"To provide weather and flood warnings, public forecasts and advisories for all of the United States...and it territories...for the protection of life and property.

National Weather Service

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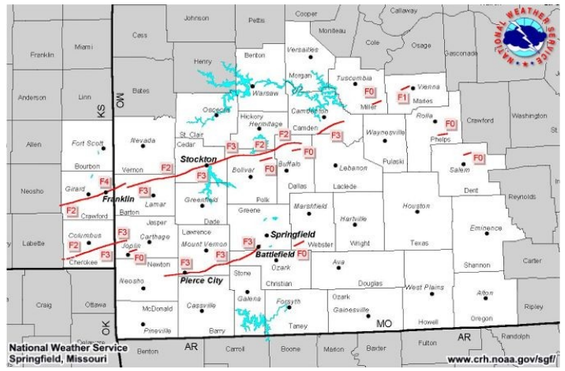
National Weather Service

Natural Hazard Risk Assessment Information For:

Cherokee County Kansas



Information Provided By
WFO Springfield, Mo

2009 Update

Includes data and information through December 2008

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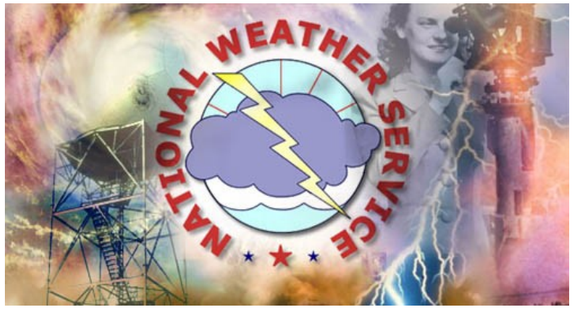


This document is intended to provide general information on severe weather that has affected Cherokee County and the communities with in the county.

By Gene Hatch
Meteorologist Intern WFO Springfield. Mo.

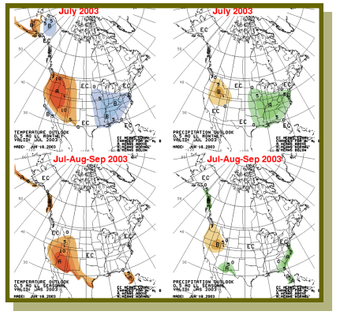
Local Climatology

Averages and records for Columbus, Kansas in Cherokee County

	42	23		7.1	77	-18	23.5
	49	28		2.4	85	-28	16.0
	59	36		1.5	93	-17	18.4
	68	44		0	97	17	9.0
	77	55		0	98	28	0
	85	64		0	108	42	0
	91	69		0	117	45	0
	90	67		0	115	44	0
	81	59		0	108	30	0
	71	47		0	97	15	2.8
	57	36		0.7	84	4	9.5
	46	26		2.6	76	-15	17.9

Links for Climate information

- www.crh.noaa.gov/sgf/
- www.cpc.ncep.noaa.gov/
- www4.ncdc.noaa.gov
- web.missouri.edu/~moclimat/
- mrcc.sws.uiuc.edu/
- agebb.missouri.edu/weather/index.htm



Historic Weather in Southeast Kansas

Mar. 6th–1994...A thunderstorm moved across Cherokee County Kansas and dropped hail sized up to an inch from southeast of Oswego to eight miles south of Columbus. This was nearly a 20 mile long path of hail.

Apr. 3rd-1956...During the afternoon, severe thunderstorms over Cherokee county KS, spawned an F4 tornado that cut a swath of damage 1200 yards wide and 10 miles long. 11 persons were injured but luckily no one was killed.

Apr. 10 - 1994... Rainfall reaching two inches in a few hours caused widespread flooding of county roads as streams and creeks went over their banks in Cherokee county KS. Ninety percent of the corn crop was lost due to the hard rain. Sycamore Creek, in Coffeyville, overflowed its banks and forced the evacuation of a few homes. Many other streams and rivers flooded and caused roads to be closed by the high water.

