

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 February	YEAR 2015
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 March 6, 2015	

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.

The first two weeks of February 2015 were mostly mild and dry, with the second half of the month marked by several winter storms and cold temperatures. Normal precipitation across the Hydrologic Service Area (HSA) in February ranges from 1.8 inches in Osage County to 3.2 inches in Choctaw County. In the Ozark region of northwest Arkansas, the normal monthly precipitation is 2.9 inches. This report, past E-5 reports, and monthly hydrology and climatology summaries can be found at <http://www.srh.noaa.gov/tsa/?n=hydro-monthly-summary>.

Monthly Summary

Using the radar-derived estimated observed precipitation from the RFCs (Fig. 1a), rainfall totals for February 2015 ranged from around 0.25" to around 2" from west to east across eastern OK and northwest AR. The majority of the HSA received 0.50"-1.5" of rain this month. The entire HSA received below normal rainfall this month (Fig. 1b). The greatest deficits occurred across Okfuskee, southern Okmulgee, McIntosh, and northern Pittsburg Counties, where only 10%-25% of the normal February rainfall was received. The remainder of the area received 25%-75% of the normal rainfall this month, except for portions of Benton, Delaware, and Ottawa Counties, which had slightly lower deficits.

Tulsa, OK (TSA): February, 2015 Monthly Observed Precipitation
 Valid at 3/1/2015 1200 UTC- Created 3/2/15 14:14 UTC

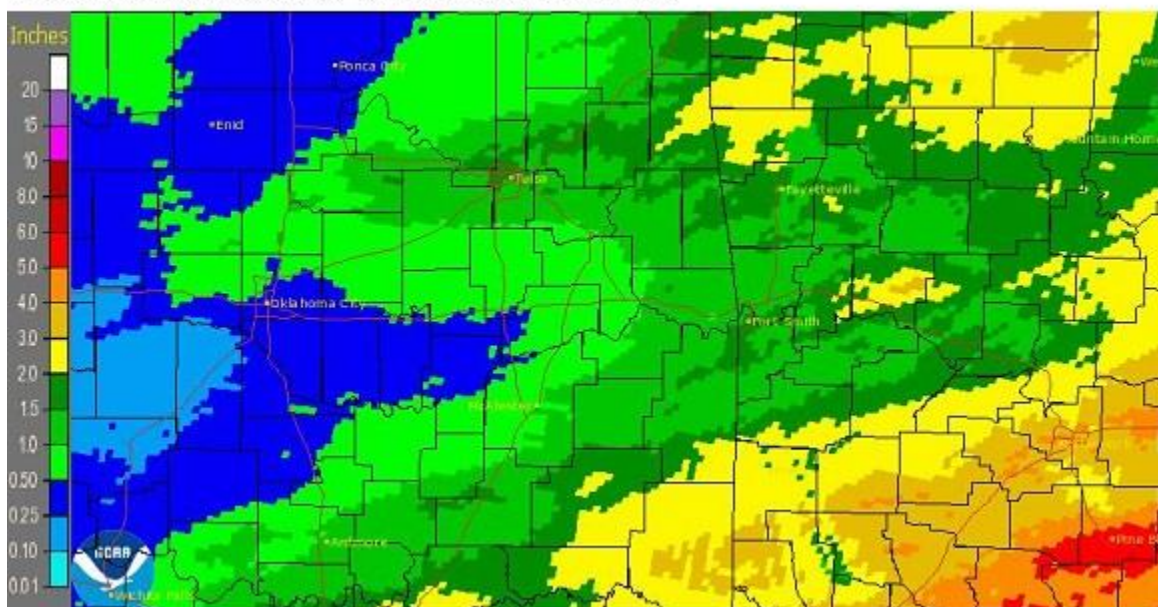


Fig. 1a. Estimated Observed Rainfall for February 2015

Tulsa, OK (TSA): February, 2015 Monthly Percent of Normal Precipitation
 Valid at 3/1/2015 1200 UTC- Created 3/2/15 14:15 UTC

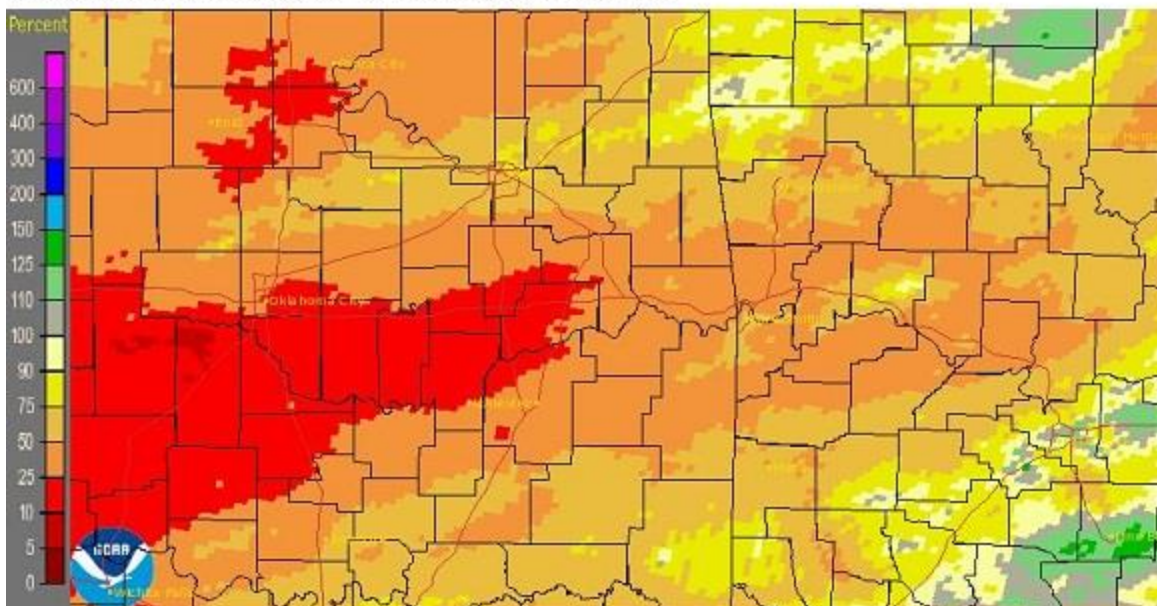


Fig. 1b. Estimated % of Normal Rainfall for February 2015

In Tulsa, OK, February 2015 ranked as the 12th coldest February (36.0°F; since records began in 1905), the 57th wettest February (1.57", tied 1977; since records began in 1888), and the 12th snowiest February (5.8"; since records began in 1900). Fort Smith, AR had the 14th coldest February (37.6°F; since records began in 1883), the 60th wettest February (2.39"; since records began in 1883), and the 17th snowiest February (5.6"; since records began in 1884). Fayetteville, AR had the 4th coldest (32.9°F), the 27th driest (1.95") February, and the 14th snowiest February (5.3") since records began in 1950.

