

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 June	YEAR 2014
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 July 14, 2014	

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.

Eastern Oklahoma and northwest Arkansas were affected by numerous mesoscale convective systems during June 2014, bringing much needed rain to the region. Normal rainfall in the month of June ranges from 3.9 inches in McIntosh County to 5.9 inches in Wagoner County. The Ozark region of northwest Arkansas averages 5.1 inches for the month.

Monthly Summary

Using the radar-derived estimated observed precipitation from the RFCs (Fig. 1a), rainfall totals for June 2014 ranged from 2" in southeast OK and west central AR to around 10" in isolated locations of Rogers, Delaware, and Pittsburg Counties. The majority of the HSA received 3"-5" of rain this month. A large area from southeast OK into west central and northwest AR received only 50%-75% of the normal June rainfall, with a few spots receiving less than 50% of normal (Fig. 1b). Below normal precipitation was also observed along the Arkansas River Valley in northeast OK, with this area seeing 50% to 90% of the normal June rain. Eastern Kay County, far northeast OK, and Benton and Carroll Counties in northwest AR received well above normal rainfall this month, at 125% to around 200% of the June normal.

Tulsa, OK (TSA): June, 2014 Monthly Observed Precipitation
 Valid at 7/1/2014 1200 UTC- Created 7/3/14 23:56 UTC

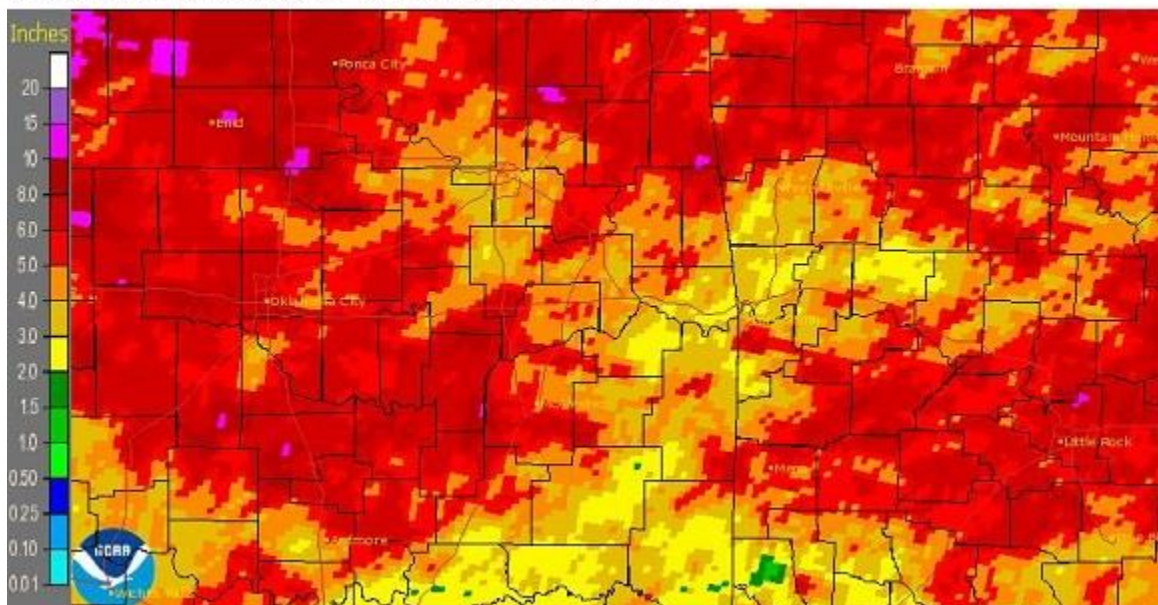


Fig. 1a. Estimated Observed Rainfall for June 2014

Tulsa, OK (TSA): June, 2014 Monthly Percent of Normal Precipitation
 Valid at 7/1/2014 1200 UTC- Created 7/3/14 23:56 UTC

