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 **March** 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 **March 14, 2018**

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.**

A heavy rainfall event at the end of the month brought some flooding to eastern OK and northwest AR, while locations northwest of the I-44 corridor once again missed out and remained impacted by drought. 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 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 March 2018 ranged from around 0.5" to near 1.5" northwest of the I-44 corridor and from 2" to 8" along and southeast of the I-44 corridor in eastern OK and northwest AR. This corresponds to near normal to 10-50% of the normal March rainfall northwest of the I-44 corridor, 25-90% of the normal March rainfall across southeast OK and west central AR, and near normal to around 150% of the normal March rainfall for the remainder of the area (Fig. 1b).

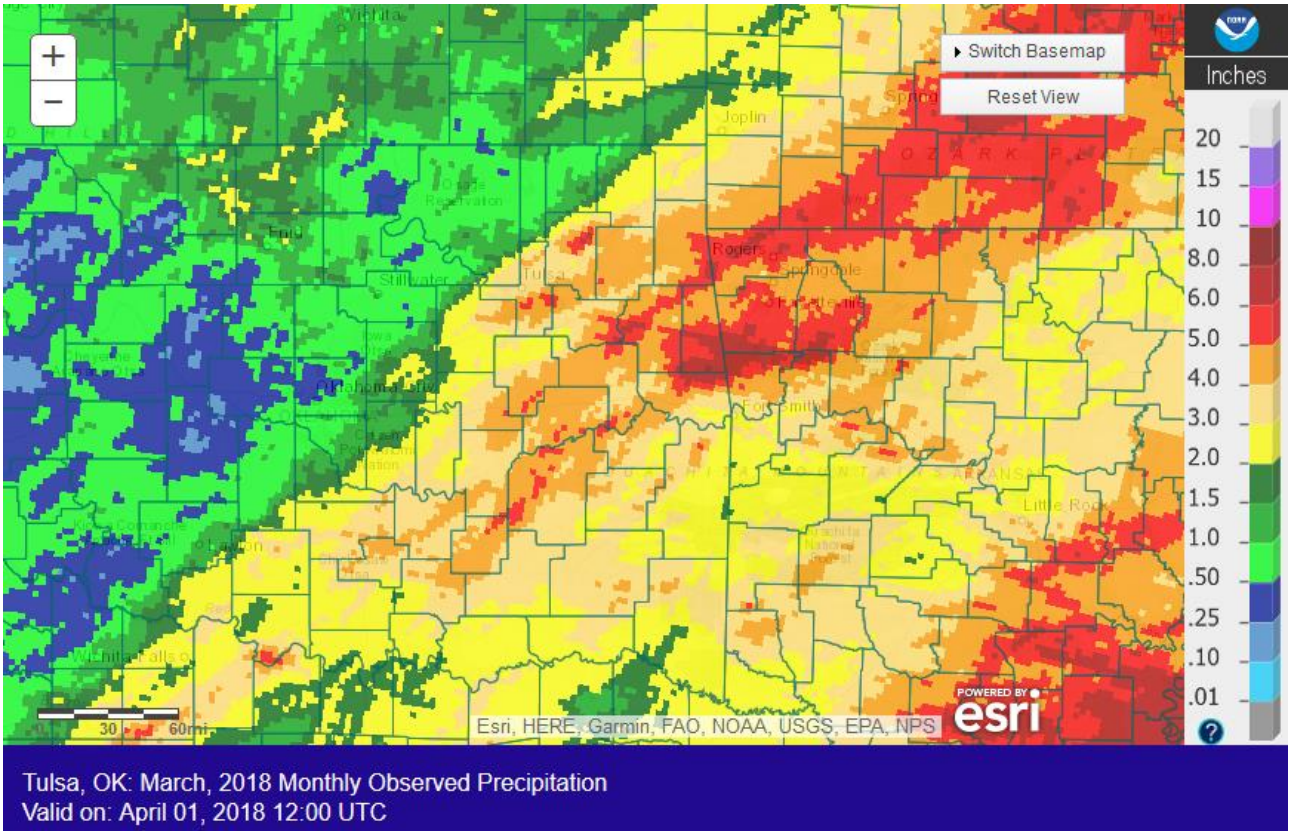


Fig. 1a. Estimated Observed Rainfall for March 2018

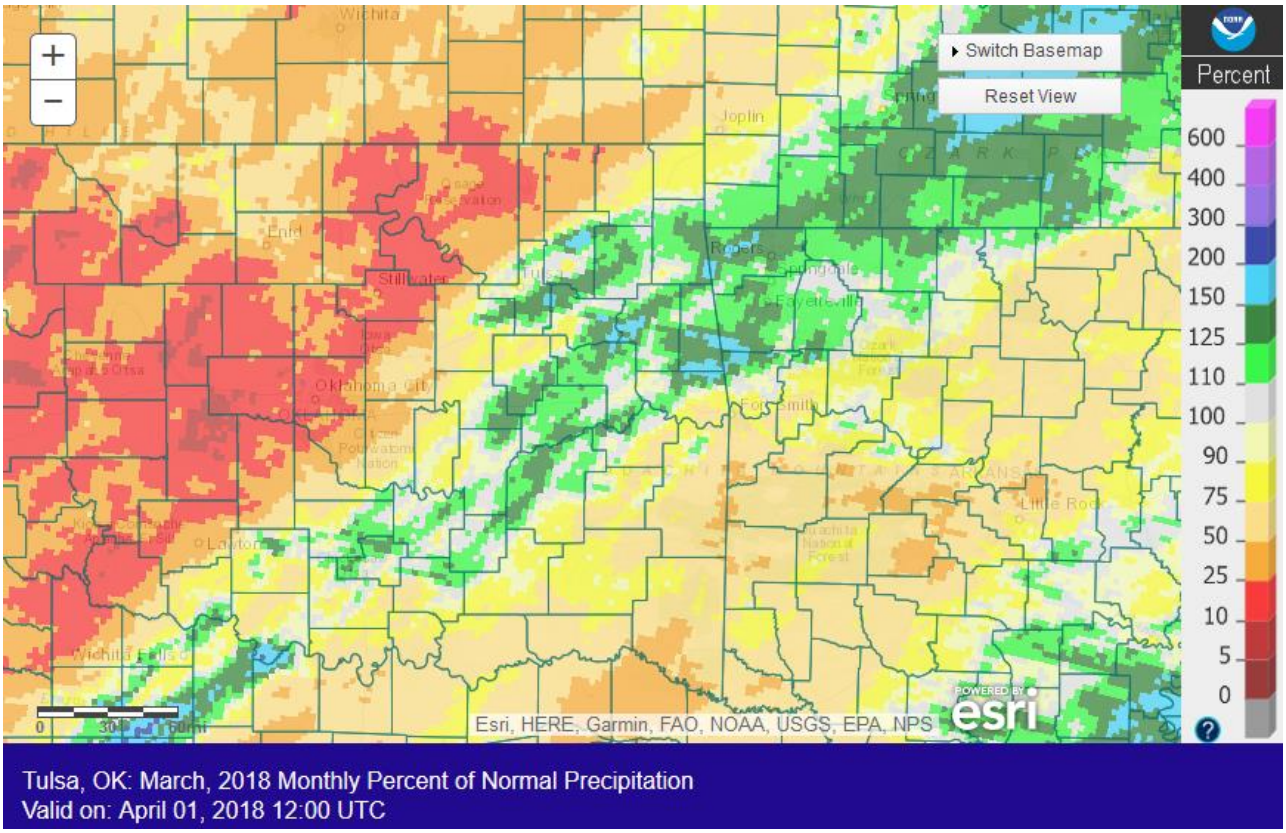


Fig. 1b. Estimated % of Normal Rainfall for March 2018

In Tulsa, OK, March 2018 ranked as the 38th warmest March (53.0°F, tied 1994, 1972; since records began in 1905), the 48th wettest March (3.31"; since records began in 1888), and ties with 38 other years as the least snowy March (0.0"; since records began in 1900). Fort Smith, AR had the 31st warmest March (54.9°F, tied 1916; since records began in 1883), the 64th wettest March (3.07"; since records began in 1883), and tied with 76 other years as the least snowy March (0.0"; since records began in 1884). Fayetteville, AR had the 25th warmest (49.7°F), the 17th wettest (5.40"), and the least snowy (0.0", tied 21 other years) March since records began in 1950.

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

St. Paul 1E, AR (coop)	7.45	Mountainburg 2NE, AR (coop)	7.18	Decatur 2.6ESE, AR (coco)	6.58
Kingston 2S, AR (coop)	6.51	Bunch 0.8N, OK (coco)	6.37	Bella Vista 2.0E, AR (coco)	6.16
Upper Spavinaw Port, OK (coop)	6.05	Winslow 7NE, AR (coop)	6.04	Uniontown 2.1ESE, AR (coco)	6.01

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

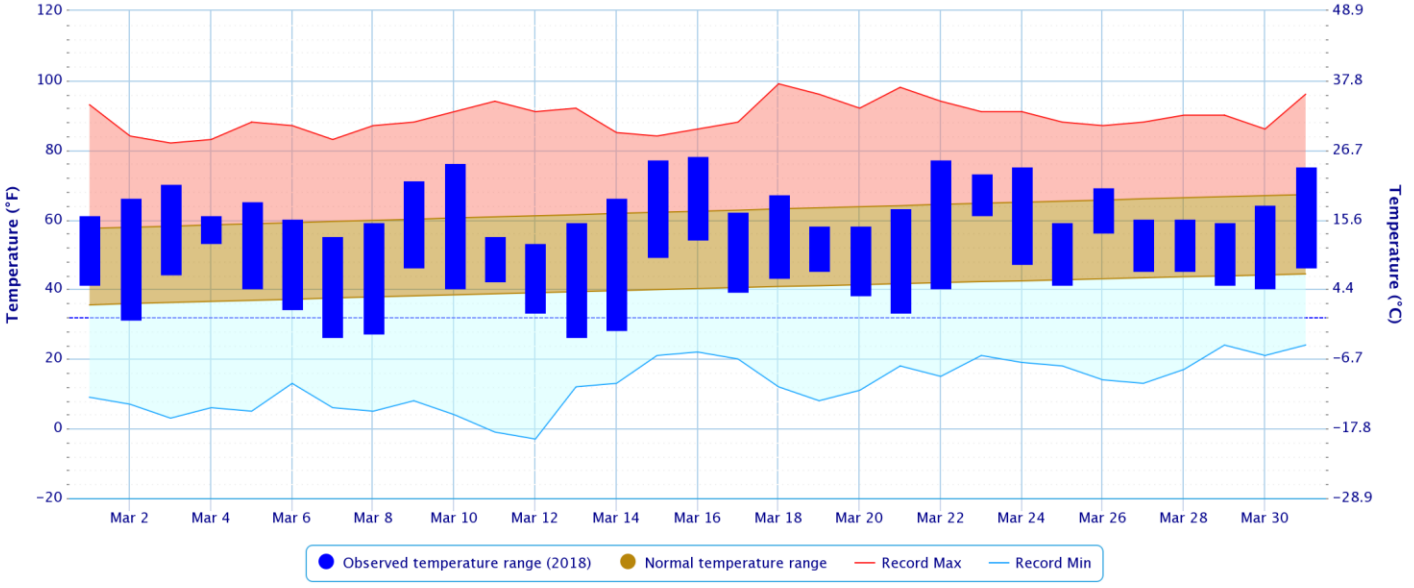
Pawnee, OK (meso)	0.51	Bartlesville, OK (ASOS)	0.54	Ralston, OK (coop)	0.55
Burbank, OK (meso)	0.65	Ochelata 5.6N, OK (coco)	0.68	Wynona, OK (meso)	0.90
Foraker, OK (meso)	1.08	Talala, OK (meso)	1.18	Nowata, OK (meso)	1.18

