

MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS

REPORT FOR:

MONTH

YEAR

April

2011

SIGNATURE

Steven F. Piltz

(Meteorologist-in-Charge)

DATE

May 11, 2011

TO: Hydrometeorological Information Center, W/OH2
 NOAA / National Weather Service
 1325 East West Highway, Room 7230
 Silver Spring, MD 20910-3283

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.

Very heavy rainfall and catastrophic flooding affected the Hydrologic Service Area during the last half of April 2011 after many months of below normal rainfall and expanding drought conditions. Two river forecast points exceeded record flood stage, while two other points reached major flood stage this month. April also brought a record number of tornadoes to the area. Normal precipitation for the month of April ranges from 3.1 inches in Pawnee County to 4.7 inches in Latimer County. The Ozark region of northwest Arkansas averages 4.3 inches for the month.

Monthly Summary

Using the radar-derived estimated observed precipitation from the RFCs (Fig. 1a), rainfall totals for April 2011 ranged from around 1.5" in western Pawnee and western Osage Counties to over 15" in portions of Adair County in OK and Benton, Washington, Carroll, and Madison Counties in AR. The highest values of 10" to over 15" correspond to 300% to 500% of the normal April rainfall (Fig. 1b). A large portion of the HSA received 5" to over 10" of rain this month (see Fig. 1a), which equates to 150% to over 300% of the normal April rainfall (Fig. 1b). While most of eastern OK and northwest AR received near to above normal rainfall this month, portions of Pawnee and Osage Counties received only 25% to 75% of the normal April rainfall (see Fig. 1b).

Tulsa, OK (TSA): April, 2011 Monthly Observed Precipitation
 Valid at 5/1/2011 1200 UTC- Created 5/3/11 21:38 UTC

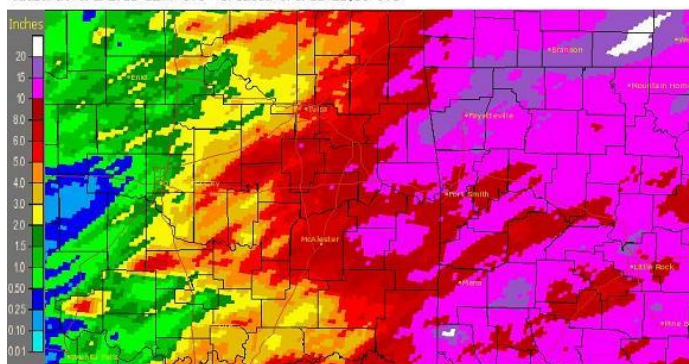
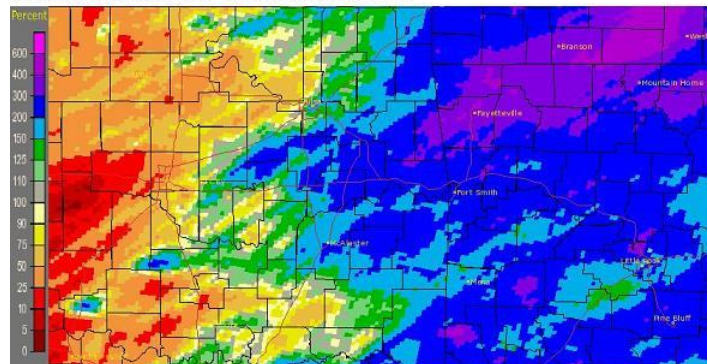


Fig. 1a. Estimated Observed Rainfall for April 2011

Tulsa, OK (TSA): April, 2011 Monthly Percent of Normal Precipitation
 Valid at 5/1/2011 1200 UTC- Created 5/3/11 17:42 UTC



1b. Estimated % of Normal Rainfall for April 2011

According to the Oklahoma Climatological Survey, southeast OK went from the driest March on record to the 11th wettest April on record and east central OK went from the 6th driest March to the 5th wettest April! Fort Smith, AR also experienced a large shift over the last month, going from the 5th driest March on record to the 3rd wettest April on record!

In Tulsa, OK, April 2011 ranked as the 23rd warmest April (63.4°F; since records began in 1905) and the 31st wettest April (5.41"; since records began in 1888). Fort Smith, AR was the 20th warmest April (64.5°F, tied with 2010) and the 3rd wettest April (9.55") since records began in 1883.

