



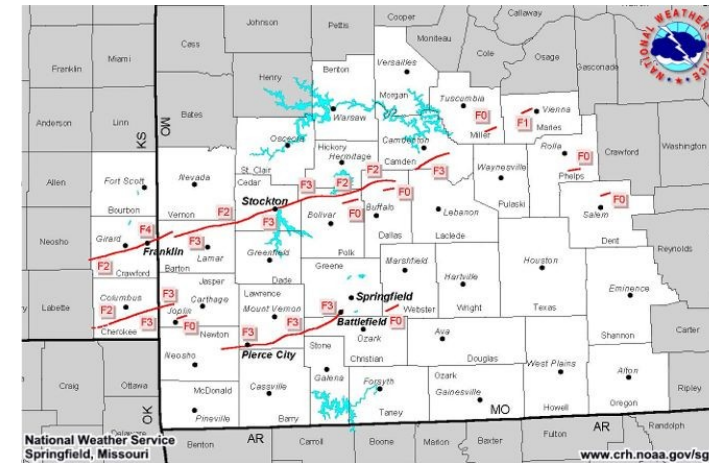
"To provide weather and flood warnings, public forecasts and advisories for all of the United States...and its territories...for the protection of life and property."

National Weather Service

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National Weather Service

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



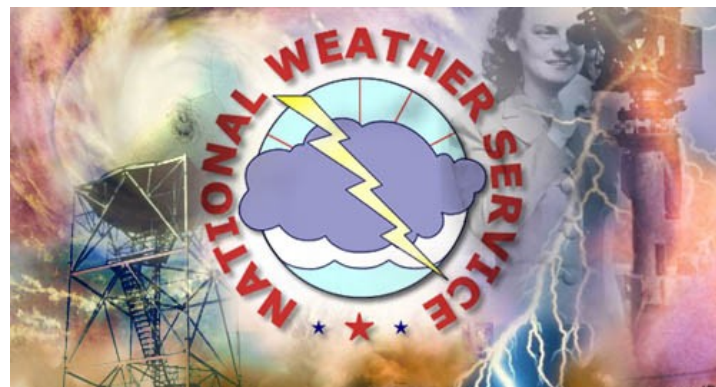
Information Provided By
WFO Springfield, Mo

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 Vernon County and the communities with in the county.

By Gene Hatch
 Meteorologist Intern WFO Springfield. Mo.

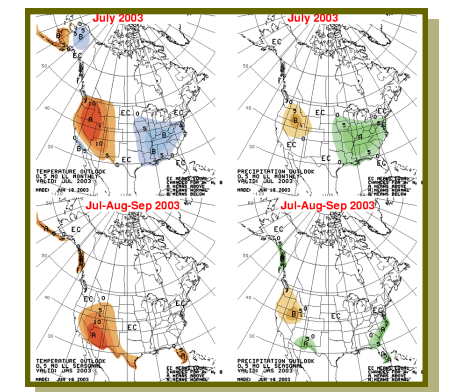
Local Climatology

Averages and records for Nevada, Missouri in Vernon County

41	20	4.8	77	-20	21.0
48	25	3.1	82	-21	15.0
59	35	1.7	90	-9	15.0
69	44	0.1	95	15	6.0
77	54	0	98	27	0
86	63	0	106	42	0
91	67	0	117	44	0
90	65	0	114	43	0
82	57	0	109	25	0
71	45	0	96	18	2.0
56	35	0.8	85	0	22.7
45	25	2.9	77	-25	16.0

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.

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. 19th-1998...A line of severe thunderstorms moved across the Ozarks dropping up to golf ball sized hail and producing winds in excess of 60 mph. Numerous trees were blown down and tents



and booths at an outdoor activity near Nevada were damaged.

Jul. 31st-1989...Overnight thunderstorms soaked eastern Kansas and western Missouri with heavy rains. 4 ½ inches of rain was reported at Nevada, MO. Evening thunderstorms in Oklahoma produced wind gusts to 75 mph at Covington.

Nov. 6th-1951...Snow fell from the Texas panhandle to the Lower Great Lakes, leaving record totals of 12.5 inches at Saint Louis, MO, and 14.1 inches at Springfield, MO. Other heavier snowfall totals included 20 inches at Nevada, MO, 13.5 inches at Sedan, KS, 13 inches at Decatur, IL, and 10 inches at Alva, OK. In the Saint Louis area up to 20 inches was reported in Washington County.