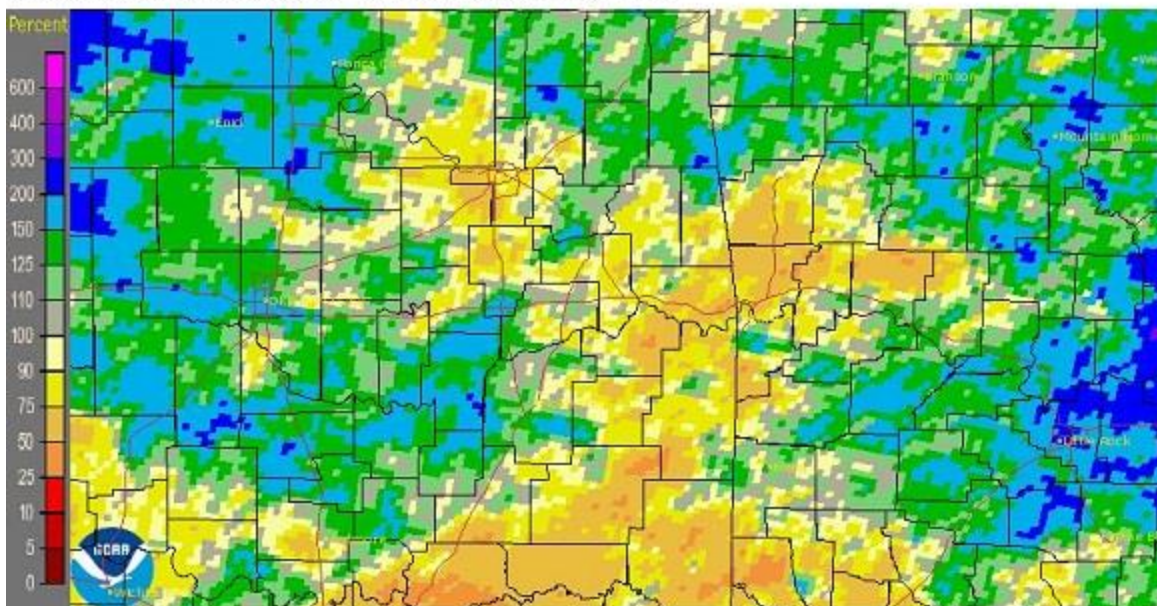


Fig. 1b. Estimated % of Normal Rainfall for June 2014

In Tulsa, OK, June 2014 ranked as the 45th warmest June (78.2°F, tied 2008, 2006, 2001, 1964; since records began in 1905) and the 59th wettest June (4.67"; since records began in 1888). Fort Smith, AR was the 30th warmest June (79.3°F, tied 1986, 1924, 1922; since records began in 1882) and the 50th wettest June (4.45", tied 1944; since records began in 1882). Fayetteville, AR was the 28th warmest (73.5°F, tied 1965, 1975, 1996) and the 32nd driest (4.10") June since records began in 1950.

Some of the larger precipitation reports (in inches) for June 2014 included:

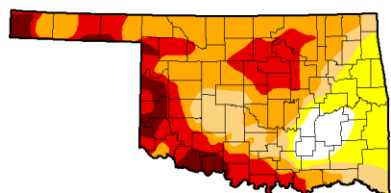
Porter, OK (meso)	8.59	Bartlesville, OK (ASOS)	8.37	Nowata, OK (meso)	8.32
Wynona, OK (meso)	8.28	Westville, OK (meso)	8.16	Pryor, OK (meso)	8.03
Kingston 2S, AR (coop)	7.94	Copan, OK (meso)	7.89	Spavinaw, OK (coop)	7.33

Some of the lowest precipitation reports (in inches) for June 2014 included:

Hugo, OK (meso)	3.23	Sallisaw, OK (meso)	3.30	Stigler, OK (meso)	3.30
Antlers, OK (coop)	3.49	Cloudy, OK (meso)	3.71	Muskogee, OK (coop)	3.84
Winslow 7NE, AR (coop)	3.84	Antlers, OK (meso)	3.92	Webbers Falls, OK (meso)	3.96

**U.S. Drought Monitor
Oklahoma**

July 1, 2014
 (Released Thursday, Jul. 3, 2014)
 Valid 8 a.m. EDT



	Drought Conditions (Percent Area)					
	None	D0-D1	D1-D2	D2-D3	D3-D4	D4
Current	5.50	94.50	30.12	65.61	30.07	6.67
Last Week 6/24/14	9.08	90.92	79.40	65.61	40.57	10.99
3 Months Ago 4/1/14	4.05	95.95	77.48	50.67	24.03	8.61
Start of Calendar Year 1/1/14	50.84	49.16	39.17	18.99	4.04	2.40
Start of Water Year 1/1/13	21.74	78.26	43.00	17.62	4.42	1.45
One Year Ago 7/1/13	38.46	61.54	42.17	36.89	26.45	8.89

Intensity:
 D0 Abnormally Dry D3 Extreme Drought
 D1 Moderate Drought D4 Exceptional Drought
 D2 Severe Drought

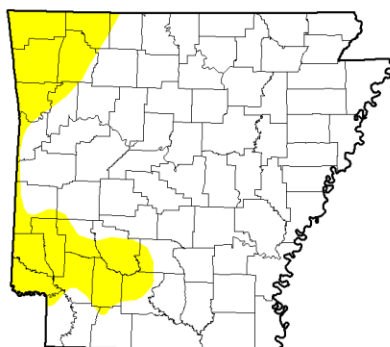
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
 Anthony Artusa
 NOAA/NWS/NCEP/CPC

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

**U.S. Drought Monitor
Arkansas**

July 1, 2014
 (Released Thursday, Jul. 3, 2014)
 Valid 8 a.m. EDT



	Drought Conditions (Percent Area)					
	None	D0-D1	D1-D2	D2-D3	D3-D4	D4
Current	62.50	17.50	0.04	0.00	0.00	0.00
Last Week 6/24/14	64.20	15.80	0.00	0.00	0.00	0.00
3 Months Ago 4/1/14	72.14	27.86	0.29	0.00	0.00	0.00
Start of Calendar Year 1/1/14	86.56	3.44	0.00	0.00	0.00	0.00
Start of Water Year 1/1/13	47.69	52.31	23.96	11.67	3.34	0.00
One Year Ago 7/1/13	86.65	13.35	0.00	0.00	0.00	0.00

Intensity:
 D0 Abnormally Dry D3 Extreme Drought
 D1 Moderate Drought D4 Exceptional Drought
 D2 Severe Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

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

Fig. 2. Drought Monitor for Oklahoma

Fig. 3. Drought Monitor for Arkansas

According to the [U.S. Drought Monitor](http://droughtmonitor.unl.edu/) (USDM) from July 1, 2014 (Figs 2, 3), Extreme Drought (D3) conditions were affecting Pawnee, Osage, and western Creek Counties in northeast Oklahoma. Severe Drought (D2)

conditions were impacting western Choctaw County and locations primarily along and north of I-44, including Osage, eastern Creek, western Okfuskee, western Okmulgee, Tulsa, Washington, Rogers, Nowata, and Craig Counties. Moderate Drought (D1) conditions were present across Ottawa, eastern Okfuskee, Okmulgee, Mayes, western Wagoner, far southern Pushmataha, and eastern Choctaw Counties. Abnormally Dry (D0), but not experiencing drought, conditions were occurring across the remainder of eastern OK, except for Pittsburg, western Latimer, and far western Haskell Counties. In northwest AR, D0 conditions were affecting Benton, Carroll, Washington, Crawford, and northwestern Franklin Counties.

