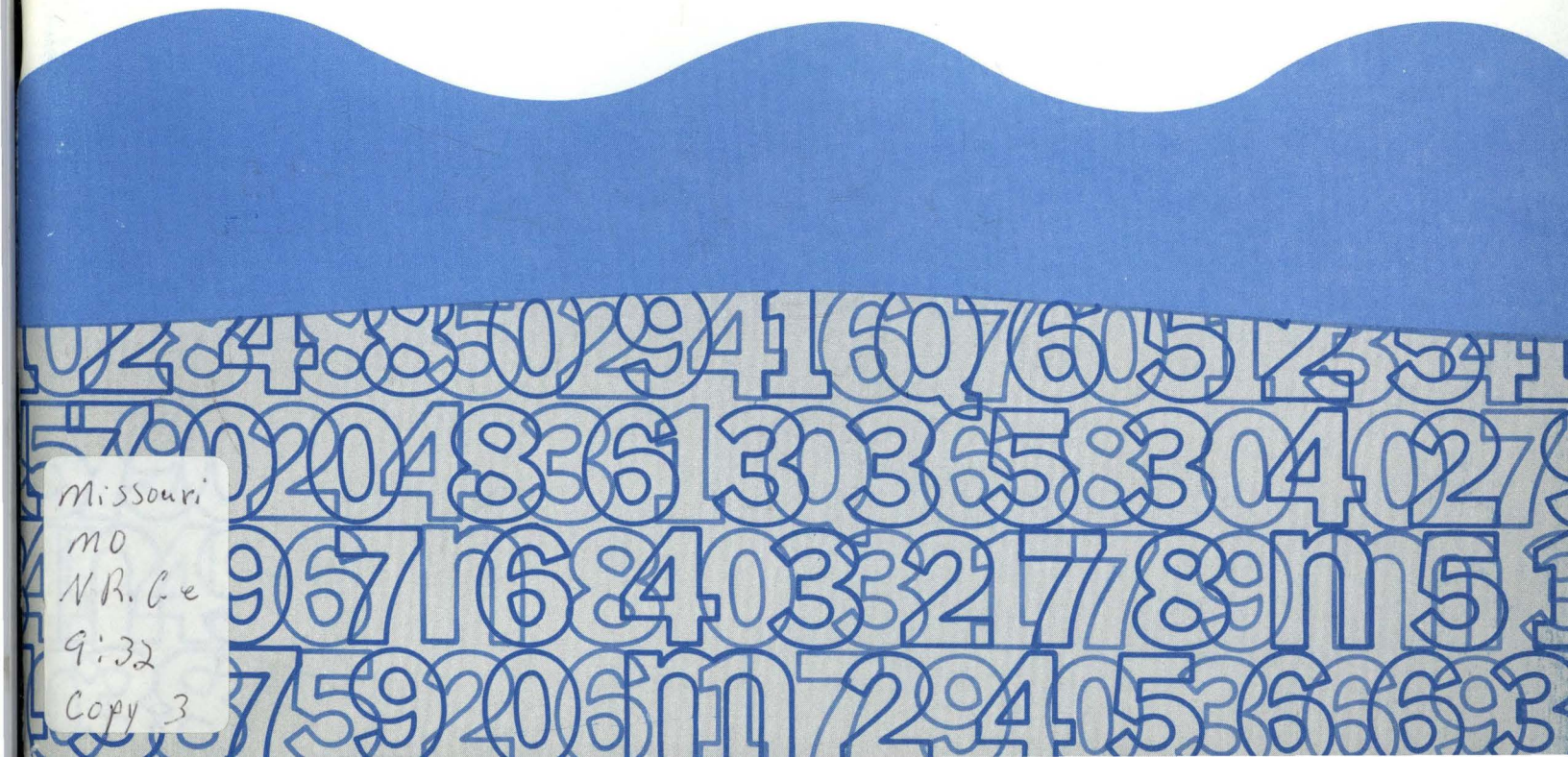
WATER RESOURCES REPORT NUMBER 32

MISSOURI STREAM AND SPRINGFLOW CHARACTERISTICS

low-flow frequency and flow duration

by john skelton



WATER RESOURCES REPORT NO. 32

1976

MISSOURI STREAM AND SPRINGFLOW CHARACTERISTICS LOW-FLOW FREQUENCY AND FLOW DURATION

By John Skelton, Hydrologist

WATER RESOURCES DIVISION
U.S. GEOLOGICAL SURVEY

Prepared In Cooperation With:

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND LAND SURVEY

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PREFACE

Water Resources Report 32 has been published in response to numerous requests for more comprehensive low-flow information for Missouri streams. An earlier report in this series (Water Resources Report 20) contained analyses of low-flow data collected through the 1959 climatic year. However, intensive low-flow investigations during the 1960's and early 1970's have provided a wealth of additional information that should be used in the management of Missouri's considerable surface-water resources. In addition to an update of the frequency and duration data in Water Resources Report 20, this report contains a tabulation of low-flow frequency characteristics at approximately 260 additional gaged sites where data were not previously available plus a frequency analysis of available seepage-run data. Because of the additional data available and the improved methods of low-flow analysis used in this study, Water Resources Report 32 should be used as the standard reference on low flows for the state.

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MISSOURI STREAM AND SPRINGFLOW CHARACTERISTICS:

LOW-FLOW FREQUENCY AND FLOW DURATION

By John Skelton*

ABSTRACT

This report contains a statistical analysis of low-flow information for Missouri streams. Low-flow frequency data for 460 continuous- and partial-record gaging stations, discharge measurements and approximate frequency data for 66 partial-record stations, and flow-duration data for 84 long-time continuous-record stations are tabulated in the report.

Maps showing seepage-run data collected in Ozarks basins are included to supplement tabulated frequency information from the gaging stations and to permit extrapolation of these frequency data to many additional sites.

Low-flow characteristics of streams vary among physiographic regions in Missouri. The low-flow potential of most Plains streams is poor because of the low hydraulic conductivity of the clays and shales in the area. Storage reservoirs are required for effective utilization of surface-water supplies in this region. Ozark streams generally have the best sustained low flows in the state because of groundwater inflow from extensive natural reservoirs in the soluble carbonate rocks, but this pattern is not consistent in the region. The solution cavities result in water losses and non-conformance to areal patterns in some basins. Low flows in the Southeastern Lowlands are second in magnitude to those of the Ozarks because of groundwater inflow from the extensive alluvial aquifer.

In general, the most definitive means of estimating low-flow frequency characteristics at ungaged sites in Missouri is to collect some low-flow information at the site and relate it graphically to nearby continuous-record station data. In the Plains, however, reliable estimates of low-flow characteristics can be made on the basis of drainage basin size or by interpolation between gaged points.

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INTRODUCTION

The increase in size and activity of Missouri's population has been accompanied by industrial growth and a rapidly increasing tourist trade; these are major factors in the escalating demand for water in the state. Wise management of Missouri's considerable water resources is becoming more essential each year.

Some of the best available water management data are low-flow frequency and flow-duration information. State and federal agencies, municipalities, private industry, consulting firms and private citizens submit numerous requests each year to the U.S. Geological Survey for these data.

There is a special need for computation of the 7-day Q_{10} (defined in a subsequent section of this report under "Definition of Terms and Conversion of Units") at all possible sites because it is the value used by the Missouri Clean Water Commission as the maximum flow for which waste treatment facilities may be designed. There is also a need for compilation and analysis of seepage-run data; these data are especially useful to regulatory agencies concerned with the disposal of pollutants.

The purpose of this report is to fulfill these basic needs by (a) updating frequency and duration data from a previous study that utilized streamflow records through 1959 (Skelton, 1966), (b) defining low-flow frequency characteristics at approximately 260 additional gaged sites where data were not previously available, and (c) compiling and making a frequency analysis of available seepage-run data. An additional aim of the study is to provide the best possible solutions to the problem of estimating low-flow parameters at ungaged sites.

ACKNOWLEDGMENTS

The information contained in this report is based on data collected by the U.S. Geological Survey in cooperation with state and federal agencies. The report was prepared in the Missouri district office of the U.S. Geological Survey under the direction of Anthony Homyk, district chief, in cooperation with the Division of Geology and Land Survey of the Missouri Department of Natural Resources, Wallace B. Howe, State Geologist and Director.

