



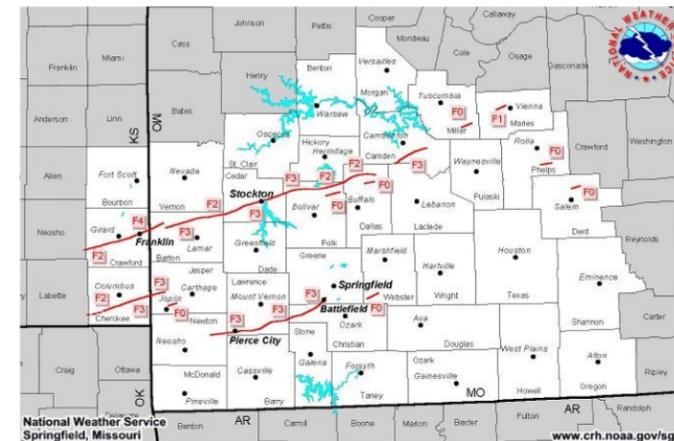
*"To provide weather and flood warnings, public forecasts and advisories for all of the United States...and its territories...for the protection of life and property."*

## National Weather Service

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## National Weather Service

### Natural Hazard Risk Assessment Information For: **Cedar County Missouri**



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 Cedar County and the communities with in the county.

By Gene Hatch  
 Meteorologist Intern WFO Springfield. Mo.

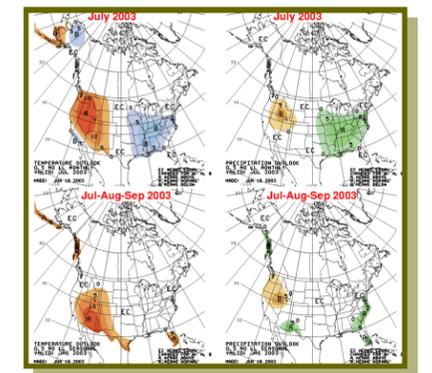
# Local Climatology

Averages and records for Stockton, Missouri in Cedar County

40	21	2.8	70	-16	15.0
46	25	2.1	80	-14	15.5
57	34	1.3	87	-1	14.0
67	44	0	91	19	0.5
76	54	0	93	30	0
84	64	0	104	42	0
90	69	0	108	47	0
90	67	0	107	47	0
81	59	0	106	29	0
70	47	0	92	19	0
56	36	0.8	83	5	9.0
44	26	1.4	75	-18	14.7

Links for Climate information

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



## Historic Weather in Southwest Missouri

**Jan. 8th-1997**...Six inches or more of snow fell over much southwest, south central and central Missouri from noon on the eighth to noon on the ninth. The heaviest snow fell in a band from Cassville to Springfield north to Hermitage where up to ten inches was recorded. Damage estimates at 670K dollars were due to the cost of snow removal.

**Mar. 12th-1961**...A tornado touched down at 745 am in southern Greene County and moved northeast from near Plainview road towards the KWTO towers. The tornado blew down 2 of KWTO's towers, damaged the roof on the Disney school and damage 3 other homes.

**Apr. 23rd-1967**...A severe thunderstorm formed over the northwest portion of the city of Springfield, MO spawning a tornado. The weather service office measured a wind gust of 63 mph as the tornado moved through the center of the city. Nearly 1000 homes and businesses were destroyed with one fatality and 9 injuries reported.

**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. 23rd-1995**...Thunderstorm winds flipped three mobile homes to the north of Stockton Missouri and downed trees in Monett and south of Dadeville. A tractor-semitrailer was blown off of Interstate 44 near Mt Vernon.

**Nov. 24th-1993**...Flash flooding was observed along County Road M about 3 miles northeast of Stockton Missouri after the Bear Creek rose out of its bank. The road was closed for several hours.

**Dec. 17-18th-2002**...At approximately 1118 pm a tornado struck near Chesapeake Mo. The F2 tornado hit the Lucky Lady trailer park in addition to 1 home northeast and 3 homes southwest of the trailer park. The tornado resulted in 1 fatality and 15 injuries.

