



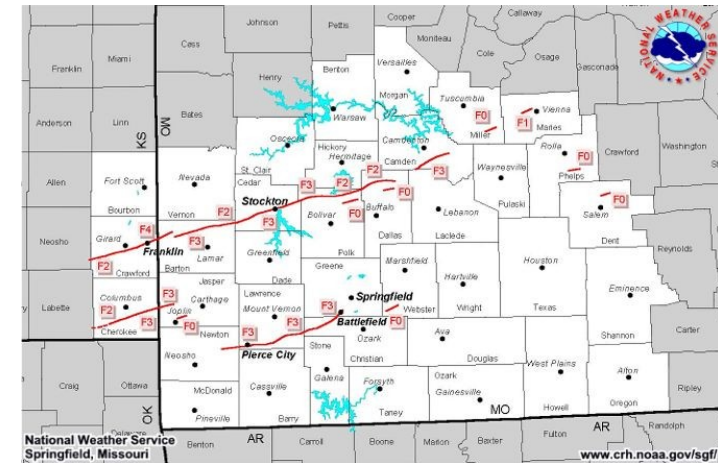
"To provide weather and flood warnings, public forecasts and advisories for all of the United States...and its territories...for the protection of life and property."

National Weather Service

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National Weather Service

Natural Hazard Risk Assessment Information For: **Ozark 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 Ozark County and the communities with in the county.

By Gene Hatch
 Meteorologist Intern WFO Springfield. Mo.

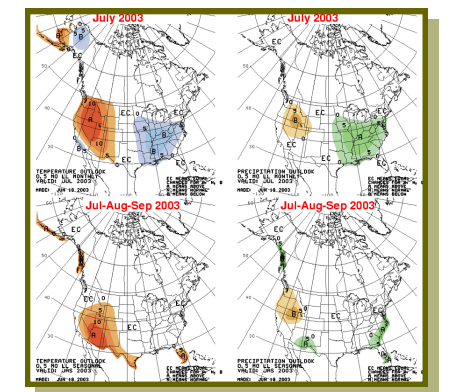
Local Climatology

Averages and records for Wasola, Missouri in Ozark County

44	23	1.9	84	-10	12.0
50	27	1.9	83	-10	20.5
60	36	0.5	88	-1	14.5
70	45	0.4	93	21	6.5
77	54	0	95	29	0
84	62	0	105	43	0
89	67	0	111	49	0
89	65	0	105	48	0
80	58	0	104	31	0
71	46	0	95	19	0
57	36	0.8	85	4	17.3
47	26	0.2	78	-22	11.0

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 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. 2nd-1982...A tornadic thunderstorm developed a tornado in Ozark county MO. The tornado, F4 in strength, left 2 dead and 28 injured during its 20 mile long track. The ½ mile wide path of damage was estimated at 50 million dollars.

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.

Jun. 9th-1975...Thunderstorms that developed over the Springfield area dropped 3.62 inches of rainfall in one hour. This was the greatest hourly rainfall rate recorded for Springfield.

Nov. 11th-1911...A high of 80 and low of 13 were recorded on the same day in Springfield. A cold front, ahead of a very cold airmass, moved through the Ozarks making temperatures fall rapidly.

Nov. 29th-1991...An F4 tornado that developed 3 miles north of Nixa tracked southeast for 10 miles to Springfield and lifted over east Springfield. Extensive damage to homes and businesses was reported. 2 deaths and 64 injuries were directly related to the tornado.

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.