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

Rank since 1921	March 2018	Last 60 Days (Jan 31-Mar 31)	Year-to-Date (Jan 1 – Mar 31)	Last 120 Days (Dec 2 – Mar 31)	Water-Year-to-Date (Oct 1– Mar 31)	Last 365 Days (Apr 1, 2017 – Mar 31, 2018)
Northeast OK	41st driest	14th wettest	30th wettest	41st wettest	42nd wettest	17th wettest
East Central OK	28th wettest	**4th wettest**	**6th wettest**	11th wettest	37th wettest	**6th wettest**
Southeast OK	34th driest	**3rd wettest**	**6th wettest**	**8th wettest**	28th wettest	17th wettest
Statewide	30th driest	12th wettest	31st wettest	41st wettest	39th driest	26th wettest

Daily Temperature Data – Tulsa Area, OK (ThreadEx)

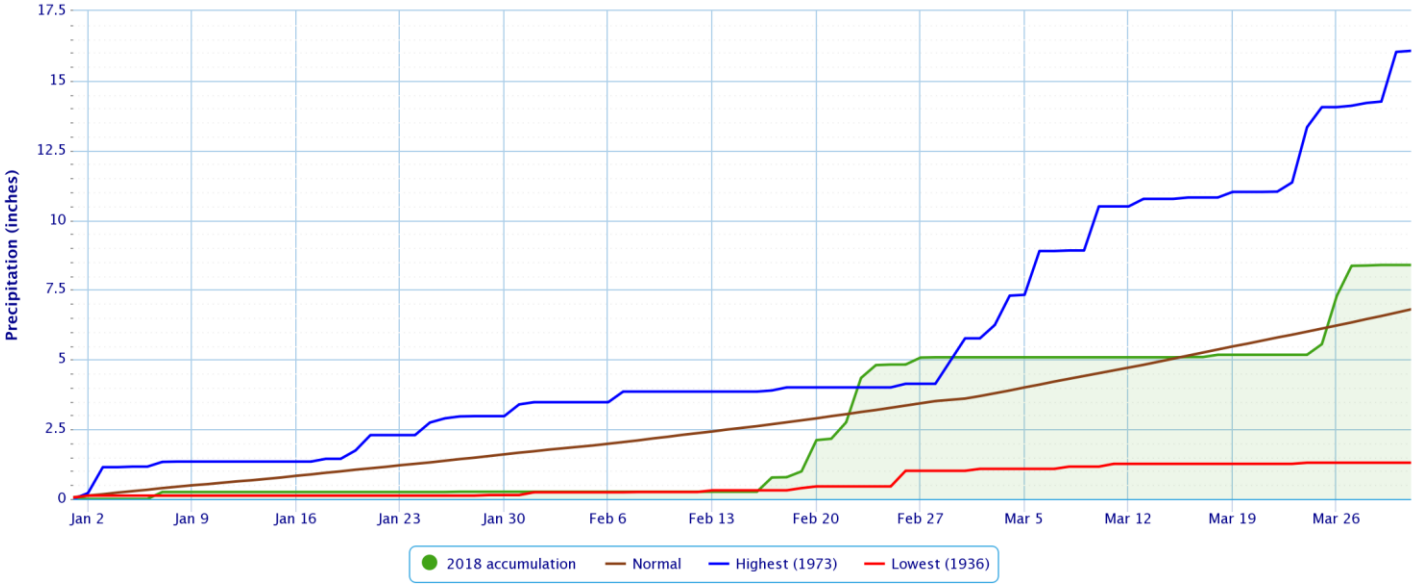
Period of Record – 1905-01-06 to 2018-04-15. Normals period: 1981-2010. Click and drag to zoom chart.



Powered by ACIS

Accumulated Precipitation – Tulsa Area, OK (ThreadEx)

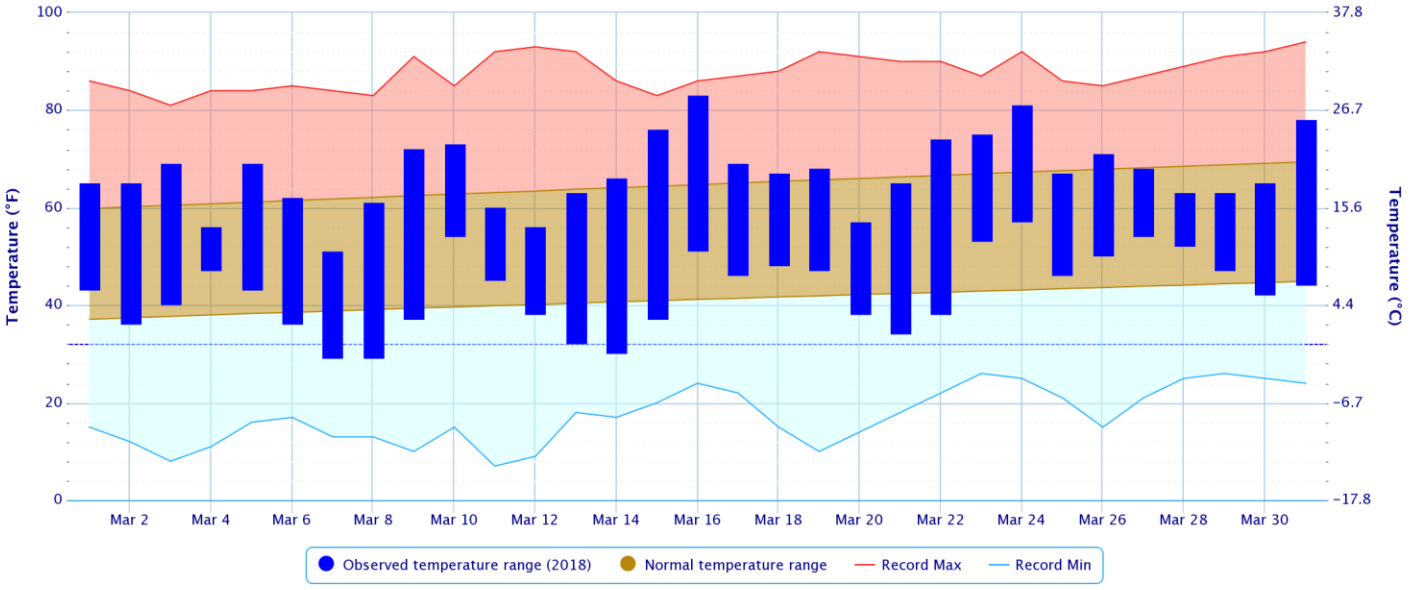
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



Powered by ACIS

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

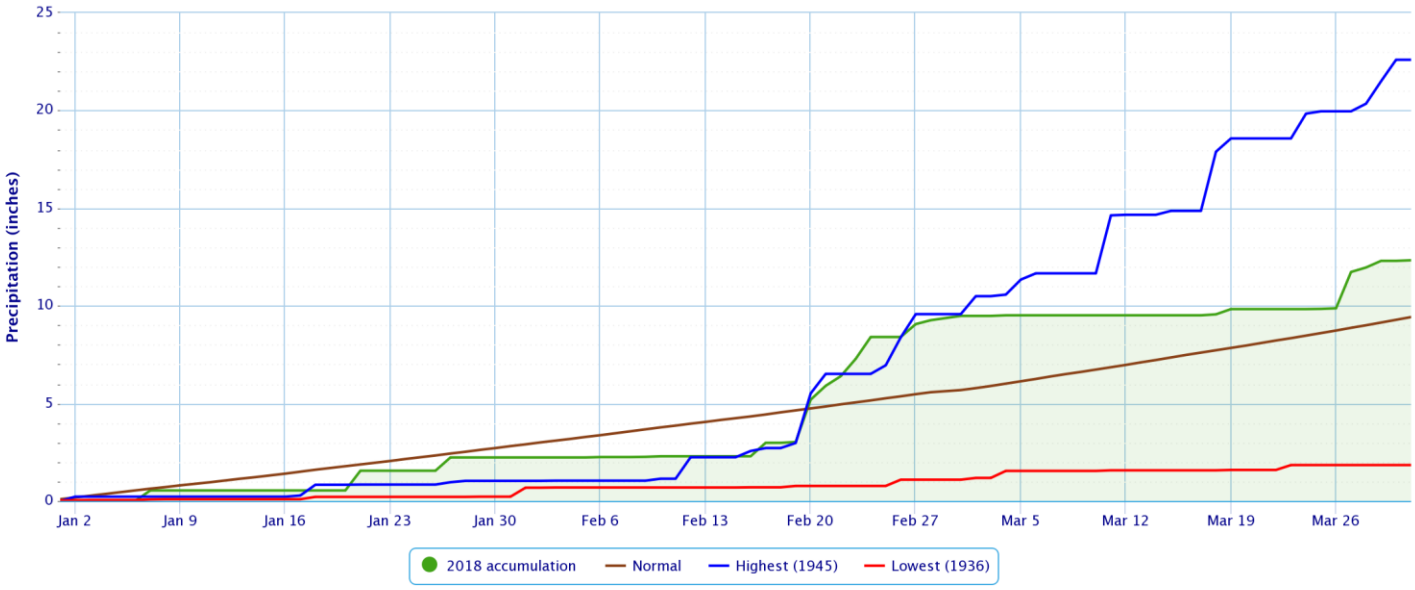
Period of Record – 1882-06-01 to 2018-04-15. Normals period: 1981-2010. Click and drag to zoom chart.