Some of the larger precipitation reports (in inches) for February 2015 included: *Note: the mesonet values will be slightly under done due to frozen precipitation Feb. 27-28 that did not have time to melt and get measured.*

Kingston 2S, AR (coop)	3.24	Antlers, OK (coop)	2.88	Hugo, OK (meso)	2.47
Cloudy, OK (meso)	2.45	Fort Smith, AR (ASOS)	2.39	Fanshawe, OK (coop)	2.18
Clayton, OK (meso)	2.09	Winslow 7NE, AR (coop)	2.01	Spavinaw, OK (coop)	1.96

Some of the lowest precipitation reports (in inches) for February 2015 included: *Note: the mesonet values will be slightly under done due to frozen precipitation Feb. 27-28 that did not have time to melt and get measured.*

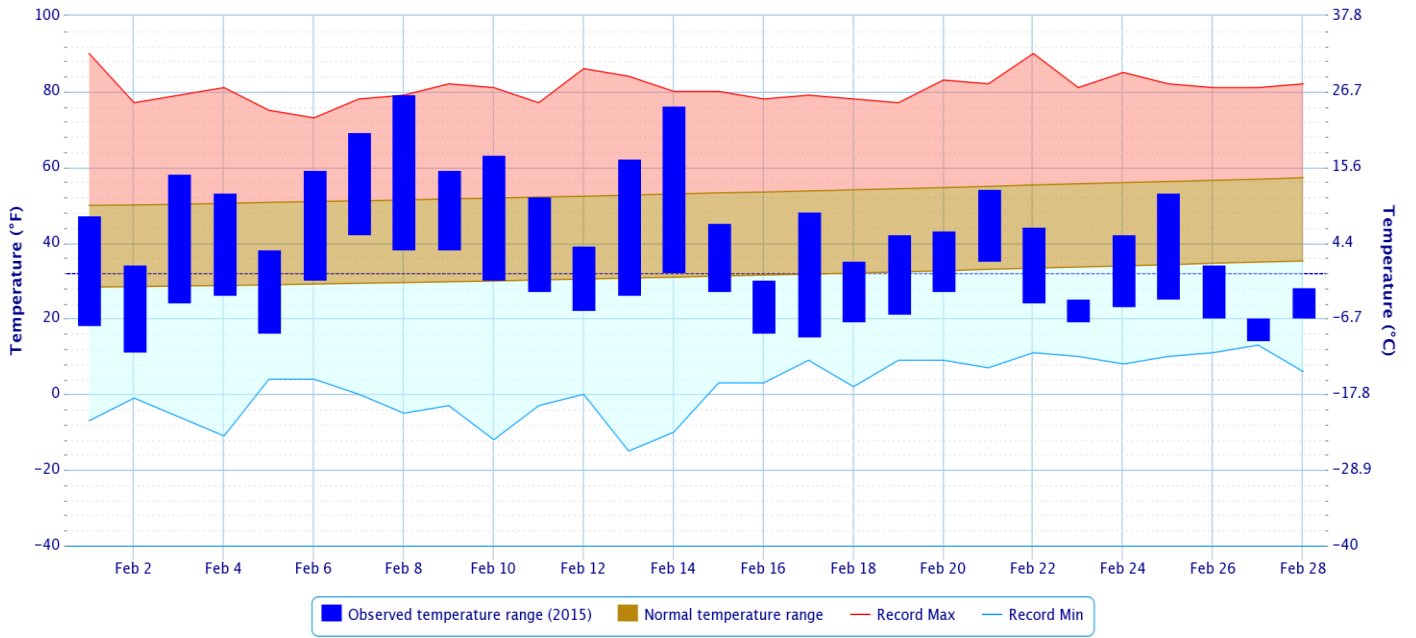
Burbank, OK (meso)	0.30	Pawnee, OK (meso)	0.37	Foraker, OK (meso)	0.39
Copan, OK (meso)	0.54	Okemah, OK (meso)	0.55	Wynona, OK (meso)	0.56
Okmulgee, OK (meso)	0.61	Bartlesville, OK (ASOS)	0.63	Bristow, OK (meso)	0.71

According to statistics from the [Oklahoma Climatological Survey](#) (OCS) Mesonet: *Note: these values will be slightly under done due to frozen precipitation Feb. 27-28 that did not have time to melt and get measured by the mesonet.*

Rank since 1921	Last 30 Days (Jan 30-Feb 28)	Year-to-Date (Jan 1 – Feb 28)	Winter-to-Date (Dec 1 – Feb 28)	Last 120 Days (Nov 1 – Feb 28)	Water Year-to-Date (Oct 1, 2014 – Feb 28, 2015)	Cool Growing Season (Sep 1, 2014 – Feb 28, 2015)	Last 365 Days (Mar 1, 2014 – Feb 28, 2015)
Northeast OK	32 nd driest	13th driest	13th driest	14th driest	46 th wettest	44 th driest	23 rd driest
East Central OK	29 th driest	20 th driest	31 st driest	29 th driest	47 th wettest	40 th driest	29 th driest
Southeast OK	30 th driest	40 th driest	34 th driest	23 rd driest	35 th driest	40 th driest	41 st driest
Statewide	28 th driest	28 th driest	25 th driest	30 th driest	44 th driest	30 th driest	22 nd driest

Daily Temperature Data - Tulsa Area, OK (ThreadEx)

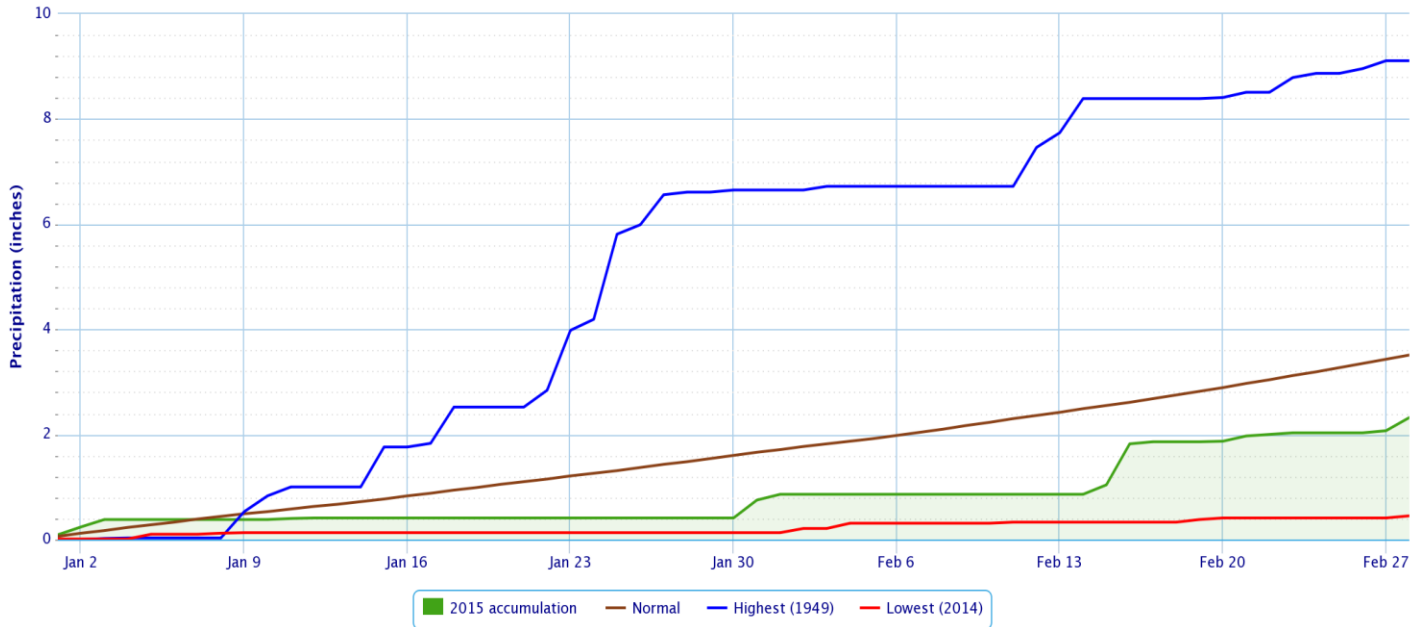
Period of Record - 1905-01-06 to 2015-03-01. Normals period: 1981-2010. Click and drag to zoom chart.



