



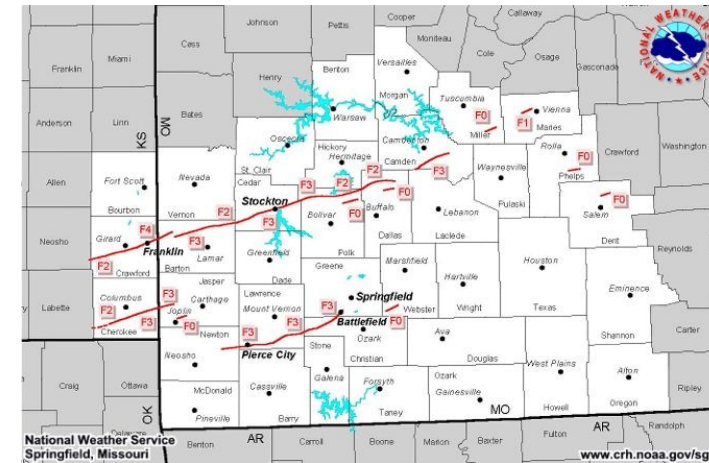
"To provide weather and flood warnings, public forecasts and advisories for all of the United States...and its territories...for the protection of life and property."

National Weather Service

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National Weather Service

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

By Gene Hatch
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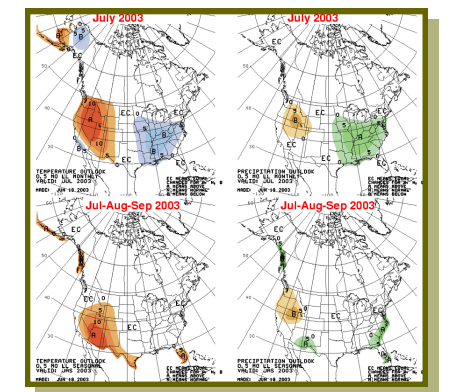
Local Climatology

Averages and records for West Plains, Missouri in Howell County

43	22	3.6	77	-18	18.2
50	26	3.4	87	-21	23.8
59	34	2.1	89	-3	16.4
69	43	0.2	91	19	5.0
76	53	0	95	28	0
84	61	0	105	39	0
90	66	0	107	46	0
89	64	0	106	40	0
81	57	0	103	31	0
71	44	0.1	94	19	2.5
57	34	0.7	84	5	9.3
46	25	2.0	78	-13	14.0

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 29th-1985...Severe thunderstorms over Howell County MO dropped softball size hail. There were no reports of injuries.

Feb. 20th-1997...Thunderstorm winds lifted roof off the Glass Sword Theater in West Plains MO and caused damage to equipment inside theater. Numerous trees were also uprooted as the thunderstorm blew through the city.

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. 20th-1988...Numerous trees and large branches were broke off from high wind causing some damage to houses across Howell County MO. Lightning from the thunderstorms also started two separate house fires

Nov. 16th-1955...An F2 tornado moved across portions of Howell County MO leaving a 4 mile long, 3000 yard path of destruction. The nearly 1 and 3/4 mile wide path of damage caused 50K dollars of damage and 2 injuries were reported

Dec. 12th-2000...A major winter storm was in the works for the Ozarks region this day. An arctic air-mass had just moved into the area on Monday and was firmly entrenched over Missouri. Daytime highs Tuesday were only in the teens and lower 20's across southern Missouri. As it turned out, total accumulations included 8-11 inches over southwestern MO, with 12-14 inch amounts along I-44 from Joplin, through Springfield, to Lebanon. Areas near West Plains received a mixture of snow and sleet throughout the storm, with snow/sleet depths of 4 to 8 inches.

