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 **December** YEAR **2012**
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 **January 11, 2013**

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.

Severe weather brought an EF-1 tornado to west central AR in December 2012, while southeast OK and northwest AR had a white Christmas. December 2012 had above normal temperatures, and 2012 ended as the warmest year on record for Tulsa, Fort Smith, Fayetteville, the state of Oklahoma, and the contiguous United States. The state of Arkansas recorded its 2nd warmest year on record. Normal precipitation for December ranges from 1.5 inches in Pawnee County to 3.2 inches in Haskell County. Normal precipitation for the Ozark region of northwest Arkansas averages 3.2 inches for the month.

Monthly Summary

Using the radar-derived estimated observed precipitation from the RFCs (Fig. 1a), rainfall totals for December 2012 ranged from around 0.25" near the OK/KS state line to around 4" in southern Franklin County. This represents 75% or less of the normal December rainfall (Fig. 1b) for most of eastern OK and northwest AR. The low totals near the OK/KS border resulted in portions of Pawnee, Osage, Washington, Nowata, and Craig Counties receiving only 10%-25% of the normal December rainfall this month.

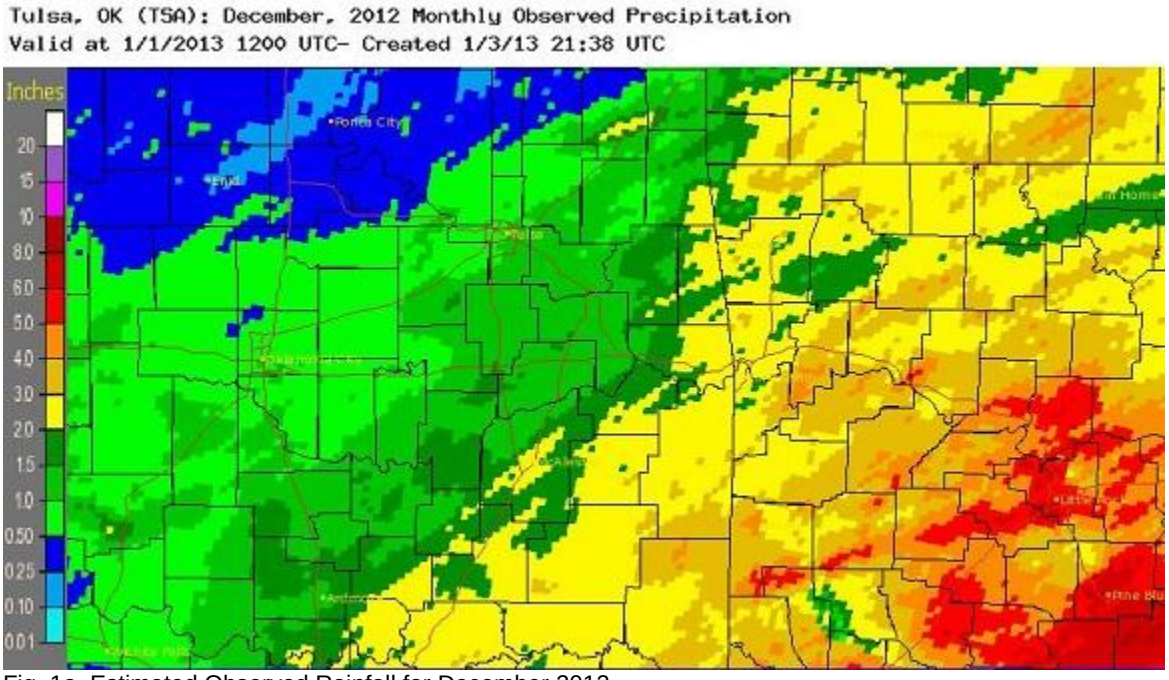


Fig. 1a. Estimated Observed Rainfall for December 2012

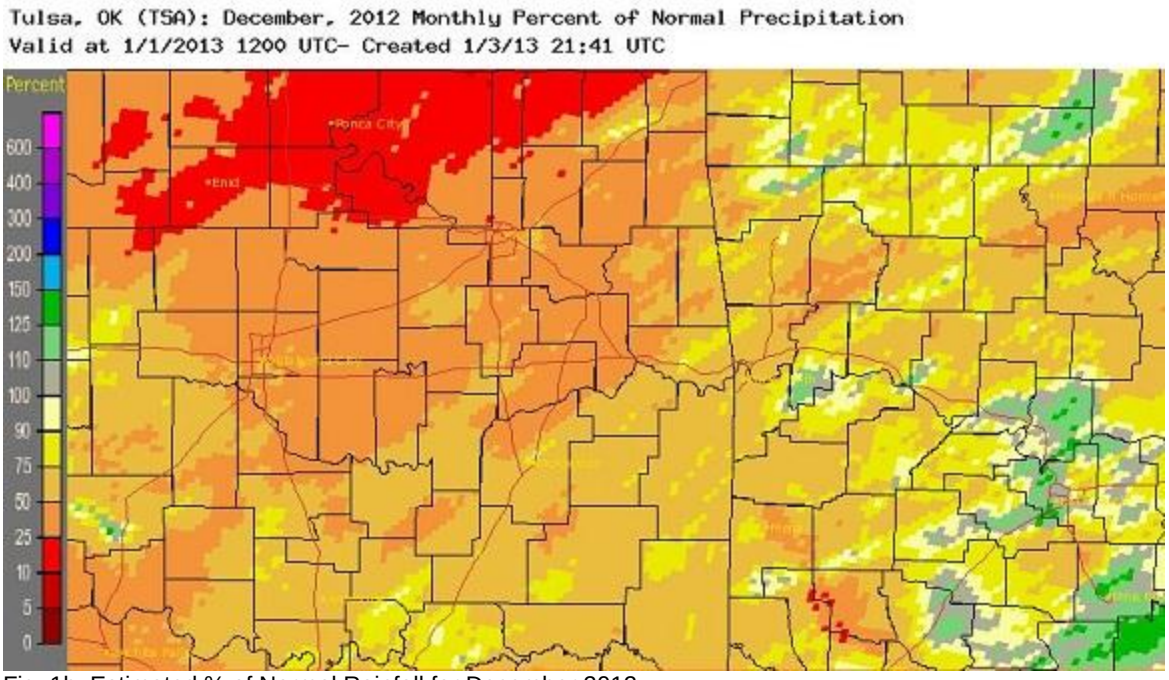


Fig. 1b. Estimated % of Normal Rainfall for December 2012

In Tulsa, OK, December 2012 ranked as the 18th warmest December (43.6°F, tied 2001, 1941; since records began in 1905) and the 30th driest December (0.85, tied 2004"; since records began in 1888). A trace of snow was recorded this month in Tulsa. Fort Smith, AR was the 13th warmest December (46.2°F, tied 1896; since records began in 1882), the 63rd wettest December (2.75"; since records began in 1882), and the 9th snowiest December (4.0", tied 1963; since records began in 1883). Fayetteville, AR was the 10th warmest December (42.3°F), the 30th wettest December (2.85), and the 23rd snowiest December since records began in 1949.

