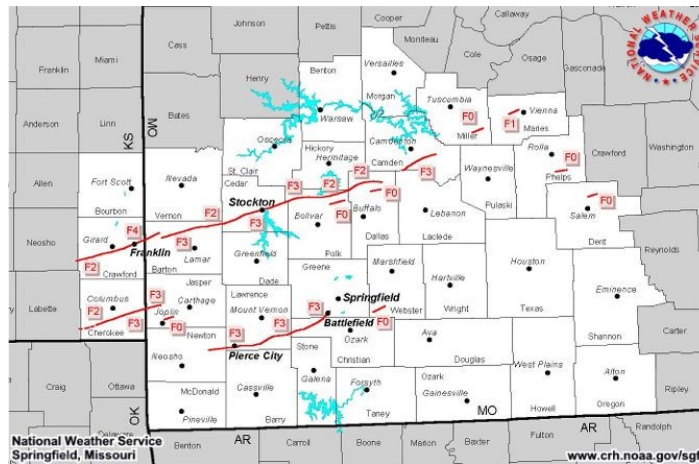


National Weather Service

Natural Hazard Risk Assessment Information For: **Barry County Missouri**



Information Provided By
WFO Springfield, Mo

2009 Update

Includes data and information
through December 2008

Table of Contents

Overview of Weather Hazards in Southwest Missouri	2
Historical information for Barry County Missouri	3
Tornado Information	4
Severe Hail, Lightning, Wind and Winter Weather	5
Flooding	6
Heat , Drought, and Wildfires	7
Dam Failure	8
Historic Weather in Southwest Missouri	9
Local Climatology	10



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

**By Gene Hatch
Meteorologist Intern WFO Springfield. Mo.**

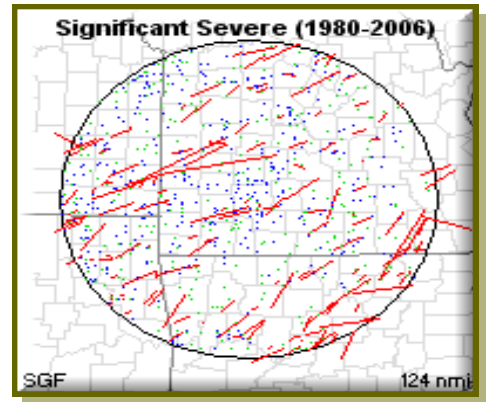
Overview of Weather Hazards in Southwest Missouri & Extreme Southeast Kansas

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

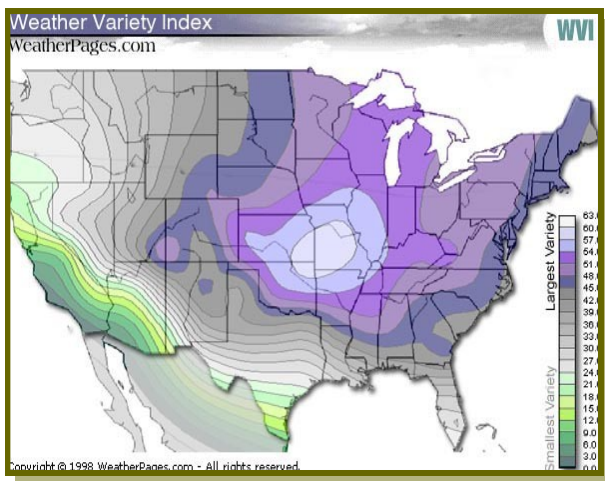
Tornadoes by county for the Springfield County Warning Area from 1950 to 2008

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 Barry County, Missouri

Severe Weather in Barry 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.

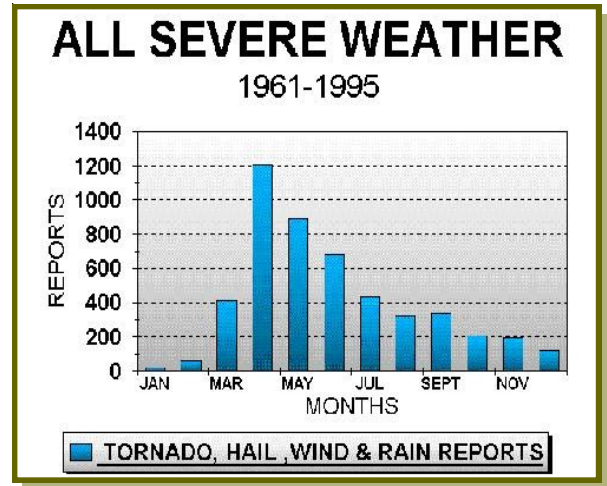


From www.weatherpages.com

Barry County Missouri is located on the Ozark Plateau along the eastern edge of tornado ally. Because of its location Barry 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 Barry 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, Barry County averages an event every 2 years.

