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 **July** 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 **August 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)

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

There was a mix of above and below normal rainfall across eastern OK and northwest AR this month, as can happen with typical summertime convection. Normal rainfall for the month of July ranges from 2.6 inches in McIntosh County to 3.4 inches in Ottawa County. The Ozark region of northwest Arkansas averages 3.1 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 July 2018 ranged from around 1.5" to isolated amounts around 7" across eastern OK and northwest AR. The highest rainfall totals were primarily across far northeast OK and northwest AR and Le Flore County in southeast OK. This corresponds to 25-200% of the normal July rainfall scattered around eastern OK and northwest AR (Fig. 1b).

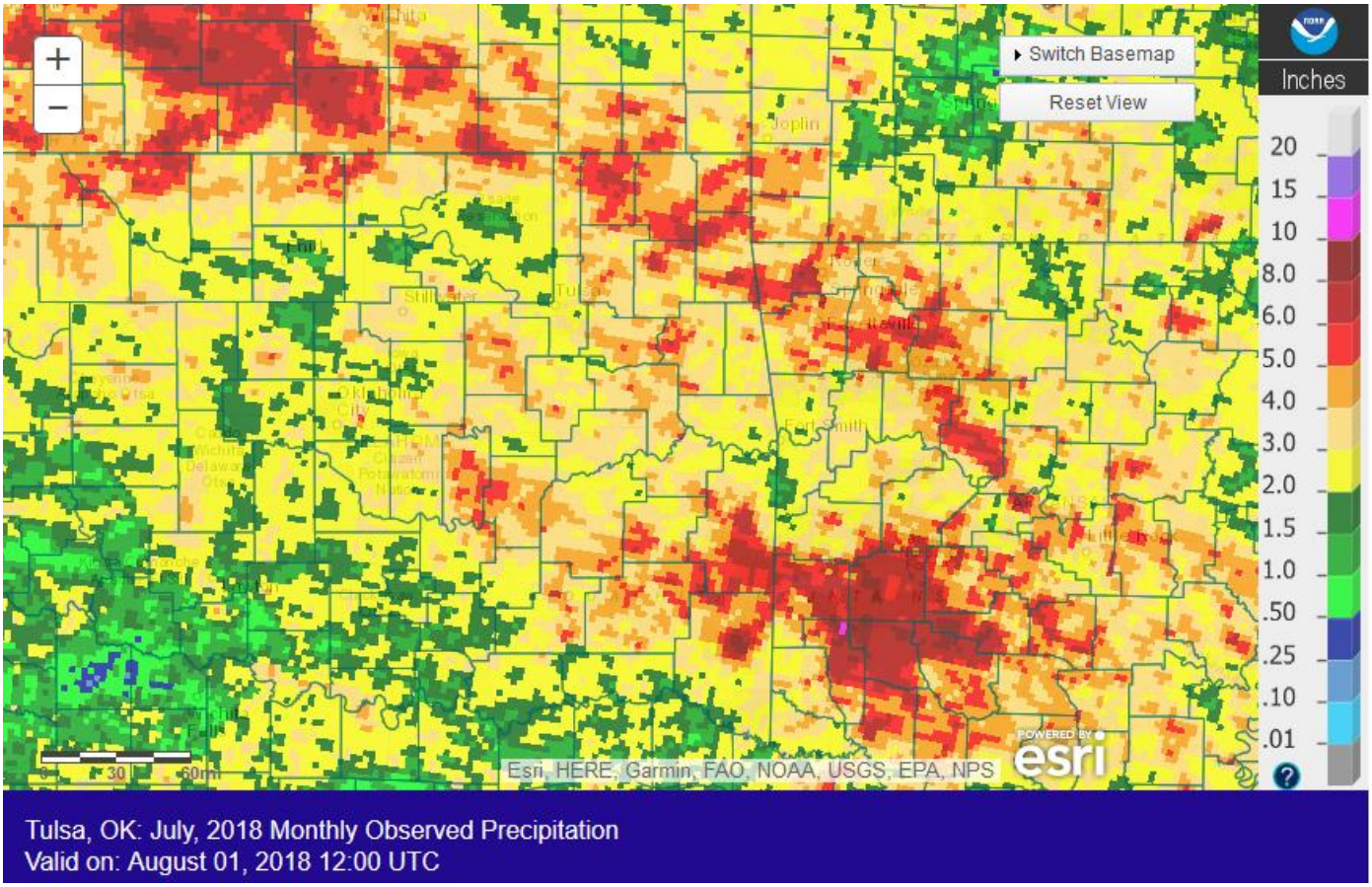


Fig. 1a. Estimated Observed Rainfall for July 2018

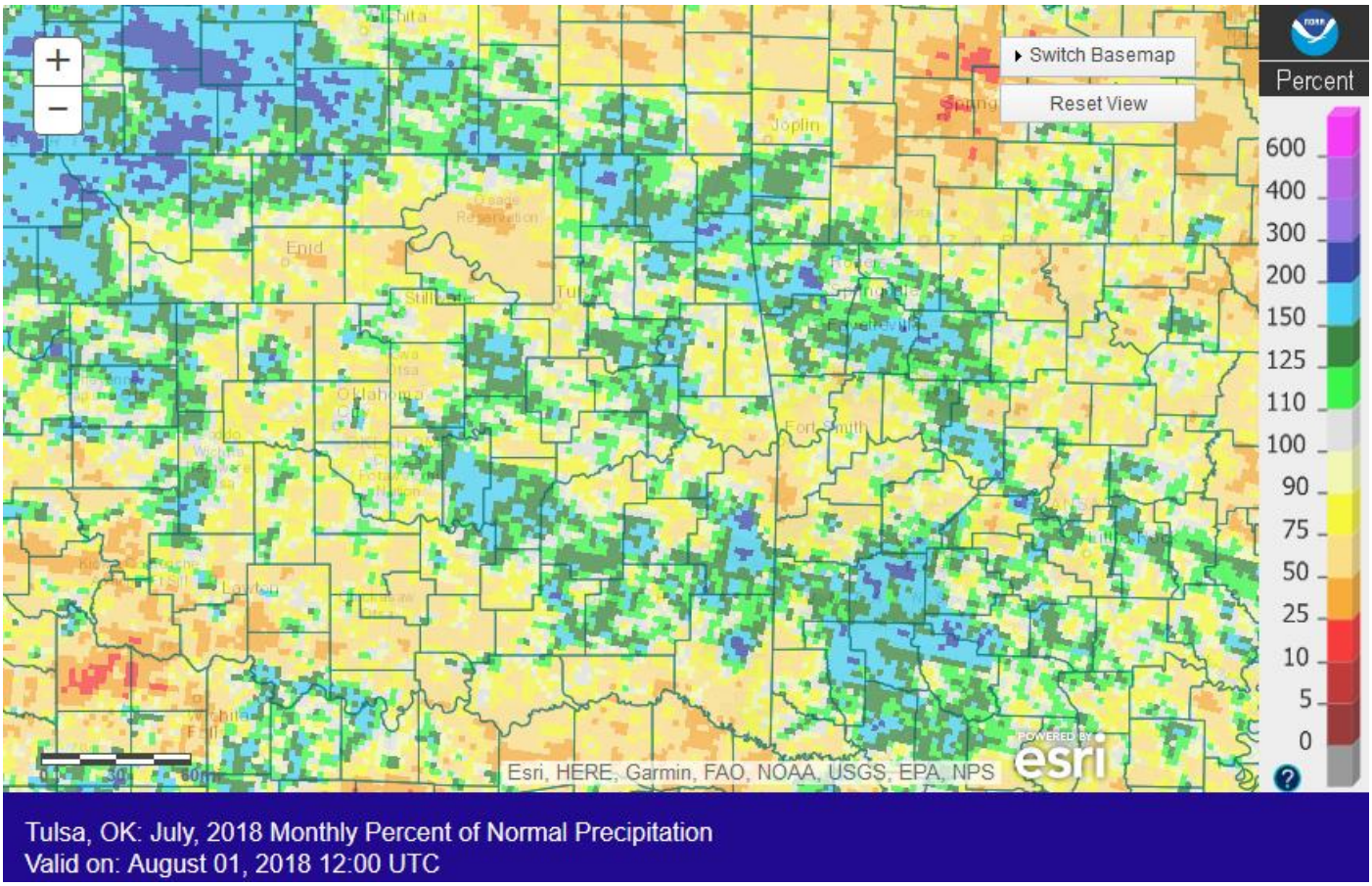


Fig. 1b. Estimated % of Normal Rainfall for July 2018

In Tulsa, OK, July 2018 ranked as the 40th warmest July (83.9°F, tied 1937, 1913; since records began in 1905) and the 60th wettest June (2.70"; since records began in 1888). Fort Smith, AR had the 18th warmest July (84.7°F; since records began in 1882) and the 61st driest July (2.31", tied 1898; since records began in 1882). Fayetteville, AR had the 33rd warmest (78.4°F) and the 19th wettest (4.31", tied 2008) July since records began in 1950.