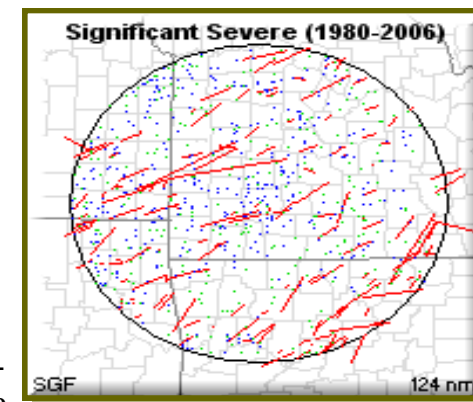


Overview of Weather Hazards in Southwest Missouri & Extreme Southeast Kansas

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

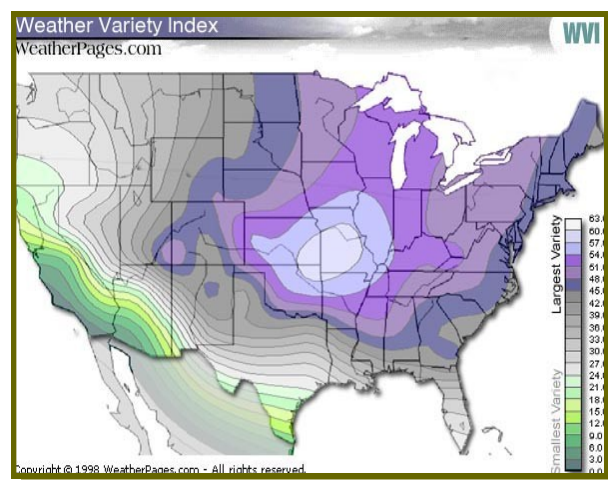
Tornadoes by county for the Springfield County Warning Area from 1950 to 2008

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 Howell County, Missouri

Severe Weather in Howell 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.

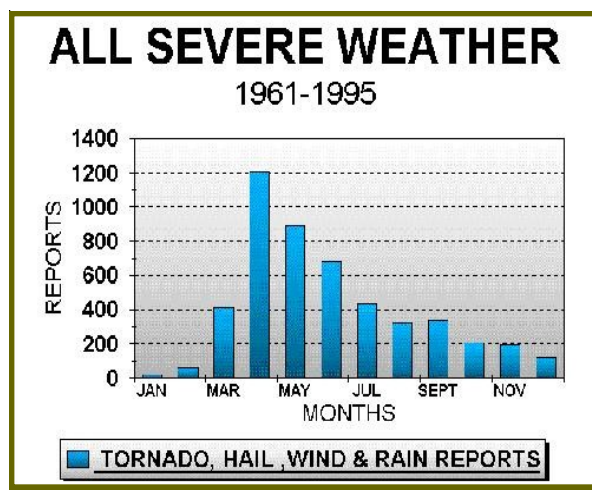


From www.weatherpages.com

Howell County Missouri is located on the Ozark Plateau along the eastern edge of tornado alley. Because of its location Howell 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 Howell County have dropped hail up to 4 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, Howell County averages an event every 1 1/2 years.

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

<u>F0/F1</u>	<u>F2</u>	<u>F3</u>	<u>F4</u>	<u>F5</u>
20	11	3	1	0
57%	31%	9%	3%	0%

During the winter season Howell County averages 12.1 inches of snow. With the most snow in one season at 39.3 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 Howell County

Howell County contains 16 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 Howell County are of earthen construction and there have been no recorded failures.

Where are they Located

- Donald Brown Lake Dam: Mustion Creek, West Plains
- Simms Valley Community Dam: Eleven Point River, Hutton Valley
- Willow Springs Hunting Club Dam: Eleven Point River, Willow Springs
- Stokes Dam #2: Spring Creek, Lanton
- Brent Lake Dam: South Fork spring River, Lanton
- Alter Dam: South Fork spring River, Lanton
- Hide A Way Lake Dam: Wilson Creek, Tecumseh
- Stokes Lake Dam #1: Spring Creek, Lanton
- Byler Lake Dam: West Fork Spring River, Lanton
- Stace Shannon Lake Dam: South Fork Spring River, Lanton
- Siloam Springs Quad #1 Dam: Tabor Creek, Springs
- Kennedy Dam: Hyatt Creek, Lanton
- Martin Lake Dam: Hyatt Creek, Lanton
- Cooper Dam: Eleven Point River, Thom- asville



- Grisham Lake Dam: Howell Creek, West Plains
- Raikos Lake Dam: Eleven Point River, Willow Springs

Most of the dams in Howell 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 Howell county on almost a yearly basis.

