

Southeast Kansas Climate Summary for 2023

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Summary

Temperature and rainfall are important factors influencing agricultural performance. This report summarizes weather conditions in southeast Kansas. Comparisons to long-term records are used to indicate deviations from historical averages. Overall, in 2023 the southeast region had below average precipitation and above normal temperatures.

Introduction

Temperature and precipitation are primary determinants of crop growth and yield. In addition to contributing to the physical comfort of human inhabitants, these weather parameters also determine the health and performance of livestock. Climatic trends are determined by a range of complex interactions across the globe.

Humans have tracked weather parameters for decades. Improvements in instrumentation, frequency, and coverage of measurements have improved the accuracy and reliability of reported values, allowing crop and animal scientists to better track changes in climate.

Here, weather conditions (temperature and rainfall) over the 14-county region of Kansas designated as the Southeast Region (Figure 1) are examined. Historical data are used to build trends and comparative information across multiple years.

Experimental Procedures

The divisional precipitation and temperature data were downloaded from the National Centers for Environmental Information (NCEI; <https://www.ncei.noaa.gov/>). NCEI generated monthly divisional averages based on individual station data from observers within the 14 counties that comprise southeast Kansas. The observations were collected from official reporting sites, such as airports as well as co-operative and citizen observers who measure both temperature and precipitation. These observations expand the number of observations in an area, and are different than the automated weather stations reported in the Kansas Mesonet site (<https://mesonet.k-state.edu/>).

Results and Discussion

Precipitation was below normal in 2023 (Figure 2). 2023 ranked as the 20th driest year on record in southeast Kansas dating back to the beginning of NCEI records in 1895 and was the driest year since 2012. Temperatures averaged above normal as well. 2023 was the 11th warmest year on record in this division and was the warmest year since 2016.

In terms of percent of normal and departure from normal, southeast Kansas (Figure 1) was the driest division in the state in 2023. Last year's annual precipitation across southeast Kansas averaged 29.49 in., or 72% of normal. This total was 11.27 in. below the 30-year normal of 40.76 in. (Table 2). Despite the dry year, drought conditions improved somewhat during the past 12 months. At the beginning of 2023, all of southeast Kansas' counties were in drought status on the U.S. Drought Monitor conditions map (Figure 2a, Table 1). Parts of eight counties were in D4, the most severe drought category. The D4 area included all of Elk and Chautauqua Counties, as well as portions of Butler, Cowley, Greenwood, Woodson, Wilson, and Montgomery Counties. By the end of 2023, the worst drought category in southeast Kansas was only D2 across parts of Elk, Chautauqua, Wilson, and Montgomery Counties (Figure 2b). Cherokee County was drought free, as were portions of Bourbon, Crawford, and Labette Counties. The improvements in drought conditions across southeast Kansas happened primarily within the last few weeks of the year. December had 160% of normal precipitation (1.06 in. above normal) in southeast Kansas, the highest percent of normal of any month in 2023 and the wettest December since 2015 (Table 2).

Despite these improvements, precipitation in 2024 will need to be much greater than average to fully erase the drought deficits from 2023. The likelihood of an annual surplus of precipitation of the same magnitude or larger than 2023's deficit is historically rare. During the previous 129 years, only four years had more than 11.27 in. above normal precipitation (i.e., 52.03 in. of total precipitation, the normal 40.76 in. plus the 2023 deficit of 11.27 in.). It last happened just five years ago in 2019 (Table 3), when an average of 57.60 in. of precipitation fell across southeast Kansas, the wettest year on record.

The 2023 average annual temperature in southeast Kansas was 59.0°F, or a departure of +1.9°F (Table 2). All months were above normal except March. December (+6.3°F), January (+4.8°F) and September (+3.4°F) were the three months most above normal. The number of 90-degree and 100-degree days in 2023 were much above normal across the division (Table 4). All three summer months (June, July, and August) had average temperatures that were much above normal, primarily driven by very warm days. The average low temperatures during both June and July were slightly below normal (Table 5), and the counts of days with lows at or above 70 degrees were mostly below normal across the division, suggestive of drier than normal conditions that allowed temperatures to cool more easily at night than on very humid days. At the Kansas Mesonet site in Parsons, the average dew point for summer 2023 was 66.1°F, lower than the normal dew point for June 1 – August 31 of 67.2°F (based on 1991 – 2020 hourly data). During the summers of 1991 through 2020, Parsons had a dew point at or above 70°F, indicating very humid conditions 35.6% of the time. In 2023 this threshold was exceeded only 23.1% of the time, further evidence of lower humidities during the past summer in southeast Kansas.