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Accumulated Precipitation - Tulsa Area, OK (ThreadEx)

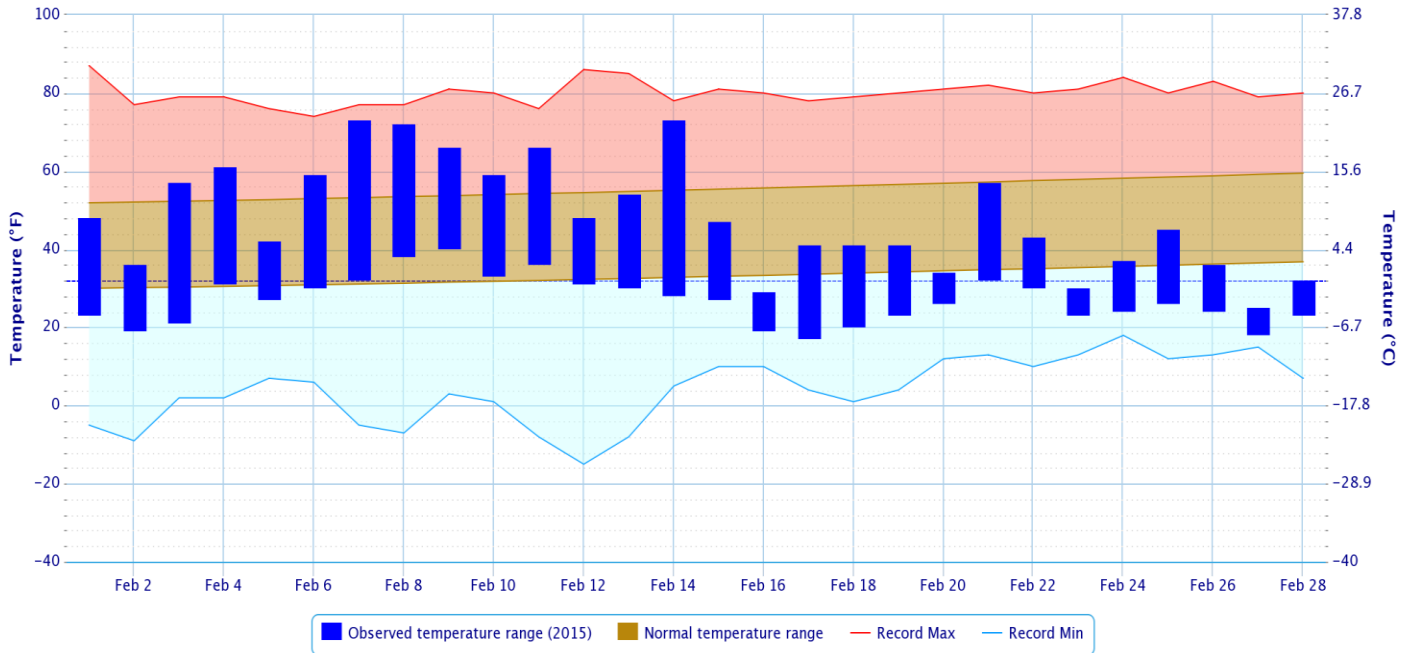
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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

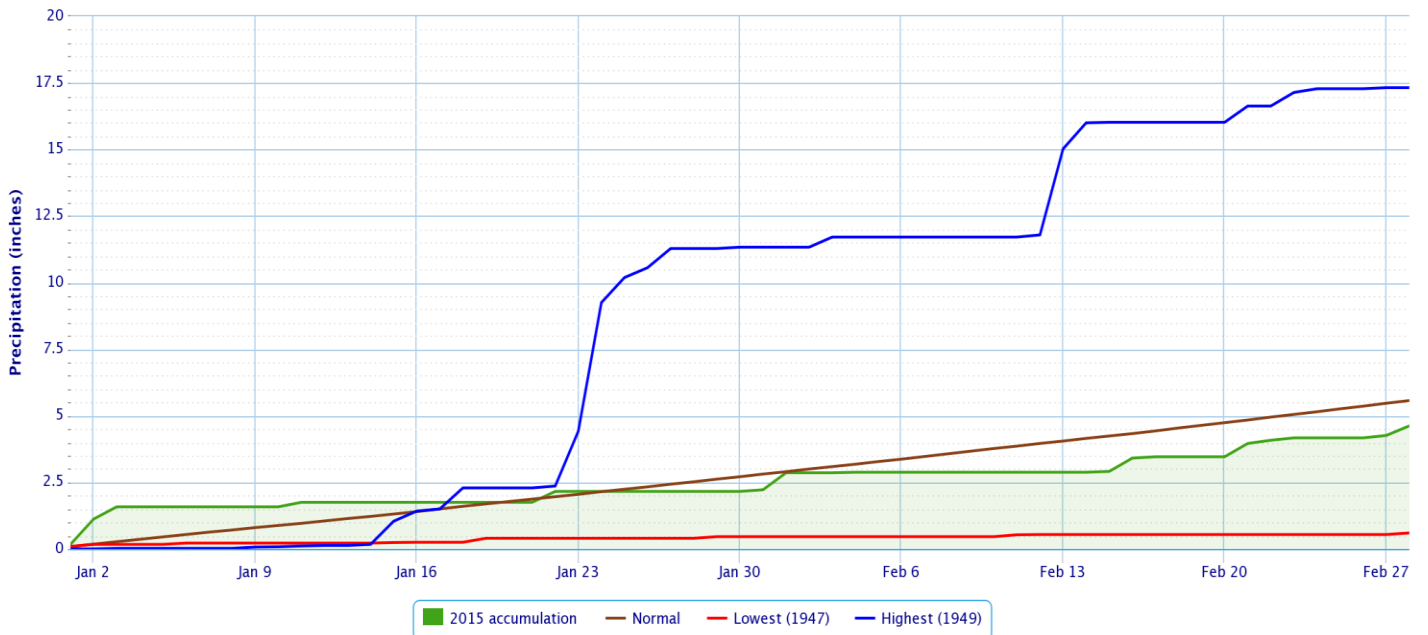
Period of Record – 1882-06-01 to 2015-03-01. Normals period: 1981-2010. Click and drag to zoom chart.