April 2011 set the record for the most tornadoes in a month in the NWS Tulsa forecast area. There were 42 tornadoes in April, all of which occurred in a 12-day period. The previous record was 39 tornadoes in May 2010. April 14, 2011 also broke the calendar day record for tornadoes, with 25 confirmed tornadoes. The previous forecast area record was 22 tornadoes on May 10, 2010.

Some of the larger precipitation reports (in inches) for April 2011 included:

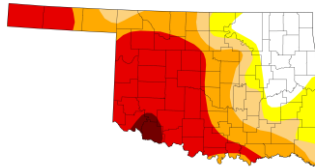
Hindsville, AR 10E (coop)	19.32	Prairie Grove, AR (coop)	18.30	Hindsville, AR 10NNE (coop)	17.45
Eureka Springs, AR 3WNW (coop)	17.29	Wesley, AR 3N (coop)	16.63	Berryville, AR 5NW (coop)	16.19
Fayetteville, AR (ASOS)	15.28	Westville, OK (meso)	14.91	Cookson, OK (meso)	14.46
Odell, AR 2N (coop)	13.77	St. Paul, AR (coop)	13.56	NW AR Regional Arpt (ASOS)	12.98
Gravette, AR (coop)	12.54	Webbers Falls, OK (meso)	12.40		

According to the [U.S. Drought Monitor](#) (USDM) from April 26, 2011, significant improvements have occurred this month due to the heavy rain and flooding event during the last couple of weeks in April. Severe (D2) drought conditions were still affecting Choctaw and southern Pushmataha Counties, where extreme (D3) conditions existed last month and the heaviest rainfall this month remained just to the north of this area. Moderate (D1) drought conditions remained over Pushmataha, Pawnee, and portions of Creek and Okfuskee Counties. Abnormally dry (D0) conditions were affecting all or portions of Osage, Tulsa, Creek, Okmulgee, Okfuskee, Pittsburg, Haskell, Latimer, Le Flore, Sequoyah, Crawford, Sebastian, and Franklin Counties (see Figs. 2 & 3).

U.S. Drought Monitor Oklahoma

April 26, 2011
Valid 7 a.m. EST

	Drought Conditions (Percent Area)					
	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	16.89	83.11	72.45	60.83	38.88	1.95
Last Week (04/19/2011 map)	3.83	96.17	86.21	72.88	37.93	0.00
3 Months Ago (01/25/2011 map)	0.36	99.64	64.35	5.51	0.00	0.00
Start of Calendar Year (12/28/2010 map)	13.82	86.18	47.90	1.50	0.00	0.00
Start of Water Year (09/28/2010 map)	66.28	33.72	4.21	0.00	0.00	0.00
One Year Ago (04/29/2010 map)	92.03	7.97	0.00	0.00	0.00	0.00



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

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



Released Thursday, April 28, 2011
Michael Brewer, National Climatic Data Center NOAA

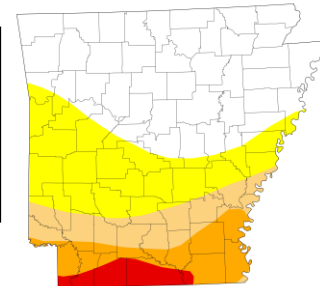
<http://drought.unl.edu/dm>

Fig. 2. Drought Monitor for Oklahoma

U.S. Drought Monitor Arkansas

April 26, 2011
Valid 7 a.m. EST

	Drought Conditions (Percent Area)					
	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	50.13	49.87	24.45	13.41	3.86	0.00
Last Week (04/19/2011 map)	1.67	98.33	80.60	48.13	17.25	0.00
3 Months Ago (01/25/2011 map)	0.00	100.00	97.24	70.02	12.43	0.00
Start of Calendar Year (12/28/2010 map)	0.00	100.00	85.33	69.74	13.26	0.00
Start of Water Year (09/28/2010 map)	25.16	74.84	50.68	25.16	0.00	0.00
One Year Ago (04/29/2010 map)	85.90	14.10	0.66	0.00	0.00	0.00



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

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



Released Thursday, April 28, 2011
Michael Brewer, National Climatic Data Center NOAA