According to the USACE, most of the major reservoirs in the HSA were operating within $\pm 3\%$ of the top of their conservation pools as of 7/8/2014. A few lakes remained below normal: Skiatook Lake 65%, Birch Lake 88%, and Heyburn Lake 91%. Several lakes had levels within their flood control pools: Oologah Lake 111%, Eufaula Lake 108%, Keystone Lake 106%, Tenkiller Lake 105%, and Ft. Gibson Lake 104%.

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

Rank since 1921	June 2014	Last 60 Days (May 2 – Jun 30)	Last 90 Days (Apr 2 – Jun 30)	Warm Growing Season (Mar 1 – Jun 30)	Year-to-Date (Jan 1 – Jun 30)	Water Year-to-Date (Oct 1 – Jun 30)	Last 365 Days (Jul 1, 2013 – Jun 30, 2014)
Northeast OK	27 th wettest	47 th driest	12th driest	16 th driest	10th driest	12th driest	29 th driest
East Central OK	33 rd wettest	40 th driest	25 th driest	26 th driest	8th driest	25 th driest	26 th driest
Southeast OK	43 rd wettest	46 th wettest	30 th driest	39 th driest	18 th driest	30 th driest	34 th driest
Statewide	21 st wettest	46 th driest	15th driest	21 st driest	11th driest	15th driest	28 th driest

Outlooks

The [Climate Prediction Center](#) (CPC) outlook for July 2014 (issued June 30, 2014) indicates a slightly enhanced chance for below median precipitation across west central and northwest AR, with equal chances for above, near, and below median precipitation elsewhere across the area. This outlook also indicates equal chances for above, near, and below normal temperatures across all of eastern OK and northwest AR. This outlook is based on short-range forecasts of expected weather conditions.

For the 3-month period July-August-September 2014, CPC is forecasting an enhanced chance for above normal temperatures and equal chances for above, near, and below median rainfall across all of eastern OK and northwest AR (outlook issued June 19, 2014). According to CPC, current atmospheric and oceanic observations suggest a transition from ENSO neutral to El Niño conditions is underway. El Niño is forecast to develop during the next several months, with the probability of El Niño conditions during July-August-September 2014 over 70%. An El Niño of moderate strength is most likely. Therefore, this outlook is based on both statistical and dynamical forecast tools and considering El Niño conditions.

Summary of Precipitation Events

June 1-15

A complex of thunderstorms developed across KS and moved southeast into northeast OK and northwest AR during the early morning hours of the 1st. Most locations north of I-40 received 0.50"-2" of rain from this mesoscale convective system (MCS), though a few locations in northeast OK had a little over 2". The highest totals within the HSA occurred across southwest Creek County, where 2.5" to around 3" of rain fell (Fig. 4). The storms fizzled out by the time they reached I-40 in the late morning.

Tulsa, OK (TSA): 6/2/2014 1-Day Observed Precipitation
Valid at 6/2/2014 1200 UTC- Created 6/4/14 23:30 UTC

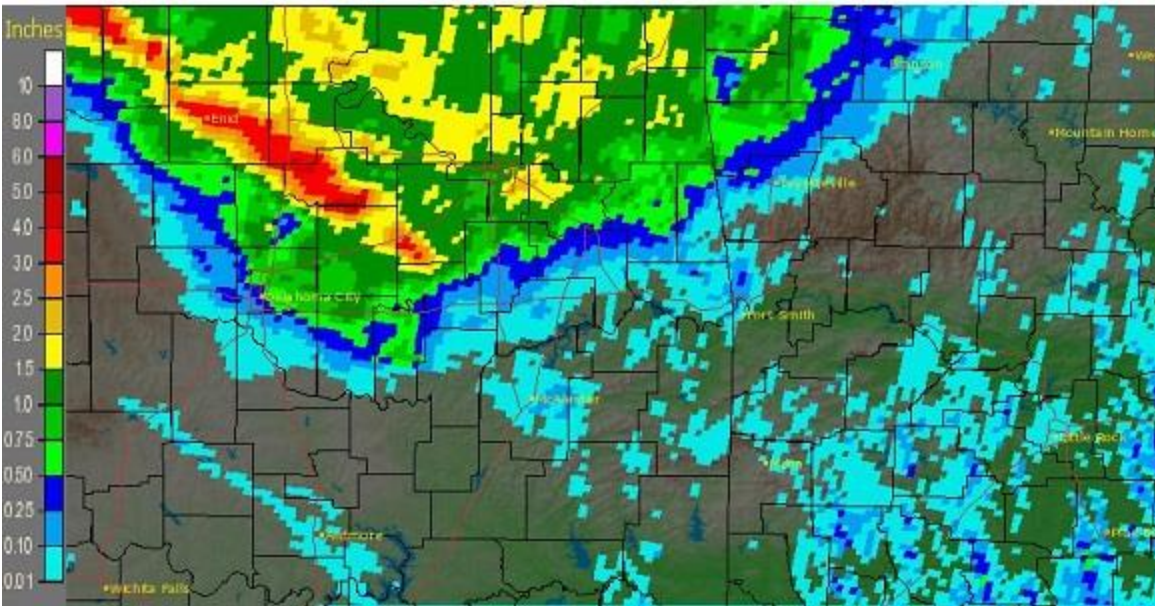


Fig. 4. Estimated observed 24-hr rainfall ending at 7am 6/2/2014.