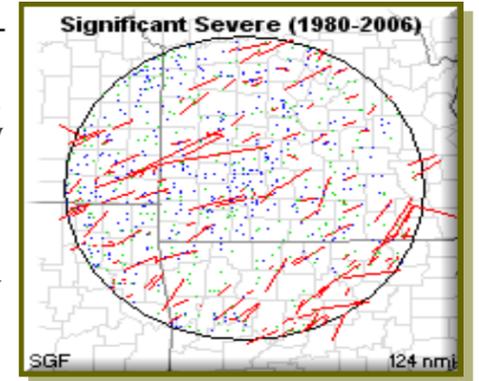


## Overview of Weather Hazards in Southwest Missouri & Extreme Southeast Kansas

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.



**Weather in the Ozarks**

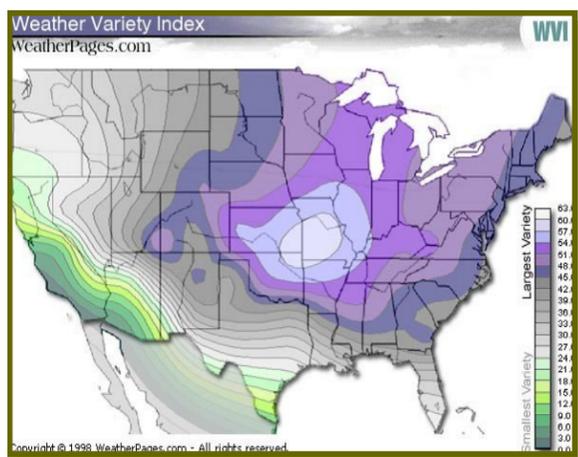
### Tornadoes by county for the Springfield County Warning Area from 1950 to 2008

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	WEBTSE	19	7	2	0	0
												WRIGHT	10	4	0	1	0

## Historical information for Cedar County, Missouri

### Severe Weather in Cedar 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.

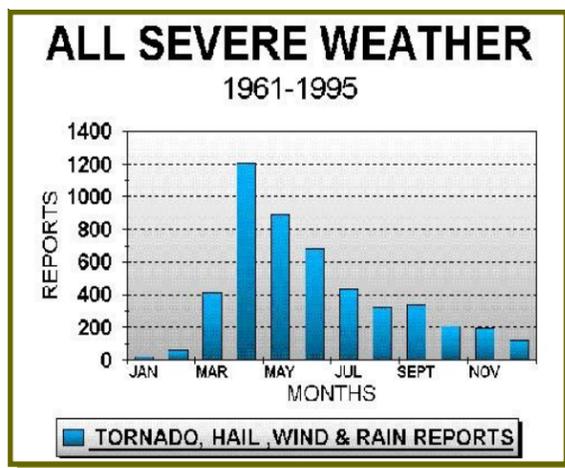


### From www.weatherpages.com

Cedar County Missouri is located on the Ozark Plateau along the eastern edge of tornado ally. Because of its location Cedar 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 Cedar County have dropped hail up to 3 1/2" in diameter, created winds in excess of 80 miles an hour and rainfall rates greater than 2" in an hour. While southwest Missouri receives nearly 11 tornadoes a year, Cedar County averages an event every 4 years.

### Number of Tornadoes in Cedar Co. (1950 to 2008)

<u>F0/F1</u>	<u>F2</u>	<u>F3</u>	<u>F4</u>	<u>F5</u>
10	2	3	0	0
67%	13%	20%	0%	0%

During the winter season Cedar County averages 8.4 inches of snow. With the most snow in one season at 28.6 inches, falling during the 1974 to 1975 winter season. Ice storms also affect the county during the winter season causing significant damage to homes, trees and utilities.

## Dam Failure

### Dams in Cedar County

Cedar County contains 9 dams. While the majority of these dams are small and used primarily for storm water management, irrigation and recreation, some are a part of local reservoirs. The most significant dam in Cedar county is Stockton dam. Most of the dams in Cedar County are of earthen construction and there have been no recorded failures.