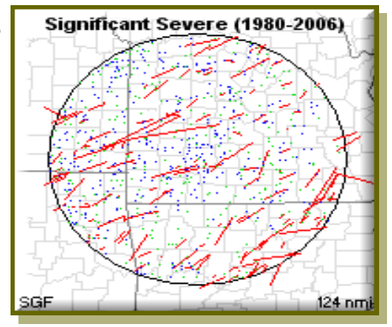
May 4th– 2003...Three tornadic supercell thunderstorms formed over southeast Kansas and moved across the Missouri Ozarks, spawning 13 tornadoes. This was a very rare event for this part of Missouri since many of the tornadoes experienced across this area are short lived small tornadoes. This event surpassed the December 17-18, 2002 tornado event in both loss of lives and property damage, and exceeded tornado events that occurred over the past 100 Years for this part of Missouri. The hardest hit locations included Battlefield, Stockton and Pierce City. 14 tornadoes resulted in extensive damage and 24 deaths. Several of the tornadoes tracked long distances ranging from 15 to 80 miles.

Jul. 26th-1997...Golfball size hail fell in a four mile wide, ten mile long path from near Faulkner to Baxter Springs in the southern part of the Cherokee county KS. Hail caused damage to roofs and windows to about 30 farmsteads and affected about 4000 acres of wheat, 300 acres of corn and 300 acres of beans.

Sept 27 - 1959...A tornado 440 yards wide traveled 20 miles from near Hollow, OK to western Cherokee County KS. Although a strong tornado, it was very slow moving, and gave a tremendous warning roar, and as a result no one was killed.

Dec 28 - 1997 Thunderstorms produced very heavy rainfall over Bourbon and Cherokee counties in southeast Kansas. Up to 3 inches of rain fell causing creeks and steams to fill quickly and over flow their banks.

Overview of Weather Hazards in Southwest Missouri & Extreme Southeast Kansas



Weather in the Ozarks

From 1961 to 2008, 522 tornadoes were reported in the 37 counties that WFO Springfield is responsible for, with an average of 11 occurring each year. There were 71 fatalities from these tornadoes, or near one and a half each year. Tornadoes occurred during every month of the year and at every hour of the day. The majority of these tornadoes are weak, but the occurrence of strong and violent storms is always a possibility and cannot be discounted.

The Ozarks experiences between 50 and 70 thunderstorm days a year. During any given storm, large hail, damaging winds and microbursts are possible. The Ozarks go through three severe thunderstorm seasons during the course of the year. The spring season is the period that supercell thunderstorms are most common, next comes summer as large clusters of storms move across the region, mainly during the overnight hours. Finally fall sees the return of supercells and tornadoes, squall lines and training storms (thunderstorms that form and move over the same area).

The region is affected during the course of any year by flooding, drought, heat and cold extremes and winter storms. Heat extremes and flooding have caused the greatest number of fatalities in the area. Winter storms affect the region in many forms. Ice storms, heavy snow and extreme cold have occurred across the area. Freezing rain is the typical form ice storms in the Ozarks take. Ice storms have deposited 2 to 3 inches of ice during their duration causing power outages, tree damage, and traffic problems.

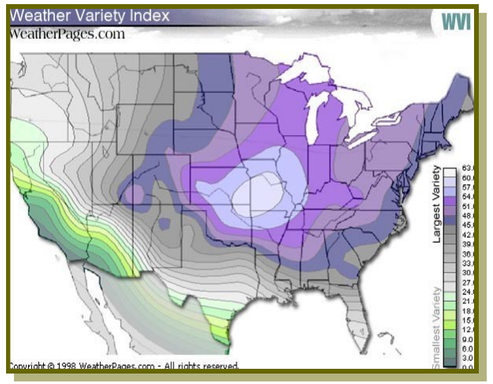
Tornadoes by county for the Springfield County Warning Area from 1950 to 2008