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

Vinita 8.6ESE, OK (coco)	7.23	Bentonville 6.6SSW, AR (coco)	7.04	Siloam Springs 1.8N, AR (coco)	6.65
St. Paul 1E, AR (coop)	6.62	Kingston 2S, AR (coop)	6.24	Elkins 10.6SSE, AR (coco)	6.19
Pryor, OK (meso)	6.09	Rogers 2.4SSW, AR (coco)	5.93	Holiday Island 1.3SSW, AR (coco)	5.75

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

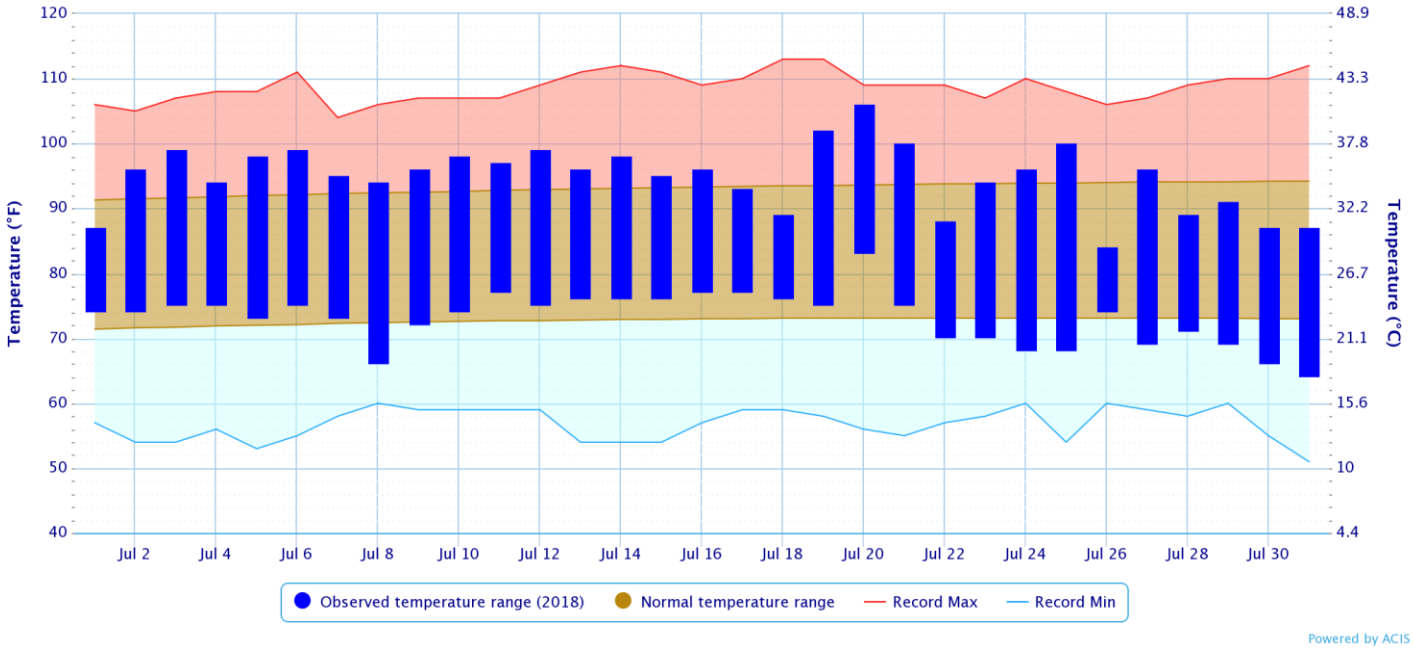
Ozark, AR (coop)	1.91	Pawnee, OK (meso)	2.06	Hugo, OK (meso)	2.13
Morris 2.4SW, OK (coco)	2.17	Skiatook, OK (meso)	2.23	Haskell, OK (meso)	2.27
Fort Smith, AR (ASOS)	2.31	Bella Vista 2.0E (coco)	2.46	Hectorville, OK (meso)	2.49

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

Rank since 1921	Last 30 Days (Jul 2-Jul 31)	Summer-to-Date (Jun 1 – Jul 31)	Last 120 Days (Apr 3 – Jul 31)	Warm Growing Season (Mar 1 – Jul 31)	Year-to-Date (Jan 1 – Jul 31)	Water-Year-to-Date (Oct 1– Jul 31)	Last 365 Days (Aug 1, 2017 – Jul 31, 2018)
Northeast OK	49th driest	34th driest	12th driest	14th driest	22nd driest	32nd driest	39th driest
East Central OK	48th wettest	46th driest	38th driest	43rd driest	27th wettest	44th wettest	41st wettest
Southeast OK	46th driest	43rd driest	13th driest	13th driest	35th wettest	43rd driest	47th driest
Statewide	49th driest	49th wettest	29th driest	26th driest	38th driest	27th driest	47th driest

Daily Temperature Data – Tulsa Area, OK (ThreadEx)

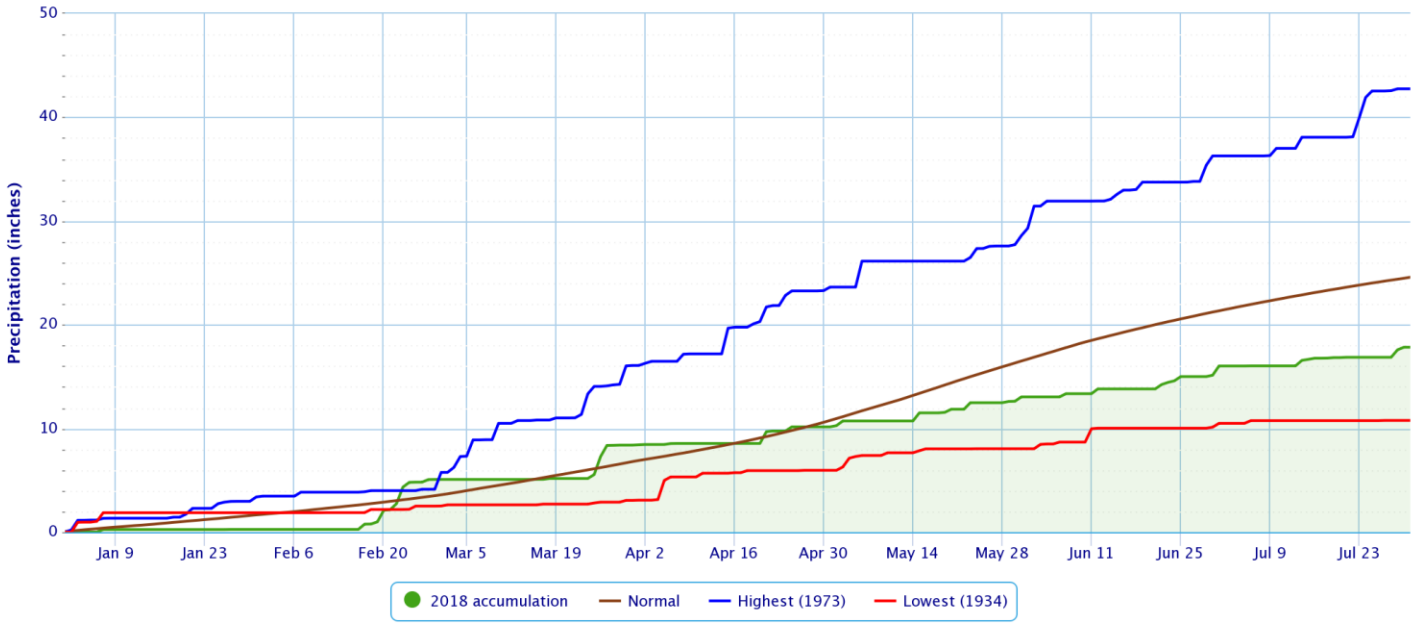
Period of Record – 1905-01-06 to 2018-07-31. Normals period: 1981-2010. Click and drag to zoom chart.



Powered by ACIS

Accumulated Precipitation – Tulsa Area, OK (ThreadEx)

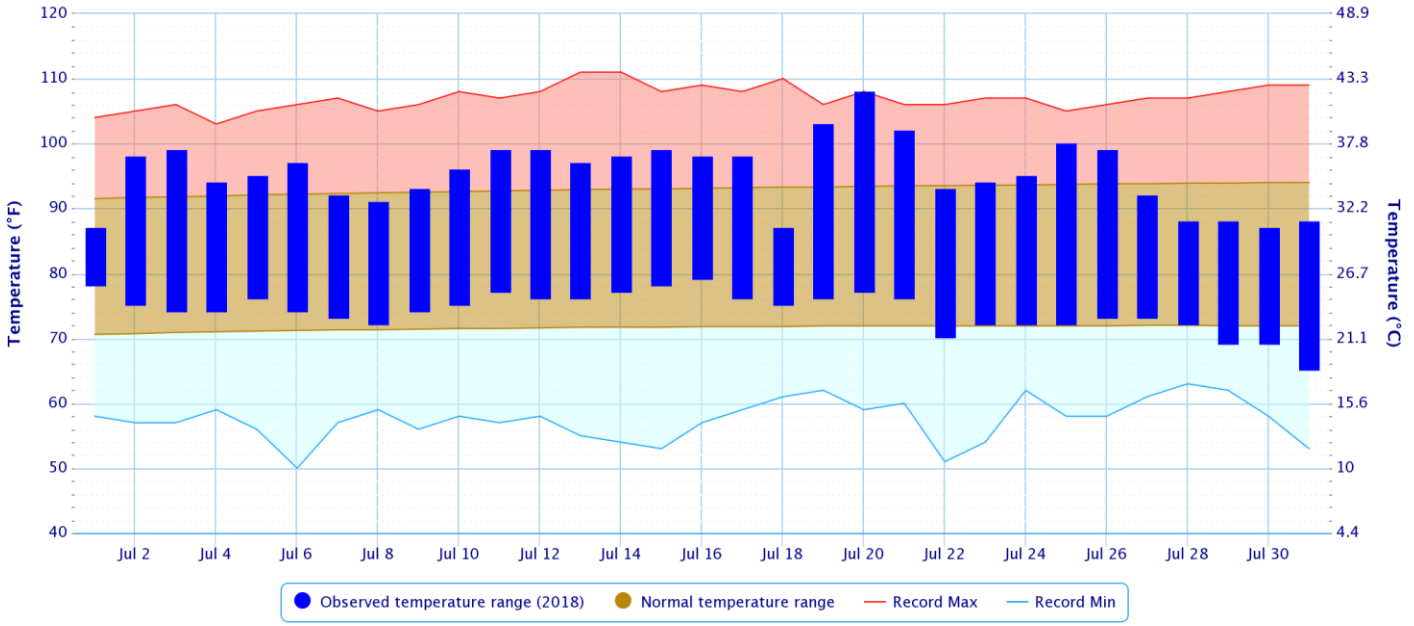
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



Powered by ACIS

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

Period of Record – 1882-06-01 to 2018-07-31. Normals period: 1981-2010. Click and drag to zoom chart.