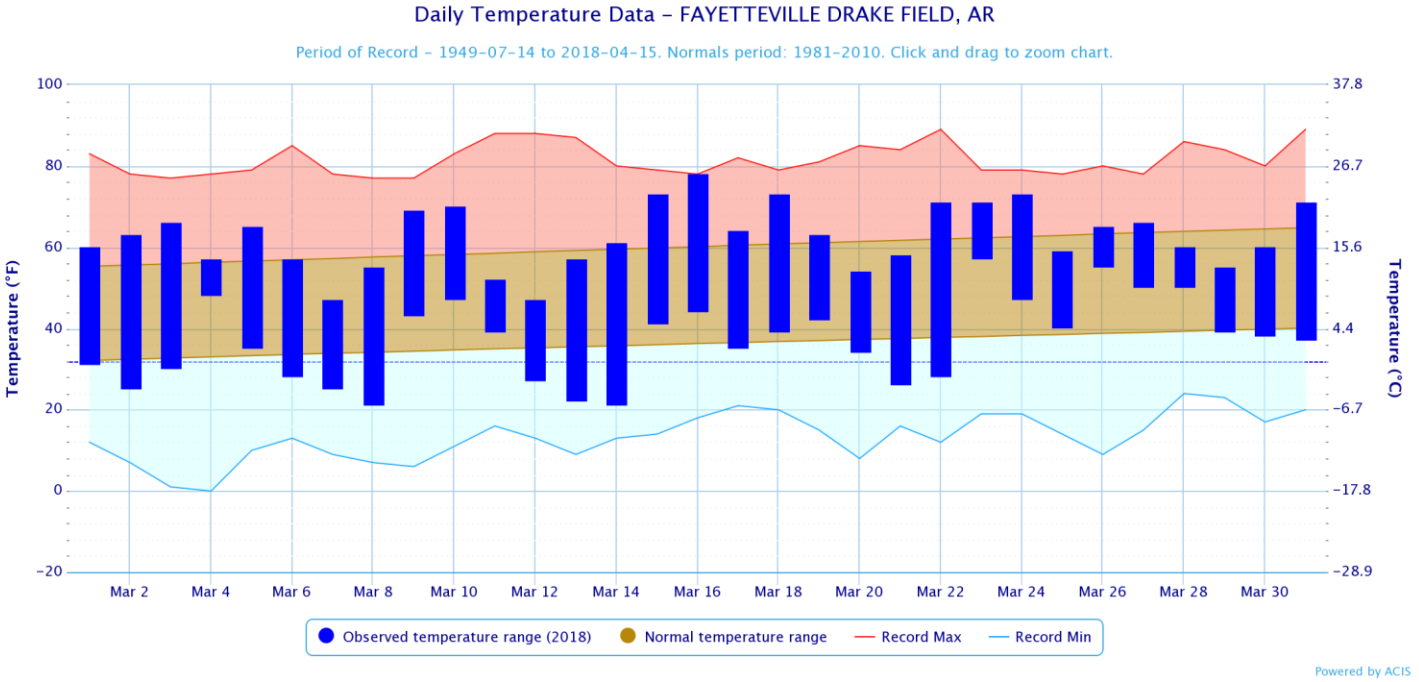
Powered by ACIS

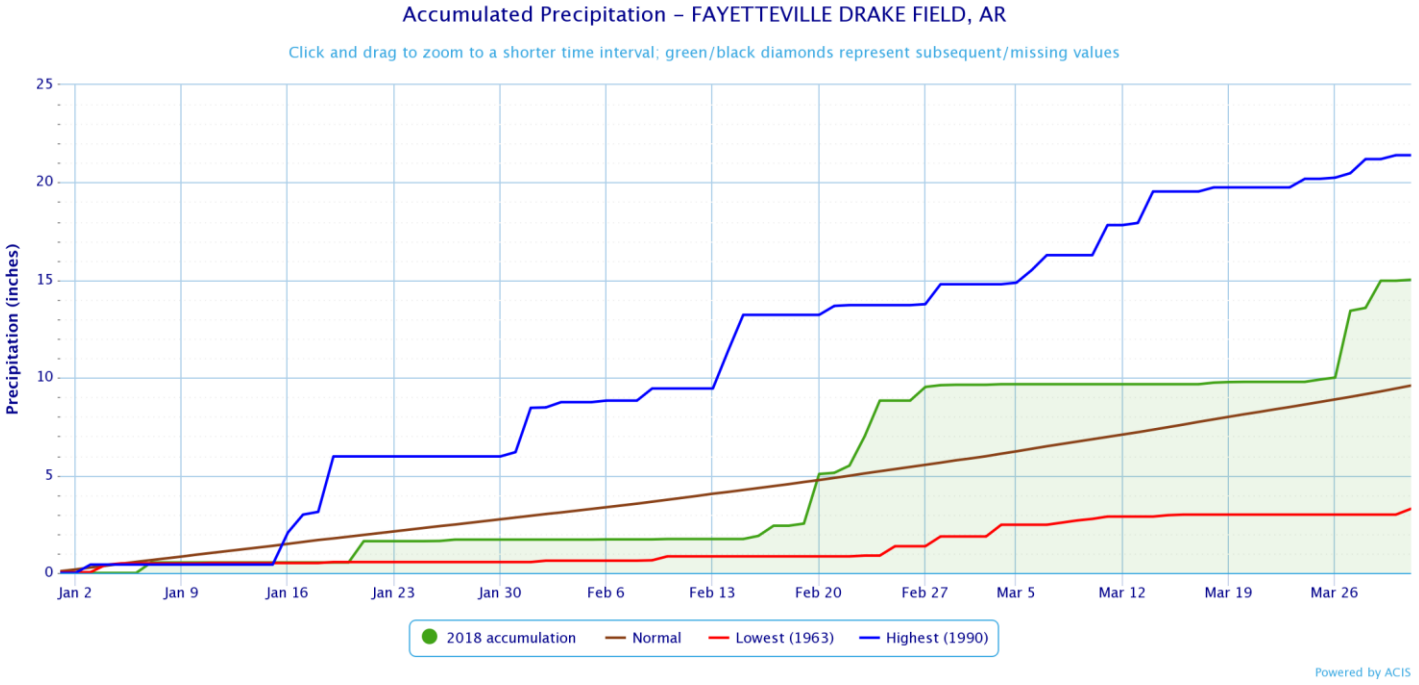
Accumulated Precipitation – Fort Smith Area, AR (ThreadEx)

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



Powered by ACIS





Drought

According to the U.S. Drought Monitor (USDM) from April 3, 2018 (Figs. 2, 3), Severe (D2) Drought conditions were impacting northwest Osage County and eastern Kay County in eastern OK. Moderate (D1) drought conditions were present across portions of Osage, Pawnee, Washington, and Nowata Counties in eastern OK. Abnormally Dry (D0) but not in drought conditions encompassed portions of Pawnee, Creek, Osage, Washington, Tulsa, Rogers, Nowata, and Craig Counties.

