
*In cooperation with the National Park Service*

# Streamflow Information for the Jacks Fork and Current River in the Ozark National Scenic Riverways, South-Central Missouri

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## INTRODUCTION

The U.S. Geological Survey (USGS), in cooperation with the National Park Service (NPS), has been collecting streamflow information on the Current River and one of its tributaries, the Jacks Fork, for 78 years. Both rivers are located in south-central Missouri (fig. 1) in an area with large springs, streams, caves, and rugged countryside. Outdoor activities, such as camping, floating, fishing, hunting, and hiking, are numerous. Part of both the Jacks Fork and the Current River are in the Ozark National Scenic Riverways (ONSR), which is administrated by the NPS. The Jacks Fork and Current River were the Nation's first congressionally designated scenic riverways.

The Jacks Fork and Current River are ideal for recreational use because the main-channel gradients are steeper than gradients in other rivers in the State, thereby creating swifter currents. The large amount of spring inflow produces large and stable flows, and tends to decrease the temperature of the water in the rivers, thereby keeping that water cool through even the hottest months of the year.

This fact sheet provides information about the Jacks Fork and Current River. Long-term streamflow data provide trends and statistical information such as daily, monthly, and annual mean flows; flow durations; flood peaks; and high- and low-flow frequencies. These data are critical for day-to-day administration and management of water resources, determining the extent and severity of droughts, characterizing and predicting conditions during floods, and monitoring the effects of human activities on streamflow and water quality.

Flood-peak movement, rates of rise, lengths of floods, and flood-safety management also are provided in this fact sheet. Real-time streamflow data and additional information are available on the Internet at "http://missouri.usgs.gov".

Photo courtesy of J. Richards

Floaters on the Jacks Fork.