Some of the larger precipitation reports (in inches) for December 2012 included:

Antlers, OK (meso)	3.22	Cloudy, OK (meso)	3.21	Gravette, AR (coop)	3.15
Clayton, OK (meso)	2.95	Hugo, OK (meso)	2.89	Fayetteville, AR (ASOS)	2.85
Westville, OK (meso)	2.84	Fort Smith, AR (ASOS)	2.75	Sallisaw, OK (meso)	2.67

Some of the lowest precipitation reports (in inches) for December 2012 included:

Burbank, OK (meso)	0.33	Foraker, OK (meso)	0.33	Bartlesville, OK (ASOS)	0.42
Pawnee, OK (meso)	0.43	Nowata, OK (meso)	0.44	Copan, OK (meso)	0.47
Wynona, OK (meso)	0.53	Mannford, OK (coop)	0.57	Claremore, OK (coop)	0.74

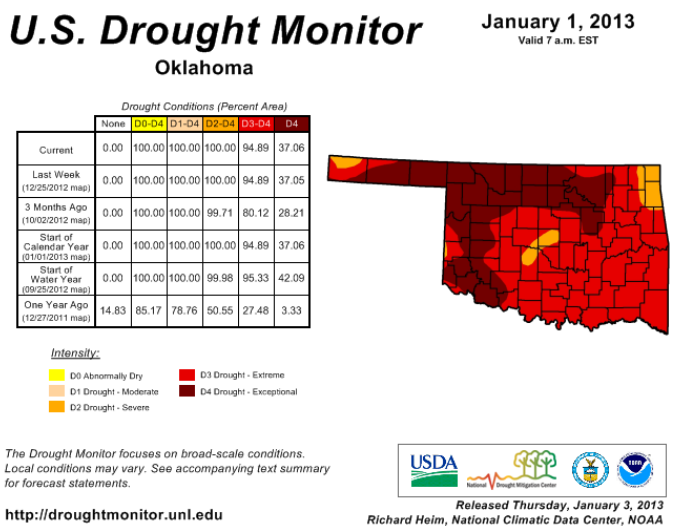


Fig. 2. Drought Monitor for Oklahoma

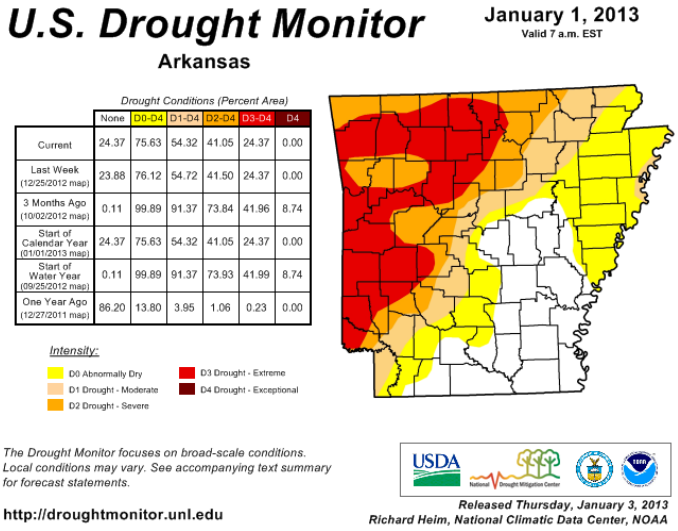


Fig. 3. Drought Monitor for Arkansas

According to the U.S. Drought Monitor (USDM) from January 1, 2013 (Figs 2, 3), all of eastern OK and northwest AR was in Severe to Exceptional drought. Exceptional (D4) drought was occurring over portions of Osage,

Pawnee, Creek, western Tulsa, and Washington Counties in eastern OK. Severe (D2) drought was present across portions of Ottawa, eastern Craig, and Delaware Counties in eastern OK, and Benton, northern Carroll, Crawford, and northern Franklin Counties in northwest AR. Extreme drought (D3) conditions existed across the remainder of the area.

Most of the major reservoirs in the Tulsa HSA were operating below 90% of their conservation pools as of January 8, 2013. However, 1 reservoir was operating above its conservation pool: Hudson Lake 108%. Reservoirs reporting conservation pool deficits below 90% as of January 8, 2013: Hugo Lake 40%, Hulah Lake 46%, Birch Lake 50%, Skiatook Lake 65%, Beaver Lake 67%, Eufaula Lake 67%, Tenkiller Lake 68%, Keystone Lake 69%, Copan Lake 74%, Oologah Lake 80%, Ft. Gibson Lake 83%, Wister Lake 84%, Heyburn Lake 86%, and Sardis Lake 89%.