<http://drought.unl.edu/dm>

Fig. 3. Drought Monitor for Arkansas

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

Rank since 1921 ("Last XX days" ending April 30, 2011)	April 2011	Spring 2011 (Mar 1, 2011 – Apr 30, 2011)	Last 90 days (Jan 31, 2011 – Apr 30, 2011)	Year-to-Date (Jan 1, 2011 – Apr 30, 2011)	Water Year (Oct 1, 2010 – Apr 30, 2011)	Last 365 Days (May 1, 2010 – Apr 30, 2011)
Northeast OK	20 th wettest	38 th wettest	31 st wettest	44 th wettest	18 th driest	44 th wettest
East Central OK	5 th wettest	13 th wettest	15 th wettest	30 th wettest	27 th driest	35 th driest
Southeast OK	11 th wettest	39 th wettest	40 th driest	22 nd driest	12 th driest	5 th driest
Statewide	37 th driest	19 th driest	16 th driest	8 th driest	7 th driest	17 th driest

After several months of below normal conservation pools, the heavy rain during the end of April caused most of the major reservoirs in the Tulsa HSA to go into flood control operations, with only a few reservoirs right around 100% of conservation pool. Skiatook Lake was the only reservoir reporting a conservation pool deficit as of May 2, 2011, with 84% conservation pool. As of May 2, 2011, the following reservoirs were reporting flood control storage: Tenkiller Lake 82%, Wister Lake 61%, Fort Gibson Lake 42%, Sardis Lake 38%, Hudson Lake

33%, Pensacola/Grand Lake 29%, Eufaula Lake 20%, Oologah Lake 11%, Hugo Lake 10%, and Copan Lake 4%. Beaver Lake saw an extreme change in April, going from only having 81% of its conservation pool storage on April 1 to 90% of flood control storage as of April 29, 2011 (with a maximum of 119% of flood control pool utilized on April 26).

Outlooks

The [Climate Prediction Center](#) (CPC) outlook for May 2011 (issued April 30, 2011) indicates a slightly enhanced chance for above average temperatures south of a Tulsa to Fort Smith line and an equal chance for above, near, and below average temperatures elsewhere. The May 2011 outlook also calls for a slightly enhanced chance for below median precipitation northwest of I-44, and a slightly enhanced chance for above median precipitation southeast of a McAlester to Bentonville line. Equal chances for above, near, and below median precipitation are projected in between these areas. For the 3-month period May-Jun-Jul 2011, CPC is forecasting an equal chance for above, near, and below average temperatures across eastern OK and northwest AR. This outlook also calls for a slightly enhanced chance for above median precipitation across far northeast OK and far northwest AR, with an equal chance for above, near, and below median precipitation elsewhere (outlook issued April 21, 2011).

According to CPC, weak La Niña conditions were observed at the end of April as negative sea surface temperature anomalies continued to weaken in parts of the Pacific Ocean. The direct impact of La Niña is expected to be minimal on the U.S. in May. Current computer models indicate that La Niña conditions will continue to diminish through the remainder of spring 2011, with ENSO-neutral conditions likely by June 2011. A La Niña Advisory continues, meaning La Niña conditions have been observed and are expected to continue.

Summary of Precipitation Events

April 1 – 18 (Record Tornado Event 4/14):

Elevated showers developed from northeast OK into northwest AR on the 1st as an upper-level jet streak moved through the region. However, only a few hundredths of rain fell over locations northeast of a Vinita, OK to Ozark, AR line.

Showers and thunderstorms developed along a cold front late on the 3rd and continued through the morning hours of the 4th, affecting locations east of a Pawhuska to Sallisaw to Hugo line. Rainfall totals were generally a few hundredths to near 0.50", though areas with the stronger thunderstorm activity in Franklin and Madison Counties received up to 1" of rain.

Severe thunderstorms developed along a dry line across north central OK on the evening of April 8. As these storms moved eastward through the overnight hours, they affected locations across northeast OK north of a Pawhuska to Grove line. A supercell wind gust of 82 kt (94 mph) was measured at Ponca City. Additional reports of large hail the size of golf balls (1.75") to tennis balls (2.5") were reported across northeast OK. Rainfall totals were highest across the far northwest portion of the HSA, where 1" to 4" of rain was estimated across eastern Kay and northwestern Osage Counties. The remainder of the affected area received around 0.10" to 1" of rainfall.