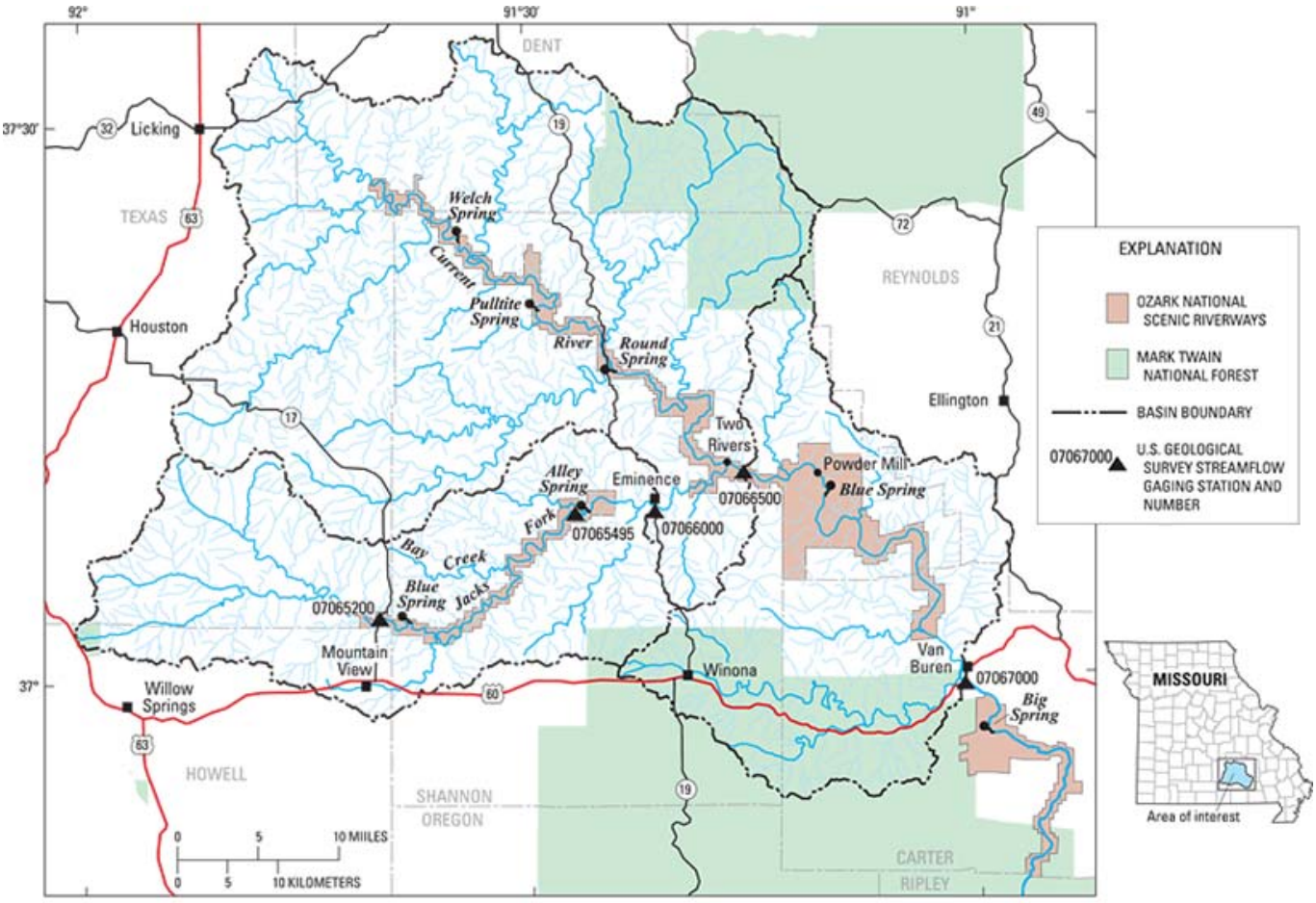


**Figure 1.** Location of the Jacks Fork and the Current River and the Ozark National Scenic Riverways.

## SPRINGS

Numerous springs in the ONSR (Vineyard and Feder, 1974) flow into the Jacks Fork and Current River. These springs include Round Spring, Alley Spring, and Big Spring (fig. 1). The base flow (flow not a result of direct rainfall runoff) of the Jacks Fork and Current River is derived mostly from inflow from springs. The USGS collected discharge data (volume of water that flows past a point during some period of time) at Round Spring from 1928 to 1939 and 1965 to 1979; Alley Spring from 1928 to 1939 and 1965 to 1979; and Big Spring from 1922 to 1996. Average discharges were 46.9 $ft^3/s$ (cubic feet per second) for Round Spring, 135 $ft^3/s$ for Alley Spring (U.S. Geological Survey, 1980), and 447 $ft^3/s$ for Big Spring (Hauck and others, 1997). Big Spring, which has the largest discharge of springs in Missouri, emerges from a cave outlet and flows about 1,000 ft (feet) into the Current River. The average discharge from Big Spring would fill Busch Stadium in St. Louis in about 33 hours.

Big Spring

Photo courtesy of C. Pepmiller

Flow-duration curves indicate the percentage of time specific discharges are equalled or exceeded. The flow-duration curves of the Jacks Fork and Current River (base flow primarily from spring discharge) are much flatter than the curves for streams with flows derived primarily from direct runoff, such as is typical of northern Missouri (fig. 2). The higher sustained flows in the Jacks Fork and Current River make them ideal for recreational use.

## RIVERS

The USGS currently collects data from streamflow gaging stations on the Jacks Fork at three locations (fig. 1)—at the State Highway 17 bridge (07065200; since February 2000), at Alley Spring (07065495; since 1993), and at Eminence (07066000; since 1921)—and on the Current River at Van Buren (07067000; since 1912). In addition, data were collected from a gaging station on the Current River below the junction with the Jacks Fork (07066500; near Eminence) from August 1921 to September 1975, when the gaging station was removed.

