



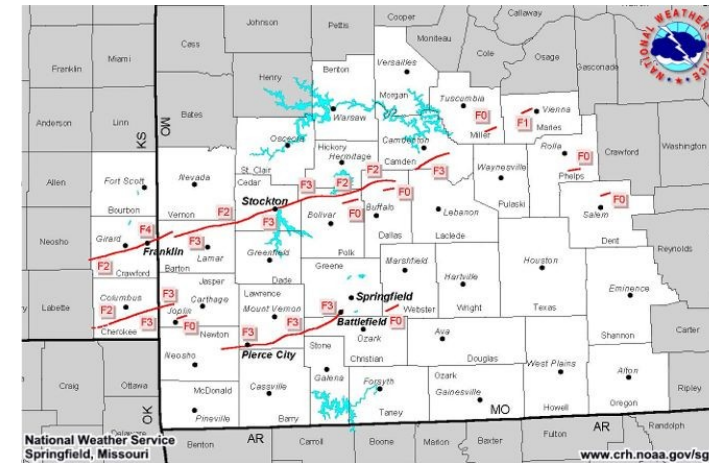
“To provide weather and flood warnings, public forecasts and advisories for all of the United States...and its territories...for the protection of life and property.”

National Weather Service

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National Weather Service

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



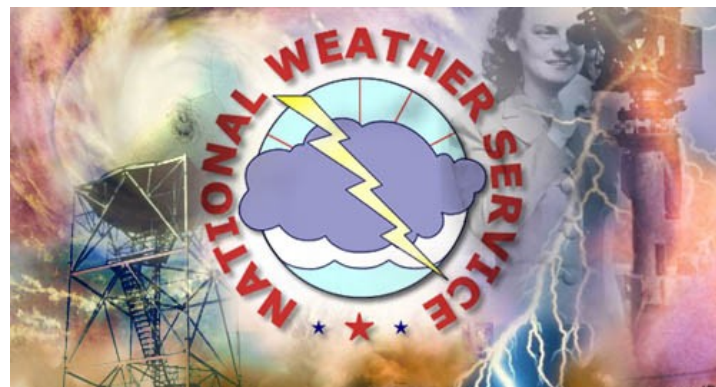
Information Provided By
WFO Springfield, Mo

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 Christian County and the communities with in the county.

By Gene Hatch
 Meteorologist Intern WFO Springfield. Mo.

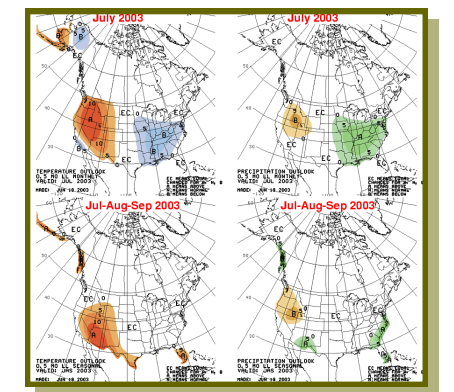
Local Climatology

Averages and records for Oldfield, Missouri in Christian County

40	19	5.4	79	-15	23.5
47	24	3.4	82	-17	19.0
57	33	2.5	85	-5	20.0
67	42	0.1	89	19	4.0
74	51	0	89	30	0
82	60	0	99	40	0
88	65	0	105	47	0
87	63	0	103	46	0
80	55	0	100	27	0
70	44	0.1	93	19	1.1
55	33	1.2	80	4	6.0
45	24	1.9	75	-13	14.9

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. 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

Apr. 28th-1996...A thunderstorm complex contain-



ing straight-line winds of 80 mph affected the western part of the Christian County MO. The main damage was in a path from Billings to Clever where 150 homes and businesses sustained damage. The hardest hit was the town of Clever where 100 homes and businesses were severely damaged, including the First Peoples Bank which had its roof blown off. Two people were injured in Clever when winds hit a mobile home park overturning trailers.

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.

Dec. 24th- 1982...An F2 tornado touched down in Christian County Missouri and cut a 300 yard wide 16 mile long path of damage. One person was injured and 5 million dollars of damage was reported.