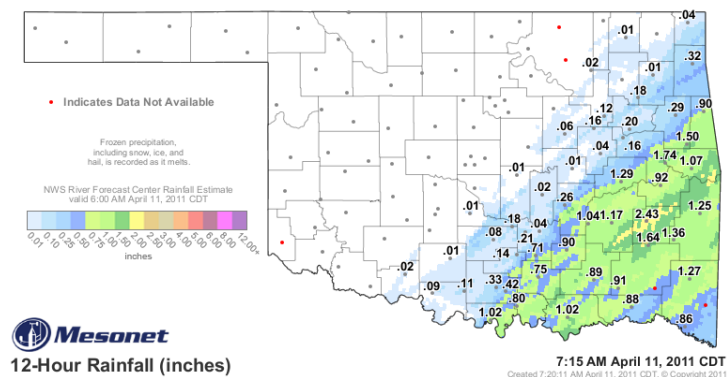


Fig. 4. 12-hr rainfall ending at 7:15am 4/11/11.

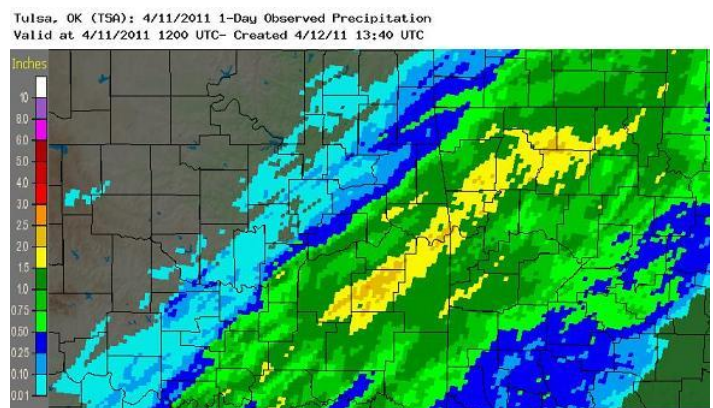


Fig. 5. 24-hr rainfall estimate ending at 7am 4/11/11.

Another dry line pushed into eastern OK during the evening of the 10th, bringing widespread showers and thunderstorms to eastern OK and northwest AR, primarily south of I-44. The storms continued through the overnight hours as a cold front overtook the dryline. The heaviest rainfall occurred where it was needed most, across the drought stricken southeast and east central OK and west central AR. This area received 1" to 2.5" of rain from this activity (see Figs. 4, 5), with hail the size of ping pong balls (1.5") to hen eggs (2") also reported. The COOP observer in Midland, AR measured the highest total of 2.90". Elsewhere, rainfall amounts were generally a few hundredths to one quarter of an inch.

A severe thunderstorm and tornado outbreak affected eastern OK and northwest AR on the 14th as a strong low pressure system moved out of the Rockies and into the Southern Plains. A surface low deepened across central Kansas by early afternoon, with a sharp dryline extending from the surface low southward along the I-35 corridor. Initial convection occurred along the dryline from near Ponca City to Ardmore at around 3 pm CDT. These storms quickly matured into supercells as they moved further east into eastern OK due to favorable wind profiles and instability. Storms continued to increase as the dryline slowly moved east during the evening. A trailing cold front overtook the dryline during the late evening hours, leading to additional development and a line of storms across western Arkansas. 25 tornadoes (a new daily record for the NWS Tulsa area) and reports of hail to the size of golf balls and softballs were received by the NWS office in Tulsa through the evening hours as the storms moved through eastern OK and northwest AR. The storms moved further east into AR and out of the HSA by around 1:30 am. Additional information on this event can be found at <http://www.srh.noaa.gov/tsa/?n=weather-event-2011apr14>.

In addition to the large hail and tornadoes, heavy rainfall also occurred with this storm system. A large portion of the HSA received rainfall totals of 0.5" to 2", with amounts of 2" to 4" across portions of southeast OK and west central AR (see Fig. 6). The NWS COOP observer located 14WNW of Clayton measured 3.50" of rain from this event. This rainfall, combined with the rain from the 10th, greatly helped to improve the drought conditions across southeast OK. As the upper-level low moved across far northeast OK, additional light wrap-around precipitation occurred. This rainfall totaled 0.1" to 0.5" across far northeast OK.