A wet weather pattern, due to a series of upper-level waves traversing the region under zonal flow aloft, developed across the region, causing MCSs to affect eastern OK and northwest AR for several days in a row. On June 5, an MCS raced east southeast out of KS and into far northeast OK and far northwest AR during the morning and early afternoon hours. Then, during the late evening and overnight hours, thunderstorms developed over northeast OK and northwest AR along and north of a stationary front. The June 5 storms affected locations mainly along and north of Hwy 412, bringing widespread 0.25"-0.75". More isolated areas received 0.75"-1.5", with the highest rainfall totals of 2"-3.5" occurring across northern Rogers County (Fig. 5).

Tulsa, OK (TSA): 6/6/2014 1-Day Observed Precipitation
Valid at 6/6/2014 1200 UTC- Created 6/8/14 23:30 UTC

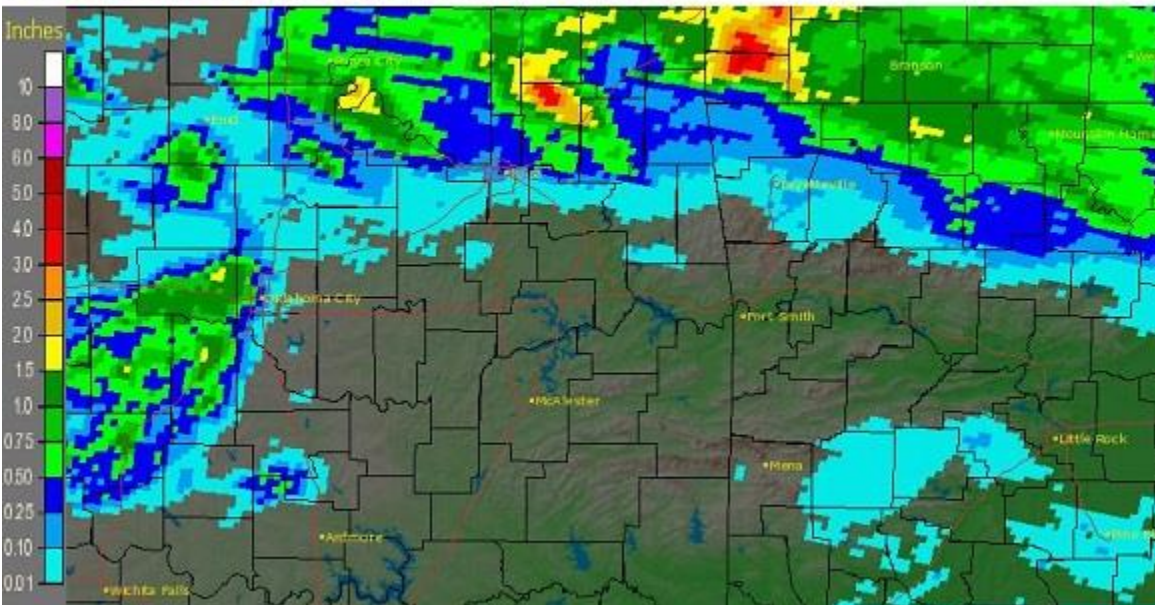


Fig. 5. Estimated observed 24-hr rainfall ending at 7am 6/6/2014.

A line of thunderstorms brought rain to the area during the morning and early afternoon of the 6th as storms in western OK and the TX panhandle moved east into the HSA. A repeat occurred later that night and into the early morning of the 7th, with another line of thunderstorms moving across the area. By 7am on the 7th, rainfall totals were generally around 0.50"-1" across the entire HSA. Southern Creek and southern Okmulgee Counties ended up with 1.5"-3.5" of rain, with isolated pockets of 1"-2" elsewhere across the region (Fig. 6).

The early morning MCS aided in pushing an effective surface boundary into far northwest AR and east central OK where thunderstorms then redeveloped in the afternoon on the 7th. After a lull in storm activity during the late afternoon and evening hours, storms fired up again near and south of the boundary across southeast OK and west central AR. By 7am on the 8th, most locations south of a Tulsa to Fort Smith line had received rainfall. The heaviest rain of 1.5" to near 5" occurred across the southern half of Pittsburg County (Fig. 7).

Tulsa, OK (TSA): 6/7/2014 1-Day Observed Precipitation
Valid at 6/7/2014 1200 UTC- Created 6/9/14 23:30 UTC