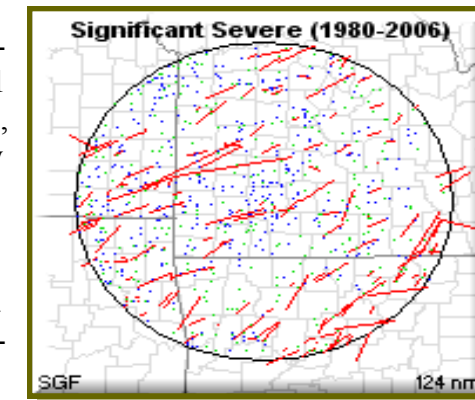


Overview of Weather Hazards in Southwest Missouri & Extreme Southeast Kansas

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

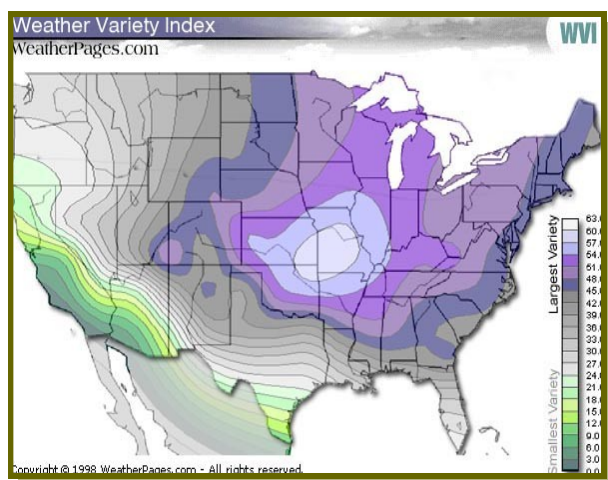
Tornadoes by county for the Springfield County Warning Area from 1950 to 2008

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

Historical information for Christian County, Missouri

Severe Weather in Christian 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.

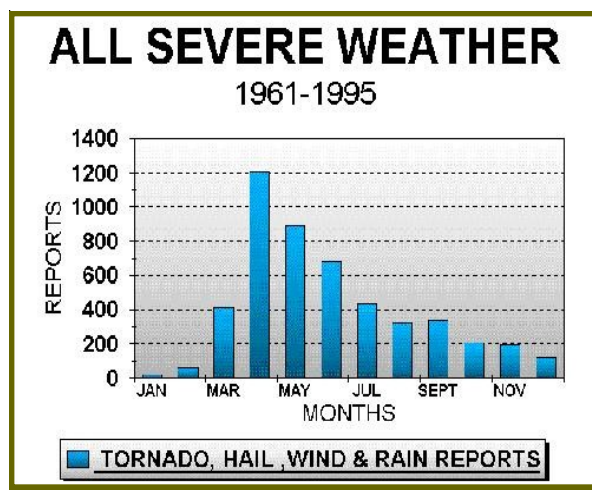


From www.weatherpages.com

Christian County Missouri is located on the Ozark Plateau along the eastern edge of tornado ally. Because of its location Christian 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 Christian County have dropped hail up to 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, Christian County averages an event every 2 1/2 years.

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

<u>F0/F1</u>	<u>F2</u>	<u>F3</u>	<u>F4</u>	<u>F5</u>
19	2	1	1	0
83%	9%	4%	4%	0%

During the winter season Christian County averages 14.6 inches of snow. With the most snow in one season at 32.5 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 Christian County

Christian County contains 2 dams. These dams are small and used primarily for storm water management, irrigation and recreation. All of the dams in Christian County are of earthen construction and there have been no recorded failures.

Where are they Located

- Paul's Lake Dam: Finley Creek, Ozark
- Liars Lake Dam: Elkhorn Creek, Garrison

The only significant dams in Christian County are less than 100 feet high. Many other dams may be located across Christian 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.

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 Christian county on almost a yearly basis.