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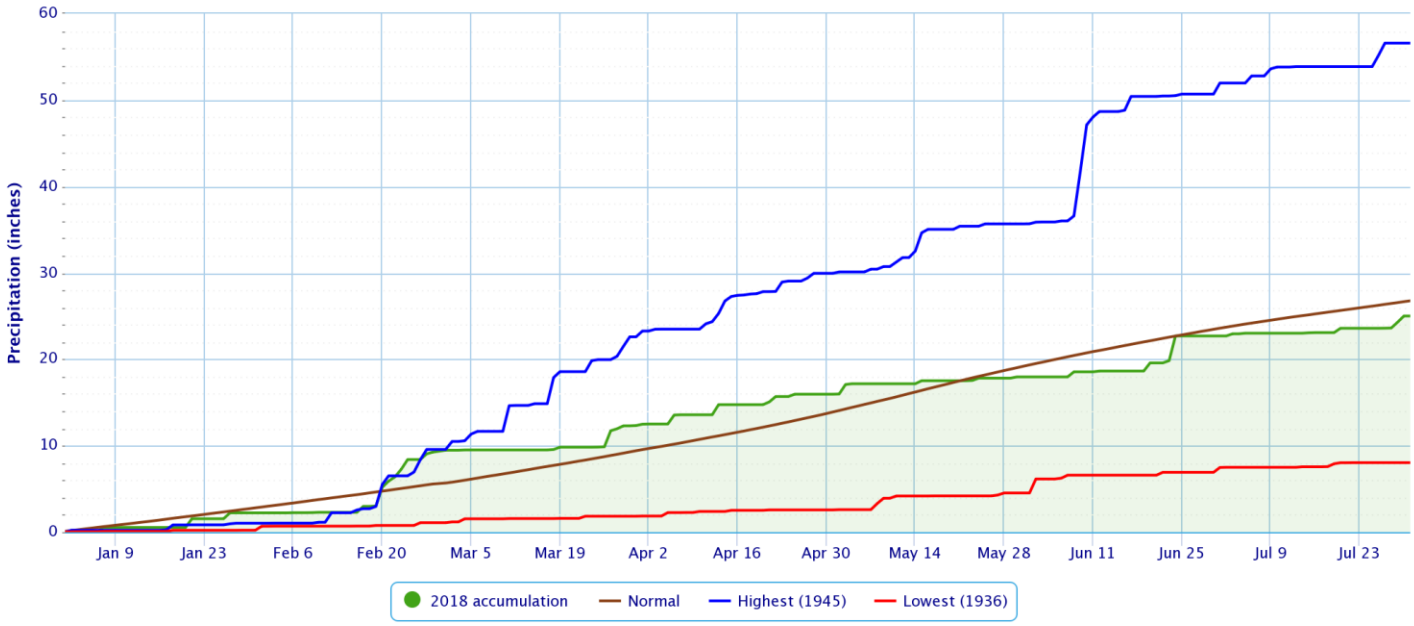
Accumulated Precipitation – Fort Smith Area, AR (ThreadEx)

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



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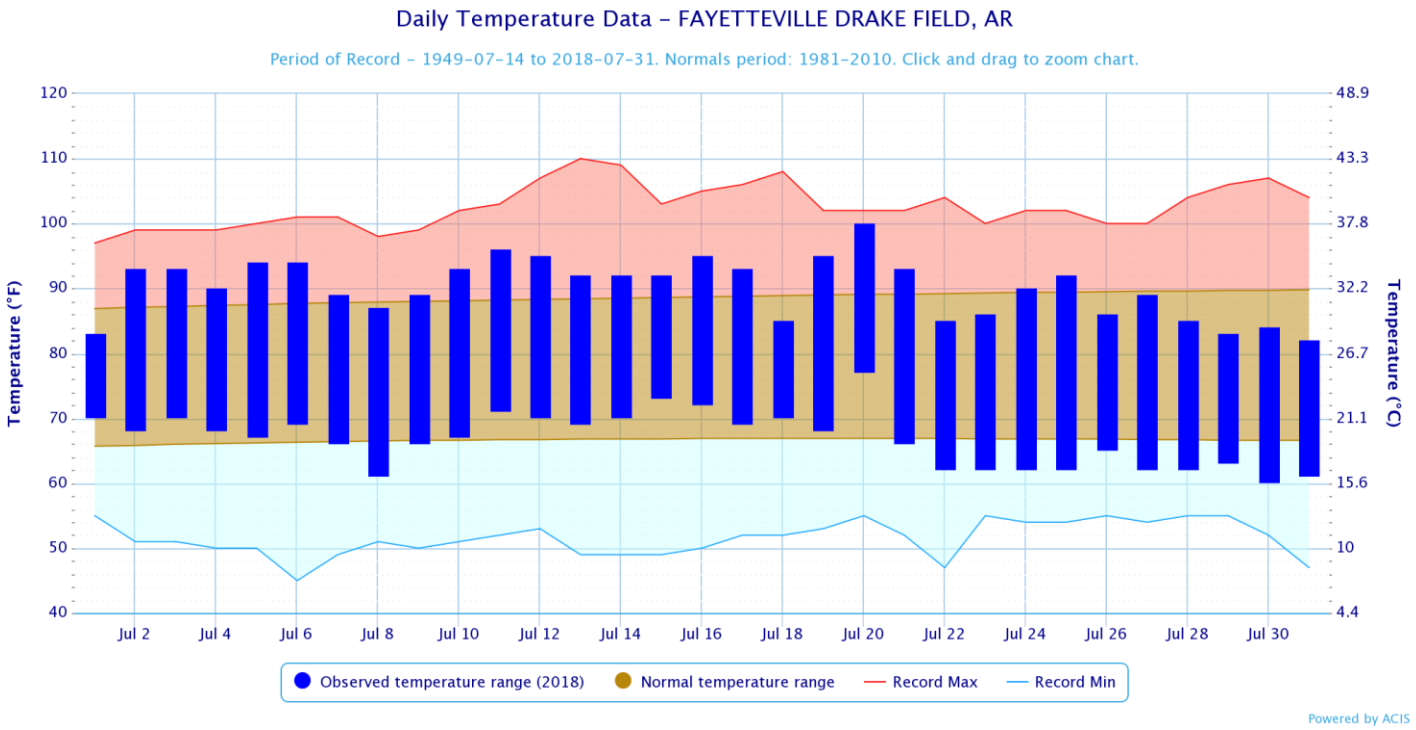
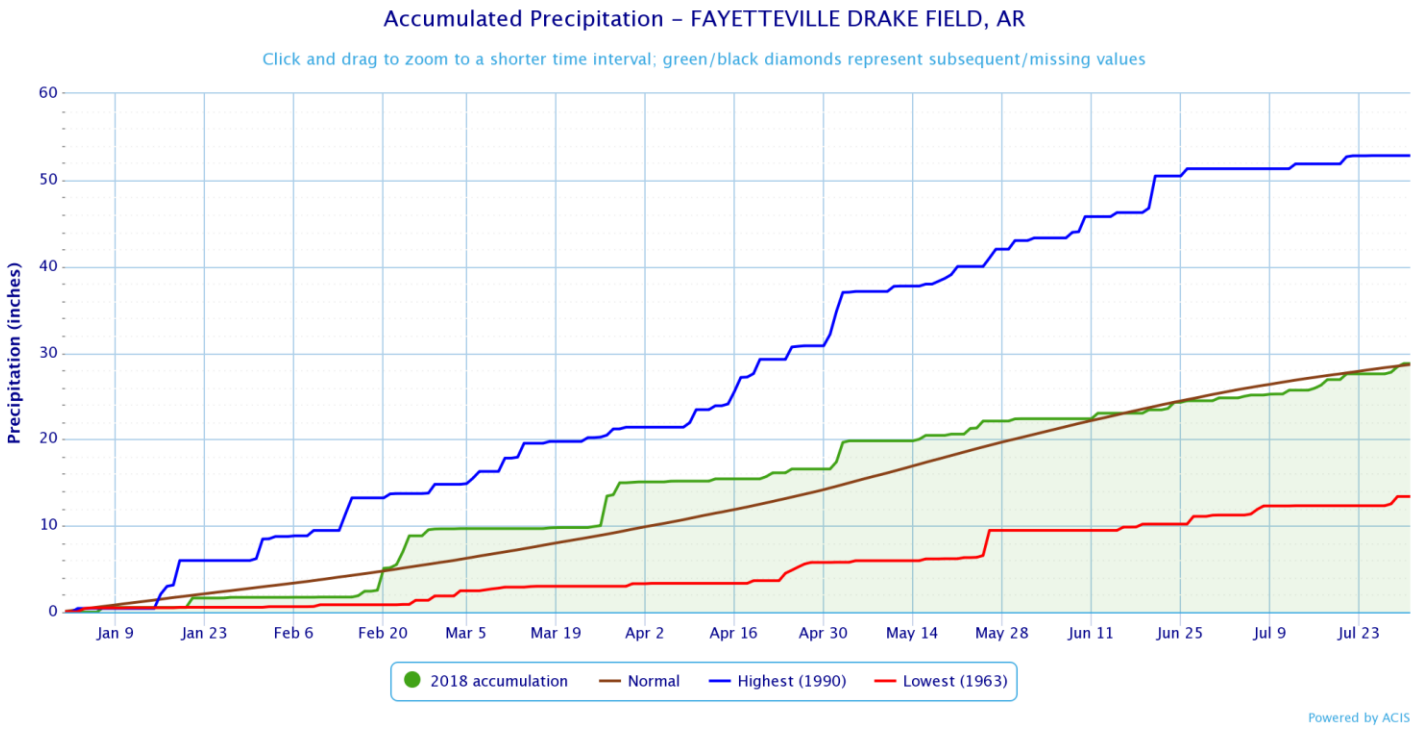




Drought

According to the U.S. Drought Monitor (USDM) from July 31, 2018 (Figs. 2, 3), Extreme (D3) Drought conditions existed over northern Craig, southern Pushmataha, and Choctaw Counties in eastern OK. Severe (D2) Drought conditions were impacting Osage, northern Pawnee, Washington, northern Tulsa, Nowata, Rogers, Craig, Ottawa, Pushmataha, and Choctaw Counties in eastern OK. Moderate (D1) drought conditions were present across portions of Osage, Pawnee, eastern Kay, Washington, Tulsa, Craig, Ottawa, Rogers, Mayes, Delaware, Cherokee, and Pushmataha Counties in eastern OK, and Benton, Carroll, Washington, Madison, Crawford, Sebastian, and Franklin Counties in northwest Arkansas. Abnormally Dry (D0) but not in drought conditions encompassed portions of Pawnee, Creek, Tulsa, Okmulgee, Wagoner, Cherokee, Adair, Sequoyah, Muskogee, Haskell, Le Flore, and Pushmataha Counties in eastern Oklahoma and Sebastian County in west central Arkansas.