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Accumulated Precipitation – Fort Smith Area, AR (ThreadEx)

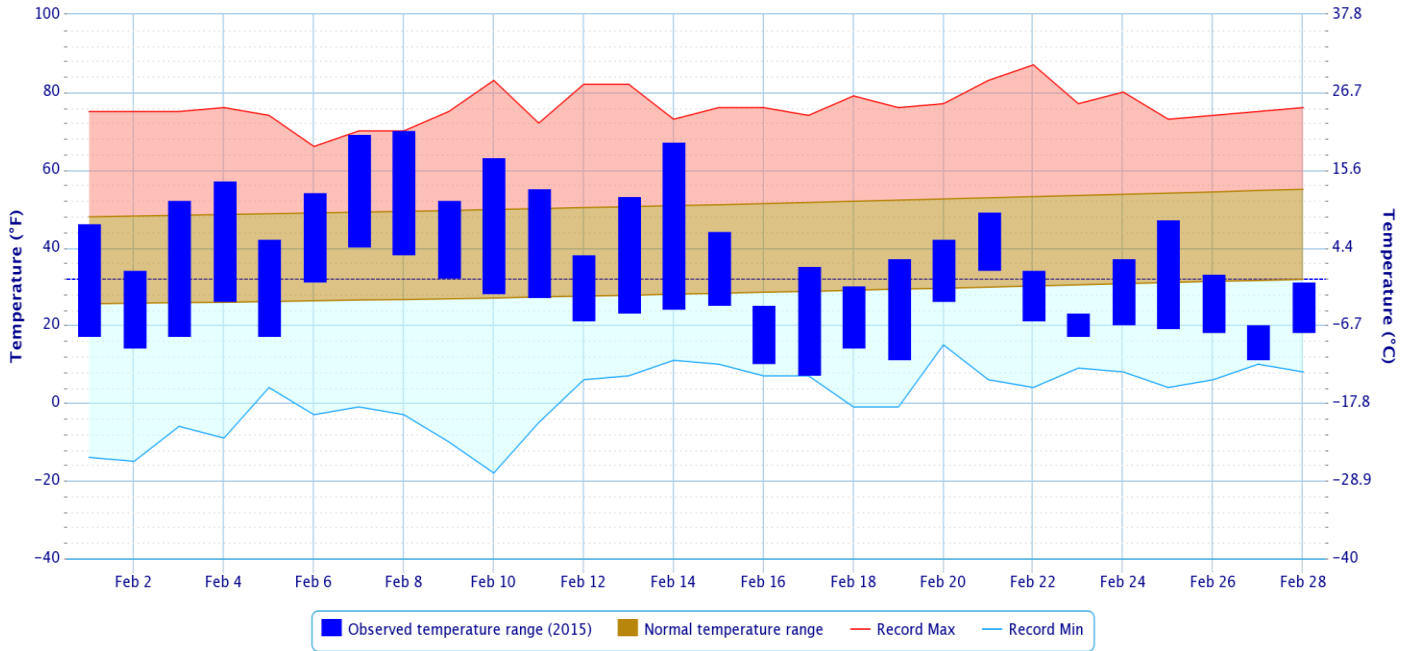
Click and drag to zoom to a shorter time interval; green/black diamonds represent subsequent/missing values



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Daily Temperature Data - FAYETTEVILLE DRAKE FLD, AR

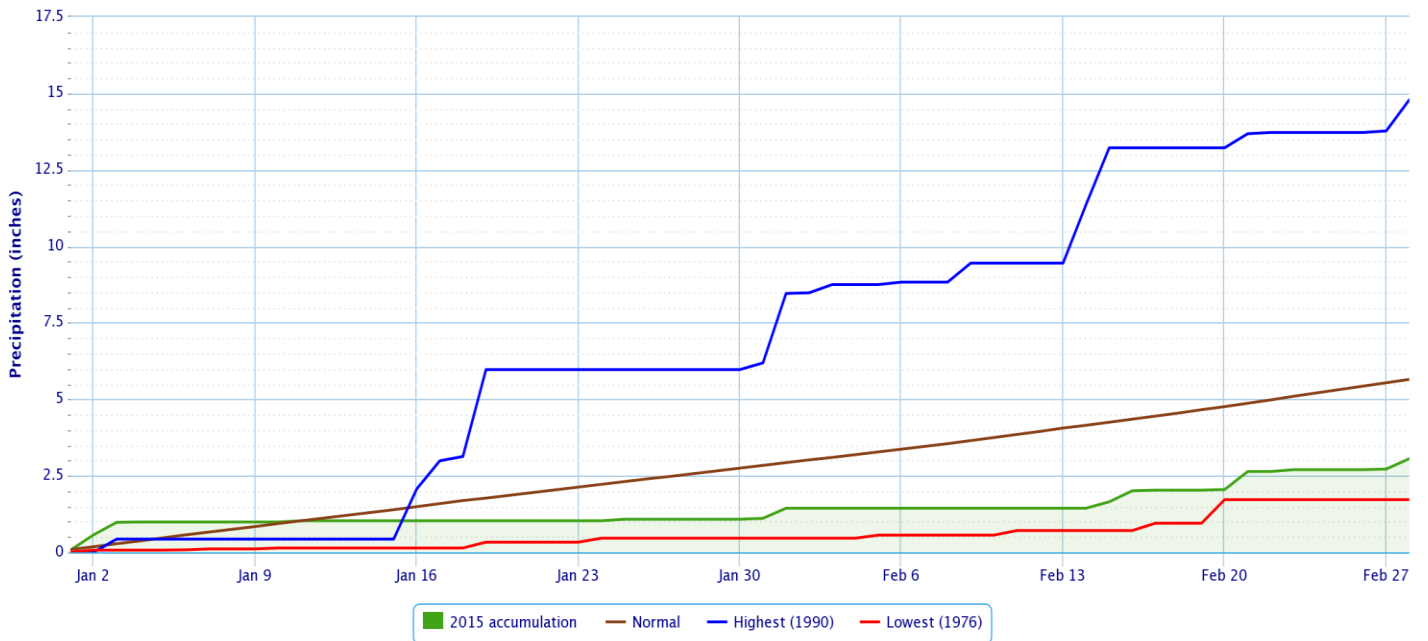
Period of Record - 1949-07-14 to 2015-03-01. Normals period: 1981-2010. Click and drag to zoom chart.



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Accumulated Precipitation - FAYETTEVILLE DRAKE FLD, AR

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



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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 3/01/2015. Skiatook Lake has slightly decreased in its conservation pool from 53% (696.80') at the end of January to 52% (696.37') at the end of February. This is the lowest the lake has been since it was filled in 1984. New low pool records will continue as the lake continues to fall. Several lakes were reporting below normal pool levels: Skiatook Lake 52%, Eufaula Lake 78%, Beaver Lake 79%, Keystone Lake 80%, Tenkiller Lake 85%, and Birch Lake 88%.

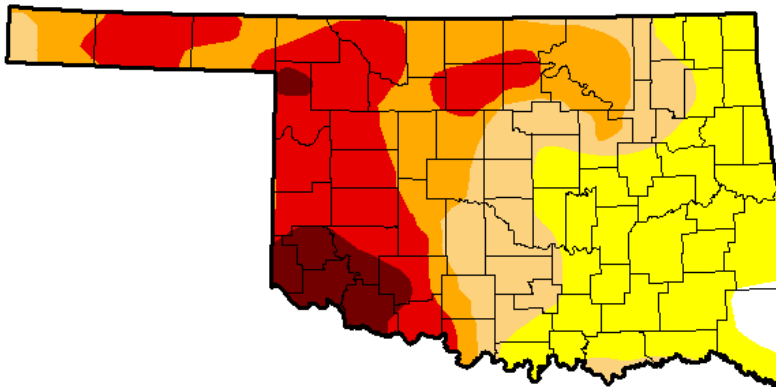
According to the [U.S. Drought Monitor](#) (USDM) from March 3, 2015 (Figs 2, 3), Severe Drought (D2) conditions were occurring across portions of Osage, eastern Kay, Pawnee, northern Creek, and far western Tulsa Counties in eastern OK. Moderate Drought (D1) conditions were present across portions of Osage, Tulsa, Creek, Washington, Rogers, southwestern Nowata, and western Wagoner Counties in eastern OK. Abnormally Dry (D0), but not experiencing drought, conditions existed across the remainder of eastern OK and all of northwest AR.