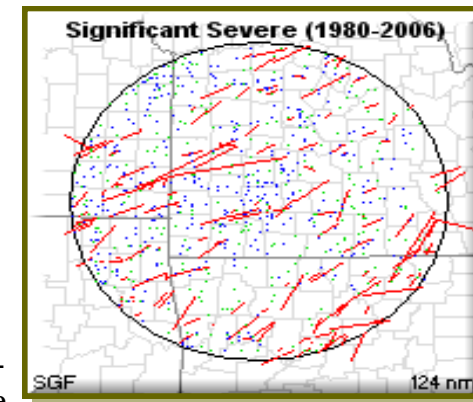


Overview of Weather Hazards in Southwest Missouri & Extreme Southeast Kansas

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

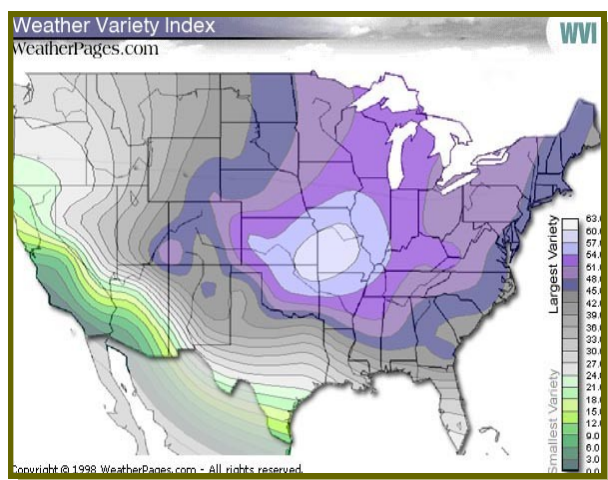
Tornadoes by county for the Springfield County Warning Area from 1950 to 2008

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 Ozark County, Missouri

Severe Weather in Ozark 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.

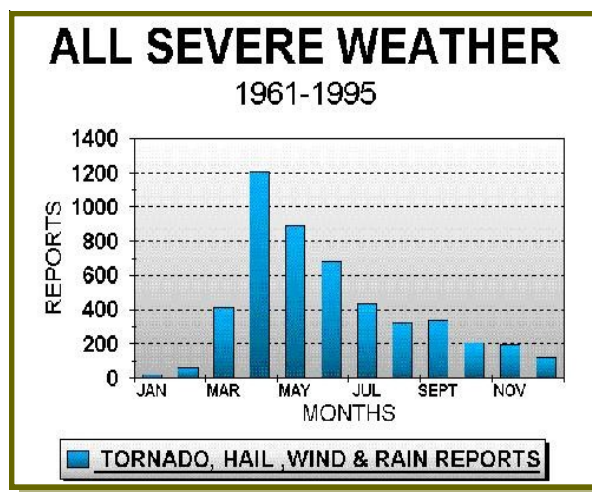


From www.weatherpages.com

Ozark County Missouri is located on the Ozark Plateau along the eastern edge of tornado ally. Because of its location Ozark 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 thunder storms in Ozark County have dropped hail up to 4 1/2" in diameter, created winds in excess of 81 miles an hour and rainfall rates greater than 2" in an hour. While southwest Missouri receives nearly 11 tornadoes a year, Ozark County averages an event every 2 years.

Number of Tornadoes in Ozark Co. (1950 to 2008)

<u>F0/F1</u>	<u>F2</u>	<u>F3</u>	<u>F4</u>	<u>F5</u>
21	2	2	1	0
81%	8%	8%	3%	0%

During the winter season Ozark County averages 5.7 inches of snow. With the most snow in one season at 33.0 inches, falling during the 1980 to 1981 winter season. Ice storms also affect the county during the winter season causing significant damage to homes, trees and utilities.

Dam Failure

Dams in Ozark County

Ozark County contains 6 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. All of the dams in Ozark County are of earthen construction and there have been no recorded failures.

Where are they Located

- Etuchee Dam: Pond Fork, Pontiac
- Merrell Lake Dam: Lick Creek, Mammoth
- Gardener Dam: Nance Creek, Souder
- Mallow Lake Dam: Brixey Creek, Tecumseh
- Herd Dam: Barren Fork, Wilhoit
- D. O. Allen Dam: Gardener Hollow Creek, Souder

All of the dams in Ozark County are less than 100 feet high. Many are located on private land and fall under private ownership.



While there may be more dams in Ozark county, the dams listed are the only significant dams.



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, it is not surprising that excessive heat impacts Ozark county on almost a yearly basis.