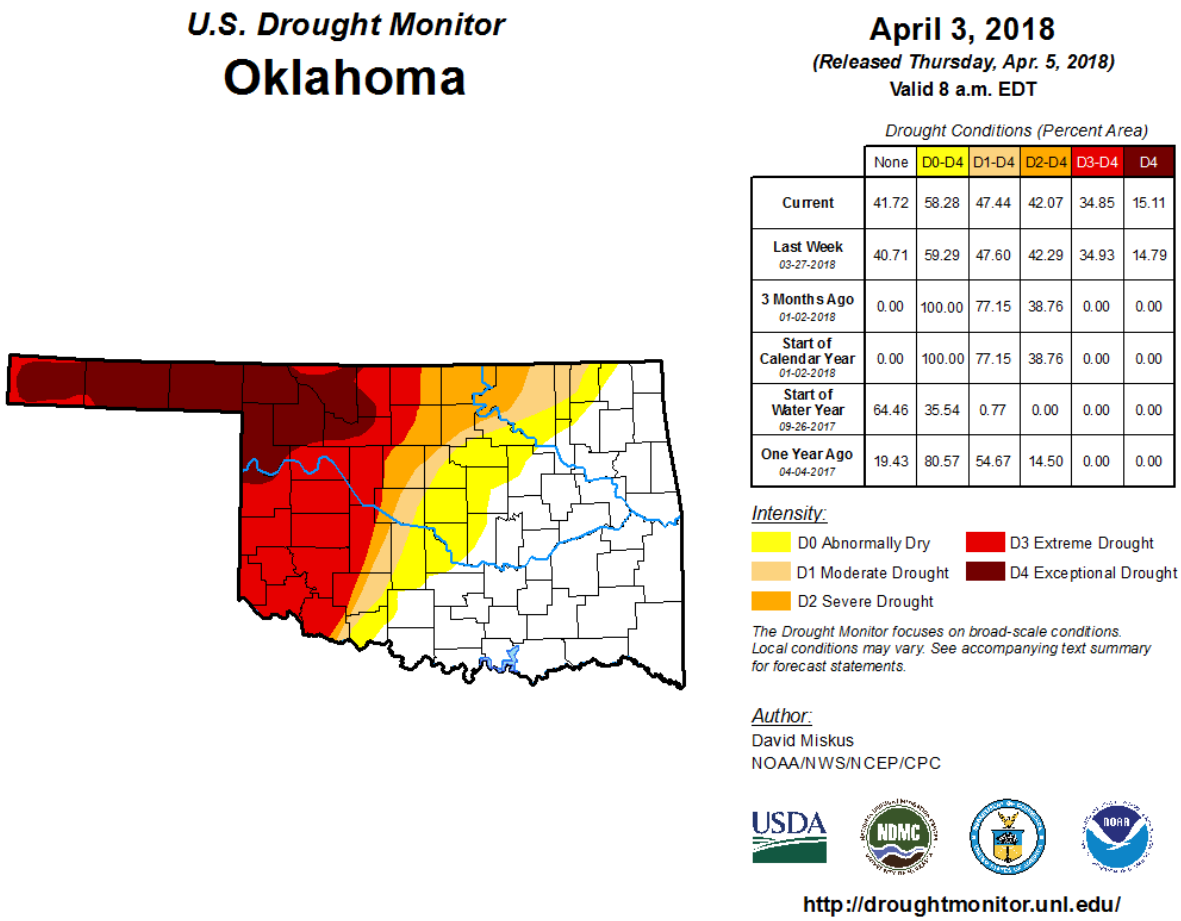


Fig. 2. Drought Monitor for Oklahoma

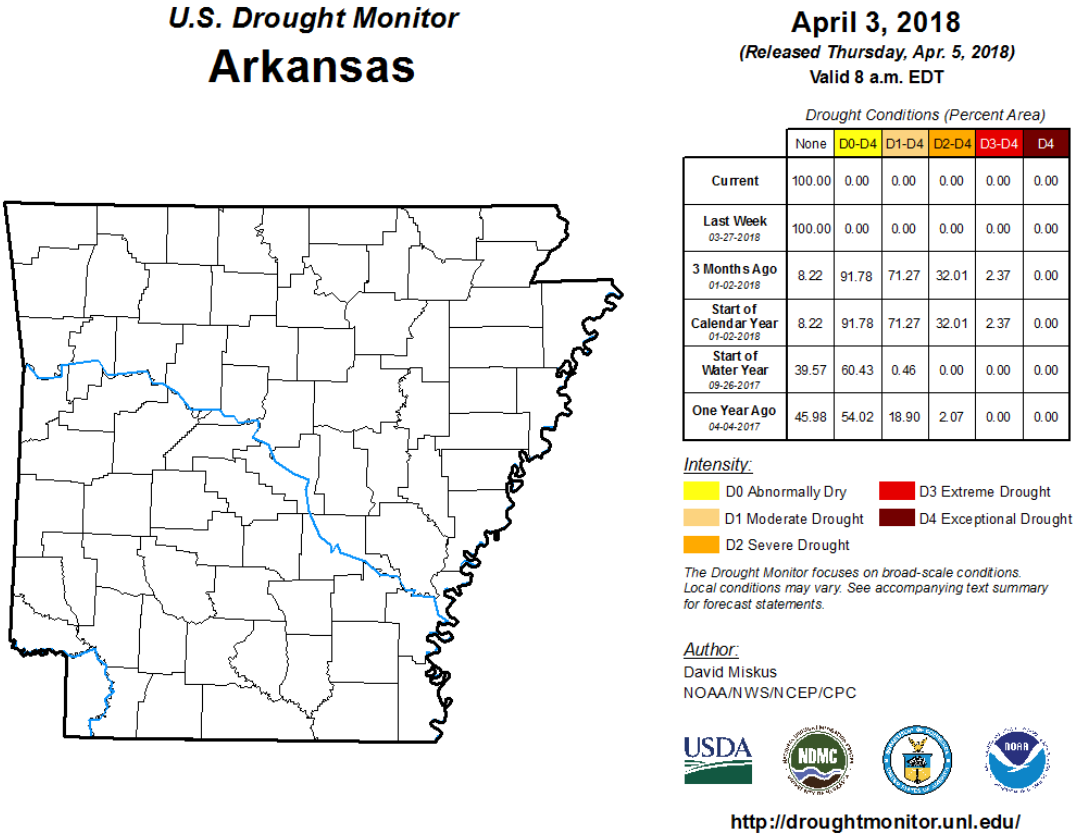
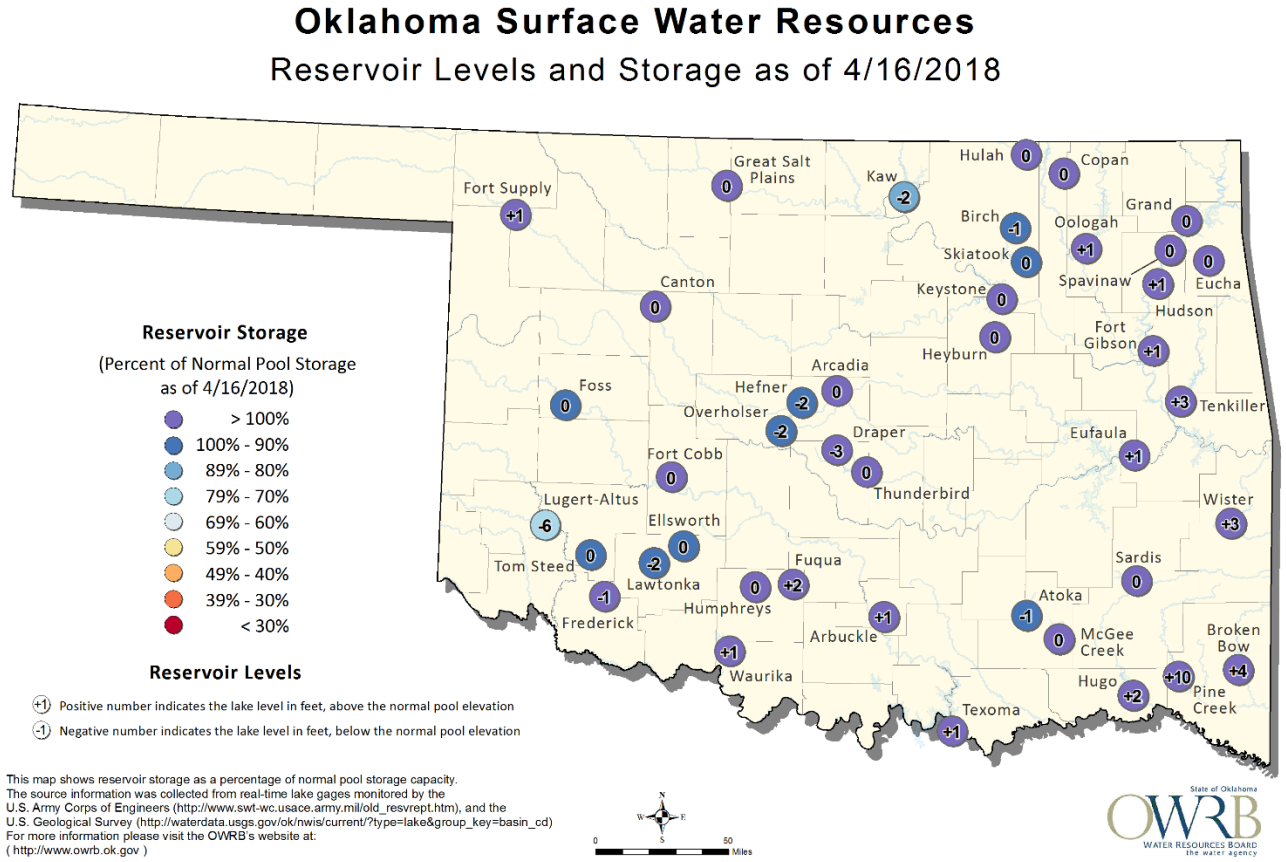


Fig.3. Drought Monitor for Arkansas

Reservoirs



According to the USACE, most lakes in the HSA were within ±3% of their conservation pool level. Reservoirs below 3% of their conservation pool storage as of 4/16/2018: Kaw Lake 88% and Birch Lake 95%. Reservoirs above 3% of their conservation pool storage as of 4/16/2018: Beaver Lake 175%, Tenkiller Lake 107%, Wister Lake 105%, Hudson Lake 105%, Sardis Lake 104%, and Eufaula Lake 104%.

Outlooks

The Climate Prediction Center (CPC) outlook for April 2018 (issued March 31, 2018) indicates a slightly enhanced chance for below normal temperatures along the OK/KS and AR/MO state line, and equal chances for above, near, and below normal temperatures elsewhere across all of eastern OK and northwest AR. This outlook also indicates a slightly enhanced chance for above median precipitation across northeast and east central OK, and northwest and west central AR, with equal chances for above, near, and below median precipitation across southeast OK. This outlook takes into account weather conditions forecast over the next 1-2 weeks, sub-seasonal climate signals, including the Madden-Julian Oscillation (MJO), soil moisture, and influence from the weak La Niña. The MJO state would favor a cold trend over the north central U.S. mid-month.

For the 3-month period April-May-June 2018, CPC is forecasting an enhanced chance for above normal temperatures across all of eastern OK and northwest AR. This outlook also indicates a slightly enhanced chance for below median rainfall across southeast OK and an equal chance for above, near, and below median precipitation across the remainder of eastern OK and northwest AR (outlook issued March 15, 2018). This outlook is based on both statistical and dynamical forecast tools and decadal timescale climate trends, as well as impacts from La Niña and the MJO. According to CPC, La Niña conditions continued in March, but have decayed rapidly over the past month. ENSO neutral conditions are predicted to rapidly develop this spring and are favored to persist through the summer.

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 band of showers and thunderstorms developed along a cold front as it sagged south into the area. While most of eastern OK and northwest AR remained dry, areas from around Tulsa southeast to Franklin Co. AR received around 0.25" to around 2" of rain (Fig. 4).

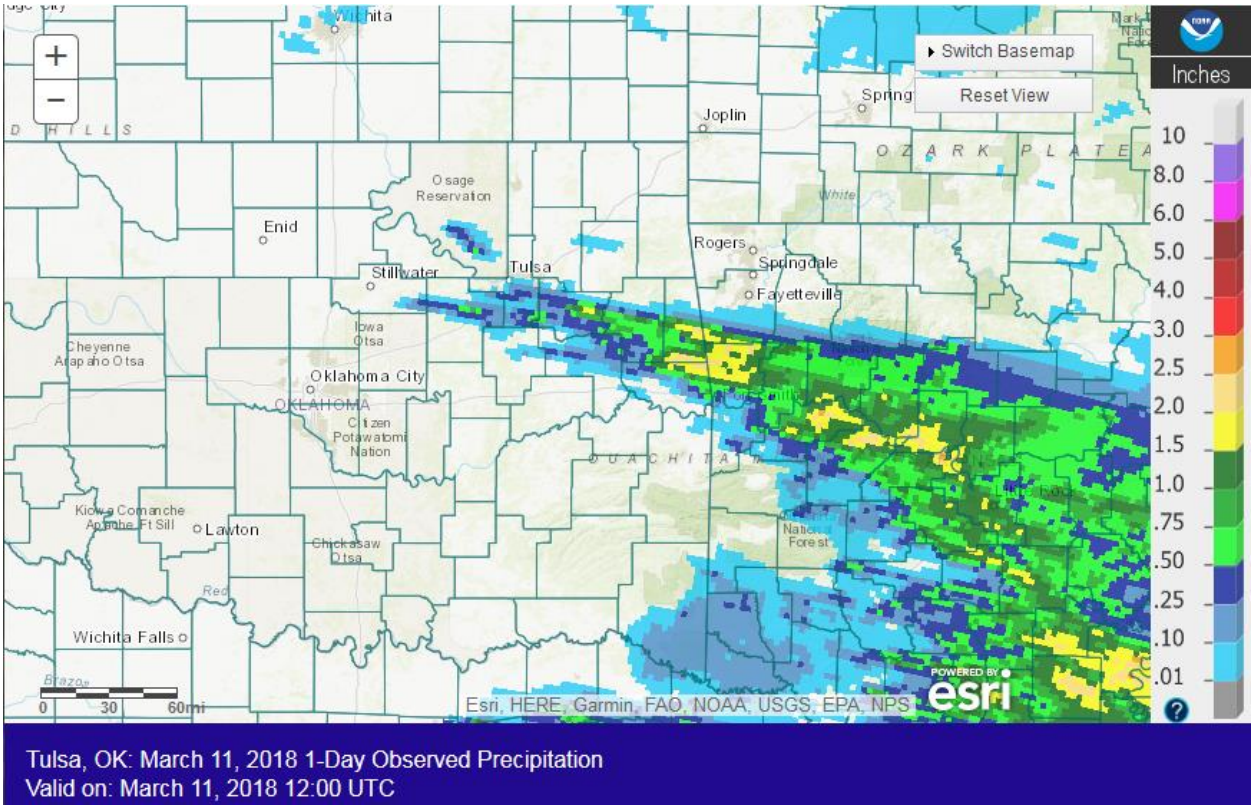


Fig. 4. 24-hour Estimated Observed Rainfall ending at 7am CDT 3/11/2018.

Persistent warm air advection resulted in a line of showers and thunderstorms on the morning of the 26th, with widespread convection increasing later in the day. Precipitable water forecast values were 1.7" for the end of March, which is in the 99th percentile. This impressive moisture, combined with southwesterly low-level flow resulted in a favorable environment for training storms along an advancing cold front during the evening and overnight hours. The heavy rain axis slowly shifted south during the day of the 27th as the front continued to move through the area. Locations northwest of the I-44 corridor missed most of the rain, only receiving around 0.50" or less, while along and southeast of the I-44 corridor, rainfall totals were 1"-5" (Figs. 5-8). Minor to Moderate flooding occurred along the Illinois River and Minor flooding occurred along Lee Creek due to this heavy rain (see preliminary hydrographs at the end of this report; see E3 Report for details). Numerous roads were underwater and impassable, especially across northwest AR. In addition to the heavy rain, a brief EF-0 tornado formed along the leading edge of a bowing severe line segment of thunderstorms as it moved into west central AR (more information https://arcg.is/1f5Ob4).

Another round of rainfall occurred on the 28th in association with an upper-level wave. This rainfall remained lighter, bringing around 0.25" to 1.5" to locations southeast of I-44. With this additional rainfall, the total amount over the three days was 2" to 4" widespread along and south of I-44, and smaller areas that received 5"-6" (Figs. 9, 10).

