



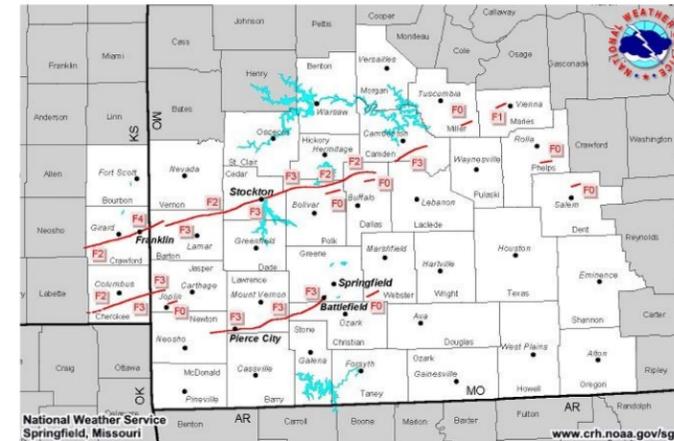
“To provide weather and flood warnings, public forecasts and advisories for all of the United States...and its territories...for the protection of life and property.”

National Weather Service

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National Weather Service

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

By Gene Hatch
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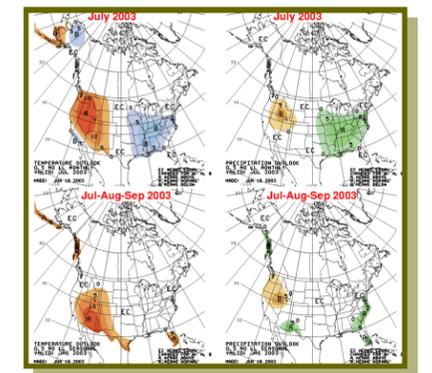
Local Climatology

Averages and records for Lockwood, Missouri in Dade County

42	22	5.5	76	-22	21.8
49	27	3.8	84	-29	16.5
59	36	3.0	92	-4	26.6
69	45	0.1	91	17	8.0
77	54	0	98	29	0
85	63	0	104	44	0
90	68	0	116	47	0
90	66	0	108	45	0
82	58	0	108	31	0
71	47	0	95	17	0.5
57	36	0.9	87	1	20.5
46	26	3.2	78	-17	15.0

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 north-east 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-1956...A severe afternoon thunderstorm dropped hail 3 inches in diameter over central Dade County MO.

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. 10th-1995 ...A severe thunderstorm with one to two inch hail heavily damaged homes in and around Lockwood MO. Over 50K dollars in damage was reported due to the hail. Also a tornado skipped across the Lebanon area, destroying several buildings including the Tracker Marine plant, and heavily damaged another 30 homes.

Nov. 24th-1996 ...Freezing rain fell across the Dade County MO causing ice accumulations of one-half to one inch. Numerous power lines and trees were downed causing power outages. The southeast part Dade County was hardest hit.

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.

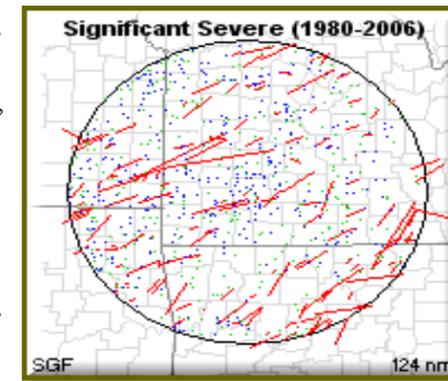


Overview of Weather Hazards in Southwest Missouri & Extreme Southeast Kansas

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

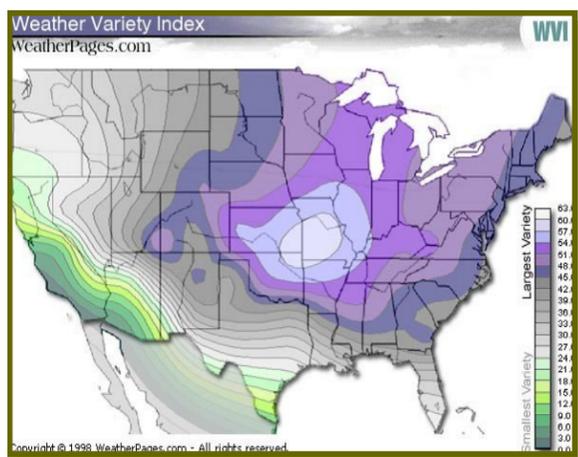
Tornadoes by county for the Springfield County Warning Area from 1950 to 2008

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 Dade County, Missouri

Severe Weather in Dade 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.