DEFINITION OF TERMS AND CONVERSION OF UNITS

1. Conversion of English units to International System of units.

Multiply English Units	By	To Obtain SI Units
feet (ft)	0.3048	meters (m)
miles (mi)	1.609	kilometers (km)
acres	4047	square meters (m^2)
square miles (mi^2)	2.590	square kilometers (km^2)
acre-feet (acre-ft)	1233	cubic meters (m^3)
cubic feet per second (ft^3/s)	.02832	cubic meters per second (m^3/s)

2. Cubic feet per second (ft^3/s) – *the unit rate of discharge.*

One ft^3/s is the rate of discharge of a stream having a cross-sectional area of 1 square foot and an average velocity of 1 foot per second.

1 ft^3/s=7.48 U.S. gallons per second=0.646 millions of U.S. Gallons per day.

3. Recurrence interval – *the average interval in years between occurrences of a low flow less than that indicated by the data.*

Recurrence intervals are averages and regularity of occurrence should not be implied; an event with recurrence interval of 10 years might occur in consecutive years or it might not occur in a 20-year period. In other words, an event with a recurrence interval of 10 years has a probability of 0.10 (or a 10 percent chance) of occurring during any given year.

4. Seepage run – *a series of discharge measurements along a stream reach made in a short time to identify where gains or losses in flow occur.*

Measurements of temperature and specific conductance of the water are also made at each site to provide supplementary reconnaissance information.

5. Standard error – *the principal measure of the accuracy with which a streamflow characteristic can be determined from a regression equation and is expressed as a percentage of the average value of the characteristic.*

It is the estimated limit above and below the average within which about 67 percent of future values of the streamflow characteristics are expected to fall. Thus, there is about one chance in three that future values will differ from the average by more than one standard error.

6. X-day Q_n – *the average minimum flow for X consecutive days that has a recurrence interval of n years.*

For example, the 7-day Q_{10} is the 7-day average minimum flow with a recurrence interval of 10 years.

DATA COLLECTION NETWORK AND PROGRAM

The data collection network that provided information for this report (pl. 1) consisted of 526 continuous- and partial-record gaging stations. In addition to data from this network, low-flow information was obtained at hundreds of additional stream sites during basin seepage runs (see subsequent section, "Seepage-Run Information").

The continuous-record stations provided the most important basic data for the study. They were also used as index stations in defining low-flow frequency characteristics at the partial-record stations.

Low-flow partial-record stations are sites at which low-flow measurements are obtained on a systematic basis in order to define an adequate relation with concurrent flows at a nearby continuous-record station. Discharge measurements are usually made at these partial-record stations during one or two low-flow periods each year.

A continuing program of systematic low-flow discharge measurements is being carried out in the State. The long-range plan for low-flow data collection, as described by Skelton and Homyk (1970), is to collect information until low flows have been sampled from all drainage basins of 50 mi^2 (130 km^2) or more in the Ozarks and Southeastern Lowlands and 100 mi^2 (259 km^2) or more in the Plains.

All Missouri data collected in the future can be obtained from the district office of the U.S. Geological Survey in Rolla, Mo.

USES OF LOW-FLOW AND FLOW-DURATION DATA

The U.S. Geological Survey receives numerous requests from the U.S. Army Corps of Engineers, U.S. Soil Conservation Service, state agencies, con-

sultants, mining companies, and municipalities for minimum flow data because of the many uses of low-flow frequency and flow-duration data for engineering and hydrologic studies.

Low-flow frequency data can be used to estimate the potential yield of a stream and thus are very useful in water supply and management studies. In water-quality studies, the data are used to determine when temporary storage of effluents is necessary during critical low-flow periods.

Drought-frequency and duration data are needed in order to administer state water laws in many sections of the country, and will be needed in Missouri if such laws are passed. As described by Skelton (1970), knowledge of low-flow recession characteristics and seasonal low-flow data can be used to make estimates of probable future low flows for purposes of appropriation.

Low-flow frequency curves and duration curves are useful in studies of basin hydrology. The shape of these curves reflects the hydrologic character of a drainage basin by indicating whether large or small amounts of ground water are in storage and available to sustain flow (see Skelton, 1966, p. 14 and 21).

