HYDROLOGY

Precipitation

The average annual precipitation for the Cuivre River Basin is 36 inches. Precipitation peaks in spring (March-May) and averages 12 inches. Precipitation is next highest in summer and fall (11 inches each season), and lowest in winter (5-6 inches). For comparison, the state's average annual precipitation ranges from 32 inches in the northwest to 48 inches in the southeast (Missouri Department of Natural Resources 1986).

U.S. Geological Gaging Stations

Only one U.S. Geological Survey (USGS) gaging station, number 05514500, is active in the Cuivre River Basin. It is located on the Cuivre River, on the downstream side of the U.S. Highway 61 bridge, 1.2 miles downstream from the confluence of the North Fork Cuivre River and the West Fork Cuivre River, and 2 miles north of Troy in Lincoln County (Table 5; Figure gs). The datum of the gage is 450.27 feet above the National Geodetic Vertical Datum of 1929. It is a water-stage recorder and crest-stage gage. It has been recording hydrographic data from February 1922 to July 1972 and May 1979 to the present. Water-quality data was collected as this station from 1972 to 1975 and from 1982 to the present. A National Weather Service gage-height telemeter also is present at this site. From October 1930 to July 1939 there was a nonrecording gage at the present site. Prior to October 1930, there was a nonrecording gage 3 miles downstream of the present one, at datum 445.96 feet. There are six other gage stations (three low-flow and three crest-stage record stations) in the basin which are currently inactive (Table 5; Figure gs). They were used before 1966.

Permanence/Intermittence of Flow in Stream Reaches

Permanence of stream flow and pools was determined for fourth-order-and-larger streams from USGS topographic maps and literature review. No streams in the Cuivre River Basin are currently identified as losing streams by the Missouri Department of Natural Resources, Division of Geology and Land Survey (Duchrow 1992a). The USGS identified perennial reaches of stream with solid blue lines, defining perennial as streams having water 12 months of the year during years of normal precipitation. Intermittent streams were indicated by a broken line and were defined as streams carrying water less than 12 months of the year. Funk (1968) classified streams as permanent if they had flow during drought. Funk's classification was meant to identify streams capable of sustaining fish populations. The results of these two methods are summarized in Table 6.

In general, fewer miles of stream had permanent pools during drought than were indicated as perennial stream by the USGS. The entire seventh order reach of the Cuivre River always has water that supports fish. Seventy to 75 percent of the West Fork Cuivre River and the North Fork Cuivre River have permanent pools.

Average Annual Discharge

The average annual discharge at gage station #05514500 on the Cuivre River near Troy for the last 61-year period is 650 cubic feet per second (U.S. Geological Survey 1990). Actual discharge into the Mississippi River is larger because drainage from 305 square miles enters Cuivre River below this gage station. Stream flows are lowest in August, September and October and highest in March, April and May (Figure 6). The highest instantaneous peak flow, 120,000 cfs, was recorded on October 5, 1941. The lowest instantaneous peak flow was 0 cfs and occurred several times.

Detailed Hydrologic Data

7-day Q2, Q10, Q20 low flows and slope index:

Every 20 years Cuivre River flows fall below 0.1 cfs for seven days. Available seven-day Q2, Q10 and Q20 flows for the Cuivre River, the West Fork Cuivre River, the North Fork Cuivre River and Big Creek are summarized in Table 7. The slope index (the ratio of the seven-day Q2 to Q20) for the Cuivre River gaging station near Troy is 45. This indicates highly variable low flows. A slope index of 45 is high even for the Dissected Till Plains physiographic region (Spears and Schrader 1989).

Flow duration curve and 90:10 ratio:

Figure 7 shows a flow duration curve which allows for interbasin comparisons of discharge variability. Median discharge (discharge exceeded 50% of the time) is about 100 cfs. The 90:10 ratio (discharge exceeded 90% of the time to that exceeded 10% of the time) is 218. This value indicates highly variable flows.

Flood Frequency

Flood magnitude for the Cuivre River near Troy, Lincoln County, is provided in Table 8 for 2-5-, 10-, 25-, 50- and 100-year recurrence intervals. The flood magnitude for the Cuivre River is high for its small basin area (Hauth 1974). The Corps of Engineers (Corps of Engineers 1991) identified three locations along the Cuivre River and one site along the North Fork Cuivre River that frequently flood; the town of Old Monroe; near the town of Chain of Rocks; Highway C to Highway 61; and the town of Silex.