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

Rank since 1921	Dec. 2012	Last 60 Days (Nov 2 – Dec 31)	Water Year-to-Date (Oct 1 – Dec 31)	Cool Growing Season (Sep 1 – Dec 31)	Last 180 Days (Jul 5 – Dec 31)	Year 2012 (Jan 1 – Dec 31)
Northeast OK	17th driest	**7th driest**	**15th driest**	**10th driest**	**3rd driest**	**9th driest**
East Central OK	30th driest	**9th driest**	**10th driest**	**13th driest**	**9th driest**	**6th driest**
Southeast OK	40th driest	**10th driest**	**7th driest**	**5th driest**	**11th driest**	**9th driest**
Statewide	26th driest	**8th driest**	**6th driest**	**9th driest**	**2nd driest**	**7th driest**

2012 Annual Summary

Using the radar-derived estimated observed precipitation from the RFCs (Fig. 4a), rainfall totals for 2012 ranged from around 20" in Pawnee and western Osage Counties to around 45" in portions of southeast OK and west central AR. This represents 50%-90% the normal annual rainfall across eastern OK and northwest AR, though a few pockets of only 25%-50% of normal were found in Pawnee, Tulsa, and Washington AR Counties (Fig. 4b).

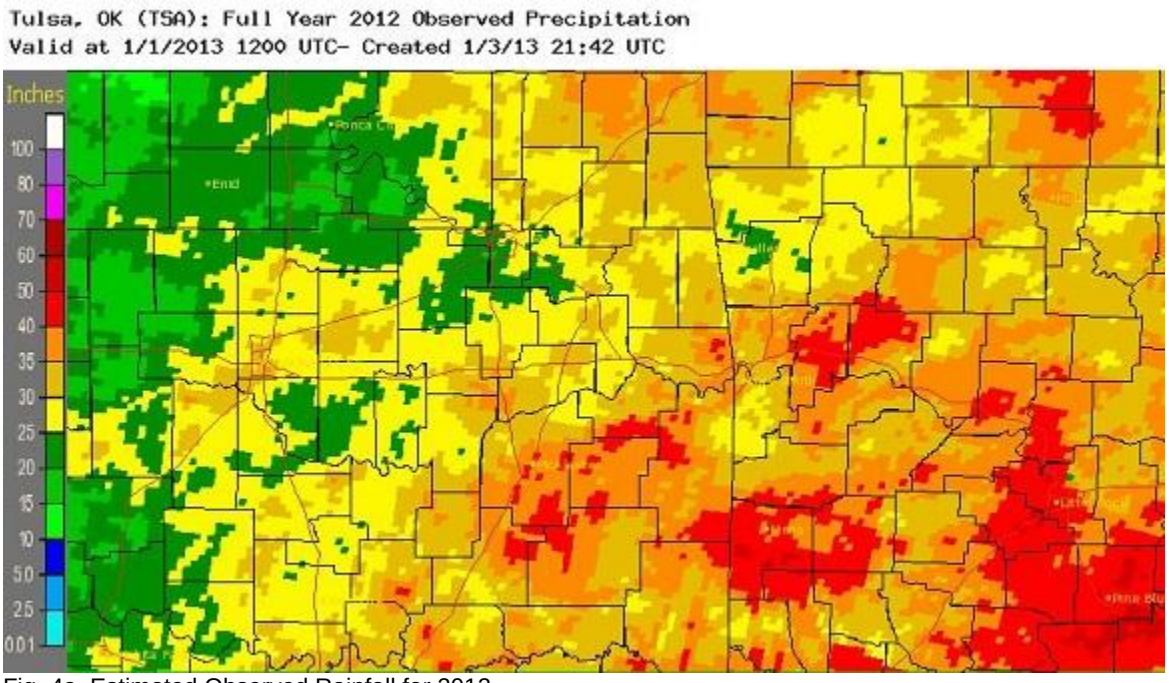


Fig. 4a. Estimated Observed Rainfall for 2012

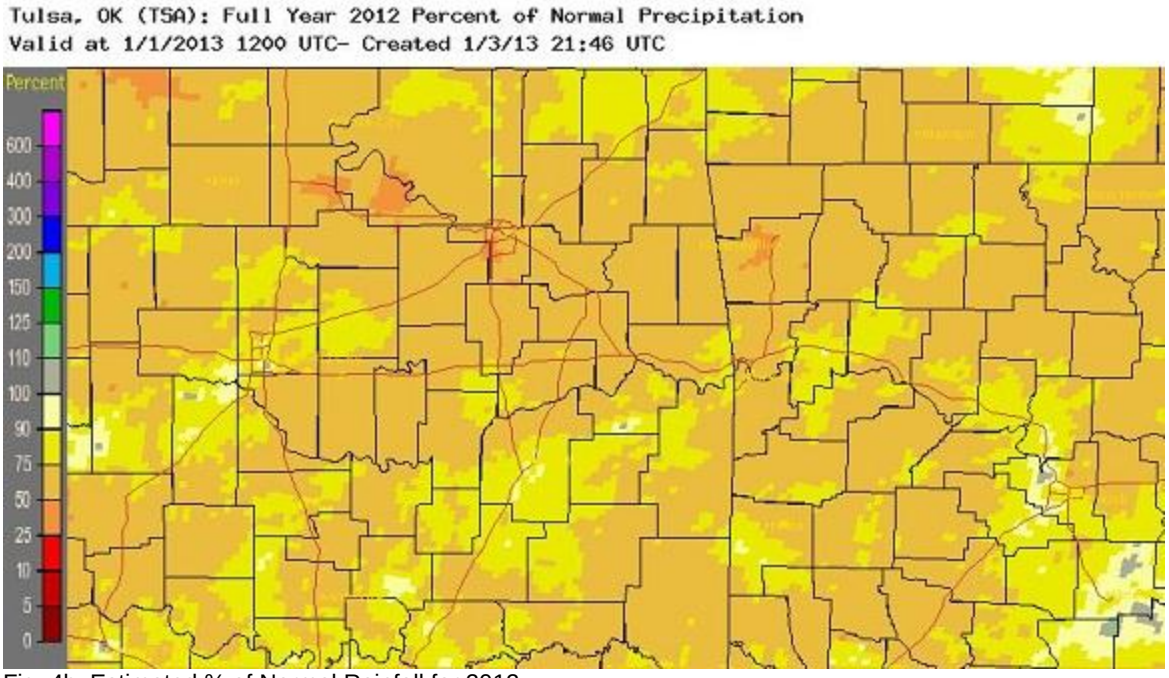


Fig. 4b. Estimated % of Normal Rainfall for 2012

2012 was also defined by the Severe to Exceptional Drought that affected the region for much of the year. Despite a wetter winter 2011-12, the 2012 Drought was an extension of the drought conditions that began in October 2010. According to the Oklahoma Climatological Survey, 2012 was the 3rd driest year (since records began in 1921) in northeast OK, the 9th driest in east central OK, and the 11th driest in southeast OK.