Howell County averages 14 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	39	12	15
1953	48	17	9
1954	54	22	9
1980	53	19	16
1983	32	7	15
1990	31	5	7
Normal # of Days	14	3	▲ Above 95*

Years with above average summer heat

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

- 40 days: 16 Aug 1976 ~ 24 Sept 76
- 33 days: 13 Sept 1963 ~ 15 Oct 63
- 32 days: 12 Aug 1998 ~ 12 Sept 98
- 29 days: 28 Sept 1964 ~ 26 Oct 64
- 28 days: 21 Dec 1985 ~ 17 Jan 85
- 26 days: 7 Dec 1950 ~ 1 Jan 51

While no major wildfires have affected Howell 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 Douglas, Howell, Ozark, Webster and Wright 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

Howell County lies at the eastern edge of tornado ally and receives on average a tornado every one and a half years. From 1950 to 2008 Howell county recorded 35 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 14 mile track it caused 25 million dollars in damage, injured 28 and killed 2.

Historical Tornadoes of Howell County

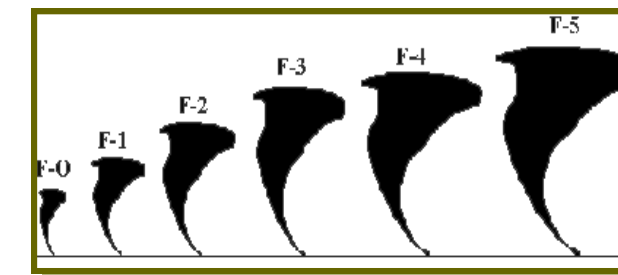
- May 25, 1883 (F3) 2 inj, 0 dead
- Nov 25, 1926 (F4) 5 inj, 0 dead
- Apr 27, 1937 (F2) 3 inj, 0 dead
- Apr 14, 1944 (F2) 3 inj, 0 dead
- Jan 29, 1947 (F3) 0 inj, 0 dead
- Jan 29, 1947 (F3) 1 inj, 0 dead
- Jun 1, 1947 (F3) 2 inj, 1 dead
- Mar 12, 1969 (F3) 11 inj, 1 dead
- Apr 2, 1982 (F4) 20 inj, 2 dead

For the Record Howell County

- Has experienced two F4 tornadoes.
- No F5 tornadoes
- Most recent Tornado April 10, 2008 (F0)
- 4 deaths and 63 injuries since 1880.

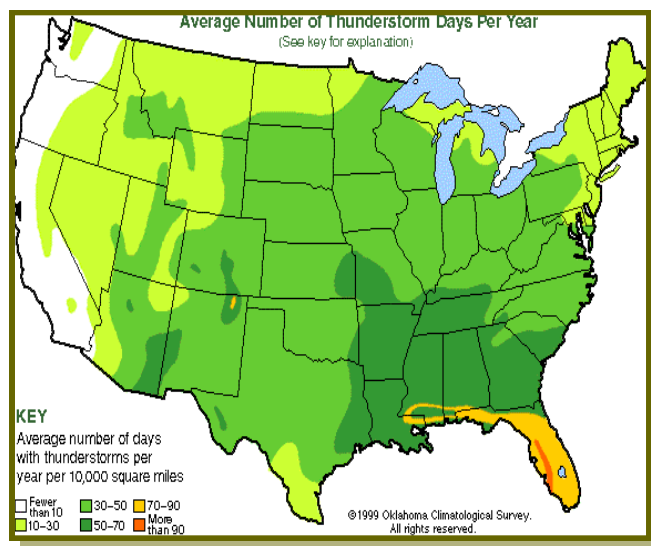


An F2 tornado caused extensive damage from 2 miles west of the Willow Springs Highway Patrol Headquarters, northeast to a mile and a half northeast of Willow Springs along Highway 378. Large, century year old oak trees were uprooted throughout the area. West of the Willow Springs, a bass boat was thrown across two pastures and over two fences. Troop G Headquarters had their 365' radio tower blown down. A church was rotated 45 degrees off its foundation.