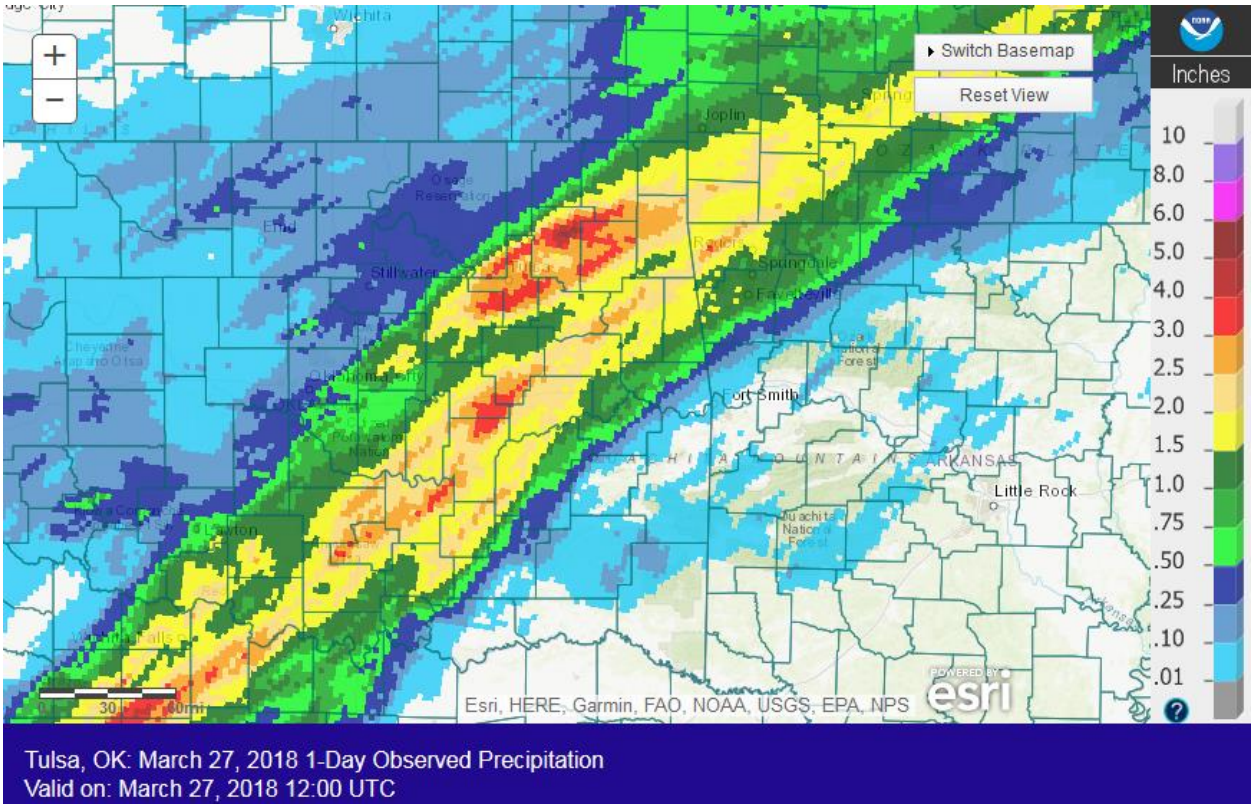


Fig. 5. 24-hour Estimated Observed Rainfall ending at 7am CDT 3/27/2018.

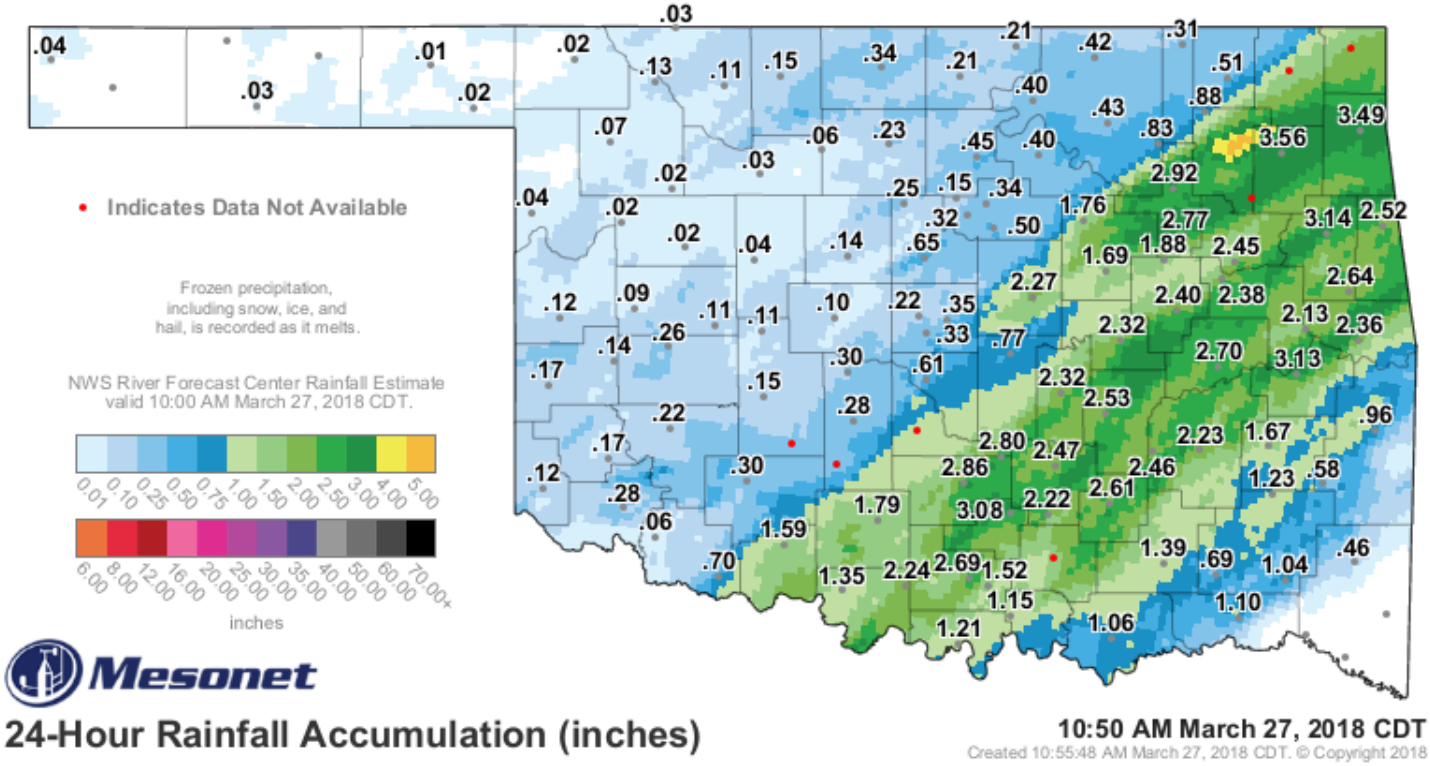


Fig. 6. 24-hour Estimated Observed Rainfall (image) and OK Mesonet measurements ending at 10:50 am CDT 3/27/2018.

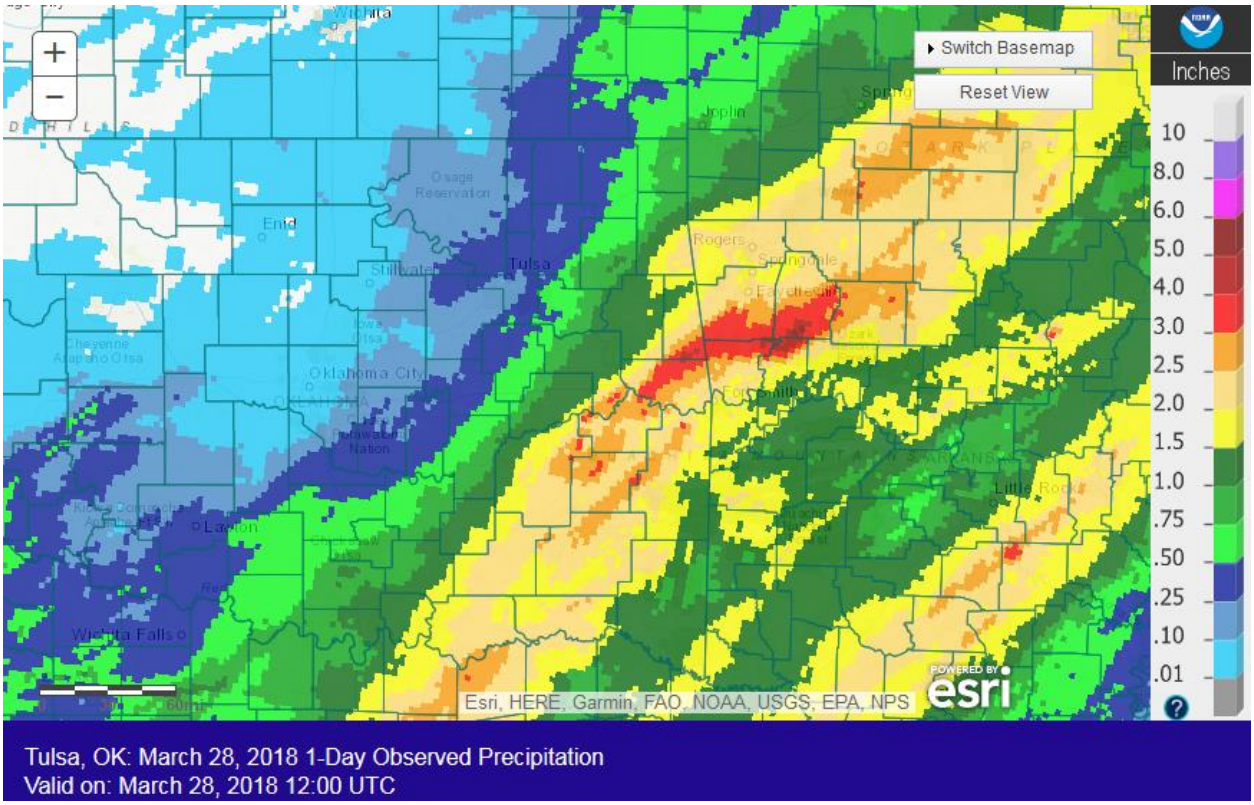


Fig. 7. 24-hour Estimated Observed Rainfall ending at 7am CDT 3/28/2018.