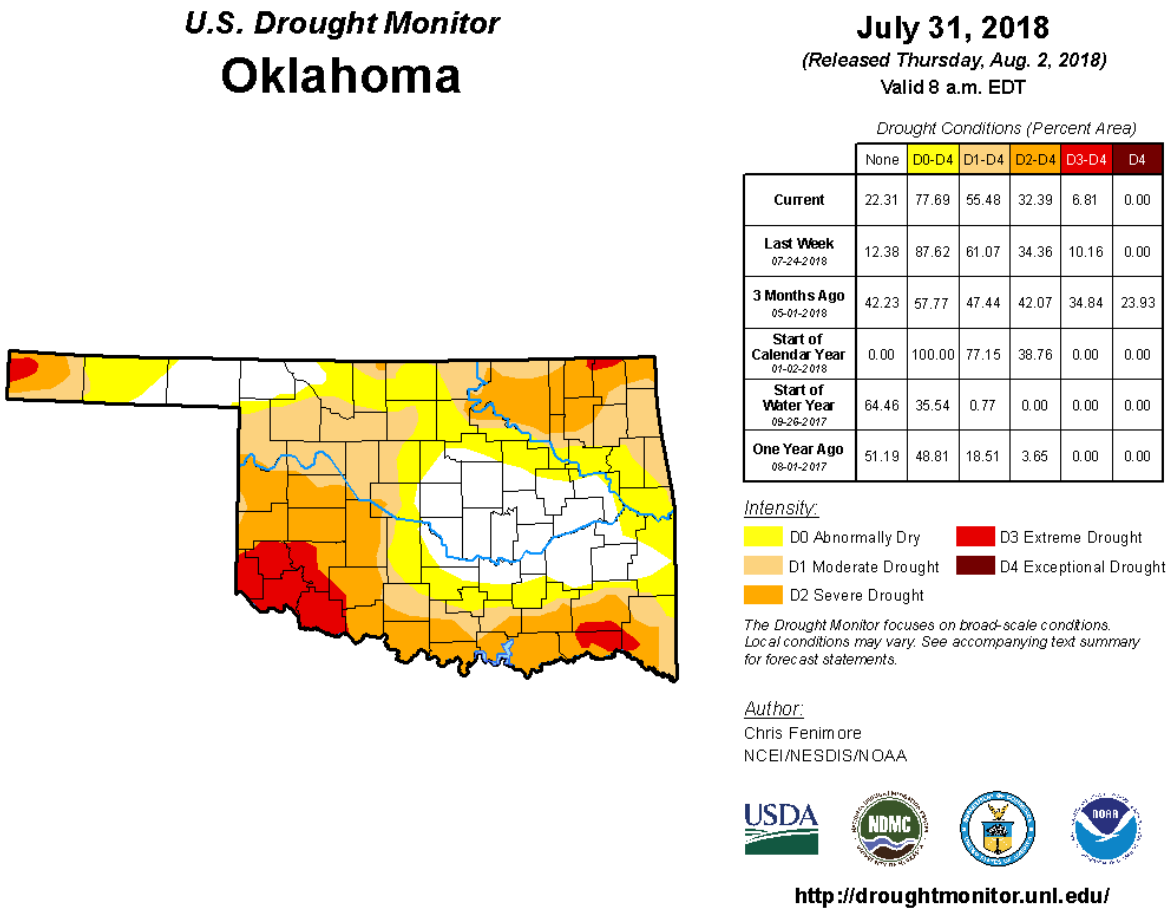


Fig. 2. Drought Monitor for Oklahoma

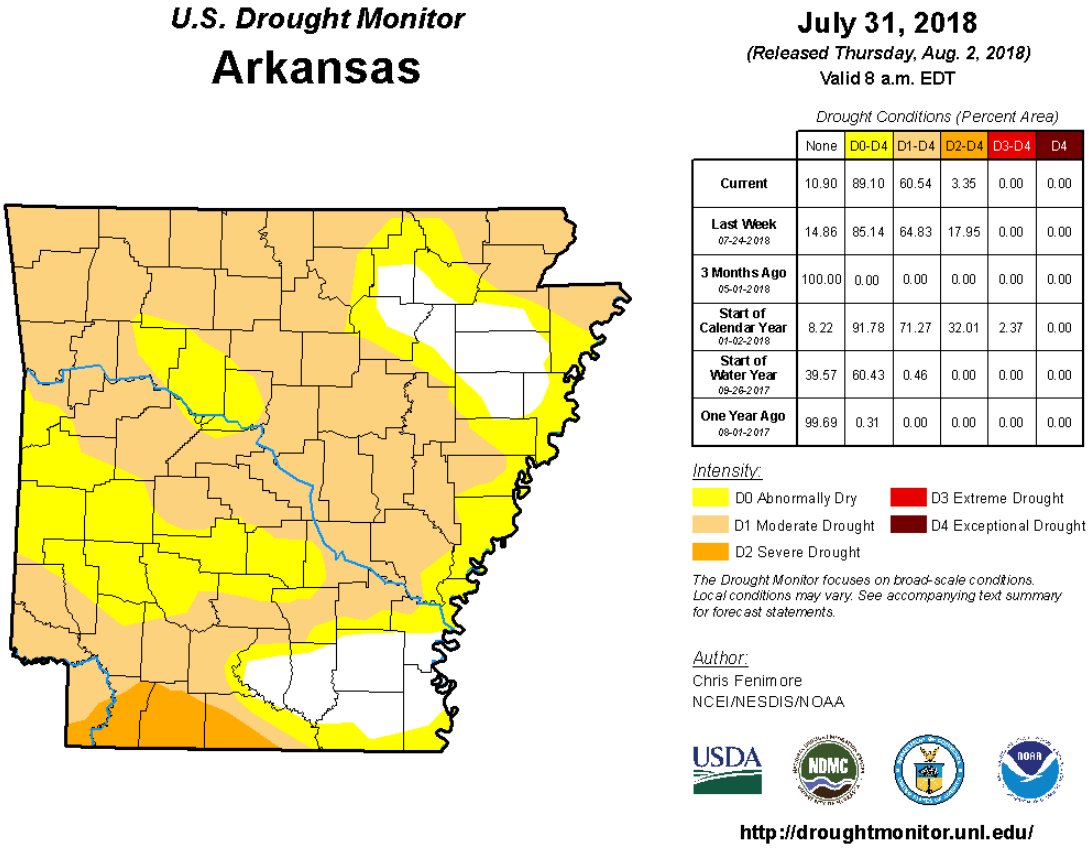
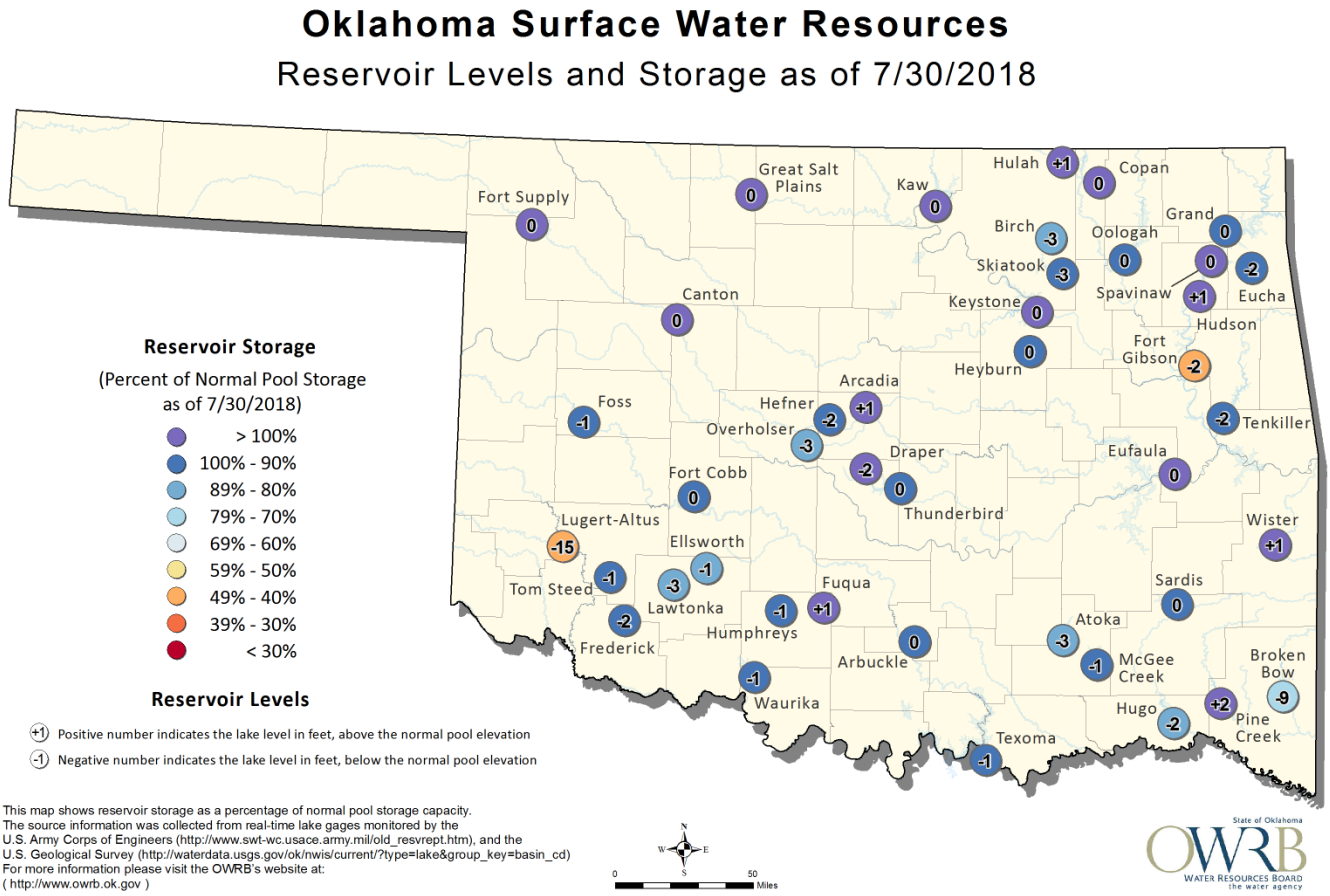