- **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



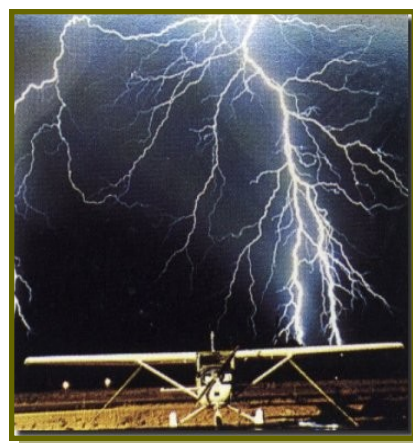
Average number of thunderstorm days per year.

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 Howell county on March 29, 1985. 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 Howell county reached 86 mph and occurred in 2003 on the 28th of April. Since 1960 high winds have caused around \$889,000.00 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 Howell 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 Howell County. Howell 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.

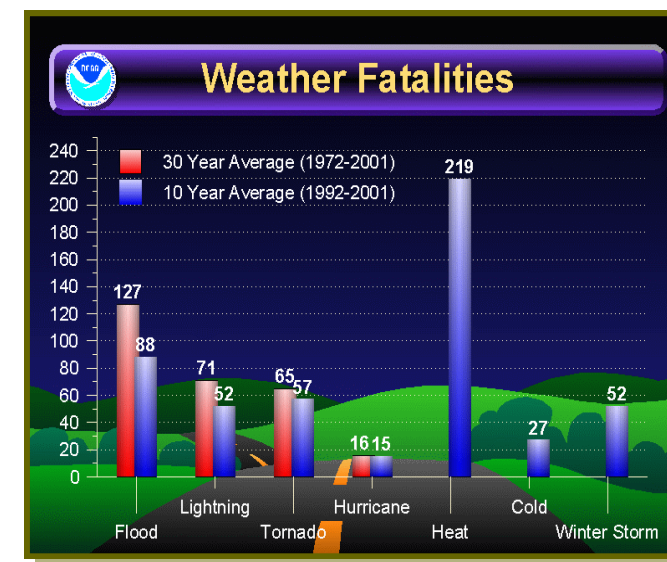


Floods in Howell County

26 Feb 1997: A two year old girl drowned after the pickup truck driven by her mother was swept off a rain-swollen low water crossing on County Road 1550, six miles east of Willow Springs. Her mother was rescued. The young girl's body, which was strapped in a car seat, was found downstream about six hours later.

4 Jan 1993: A woman was killed after she drove into water over a low water bridge. Two people were injured in a fire caused by a propane leak after high water caused a break in the line. The campground at Dogs Bluff was also flooded.

13 Apr 2002: A cluster of slow moving thunder



National Weather Fatality Statistics

storms moved across northern Howell county producing three to four inches of rain in less than two hours. In addition to the intense localized band of three to four inches, a broad area of one to two inches fell over all of northern Howell county between 8 and 10 pm. Highway 17 south of Mountain View and east of Pomona was flooded and impassable during the height of the storm. Highway N east of Pomona was also closed due to high water. County roads 4740, 4870 and 5130 were completely washed out by the flood waters. The heavy rains also caused considerable damage around the West Plains area, especially at the Southern Hills Shopping Center where carpets and inventory were damaged.

19 Jul 2002: Two to four inches of rain fell over southern Shannon, southern Texas, and northern Howell County during the morning of July 19th. Numerous low water crossings were flooded across southern Shannon County, plus Highway 17 near Mountain View was closed due to the flooding. Major street flooding was also reported in Cabool.