U.S. Drought Monitor Oklahoma

March 3, 2015
(Released Thursday, Mar. 5, 2015)
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	1.48	98.52	65.55	47.81	28.29	5.75
Last Week <i>2/24/2015</i>	1.48	98.52	65.55	48.46	27.80	5.75
3 Months Ago <i>12/2/2014</i>	24.48	75.52	60.29	40.85	18.33	5.04
Start of Calendar Year <i>1/3/2014</i>	25.63	74.37	62.03	40.84	21.74	5.70
Start of Water Year <i>9/30/2014</i>	8.55	91.45	73.31	58.13	20.92	4.64
One Year Ago <i>3/4/2014</i>	0.78	99.22	62.55	28.86	13.07	2.40



Intensity:

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

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

Author:

*David Simeral
Western Regional Climate Center*

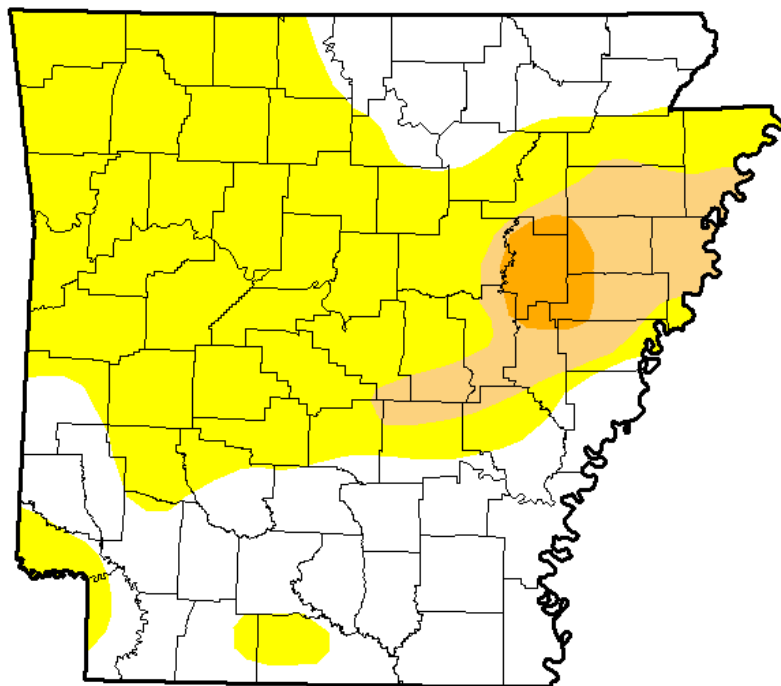


<http://droughtmonitor.unl.edu/>

Fig. 2. Drought Monitor for Oklahoma

U.S. Drought Monitor Arkansas

March 3, 2015
(Released Thursday, Mar. 5, 2015)
Valid 7 a.m. EST



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	38.17	61.83	10.66	2.18	0.00	0.00
Last Week 2/24/2015	17.47	82.53	19.99	4.55	0.00	0.00
3 Months Ago 12/2/2014	57.78	42.22	10.54	0.00	0.00	0.00
Start of Calendar Year 12/30/2014	36.88	63.12	14.40	0.00	0.00	0.00
Start of Water Year 8/30/2014	54.54	45.46	9.13	0.00	0.00	0.00
One Year Ago 3/4/2014	62.14	37.86	0.00	0.00	0.00	0.00

Intensity:

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

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

Author:

David Simeral
Western Regional Climate Center



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

Fig. 3. Drought Monitor for Arkansas

Winter 2014-15 (December-January-February)

In Tulsa, OK, Winter 2014-15 ranked as the 43rd coldest Winter (39.1°F, tied 1905-06, 2002-03; since records began in 1905-06) and the 50th driest Winter (4.29"; since records began in 1888-89). Fort Smith, AR had the 41st coldest Winter (40.4°F, tied 1995-96, 1944-45; since records began in 1882-833) and the 50th driest Winter (6.92"; since records began in 1882-83). Fayetteville, AR had the 17th coldest (36.3°F, tied 2002-03, 1987-88) and the 12th driest (5.70") Winter since records began in 1949-50.

Outlooks

The [Climate Prediction Center](#) (CPC) outlook for March 2015 (issued February 28, 2015) indicates a slightly 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. This outlook is based on both short-term computer models for the first 2 weeks of March and medium range models for the last 2 weeks. The enhance chance for below normal temperatures is weighted toward the first week of March.

For the 3-month period March-April-May 2015, CPC is forecasting a slightly enhanced chance for below normal temperatures across all of eastern OK and northwest AR, except for locations along the Kansas state line, where there is an equal chance for above, near, and below normal temperatures. This outlook also indicates equal chances for above, near, and below median precipitation across eastern OK and northwest AR (outlook issued February 19, 2015). According to CPC, current atmospheric and oceanic observations are finally both displaying El Niño conditions, and an El Niño Advisory has been issued. CPC is forecasting a 50-

60% chance that El Niño conditions will continue through summer 2015. Due to the expected weak strength, widespread or significant global impacts are not anticipated. Therefore, this outlook is based on both statistical and dynamical forecast tools and considering weak El Niño conditions.

Summary of Precipitation Events

February 1-28 (Snowfall reports for specific days can be found at: <http://www.srh.noaa.gov/tsa/?n=qlsr>)

Other than a few isolated patches of very light rain/drizzle on a couple of day, the first two weeks of February were dry across the area. The first storm system to hit brought widespread freezing rain, sleet, and snow to most of eastern OK and northwest AR.

Precipitation developed during the afternoon and evening hours of the 15th and expanded in coverage and intensity overnight and into the morning of the 16th as a vigorous upper-level wave approached the region. Initially, it was warm enough that the precipitation fell as rain, but as temperatures cooled, the rain transitioned to a mix of freezing rain and sleet. A transition to sleet, sleet and snow, and then all snow occurred during the nighttime and morning hours. Much of eastern OK and northwest AR saw snow on the 16th, with the highest totals of 3"-6" reported across northeast OK and northwest AR where frontogenetical forcing led to mesoscale banding of the snow and sleet (Figs. 4, 5). Thunder-sleet was observed, indicating rapid sleet accumulations. Many areas of northeast OK and northwest AR received 1"-2" of sleet (for reporting purposes, snow and sleet accumulations are combined). Reports of freezing rain indicated only a glaze to around 0.10" of ice accumulation occurred. Rain and snow liquid equivalent totals ranged from around 0.10" to near 1.5", with the highest totals along the I-44 corridor, across northwest AR, and across far southeast OK (Fig. 6).

A fast moving line of showers and thunderstorms brought rain and snow from northeast OK to northwest and west central AR on the 17th. Due to the quick nature of the storms, little to no snow accumulation occurred and rainfall/liquid equivalent totals were less than 0.10".

Rain developed on the 20th as strong warm air advection occurred over a warm front as it moved north into southeast OK. While the entire area received at least a few hundredths of an inch of rain, portions of northeast OK, Le Flore County, and northwest AR had 0.25" to near 1" of rain.