Flow duration data are useful in studies involving water control and utilization, including flood control, water supplies, recreation, navigation, stream sanitation, and sedimentation.

In the realm of groundwater-surface water relationships, there are increasing numbers of problems concerning reservoir construction and the disposal of treated wastes in streams that are hydraulically connected with aquifers in carbonate rock terranes. Because of the close relationship between surface streams and aquifer systems in some sections of Missouri and because these relationships can vary with the severity of drought conditions, low-flow frequency and seepage run data are essential to many construction projects. These projects often involve disposal of municipal and industrial wastes; thus reliable low-flow data are an essential tool in planning for the health and well-being of the present and future populace.

GENERALIZED DESCRIPTION OF LOW-FLOW CHARACTERISTICS OF MISSOURI STREAMS

In Missouri distinctive low-flow patterns are associated with the physiographic regions of the state (fig. 1). The following discussion by Skelton and Homyk (1970, p. 5) summarized the low-flow characteristics of streams in each region:

"Low-flow potential of most streams in the Plains is poor because of the low hydraulic conductivity of the clays and shales of the area.... Storage reservoirs are required for effective utilization of surface-water supplies in this region.

"The streams of the Ozarks generally have the best sustained low flows in the state because of inflow from extensive natural underground reservoirs in the soluble carbonate rocks. However, the low

flows of some streams in this region are affected by the underground solution cavities, resulting in water losses and non-conformance to areal patterns.

"Low flows in the Lowlands are second in magnitude to those of the Plateaus and are sustained by groundwater inflow from the extensive alluvial aquifer. This is a relatively flat region where major manmade channels have been constructed for drainage of the excellent farmland. Since construction of the ditches, groundwater releases from the alluvium have been generally larger, and this accounts, at least in part, for the well-sustained low flows of the region.

"Minimum streamflow in Missouri usually occurs in fall or late summer. More minimum flows have occurred at long-time gaging stations in August, September and October than in any other period."