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

Year	Days 95* +	Days 100* +	Days in a row
1963	16	1	4
1964	18	3	7
1966	17	5	11
1974	15	4	6
1980	57	18	17
1999	13	2	8
Normal # of Days	4	1	▲ Above 95*

Years with above average summer heat

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

- 54 days: 6 Jan 1963 ~ 28 Feb 63
- 52 days: 12 Dec 1960 ~ 1 Feb 61
- 51 days: 18 Sept 1958 ~ 7 Nov 58
- 46 days: 3 Dec 1955 ~ 17 Jan 56
- 45 days: 3 Sept 1979 ~ 17 Oct 79
- 43 days: 12 Dec 1963 ~ 23 Jan 64

While no major wildfires have affected Christian 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

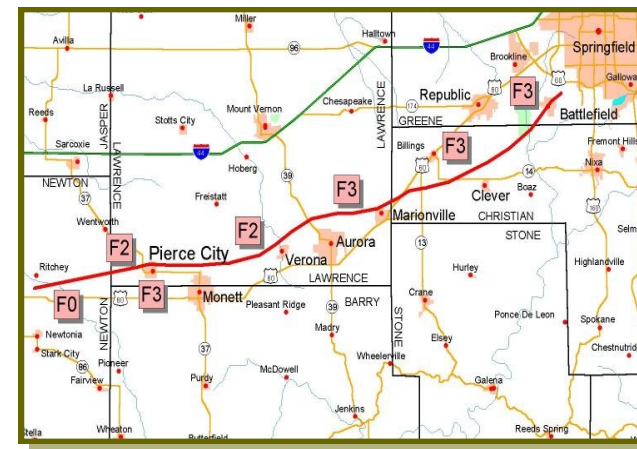
Christian County lies at the eastern edge of tornado ally and receives on average one tornado every three and a half years. From 1950 to 2002 Christian county recorded 15 tornadoes from F0 to F4 in strength. The strongest tornado, an F4, passed across the county on the afternoon of April 24th, 1975. It had a 5 mile track and was 500 yards wide.

Historical Tornadoes of Christian County

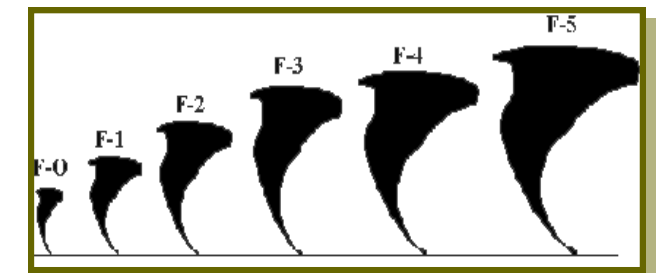
- Apr 18, 1880 (F4) 51 inj, 8 dead
- Apr 18, 1880 (F4) 0 inj, 7 dead
- May 20, 1898 (F3) 10 inj, 1 dead
- May 27, 1917 (F3) 45 inj, 0 dead
- May 27, 1917 (F1) 2 inj, 0 dead
- May 27, 1917 (F2) 4 inj, 0 dead
- Feb 20, 1937 (F3) 2 inj, 0 dead
- May 4, 2003(F3) 1 dead

For the Record Christian County

- Has experienced two F4 tornadoes.
- No F5 tornadoes
- Most recent Tornado Jan 8, 2008 (F1)
- 17 deaths and 120 injuries since 1880.