People across eastern OK and northwest AR may recall the summer of 2012 as being especially hot, but above normal temperatures occurred every month except for October in 2012. As a result, Tulsa, OK, Fort Smith, AR, and Fayetteville, AR all recorded their warmest year in 2012 for their respective periods of record. March 2012 was the warmest March on record across the region, averaging around 10°F above normal, and several other months this year had average temperatures in excess of 5°F above normal. More detailed information about the record warm 2012 can be found here. 16 tornadoes occurred in eastern Oklahoma and northwest Arkansas in 2012. Information about these tornadoes and other significant weather events in 2012 can be found on this weather events website.

- According to the National Climatic Data Center, in 2012, the contiguous United States average annual temperature of 55.3°F was 3.3°F above the 20th century average, and was the warmest year in the 1895-2012 period of record for the nation. The 2012 annual temperature was 1.0°F warmer than the previous record warm year of 1998. 19 states in the contiguous U.S. were the warmest on record, including Oklahoma.

- In Tulsa, OK, 2012 ranked as the **RECORD** warmest Year (64.7°F; since records began in 1905). The previous record was 63.7°F in 1954 and 1921. 2012 was also the 16th driest Year in Tulsa (28.74"; since records began in 1888) and the 14th least snowy Year (1.7", tied 1991, 1974, 1936, 1904; since records began in 1900).

- In Fort Smith, AR, 2012 was the **RECORD** warmest Year (66.2°F; since records began in 1883). The previous record was 64.5°F in 1938. 2012 was also the 33rd driest Year in Fort Smith (33.94"; since records began in 1882) and the 49th snowiest Year (6.0", tied with 1935, 1915; since records began in 1884).

- In Fayetteville, AR, 2012 was the **RECORD** warmest year (60.6°F; since records began in 1950). The previous record was 59.8°F in 1998. 2012 was also the 4th driest Year in Fayetteville (30.89"; since records began in 1950) and the 7th least snowy Year (1.4", tied 1974; since records began in 1950).

- The state of Oklahoma also had its **RECORD** warmest year in 2012 with an average temperature of

63.0°F. The previous record was 62.8°F in 1954. 2012 ranked as the 12th driest year on record for all of Oklahoma, with 25.80" of rain.

- The state of Arkansas ranked as the 2nd warmest year on record in 2012 with an average temperature of 63.4°F. The current record is 63.7°F in 1921. 2012 ranked as the 10th driest year on record for all of Arkansas, with 39.79" of rain.

Some of the larger precipitation reports (in inches) for 2012 included:

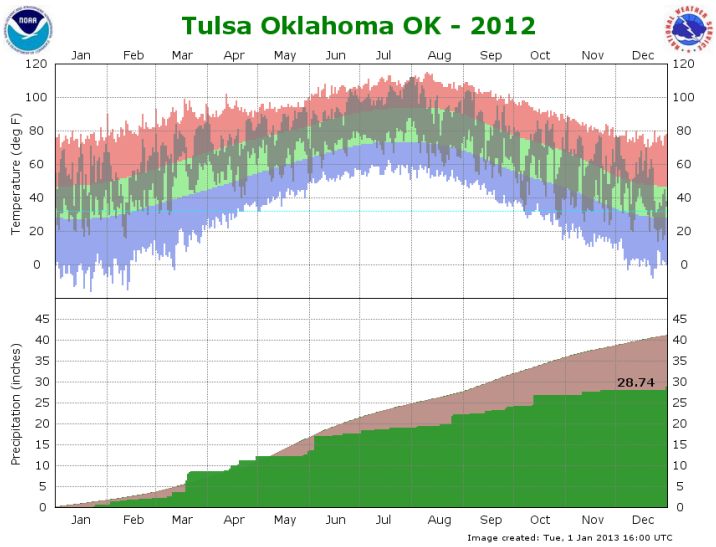
Clayton, OK (meso)	40.55	Antlers, OK (meso)	40.15	Mountainburg 2NE, AR (coop)	39.38
St. Paul, AR (coop)	39.19	Ozark, AR (coop)	39.09	Ashland, OK (coop)	38.75*
McAlester, OK (meso)	38.58	Vinita, OK (meso)	38.38	McAlester, OK (ASOS)	37.88

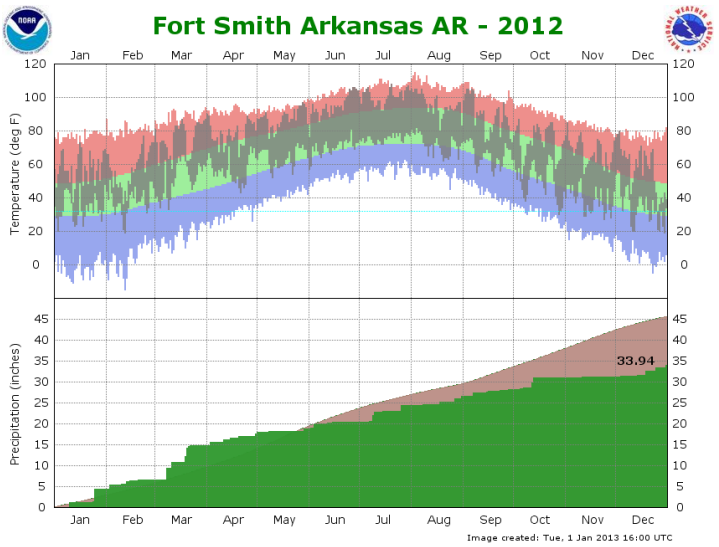
*Ashland total does not include Dec. 2012