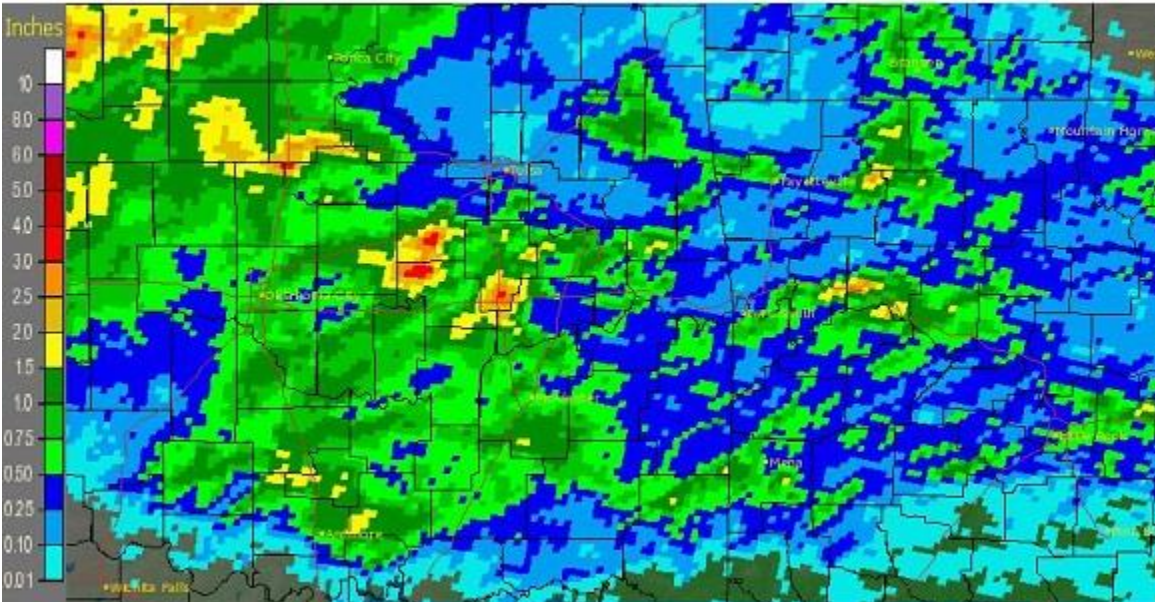


Fig. 6. Estimated observed 24-hr rainfall ending at 7am 6/7/2014.

Tulsa, OK (TSA): 6/8/2014 1-Day Observed Precipitation
Valid at 6/8/2014 1200 UTC- Created 6/10/14 23:32 UTC

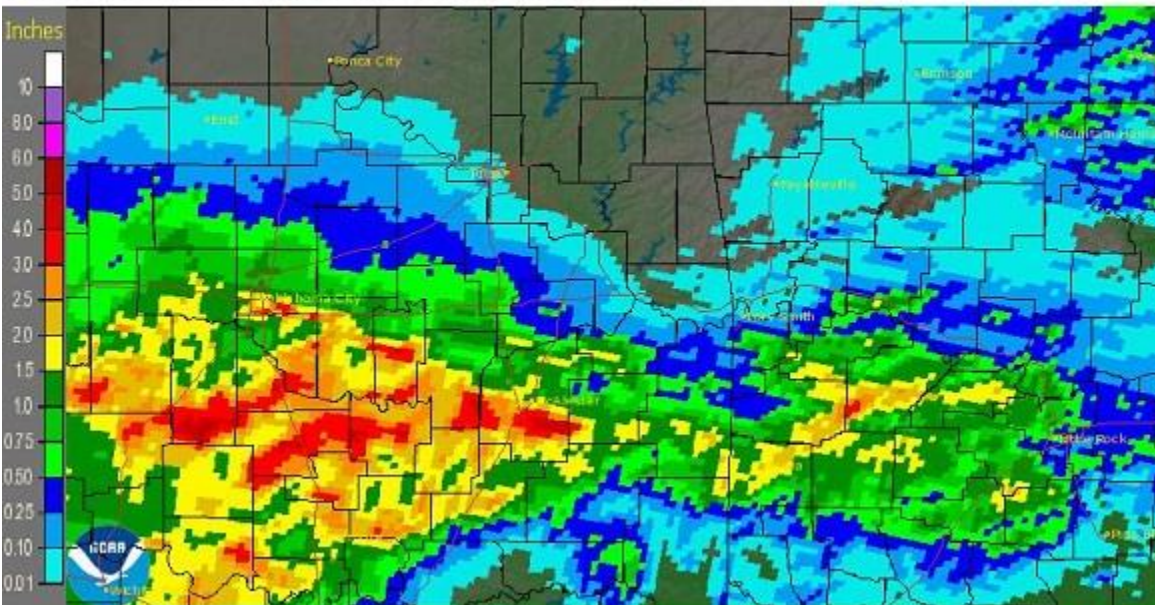


Fig. 7. Estimated observed 24-hr rainfall ending at 7am 6/8/2014.

Scattered showers and thunderstorms persisted through the day on the 8th across eastern OK and northwest central AR before coming to an end. A band of heavy rain set up between Tulsa and Muskogee Counties. Yet another MCS developed across the high plains and moved into the HSA early on the 9th, with additional storm activity developing across southeast OK in the vicinity of a northward moving warm front. By 7am on the 9th, rainfall totals ranged from 0.25"-1" across a large portion of the HSA. Higher totals of 1"-2.5" occurred over southeast OK, and 3" had fallen over southern Wagoner County (Fig. 8). Additional development occurred as an upper-level low moved over OK during the afternoon of the 9th and interacted with the northward moving

boundary. More shower activity developed during the early morning hours of the 10th across northeast OK and northwest AR in response to a vorticity lobe rotating around the low circulation. An additional 0.25"-2" had fallen primarily across southeast and far northwest OK as well as northwest AR by 7am on the 10th (Fig. 10). A second vorticity lobe led to showers and thunderstorms across mainly northwest AR later on the 10th, bringing 0.25" to around 1" of rain to that area.

Tulsa, OK (TSA): 6/9/2014 1-Day Observed Precipitation
Valid at 6/9/2014 1200 UTC- Created 6/11/14 23:31 UTC

