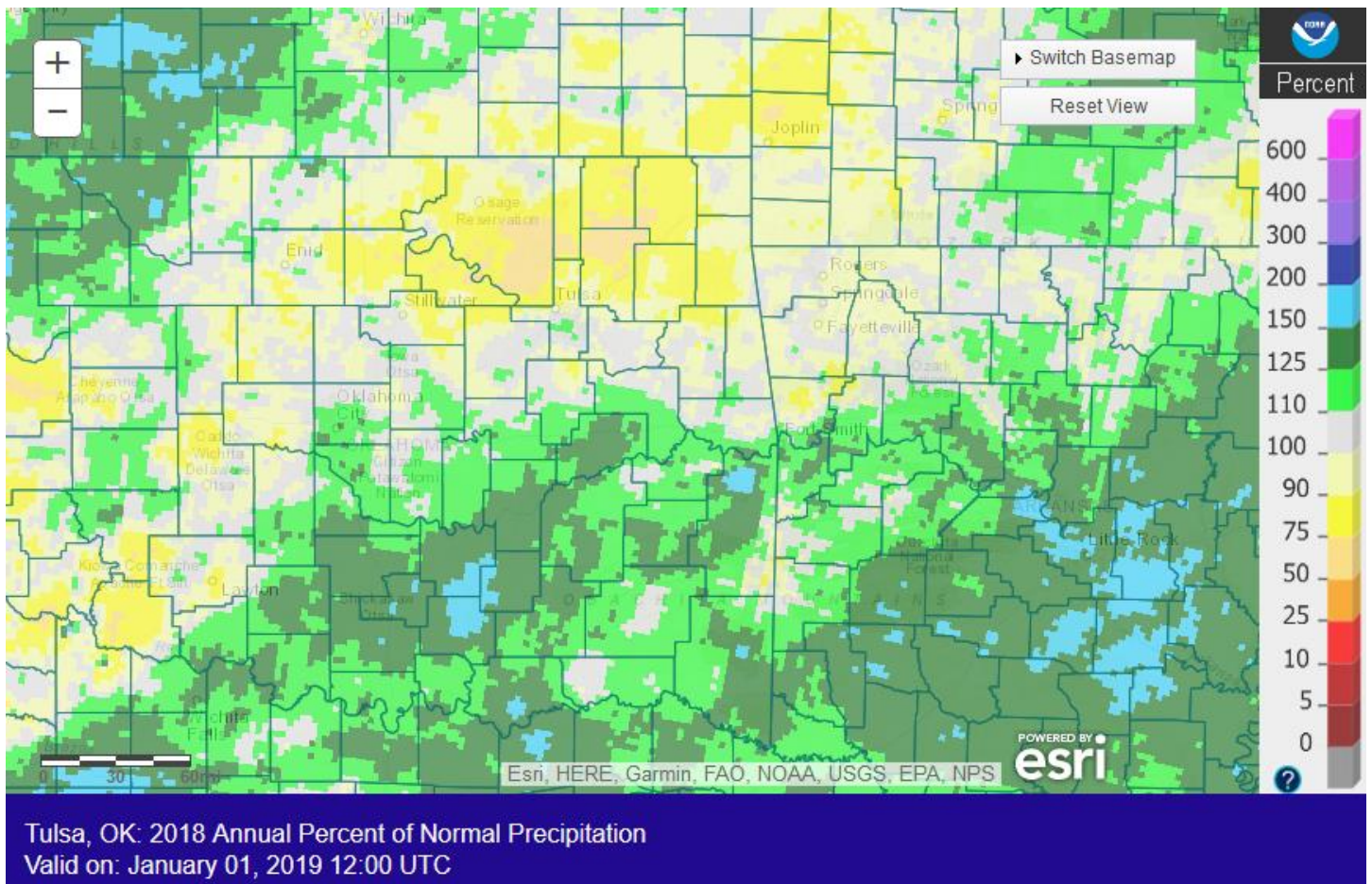
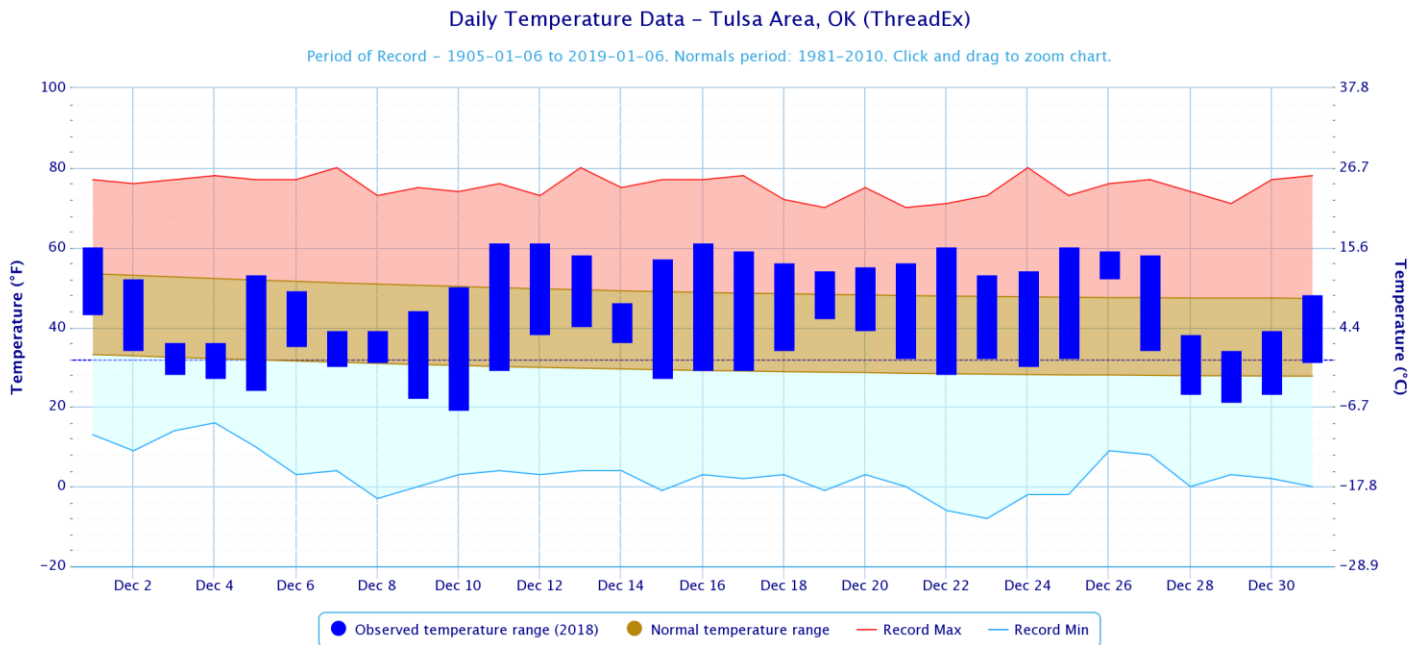
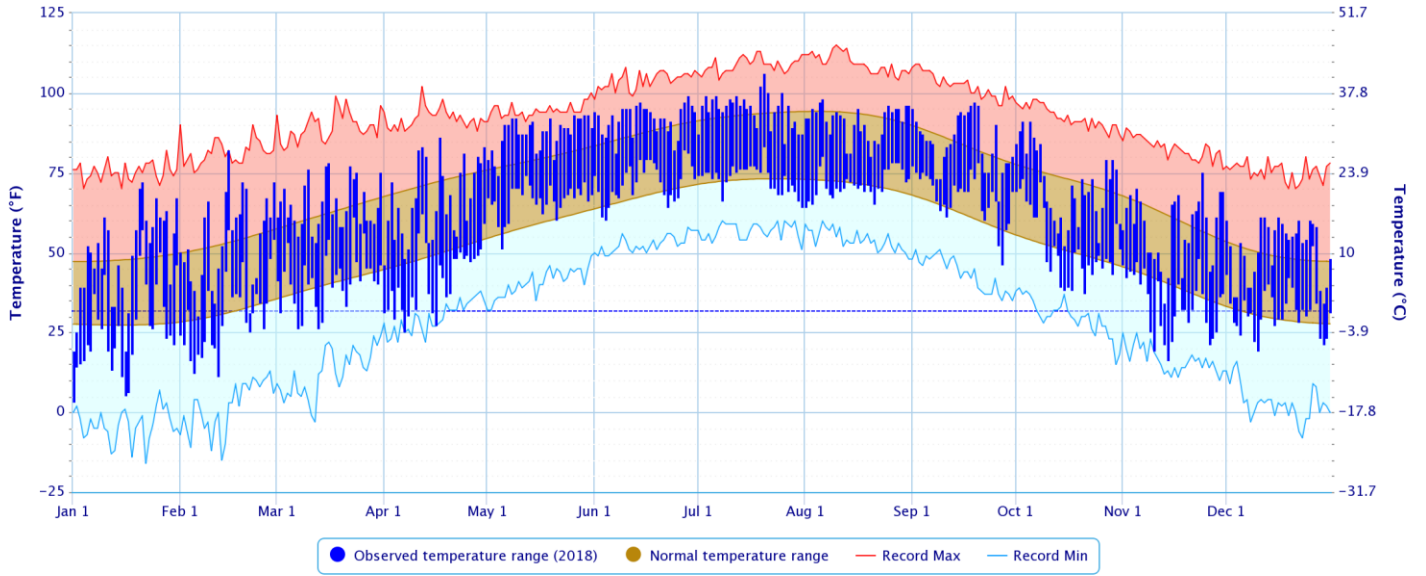


Fig. 2b. Estimated % of Normal Rainfall for 2018



Daily Temperature Data – Tulsa Area, OK (ThreadEx)