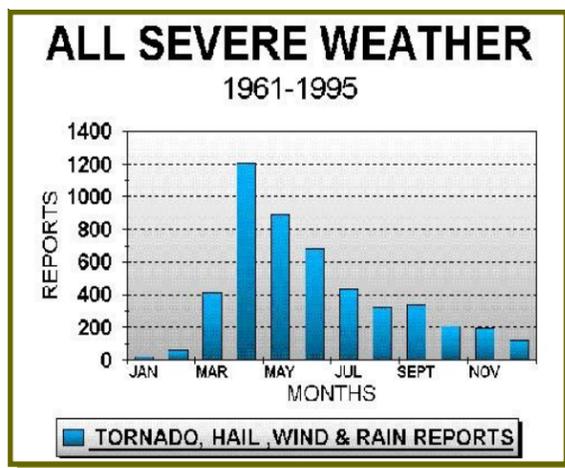


From www.weatherpages.com

Dade County Missouri is located on the Ozark Plateau along the eastern edge of tornado ally. Because of its location Dade 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 Dade County have dropped hail up to 3" 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, Dade County averages an event every 4 years.

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

F0/F1	F2	F3	F4	F5
11	2	2	0	0
74%	13%	13%	0%	0%

During the winter season Dade County averages 16.5 inches of snow. With the most snow in one season at 36.5 inches, falling during the 1933 to 1934 winter season. Ice storms also affect the county during the winter season causing significant damage to homes, trees and utilities.

Dam Failure

Dams in Dade County

Dade County contains 8 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 Dade County are of earthen construction and there have been no recorded failures.

Where are they Located

- Townly Lake Dam: Coon Creek, Lamar
- Schilling Lake Dam: North Fork to Spring River, Lamar
- Campbell Lake Dam: Chaney Branch, Lockwood
- Giddings Lake Dam: Cave Spring Branch, Dadeville
- Spain Lake Dam: South Prong Sons Creek, Stockton
- Winningham Lake Dam: Chaney Branch, Lockwood
- Davis Lake Dam: North fork to Spring River, Lamar
- Rector Lake Dam: Sons Creek, Stockton

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



Spillway gates open to relieve lake after heavy rain.



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 Dade county on almost a yearly basis.

Dade County averages 19 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
1913	51	16	19
1934	61	38	19
1936	73	48	21
1953	61	13	11
1954	78	53	19
1980	65	33	25
Normal # of Days	19	5	▲ Above 95*

Years with above average summer heat

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

- 46 days: 37 Sept 1979 ~ 18 Oct 79
- 42 days: 22 Dec 1960 ~ 1 Feb 61
- 42 days: 1 Aug 2000 ~ 11 Sept 00
- 41 days: 23 Jan 1920 ~ 3 Mar 20
- 39 days: 9 Dec 1955 ~ 16 Jan 56
- 38 days: 9 Oct 1950 ~ 15 Nov 50

While no major wildfires have affected Dade 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

Dade County lies at the eastern edge of tornado ally and receives on average a tornado every six and a half years. From 1950 to 2002 Dade county recorded 8 tornadoes from F0 to F4 in strength. The strongest tornado, an F3, passed across the county on the evening of April 20th, 1973. Along its track it caused 2.5 million dollars in damage and injured 12.

Historical Tornadoes of Dade County

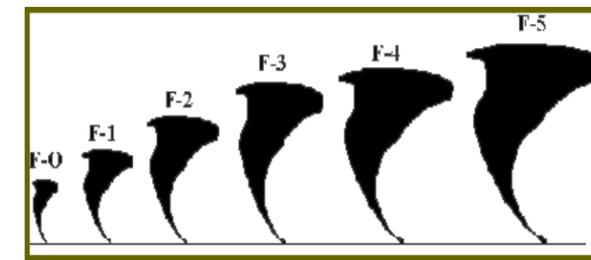
- Apr 10, 1922 (F4) 0 inj, 0 dead
- Apr 25, 1951 (F2) 0 inj, 0 dead
- Apr 20, 1973 (F4) 12 inj, 0 dead
- Apr 20, 1973 (F3) 0 inj, 0 dead
- Apr 25, 1961 (F2) 0 inj, 0 dead
- Dec 19, 1957 (F2) 0 inj, 0 dead

For the Record Dade County

- Has experienced two F4 tornadoes.
- No F5 tornadoes
- Most recent Tornado May 3, 2006 (F0)
- 0 deaths and 12 injuries since 1880.