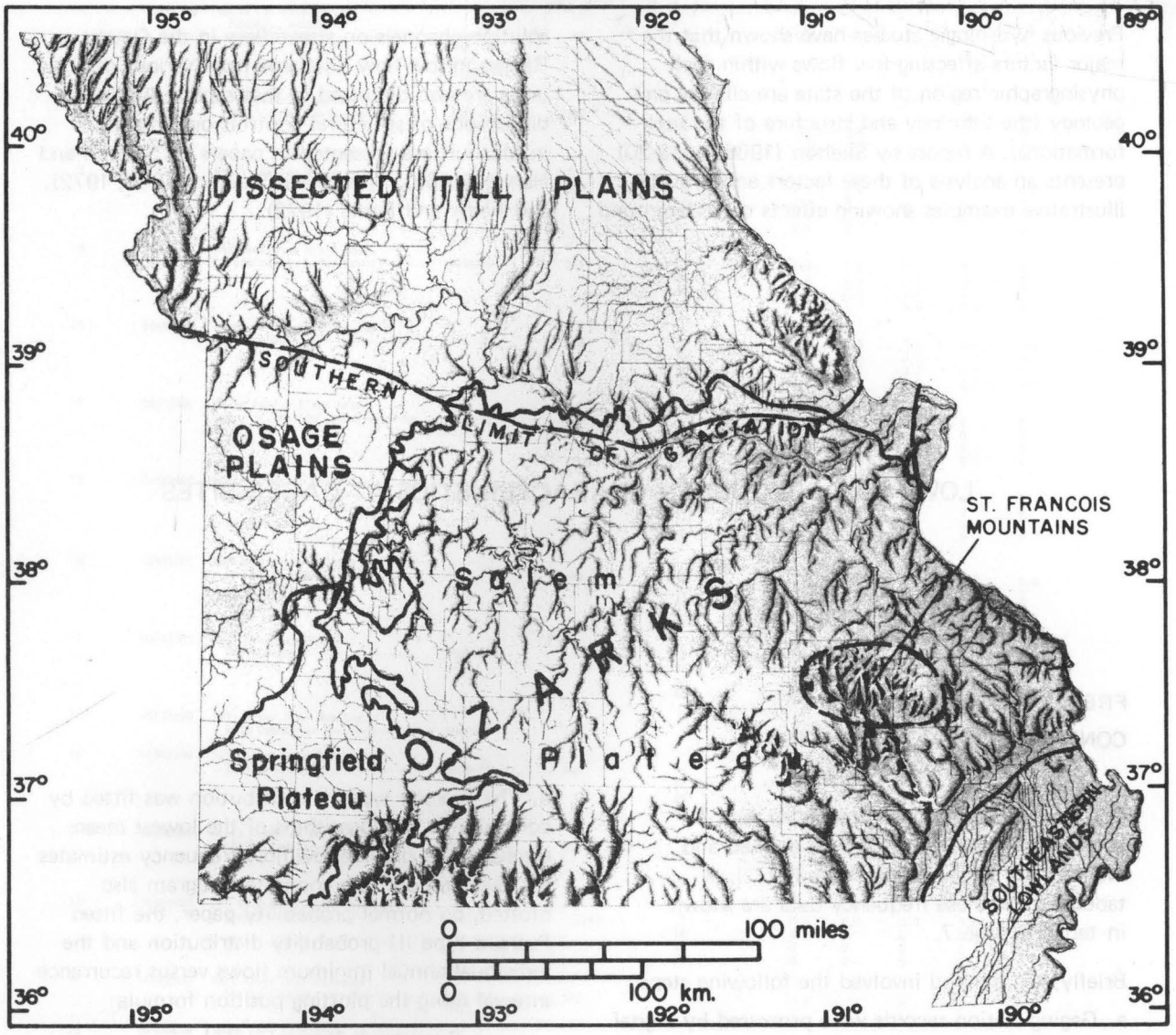

Figure 1

Map showing the physiographic divisions of Missouri. From Missouri Geological Survey and Water Resources, 1967.

FACTORS AFFECTING LOW FLOWS

Previous hydrologic studies have shown that the major factors affecting low flows within each physiographic region of the state are climate and geology (the lithology and structure of the rock formations). A report by Skelton (1966, p. 13-20) presents an analysis of these factors and provides illustrative examples showing effects of underground solution channels on streamflow in the Ozarks. Ranges in low-flow discharge from various geologic units are also discussed in that report. Additional discussions of structural controls on streamflow in Missouri are presented in papers by Skelton and Harvey (1968), Harvey and Skelton (1968, 1972), and Feder and Barks (1972).

LOW-FLOW FREQUENCY CHARACTERISTICS AT GAGED SITES

FREQUENCY DATA FOR CONTINUOUS-RECORD STATIONS

For this report, low-flow frequency data for continuous-record stations were defined and evaluated as suggested by Riggs (1972). A tabulation of these frequency data are shown in table 1, page 7.

Briefly, the method involved the following steps:

a. Gaging station records were processed by digital computer to give the lowest mean discharges for 1, 3, 7, 14, 30, 60, 90, 120 and 183 consecutive days in each climatic year (April 1-March 31).

b. The Pearson type III distribution was fitted by computer to the logarithms of the lowest mean discharges to provide low-flow frequency estimates for each station. The computer program also plotted, on normal probability paper, the fitted Pearson type III probability distribution and the individual annual minimum flows versus recurrence interval using the plotting position formula:

$$\text{Recurrence interval} = \frac{n+1}{m},$$

where n is number of years of record and m is the order number when the annual events are ranked