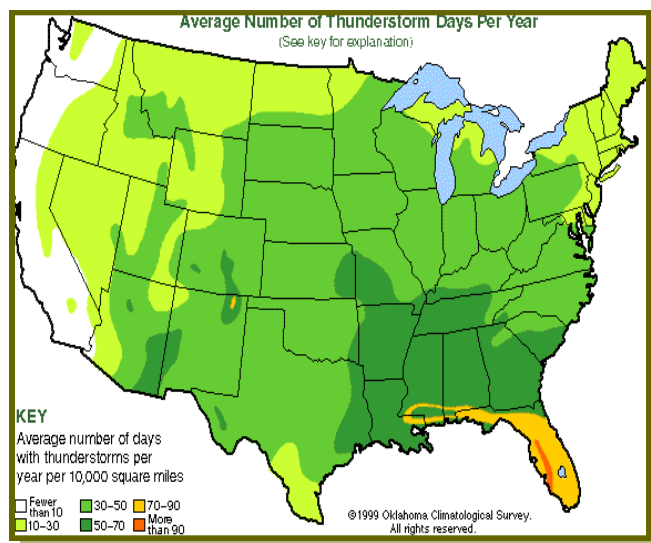


The tornado outbreak of May 4, 2003 was the one of the worst that southwest Missouri has had since the late 1800's. Fourteen tornadoes touched down across the Ozarks during the evening of May 4th one of which was an F3 that struck the town of Battlefield. This F3 is the latest killer tornado to strike Christian county since an F4 that struck the county in April of 1975.



- **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



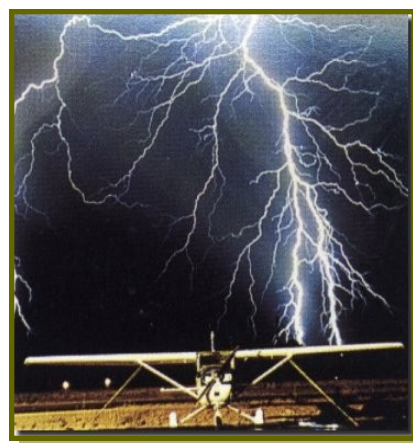
Average number of thunderstorm days per year.

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 2.00 inches in diameter in Christian county on November 10, 1995. 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 Christian county reached 80 mph and occurred in 1999 on the 1st of July. Since 1956 high winds have caused around \$3,029,000.00 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 Christian 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 Christian County. Christian 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

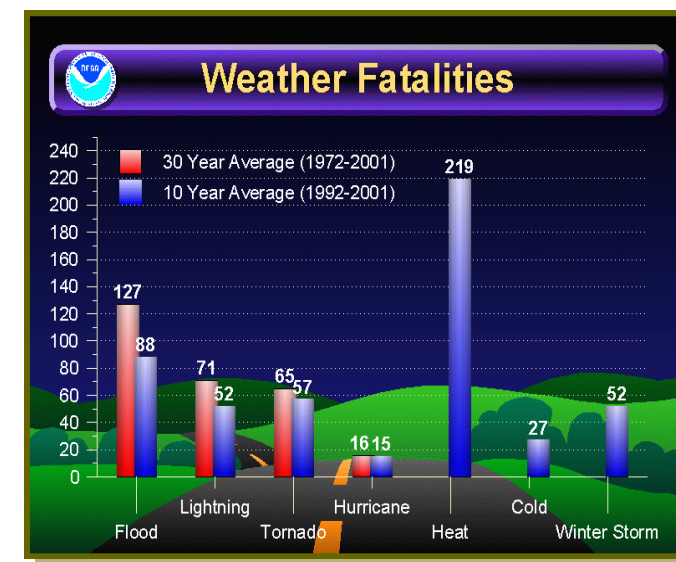


inches, major flooding can occur, and amounts over four inches creates significant flooding that affects most of the county.

Floods in Christian County

28 July 2000: Thunderstorms produced heavy rainfall of 2 to 4 inches, with rainfall rates of 2 inches per hour in some locations. Widespread street flooding occurred in south Springfield, with water as deep as 3 feet near Battlefield Mall. In Christian County, street and residence flooding occurred in Clever. Elsewhere, the flooding was mainly confined to low water crossings.

10 June 1995: Thunderstorms with heavy rains continued to move across southwest Missouri causing creeks and low lying areas to flood. Water continued to rise on earlier flooded highways. In addi



National Weather Fatality Statistics

tion Highways 176, 13, 265 and 248 in Stone County flooded, and a recreational vehicle park along Roark Creek in Branson flooded.

14 Nov 1993: Two 18 year old women drowned attempting to cross a low water bridge across Pedelo Creek. The car washed down stream and became lodged in trees and brush when found the next morning along County Road U. Swan Creek also flash flooded over numerous farm roads. Finley and James Rivers both rose out of their banks.

25 Sept 1993: Flash flooding along the Finley River damaged numerous businesses as the river reached record levels.