A ridge of high pressure over the Gulf of Alaska continued to keep the door open for arctic waves to push southward across the Plains. A cold front ushered in more cold air on the 22nd, with light snow developing west of a Nowata to Muskogee line during the morning. Less than 1" of snow accumulation occurred. Additional precipitation developed further south across southeast OK and west central AR during the afternoon. While initially rain, a switch over to sleet and snow occurred as the colder air pushed south. Rain/liquid equivalent totals ranged from around 0.10" near I-40 to near 0.75" near the Red River (Fig. 8). 1" to 3" of snow were reported across southeast OK and west central AR (Fig. 7).

After a brief break in the precipitation, another round of snow and some sleet affected eastern OK and northwest AR along and south of a Pawnee to Bentonville line on the 23rd. The heaviest snowfall occurred across east central OK and northwest AR, where 1" to 4" was common (Fig. 9). Rain/liquid equivalent totals ranged from a few hundredths to near 0.50".

On the 25th, far southeast OK received some snow as a strong upper-level low pressure system moved across TX. Snowfall totals were generally 0.5" to 2", with liquid equivalent of less than 0.10" (Fig. 10).

The last winter storm for the month affected the region on the 27th-28th as moderate to heavy bands of snow affected all of eastern OK and northwest AR. A narrow mesoscale very heavy snow band dumped 5"-7" of snow to the north and northwest of Tulsa during the afternoon and evening hours of the 27th, affecting much of Pawnee and Osage Counties. By the afternoon of the 28th, warm air advection caused the precipitation to slowly transition to a mix of snow, sleet, freezing rain, and rain across southeast OK. By the end of the event, 7"-8" of snow was reported in Barnsdall, Skiatook, and Hominy (Osage County) and 6" in Wister (Le Flore County). Most locations received 2"-4" of snow (Fig. 11). Rain/liquid equivalent totals ranged from 0.10"-0.75".



Fig. 4. Preliminary Snow and Sleet Accumulations for Feb. 15-16, 2015 based on reports.

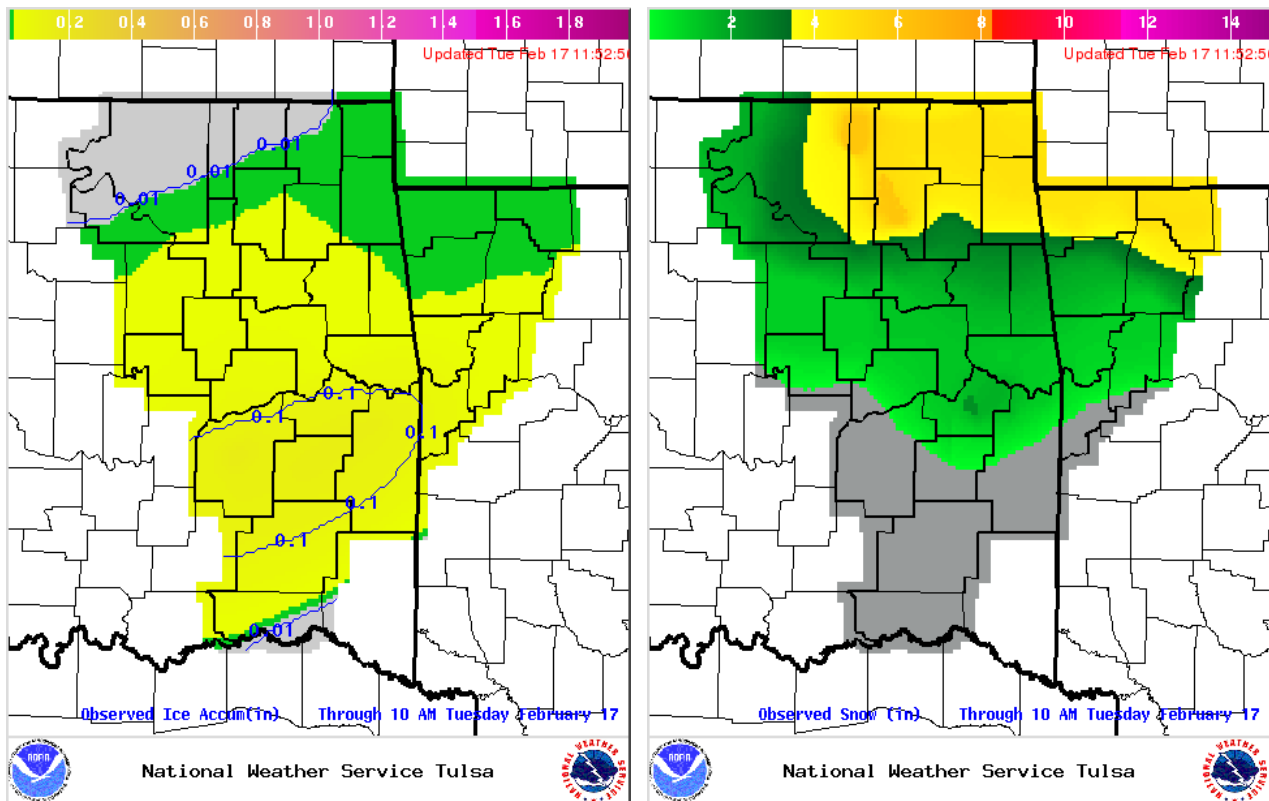


Fig. 5. Estimated Ice (left) and Snow/Sleet (right) Accumulations for Feb. 15-16, 2015 based on reports.

Tulsa, OK (TSA): 2/16/2015 1-Day Observed Precipitation
 Valid at 2/16/2015 1200 UTC- Created 2/18/15 13:34 UTC

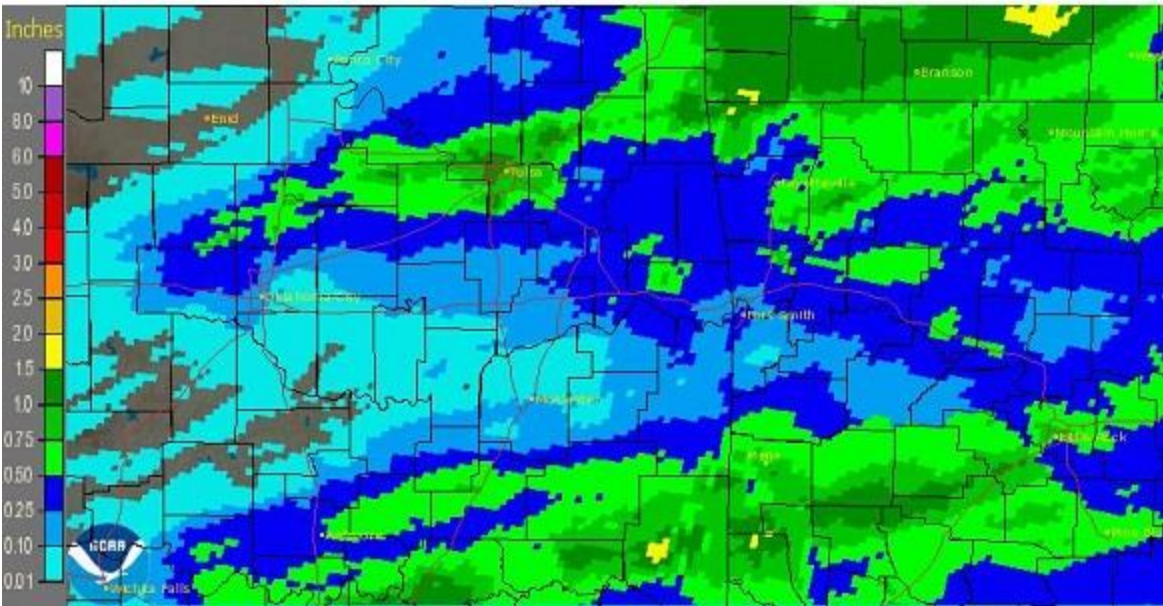


Fig. 6. 24- hour Estimated Observed Rainfall/Liquid Equivalent ending at 7am CST 02/16/2015