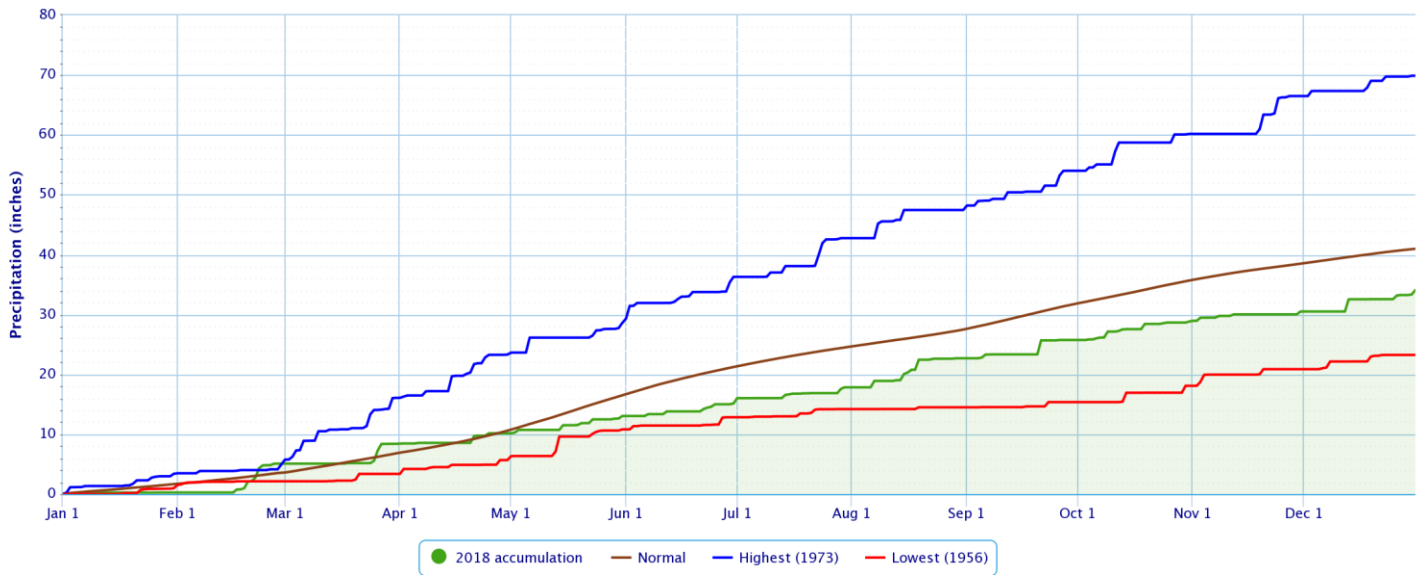
Period of Record – 1905-01-06 to 2019-01-06. Normals period: 1981-2010. Click and drag to zoom chart.



Powered by ACIS

Accumulated Precipitation – Tulsa Area, OK (ThreadEx)

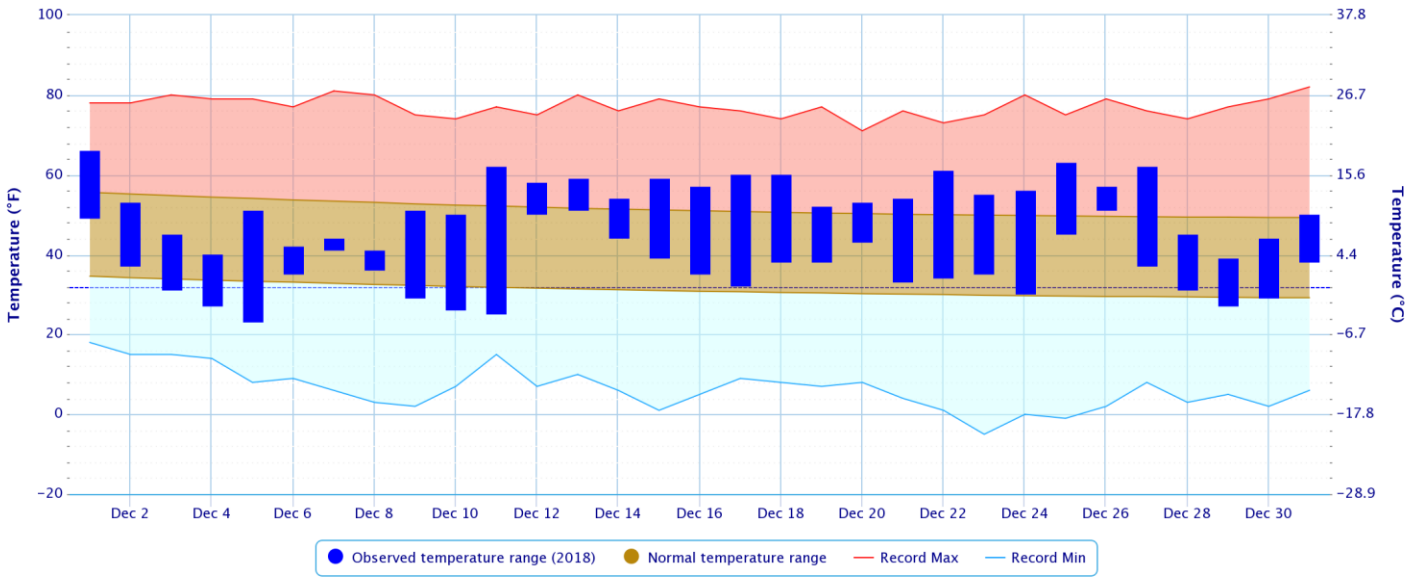
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



Powered by ACIS

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

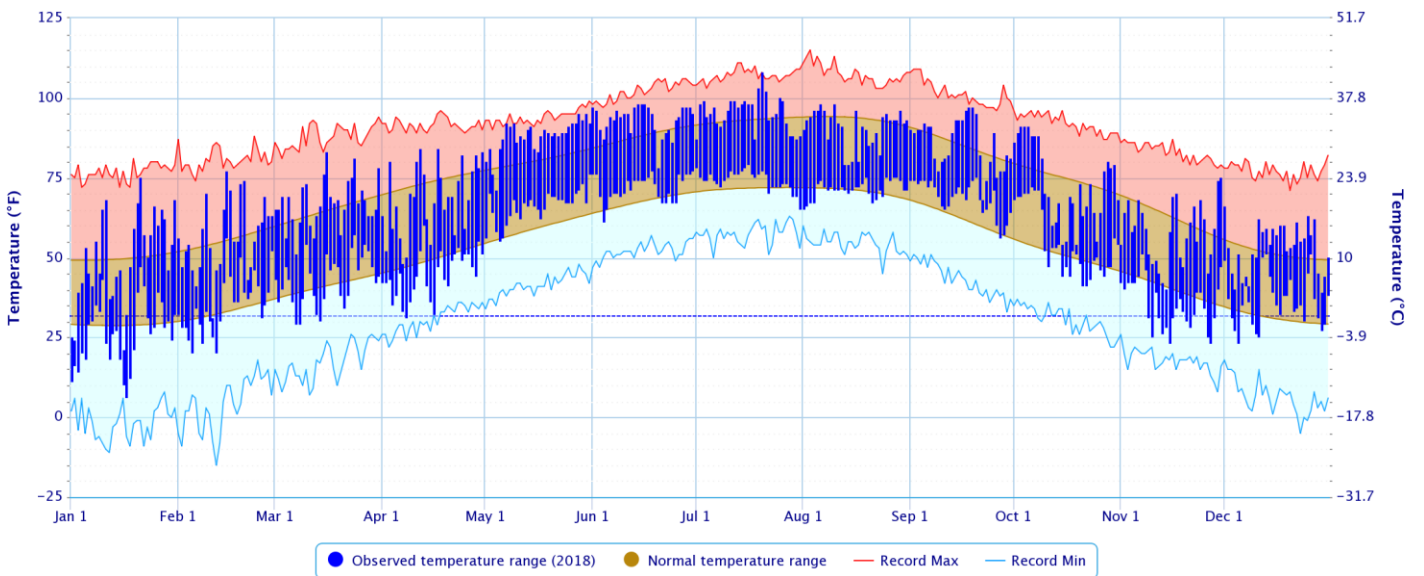
Period of Record – 1882-06-01 to 2019-01-06. Normals period: 1981-2010. Click and drag to zoom chart.



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

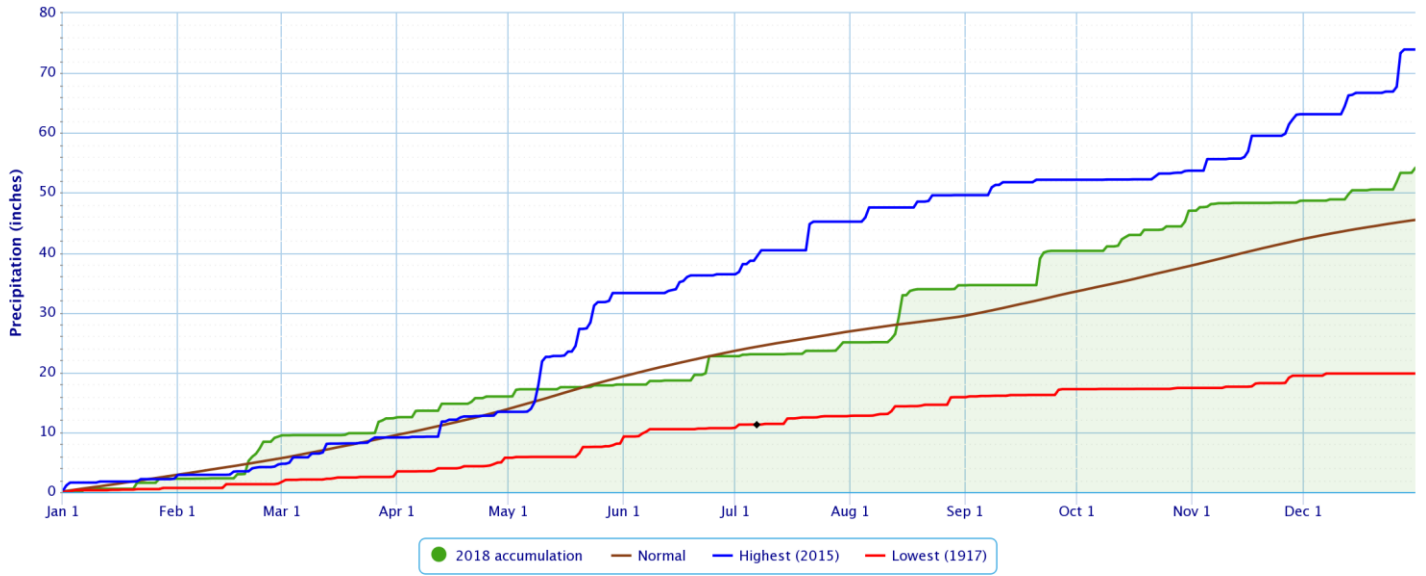
Period of Record – 1882-06-01 to 2019-01-06. Normals period: 1981-2010. Click and drag to zoom chart.