Fig.3. Drought Monitor for Arkansas

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 7/31/2018: Ft. Gibson Lake 44%, Hugo Lake 78%, Birch Lake 80%, Skiatook 92%, Tenkiller Lake 92%, Heyburn Lake 93%, and Beaver Lake 96%. Only one reservoirs was above 3% of its conservation pool storage as of 7/31/2018: Hudson Lake 105%.

Outlooks

The Climate Prediction Center (CPC) outlook for August 2018 (issued July 31, 2018) indicates an enhanced chance for above normal temperatures eastern OK and northwest AR. This outlook also calls for a slightly enhanced chance for below median precipitation across southeast OK and equal chances for above, near, and below median precipitation elsewhere. Indications favor below median rainfall at beginning of the month across the region, and favor above median rainfall at the end of the month primarily across northern OK. This outlook takes into account weather conditions forecast over the next 1-2 weeks, soil moisture conditions, and sub-seasonal climate signals.

For the 3-month period August-September-October 2018, CPC is forecasting an enhanced chance for above normal temperatures and a slightly enhanced chance for below median precipitation across all of eastern OK and northwest AR (outlook issued July 19, 2018). This outlook is based on both statistical and dynamical forecast tools and decadal timescale climate trends, as well as impacts from the dry soil moisture. According to CPC, ENSO neutral conditions were present through June, though pockets of positive sea surface temperature anomalies were observed in July. El Niño conditions are favored to begin this fall, with probabilities of El Niño conditions near 70% for winter 2018-19. An El Niño Watch has been issued by CPC.

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

At mid-month, several upper-level troughs in a northwest flow pattern, combined with summer time heat and a moist axis, resulted in several days of scattered showers and thunderstorms. While most affected areas received around 0.75" or less, isolated locations saw 2"-3" (Figs. 4, 5).

A change to a ridging pattern resulted in the hottest temperatures of the year so far. High temperatures climbed into the upper 90˚s to low 100˚s across eastern OK and northwest AR on the 19th (Fig. 6), and combined with the dewpoint, heat index values were 105˚-120˚ (Fig. 7). Several record high temperatures were then set on the 20th, with high temperatures exceeding 100˚ across all of eastern OK and northwest AR except far northern OK near the state line (Fig. 8). Heat index values reached 110˚-120˚ (Fig. 9).

Scattered showers and thunderstorms developed over eastern OK and northwest AR throughout the day on the 29th and then dissipated with the loss of daytime heating. A mesoscale convective system (MCS) moved southeast out of KS and into the region during the early morning hours of the 29th. The line of storms moved quickly southeast, bringing rain to all of eastern OK and northwest AR, before shifting east of the area shortly after noon. Another MCS developed slightly further west overnight and affected primarily eastern OK and west central AR during the morning hours of the 30th. A smaller thunderstorm complex moved south out of KS into northeast OK during the afternoon, affecting northeast and east central OK and northwest AR during the afternoon and evening hours. Rainfall from each round of storms generally ranged from around 0.50" to around 3" (Figs. 10-12).

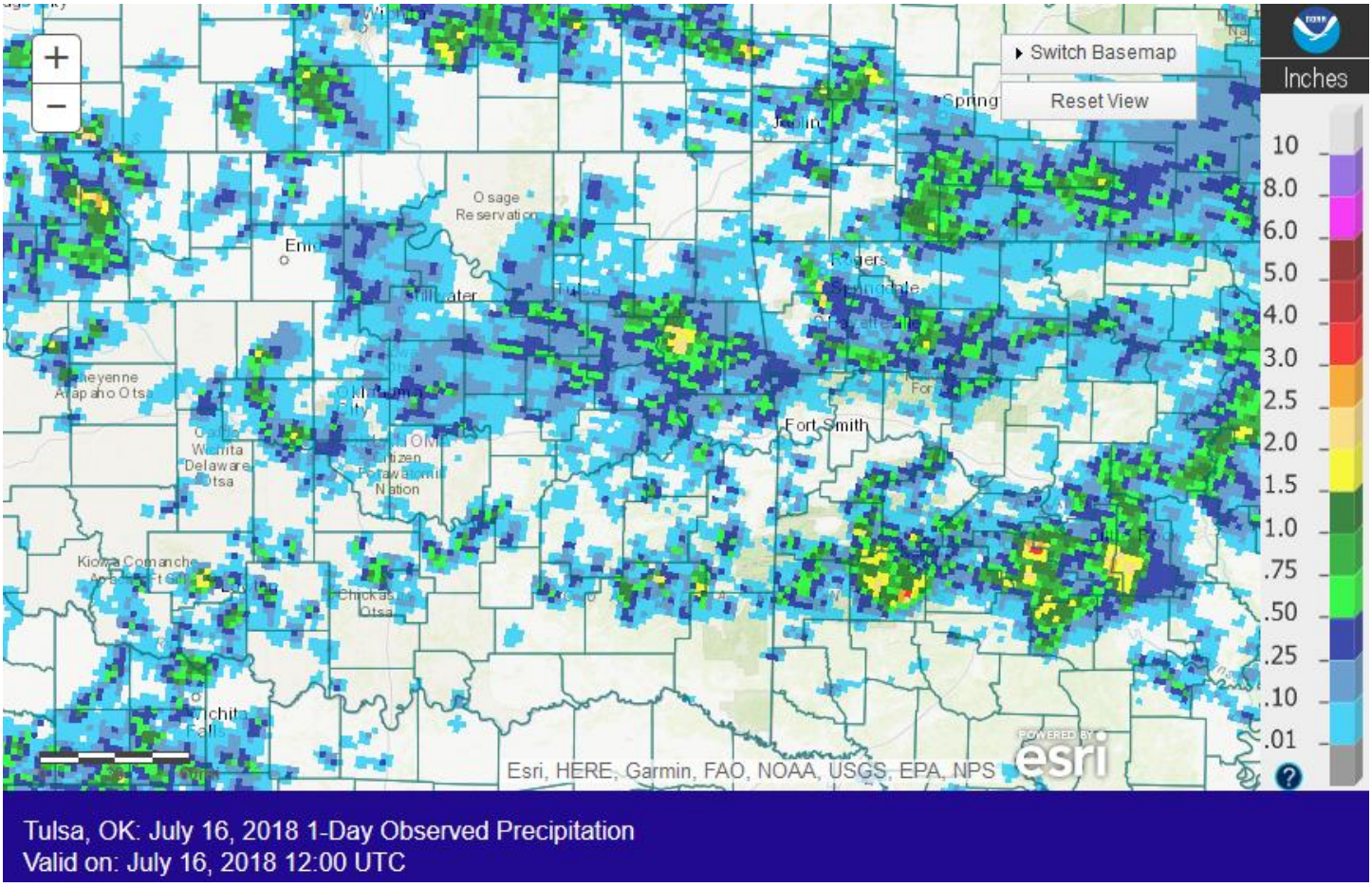


Fig. 4. 24-hour Estimated Observed Rainfall ending at 7am CDT 7/16/2018.