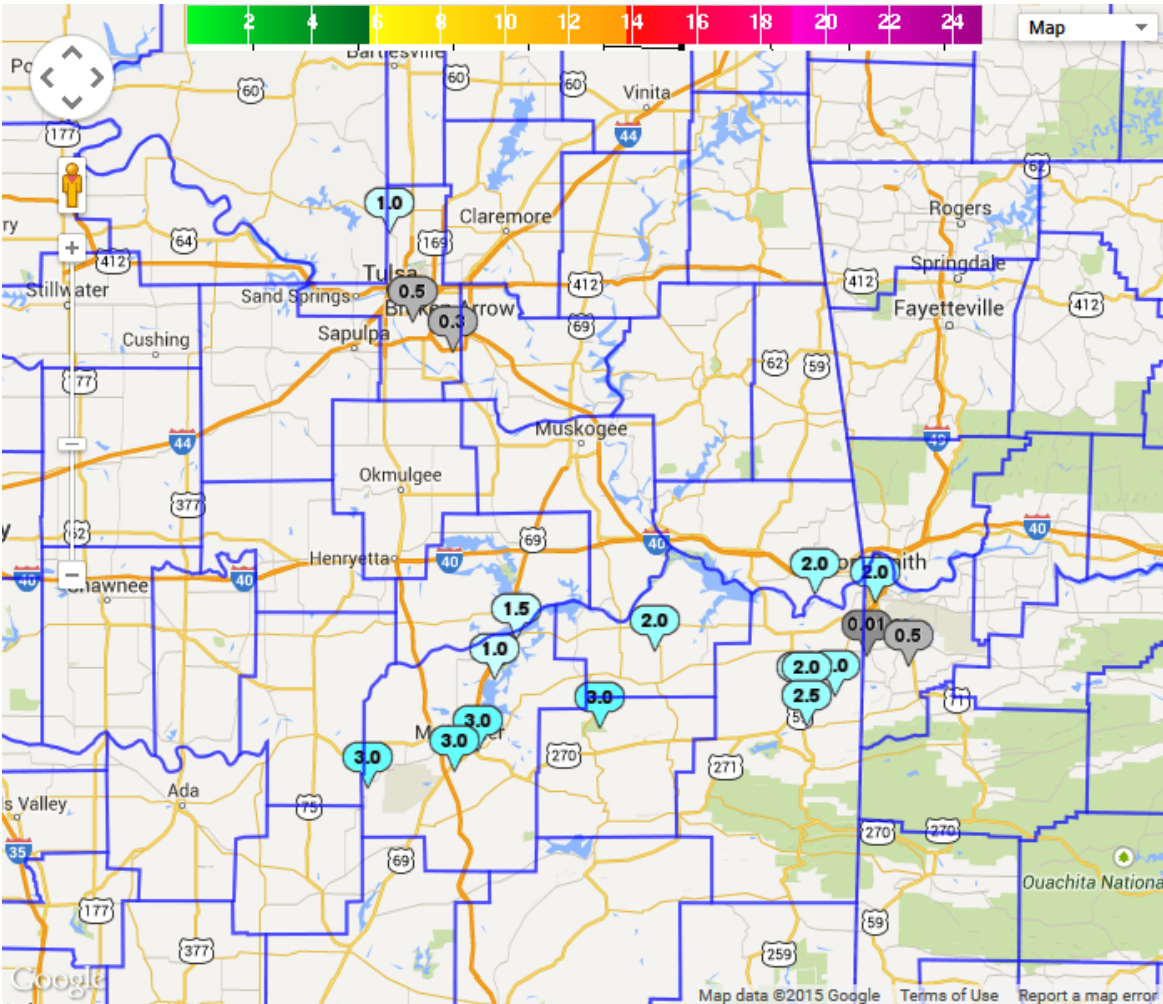


Fig. 7. Preliminary Snow and Sleet Accumulations for Feb. 22, 2015 based on reports.

Tulsa, OK (TSA): 2/23/2015 1-Day Observed Precipitation
 Valid at 2/23/2015 1200 UTC- Created 2/25/15 23:34 UTC

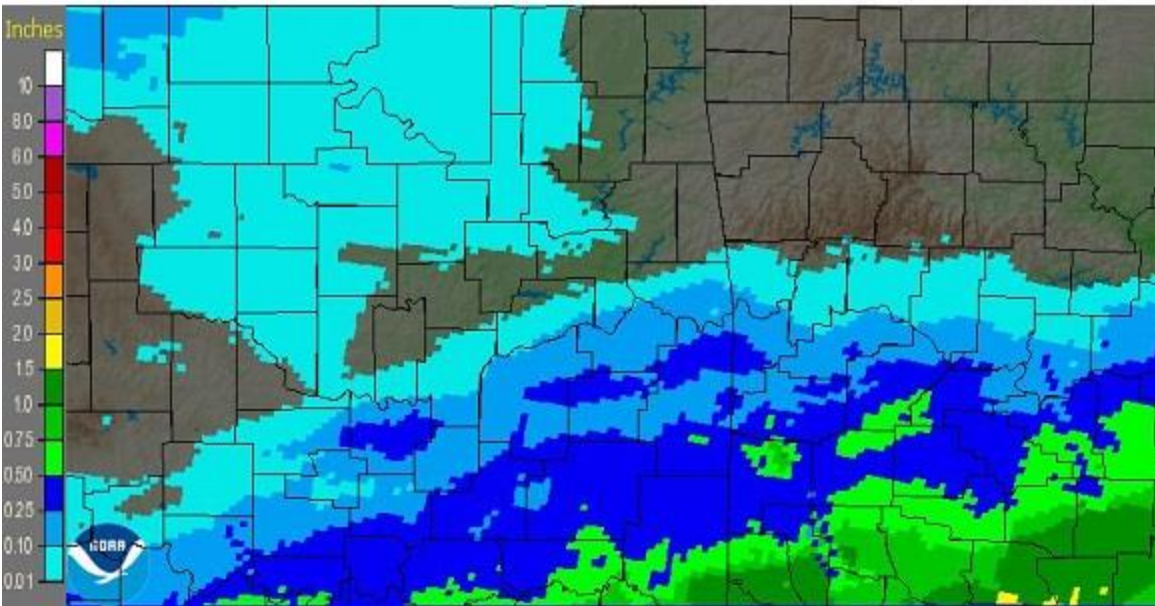


Fig. 8. 24- hour Estimated Observed Rainfall/Liquid Equivalent ending at 7am CST 02/23/2015