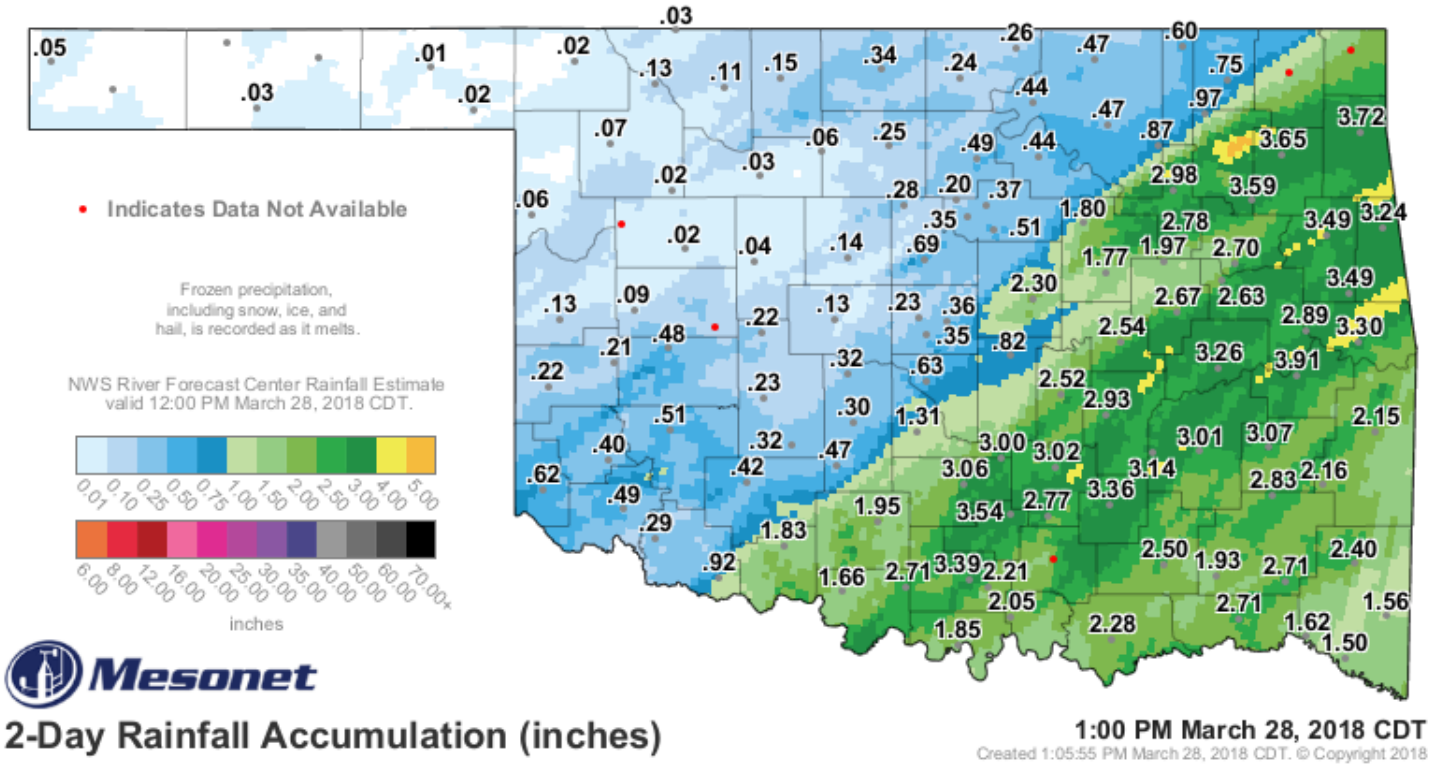


Fig. 8. 24-hour Estimated Observed Rainfall (image) and OK Mesonet measurements ending at 10:50 am CDT 3/28/2018.

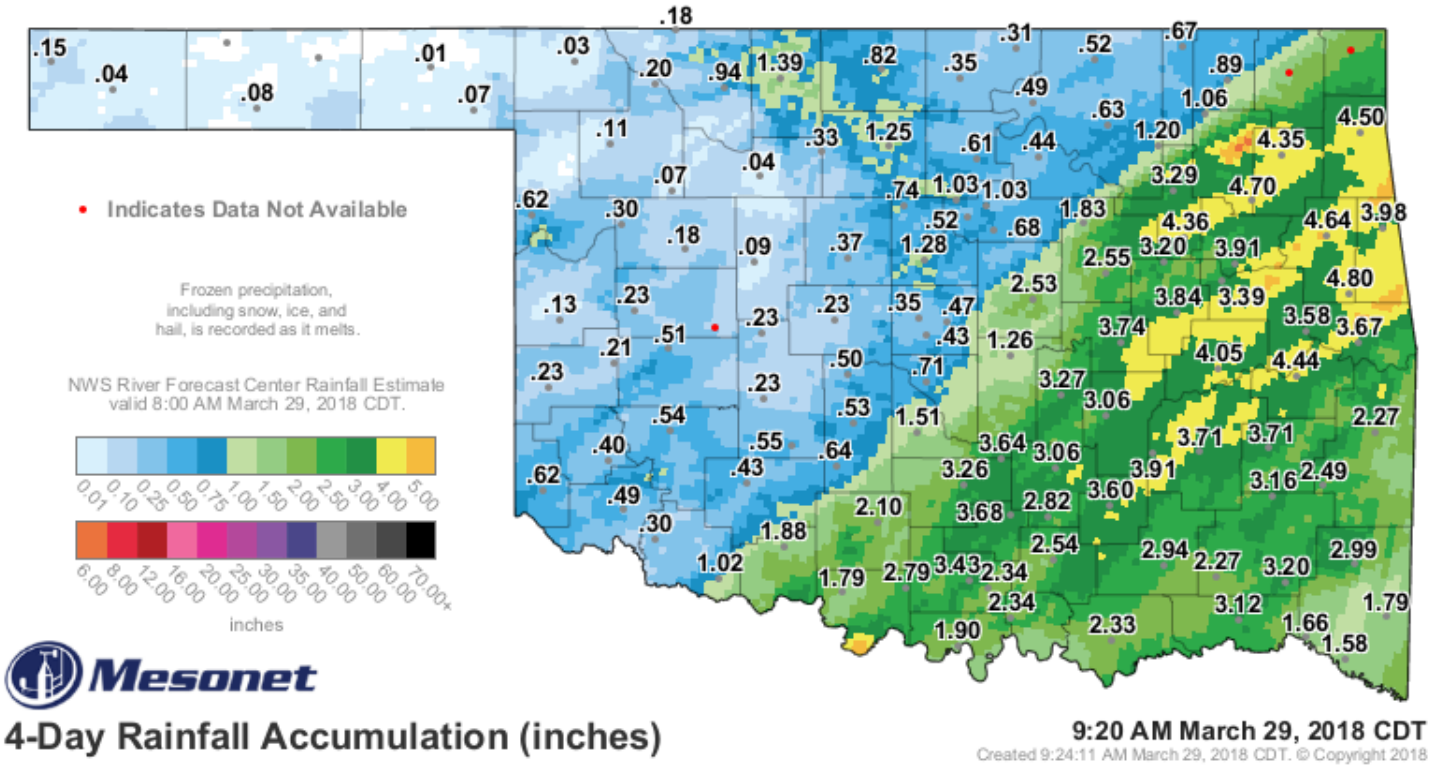


Fig. 9. 4-day Estimated Observed Rainfall (image) and OK Mesonet measurements ending at 9:20 am CDT 3/29/2018.

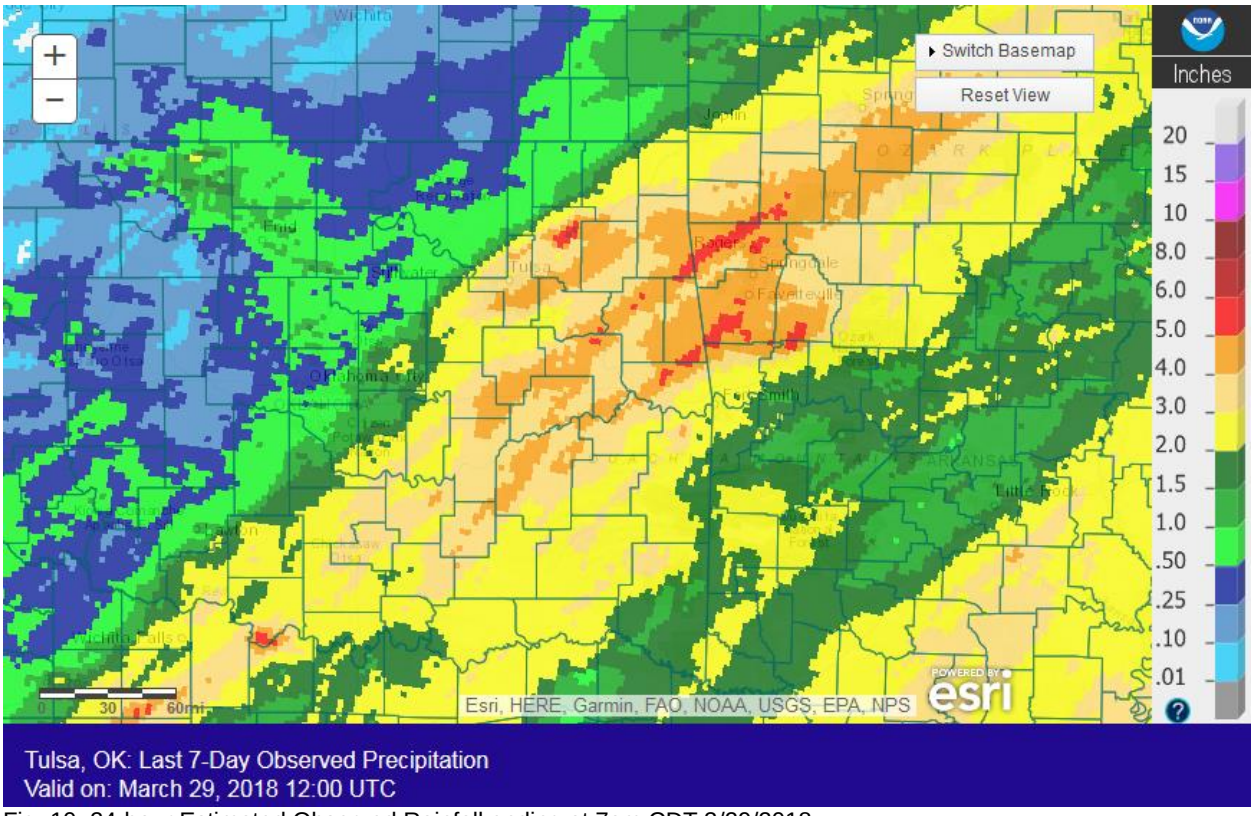


Fig. 10. 24-hour Estimated Observed Rainfall ending at 7am CDT 3/29/2018.