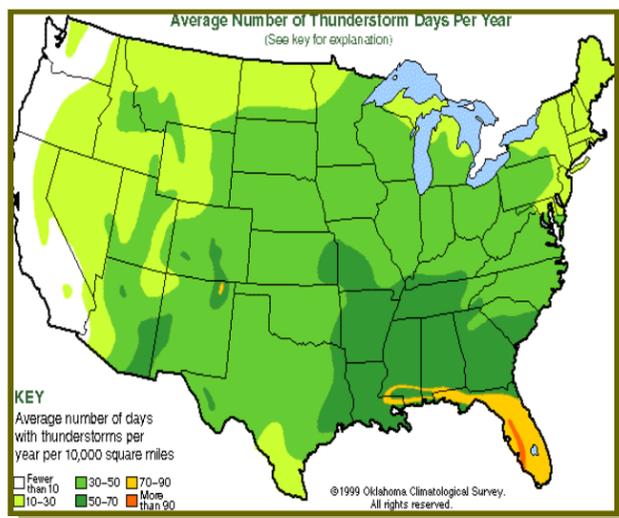


The tornado outbreak of May 4, 2003 was the one of the worst that southwest Missouri has had since the late 1800's. Fourteen tornadoes touched down across the Ozarks during the evening of May 4th one of which was an F3 that struck the town of Stockton.



- **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



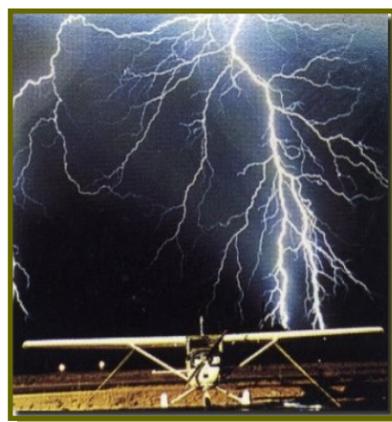
Average number of thunderstorm days per year.

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 3.00 inches in diameter in Dade county on April 2, 1956. 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 Dade county reached 86 mph and occurred in 1983 on the 216d of October. Since 1956 high winds have caused around \$869,000.00 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.

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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 Dade 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 Dade County. Dade County contains numerous low water crossings.

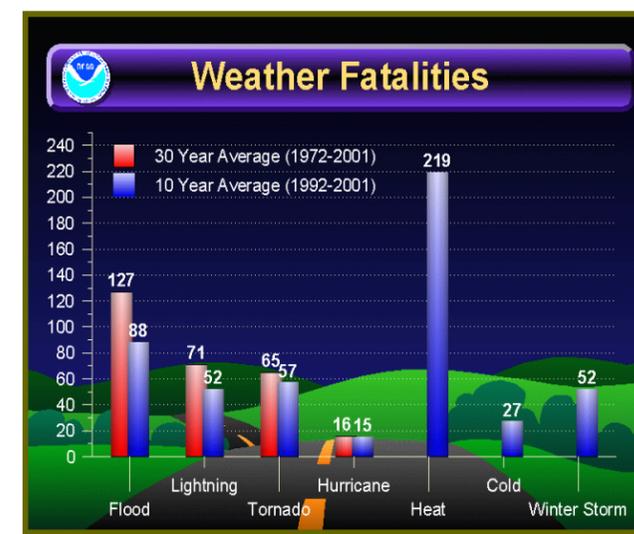
Typically, flooding in the county is caused by heavy rainfall associated with high rain producing thunderstorms which move very slowly. In towns, rainfall of one to two inches will cause streets and ditches to flood and make some low water crossings impassable. When rainfall rates reach 3 to 4



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

Floods in Dade County

10 Oct 2001: During the morning of October 10, a band of very heavy rainfall fell over portions of southwest Missouri. It produced a swath of four to eight inches of rainfall in a narrow band from Northwestern Newton County, northeast across Southern Jasper, Northern Lawrence, Southeast Dade, Northwest Greene, and Southern Polk County. It caused several roads to close around Neosho, Red Oak, Reeds, Pennsboro, Everton, Walnut Grove, Stotts City, and Morrisville. Numerous creeks and rivers also rose significantly, especially the Sac and Little Sac River, as well as



National Weather Fatality Statistics

the Spring River. The Spring River actually rose above flood stage for a few hours during the height of the storm. A bridge was damaged along Highway 51 and 28 near Walnut Grove. The torrential downpours caused nearly 4,000 dollars in damage to a local greenhouse near Sarcovie, and water damage to a barn near Pierce City. Additional heavy rainfall during the morning kept numerous roads and low water bridges flooded through the early afternoon.

12 May 2002: Another in a series of thunderstorm complexes moved across the area producing excessive rainfall on the already saturated soils. Most of the heavy rainfall began across central Missouri Sunday morning May 12th, and then produced another round of torrential rainfall Sunday evening. By Monday morning May 13th, a large area of two inches fell north of Interstate 44, with the heaviest bands of three to six inches from Joplin northeast to Greenfield, Bolivar and Urbana. Another area of excessive rain fell over eastern Texas, northern Shannon, and southern Dent counties where locally three to six inches fell.