Ozark County averages 12 days a year with temperatures at or above 95 degrees. July and August are the two warmest months, which average 5 days at or above 95 degrees.

Year	Days 95* +	Days 100* +	Days in a row
1952	42	13	15
1953	55	19	13
1954	69	34	10
1980	57	25	20
1988	28	3	11
2000	16	8	11
Normal # of Days	12	3	▲ Above 95*

Years with above average summer heat

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

- 45 days: 1 Aug 1998 ~ 14 Sept 98
- 42 days: 16 Aug 1976 ~ 26 Sept 76
- 40 days: 10 Dec 1955 ~ 18 Jan 56
- 39 days: 8 Aug 1995 ~ 15 Sept 95
- 38 days: 21 Sept 1992 ~ 28 Oct 92
- 34 days: 8 Feb 1999 ~ 13 Mar 99

While no major wildfires have affected Ozark 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 8700 fires occurred during that time in the West Plains Fire district which includes Wright, Texas, Douglas, Ozark and Howell counties. This represented nearly 15% of the wildfires in the state with over 114,000 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 West Plains fire district were the result of lightning.

Tornado Information

Ozark County lies at the eastern edge of tornado ally and receives on average a tornado every two years. From 1950 to 2008 Ozark county recorded 26 tornadoes from F0 to F4 in strength. The strongest tornado, an F4, passed across the county on the evening of April 2nd, 1982. Along its 6 mile track it caused 25 million dollars in damage.

Historical Tornadoes of Ozark County

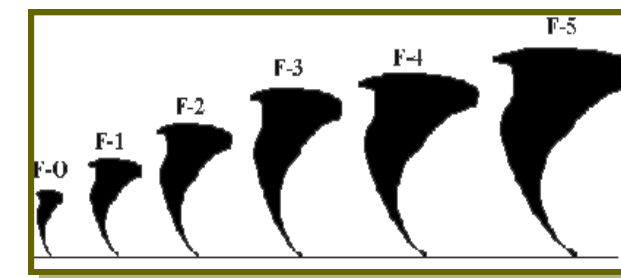
- Apr 14, 1944 (F2) 2 inj, 0 dead
- Mar 12, 1961 (F3) 0 inj, 0 dead
- Mar 12, 1961 (F3) 0 inj, 0 dead
- May 7, 1961 (F3) 0 inj, 0 dead
- Apr 2, 1982 (F4) 0 inj, 0 dead
- Dec 24, 1982 (F2) 0 inj, 0 dead

For the Record Ozark County

- Has experienced one F4 tornadoes.
- No F5 tornadoes
- Most recent Tornado March 31, 2008 (F0)
- 0 deaths and 9 injuries since 1880.

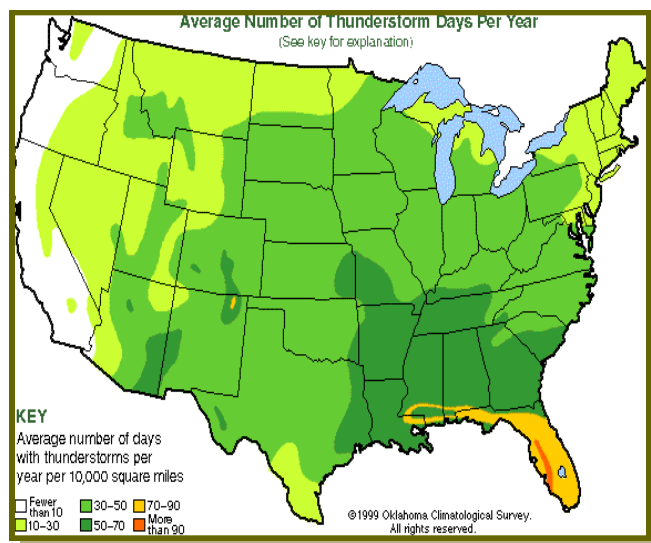


The tornado outbreak of May 4, 2003 was the one of the worst that southwest Missouri has had since the late 1800's. Fifteen tornadoes touched down across the Ozarks during the evening of May 4th and 5th one of which was an F0 that struck the town of Bakersfield. This F0 is the latest tornado to strike Ozark county since an F1 that struck Wasola in August of 2002.