Dam and Hydropower Influence

In 1985, the Missouri Department of Natural Resources (MDNR) inventorial 3,789 large lakes (dam height at least 6 feet and impounding 50 or more acre-feet or dam at least 25 feet high and storing at least 15 acre-feet of water) in the state (MDNR 1986). Its survey indicated that four of the six counties within the basin had 85-100 dams. Two counties, Lincoln and Pike had 45-65 impoundments. This is a high density of large lakes when compared with other areas around the state. No hydroelectric power reservoirs are located within the Cuivre watershed. However, the lower reaches of the Cuivre River (up

to the vicinity of Moscow Mills) are influenced by the stage of the Mississippi River regulated by Lock and Dam 26R near Alton, Illinois. Near the mouth of the Cuivre River, the mean pool elevation in the Mississippi River is 423.2 feet m.s.l.; its highest pool elevation, 442.5 feet m.s.l., occurred in April 1973. During dry periods the water level rarely drops below 418 feet m.s.

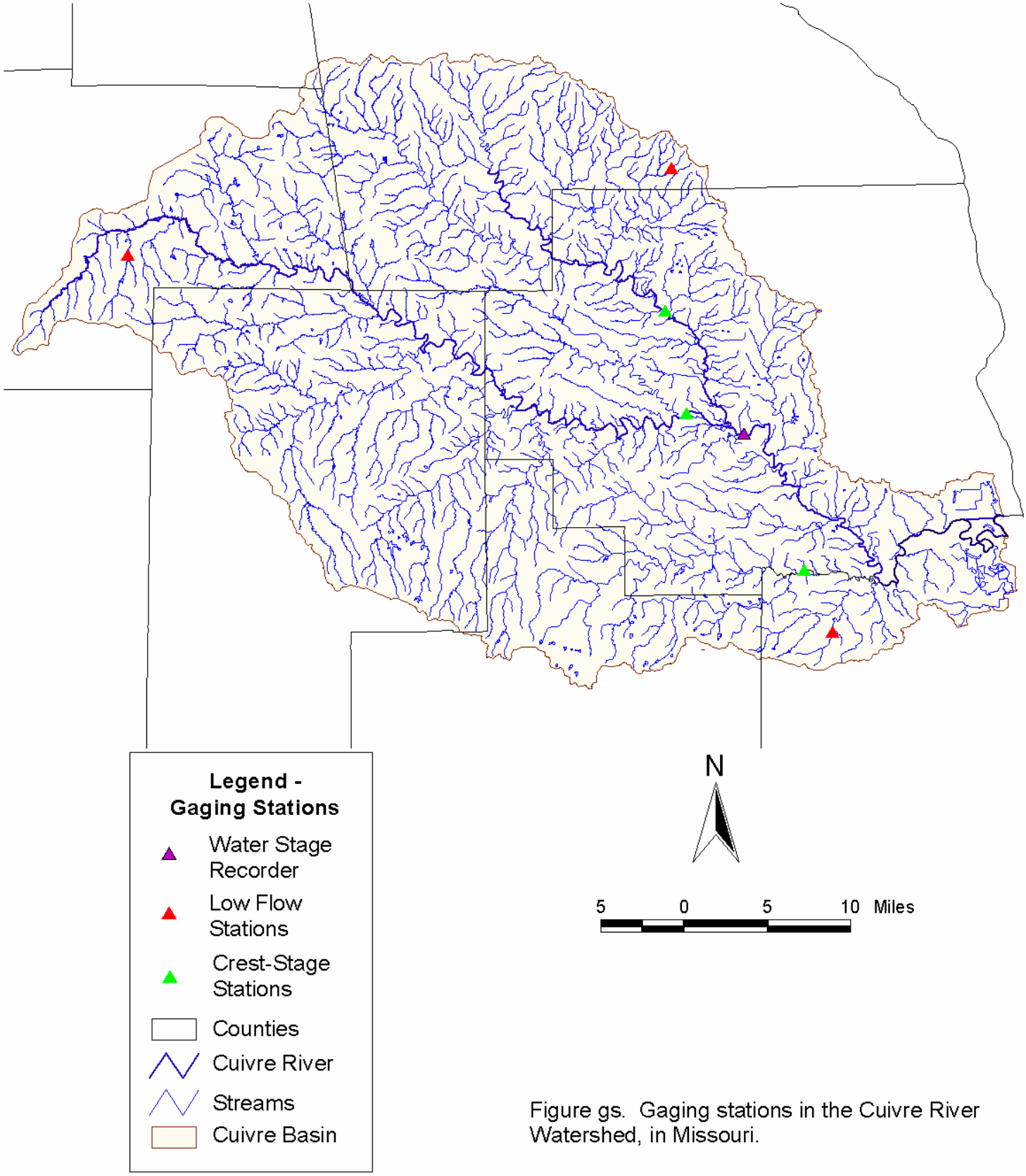

Figure gs. Gaging stations in the Cuivre River Watershed, in Missouri.