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Accumulated Precipitation – Fort Smith Area, AR (ThreadEx)

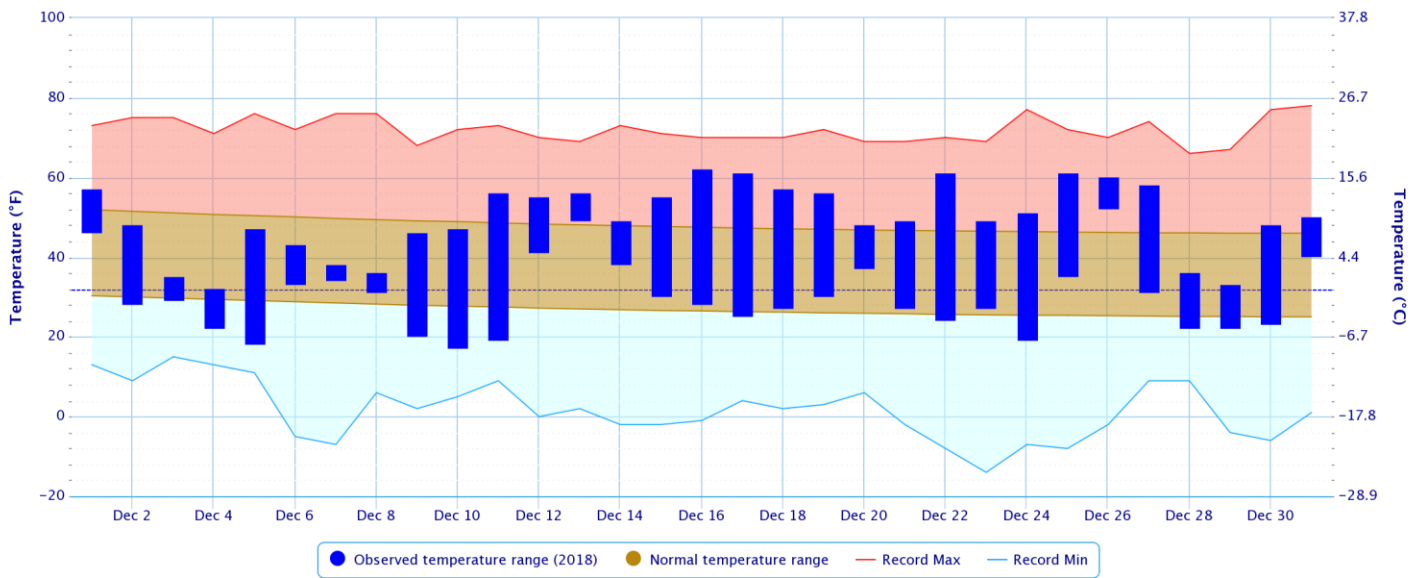
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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Daily Temperature Data – FAYETTEVILLE DRAKE FIELD, AR

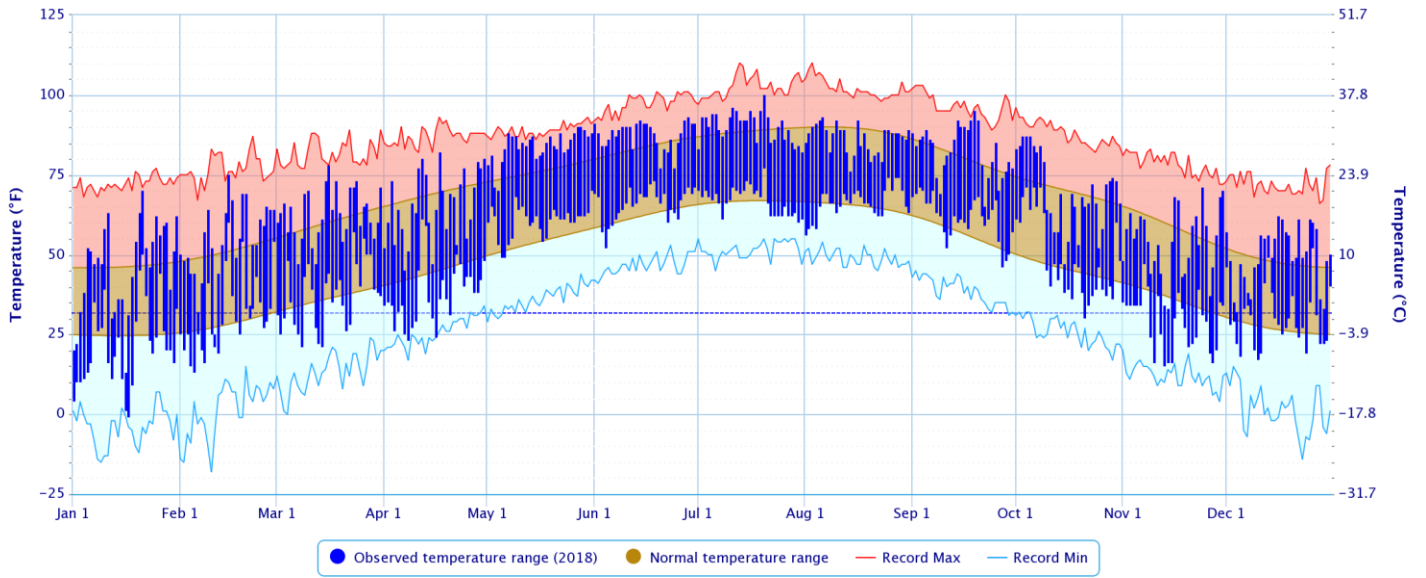
Period of Record – 1949-07-14 to 2019-01-06. Normals period: 1981-2010. Click and drag to zoom chart.



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Daily Temperature Data – FAYETTEVILLE DRAKE FIELD, AR

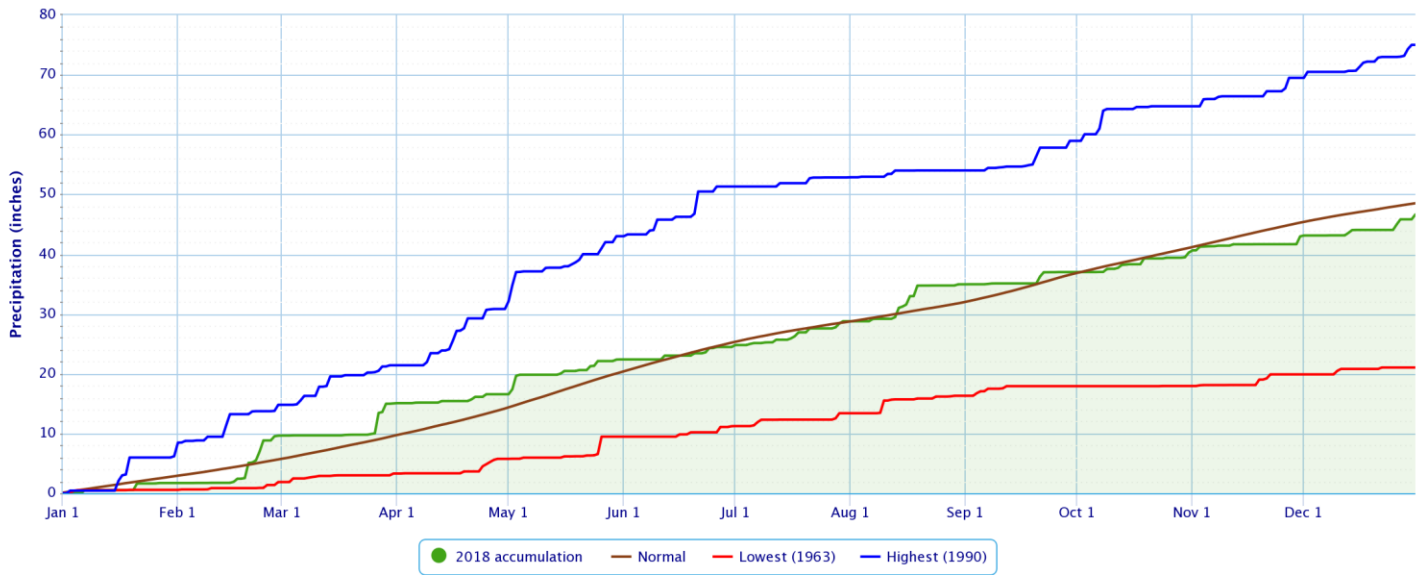
Period of Record – 1949-07-14 to 2019-01-06. Normals period: 1981-2010. Click and drag to zoom chart.