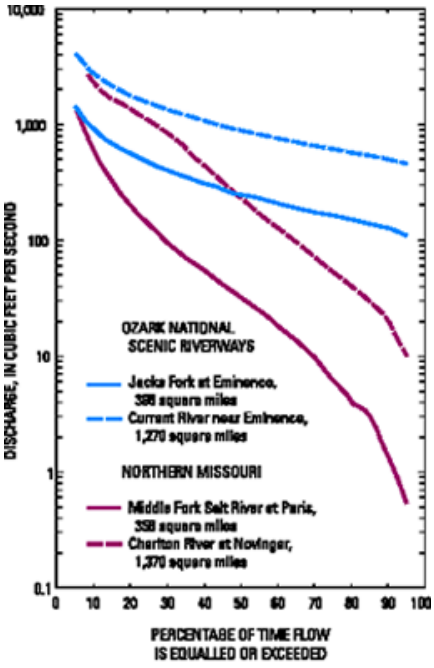


**Figure 2.** Flow-duration curves of basins with similar drainage areas.

The average discharge for gaging stations on the Jacks Fork is 304 $ft^3/s$ at Alley Spring and 466 $ft^3/s$ at Eminence, and on the Current River is 1,456 $ft^3/s$ near Eminence and 2,006 $ft^3/s$ at Van Buren (Hauck and Nagel, 2000). The average discharge from the Current River at Van Buren would fill Busch Stadium in about 7.5 hours; the average discharge from the Current River downstream from Big Spring would fill the stadium in about 6 hours.

The large basin slopes for the Jacks Fork and Current River Basins create streams well suited for recreational use than most other streams in the State because large slopes create swift currents. The Jacks Fork at Eminence and the Current River at Van Buren have basin slopes of 9.50 and 5.92 ft/mi (feet per mile) (Alexander and Wilson, 1995). Statewide, basins with similar sized drainage areas (plus or minus 10 percent) have an average basin slope of 5.80 and 3.45 ft/mi, and similar basins from northern Missouri have an average basin slope of 4.29 and 2.71 ft/mi.

The size of both the Jacks Fork and Current River Basins allow for lengthy stream reaches suitable for recreational use. The Jacks Fork is approximately 65 river miles long from its headwaters to the junction with the Current River, with 34 river miles contained within the ONSR. Alley Spring is 14 river miles upstream from the junction of the Jacks Fork with the Current River. The Current River is approximately 162 river miles from its headwaters to where it crosses the southern state boundary, with 101 river miles within the ONSR. Fifty-four river miles of the Current River is upstream from Round Spring, and 126 river miles of the river is upstream from Big Spring.

## FLOW VARIATION

Seasonal variations occur in the streamflow of the Jacks Fork and Current River (fig. 3). During the time data have been collected, seasonal average daily discharges ranged from a high of 773 and 3,131 $ft^3/s$ in the spring to a low of 287 and 1,298 $ft^3/s$ during the fall for the Jacks Fork at Eminence and the Current River at Van Buren.

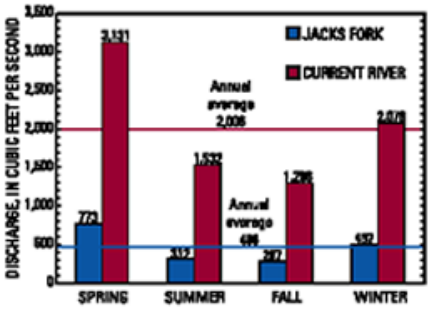


**Figure 3.** Seasonal and annual average for the Jacks Fork at Eminence and the Current River at Van Buren.

## LOW FLOW

A number commonly used in low-flow analysis of a stream is the 7-day discharge (7-day Q). The 7-day Q is the average of the annual minimum 7-day consecutive daily average discharges. The 7-day $Q_2$ is the annual minimum 7-day flow calculated to occur, on average, 1 out of every 2 years; the 7-day $Q_{10}$ represents a low flow with a recurrence interval of 10 years. The probabilities of streamflows being less than the 7-day $Q_2$ and 7-day $Q_{10}$ in any given year are 50 and 10 percent (Skelton, 1974).

Seven-day low flows indicate an upward trend from the mid-1950's to 1999 (fig. 4).