TABLE 1

Magnitude and Frequency of Annual Low-Flows

Map No. (pl. 1)	Station No.	Station Name and Location	Period of Record	Drainage Area (mi^2)	Period (days)	Annual Low-flow (in cubic feet per second) For Indicated Recurrence Interval (in years) 2	5	10	20	50
1	05495000	Fox River at Wayland, Clark County----------	1922-72	400	7	1.3	0.1	0.0	0.0	0.0
					14	1.7	0.1	0	0	0
					30	2.7	0.3	0.1	0	0
					60	7.6	1.1	0.2	0	0
2	05495800	North Wyaconda River near Granger, Scotland County----------	1962-65	---	7	0	---	0	0	---
3	05496000	Wyaconda River above Canton, Lewis County----------	1933-72	393	7	0.9	0	0	0	0
					14	1.2	0	0	0	0
					30	2.2	0.3	0	0	0
					60	4.5	0.9	0.1	0	0
4	05496950	North Fabius River at Memphis, Scotland County----------	1942-43, 1945-48, 1953, 1962-65	---	7	0.8	---	0	0	0
5	05497000	North Fabius River at Monticello, Lewis County-----	1922-72	452	7	2.1	0.1	0	0	0
					14	2.7	0.2	0	0	0
					30	4.3	0.5	0	0	0
					60	9.4	1.7	0.3	0	0
7	05497500	Middle Fabius River near Baring, Scotland County------	1937-60	185	7	0.1	0.0	0.0	0.0	0.0
					14	0.1	0	0	0	0
					30	0.2	0	0	0	0
					60	0.6	0.1	0	0	0
8	05498000	Middle Fabius River near Monticello, Lewis County-----	1946-72	393	7	1.3	0.2	0	0	0
					14	1.8	0.3	0.1	0	0
					30	2.8	0.6	0.2	0	0
					60	5.2	1.7	0.6	0.2	0
10	05498500	North Fabius River at Taylor, Marion County----------	1931-40	930	7	3.3	0.5	0.1	0	---
					14	5.4	0.8	0.2	0.1	---
					30	7.8	1.2	0.3	0.1	---
					60	14.0	2.1	0.6	0.2	---
11	05500000	South Fabius River near Taylor, Marion County--------	1935-72	620	7	1.9	0.2	0	0	0
					14	2.5	0.4	0.1	0	0
					30	4.0	0.8	0.1	0	0
					60	8.4	2.5	0.7	0.1	0
12	05500500	North River at Bethel, Shelby County----------	1937-72	58	7	0	0	0	0	0
					14	0.1	0	0	0	0
					30	0.2	0.1	0	0	0
					60	0.3	0.1	0	0	0
13	05501000	North River at Palmyra, Marion County----------	1935-72	373	7	1.2	0.2	0.0	0.0	0.0
					14	1.5	0.3	0.1	0	0
					30	3.0	0.7	0.2	0	0
					60	5.0	1.5	0.5	0.1	0
14	05502000	Bear Creek at Hannibal, Ralls County----------	1948-72	31.0	7	0.1	0	0	0	0
					14	0.2	0	0	0	0
					30	0.3	0	0	0	0
					60	0.6	0	0	0	0
15	05502200	Salt River near Novelty, Knox County----------	1962-65	---	7	0.2	---	0	0	0
16	05502500	Salt River near Shelbina, Shelby County----------	1934-72	481	7	0.3	0	0	0	0
					14	0.5	0	0	0	0
					30	1.6	0.1	0	0	0
					60	4.2	1.0	0.1	0	0
17	05502900	Black Creek at Shelbyville, Shelby County----------	1942-43, 1945-47, 1953, 1962-64	---	7	0	0	0	0	0
18	05503000	Oak Dale Branch near Emden, Shelby County----------	1957-72	2.69	7	0.0	0.0	0.0	0.0	0.0
					14	0	0	0	0	0
					30	0	0	0	0	0
					60	0	0	0	0	0
19	05503500	Salt River near Hunnewell, Shelby County----------	1931-40, 1962-65	626	7	0.4	---	0	0	0
20	05504400	South Fork Salt River at Mexico, Audrain County[1]------	1933-34, 1962-65, 1967	---	7	0.5	---	---	---	---
21	05504500	Davis Creek near Mexico, Audrain County----------	1930-41	59	7	0	0	0	0	0
22	05505000	South Fork Salt River at Santa Fe, Monroe County------	1940-68	298	7	0.3	0	0	0	0
					14	0.4	0	0	0	0
					30	0.7	0.1	0	0	0
					60	2.4	0.5	0.2	0.1	0

See footnotes at end of table.

Table 1 — ***Magnitude and Frequency*** (continued) . . . . .