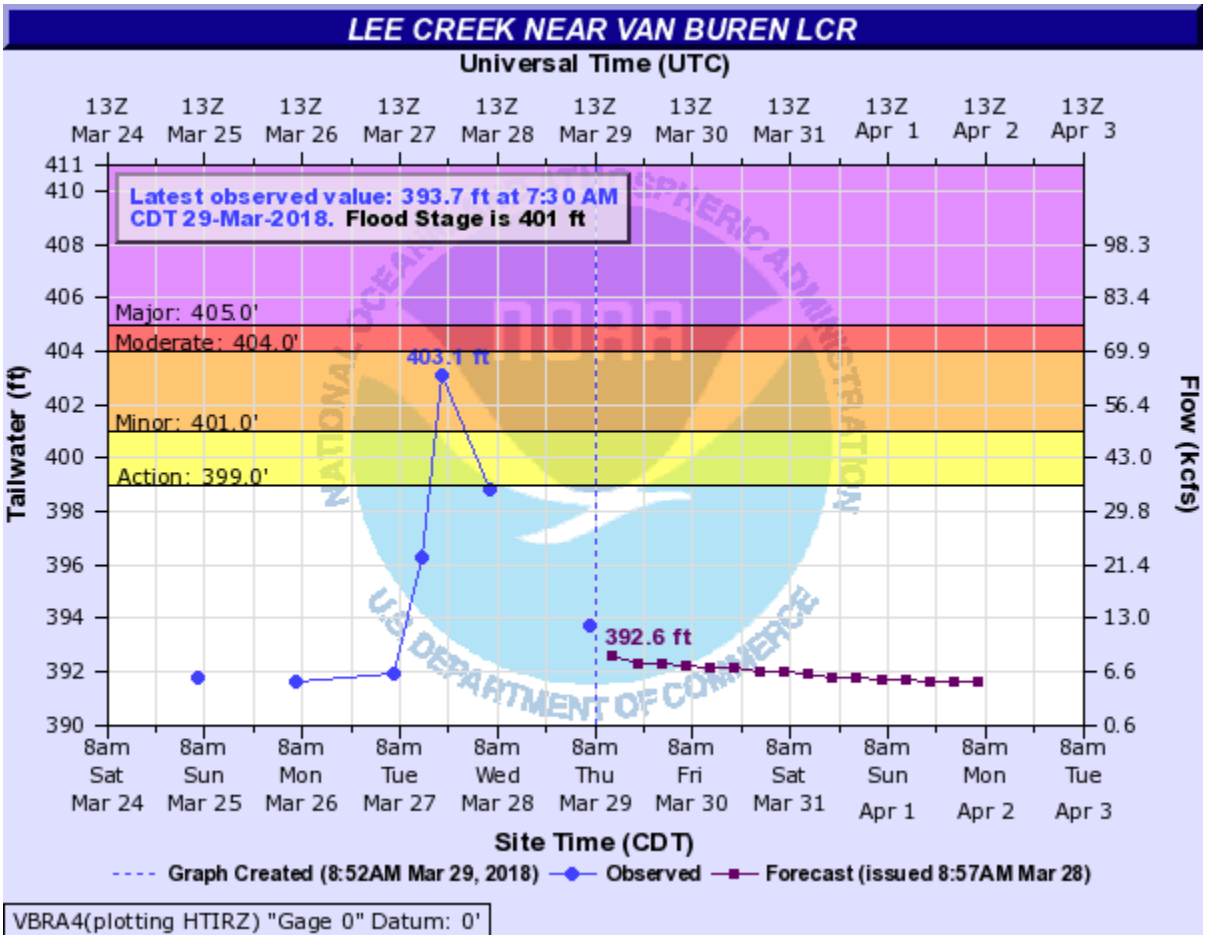
Written by:
Nicole McGavock
Service Hydrologist
WFO Tulsa

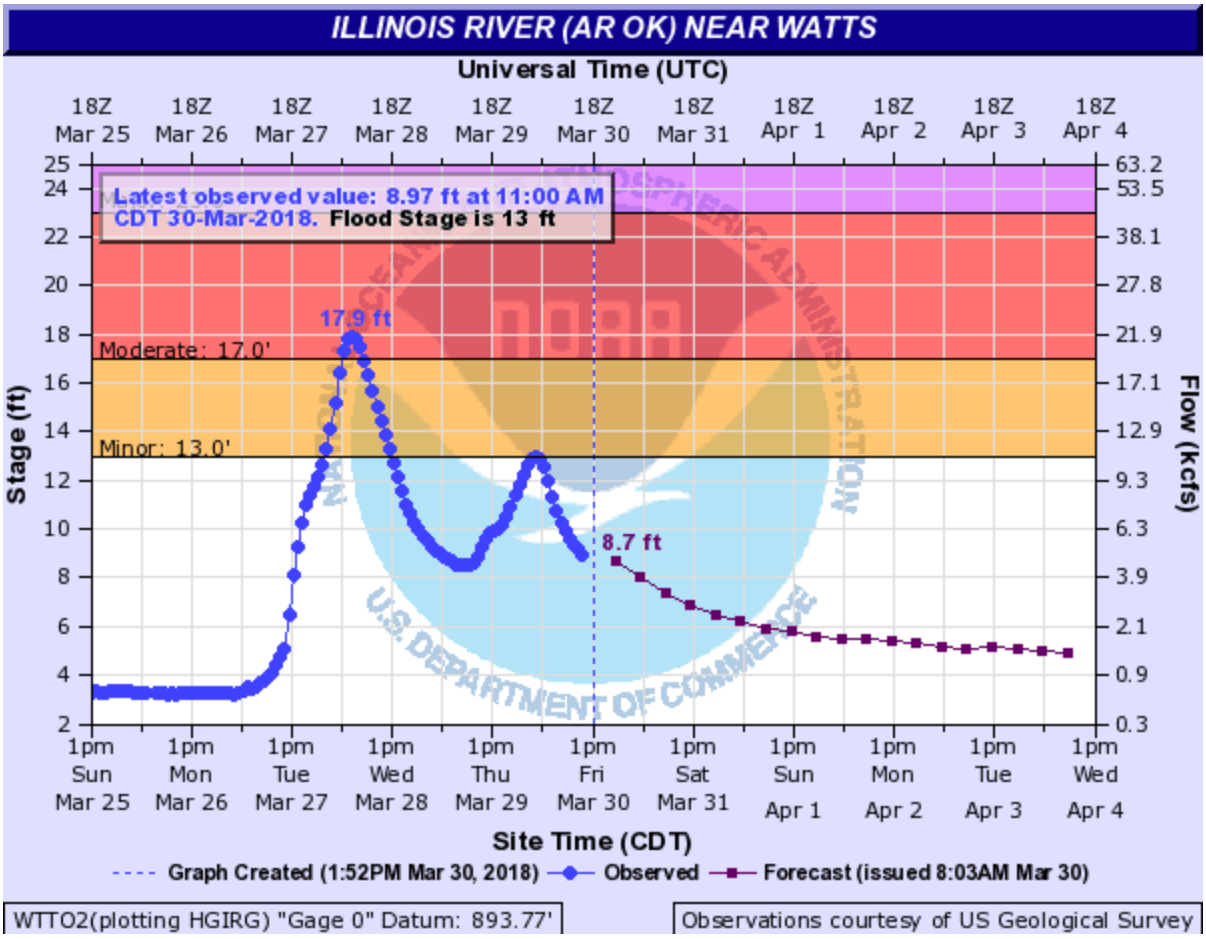
Products issued in March 2018:

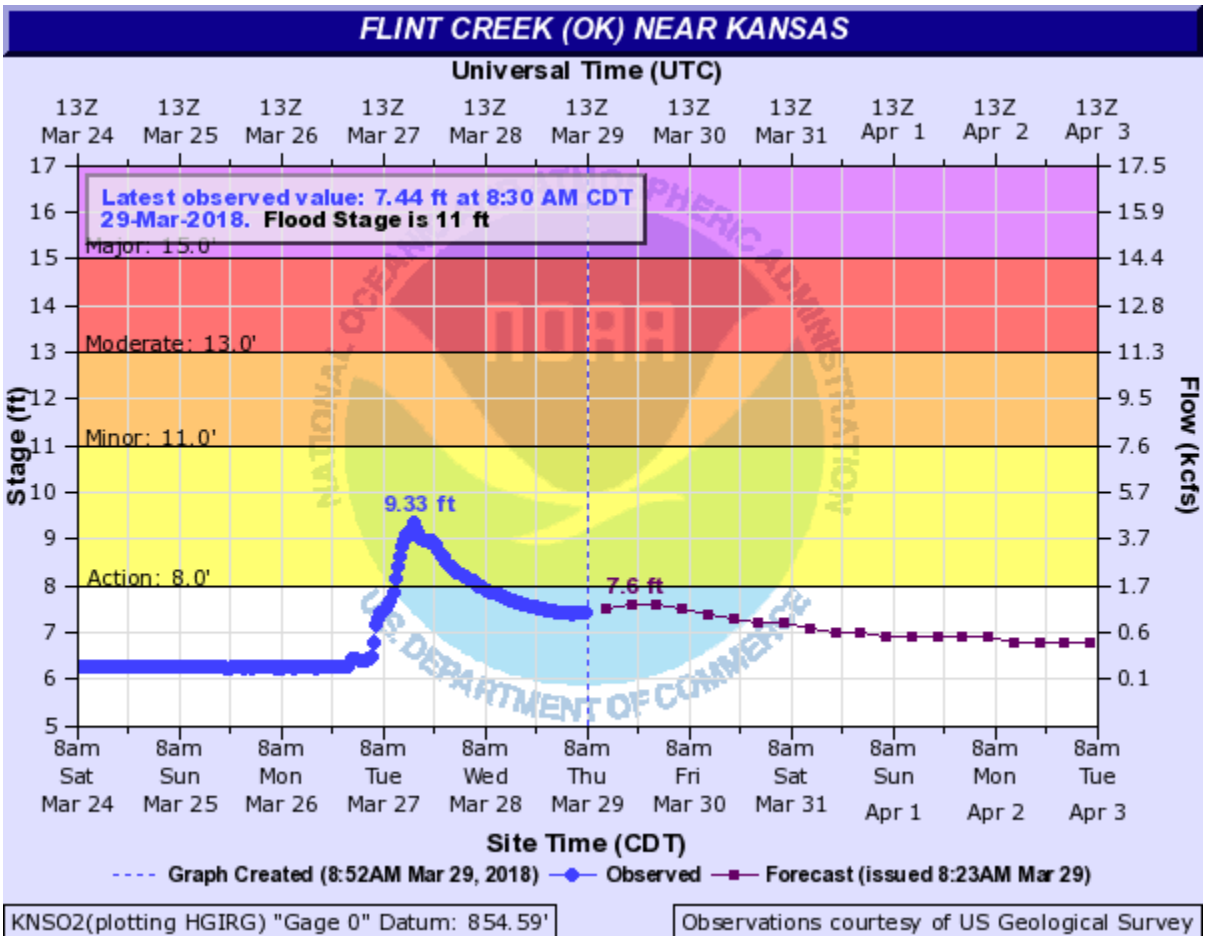
*CWYO2 became a daily river forecast point September 7, 2016
*MLBA4 and OZGA4 transferred to NWS Tulsa HSA February 5, 2014
*Mixed case River Flood products began July 31, 2013