Table 6. Permanence of stream flow in fourth-order-and-larger streams in the Cuivre River Basin.

			Perennial Stream[a]		Permanent/ Intermittent Pools[b]		Total Length (miles)
Stream Code	Stream Name	Order	Miles	% of Total Length	Miles	% of Total Length	
Cuivre River							
32100000	Cuivre River	7	32.6	100	34.5/0	100	32.6
32114000	Big Creek	5	28.5	93	9/13.5	74	30.5
32114400	Coon Creek	4	3.8	29	0/9	69	13.1
32121000	Crooked Creek	4	9.0	67	0/5.5	41	13.4
32114200	Indian Camp Creek	4	14.5	86	2/5.5	45	16.8
32114100	McCoy Creek	4	9.2	80	2/4	52	11.5
32124000	Sugar Creek	4	8.6	62	0/11	80	13.8
West Fork Cuivre River							
32210000	West Fork Cuivre River	6	73.5	96	34.5/19	70	76.8
32220000							
32216000	Bear Creek	4	17.7	80	0/14.5	66	22.1
32215000	Camp Creek	4	10.3	54	5/4.5	50	19.0
32223000	Coon Creek	4	11.0	58	0/7.5	40	18.8
32222000	Elkhorn Creek	5	20.0	73	0.5/15	57	27.3
32226000	Hickory Creek	4	7.4	51	0/6	42	14.4
32211000	Lead Creek (includes Big Lead Creek)	4	8.0	27	0.59.5	35	28.5
32223400	Little Coon Creek	4	2.9	50	-	-	5.8
32222400	Little Elkhorn Creek	4	0	0	-	-	6.8
32224000	Little Lead Creek	4	10.2	77	0/3.5	26	13.2
32224000	Sandy Creek	4	8.4	69	0/5.5	45	12.1
32222300	White Oak Creek	4	4.2	46	-	-	9.2
32222200	Wolf Creek	4	4.3	34	0/2	16	12.5
North Fork Cuivre River							
32310000 32320000	North Fork Cuivre River (to mouth of Irvine Branch)	6	37.9	100	20.5/8	75	37.9
32321120	Brushy Creek	4	2.9	44	-	-	6.6
32323000	Indian Creek	5	19.4	76	0/17	67	25.5
32316000	Mill Creek	4	3.2	43	-	-	7.5
32321100	Sandy Creek	4	7.3	64	-	-	11.3
32323600	Shady Creek	4	5.6	45	-	-	12.4
32321000	Sulphur Creek (to mouth of Middle Sulphur Creek)	5	10.6	100	1.5/9.5	100	10.6

[a] USGS 7.5-minute topographic maps (Appendix A)
[b] Funk (1968)