Number of Tornadoes in Barry Co. (1950 to 2002)				
<u>F1</u>	<u>F2</u>	<u>F3</u>	<u>F4</u>	<u>F5</u>
20	7	1	0	0
71%	25%	4%	0%	0%

During the winter season Barry County averages 11 inches of snow. With the most snow on record in one season at 23.0 inches, falling during the 1998 to 1999 winter season. Ice storms also affect the county during the winter season causing significant damage to homes, trees and utilities.

Tornado Information

Barry County lies at the eastern edge of tornado alley and receives on average 2 tornadoes every three years. From 1950 to 2008 Barry county recorded 27 tornadoes from F0 to F3 in strength. The strongest tornado, an F3, passed across the county on the night of March 24th, 1954. Along its 1 mile track it caused 25 thousand dollars in damage and injured 2.

Historical Tornadoes of Barry County

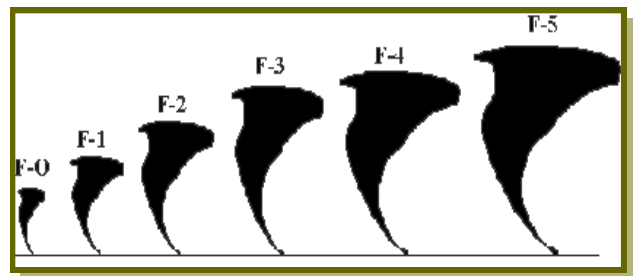
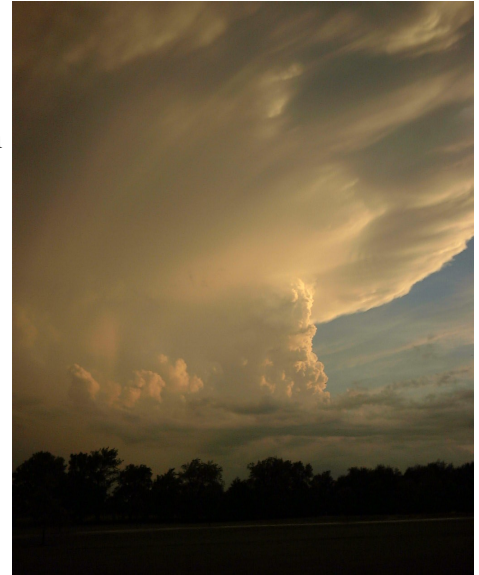
- Apr 18, 1880 (F4) 6 dead
- Apr 13, 1893 (F2) 3 inj, 0 dead
- May 20, 1898 (F2) 5 inj, 0 dead
- Apr 24, 1904 (F2) 1 inj, 0 dead
- Apr 29, 1909 (F4) 18 inj, 11 dead
- Jun 22, 1909 (F3) 7 inj, 1 dead
- May 27, 1910 (F2) 1 inj, 0 dead
- Mar 24, 1954 (F3) 1 inj, 1 dead

For the Record Barry County

- Has experienced two F4 tornadoes.
- No F5 tornadoes
- Most recent Tornado Dec 27, 2008 (F0)
- 3 deaths and 42 injuries since 1950.