Dec. 20th-1998...Periods of light rain, freezing rain, freezing drizzle, and light snow caused numerous traffic accidents across southern and central Missouri. The most prolonged period of freezing drizzle and light snow occurred in west central and central Missouri from areas around Lamar and Nevada, MO to the Lake of the Ozarks region. Hundreds of traffic accidents were reported across southern Missouri. Three fatalities occurred as a result of this storm.

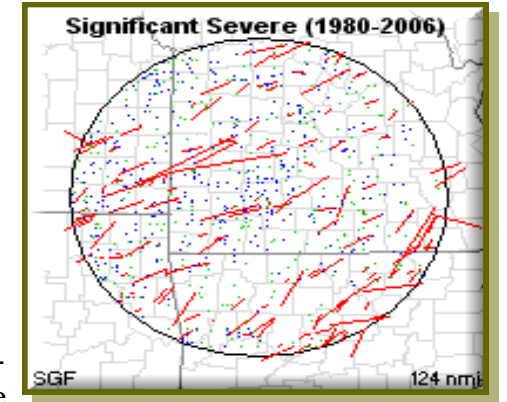


Overview of Weather Hazards in Southwest Missouri & Extreme Southeast Kansas

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

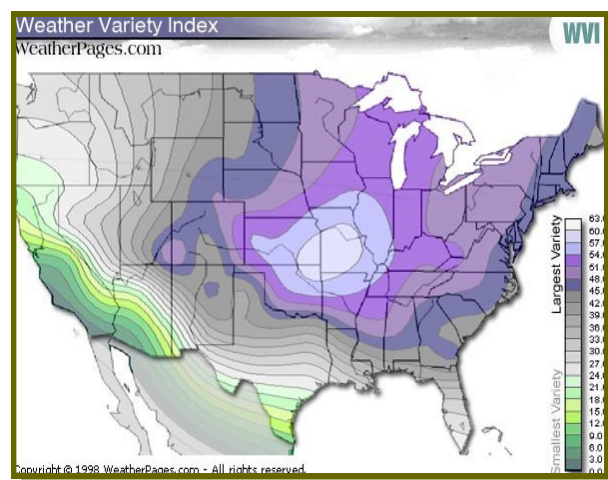
Tornadoes by county for the Springfield County Warning Area from 1950 to 2008

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 Vernon County, Missouri

Severe Weather in Vernon 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.

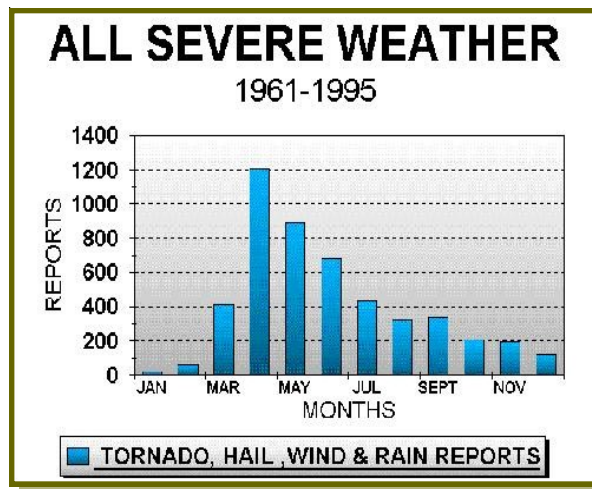


From www.weatherpages.com

Vernon County Missouri is located on the Ozark Plateau along the eastern edge of tornado ally. Because of its location Vernon 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 Vernon County have dropped hail up to 2 3/4" 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, Vernon County averages an event every 2 years.

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

F0/F1	F2	F3	F4	F5
20	1	6	0	0
63%	5%	32%	0%	0%

During the winter season Vernon County averages 13.4 inches of snow. With the most snow in one season at 36.5 inches, falling during the 1958 to 1959 winter season. Ice storms also affect the county during the winter season causing significant damage to homes, trees and utilities.

Dam Failure

Dams in Vernon County

Vernon County contains 20 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 Vernon County are of earthen construction and there have been no recorded failures.