- **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



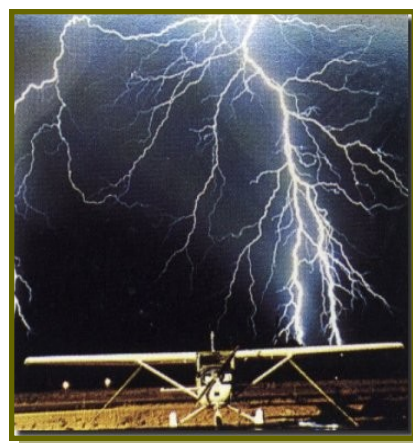
Average number of thunderstorm days per year.

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 4.50 inches in diameter in Ozark county on May 2, 2003. 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 Ozark county reached 75 mph and occurred in 2003 on the 5th of May. Since 1970 high winds have caused around \$775,000.00 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 Ozark 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 Ozark County. Ozark 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

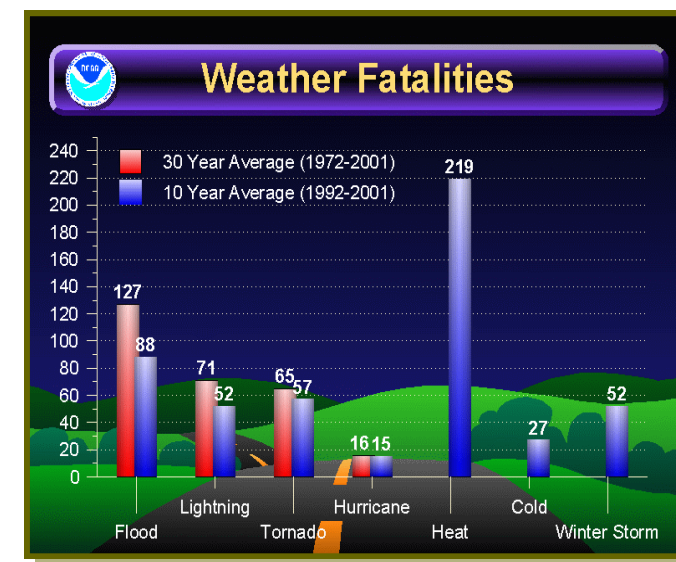


inches, major flooding can occur, and amounts over four inches creates significant flooding that affects most of the county.

Floods in Ozark County

14 Nov 1993: A 27 foot travel home was washed away at Caney Mountain Refuge when the North Fork River flash flooded. Permanent fencing around fields was also damaged across the south-east one-third of the county.

4 Jan 1998: Widespread heavy rainfall occurred over much of extreme southern Missouri from the late morning hours of Sunday January 4th into the early morning hours of Monday January 5th. Widespread rain totals of one to three inches occurred with locally higher amounts in the Branson area. This rain falling on saturated ground caused wide



National Weather Fatality Statistics

Spread flooding of low water crossings. Many highways that cross low water crossings or creeks were temporarily closed in the region. No serious damage or accidents were reported.

19 Mar 1998: Heavy rain falling on saturated ground resulted in flooding of many low water crossings in the county. Highway T near Mammoth and Highway 95 between Souder and Rockbridge were closed for over 24 hours. Low water crossings in the Gainesville area were impassable.

13 Aug 2002: Another round of heavy rainfall occurred over portions of south central Missouri. The previous night received four to five inches of rainfall, then an additional two inches fell over the area during the late morning and early afternoon hours producing another round of flash flooding. Highway 95 near Wasola, County Roads 873 & 883 near Thornfield, and County Road 531 near Caulfield were closed due to the high water. Also Highway T five miles east of State Highway 5 was flooded and closed near Hardenville. Highways BB, CC & K in the West Plains area were also closed due to the high water.