Tulsa, OK (TSA): 4/15/2011 1-Day Observed Precipitation
Valid at 4/15/2011 1200 UTC- Created 4/15/11 17:49 UTC

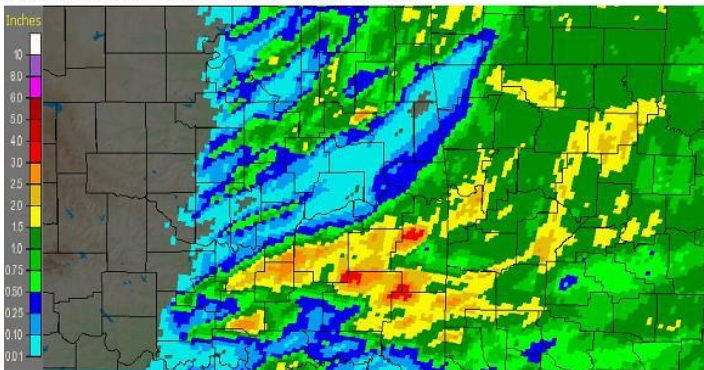


Fig. 6. 24-hr rainfall estimate ending at 7am 4/15/11.

April 19 – 30 (Record Flood Event 4/21-27):

A very active weather pattern set up over the Southern Plains from April 19-27. Another round of severe weather affected southeast OK and northwest AR on the 19th as a cold front overtook a dryline. While the cap kept the storms isolated, 4 tornadoes and hail the size of golf balls (1.75") to tea cup (3") occurred. Rainfall totals from the storms ranged from 0.1" to 1.5" across mainly northern Pushmataha, southern Le Flore, eastern Benton, northern Washington AR, Carroll, and northern Madison Counties. See <http://www.srh.noaa.gov/tsa/?n=weather-event-2011apr19> for details about this event.

Back-building showers and thunderstorms developed into portions of Choctaw, Pushmataha, Le Flore, and Sebastian Counties during the evening of the 20th. Rainfall totals were 0.1" to near 1.5". As a warm front lifted north into the HSA on the 21st, moist lift over the boundary generated showers and thunderstorms across eastern OK and western AR. These storms were efficient rain producers, with high precipitable water values present in the atmosphere. Far eastern OK and northwest AR received the highest rainfall totals of 1.5" to near 3", as shown in Fig. 7. The COOP observer at 2NNW Bengal, AR measured 2.39", and 2.32" was measured at

the OK Mesonet site in Jay, OK. Some of the storms became severe, producing very large hail. A hail stone from Fayetteville, AR measured 2.68" in diameter.

On the 22nd, the front moved back south into the HSA as a cold front, again igniting another round of severe thunderstorms, including an additional 8 tornadoes, and bringing more rain to the region. The front remained nearly stationary over the HSA through the 27th before being pushed further eastward. Severe weather continued during this time, with one tornado occurring on 4/23, two on 4/24, and two on 4/26. This front was associated with the historic tornado "Super Outbreak" across the Deep South Region after exiting the HSA. See Figs. 8-14 for rainfall during this time period.

A series of upper-level disturbances interacted with the frontal boundary while it was draped across the area, leading to multiple rounds of strong to severe thunderstorms and associated heavy rainfall. By April 24, the once drought-stricken area had become saturated and widespread flash flooding occurred. Storms that continued on April 25 only exacerbated the flash flooding. In addition, rapid rises along area creeks and rivers caused extensive river flooding, especially in the Illinois River Basin, where record flooding occurred (additional information about this event can be found at http://www.srh.noaa.gov/tsa/?n=weather-event_2011apr25).

New Record Floods:

River Location	Preliminary Crest Height	Crest Time	Previous Record
Illinois River near Watts, OK	28.60 feet	3:00 am CDT 4/26/2011	25.96 feet 7/25/1960
Baron Fork at Eldon, OK	28.51 feet	10:30 pm CDT 4/25/2011	26.77 feet 6/21/2000

Major Flooding:

River Location	Preliminary Crest Height	Crest Time	Current Record
Kings River near Berryville, AR	35.47 feet	7:45 am CDT 4/26/2011	38.91 feet 11/19/1985
Illinois River near Tahlequah, OK	25.97 feet	9:00 pm CDT 4/26/2011	27.94 feet 5/10/1950

Moderate and Minor flooding also occurred at the following locations: Arkansas River at Van Buren, AR; Lee Creek near Van Buren; Poteau River near Poteau, OK; Poteau River Panama, OK; Flint Creek near Kansas, OK; Deep Fork River near Beggs, OK; Neosho River near Commerce, OK; Spring River near Quapaw, OK, and Polecat Creek near Sapulpa. (Specific river flood information is available in the E3 Report.)