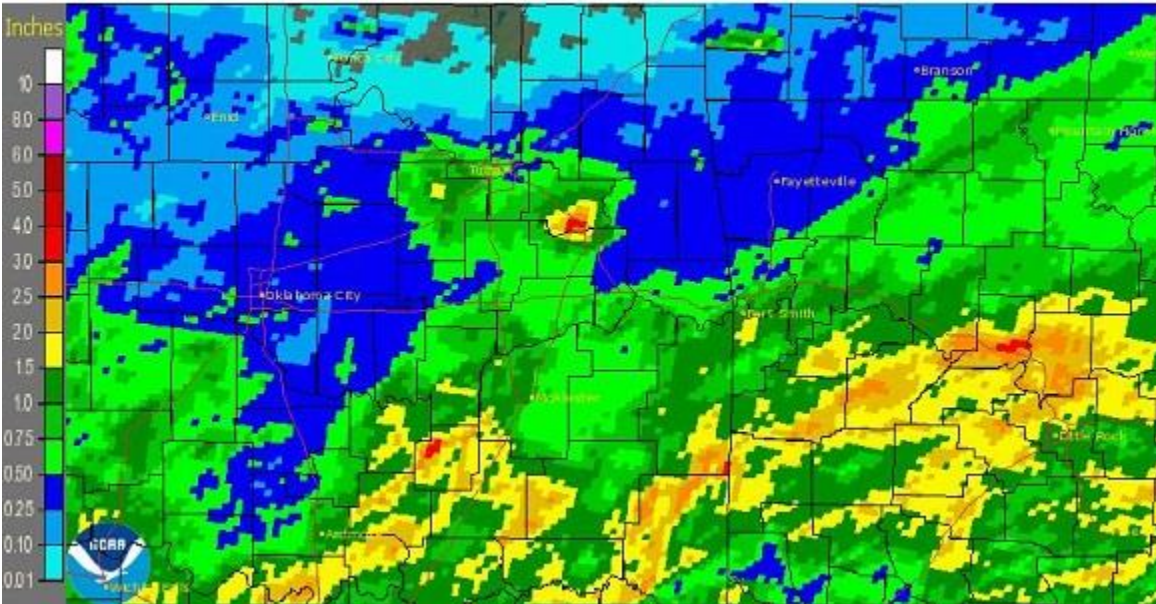
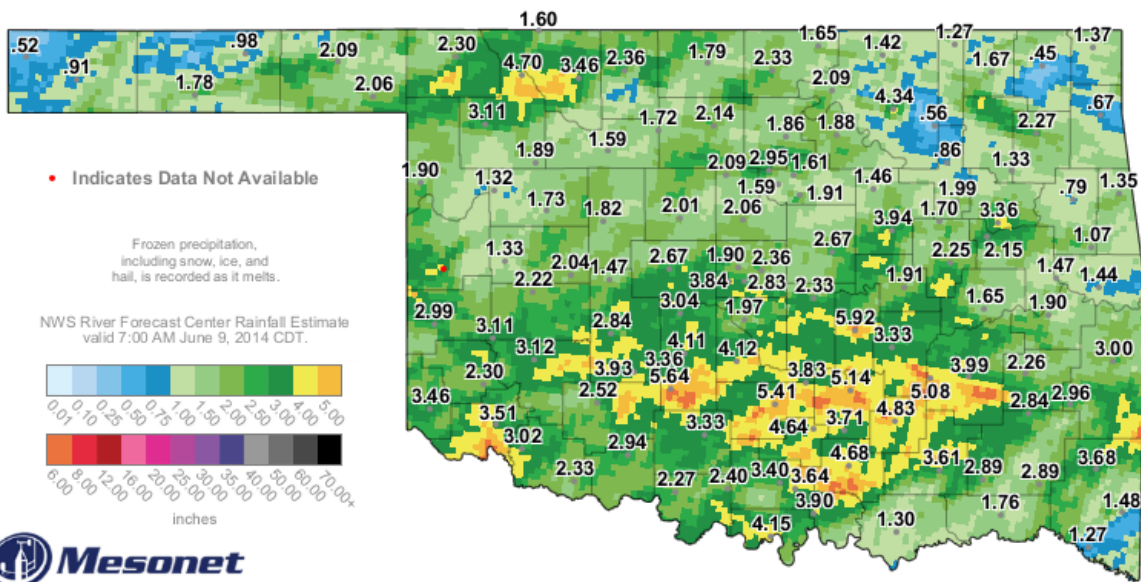


Fig. 8. Estimated observed 24-hr rainfall ending at 7am 6/9/2014.



7-Day Rainfall (inches)

8:00 AM June 9, 2014 CDT
Created 8:04:44 AM June 9, 2014 CDT. © Copyright 2014

Fig. 9. Estimated observed 7-day rainfall (image) and OK Mesonet measurements ending at 8am 6/9/2014.

Tulsa, OK (TSA): 6/10/2014 1-Day Observed Precipitation
Valid at 6/10/2014 1200 UTC- Created 6/12/14 23:30 UTC

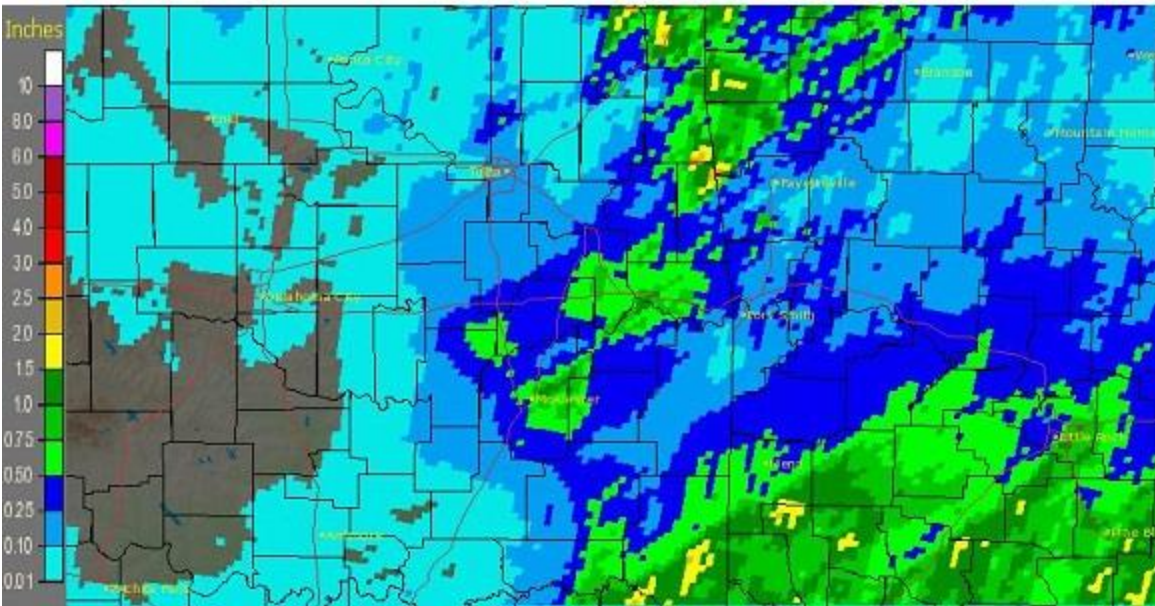


Fig. 10. Estimated observed 24-hr rainfall ending at 7am 6/10/2014.