### Where are they Located

- Cowan Lake Dam East: Sac River, Osceola
- Hickman Lake Dam: Stockton Branch, Caplinger Mills
- Truitt Lake Dam: Silver Creek, Caplinger Mills
- Baird Lake Dam: Little Sac River, Caplinger Mills
- Cowan Lake Dam West: Sac River, Osceola
- Dorman Lake Dam: Cedar Creek, Osceola
- Stockton Dam: Sac River, Caplinger Mills
- Burns Lake Dam: Conner Brook, Stockton
- Mossy Hill Dam: Horse Creek, Jerico Springs



Most of the dams in Cedar County are less than 100 feet high. Many are located on private land and fall under private ownership. Stockton dam is the most significant dam in cedar county. It is a rockfill earthen construction dam used for hydro electric power and recreation.



# Heat, Drought and Wildfires



Drought and wildfires can, and often do accompany excessive heat. Cedar 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 Cedar County

- 42 days: 21 Dec 1985 ~ 31 Jan 86
- 40 days: 12 Jun 2003 ~ 21 Jul 03
- 36 days: 19 Aug 1996 ~ 23 Sept 96
- 32 days: 22 Nov 1979 ~ 23 Dec 79
- 31 days: 1 Jul 1970 ~ 31 Jul 70
- 29 days: 16 Aug 1976 ~ 13 Sept 76

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

Cedar County averages 18 days a year with temperatures at or above 95 degrees. July and August are the two warmest months, which average 7 days at or above 95 degrees.

Year	Days 95* +	Days 100* +	Days in a row
1970	23	5	5
1978	41	9	11
1980	64	29	18
1983	31	3	10
1991	43	14	9
2002	34	5	10
<b>Normal # of Days</b>	<b>18</b>	<b>4</b>	<b>▲ Above 95*</b>

Years with above average summer heat

While no major wildfires have affected Cedar County, small grass fires do pose a hazard.

A twenty year study by the Missouri Department of Conservation, from 1970 to 1989 determined that over 5500 fires occurred during that time in the Springfield Fire district which includes Cedar, Dade, Polk, Geene, Webster, Christian, Stone and Taney counties. This represented nearly 10% of the wildfires in the state with over 59,000 acres burned.

There are numerous ways wildfires can be started, but when dealing with weather related phenomenon, namely lightning, only 0.8% of the wildfires in the Springfield fire district were the result of lightning.

# Tornado Information

Cedar County lies at the eastern edge of tornado ally and receives on average one tornado every six and a half years. From 1950 to 2002 Cedar county recorded 8 tornadoes from F0 to F3 in strength. The strongest tornado, an F3, passed across the county on the evening of March 15th, 1982. Along its 14 mile track it caused 25 million dollars in damage and killed 1.

## Historical Tornadoes of Cedar County

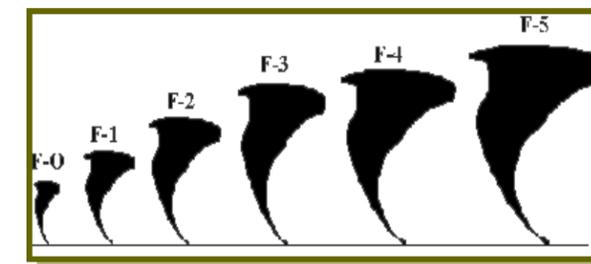
- Apr 5, 1947 (F2) 1 inj, 0 dead
- Sept 16, 1158 (F2) 0 inj, 0 dead
- Apr 20, 1973 (F3) 0 inj, 0 dead
- Mar 15, 1982 (F3) 0 inj, 1 dead
- Jul 4, 1992 (F1) 0 inj, 0 dead
- Dec 18, 2002 (F1) 0 inj, 0 dead
- May 4, 2003 (F3) 2 dead

## For the Record Cedar County

- Has experienced three F3 tornadoes.
- No F4 or F5 tornadoes
- Most recent Tornado March 31, 2008 (F0)
- 5 deaths and 42 injuries since 1880.