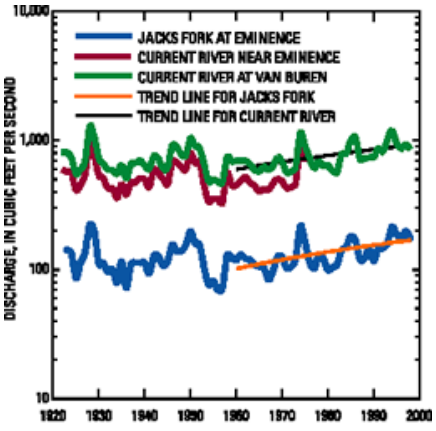


**Figure 4.** Annual 7-day discharge.

The last low-flow analysis conducted by the USGS in Missouri was in 1966 (Skelton, 1966). Updated 7-day $Q_2$ and $Q_{10}$ values have been recalculated for the Jacks Fork and the Current River at Van Buren by incorporating the additional 33 years of record (fig. 5). The

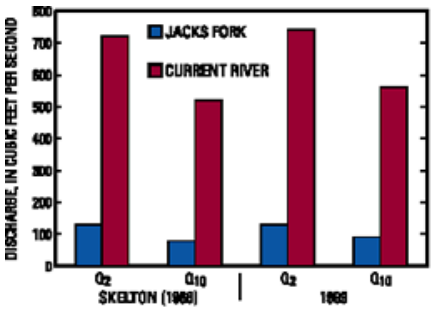


**Figure 5. Seven-day discharge with 2- and 10-year recurrence intervals. [Skelton (1966) used data for the Jacks Fork from 1921 through 1966 and for the Current River from 1912 through 1966; 1999 incorporates data from 1967 through 1998 for both rivers].**

7-day $Q_2$ and $Q_{10}$ values for the Jacks Fork at Eminence increased less than 1 and 13.8 percent, and for the Current River at Van Buren increased 3.2 and 7.9 percent.

## HIGH FLOW

Water in the Jacks Fork and Current River flows generally from west to east; weather systems also move from west to east. These factors, in addition to the large basin slope, create the possibility of large flood flows catching recreational users downstream off guard if they have experienced little or no rain at their present location.


Photo courtesy of the National Park Service

Flood on the Current River at Van Buren, Missouri, April 1983.

The distance from the gaging station at Eminence to the one at Van Buren is approximately 41 river miles. A flood peak takes about 16 hours to travel that distance, representing a wave velocity of approximately 2.6 mi/h (miles per hour). Water levels in these rivers can rise as fast as 2 ft/h (feet per hour). Although the instantaneous flood peaks can decrease immediately, the water level in the river typically declines slower than it rises. Therefore, flood events in this area typically last at least 2 to 3 days.

**Table 1.** National Park Service floating closure levels for stations available on the Internet

[USGS, U.S. Geological Survey; NPS, National Park Service; Hwy., highway; ONSR, Ozark National Scenic Riverways]

| USGS gage | Gage level at which NPS closes river to floating[a] | River section affected[b] |
|---|---|---|
| Jacks Fork near Mt. View (State Hwy. 17 bridge) | 3.65 | Jacks Fork River - ONSR Boundary to Bay Creek |
| Jacks Fork at Alley Spring | 5.3 | Jacks Fork River - Bay Creek to Alley Spring |
| Jacks Fork at Eminence | 6.4 | Jacks Fork River - Alley Spring to Two Rivers |
| Current River at Van Buren | 5.0 | Current River - Powdermill to Big Spring |

[a] Actual floating closures are determined by National Park Service rangers depending on upstream and downstream conditions and weather conditions. Wire weight and staff gages are used for other river sections.

[b] Floating closure levels for other river sections are determined using wire weight and staff gages. Those readings are not available on the Internet.

The NPS monitors the USGS gaging stations on the Jacks Fork and the Current River and issues a no-float order when the water levels reach certain heights. Some closure information is available on the Internet (table 1).

The "no-float" water level for the Jacks Fork at Eminence corresponds to a discharge of 3,100 $ft^3/s$, which is 6.7 times greater than the average flow of the river. In 1998, there were 5 days when water levels were above the "no-float" level (fig. 6). During the last 10 years, the "no-float" water level was reached an average of 7 days each year. The USGS gaging station, installed in February 2000, on the Jacks Fork at the State Highway 17 bridge, 07065200 (fig. 1), will offer faster flood detection and warning capability.