Map No. (pl. 1)	Station No.	Station Name and Location	Period of Record	Drainage Area (mi^2)	Period (days)	Annual Low-flow (in cubic feet per second) For Indicated Recurrence Interval (in years) 2	5	10	20	50
23	05506000	Youngs Creek near Mexico, Audrain County----------	1938-69	67.4	7	0.0	0.0	0.0	0.0	0.0
					14	0	0	0	0	0
					30	0	0	0	0	0
					60	0.1	0	0	0	0
24	05506500	Middle Fork Salt River at Paris, Monroe County---------	1940-72	356	7	0.8	0	0	0	0
					14	1.2	0.1	0	0	0
					30	2.6	0.2	0	0	0
					60	6.6	1.3	0.3	0.1	0
25	05507000	Elk Fork Salt River near Paris, Monroe County---------	1935-54	262	7	0.3	0	0	0	---
					14	0.4	0	0	0	---
					30	0.8	0.1	0	0	---
					60	3.9	0.7	0.2	0	---
					90	7.2	1.2	0.4	0.1	---
26	05507500	Salt River near Monroe City, Ralls County----------	1940-72	2,230	7	8.6	2.0	0.6	0.2	0
					14	10.0	2.6	1.0	0.4	0.1
					30	17.0	4.6	2.1	1.0	0.4
					60	44.0	11.0	4.8	2.2	0.8
27	05508000	Salt River near New London, Ralls County----------	1923-72	2,480	7	15.0	4.8	1.7	0.2	0.0
					14	18.0	5.8	2.0	0.8	0
					30	26.0	8.0	2.8	0.8	0.1
					60	60.0	15.0	6.2	2.8	1.0
28	05508800	Spencer Creek near Frankford, Ralls County----------	1930-36, 1962-65	---	7	0.2	---	0	0	0
30	05509700	Calumet Creek near Clarksville, Pike County----------	1965-72	15.7	7	0	0	0	0	0
31	05513500	Lost Creek at Elsberry, Lincoln County----------	1955-59	12.2	7	0	0	0	0	0
32	05514100	West Fork Cuivre River near Troy, Lincoln County---------	1962-65	---	7	1.0	---	0	0	0
33	05514300	North Fork Cuivre River at Silex, Lincoln County--------	1962-65	---	7	0.5	---	0	0	0
34	05514500	Cuivre River near Troy, Lincoln County----------	1922-72	903	7	4.5	1.0	0.3	0.1	0
					14	5.5	1.2	0.4	0.1	0
					30	9.3	1.8	0.6	0.2	0.1
					60	19.0	3.7	1.5	0.7	0.3
35	05514600	Big Creek near Moscow Mills, Lincoln County----------	1962-64	---	7	0.2	---	0.0	0.0	0.0
36	05514710	Peruque Creek near Wentzville, St. Charles County----------	1942-43, 1946, 1948, 1953, 1962-63, 1967	---	7	0.1	---	0	0	0
37	05514720	Dardenne Creek near Weldon Spring, St. Charles County---	1942-43, 1946, 1948, 1953, 1961-63	---	7	0.1	---	0	0	0
38	05587500	Mississippi River at Alton, Ill[2]----------	1934-72	171,500	7	---	---	21,500	---	---
					14	---	---	---	---	---
					30	---	---	---	---	---
					60	---	---	---	---	---
41	06812500	West Tarkio Creek near Westboro, Atchison County----------	1934-39	105	7	0.4	0.1	0.0	0.0	---
					14	0.5	0.2	0.1	0	---
					30	0.9	0.3	0.1	0.1	---
					60	1.7	0.6	0.3	0.2	---
42	06813000	Tarkio River at Fairfax, Atchison County----------	1922-72	508	7	9.0	2.2	0.8	0.3	0
					14	11.0	3.0	1.2	0.4	0.1
					30	15.0	4.4	1.7	0.6	0.1
					60	25.0	8.8	4.0	1.6	0.5
43	06815570	Little Tarkio River near Mound City, Holt County------	1962-65, 1967-70	---	7	2.4	---	0.2	---	---
45	06816000	Mill Creek at Oregon, Holt County----------	1952-72	4.90	7	0.1	0	0	0	0
					14	0.1	0	0	0	0
					30	0.2	0	0	0	0
					60	0.3	0	0	0	0
46	06817500	Nodaway River near Burlington Junction, Nodaway County-----	1922-72	1,240	7	21.0	9.5	6.1	4.1	1.1
					14	25.0	11.0	7.0	4.7	1.8
					30	34.0	15.0	10.0	7.0	3.5
					60	44.0	22.0	16.0	12.0	7.4

See footnotes at end of table.