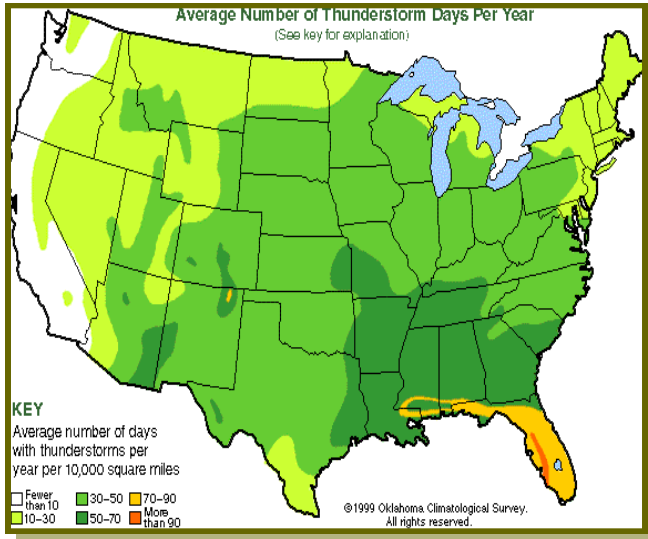


At approximately 1024 pm on December 17, 2002 an F0 tornado struck 3 miles northwest of Fairview Mo. The tornado damaged a house and barn and downed several trees. The tornado again touched down briefly approximately 6 miles west of Monett.



- **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



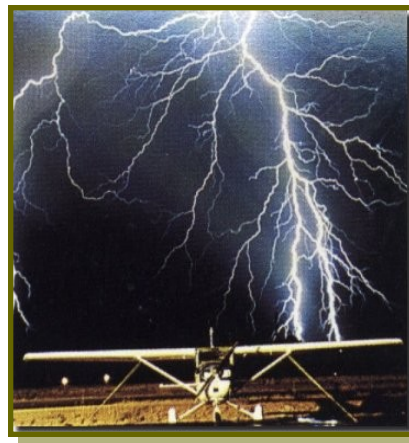
Average number of thunderstorm days per year.

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 Barry county on June 23, 1980. 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 Barry county reached 84 mph and occurred in 1957 on the 22nd of May. Since 1957 high winds have caused around \$1,079,000.00 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 Barry 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.

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 Barry 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 Barry County. Barry County contains numerous low water crossings.

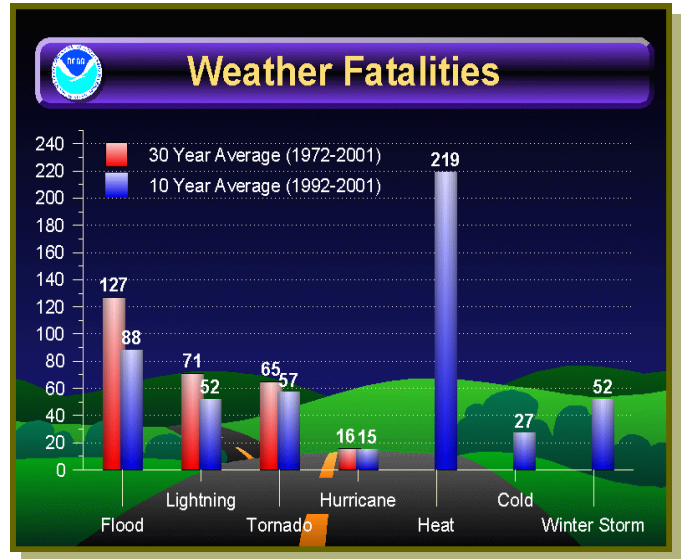
Typically, flooding in the county is caused by heavy rainfall associated with high rain producing thunderstorms which move very slowly. In towns, rainfall of one to two inches will cause streets and ditches to flood and make some low water crossings impassable. When rainfall rates reach 3 to 4



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

Floods in Barry County

16 June 2000: Thunderstorms produced widespread heavy rainfall over southwest and south central Missouri. By far, the most serious flooding occurred in Barry County in southwest Missouri. Some areas in central and southern portions of the county received 6 to 10 inches of rainfall late on the 16th of June and during the early morning hours of the 17th. Hourly rainfall rates were up to 3 inches per hour. The city of Cassville receive widespread severe flooding along Flat Creek. Fifty to sixty people along the creek were forced to evacuate from two mobile home parks, a motel, and



National Weather Fatality Statistics

10 houses. During the evacuation, some people were wading in water that was chest high. At Roaring River State Park which is located in the southern portion of the county, 187 campsites were evacuated. At least 26 mobile homes were seriously damaged or destroyed in Cassville. One mobile home had completely washed away. Numerous businesses including a motel and lumber yard were damaged. Dozens of concrete blocks from the lumber yard were carried a quarter of a mile to the town's baseball field. The water seriously damaged a number of roads and parking lots. A number of gas and propane tanks were displaced and found floating in the creek.