Where are they Located

- Francis Lake Dam: Little Dry Wood Creek, Dederick
- Izaak Walton Lake Dam: White Branch, Nevada
- Hines Sect. 10 Lake Dam: Beecham Branch, Taberville
- Timber Hill River Bend Inc. Dam: Little Osage, Taberville
- Pohl-Harner Lake Dam: Pryor Creek, Arthur
- Elliott Lake Dam: Marmaton River, Horton
- Katy Allen Lake Dam: Willow Branch, Nevada
- Pickrel Dam: Little Dry Wood Creek, Horton
- Wilmot & Steele Inc. Dam: Little Osage River, Horton
- Charles Lake Dam: Pryor Creek, Horton
- Pottorf Lake Dam: Clear Creek, Dederick
- Wilson Lake Dam: West Fork Clear Creek, Dederick
- Foreman Lake Dam: West Fork Clear Creek, Dederick
- Seitz Lake Dam: Moors Branch Dry Wood Creek, Deerfield
- Steele Lake Dam: West Fork Dry Wood



- Creek, Deerfield
- Hines Sect. 3 North Dam: Kitten Creek, Taberville
- Hines Sect. 3 South Dam: Beecham Branch Clear Creek, Taberville
- Beard Lake Dam: Kitten Creek, Taberville
- Long Upper Lake Dam: Marmaton River, Schell City
- Bushwacker Lake Dam: Little Dry Wood Creek, Bronaugh

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



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 Vernon county on almost a yearly basis.

Vernon County averages 24 days a year with temperatures at or above 95 degrees. July and August are the two warmest months, which average 10 days at or above 95 degrees.

Year	Days 95* +	Days 100* +	Days in a row
1918	46	22	13
1934	64	39	19
1936	80	61	26
1938	59	31	15
1954	80	57	23
1980	75	47	28
Normal # of Days	24	8	▲ Above 95*

Years with above average summer heat

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

- 58 days: 8 Oct 1950 ~ 4 Dec 50
- 48 days: 8 Jan 1936 ~ 25 Feb 36
- 46 days: 24 Dec 1918 ~ 7 Feb 19
- 45 days: 3 Dec 1955 ~ 16 Jan 56
- 40 days: 14 Jun 1954 ~ 23 Jul 54
- 39 days: 23 Jun 1970 ~ 31 Jul 70

While no major wildfires have affected Vernon 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 2200 fires occurred during that time in the Clinton fire district which includes Cass, Johnson, Pettis, Bates, Henry, Benton, Vernon, St. Clair, and Hickory counties. This represented nearly 4% of the wildfires in the state with over 49,000 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 Clinton fire district were the result of lightning.

Tornado Information

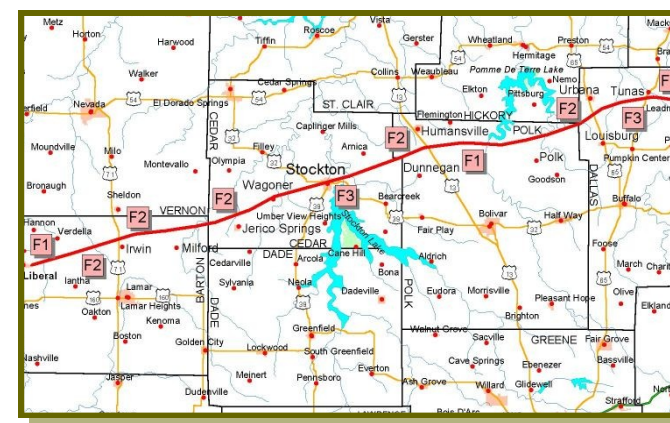
Vernon County lies at the eastern edge of tornado ally and receives on average a tornado every two years. From 1950 to 2008 Vernon county recorded 27 tornadoes from F0 to F3 in strength. The strongest tornado, an F3, passed across the county on the evening of May 17th, 1995. Along its 14 mile track it caused 7 million dollars in damage, injured 9.

Historical Tornadoes of Vernon County

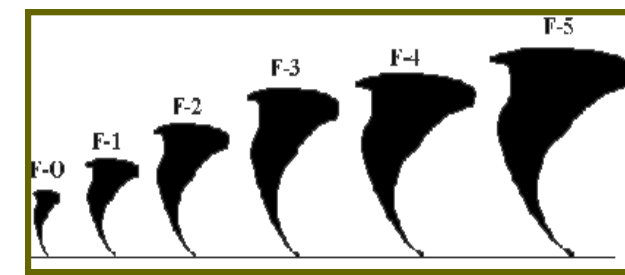
- Apr 21, 1887 (F4) 3 inj, 18 dead
- Apr 19, 1916 (F4) 4 inj, 3 dead
- Mar 15, 1919 (F2) 0 inj, 0 dead
- Mar 11, 1920 (F2) 15 inj, 3 dead
- Apr 20, 1929 (F3) 4 inj, 0 dead
- Apr 20, 1929 (F3) 6 inj, 0 dead
- Dec 1, 1982 (F1) 4 inj, 0 dead
- May 17, 1995 (F3) 9 inj, 0 dead

For the Record Vernon County

- Has experienced two F4 tornadoes.
- No F5 tornadoes
- Most recent Tornado June 2, 2008 (F0)
- 24 deaths and 49 injuries since 1880.