Conclusions

Although the drought conditions in southeast Kansas were somewhat alleviated by precipitation received at the end of the year, the substantial deficit will take time to recover. The probability of getting sufficient rain to fully relieve the deficit and refill the

soil profile is low. Current conditions in the region are primarily still listed as abnormally dry to moderate drought.

Temperatures across the region were consistently above average, except during March. This resulted in the number of days of temperatures above 90°F and 100°F being above average for 2023. Conversely, the low humidity due to drought resulted in fewer high nighttime lows.

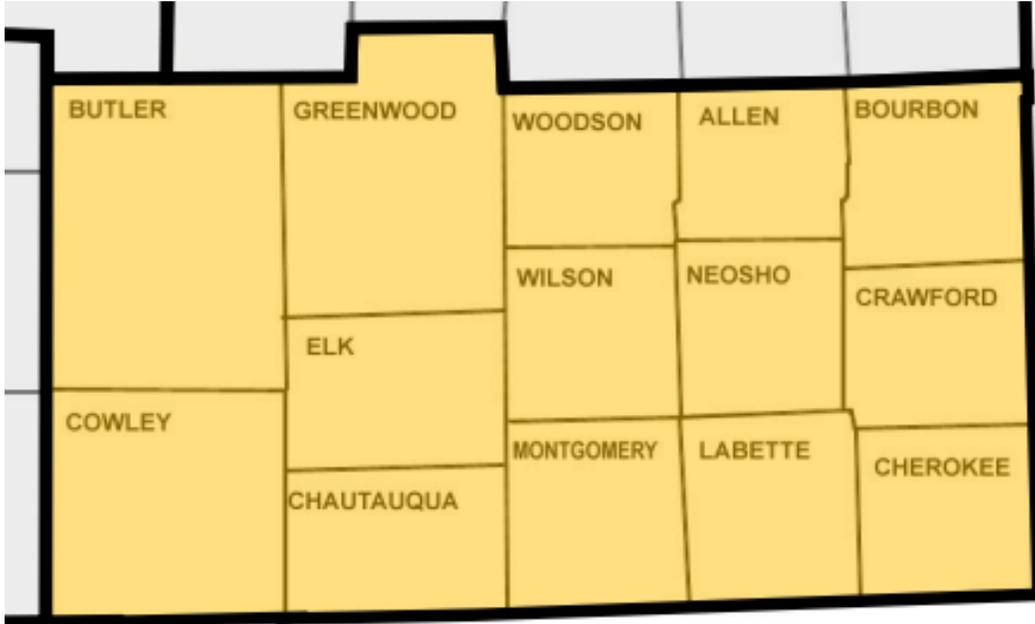
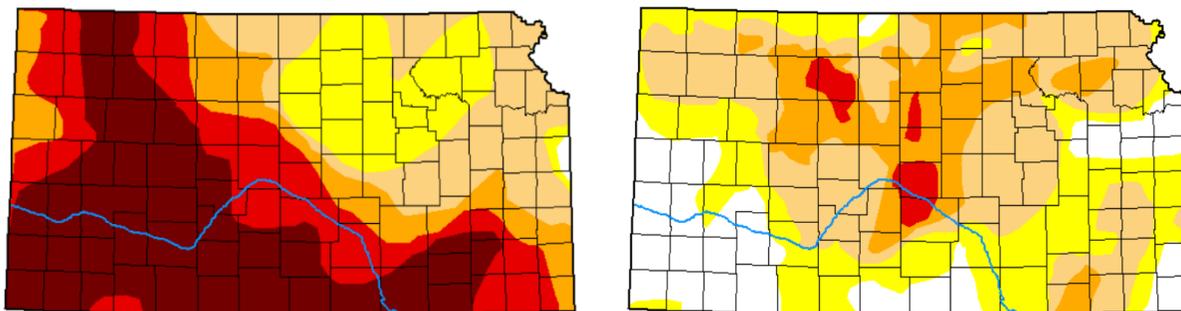


Figure 1. Map of the 14 counties comprising NCEI's southeast Kansas climate division.