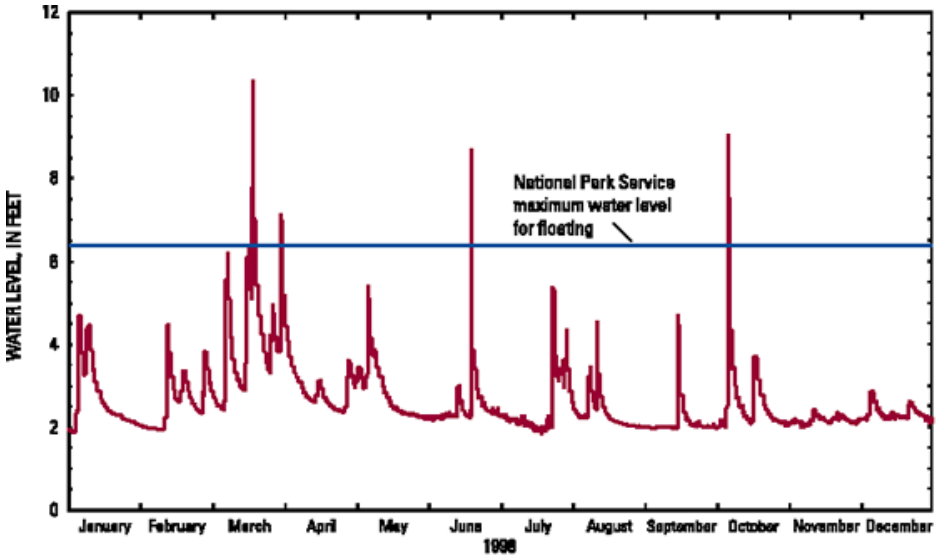


**Figure 6. Water level of the Jacks Fork at Eminence.**

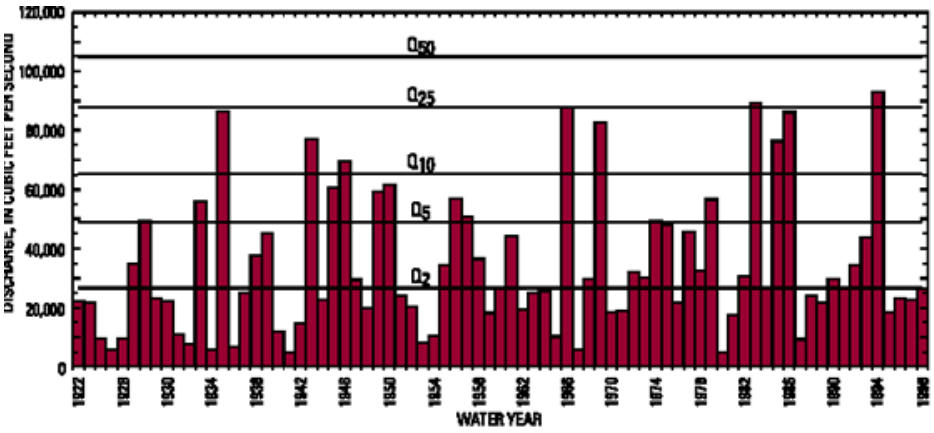


**Figure 7. Annual flood peaks and recurrence interval values for the streamflow gaging station at the Current River at Van Buren.**

A discharge calculated to occur, on average, 1 out of every 100 years would be referred to as $Q_{100,}$ and one calculated to occur 1 out of every 2 years is referred to as $Q_2$. The chance of occurrence would be 1 and 50 percent for the $Q_{100}$ and $Q_2$. Typically, the Missouri Department of Transportation designs their bridges using the $Q_{50}$ discharge (2 percent chance of occurrence). However, the occurrence of a flood greater than the $Q_{50}$ does not mean bridge failure will occur. The annual flood peaks and the calculated discharges for 2, 5, 10, 25, and 50 years for the Current River at Van Buren are shown in figure 7 (Alexander and Wilson, 1995). The flood peak in 1993 on the Current River at Van Buren of 92,900 $ft^3/s$ was generally considered by the public to be a 100- to 500-year event, but was actually just slightly larger than the 25-year event for the station. Historically, floods near the 25-year magnitude have caused major damage to park facilities in the flood plain. The calculated discharges for 2, 5, 10, 25, 50, 100, and 500 years (Alexander and Wilson, 1995) for the Jacks Fork at Eminence and Current River at Van Buren are shown in figure 8. The flood peak of 26,600 $ft^3/s$ in 1998 for the Current River at Van Buren would fill Busch Stadium in about 33 minutes. In 1915 the peak flood of record for the Current River at Van Buren, 125,000 $ft^3/s$, occurred; this discharge would fill Busch Stadium in about 7 minutes.