A MCS moved south out of KS and into the central portion of OK during the early hours of the 12th, affecting areas primarily west of Hwy 75. Most of the areas affected received less than 0.25", though eastern Kay County did get around 1.5" of rain. The MCS weakened as it moved south southeast, with just additional light rain across southeast OK.

Convection once again developed over the High Plains on the 14th and moved eastward. The southern periphery of this MCS affected northeast OK and northwest AR during the morning hours of the 15th. Widespread rainfall totals of 1"-2" occurred north of a Ponca City to Tahlequah line, with 3"-4" of rain across Nowata, Mayes, and Craig Counties. Lesser amounts fell elsewhere north of a Ponca City to Tulsa to Fort Smith line (Figs. 11 and 12).

Tulsa, OK (TSA): 6/15/2014 1-Day Observed Precipitation
Valid at 6/15/2014 1200 UTC- Created 6/17/14 23:32 UTC



Fig. 11. Estimated observed 24-hr rainfall ending at 7am 6/15/2014.

Tulsa, OK (TSA): 6/16/2014 1-Day Observed Precipitation
Valid at 6/16/2014 1200 UTC- Created 6/18/14 23:32 UTC



Fig. 12. Estimated observed 24-hr rainfall ending at 7am 6/16/2014.

June 16-30

Storms that developed over south central OK moved northeast, affecting primarily east central OK and portions of west central AR on the 19th. This activity brought 0.25" to around 1.5" of rain (Fig. 13). Scattered afternoon thunderstorms developed over portions of southern Haskell, northern Latimer, northern Le Flore, eastern Carroll and Madison Counties on the 20th. Affected locations received 0.25"-1.5" of rain.

Tulsa, OK (TSA): 6/20/2014 1-Day Observed Precipitation
Valid at 6/20/2014 1200 UTC- Created 6/22/14 23:32 UTC



Fig. 13. Estimated observed 24-hr rainfall ending at 7am 6/20/2014.

Widely scattered showers and thunderstorms affected eastern OK and northwest AR during the afternoon hours of the 22nd. A couple of MCSs made a run for eastern OK and northwest AR overnight and through the day on the 23rd. A mesoscale convective vortex (MCV) associated with the MCS over central OK, kept the MCS going as it moved eastward across the HSA. Most of eastern OK and western AR received rain, with totals ranging from 0.10" to around 2" (Figs. 14 and 15).

Tulsa, OK (TSA): 6/23/2014 1-Day Observed Precipitation
Valid at 6/23/2014 1200 UTC- Created 6/25/14 23:39 UTC



Fig. 14. Estimated observed 24-hr rainfall ending at 7am 6/23/2014.

Tulsa, OK (TSA): 6/24/2014 1-Day Observed Precipitation
Valid at 6/24/2014 1200 UTC- Created 6/26/14 23:32 UTC



Fig. 15. Estimated observed 24-hr rainfall ending at 7am 6/24/2014.

A line of thunderstorms in south central KS moved into portions of northeast OK during the evening of the 24th, bringing 0.25"-1.5" of rain. Northeast Osage and western Washington Counties had higher totals of 1.5"-2.5", with a small area of far western Osage County receiving around 3" of rain (Fig. 16). Hulah Dam measured 2.51" of rain.

Tulsa, OK (TSA): 6/25/2014 1-Day Observed Precipitation
Valid at 6/25/2014 1200 UTC- Created 6/27/14 23:39 UTC



Fig. 16. Estimated observed 24-hr rainfall ending at 7am 6/25/2014.

A left-over MCV, combined with residual surface boundaries from previous storms and a weak front lifting north across the area, provided a focus for scattered showers and thunderstorms within an unstable and weakly capped airmass on the 25th. Locations that experienced storm activity received 0.25"-2.5" of rain, with around 3" occurring in far southwest Latimer and Sebastian Counties (Fig. 17). 3.12" was measured 1.9 miles WNW of Greenwood, AR. Afternoon heating brought some rain, generally less than 0.50", to west central AR on the 26th.

Tulsa, OK (TSA): 6/26/2014 1-Day Observed Precipitation
Valid at 6/26/2014 1200 UTC- Created 6/28/14 23:32 UTC