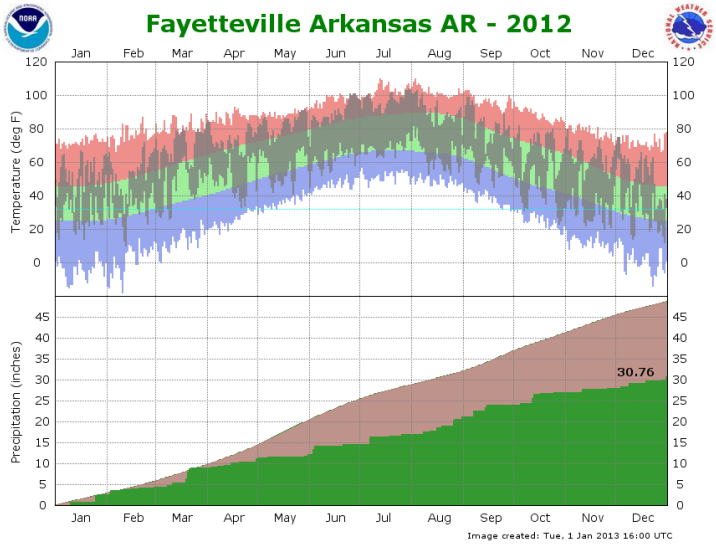
Some of the lowest precipitation reports (in inches) for 2012 included:

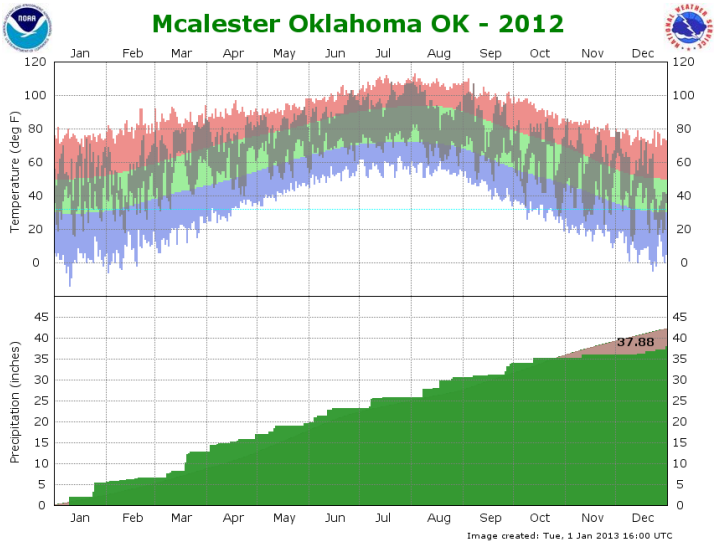
Pawnee, OK (coop)	18.21	Ralston, OK (coop)	18.59	Pawnee, OK (meso)	19.43
Tuskahoma, OK (coop)	20.32	Hectorville, OK (meso)	21.34	Jenks Riverside Arpt, OK (ASOS)	24.07
Burbank, OK (meso)	24.13	Bristow, OK (meso)	24.25	Porter, OK (meso)	25.42

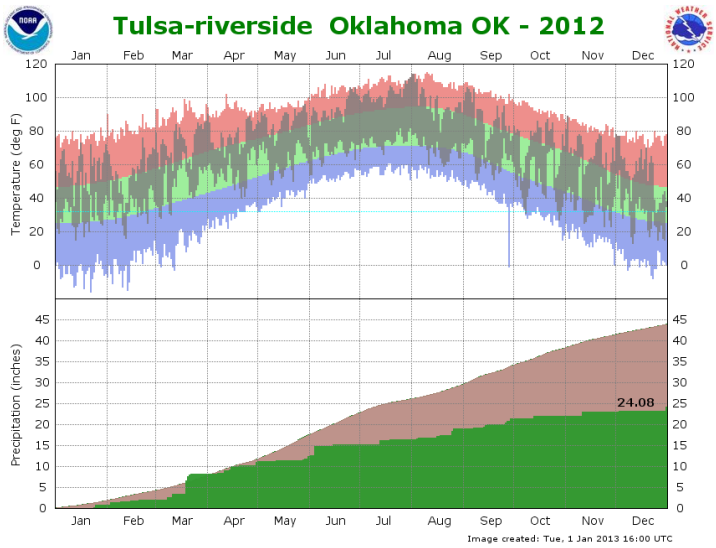
2012 Observed High/Low Daily Temperatures and Rainfall:

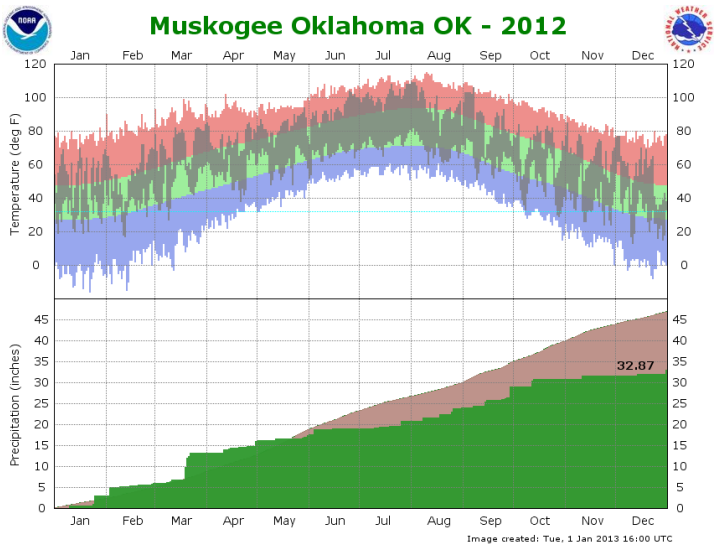


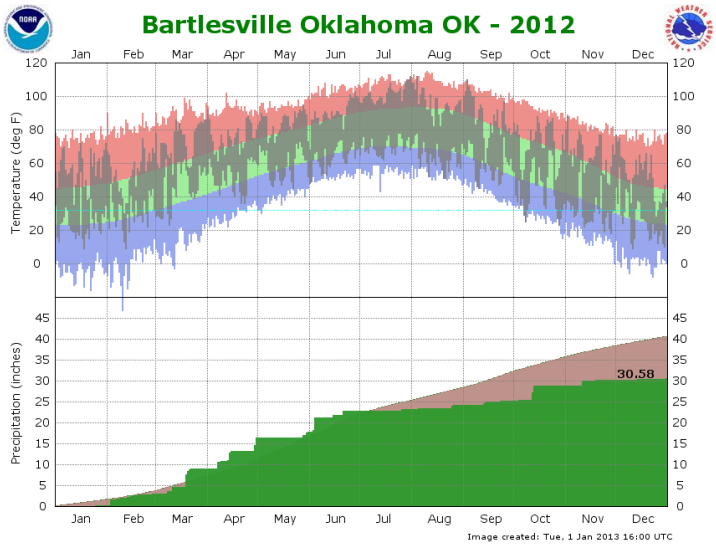












Outlooks

The Climate Prediction Center (CPC) outlook for January 2012 (issued December 31, 2012) indicates an enhanced chance for above normal temperatures and equal chances for above, near, and below median precipitation across all of eastern OK and northwest AR. This outlook is based primarily on short-range computer models. However, indications are that January 15-21 have increased odds of below normal temperatures and long-range computer models hint at colder than normal temperatures at the end of the month. 2-week forecasts for both the Arctic (AO) and North Atlantic Oscillations (NAO) show negative values, which can allow the colder Canadian air to move much further south into the U.S.

For the 3-month period Jan-Feb-Mar 2013, 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 December 20, 2012). According to CPC, ENSO neutral conditions were observed in late December and are expected to continue through Spring 2013. Therefore, this outlook is primarily based on dynamic computer model output.

Summary of Precipitation Events

December 2012

December started off very warm, with several daily temperature records broken across eastern OK and northwest AR. Temperatures climbed into the mid-70s on the 3rd ahead of a cold front that moved into eastern OK during the late evening hours. Showers and thunderstorms developed along the front as it pushed east into AR during the overnight and early morning hours. Most of northwest and west central AR received some rain,

as well as northeast OK west of Hwy75 and north of a Tulsa to Fort Smith line. Rainfall totals ranged from a few hundredths to near 1.5" (see Fig. 5). The highest totals occurred in Benton County, where 1.5"-2.5" of rain fell. 2.40" was measured in Centerton, AR. The front brought colder air, but temperatures still remained above normal for several more days.

Fig. 5. Estimated 24-hr Observed Rainfall ending at 6am CST 12/04/2012.

A front became stationary near I-40 on the 8th. A couple of isolated showers and thunderstorms develop near and south of the front, affecting primarily southeast OK and northwest AR. Overall coverage was limited, but areas that did have storm activity received around 0.10" to near 0.75". A stronger cold front moved through the region on the 9th, bringing an additional 0.10" to 0.50" to portions of northwest AR.

Showers developed over all of eastern OK and northwest AR on the afternoon and evening of the 14th as low-level moisture increased over the region. Rainfall totals remained light, with totals from around 0.10" to around 0.50".

A line of strong to severe thunderstorms developed during the evening of the 19th as a cold front and dry line moved into the area. The convection affected locations along and east of a McAlester, OK to Bentonville, AR line. 63 mph winds were measured at the Fort Smith Regional Airport, and an EF-1 tornado damaged several homes, trees, and outbuildings and destroyed a mobile home in Riverdale, AR (~6 miles NE of Lavaca in Sebastian County). Rainfall totals were 0.25" to around 0.75" in the affected area, with isolated areas of 1" to 1.5" of rain. Strong winds to 50 mph and much colder air moved into the region behind the front as the upper-low crossed the Southern Plains. Snow flurries were observed over far northeast OK and northwest AR associated with some light wrap-around precipitation. No snow accumulations were reported.

A strong winter storm developed over the southern plains on Christmas Day bringing a mixture of winter weather to the area. Heavy snow fell over parts of southeast OK and western AR, as shown in Fig. 6. Other areas received periods of light sleet and freezing rain. The Tulsa area missed out on most of the wintry precipitation only getting a little bit of freezing rain early Christmas morning. Liquid equivalent totals ranged from 0.10" to near 2" (see Fig. 7).

<u>Some of the highest reported 12/25/12 snowfall totals were:</u>
8.00" of snow 10 miles south of Heavener in Le Flore County
7.00" of snow at Octavia in Le Flore County
7.00" of snow 7 miles northeast of Big Cedar in Le Flore County
6.00" of snow at Warner in Muskogee County
6.00" of snow at Greenwood in Sebastian County

5.00” of snow at Charleston in Franklin County
5.00” of snow at Arkoma in Le Flore County
5.00” of snow 5 miles north of Red Oak in Latimer County
5.00” of snow at Panama in Le Flore County
5.00” of snow at Muse in Le Flore County