County	F0/1	F2	F3	F4	F5	County	F0/1	F2	F3	F4	F5	County	F0/1	F2	F3	F4	F5
BARRY	20	7	1	0	0	DOUGLAS	8	6	1	0	0	OREGON	9	4	2	1	0
BARTON	23	1	3	1	0	GREENE	19	10	3	1	0	OZARK	21	2	2	1	0
BENTON	18	2	4	0	0	HICKORY	8	1	1	0	0	PHELPS	15	4	2	0	0
BOURBON,KS	10	5	0	0	0	HOWELL	20	11	3	1	0	POLK	16	3	0	0	0
CAMDEN	15	6	1	0	0	JASPER	30	5	4	1	0	PULASKI	9	4	1	0	0
CEDAR	10	2	3	0	0	LACLEDE	9	6	1	0	0	SHANNON	11	1	1	0	0
CHEROKEE,KS	28	5	2	1	0	LAWRENCE	11	2	3	0	0	ST.CLAIR	13	2	2	0	0
CHRISTIAN	19	2	1	1	0	MARIES	4	3	0	0	0	STONE	10	3	0	0	0
CRAWFORD,KS	19	11	3	1	0	McDONALD	11	5	0	0	0	TANEY	6	1	0	0	0
DADE	11	2	2	0	0	MILLER	22	3	0	0	0	TEXAS	14	8	1	2	0
DALLAS	7	1	1	0	0	MORGAN	11	7	0	0	0	VERNON	20	1	6	0	0
DENT	8	1	1	0	0	NEWTON	30	5	1	2	0	WEBTSER	19	7	2	0	0
												WRIGHT	10	4	0	1	0

Historical information for Cherokee County, Kansas

Severe Weather in Cherokee County

In 2000, a private company looked at 277 cities across the United States. They rated each city on variations in temperature, precipitation and other factors. Of all the cities in their study Springfield, Missouri rated number one as the city with the most variable weather in the U.S.

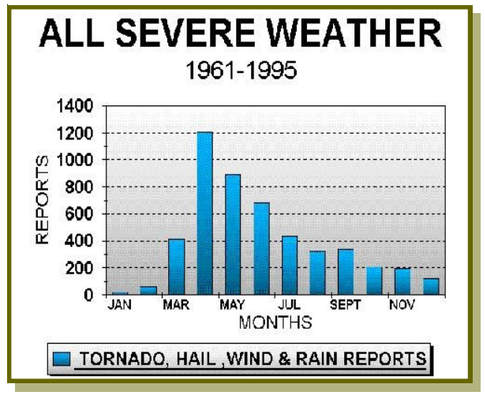


From www.weatherpages.com

Cherokee County Missouri is located on the Ozark Plateau along the eastern edge of tornado ally. Because of its location Cherokee County is subjected to severe thunderstorms, heavy rainfall, winter storms, flooding, ice storms, droughts, tornadoes and other wind storms.

When does severe weather occur ?

Severe weather in the Ozarks can occur in any month of the year. While the months of April through June are the peak severe weather season, there is a secondary peak from September to November.



Severe thunderstorms in Cherokee County have dropped hail up to 2.50" in diameter, created winds in excess of 100 miles an hour and rainfall rates greater than 2" in an hour. While southeast Kansas receives nearly 11 tornadoes a year, Cherokee County averages an event every 1 1/2 years.

Number of Tornadoes in Cherokee Co. (1950 to 2008)				
F0/F1	F2	F3	F4	F5
28	5	2	1	0
78%	14%	6%	2%	0%

During the winter season Cherokee County averages 11.3 inches of snow. With the most snow in one season at 31.5 inches, falling during the 1912 to 1913 winter season. Ice storms also affect the county during the winter season causing significant damage to homes, trees and utilities.