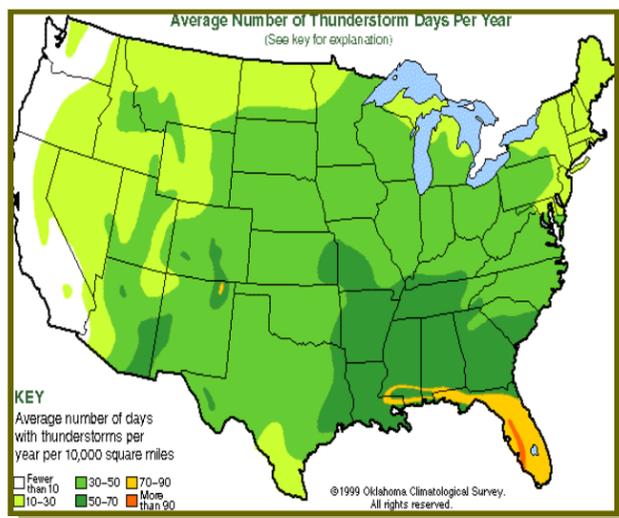


An F3 tornado entered the town of Stockton and passed just to the north of the county courthouse. The tornado was estimated to be between one-half and three-quarters of a mile wide. Two fatalities occurred in downtown Stockton. Damage within the town of Stockton was extensive with numerous buildings destroyed or damaged within the downtown area.



- **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.

## 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 2.75 inches in diameter in Cedar county on May 6, 1998. 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 Cedar county reached 65 mph and occurred in 1996 on the 22nd of July. Since 1958 high winds have caused around \$100,000.00 in damages.

With any thunderstorm, lightning will be present and the safest place to be is indoors. In August of 2002, four people were killed near Willard in Greene County during a funeral. As a thunderstorm moved into the area, the victims sought shelter under a tree.



Nationally, Missouri ranks 27th in Lightning fatality rate, 44th in injuries and 38th in property damage related to lightning. During the period from 1960 to 1994, the total number of lightning casualties in Missouri was 165. This is nearly five 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 these 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 Cedar County in 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 Cedar County. Cedar 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

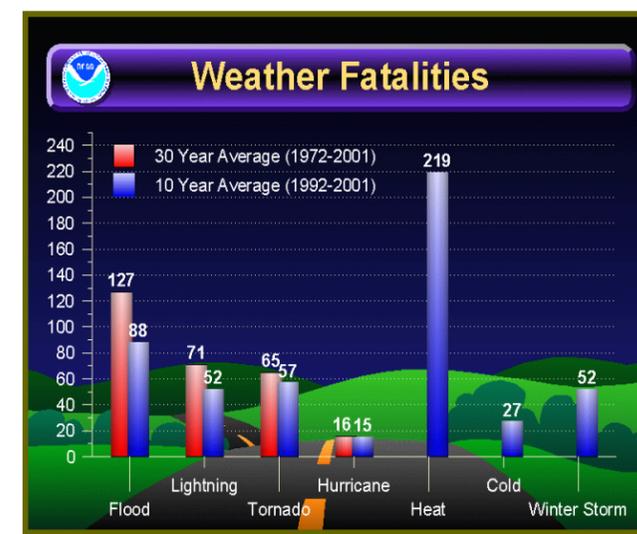
inches, major flooding can occur, and amounts over four inches creates significant flooding that affects most of the county.



### Floods in Cedar County

**25 Sept 1993:** Steady rains brought widespread flash flooding to Springfield with water as high as 10 feet deep in some places. Vehicles were seen floating in some spots.

**7 May 2002:** This extraordinary event consisted of three primary waves of severe weather and flooding. The first occurred during the early morning of May 7th. The second consisted of four separate severe and flooding events which overlapped and lasted from the mid-morning of May 7th, to near sunrise on May 8th. The last wave of severe



### National Weather Fatality Statistics

weather and flooding swept through the area during the evening of May 8th, into the early morning hours of May 9th. Rainfall amounts of four to eight inches fell across the area during this 36 to 48 hour period. Excessive rainfall amounts greater than 10 inches were shown over Bourbon, Crawford, Vernon, Cedar, and Morgan counties, with several observers reporting amounts in excess of 11 inches. The widespread heavy rain amounts and periods of torrential rainfall rates resulted in extensive flooding of small streams and creeks, county roads, low water crossings and other low lying areas. Major highways were also affected. The widespread flooding forced evacuations in several communities and the closing of some schools. A 17 year old female died after being swept off a low water crossing on Beaver Creek six miles north of Mountain Grove, or along the Wright/Texas County border. More specific county information along with all monetary damages, will be included in the flood narrative listed on May 9th.