A business along the Illinois River near Watts had ~8' of water inside the building due to the record flooding (see Fig. 15). The Fiddlers Bend area, at the confluence of the Illinois River and Flint Creek, also experienced extensive damage. Several cottages were submerged or swept off their foundations (see Fig. 16). While notified ahead of time that major flooding was expected, several residents refused to leave. Thankfully, there were no fatalities in this area. Canoe and other recreational businesses along the Illinois River in Cherokee County were flooded as well. The Oklahoma Scenic Rivers Commission (OSRC) headquarters, which is located along the Illinois River, became an island as Hwy 10 was flooded both north and south of their building. The five men that were stranded at the OSRC were still able to receive flood forecast and warning information, and were able to pass this information along to the hundreds of others that were also stranded and without utilities. Camp Egan, upstream of Eldon along the Baron Fork, also experienced flood damage. Water reached a depth of 6' at an open-air tabernacle, with ~12"-18" of water in the Lodge and storage sheds.

Widespread rainfall totals of 6" to 12" affected east central Oklahoma and northwest Arkansas during the 7-day period ending at 7 am CDT April 28, 2011. Portions of Adair County in Oklahoma and Washington and Benton Counties in Arkansas (Illinois River basin) received 12" to 16" of rainfall during this same time. For reference, the 30-year normal (1971-2000) April rainfall for Fayetteville, AR is 4.33", and the normal annual rainfall is 46.02". The widespread flash flooding unfortunately led to 5 fatalities in northwest Arkansas when 3 vehicles were swept away or stalled in high water (one vehicle went around a road closed barricade). Dozens of water rescues occurred during this multi-day event across east central OK and northwest AR. So many roads were flooded that emergency management officials in Adair County, OK and Washington County, AR issued emergency requests discouraging travel throughout and into the counties.

Several locations across northwest Arkansas and east central Oklahoma measured over 5" of rain in one day, including: Haskell, OK 6.77" (4/24 OK mesonet), Okmulgee, OK 6.76" (4/24 OK mesonet), Prairie Grove, AR 6.07" (4/25, COOP), Hectorville, OK 5.74" (4/24, OK mesonet), Porter, OK 5.51" (4/24, OK mesonet), Muskogee Davis Field, OK 5.19" (4/24, ASOS), and Hindsville, AR 10E 5.10" (4/24, COOP). In addition, many locations in this area received 3+ inches of rainfall for 3 days in a row (rain that fell on April 23-25).

The heavy rain also caused several reservoirs to reach critical levels. Beaver Lake in northwest AR reached a pool elevation of 1130.1' by 11pm on April 25th, where the top of the flood pool is 1130.0'. By 2 pm on the 26th, the pool had exceeded the top of flood pool with a maximum elevation of 1131.7' (119% of flood pool). Due to the high pool level, releases out of Beaver Lake Dam increased through the day on the 25th, with a maximum release of 71,068 cfs by 3 pm of the 26th. These high releases, combined with a high pool elevation downstream at Table Rock Lake, led to additional flooding along the White River in Carroll County (see Figs 17, 18). Several homes were reported under water near the river.

Inflows from the Illinois River caused Tenkiller Lake to reach a maximum pool elevation of ~663.3' during the morning of the 29th, where top of the flood pool is 667' (over 80% full and ~31' above normal). Thankfully the rain ended before the dam reached the top of the flood pool, and releases out of Tenkiller remained within banks downstream of the dam. Wister Lake also rose well into its flood pool, with a maximum pool elevation of ~501', where the top of the flood pool is 502.5' (over 90% full and ~23' above normal). Releases were able to be halted while flooding of the Poteau River downstream occurred. Once the flooding ended, releases began to lower the pool at Wister Lake. These releases did not cause any additional flooding downstream.

Tulsa, OK (TSA): 4/22/2011 1-Day Observed Precipitation
Valid at 4/22/2011 1200 UTC- Created 4/24/11 23:39 UTC

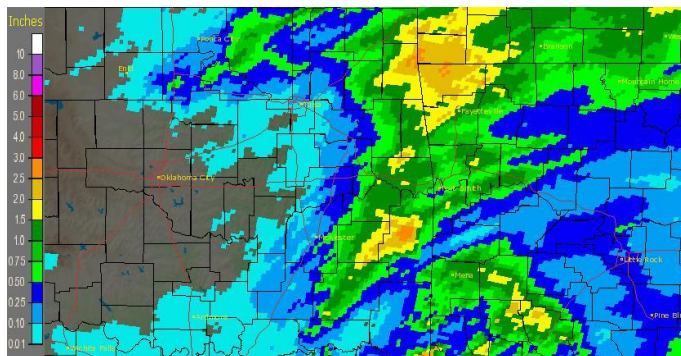


Fig. 7. 24-hr rainfall estimate ending at 7am 4/22/11.