Dam Failure

Dams in Cherokee County

Cherokee County contains 7 dams. While the majority of theses dams are small and used primarily for storm water management, irrigation and recreation, some are a part of local reservoirs. All of the dams in Cherokee County are of earthen construction and there have been no recorded failures.

Where are they Located

- Johnston Dam: Lightning Creek, Baxter Springs
- Empire District Electric Dam: Spring River, Chetopa
- Empire District Electric Dam: Shoal Creek, Baxter Springs
- Ruaniker Inc. Dam: Shoal Creek, Lowell
- Riverton Hydro Project Dam: Spring River, Baxter Springs
- Kansas Dam 64: Willow Creek Trib., Baxter Springs
- Kansas Dam 2985: Shawnee Creek Trib., Riverton

The only significant dam in Cherokee County is the Riverton Hydro Dam. It is less than 100 feet high. Many other dams may be located across Cherokee county on private land and fall under private ownership. However, theses small dams are not large enough or do not hold a minimum amount of water be listed as significant.

Spillway release of water after heavy rains

Heat, Drought and Wildfires

Excessive heat is the leading cause of weather fatalities in the nation. With the variability of the weather in southwest Missouri and southeast Kansas, it is not surprising that excessive heat impacts Cherokee county on almost a yearly basis.

Cherokee County averages 22 days a year with temperatures at or above 95 degrees. July and August are the two warmest months, which average 9 days at or above 95 degrees.

Year	Days 95* +	Days 100* +	Days in a row
1901	50	28	27
1913	62	42	20
1918	60	35	23
1934	69	50	40
1936	79	57	22
1954	86	58	45
Normal # of Days	22	7	▲ Above 95*

Years with above average summer heat

Drought and wildfires can, and often do accompany excessive heat. Cherokee County has gone through dry periods and drought. The latest droughts occurred in 1999 and 2000 when well below normal rainfall and high temperatures combined to produce drought conditions.

Longest periods without rainfall in Cherokee County

- 46 days: 3 Sept 1979 ~ 18 Oct 79
- 45 days: 3 Dec 1955 ~ 16 Jan 56
- 37 days: 30 Jul 2000 ~ 4 Sept 00
- 34 days: 17 Dec 1901 ~ 19 Jan 02
- 33 days: 7 Oct 1952 ~ 8 Nov 52
- 33 days: 10 Feb 1956 ~ 13 Mar 56

In a press release issued in 2000 Casey McCoy, rural fire service specialist with the Kansas Forest Service indicated that-
"California and Kansas are No. 1 and 2 among western U.S. states for producing the greatest number of wildfires every year. California just makes the news a lot more often. Kansas actually surpasses California on amount of land affected. With an average 190,638 acres burned annually, Kansas is second only to Alaska (409,340 acres). Many would guess the leading cause in Kansas is ranchers' pasture burning. That's a widely used and well accepted practice for managing grasslands. Research has shown burning is what many native Plains grass seeds need to germinate - just as they did in buffalo-roaming days, when lightning set the fires.'

Tornado Information

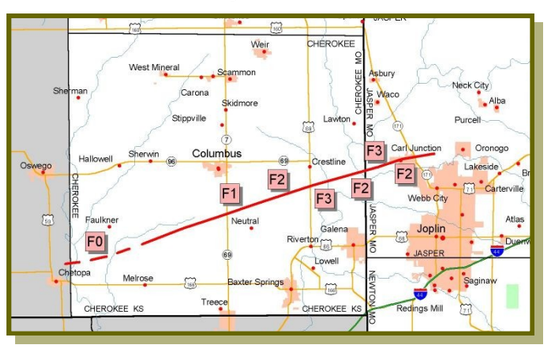
Cherokee County lies at the eastern edge of tornado ally and receives on average 1 tornado every 2 years. From 1950 to 2002 Cherokee county recorded 27 tornadoes from F0 to F4 in strength. The strongest tornado, an F4, passed across the county on the overnight on April 3rd, 1956. Along its 3 mile track it caused 2.5 million dollars in damage and injured 5.