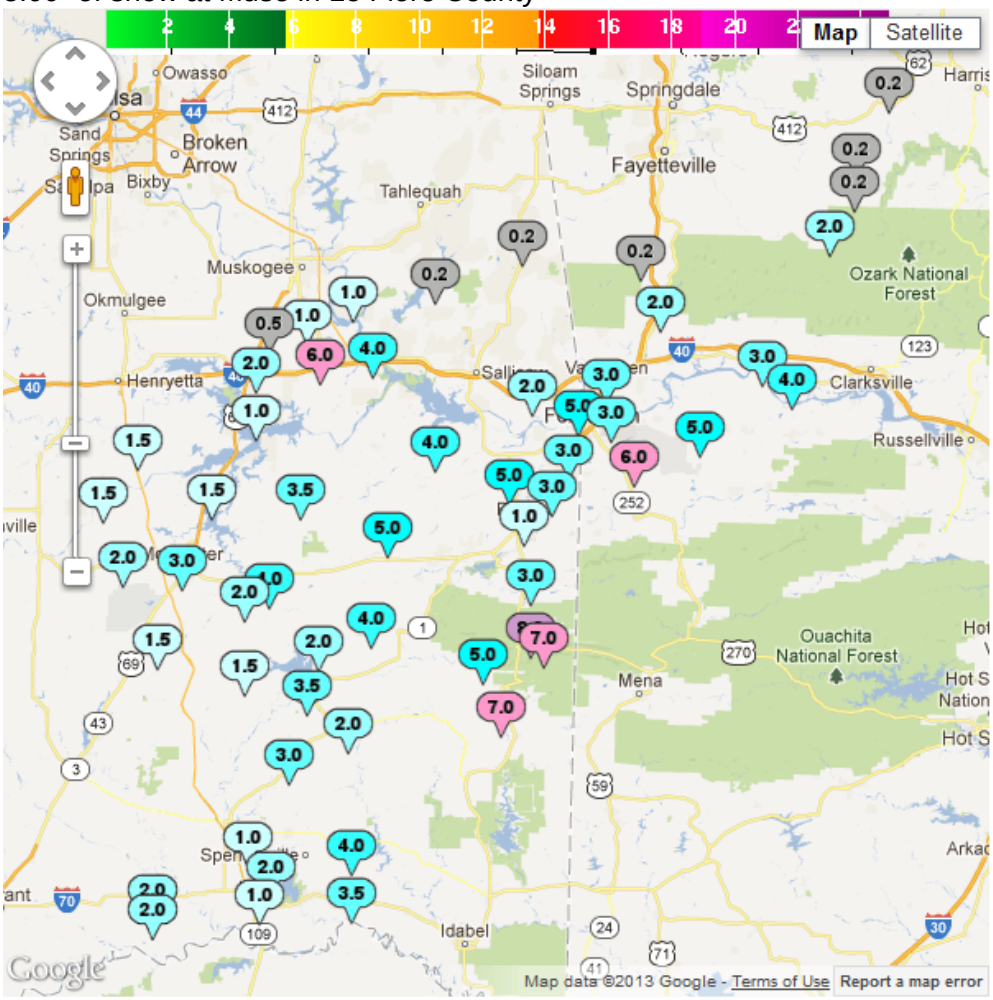


Fig. 6. Reported snowfall totals for December 25, 2012.

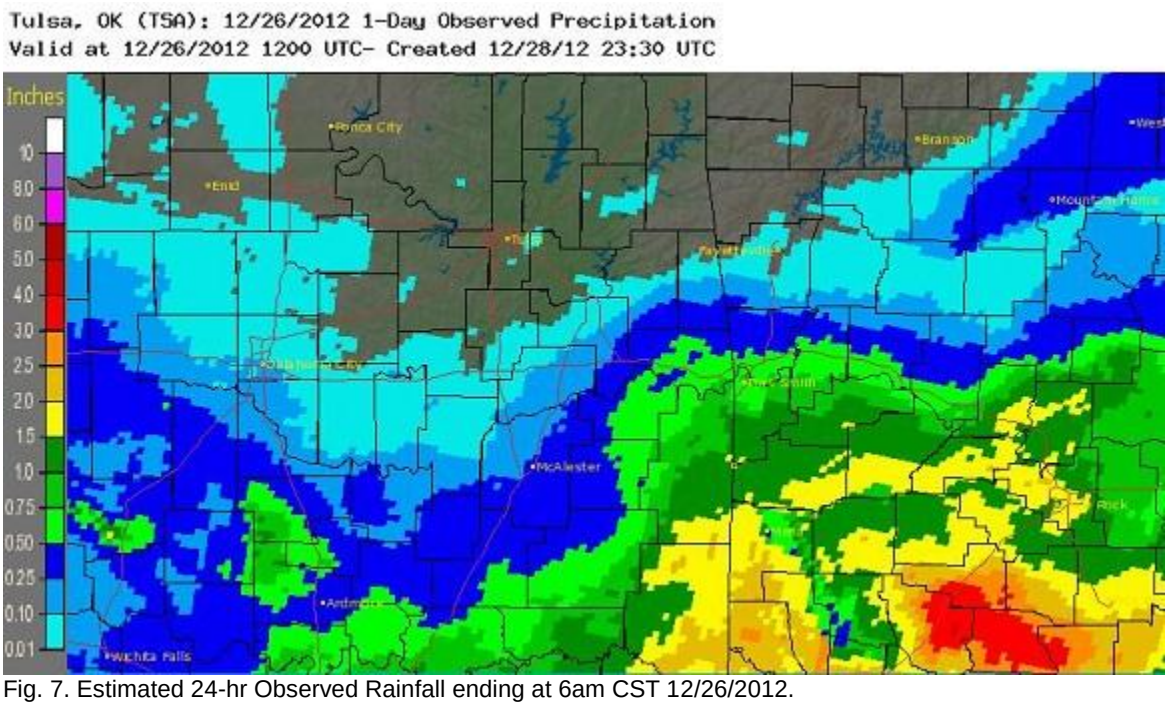
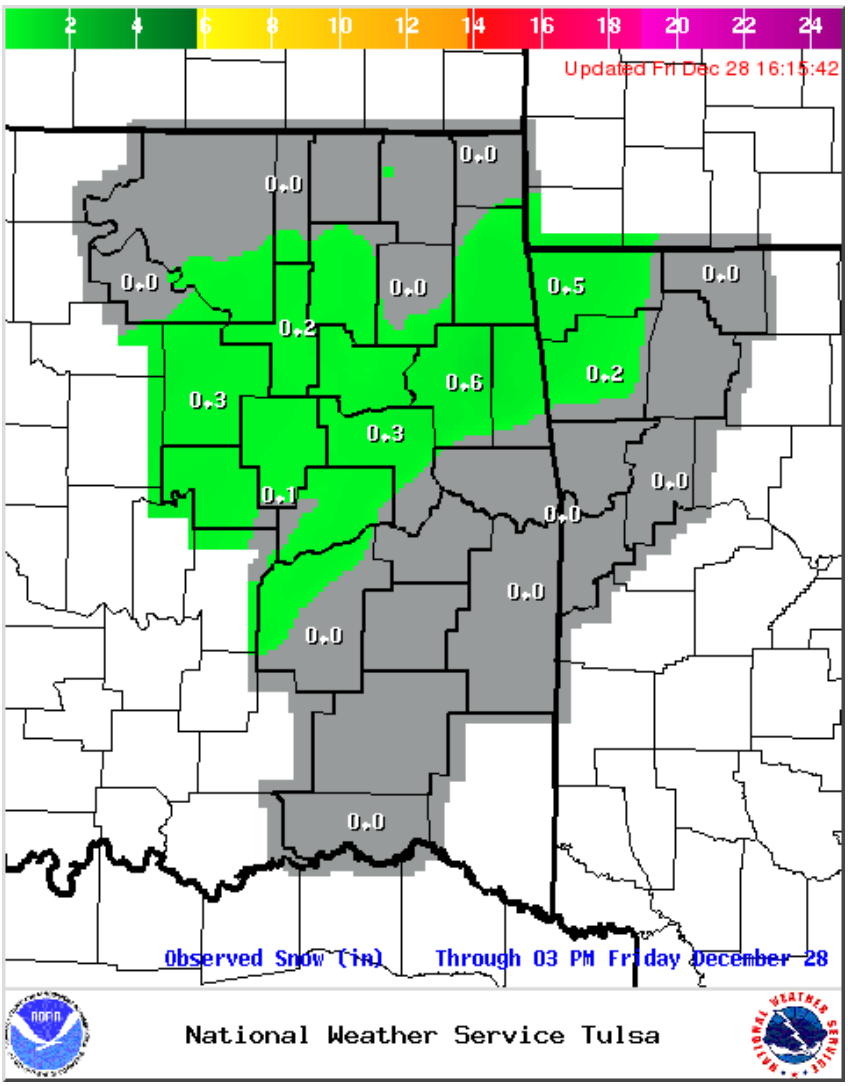