Tulsa, OK (TSA): 4/23/2011 1-Day Observed Precipitation
Valid at 4/23/2011 1200 UTC- Created 4/25/11 23:39 UTC

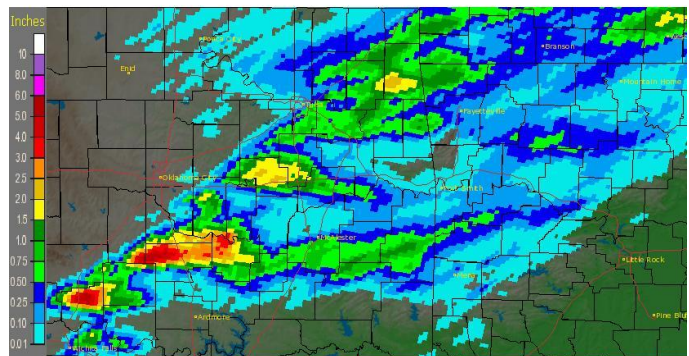


Fig. 8. 24-hr rainfall estimate ending at 7am 4/23/11.

Tulsa, OK (TSA): 4/24/2011 1-Day Observed Precipitation
Valid at 4/24/2011 1200 UTC- Created 4/26/11 15:39 UTC

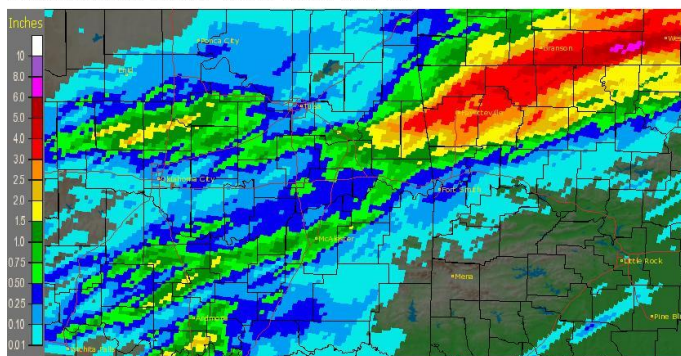


Fig. 9. 24-hr rainfall estimate ending at 7am 4/24/11.

Tulsa, OK (TSA): 4/25/2011 1-Day Observed Precipitation
Valid at 4/25/2011 1200 UTC- Created 4/26/11 15:41 UTC

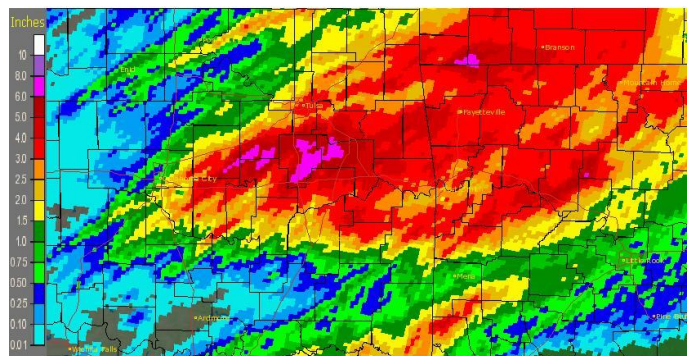


Fig. 10. 24-hr rainfall estimate ending at 7am 4/25/11.

Tulsa, OK (TSA): 4/26/2011 1-Day Observed Precipitation
Valid at 4/26/2011 1200 UTC- Created 4/26/11 15:50 UTC

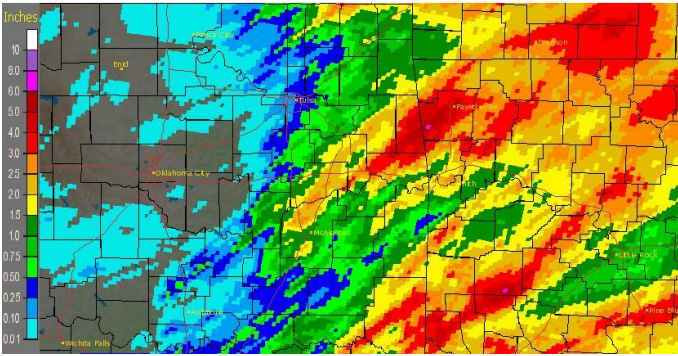


Fig. 11. 24-hr rainfall estimate ending at 7am 4/26/11.