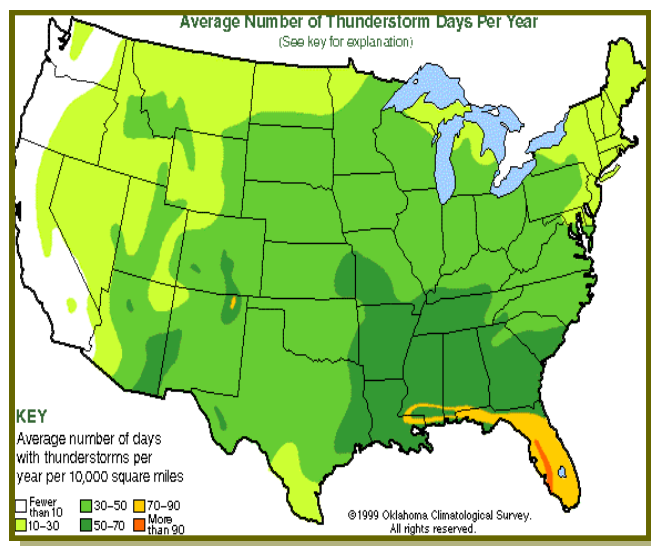


The tornado outbreak of May 4, 2003 was the one of the worst that southwest Missouri has had since the late 1800's. Fourteen tornadoes touched down across the Ozarks during the evening of May 4th one of which was an F3 that passed just south of Vernon county. This F3 is the latest killer tornado to strike near Vernon county since an F2 that struck Nevada in March of 1920.



- **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



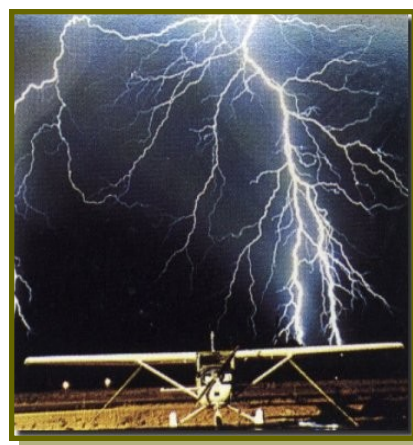
Average number of thunderstorm days per year.

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 Vernon county on May 6, 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 Vernon county reached 86 mph and occurred in 1966 on the 17th of May. Since 1956 high winds have caused around \$400,000.00 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 Vernon 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 Vernon County. Vernon County contains numerous low water crossings.

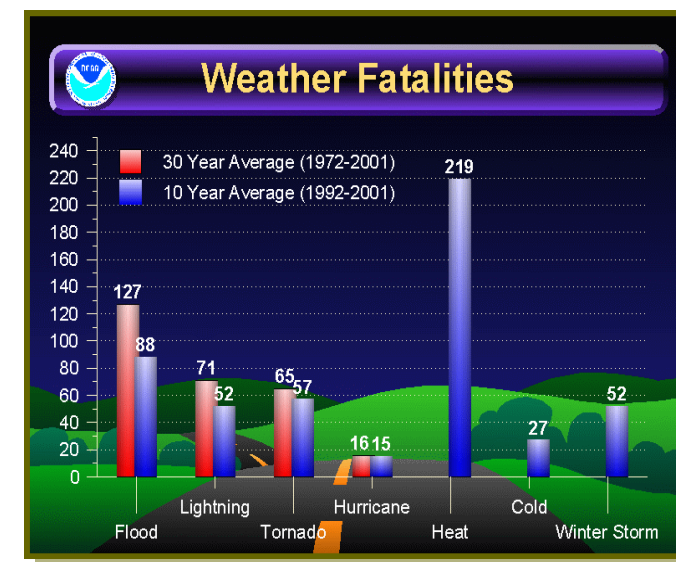
Typically, flooding in the county is caused by heavy rainfall associated with high rain producing thunderstorms which move very slowly. In towns, rainfall of one to two inches will cause streets and ditches to flood and make some low water crossings impassable. When rainfall rates reach 3 to 4 inches,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



Floods in Vernon County

4 Oct 1998: An estimated 5 to 6 inches of rain fell in 3 hour period flooding a large portion of Appleton City including the hospital. Damage was confined to lower areas of homes and businesses. Minor flooding of highways was reported in Barton and Vernon Counties.

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



National Weather Fatality Statistics

sunrise on May 8th. The last wave of severe 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.