Fig. 7. Estimated 24-hr Observed Rainfall ending at 6am CST 12/26/2012.



(Left) Fig. 8. Estimated snowfall for 12/28/2012

A weak upper-level system moved through the region on the 28th, and with overnight temperatures near 32°F, portions of eastern OK and northwest AR received some light freezing rain/drizzle through the morning hours. A band of snow also moved through the area during the day, bringing flurries to around half an inch of snow accumulation (see Fig. 8). Liquid equivalent totals were less than 0.10".

The final precipitation for the year affected eastern OK and northwest AR on the 31st as an upper-level storm system approached the area from the southwest. Rainfall totals were around half an inch or less in the affected areas (see Fig. 9 below).

Tulsa, OK (TSA): 12/31/2012 1-Day Observed Precipitation
Valid at 12/31/2012 1200 UTC- Created 1/2/13 21:30 UTC

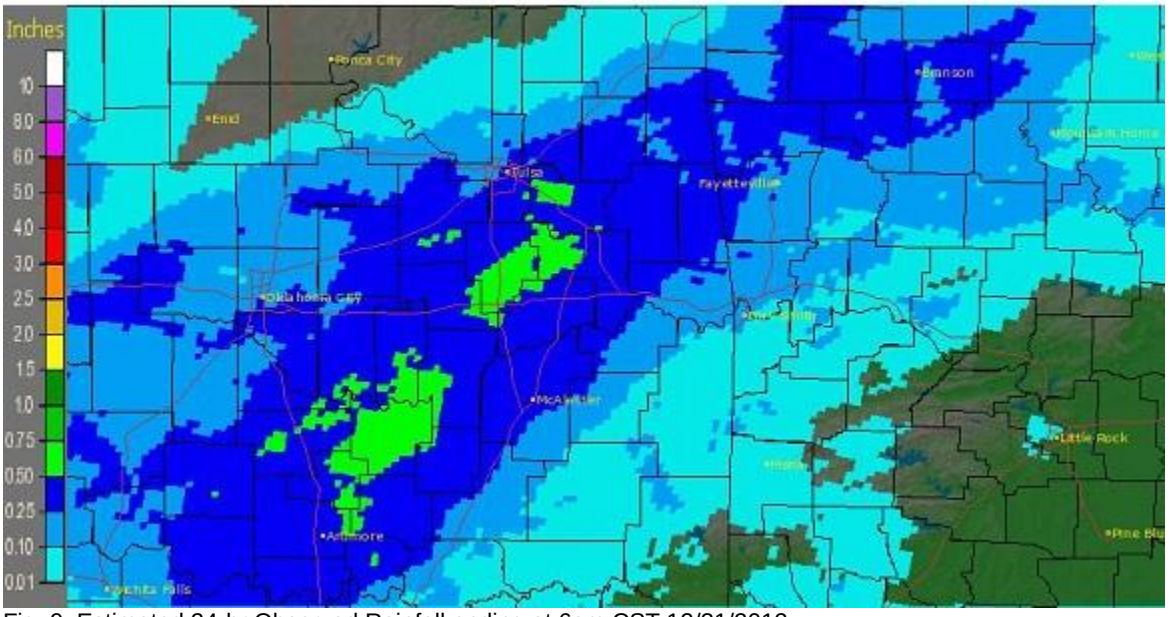


Fig. 9. Estimated 24-hr Observed Rainfall ending at 6am CST 12/31/2012.

Written by:
Nicole McGavock
Service Hydrologist
WFO Tulsa

Products issued in December 2012:

0 Flash Flood Warnings (FFW)
0 Flash Flood Statements (FFS)
0 Flash/Areal Flood Watches (FFA) (2 Watch FFA CON/EXT/CAN)
0 Urban and Small Stream Advisories (FLS)
0 Areal Flood Warnings (FLW)
0 Areal Flood Statements (FLS)
0 River Flood Warnings (FLW)
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:

No river flooding occurred this month.