Heat, Drought and Wildfires



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

- 45 days: 25 Dec 1918~ 7 Feb 19
- 45 days: 19 Dec 1985~ 1 Feb 86
- 41 days: 10 Dec 1980~ 19 Jan 81
- 38 days: 20 May 1953 ~ 26 Jun 53
- 38 days: 27 Sept 1963 ~ 3 Nov 63
- 32 days: 15 Jun 1966 ~ 16 Jul 66
- 31 days: 18 Dec 2001 ~ 17 Jan 02

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 Barry county on almost a yearly basis.

Barry County averages 4 days a year with temperatures at or above 95 degrees. July and August are the two warmest months, which average 1 to 2 days at or above 95 degrees.

Year	Days 95* +	Days 100* +	Days in a row
1918	23	15	6
1966	11	6	11
1970	16	7	11
1980	51	28	18
1987	11	1	6
1990	11	0	6
Normal # of Days	4	1	▲ Above 95*

Years with above average summer heat

While no major wildfires have affected Barry 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 5600 fires occurred during that time in the Neosho fire district which includes Barton, Jasper, Newton, McDonald, Lawrence and Barry counties. This represented nearly 10% of the wildfires in the state with over 88,000 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 Neosho fire district were the result of lightning.

Dam Failure

Dams in Barry County

Barry County contains 1 significant dam.

While the majority of 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 Barry County are of earthen construction and there have been no recorded failures.

Where are they Located

- Lake Vollenweider Dam: Flat creek tributary, Cassville

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



Spill way release gates open to ease lake level after heavy rains.



Flooding after heavy rains.

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. 13th-1999...A winter storm produced an area of 3 to as much as 16 inches of snow over a portion of southwest and south central Missouri. The hardest hit areas, where 14 to 16 inches of snow was reported, were in an area from Pineville and Neosho to Springfield then east to the Houston and Cabool areas. Unofficial snowfall reports of 23 inches were reported by law enforcement near Cassville and 18 to 22 inches in the Nixa/Ozark area in Christian County. Snow drifts were 3 to 4 feet high in some of the hardest hit areas. Although there were numerous accidents reported by law enforcement, no serious damage or injuries were reported. Scattered power outages were also reported by local electric cooperatives. Some homes in the hardest hit areas around Cassville and Pineville were without power for over 24 hours.

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.

June 16th- 2000...Thunderstorms produced up to 6 to 8 inches of rain during a 6 to 8 hour period in central and southern Barry county Missouri. Significant flash flooding occurred as a result of the copious rainfall. The flood waters destroyed 14 homes in Cassville, MO and damaged 32 homes and 26 businesses. Much of the area around the Roaring River State Park had to be evacuated as the waters rose

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.



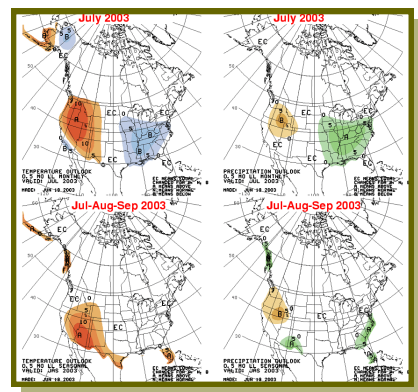
Local Climatology

Averages and records for Cassville, Missouri in Barry County

	Normal High	Normal Low	Normal Precip.	Normal Snow	Record High	Record Low	Record Precip.	Record Snow
Jan	43	20	2.09	3.2	72	-19	5.82	21.3
Feb	49	24	2.41	2.5	82	-22	7.43	12.0
Mar	58	34	4.24	2.7	86	-2	8.64	23.0
Apr	68	42	4.65	0.3	90	17	9.36	7.5
May	75	51	4.86	0	92	26	15.39	0
Jun	83	61	4.75	0	101	37	12.52	0
Jul	88	65	3.50	0	106	41	9.98	0
Aug	88	63	3.38	0	106	41	8.65	0
Sept	80	55	4.61	0	102	29	11.41	0
Oct	71	43	3.29	0	96	19	10.10	0
Nov	57	33	4.26	0.7	83	2	10.73	8.5
Dec	47	24	3.55	2.1	78	-15	8.90	15.0

Links for Climate information

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





“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

5808 W Hwy EE
Springfield, Mo. 65802

Phone: 417-864-8535

Email: Steve.Runnels@noaa.gov

Gene.Hatch@noaa.gov