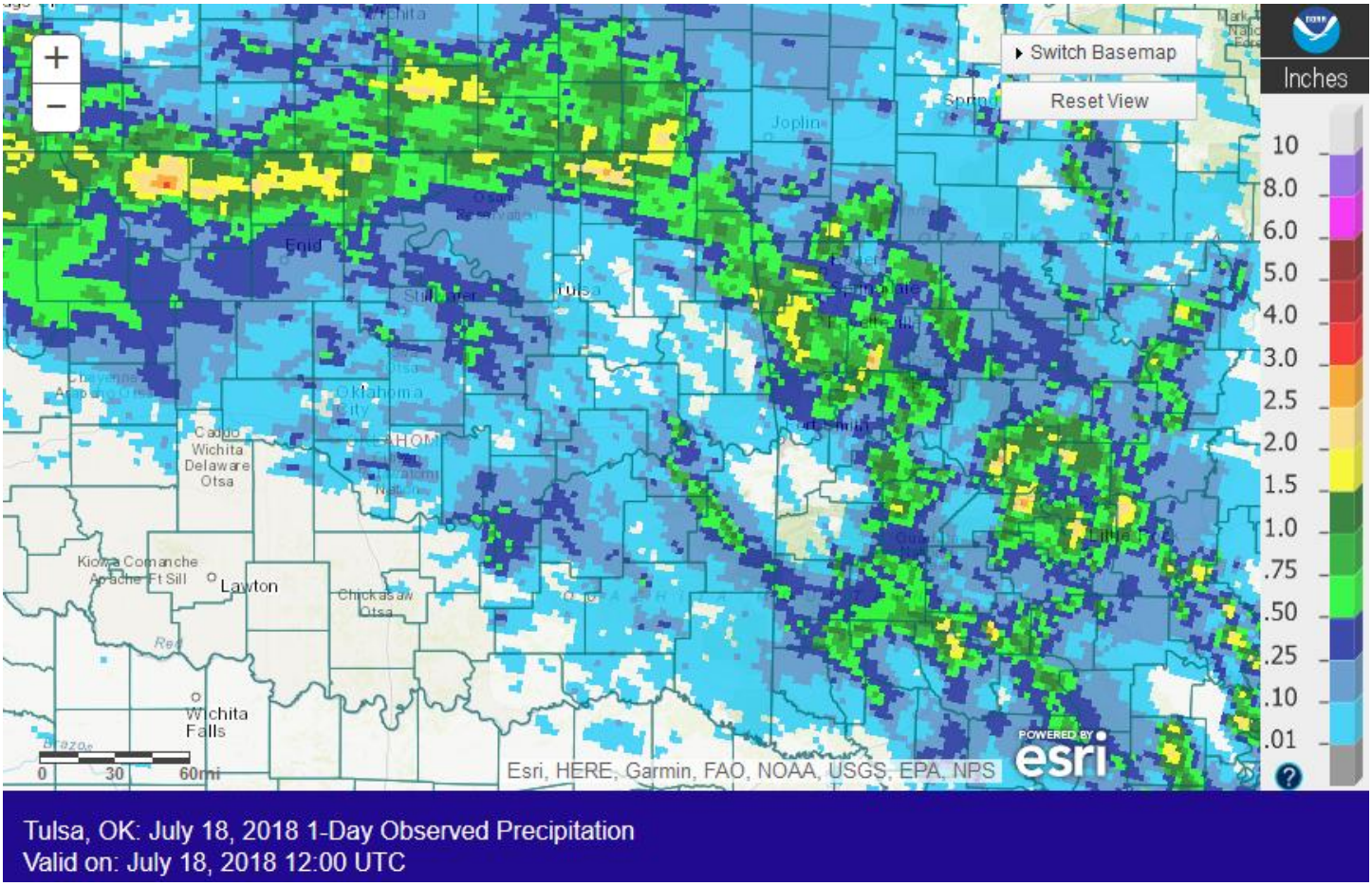


Fig. 5. 24-hour Estimated Observed Rainfall ending at 7am CDT 7/18/2018.

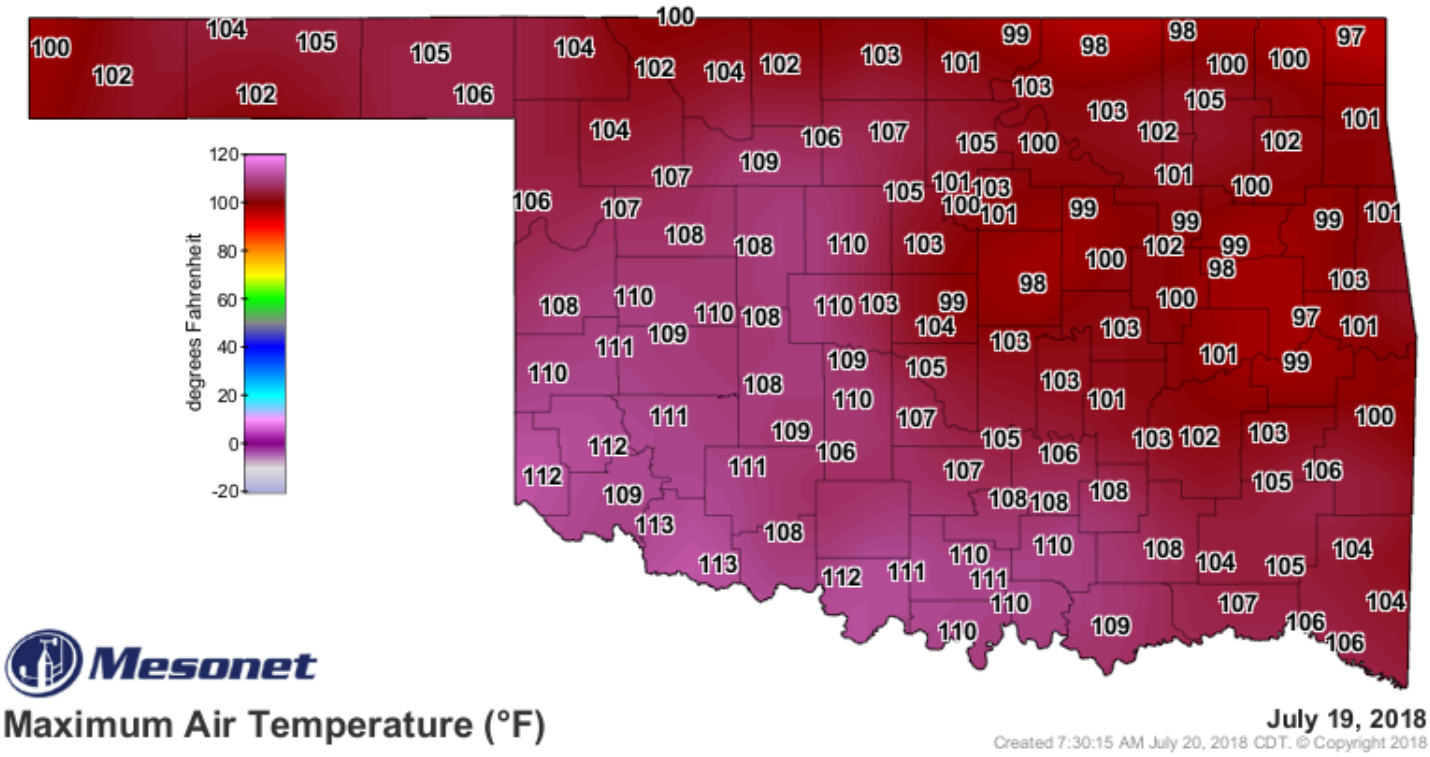


Fig. 6. Maximum temperature from the OK Mesonet 7/19/2018.

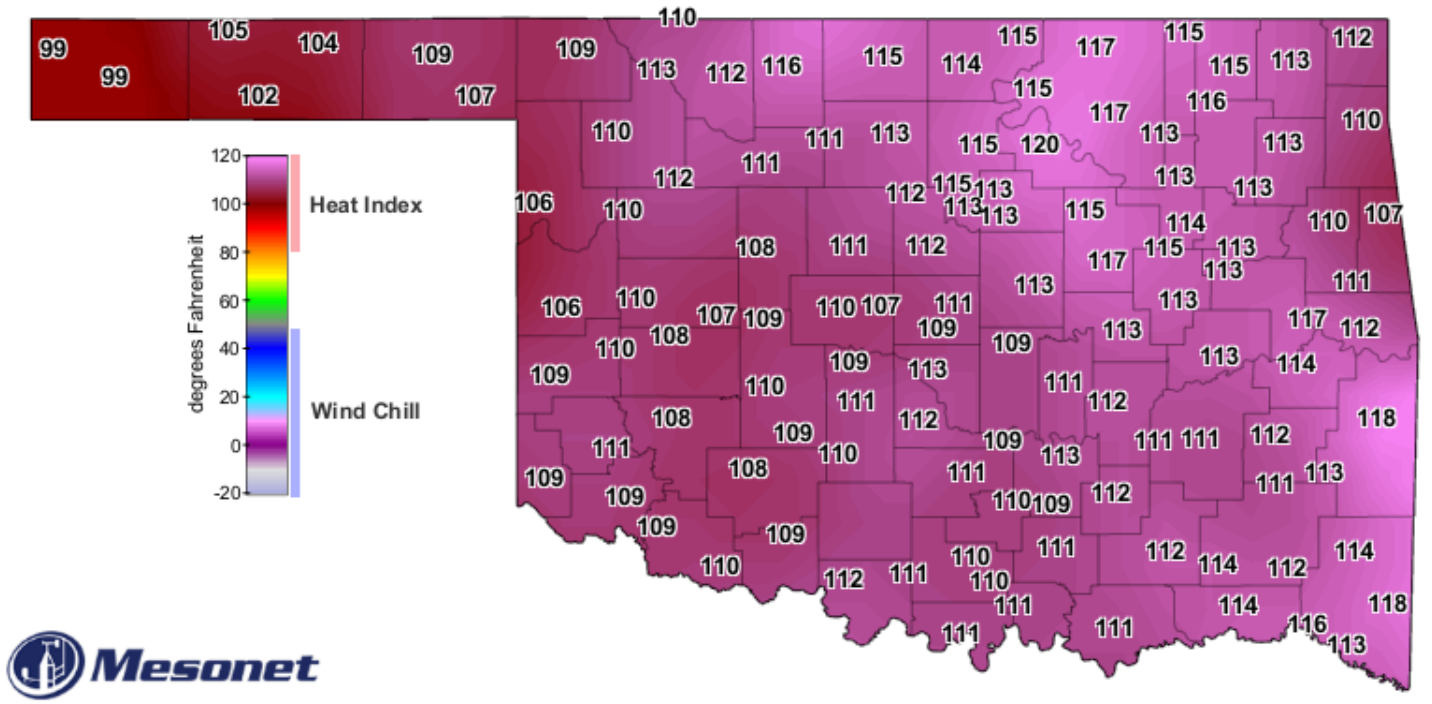


Fig. 7. Maximum heat index from the OK Mesonet 7/19/2018.