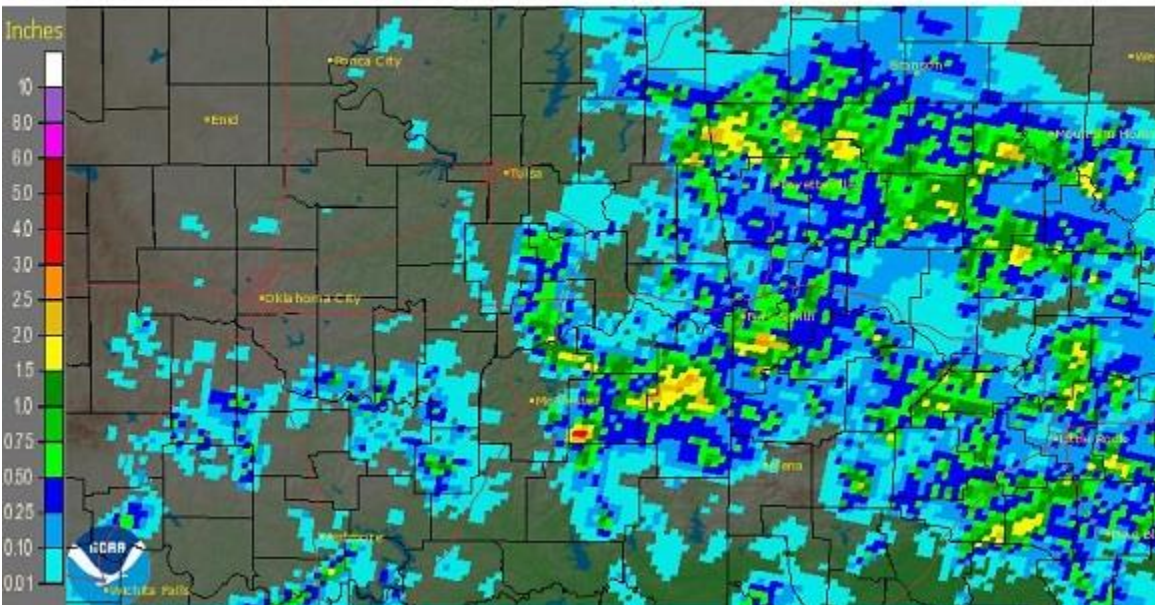


Fig. 17. Estimated observed 24-hr rainfall ending at 7am 6/26/2014.

A complex of strong to severe thunderstorms affected northeast OK and northwest AR on the 28th as an upper-level shortwave moved across the Plains. This activity occurred along and north of an Oklahoma City to Tulsa to Fayetteville line, where widespread 0.50" to 1.5" of rain fell (Fig. 18). Isolated higher totals of 1.5"-2" occurred northwest of I-44.

Tulsa, OK (TSA): 6/29/2014 1-Day Observed Precipitation
Valid at 6/29/2014 1200 UTC- Created 7/1/14 23:33 UTC

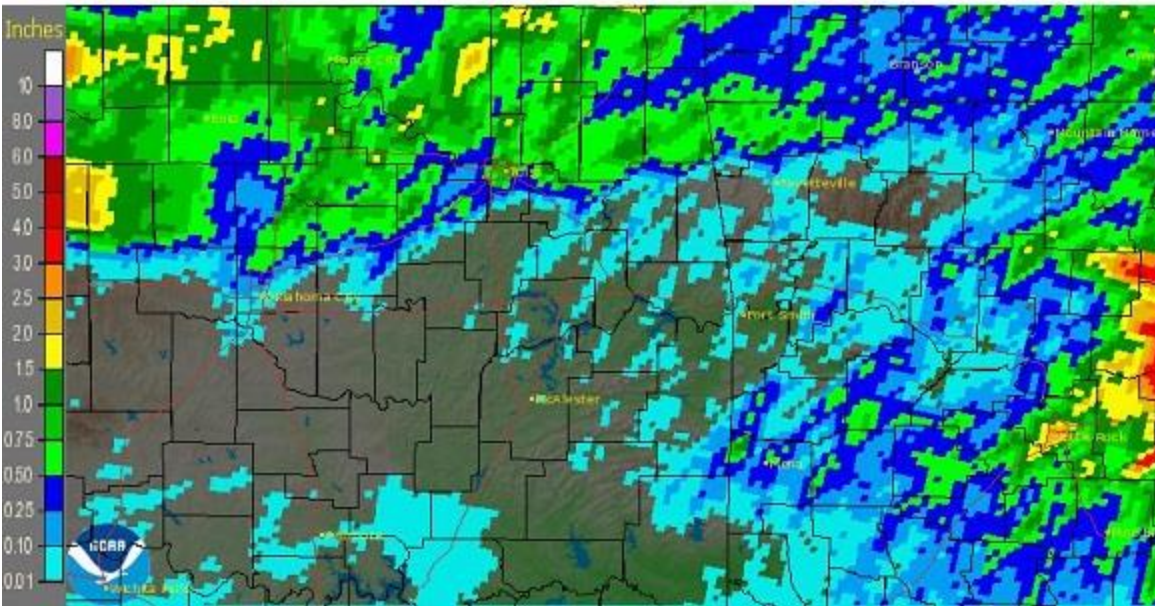


Fig. 18. Estimated observed 24-hr rainfall ending at 7am 6/29/2014.

Written by:

Nicole McGavock
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Products issued in June 2014:

*MLBA4 and OZGA4 transferred to NWS Tulsa HSA February 5, 2014

*Mixed case River Flood products began July 31, 2013

- 4 Flash Flood Warnings (FFW)
- 5 Flash Flood Statements (FFS)
- 1 Flash/Areal Flood Watches (FFA) (9 Watch FFA CON/EXT/EXA/CAN)
- 17 Urban and Small Stream Advisories (FLS)
- 1 Areal Flood Warnings (FLW)
- 0 Areal Flood Statements (FLS)
- 1 River Flood Warnings (FLW)
- 4 River Flood Statements (FLS)
- 1 River Flood Advisories (FLS) (4 Advisory FLS CON/EXT/CAN)
- 0 River Flood Watches (FFA) (0 Watch FFA CON/EXT/CAN)
- 0 River Statements (RVS)
- 0 Hydrologic Outlooks (ESF)
- 2 Drought Information Statements (DGT)

Preliminary Hydrographs:

None