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

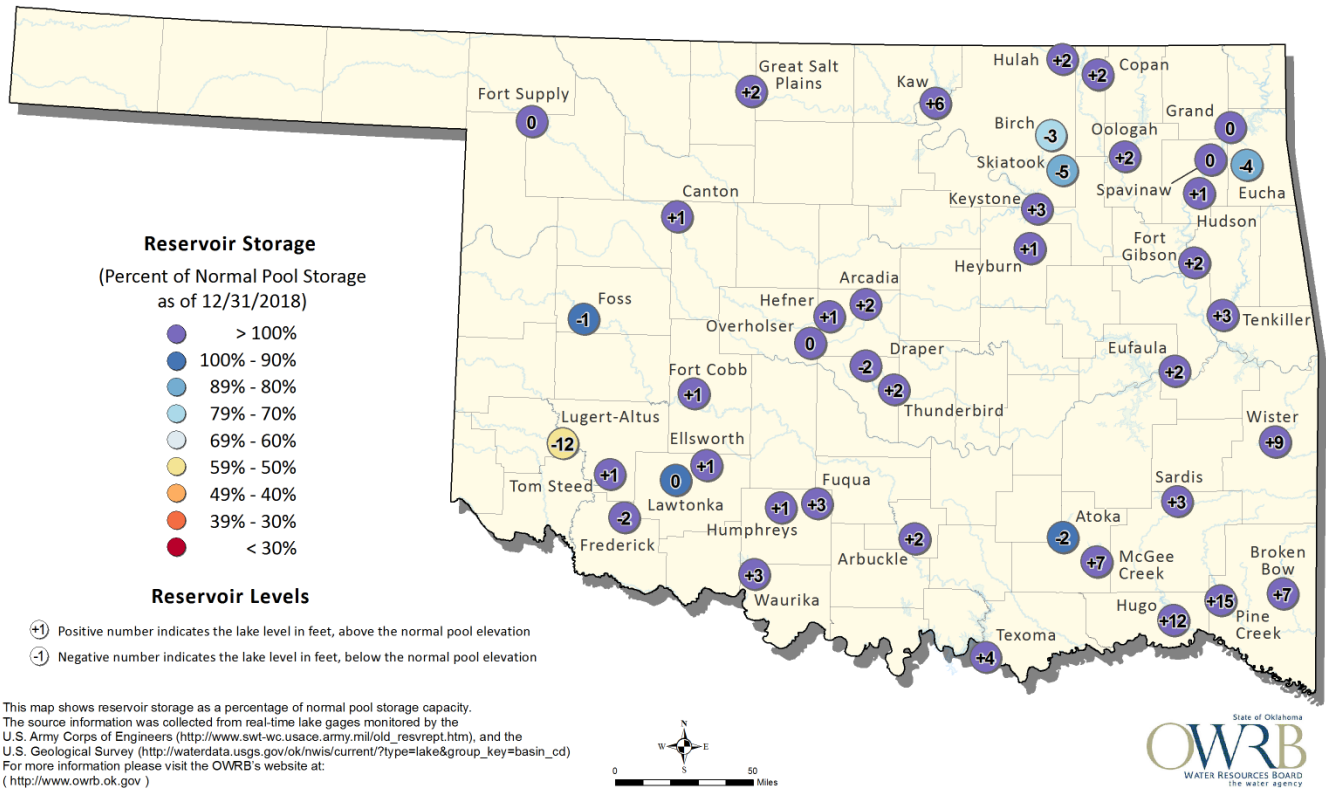


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Reservoirs

Oklahoma Surface Water Resources

Reservoir Levels and Storage as of 12/31/2018



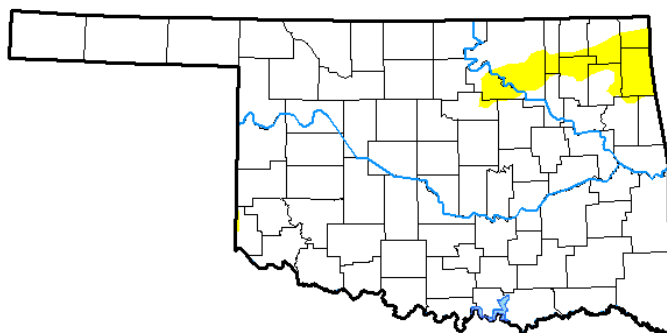
According to the USACE, most lakes in the HSA were within $\pm 3\%$ of their conservation pool level. Reservoirs below 3% of their conservation pool storage as of 12/31/2018: Skiatook Lake 95%. Reservoirs above 3% of their conservation pool storage as of 12/31/2018: Hugo Lake 112%, Wister Lake 109%, and Kaw Lake 106%.

Drought

According to the [U.S. Drought Monitor](#) (USDM) from January 1, 2019 (Figs. 3, 4), Abnormally Dry (D0) but not in drought conditions encompassed portions of Pawnee, Osage, Washington, Rogers, Mayes, Nowata, Craig, Ottawa, Delaware, and Cherokee Counties in eastern Oklahoma and Benton, Washington, and Crawford Counties in northwest Arkansas.

U.S. Drought Monitor Oklahoma

January 1, 2019
(Released Thursday, Jan. 3, 2019)
Valid 7 a.m. EST



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	94.85	5.15	0.00	0.00	0.00	0.00
Last Week 12-25-2018	50.34	49.66	5.08	0.00	0.00	0.00
3 Months Ago 10-02-2018	76.55	23.45	8.94	2.91	0.00	0.00
Start of Calendar Year 01-01-2019	94.85	5.15	0.00	0.00	0.00	0.00
Start of Water Year 09-25-2018	72.93	27.07	9.11	4.16	0.00	0.00
One Year Ago 01-02-2018	0.00	100.00	77.15	38.76	0.00	0.00

Intensity:

- 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. See accompanying text summary for forecast statements.

Author:

David Miskus
NOAA/NWS/NCEP/CPC

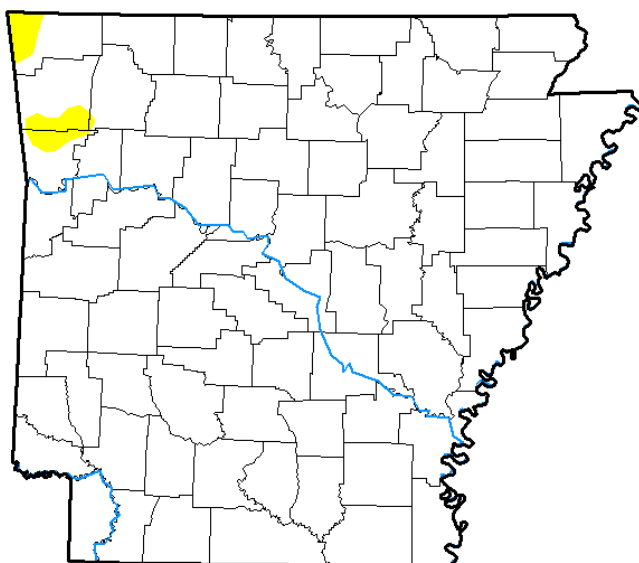


<http://droughtmonitor.unl.edu/>

Fig. 3. Drought Monitor for Oklahoma

U.S. Drought Monitor Arkansas

January 1, 2019
(Released Thursday, Jan. 3, 2019)
Valid 7 a.m. EST



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	98.79	1.21	0.00	0.00	0.00	0.00
Last Week 12-25-2018	93.04	6.96	1.22	0.00	0.00	0.00
3 Months Ago 10-02-2018	93.42	6.58	2.54	0.00	0.00	0.00
Start of Calendar Year 01-01-2019	98.79	1.21	0.00	0.00	0.00	0.00
Start of Water Year 09-25-2018	93.15	6.85	2.59	0.00	0.00	0.00
One Year Ago 01-02-2018	8.22	91.78	71.27	32.01	2.37	0.00

Intensity:

- 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. See accompanying text summary for forecast statements.

Author:

David Miskus
NOAA/NWS/NCEP/CPC



<http://droughtmonitor.unl.edu/>

Fig. 4. Drought Monitor for Arkansas

Outlooks

The [Climate Prediction Center](#) (CPC) outlook for January 2019 (issued December 31, 2018) indicates an equal chance for above, near, and below normal temperatures and precipitation across all of eastern OK and northwest AR. This outlook takes into account weather conditions forecast over the first week of January, 8-10 day outlook, weeks 3-4 outlook, and sub-seasonal climate signals. The Madden-Julian Oscillation (MJO) also played a role in the outlook since it will favor a transition to a colder pattern for much of the eastern and central CONUS mid- to late month. The predicted phases of the Pacific North America (PNA) pattern and the Arctic Oscillation (AO) were also considered. Finally, weak El Niño impacts were included.

For the 3-month period January-February-March 2019, CPC is forecasting an equal chance for above, near, and below normal temperatures and precipitation across all of eastern OK and northwest AR (outlook issued December 20, 2018). This outlook is based on both statistical and dynamical forecast tools, decadal timescale climate trends, and influence from a weak El Niño and robust MJO. According to CPC, El Niño conditions were present in the ocean, but atmospheric observations remain consistent ENSO neutral conditions through November. A robust MJO has been the major influence in the Pacific and is expected to play a role in the circulation pattern and temperatures across the mid-latitudes of North America during January 2019. Weak El Niño conditions are favored to continue through April-May-June 2019, with probabilities of El Niño conditions greater than 70% through March-April-May 2019. The El Niño Watch issued by CPC continues.