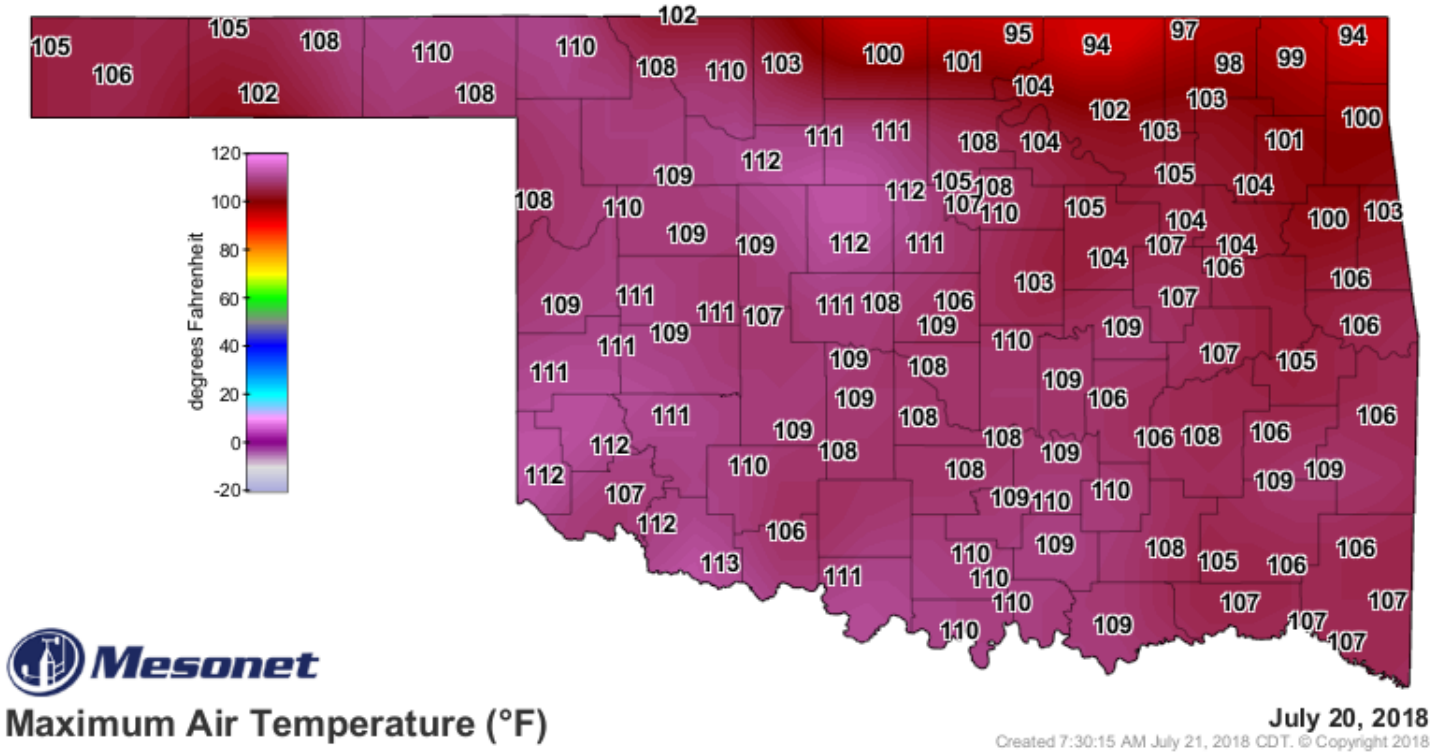


Fig. 8. Maximum temperature from the OK Mesonet 7/20/2018.

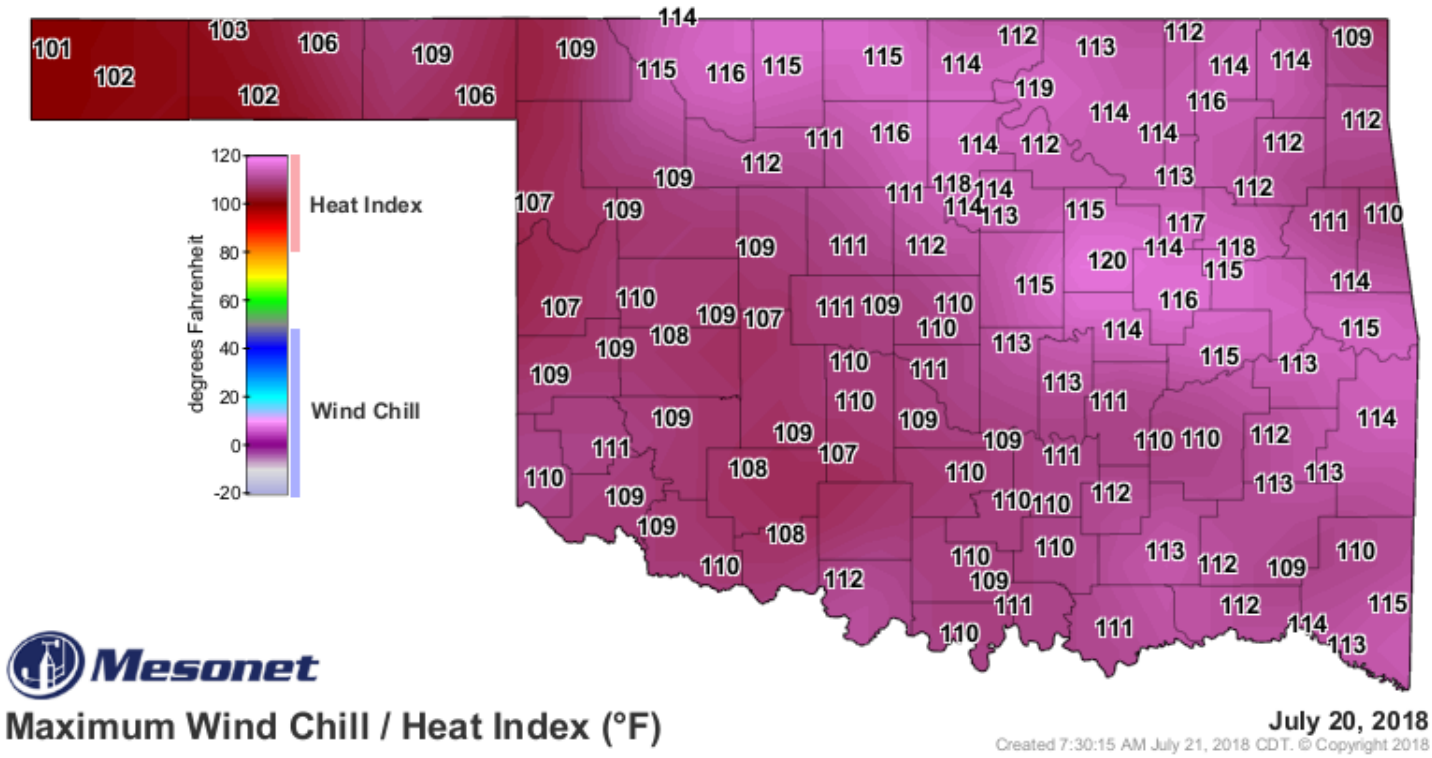


Fig. 9. Maximum heat index from the OK Mesonet 7/20/2018.

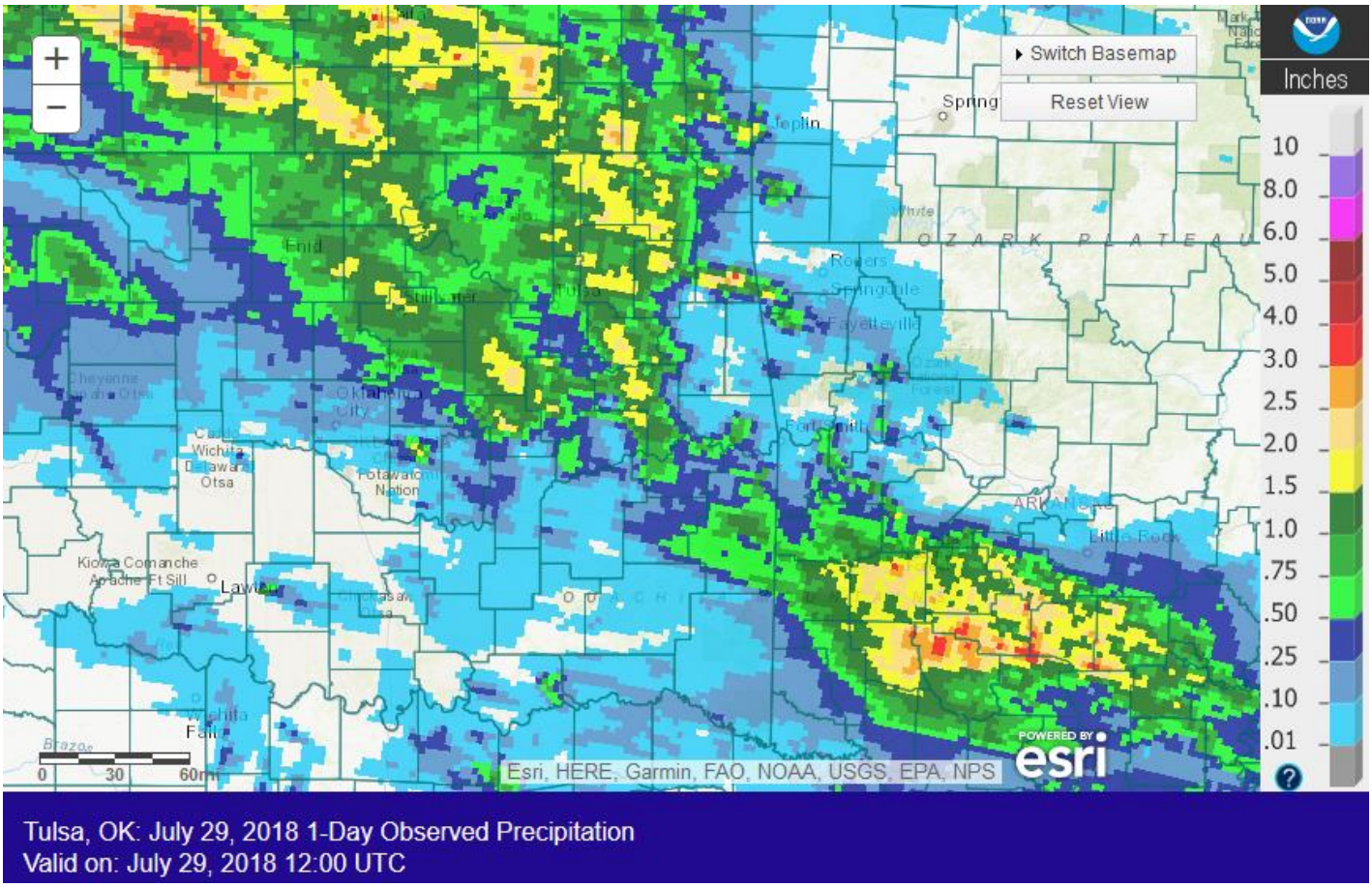


Fig. 10. 24-hour Estimated Observed Rainfall ending at 7am CDT 7/29/2018.