Tulsa, OK (TSA): 4/27/2011 1-Day Observed Precipitation
Valid at 4/27/2011 1200 UTC- Created 4/29/11 23:31 UTC

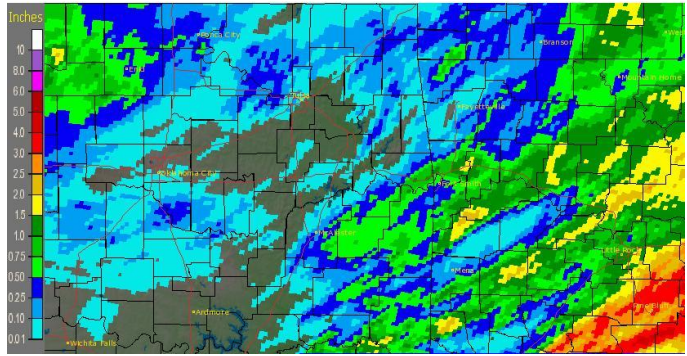


Fig. 12. 24-hr rainfall estimate ending at 7am 4/27/11.

Tulsa, OK (TSA): 4/28/2011 1-Day Observed Precipitation
Valid at 4/28/2011 1200 UTC- Created 4/30/11 23:31 UTC

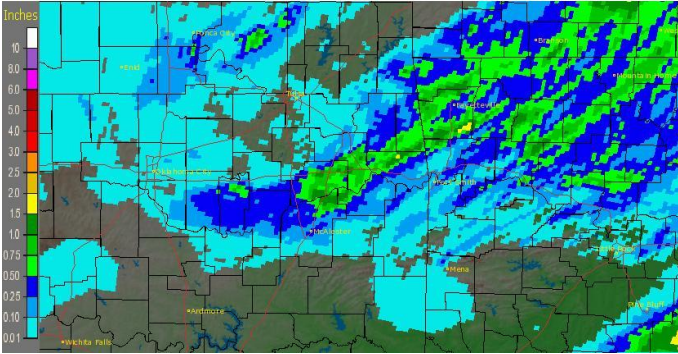


Fig. 13. 24-hr rainfall estimate ending at 7am 4/28/11.

Tulsa, OK (TSA): Current 7-Day Observed Precipitation
Valid at 4/26/2011 1200 UTC- Created 4/26/11 16:09 UTC

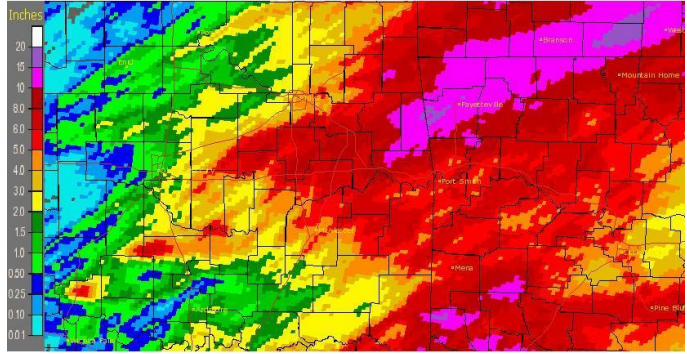


Fig. 14. 7-day rainfall estimate ending at 7am 4/26/11.



Fig. 15. Flooded business along the Illinois River near Watts. Water reached approximately the blue dashed line.



Fig. 16. Fiddlers Bend along the Illinois River. Green home was washed from its foundation. Red home was also moved off its foundation.



Fig. 17. Suspension bridge on Hwy 187 over the White River.



Fig. 18. Releases out of Beaver Dam.

Written by:

Nicole M^cGavock,
Service Hydrologist
WFO Tulsa

Products issued:

- 30 River Flood Warnings (FLW)
- 128 River Flood Statements (FLS)
- 2 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)
- 1 Drought Information Statements (DGT)

Preliminary Hydrographs for April 2011:



