MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS

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 June 11, 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.

Overall, May 2018 was a hot and dry month. This May was the warmest on record for the entire states of Oklahoma and Arkansas, as well as at Tulsa, Fort Smith, and Fayetteville. This follows near record cold in April 2018. Only a few locations received above normal rainfall this month. Normal precipitation values climatologically rank May as the wettest month of the year. These averages range from 5.0 - 5.5 inches across northeast Oklahoma to 5.5 - 6.0 inches across southeast Oklahoma. The Ozark region of northwest Arkansas averages 5.8 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 May 2018 ranged from around 2” to isolated amounts around 8” across eastern OK and northwest AR. This corresponds to 25-90% of the normal May rainfall for most of eastern OK and northwest AR (Fig. 1b). However, portions of McIntosh, Muskogee, Wagoner, Cherokee and northern Osage Counties, as well as small portions of other counties, received near normal to near 150% of the normal May rainfall.

Fig. 1a. Estimated Observed Rainfall for May 2018
In Tulsa, OK, May 2018 ranked as the Record warmest May (76.7°F, previous record 75.3°F in 1962; since records began in 1905) and the 27th driest May (2.89”; since records began in 1888). Fort Smith, AR had the Record warmest May (76.8°F, previous record 75.8°F in 2012; since records began in 1883) and the 14th driest May (2.00”; since records began in 1883). Fayetteville, AR had the Record warmest (72.0°F; previous record 71.8°F in 1962) and the 31st wettest (5.82”) May since records began in 1950. May 2018 was the warmest May on record for the State of Oklahoma (74.9°F, breaking the previous record of 74.0°F in 1962; this follows the second coldest April on record for Oklahoma), the State of Arkansas (74.8°F, breaking the previous record of 74.2°F in 1896), and for the CONUS (65.4°F, breaking the previous record of 64.7°F in 1934). Oklahoma set a record for the latest first tornado of the year. The first tornado in Oklahoma in 2018 occurred on May 1 near Buffalo, breaking the previous record of April 26, 1962 as the latest first date of a tornado in the state.

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

<table>
<thead>
<tr>
<th>Location</th>
<th>Precipitation (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmington 0.4NNE, AR (coco)</td>
<td>7.70</td>
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<tr>
<td>Cookson, OK (meso)</td>
<td>7.12</td>
</tr>
<tr>
<td>Siloam Springs 1.8N, AR (coco)</td>
<td>6.92</td>
</tr>
<tr>
<td>Westville 0.2ENE, OK (coco)</td>
<td>7.60</td>
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<tr>
<td>Westville 3.0SSW, OK (coco)</td>
<td>7.01</td>
</tr>
<tr>
<td>Decatur 2.6ESE, AR (coco)</td>
<td>6.79</td>
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<tr>
<td>Eufaula 4.6ENE, OK (coco)</td>
<td>7.41</td>
</tr>
<tr>
<td>Morris 2.4SW, OK (coco)</td>
<td>6.96</td>
</tr>
<tr>
<td>Muskogee, OK (ASOS)</td>
<td>6.66</td>
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Some of the lowest precipitation reports (in inches) for May 2018 included:

<table>
<thead>
<tr>
<th>Location</th>
<th>Precipitation (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand Springs 4.6WNNW, OK (coco)</td>
<td>1.77</td>
</tr>
<tr>
<td>Greenwood 1.4W, AR (coco)</td>
<td>1.83</td>
</tr>
<tr>
<td>Sand Springs 2.1ENE, OK (coco)</td>
<td>2.25</td>
</tr>
<tr>
<td>Antlers, OK (coop)</td>
<td>2.45</td>
</tr>
<tr>
<td>Fort Smith, AR (ASOS)</td>
<td>2.00</td>
</tr>
<tr>
<td>Wynona, OK (meso)</td>
<td>2.40</td>
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<tr>
<td>Wilburton, OK (meso)</td>
<td>2.49</td>
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According to statistics from the Oklahoma Climatological Survey (OCS) Mesonet:

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</tr>
</thead>
<tbody>
<tr>
<td>Northeast OK</td>
<td>41st driest</td>
<td>14th driest</td>
<td>14th driest</td>
<td>41st driest</td>
<td>31st driest</td>
<td>23rd driest</td>
<td>35th driest</td>
<td>34th driest</td>
</tr>
<tr>
<td>East Central OK</td>
<td>46th driest</td>
<td>31st driest</td>
<td>45th driest</td>
<td>11th wettest</td>
<td>16th wettest</td>
<td>25th wettest</td>
<td>43rd wettest</td>
<td>30th wettest</td>
</tr>
<tr>
<td>Southeast OK</td>
<td>15th driest</td>
<td>12th driest</td>
<td>11th driest</td>
<td>18th wettest</td>
<td>25th wettest</td>
<td>25th wettest</td>
<td>45th driest</td>
<td>27th wettest</td>
</tr>
<tr>
<td>Statewide</td>
<td>40th driest</td>
<td>23rd driest</td>
<td>15th driest</td>
<td>49th wettest</td>
<td>38th wettest</td>
<td>32nd driest</td>
<td>23rd driest</td>
<td>45th driest</td>
</tr>
</tbody>
</table>
Accumulated Precipitation – Tulsa Area, OK (ThreadEx)

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

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

Drought

According to the U.S. Drought Monitor (USDM) from May 29, 2018 (Figs. 2, 3), Severe (D2) Drought conditions were impacting western Osage and far northwest Pawnee Counties in eastern OK. Moderate (D1) drought conditions were present across portions of Osage, Pawnee, and eastern Kay Counties in eastern OK. Abnormally Dry (D0) but not in drought conditions encompassed portions of Pawnee, Creek, Osage, Washington, Tulsa, Rogers, Nowata, Ottawa, Delaware, Mayes, Craig, Latimer, Le Flore, and Choctaw Counties in eastern Oklahoma and far western 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 6/01/2018: Birch Lake 91%. Reservoirs above 3% of their conservation pool storage as of 6/01/2018: Beaver Lake 159%, Keystone Lake 106%, and Fort Gibson Lake 105%.

**Spring (March-April-May) 2018**

In Tulsa, OK, Spring 2018 ranked as the 33rd warmest Spring (61.3°F, tied 2001, 1972, 1908; since records began in 1905) and the 19th driest Spring (7.96"; since records began in 1888). Fort Smith, AR had the 28th warmest Spring (62.8°F, tied 2016; since records began in 1883) and the 23rd driest Spring (8.70"; since records began in 1883). Fayetteville, AR had the 21st warmest (57.8°F; tied 2000, 1990) and the 30th driest (12.76") Spring since records began in 1950.

**Outlooks**

The Climate Prediction Center (CPC) outlook for June 2018 (issued May 31, 2018) indicates a significantly enhanced chance for above normal temperatures and a slightly enhanced chance for below median precipitation across all of eastern OK and northwest AR. This outlook takes into account weather conditions forecast over the next 1-2 weeks, soil moisture conditions, and sub-seasonal climate signals, including the Madden-Julian Oscillation (MJO).
For the 3-month period June-July-August 2018, CPC is forecasting an enhanced chance for above normal temperatures and an equal chance for above, near, and below median precipitation across all of eastern OK and northwest AR (outlook issued May 17, 2018). This outlook is based on both statistical and dynamical forecast tools and decadal timescale climate trends, as well as impacts from the ENSO state and the MJO. According to CPC, ENSO neutral conditions were present in May, though some lingering La Niña conditions remained in the atmosphere. ENSO neutral conditions are favored to persist through the summer, with a growing chance of El Niño by fall and winter 2018-19.

**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](http://water.weather.gov/precip/index.php?location_type=wfo&location_name=tsa)

Several rounds of showers and thunderstorms, some of which were severe, affected eastern OK and northwest AR from the evening of the 2nd through the late afternoon of the 3rd. The first line of storms moved into the area from the west during the evening of the 2nd and continued to progress eastward through the overnight hours. This activity moved out of western AR during the early morning hours of the 3rd, while additional storms moved into eastern OK from the west. By mid-morning of the 3rd, the 3rd line of storms pushed into eastern OK. By afternoon, this line moved into western AR. Part of the line began to accelerate forward as a bow echo as the storms moved into west central Arkansas. An EF-1 tornado developed within this bow echo segment near Peter Pender in Franklin County Arkansas (for more information on this event: [https://arcg.is/1f5Ob4](https://arcg.is/1f5Ob4)). All of this activity came to an end by late afternoon. The three rounds of storms brought 0.75” to 3.5” to most of eastern OK and northwest AR, with some isolated totals to around 4” (Figs. 4-6). However, far northwest Osage County only received 0.10”-0.30” of rain. This rainfall resulted in some flooding of roadways, as well as minor flooding along the Illinois River (see preliminary hydrographs at the end of this report; see E3 Report for details).
Fig. 5. 24-hour Estimated Observed Rainfall ending at 7am CDT 5/04/2018.

Fig. 6. 24-hour Estimated Observed Rainfall (image) and OK Mesonet measurements ending at 4:20 pm CDT 5/03/2018.
Fig. 7. 24-hour Estimated Observed Rainfall ending at 7am CDT 5/15/2018.

Fig. 8. 24-hour Estimated Observed Rainfall (image) and OK Mesonet measurements ending at 8:50 am CDT 5/15/2018.
A supercell impacted far northwest Osage County during the evening of the 14th, bringing a small area of 2"-4" of rain (Fig. 7). Additional storms moved south out of KS during the overnight hours, developing into a southeasterward propagating MCS. The MCS weakened as it moved into western AR during the morning hours of the 15th. Convection also occurred over southeast OK during the early morning hours in response to an MCV (mesoscale convective vortex) from earlier storms in southwest OK. Rainfall totals generally ranged from 0.25" to 2", with isolated pockets of 2"-3" (Figs. 7, 8).

Another MCV moved across eastern OK and northwest AR on the 16th, centered along an Okmulgee to Sallisaw path. Showers and thunderstorms rapidly developed during the late morning hours along and ahead of this feature and continued through the afternoon as the MCV shifted east. Some minor flooding was reported in the Muskogee and Bentonville areas. Additional thunderstorms affected Osage, Pawnee, Washington, and northern Tulsa Counties during the afternoon as well. All of the rain dissipated by mid evening. Rainfall totals were generally 0.25"-2", with localized totals of 2"-3" (Fig. 9).

Scattered showers and thunderstorms affected northeast OK, primarily along and north of I-44, during the morning hours of the 19th. This activity dissipated by around noon. Additional showers and thunderstorms developed along a cold front during the early afternoon across north central OK, which again moved across northeast OK affecting locations along and north of a Pawnee to Miami line. Damaging straight-line winds of 80-90 mph occurred near Fairfax in Osage County and Ralston in Pawnee County, and two brief EF-0 tornadoes occurred in Osage County (for more information on this event: https://arcg.is/1f5Ob4). Shortly after midnight on the 20th, a third round of more widespread shower and thunderstorm activity in central OK moved east into eastern OK. These storms moved quickly northeast, exiting the region during the morning hours. All of this rainfall resulted in rainfall totals of 0.25" to 2" for most of the affected area, with higher totals of 2" to 4" falling over portions of Osage, Washington (OK), Nowata, and Craig Counties (Fig. 10). These higher totals also occurred across the Neosho River basin in southeast KS, resulting in the Neosho River rising to about half a foot below flood stage (see preliminary hydrograph at the end of this report).
Fig. 10. 24-hour Estimated Observed Rainfall ending at 7am CDT 5/20/2018.

Written by:
Nicole McGavock
Service Hydrologist
WFO Tulsa

**Products issued in May 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

1. Flash Flood Warnings (FFW)
0. Flash Flood Statements (FFS)
0. Flash/Areal Flood Watches (FFA) (0 Watch FFA CON/EXT/EXA/EXB/CAN)
18. Urban and Small Stream Advisories (FLS)
0. Areal Flood Warnings (FLW)
0. Areal Flood Statements (FLS)
5. River Flood Warnings (FLW) (includes category increases)
23. River Flood Statements (FLS)
3. River Flood Advisories (FLS) (6 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:**
Latest observed value: 10.85 ft at 7:30 AM CDT May 22, 2018. Flood Stage is 16 ft.

Moderate: 18.0 ft
Minor: 15.0 ft
Action: 14.0 ft

Site Time (CDT)