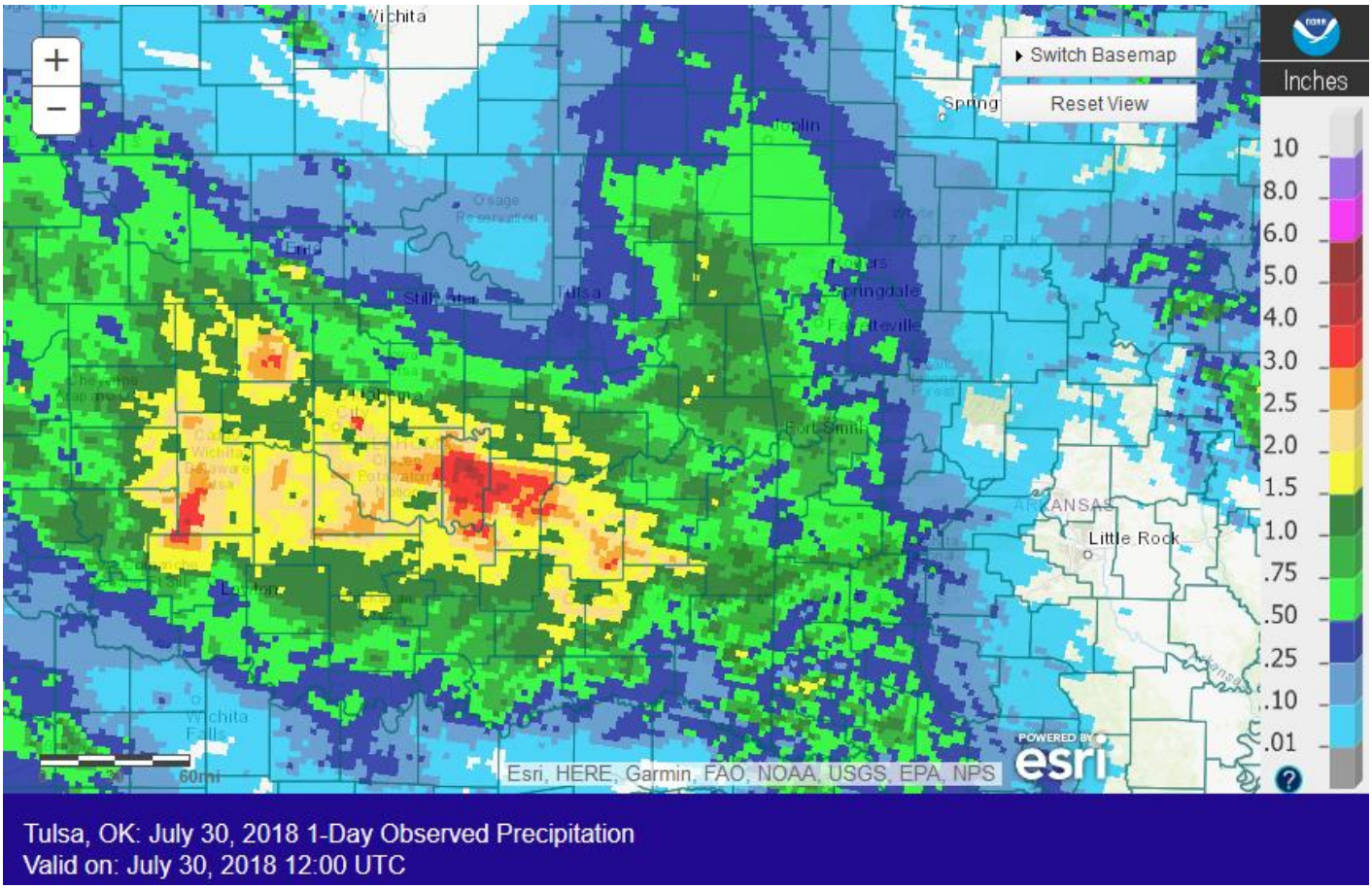


Fig. 11. 24-hour Estimated Observed Rainfall ending at 7am CDT 7/30/2018.

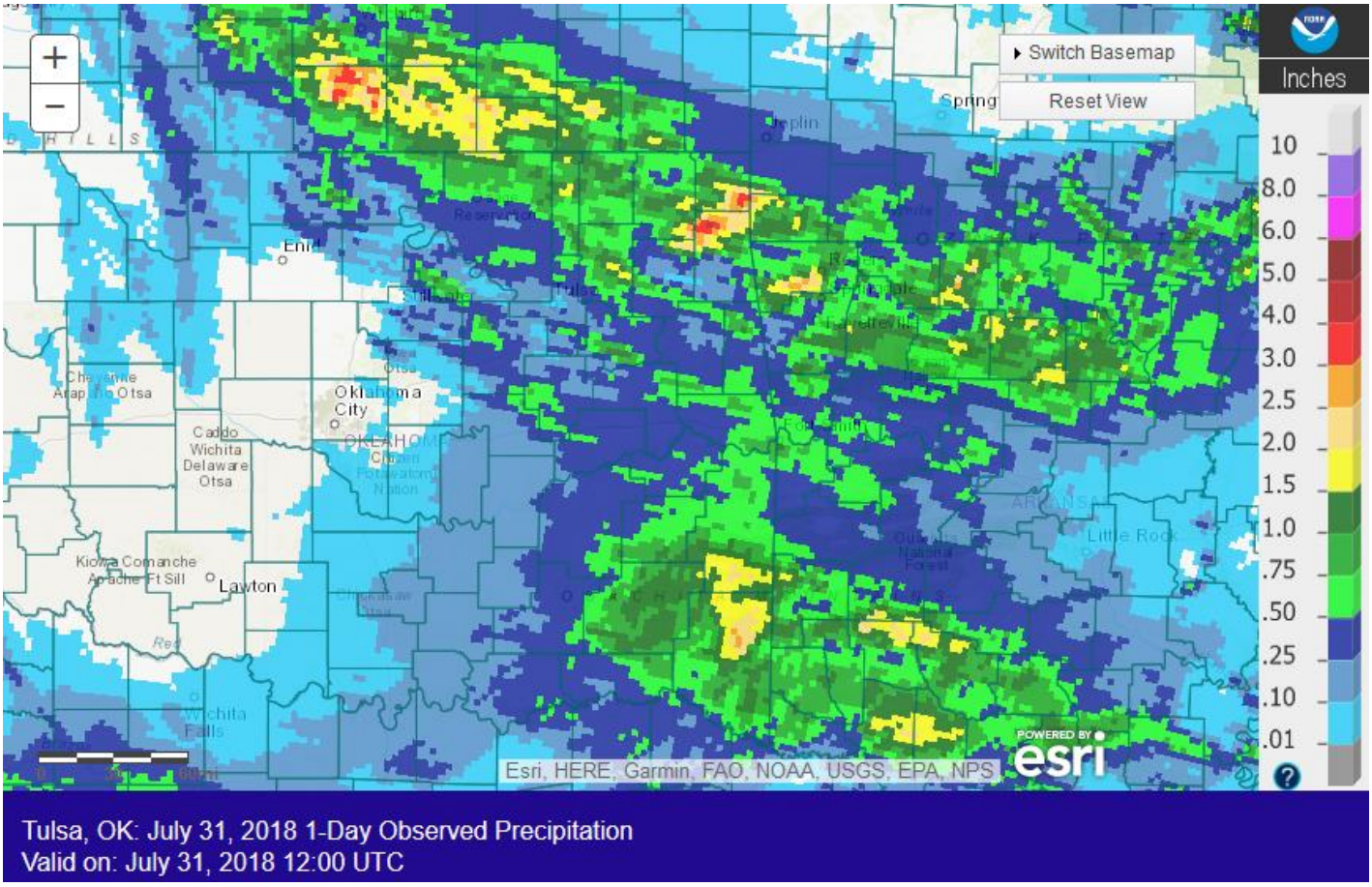


Fig. 12. 24-hour Estimated Observed Rainfall ending at 7am CDT 7/31/2018.

Written by:
Nicole McGavock
Service Hydrologist
WFO Tulsa

Products issued in July 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)
5 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)
0 River Flood Advisories (FLS) (0 Advisory FLS CON/EXT/CAN)
0 River Flood Watches (FFA) (0 Watch FFA CON/EXT/CAN)
0 River Statements (RVS)
0 Hydrologic Outlooks (ESF)
1 Drought Information Statements (DGT)

Preliminary Hydrographs:

None