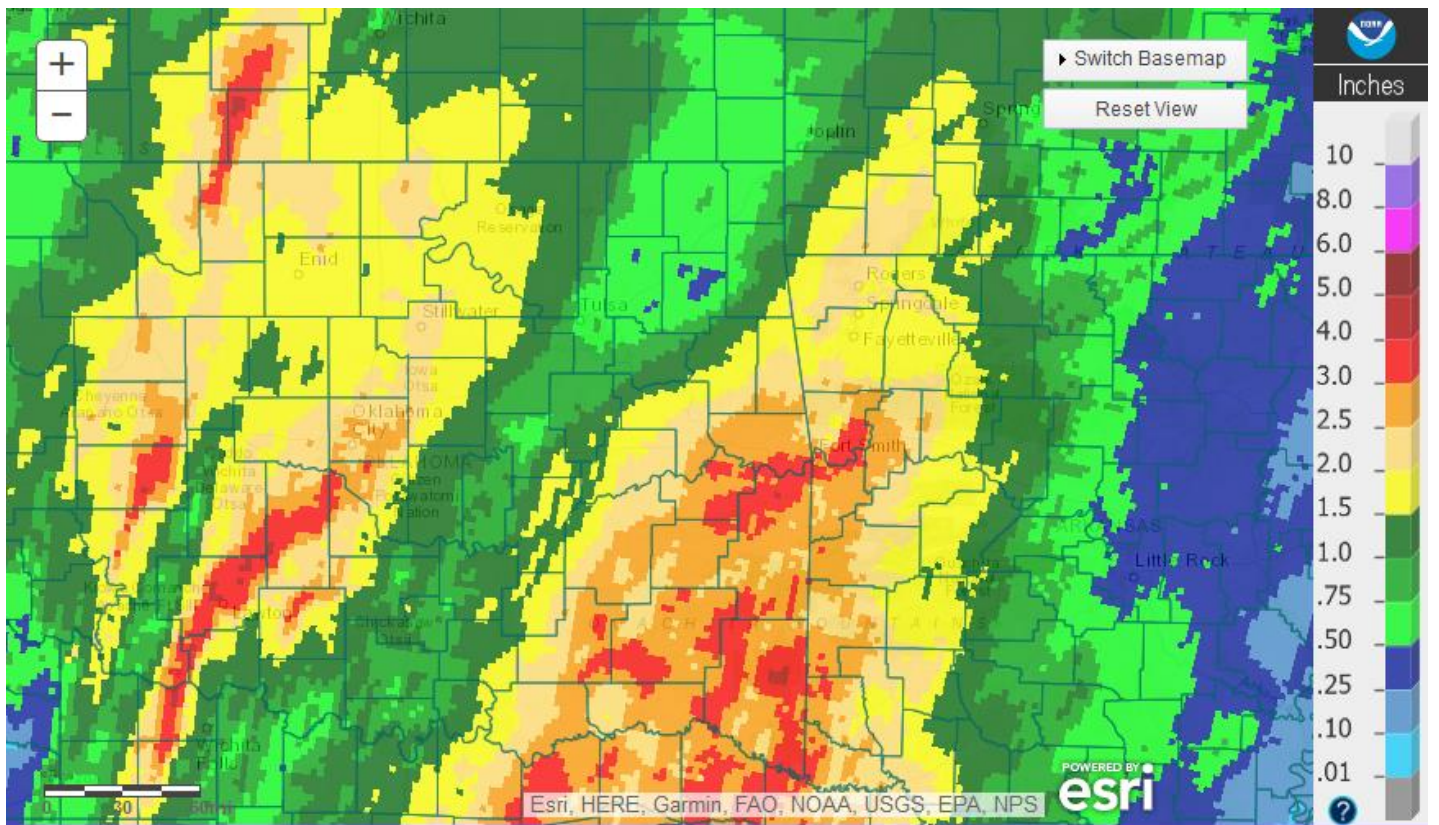
Summary of Heavy Precipitation Events Daily quality controlled rainfall maps can be found at: http://water.weather.gov/precip/index.php?location_type=wfo&location_name=tsa

Showers impacted southeast OK and west central AR for much of the day on the 8th as an upper-level low moved across the area. The majority of the precipitation remained as a cold rain along and south of I-40, while areas of light snow and a light wintry mix occurred across the higher terrain areas in northwest AR. Rainfall and liquid equivalent rainfall totals ranged from 0.10" to 1".

Scattered showers and isolated thunderstorms moved northeast out of TX across southeast OK into northwest AR after midnight on the 13th. This activity continued through the morning, becoming more widespread across eastern OK and northwest AR through the afternoon hours as an upper-level low moved from north TX toward the lower Mississippi River Valley and a cold front moved across the region. The widespread rain continued through the evening hours, before decreasing in coverage after midnight on the 14th. Wrap around showers and isolated thunderstorms continued through the morning and afternoon southeast of I-44 as the associated surface low passed south of the area. By 6 am on the 14th, rainfall totals ranged from 0.25" to 3" across eastern OK and northwest AR (Fig. 5). An additional 0.10" to 1.5" fell during the remainder of the 14th, southeast of an Okemah to Bentonville line (Fig. 6). This rainfall led to minor flooding along the Poteau River near Panama (see preliminary hydrographs at the end of this report; see E3 Report for details).

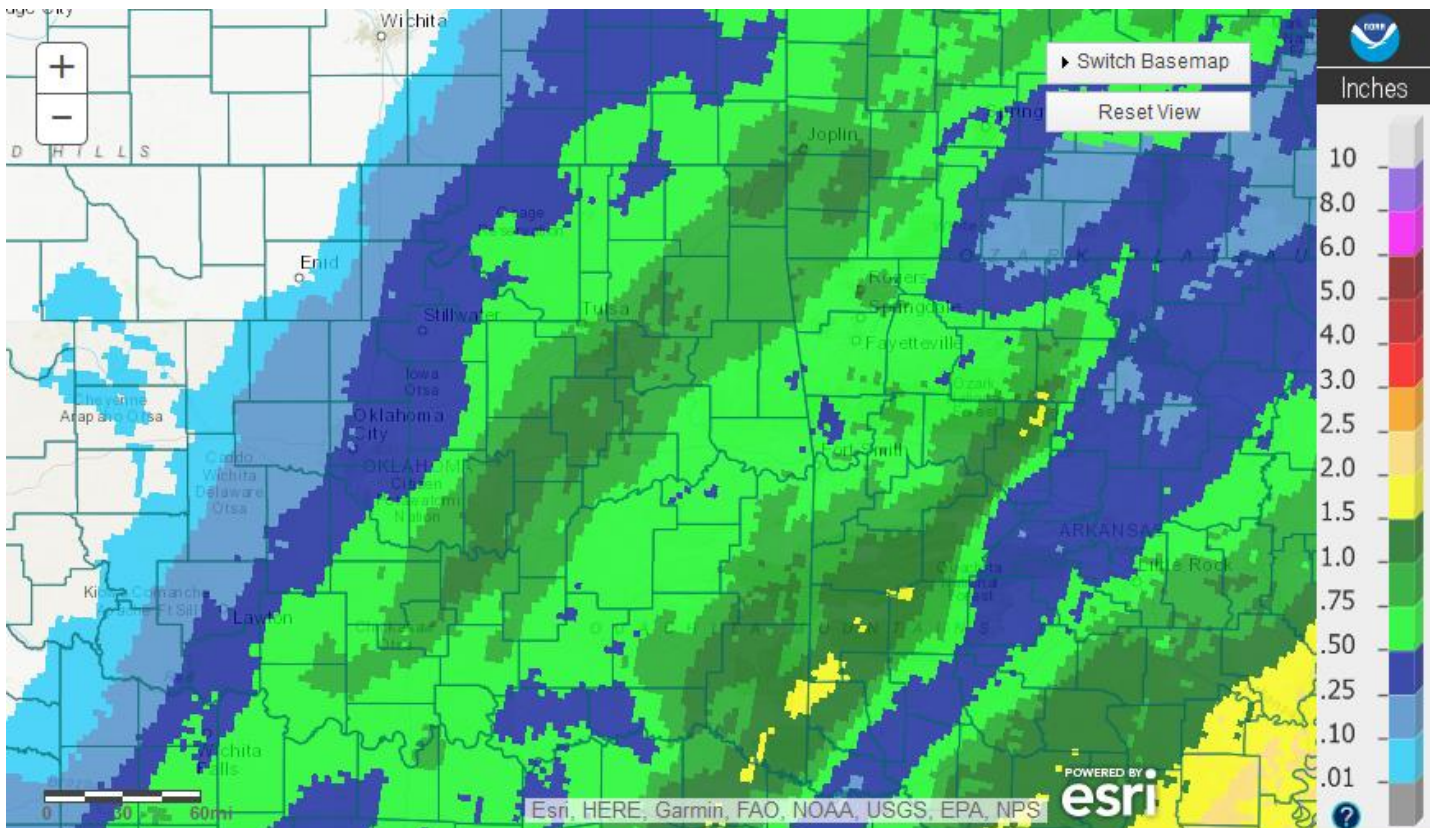
Scattered showers and thunderstorms began to affect eastern OK mid-day on the 26th within a region of warm air advection as forcing strengthened over the High Plains downstream of a strong upper-level wave. The rain expanded eastward, and by evening, had become widespread across all of eastern OK and northwest AR. The rain finally shifted east of the area by sunrise on the 27th. Rainfall totals ranged from around 0.50" to 4" (Fig. 7). 2.5"-4" of rain fell over the Poteau River basin, which had received heavy rain a couple of weeks previously. Minor to Moderate flooding occurred along the Poteau River at Poteau and Panama, respectively, with this latest rainfall (see preliminary hydrographs at the end of this report; see E3 Report for details). Rises also occurred along the Illinois River, but flood stage was not reached.

During the late evening hours of the 30th, rain developed across eastern OK and northwest AR as an upper-level low lifted out of northern Mexico and to the northeast across the Southern Plains. This activity spread over the entire area during the overnight hours before shifting northeast by mid-morning of the 31st. Some additional wrap-around precipitation affected northeast OK before noon. Rainfall totals were around 0.50" to near 1.5" (Fig. 8). This rainfall, combined with the higher amounts from the 26th, resulted in minor flooding along the Neosho River near Commerce (see preliminary hydrographs at the end of this report; see E3 Report for details).



Tulsa, OK: December 27, 2018 1-Day Observed Precipitation
Valid on: December 27, 2018 12:00 UTC

Fig. 7. 24-hour Estimated Observed Rainfall ending at 7am CST 12/27/2018.



Tulsa, OK: December 31, 2018 1-Day Observed Precipitation
Valid on: December 31, 2018 12:00 UTC

Fig. 8. 24-hour Estimated Observed Rainfall ending at 7am CST 12/31/2018.

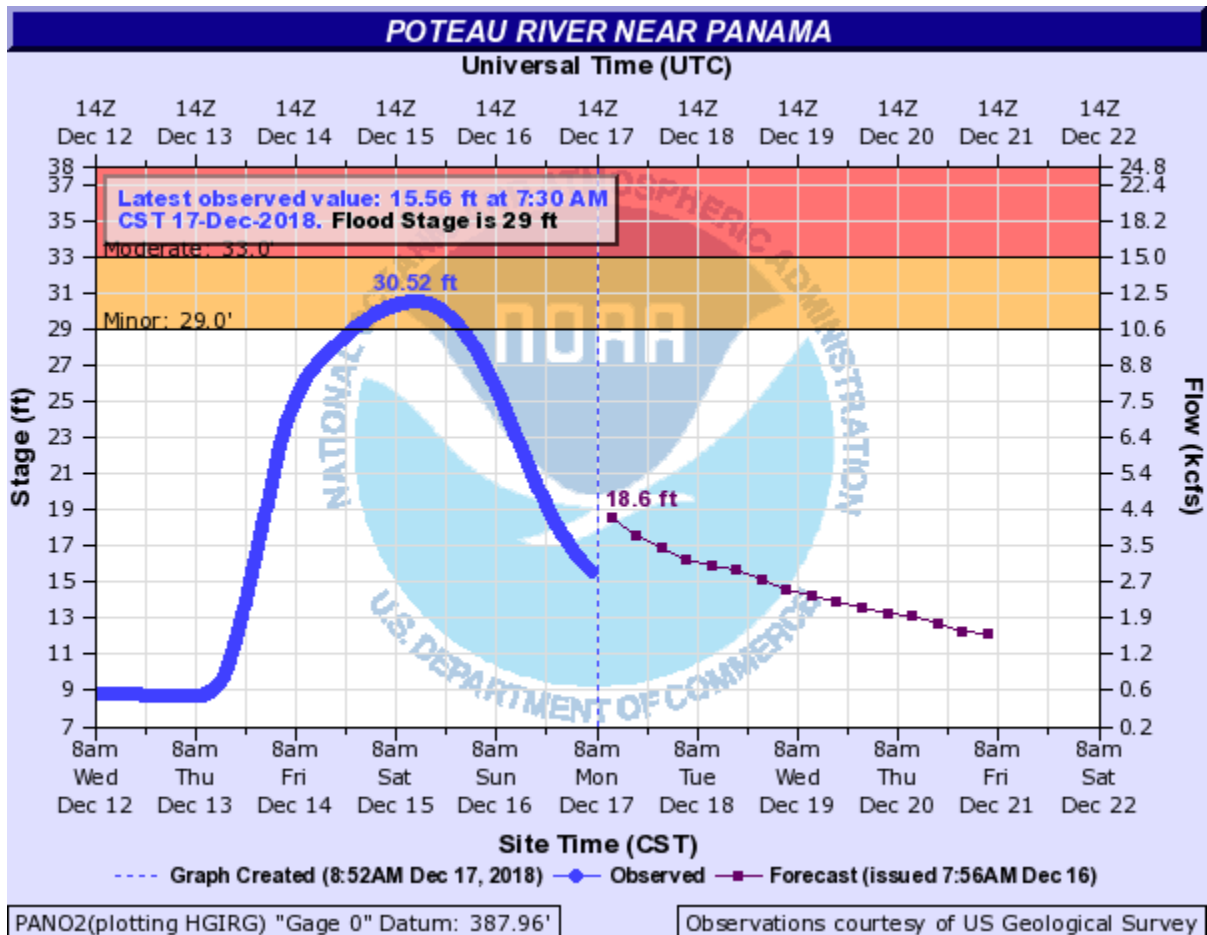
Written by:
 Nicole McGavock
 Service Hydrologist
 WFO Tulsa

Products issued in December 2018:

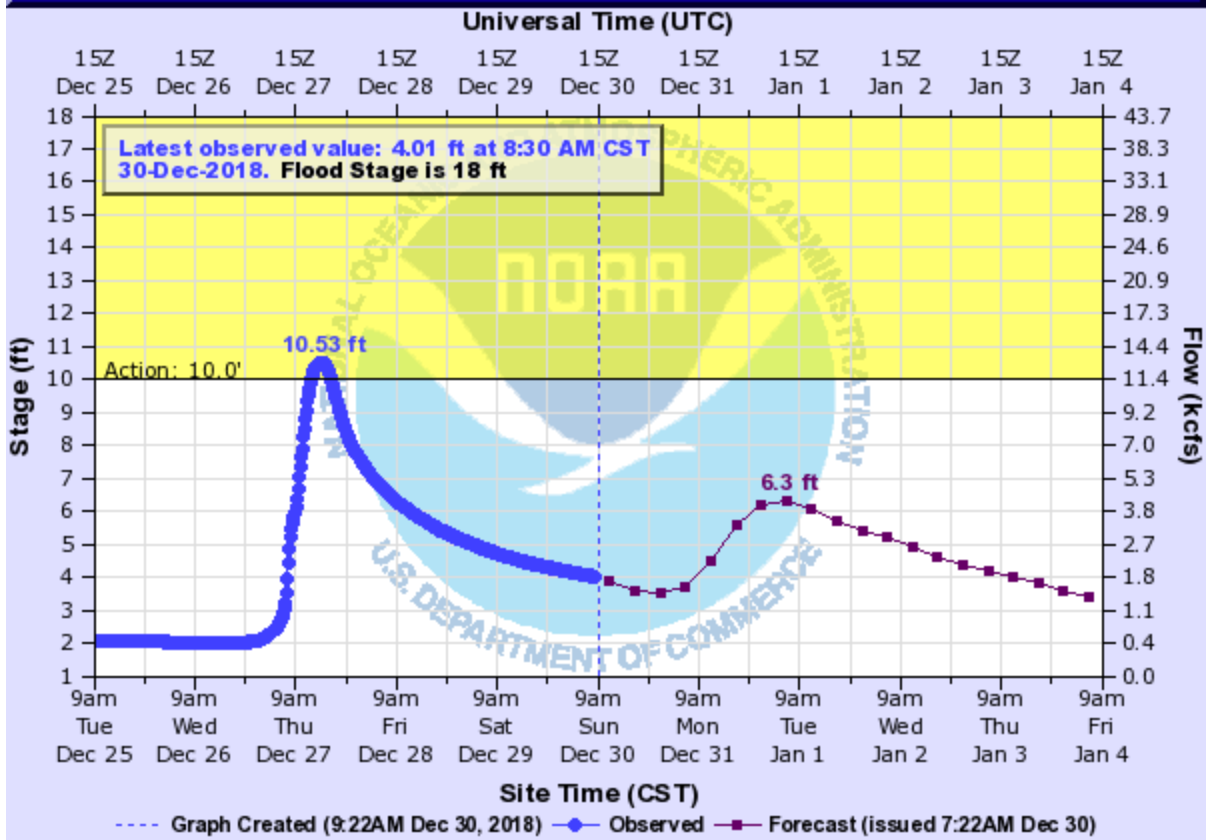
- *CWYO2 became a daily river forecast point September 7, 2016
- *MLBA4 and OZGA4 transferred to NWS Tulsa HSA February 5, 2014
- *Mixed case River Flood products began July 31, 2013

- 0 Flash Flood Warnings (FFW)
- 0 Flash Flood Statements (FFS)
- 0 Flash/Areal Flood Watches (FFA) (0 Watch FFA CON/EXT/EXA/EXB/CAN)
- 1 Urban and Small Stream Advisories (FLS)
- 0 Areal Flood Warnings (FLW)
- 0 Areal Flood Statements (FLS)
- 4 River Flood Warnings (FLW) (includes category increases)
- 20 River Flood Statements (FLS)
- 3 River Flood Advisories (FLS) (10 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:



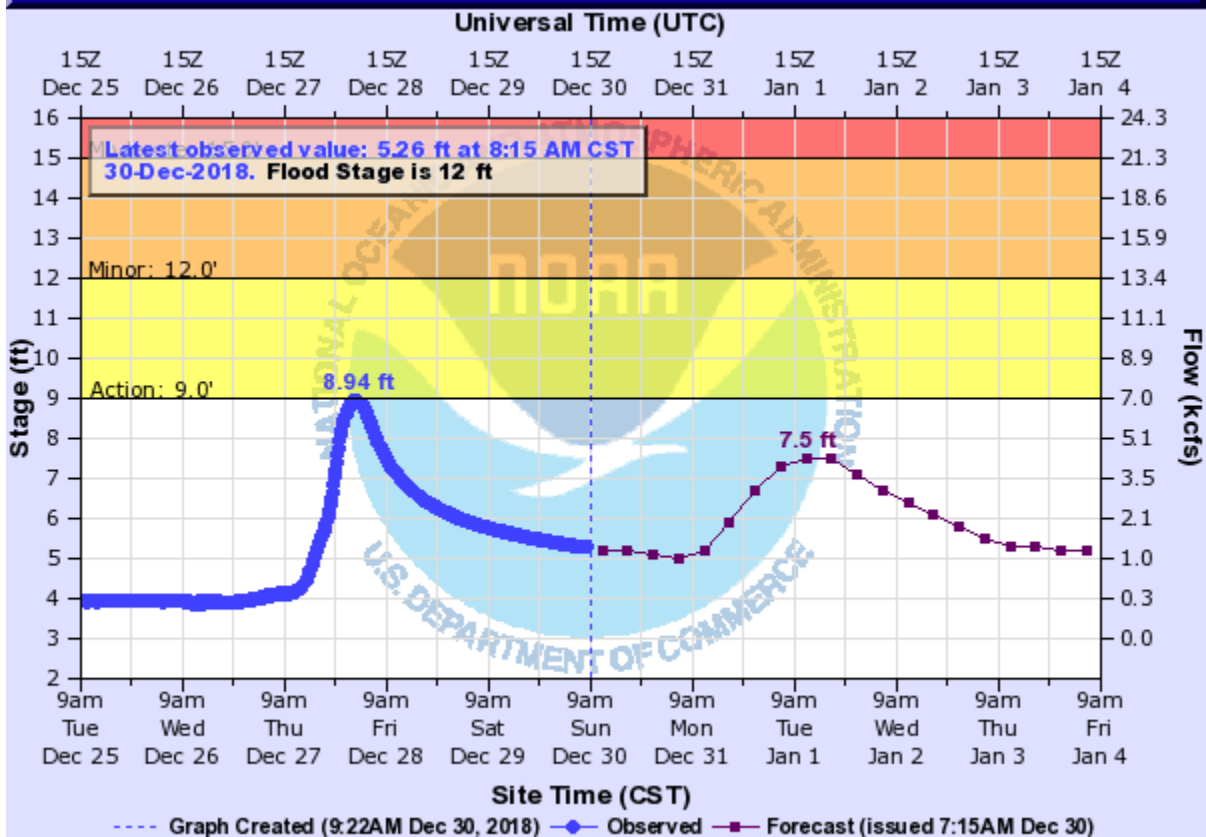
MULBERRY RIVER (AR) NEAR MULBERRY



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

Observations courtesy of USGS/USACE/ADEQ

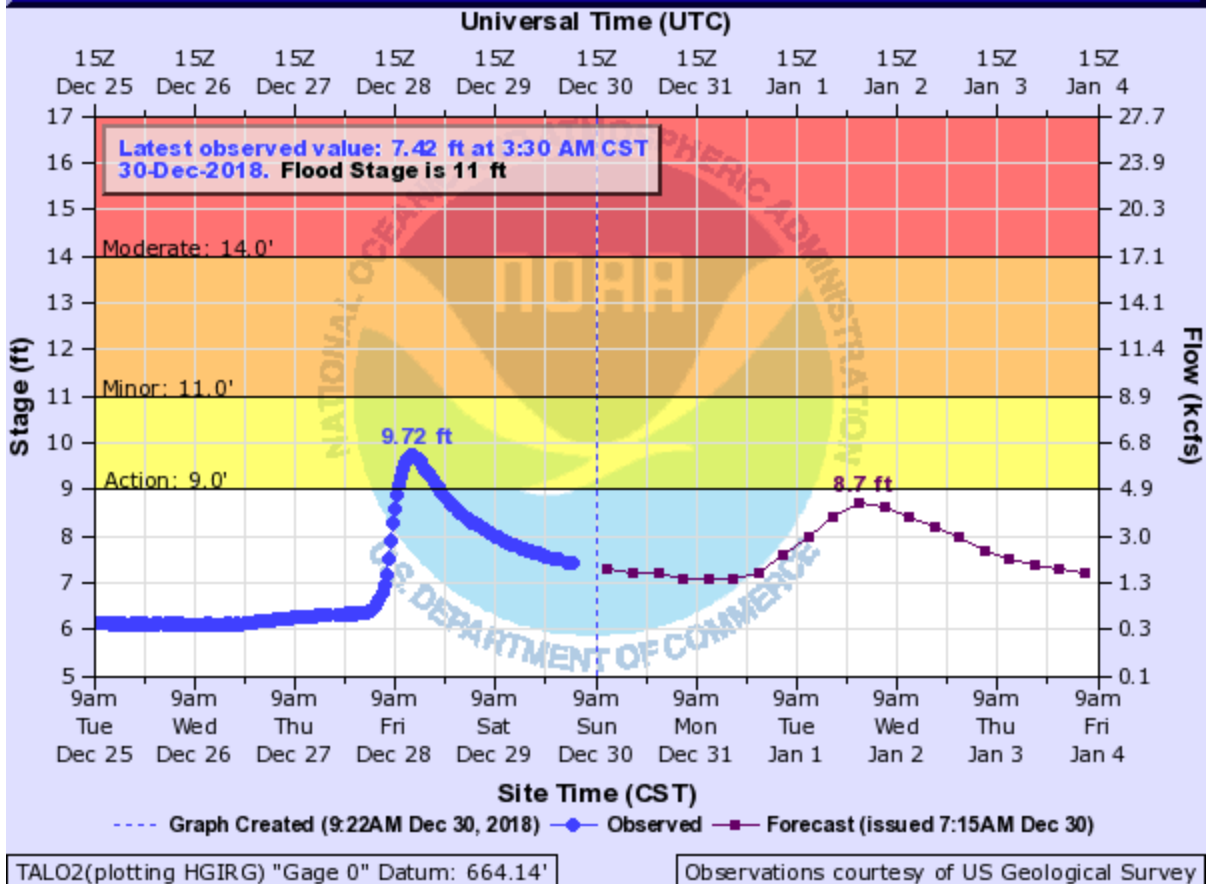
ILLINOIS RIVER (AR OK) AT CHEWEY



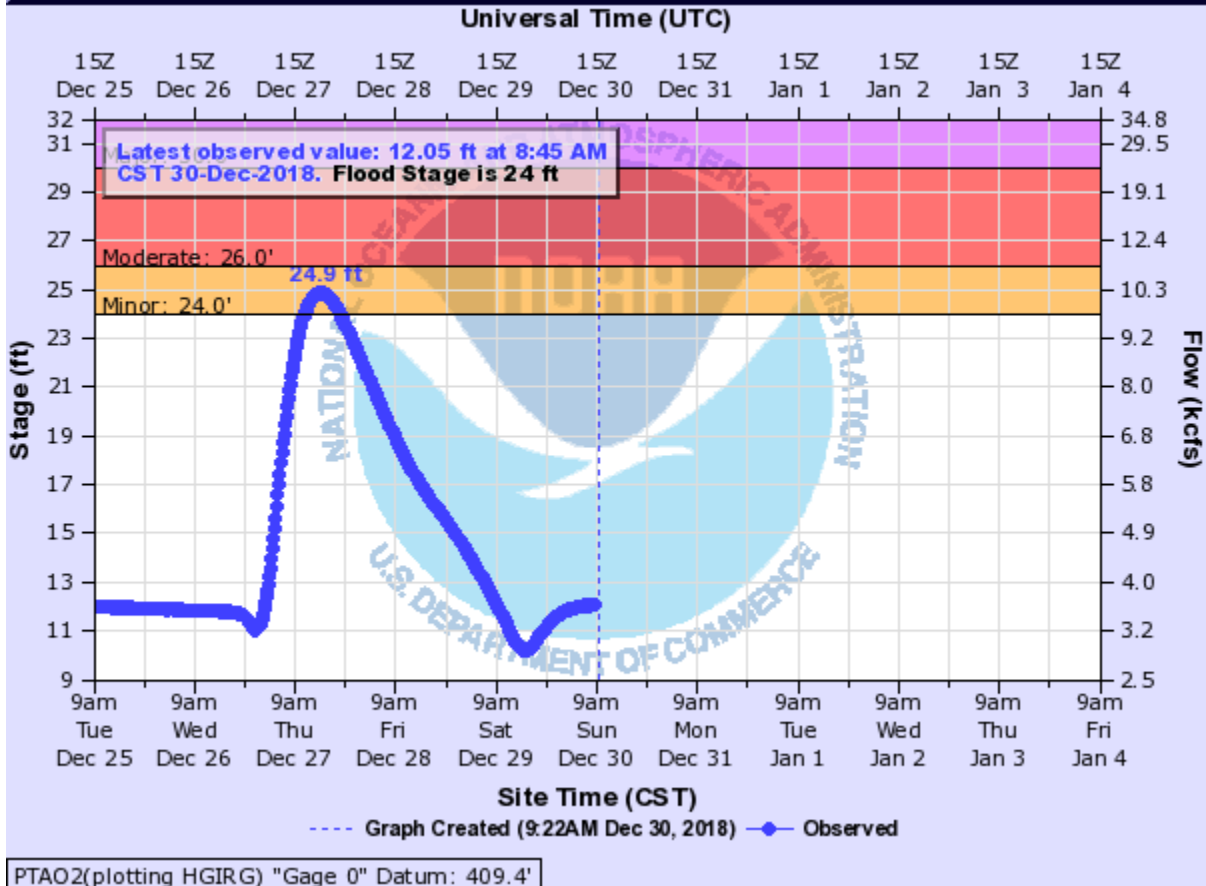
CWYO2(plotting HGIRG) "Gage 0" Datum: 800.88'

Observations courtesy of US Geological Survey

ILLINOIS RIVER (AR OK) NEAR TAHLEQUAH

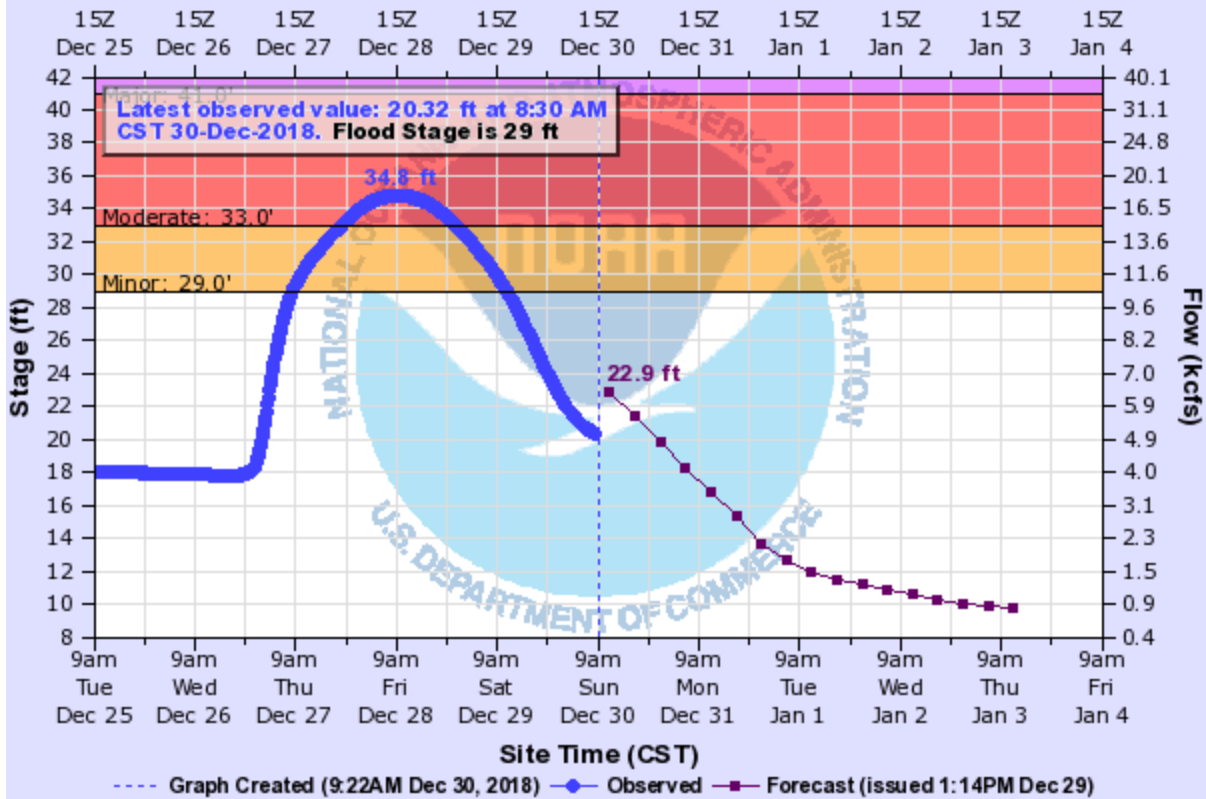


POTEAU RIVER NEAR POTEAU



POTEAU RIVER NEAR PANAMA

Universal Time (UTC)

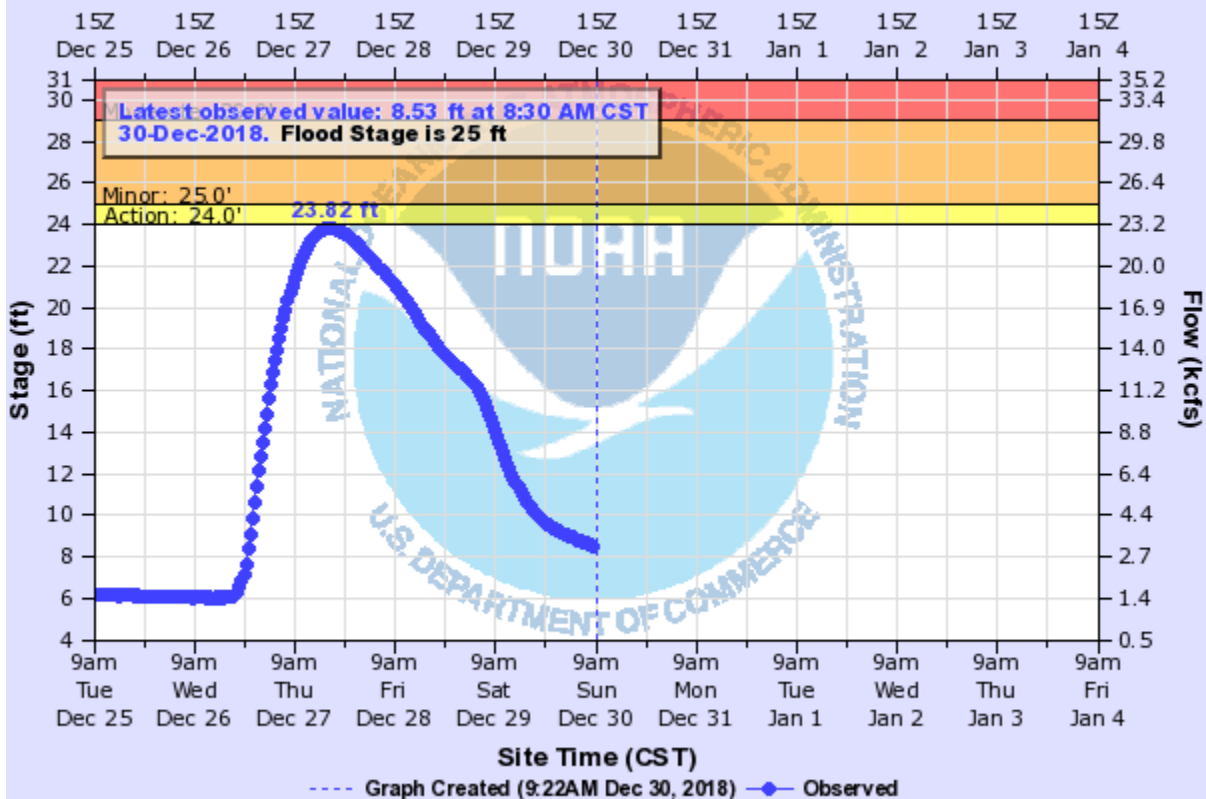


PANO2(plotting HGIRG) "Gage 0" Datum: 387.96'

Observations courtesy of US Geological Survey

KIAMICHI RIVER NEAR ANTLERS

Universal Time (UTC)

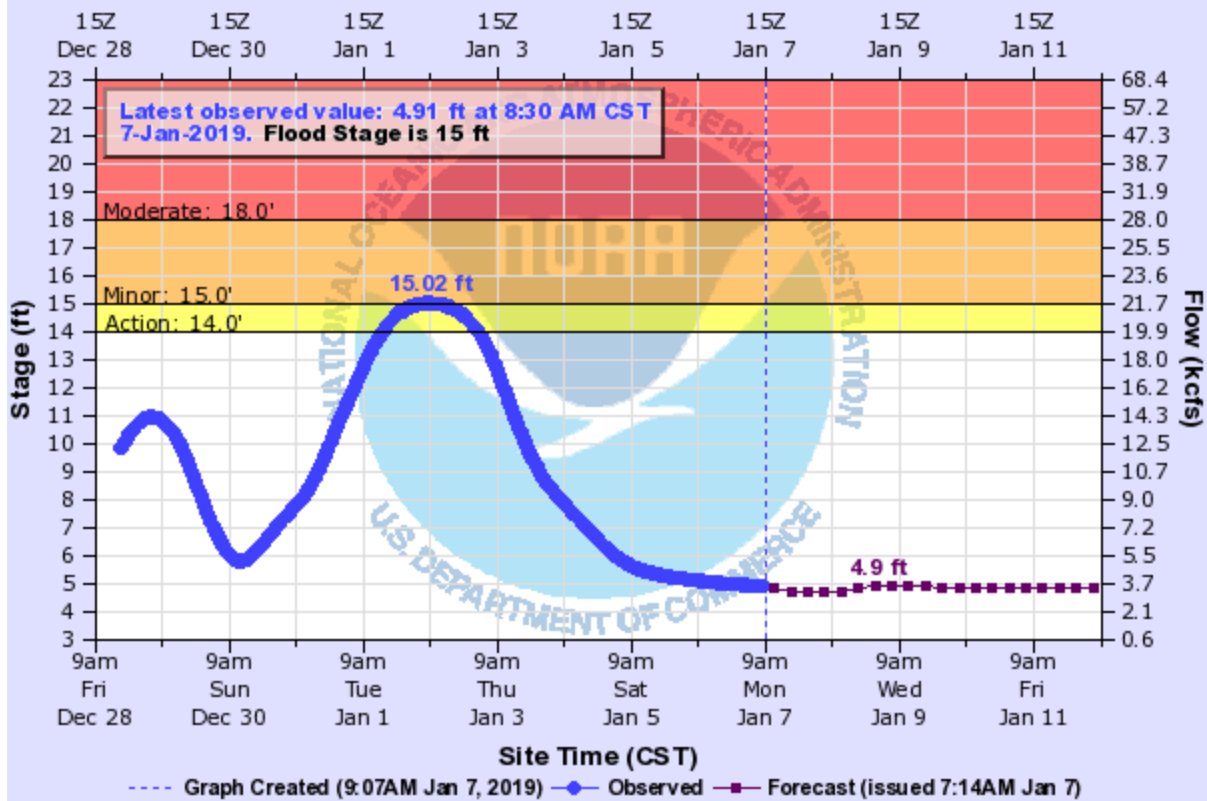


ANTO2(plotting HGIRG) "Gage 0" Datum: 419.82'

Observations courtesy of US Geological Survey

NEOSHO RIVER NEAR COMMERCE

Universal Time (UTC)



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

Observations courtesy of US Geological Survey