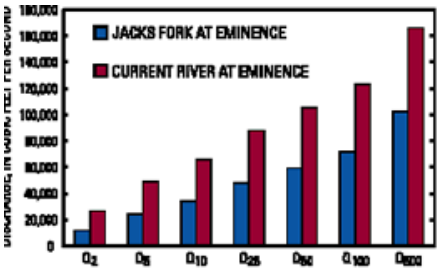


**Figure 8. Flood discharges at specific recurrence intervals (years).**

## INFORMATION ON THE INTERNET

Real-time streamflow information can be accessed from the Internet at "http://missouri.usgs.gov". Real-time data can be accessed for three gaging stations on the Jacks Fork and two stations on the Current River. Real-time streamflow data for stations within the ONSR are in the East South-Central Section of the State at this Internet site.

Hydrologic conditions are updated every 4 hours and are available for the preceding 72 hours. Future conditions at a particular gaging station can be predicted by looking at data from stations upstream.

The NPS maintains an Internet site containing information relating to the ONSR (www.nps.gov/ozar/). This site provides historical background information and information about weather and recreational facilities (camping, lodging, and canoeing). Directions from several of the surrounding metropolitan areas to OSNR also are available. For additional information, contact Ozark National Scenic Riverways, P.O. Box 490, Van Buren, MO 63965, or telephone (573) 323-4236.

## SURVIVING A FLOOD—DO'S AND DON'TS

DO AVOID A FLOOD. Camp on high ground in case a flash flood occurs.

DON'T WALK THROUGH FLOWING WATER. Drowning is the number one cause of flood-related deaths. Water currents can be deceptive; shallow, but fast-moving water can knock you off of your feet. If you walk in standing water, use a pole or stick to ensure that you don't step into deep water.

DON'T BOAT ON FLOODING WATERS. Boating on flood-swollen waters is dangerous because of possible submerged or floating logs, debris, or hidden obstacles.

DON'T DRIVE THROUGH A FLOODED AREA. More people drown in their cars than anywhere else. Don't drive around road barriers; they are put up for your protection. The road or bridge beyond the barrier may be washed out.

DO STAY AWAY FROM POWER LINES AND ELECTRICAL WIRES. The number two cause of flood-related deaths is electrocution. Electrical current can travel through water. Report downed power lines to the power company, city emergency management office, or NPS.

DO USE EXTREME CAUTION WITH ELECTRICAL EQUIPMENT. Don't use appliances or motors that have been wet unless they have been taken apart, cleaned, and dried. Some appliances, such as television sets, keep electrical charges even after they have been unplugged.

DO BE ALERT FOR GAS LEAKS. Use a flashlight to inspect for damage. Don't smoke or use candles, lanterns, or open flames unless you know the gas has been turned off and the area has been ventilated.

DO LOOK OUT FOR SMALL ANIMALS, ESPECIALLY SNAKES. Small animals that have been flooded from their homes may seek shelter in yours. Use a pole or stick to turn things over and scare away small animals.

DO LOOK BEFORE YOU STEP. After a flood, the ground and floors of buildings are covered with debris, including broken glass and nails. Floors and stairs that have been covered with mud can be extremely slippery.

(From Baker, 1997; Federal Emergency Management Agency, 1994).

## REFERENCES CITED


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**For more information contact any of the following:**

For water information:
U.S. Geological Survey, District Chief
1400 Independence Road, Mail Stop 100
Rolla, Missouri 65401
(573) 308-3664 or "http://missouri.usgs.gov".

For more information on all USGS reports and products (including maps, images, and computerized data), call 1-888-ASK-USGS.

Additional earth science information can be found by accessing the USGS "Home Page" on the Internet at "http://www.usgs.gov".