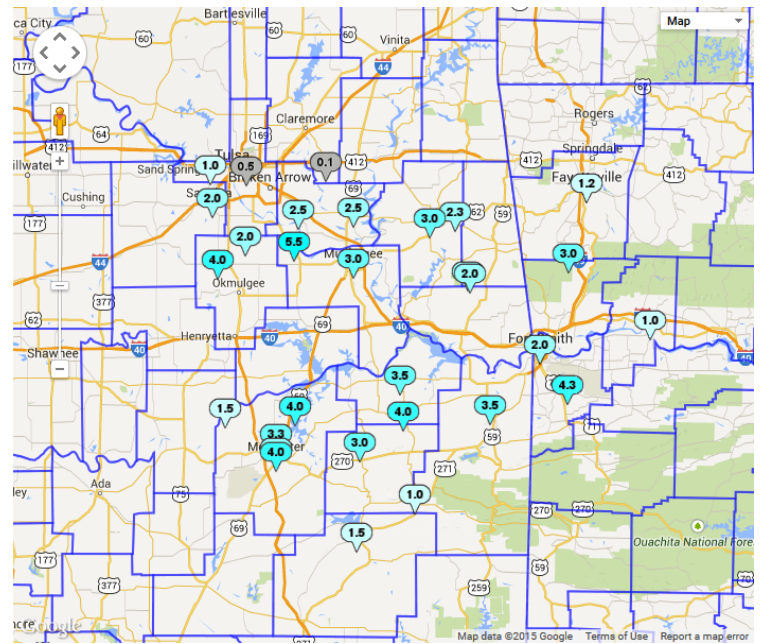


Fig. 9. Preliminary Snow and Sleet Accumulations for Feb. 23, 2015 based on reports.

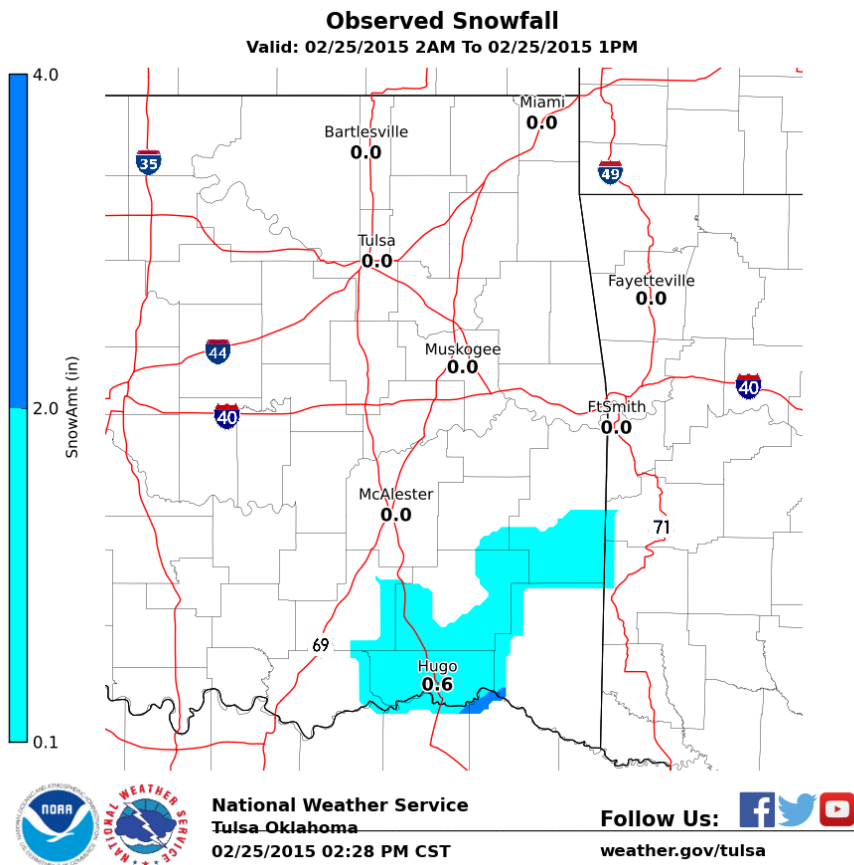


Fig. 10. Preliminary Snow and Sleet Accumulations for Feb. 25, 2015 based on reports.

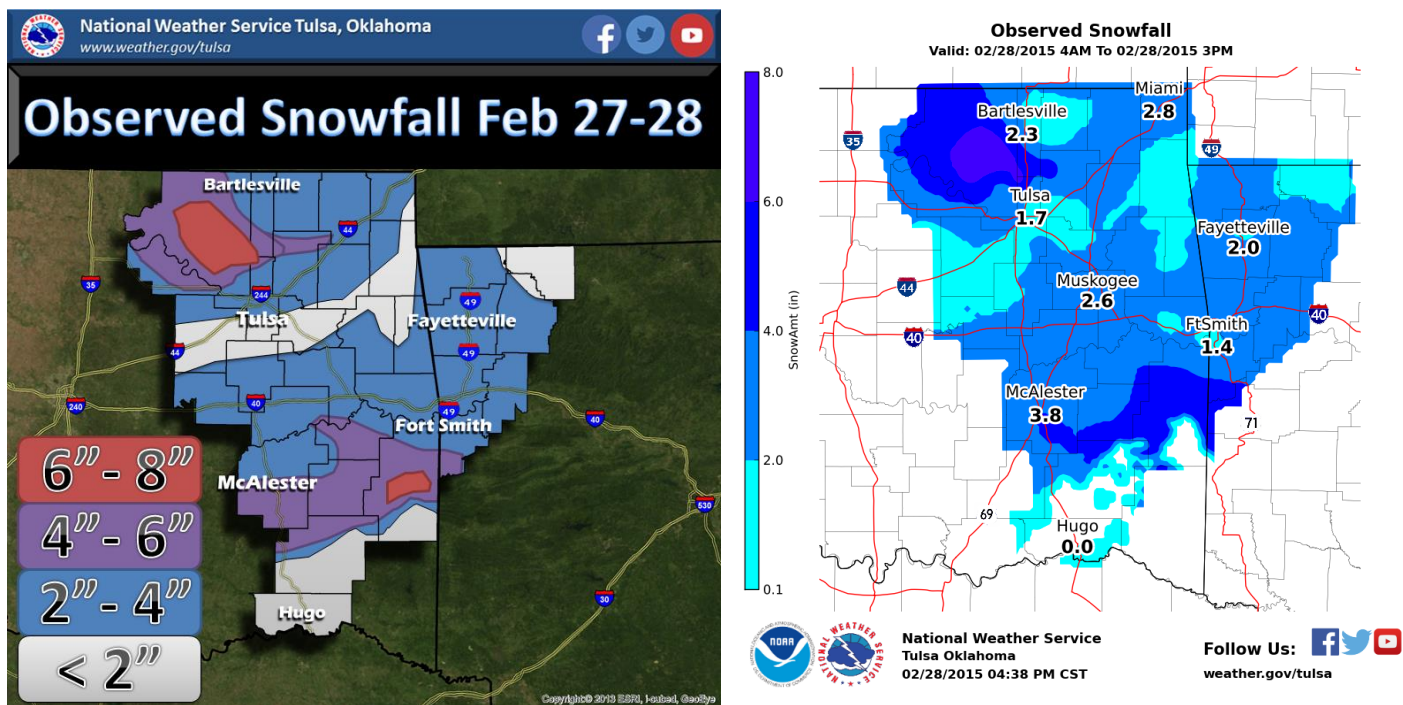


Fig. 11. Preliminary Snow and Sleet Accumulations for Feb. 27-28, 2015 based on reports.

Written by:

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Service Hydrologist
WFO Tulsa

Products issued in February 2015:

*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/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:

None