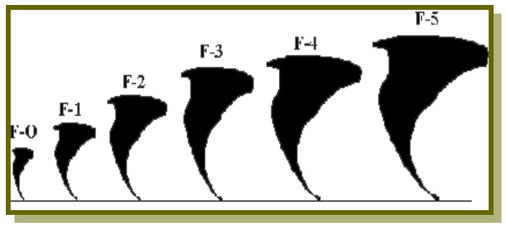
Historical Tornadoes of Cherokee County

- Apr 2, 1880 (F3) 1 inj, 0 dead
- Mar 17, 1881 (F2) 6 inj, 0 dead
- May 13, 1883 (F3) 0 inj, 0 dead
- Jul 5, 1895 (F2) 10 inj, 0 dead
- Apr 12, 1911 (F3) 3 inj, 0 dead
- Oct 9, 1914 (F4) 2 inj, 6 dead
- Jun 9, 1924 (F2) 5 inj, 1 dead
- Mar 30, 1938 (F4) 34 inj, 13 dead
- May 4, 2003 (F3) 3 dead

For the Record Cherokee County

- Has experienced three F4 tornadoes.
- No F5 tornadoes
- Most recent Tornado May 10, 2008 (F0)
- 21 deaths and 76 injuries since 1880.

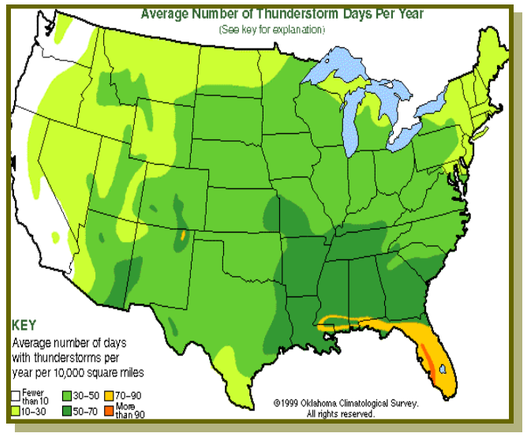




- **F-0:** 40-72 mph, chimney damage, tree branches broken
- **F-1**: 73-112 mph, mobile homes pushed off foundation or overturned
- **F-2**: 113-157 mph, considerable damage, mobile homes demolished, trees uprooted
- **F-3**: 158-205 mph, roofs and walls torn down, trains overturned, cars thrown
- **F-4**: 207-260 mph, well-constructed walls leveled
- **F-5**: 261-318 mph, homes lifted off foundation and carried considerable distances, autos thrown as far as 100 meters.

In Cherokee County, the tornado moved east northeast and passed north of Melrose where it was rated as an F-0 to just west of Highway 69/7 and rated as an F-2 until it reached just northeast of Neutral and rated an F-1. It was again rated as an F-2 just south of Quaker and rated an F-3 just southwest of Badger.

Severe Hail, Lightning, Wind and Winter Weather



Average number of thunderstorm days per year.

Thunderstorms occur in the Ozarks on the average of 50 days per year.

April and May are the two most active hail months in the Ozarks. There is also evidence of a minor secondary peak in September. The greatest number of hail reports over 2 inches occur in the months of April, May and June with the largest report being 2.50 inches in diameter in Cherokee county on May 5, 1971. Hail can cause considerable damage to homes, vehicles, and crops.

Severe thunderstorm winds are defined by the NWS as convective wind gusts that reach or exceed 50 knots (58 mph). June is the most active month with April a close second. In general, the most active period for damaging wind events occurs from April to August. This is due in part to the shift from supercell thunderstorms to large clusters of storms and squall lines. The highest wind gust recorded in Cherokee county reached 101 mph and occurred in 1998 on the 19th of August. Since 1956 high winds have caused around $5,296,000.00 in damages.