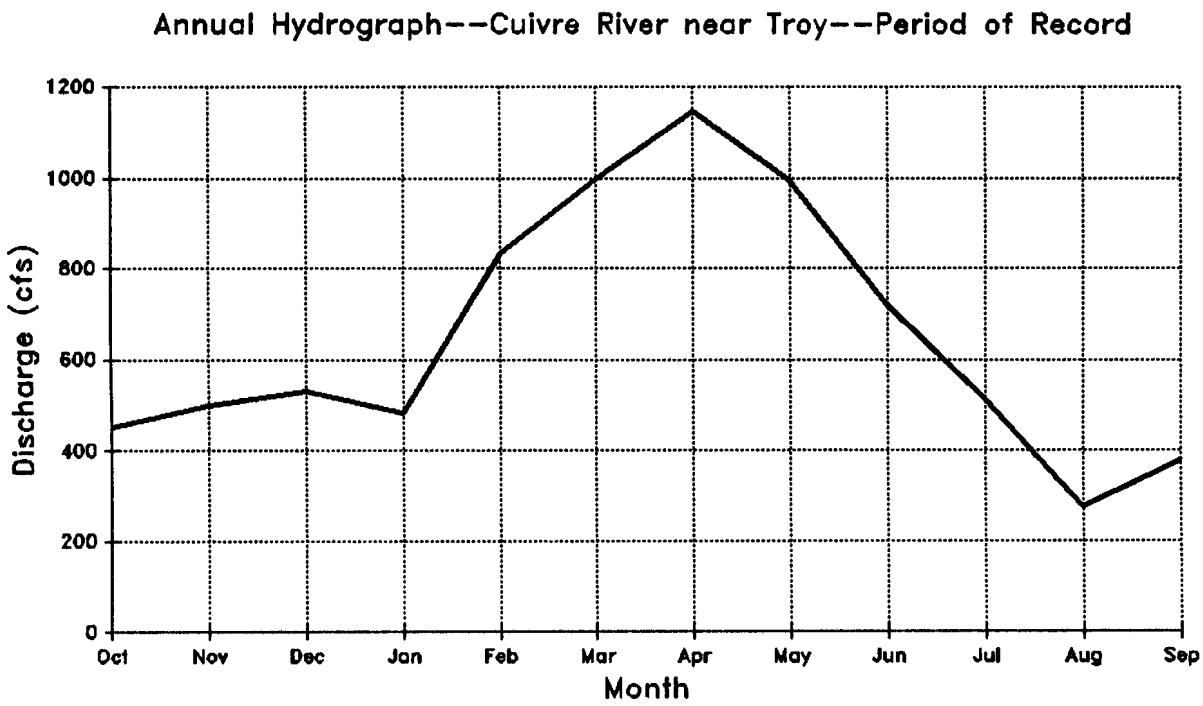

Figure 6. Annual hydrograph of Cuivre River near Troy at gage #05514500, 1922 to 1972 and 1979 to 1990.

Table 7. Seven-day low-flow characteristics for the Cuivre River, the West Fork Cuivre River, the North Fork Cuivre River and Big Creek (Skelton, 1976).

Station Number	Station Name	Period of Record	Q2 (cfs)	Q10 (cfs)	Q20 (cfs)
05514500[a]	Cuivre River near Troy	1922-1972	4.5	0.3	0.1
5-5143.0[b]	North Fork Cuivre River at Silex	1962-1965	0.5	0	0
5-5144.5[b]	West Fork Cuivre River above Troy	1962-1965	1.0	0	0
5-5146[b]	Big Creek near Moscow Mills	1962-1964	0.2	0	0

[a] - water-stage recorder and crest-stage gage
[b] - low-flow partial record station

Table 8. Flood-frequency data for the Cuivre River, Cuivre River gage station at Troy, Missouri, in Lincoln County (Hauth 1974)

Magnitude of Flood (cfs)	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
	23,300	39,600	50,600	64,400	74,400	84,000

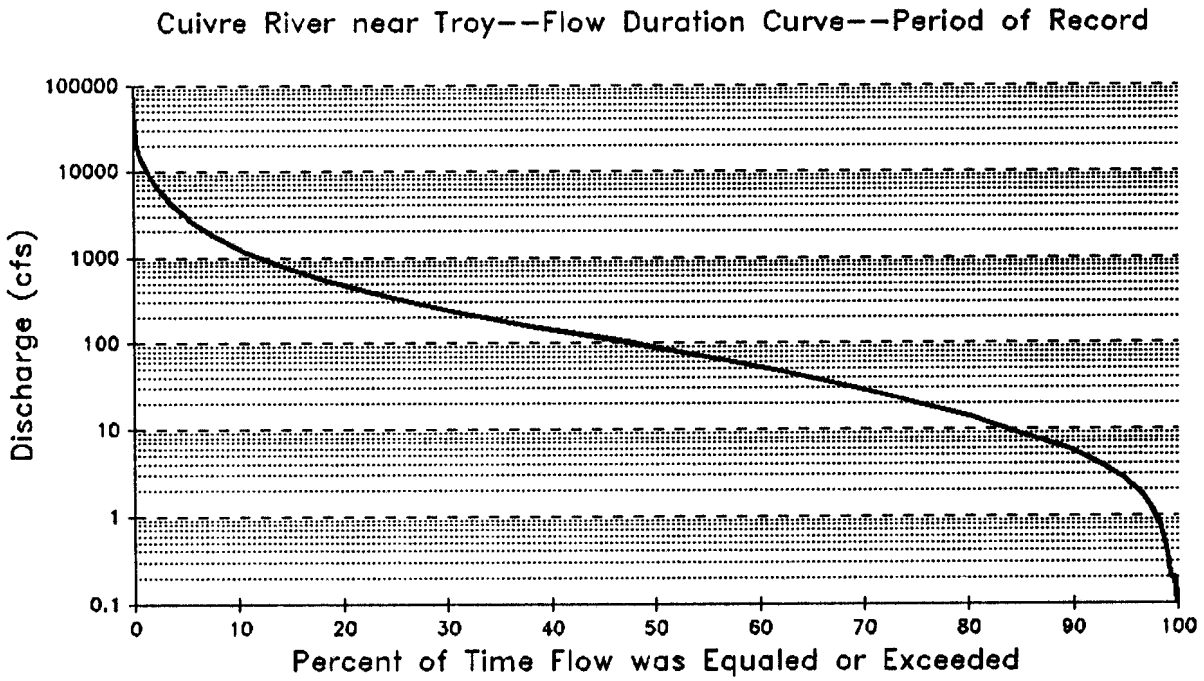

Figure 7. Flow duration curve for the Cuivre River near Troy, gage station #05514500, 1923 to 1972 and 1979 to 1985.