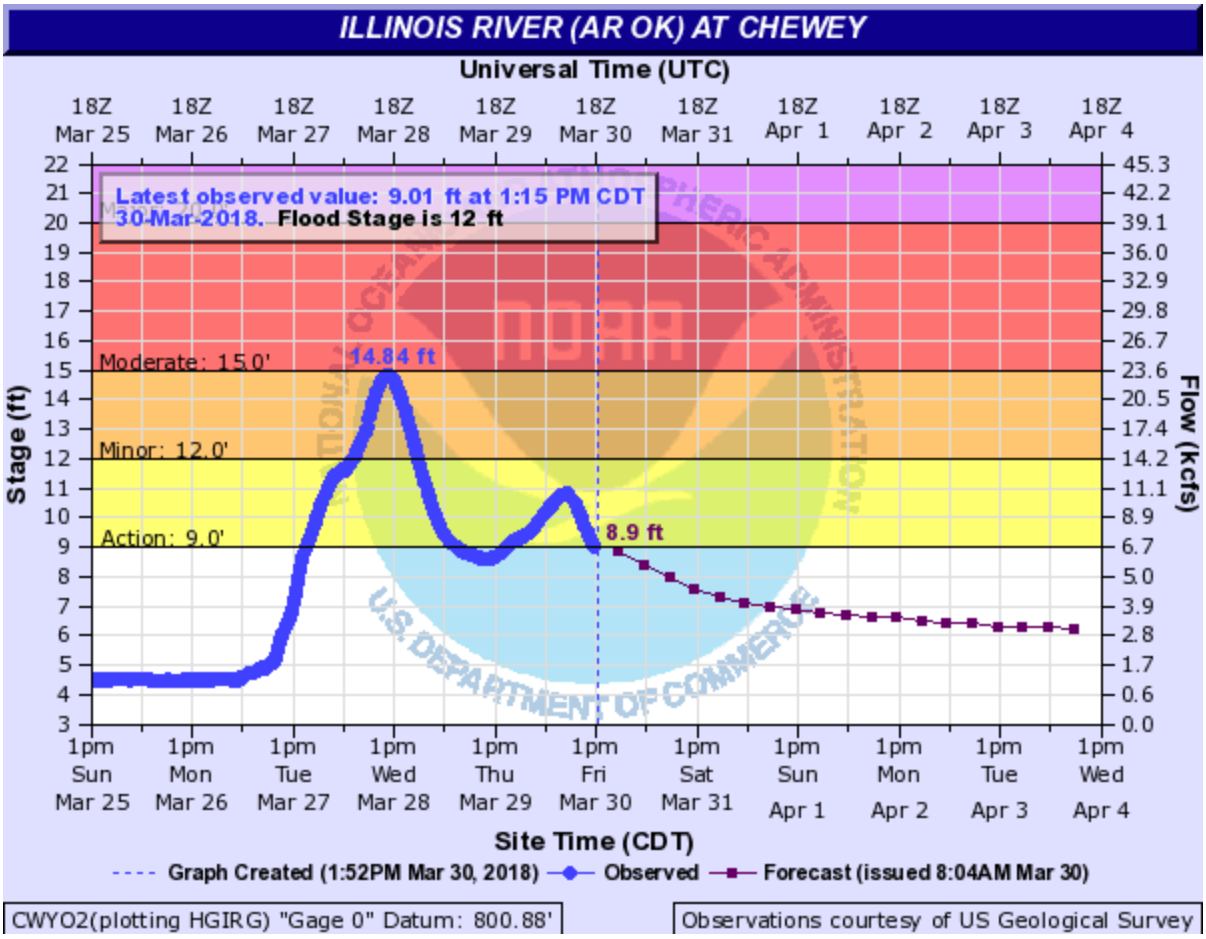
0 Flash Flood Warnings (FFW)
0 Flash Flood Statements (FFS)
1 Flash/Areal Flood Watches (FFA) (7 Watch FFA CON/EXT/EXA/EXB/CAN)
12 Urban and Small Stream Advisories (FLS)
1 Areal Flood Warnings (FLW)
0 Areal Flood Statements (FLS)
7 River Flood Warnings (FLW) (includes category increases)
39 River Flood Statements (FLS)
5 River Flood Advisories (FLS) (22 Advisory FLS CON/EXT/CAN)
0 River Flood Watches (FFA) (0 Watch FFA CON/EXT/CAN)
0 River Statements (RVS)
1 Hydrologic Outlooks (ESF)
1 Drought Information Statements (DGT)

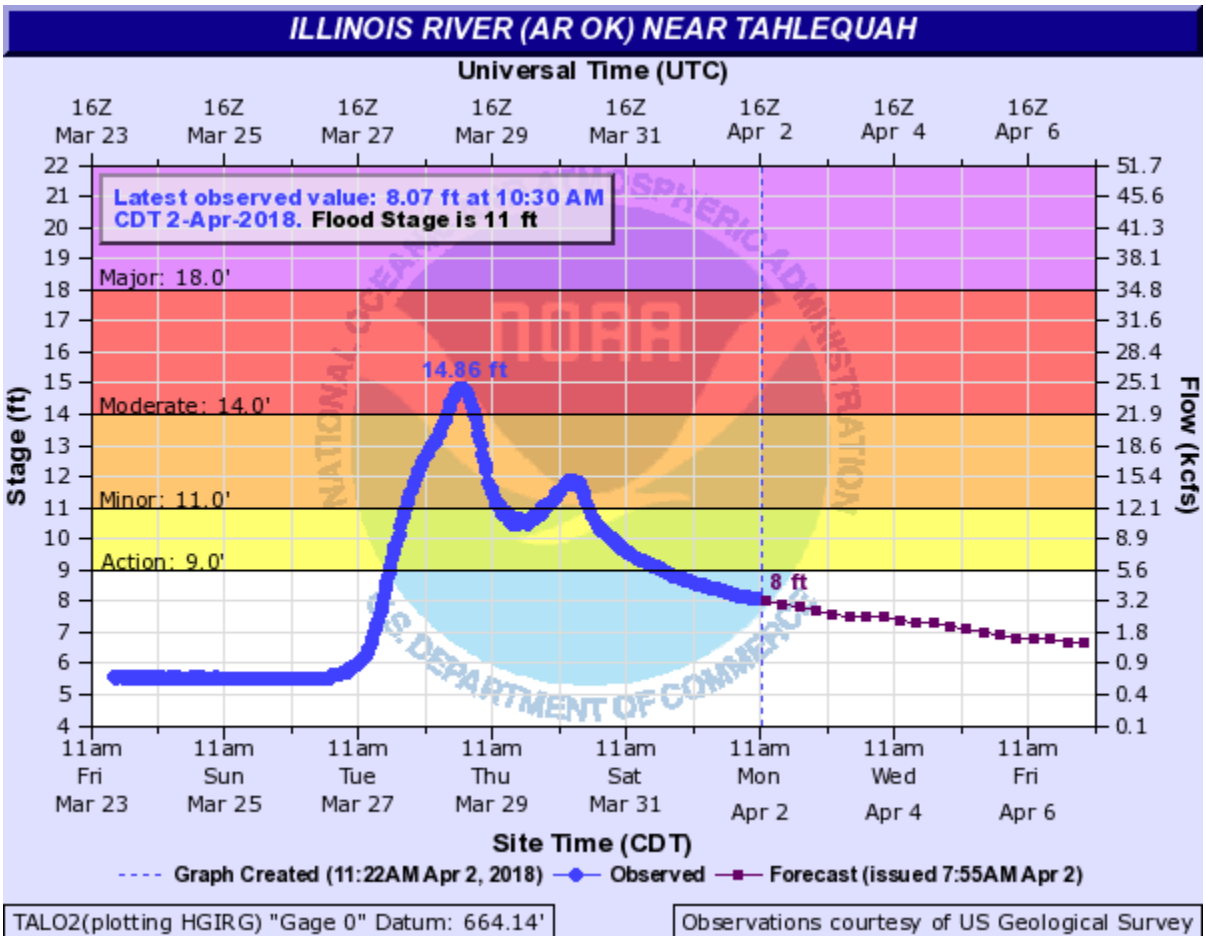
Preliminary Hydrographs:




ILLINOIS RIVER (AR OK) NEAR WATTS
Universal Time (UTC)
18Z Mar 25
18Z Mar 26
18Z Mar 27
18Z Mar 28
18Z Mar 29
18Z Mar 30
18Z Mar 31
18Z Apr 1
18Z Apr 2
18Z Apr 3
18Z Apr 4
Latest observed value: 8.97 ft at 11:00 AM CDT 30-Mar-2018. Flood Stage is 13 ft
17.9 ft
8.7 ft
Moderate: 17.0'
Minor: 13.0'
Stage (ft)
Flow (kcfs)
1pm Sun Mar 25
1pm Mon Mar 26
1pm Tue Mar 27
1pm Wed Mar 28
1pm Thu Mar 29
1pm Fri Mar 30
1pm Sat Mar 31
1pm Sun Apr 1
1pm Mon Apr 2
1pm Tue Apr 3
1pm Wed Apr 4
Site Time (CDT)
Graph Created (1:52PM Mar 30, 2018)
Observed
Forecast (issued 8:03AM Mar 30)
WTTO2(plotting HGIRG) "Gage 0" Datum: 893.77'
Observations courtesy of US Geological Survey


FLINT CREEK (OK) NEAR KANSAS
Universal Time (UTC)
13Z Mar 24
13Z Mar 25
13Z Mar 26
13Z Mar 27
13Z Mar 28
13Z Mar 29
13Z Mar 30
13Z Mar 31
13Z Apr 1
13Z Apr 2
13Z Apr 3
Latest observed value: 7.44 ft at 8:30 AM CDT 29-Mar-2018. Flood Stage is 11 ft
9.33 ft
7.6 ft
Major: 15.0'
Moderate: 13.0'
Minor: 11.0'
Action: 8.0'
Stage (ft)
Flow (kcfs)
8am Sat Mar 24
8am Sun Mar 25
8am Mon Mar 26
8am Tue Mar 27
8am Wed Mar 28
8am Thu Mar 29
8am Fri Mar 30
8am Sat Mar 31
8am Sun Apr 1
8am Mon Apr 2
8am Tue Apr 3
Site Time (CDT)
Graph Created (8:52AM Mar 29, 2018)
Observed
Forecast (issued 8:23AM Mar 29)
KNSO2(plotting HGIRG) "Gage 0" Datum: 854.59'
Observations courtesy of US Geological Survey


ILLINOIS RIVER (AR OK) AT CHEWEY
Universal Time (UTC)
18Z Mar 25
18Z Mar 26
18Z Mar 27
18Z Mar 28
18Z Mar 29
18Z Mar 30
18Z Mar 31
18Z Apr 1
18Z Apr 2
18Z Apr 3
18Z Apr 4
Latest observed value: 9.01 ft at 1:15 PM CDT 30-Mar-2018. Flood Stage is 12 ft
Moderate: 15.0'
Minor: 12.0'
Action: 9.0'
14.84 ft
8.9 ft
Stage (ft)
Flow (kcfs)
1pm Sun Mar 25
1pm Mon Mar 26
1pm Tue Mar 27
1pm Wed Mar 28
1pm Thu Mar 29
1pm Fri Mar 30
1pm Sat Mar 31
1pm Sun Apr 1
1pm Mon Apr 2
1pm Tue Apr 3
1pm Wed Apr 4
Site Time (CDT)
Graph Created (1:52PM Mar 30, 2018)
Observed
Forecast (issued 8:04AM Mar 30)
CWYO2(plotting HGIRG) "Gage 0" Datum: 800.88'
Observations courtesy of US Geological Survey


ILLINOIS RIVER (AR OK) NEAR TAHLEQUAH
Universal Time (UTC)
16Z Mar 23
16Z Mar 25
16Z Mar 27
16Z Mar 29
16Z Mar 31
16Z Apr 2
16Z Apr 4
16Z Apr 6
Latest observed value: 8.07 ft at 10:30 AM CDT 2-Apr-2018. Flood Stage is 11 ft
Major: 18.0'
Moderate: 14.0'
Minor: 11.0'
Action: 9.0'
14.86 ft
8 ft
Stage (ft)
Flow (kcfs)
11am Fri Mar 23
11am Sun Mar 25
11am Tue Mar 27
11am Thu Mar 29
11am Sat Mar 31
11am Mon Apr 2
11am Wed Apr 4
11am Fri Apr 6
Site Time (CDT)
Graph Created (11:22AM Apr 2, 2018)
Observed
Forecast (issued 7:55AM Apr 2)
TALO2(plotting HGIRG) "Gage 0" Datum: 664.14'
Observations courtesy of US Geological Survey