With any thunderstorm lightning will be present and the safest place to be is indoors. In July of 1994, The historic old Cato General Store caught fire when it was struck by lightning. The landmark was built in 1868 and was a stopping place for pioneers to replenish their supplies as they headed west.

Nationally Kansas ranks 20th in Lightning fatality rate, 15th in injuries and 2nd in property damage related to lightning. During the period from 1960 to 1994 the total number of lightning casualties in Kansas was 213. This averages to more than six casualties per year in the state.

Winter weather across the Ozarks comes in many forms. Freezing rain or drizzle, sleet and snow are common occurrences during the winter season. In the past the Ozarks have had up to 54 inches of snow, Sleet storms that produced inches of sleet and ice storms that laid a covering of one to two inches of ice on most surfaces. While the immediate impact of theses storms is to travel, winter storms cause hundreds of thousands of dollars in damages across the region on a near yearly basis.

21 Feb 2001: Sleet, freezing rain and embedded thunderstorms caused ice accumulations from one quarter, up to two inches in places across southwest, central and south central Missouri. The heaviest ice accumulations occurred along and north of Highway 60, and along the I-44 corridor. Howell-Oregon electric cooperative reported numerous power outages due to the ice around the communities of Willow Springs, Birch Tree, Mountain View, Winona, Eminence and Dora.

Flooding

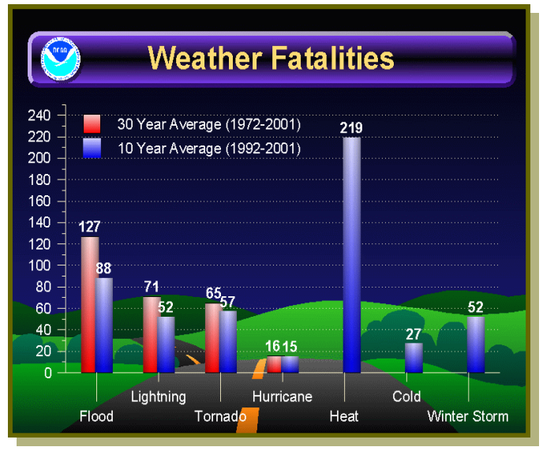
From 1993 to 2002 Flooding has occurred in Cherokee County in almost every year. While usually nuisance flooding such as water on city streets, significant flooding has caused numerous problems in the county. During the previous decade, only one injury and no deaths have been attributed to flooding in Cherokee County. Cherokee County contains numerous low water crossings.

Typically, flooding in the county is caused by heavy rainfall associated with high rain producing thunderstorms which move very slowly. In towns, rainfall of one to two inches will cause streets and ditches to flood and make some low water crossings impassable. When rainfall rates reach 3 to 4 inches, major flooding can occur, and amounts over four inches creates significant flooding that affects most of the county.

Floods in Cherokee County

25 Apr 1999: Thunderstorms produced heavy rain and flooding over extreme southeast Kansas. Portions of Baxter Springs in Cherokee County required a brief evacuation due to rapidly rising water.

11 Apr 1994: Rainfall up to 11 inches in three days caused the Neosho River to surge out of its banks from Iola to the Oklahoma border. The river went two feet above flood stage in Iola and almost nine feet above flood stage in Neosho. Neosho County received the brunt of the flooding and was declared in a state of disaster by the Governor.



National Weather Fatality Statistics

28 Apr 1994: Ten inches of rain in 24 hours caused the Neosho River to rise above flood stage for the second time this month. Extensive flooding ocurred across southeast Kansas. The flooding closed many schools and roads. Twenty homes were damaged in Iola. |The river crested in Iola 4.8 feet above flood stage on the evening of the 29th. Some residences south of town were evacuated. In Chanute it crested 9.5 feet above flood stage in the afternoon of the 29th. |In Parsons it crested at nearly 7.5 feet above flood stage on the morning of May 1st and did not go below flood stage until May 4. The crest at Oswego was almost 10 feet above flood and also did not recede into its banks until May 4.