Date	None	D0	D1	D2	D3	D4	DSCI
12/27/2022	0.25	14.15	16.74	11.83	20.18	36.85	348
12/26/2023	20.25	26.32	34.00	16.56	2.88	0.00	156

Figures 2a-b, Table 1. U.S. Drought Monitor map for Kansas on December 27, 2022 (left) and December 26, 2023 (right), as well as categorical percentages of the amount of Kansas in each of the drought categories. D4 is the most severe category, while D0 is the least severe. None refers to drought-free conditions. DSCI is the Drought Severity Coverage Index, a composite index of overall drought conditions. Higher DSCI values indicate worse drought. The DSCI can range from a minimum of 0 (entire state drought-free) to 500 (entire state in D4).

Table 2. Total precipitation and daily temperature averages for each month across the southeast Kansas climate division (Source: NCEI).

	Precipitation (in.)			Temperature (°F)		
	Total	Norm.	Dep.	Avg.	Norm.	Dep.
Jan	1.32	1.22	+0.10	37.9	33.1	+4.8
Feb	1.90	1.59	+0.31	39.4	37.6	+1.8
Mar	1.04	2.75	-1.71	45.9	47.3	-1.4
Apr	1.25	4.14	-2.89	57.0	56.7	+0.3
May	3.98	5.96	-1.98	66.9	65.7	+1.2
Jun	2.82	5.45	-2.63	75.6	75.1	+0.5
Jul	4.23	4.23	+0.00	80.1	79.7	+0.4
Aug	3.20	3.92	-0.72	81.1	78.5	+2.6
Sep	2.12	3.93	-1.81	73.7	70.3	+3.4
Oct	3.39	3.48	-0.09	60.4	58.5	+1.9
Nov	1.41	2.13	-0.92	47.6	46.3	+1.3
Dec	2.83	1.77	+1.06	42.4	36.1	+6.3
YEAR	29.49	40.76	-11.27	59.0	57.1	+1.9

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Table 3. The five wettest, driest, warmest and coldest years in southeast Kansas since 1895 (Source: NCEI). Years marked with an asterisk (*) indicate the last of multiple occurrences.

Precipitation					Temperature			
Wettest		Driest			Warmest		Coldest	
Amount (in.)	Year	Amount (in.)	Year	Rank	Value (°F)	Year	Value (°F)	Year
57.60	2019	21.93	1963	1	60.7	2012	54.0	1979
54.09	2008	22.28	1956	2	59.9	1954	54.2	1895
53.62	1961	22.60	1952	3	59.5	1946	54.3	1917
52.36	1985	23.06	1980	4	59.4	1921	54.4	1903
51.95	1973	23.40	1917	5	59.3	2016*	54.5	1993*

Table 4. Number of days in 2023 on which high temperatures were at least 90°F and 100°F, and the number of days on which low temperatures were at least 70°F, at selected locations across south-east Kansas. The average annual counts are based on 1991–2020 data. BOLD numbers in the 2023 column indicate above-normal totals.

Location	90°F Highs		100°F Highs		70°F Lows	
	2023	Avg.	2023	Avg.	2023	Avg.
Chanute	80	49	14	5	43	40
El Dorado	82	53	20	6	32	38
Eureka	78	50	19	7	29	27
Fort Scott	56	53	8	6	29	42
Girard	59	52	10	4	31	40
Independence	72	54	16	6	30	43
Iola	42	40	6	2	27	38
Parsons	52	47	8	5	33	35
Sedan	92	58	16	9	34	40
Winfield	84	55	23	9	43	35
Yates Center	56	41	13	4	29	30

Table 5. Departures from normal for average daily maximum and minimum temperature as well as average monthly temperatures for the three months of meteorological summer 2023. Departures from normal are based on average temperatures for the period 1991–2020 (Source: NCEI).

Month	Average Temperature (°F)		Maximum Temperature (°F)		Minimum Temperature (°F)	
	2023	Dep.	2023	Dep.	2023	Dep.
June	75.6	+0.5	87.6	+2.1	63.7	-1.0
July	80.1	+0.4	91.6	+1.1	68.5	-0.5
August	81.1	+2.6	93.8	+4.1	68.5	+1.2