Table 1 — ***Magnitude and Frequency*** (continued). . . . .

Map No. (pl. 1)	Station No.	Station Name and Location	Period of Record	Drainage Area (mi^2)	Period (days)	Annual Low-flow (in cubic feet per second) For Indicated Recurrence Interval (in years) 2	5	10	20	50
48	06817800	Nodaway River near Oregon, Holt County----------	1942-43, 1946, 1962-64, 1967, 1970	---	7	26.0	---	8.0	---	---
49	06818000	Missouri River at St. Joseph, Buchanan County[3]----------	1930-72	424,300	7	---	---	---	---	---
					14	---	---	---	---	---
					30	---	---	---	---	---
					60	---	---	---	---	---
51	06818900	Platte River at Ravenwood, Nodaway County----------	1921-25, 1928-32, 1958-71	486	7	2.8	---	0.1	---	---
52	06819010	Long Creek near Guilford, Nodaway County----------	1942-43, 1946, 1962-64	---	7	0	0	0	0	0
53	06819020	Platte River at Whitesville, Andrew County----------	1964-65, 1967, 1969-70	---	7	6.1	---	0.3	---	---
54	06819090	Platte River near St. Joseph, Buchanan County----------	1962-65, 1967, 1971	---	7	7.2	---	---	---	---
55	06819500	One Hundred and Two River near Maryville, Nodaway County----	1933-72	500	7	2.7	0.7	0.2	0.1	0.0
					14	3.4	1.1	0.4	0.2	0
					30	4.3	1.4	0.7	0.4	0.2
					60	5.8	2.2	1.2	0.8	0.4
56	06820000	White Cloud Creek near Maryville, Nodaway County----	1950-72	6.06	7	0	0	0	0	0
					14	0	0	0	0	0
					30	0	0	0	0	0
					60	0	0	0	0	0
57	06820400	White Cloud Creek near Barnard, Nodaway County----------	1942-43, 1946, 1962-64	---	7	0	0	0	0	0
58	06820420	One Hundred and Two River at Rosendale, Andrew County-----	1964-65, 1967, 1969-70	---	7	3.0	---	0.2	0.1	---
59	06820460	One Hundred and Two River at Avenue City, Andrews County----------	1942-43, 1946, 1962-65, 1967, 1971	---	7	5.8	---	0.3	---	---
60	06820480	One Hundred and Two River near St. Joseph, Buchanan County----------	1962-65, 1967, 1971	---	7	8.2	---	0.5	---	---
62	06820500	Platte River near Agency, Buchanan County----------	1933-72	1,760	7	17.0	3.5	1.0	0.1	0.0
					14	25.0	6.2	2.0	0.4	0
					30	30.0	8.0	2.8	0.8	0
					60	35.0	11.0	5.5	3.5	2.2
63	06820900	Castile Creek near Gower, Clinton County----------	1942-43, 1946, 1962-64	---	7	0	---	0	0	0
64	06821000	Jenkins Branch at Gower, Clinton County----------	1952-72	2.72	7	0	0	0	0	0
					14	0	0	0	0	0
					30	0	0	0	0	0
					60	0	0	0	0	0
65	06821050	Castile Creek near Edgerton, Buchanan County----------	1962-65, 1967	---	7	0.2	---	0.0	0.0	0.0
66	06821100	Little Platte River near Trimble, Clinton County------	1962-64	---	7	0	0	0	0	0
67	06821150	Little Platte River at Smithville, Clay County------	1942-43, 1946, 1962, 1964-72	234	7	0.2	---	0	0	0
68	06821200	Platte River at Platte City, Platte County----------	1962-65, 1967-71	---	7	32.0	---	2.0	---	---
69	06893000	Missouri River at Kansas City, Jackson County[3]----------	1930-72	489,200	7	---	---	---	---	---
					14	---	---	---	---	---
					30	---	---	---	---	---
					60	---	---	---	---	---
70	06893200	Blue River at Kansas City, State Highway 150, Jackson County----------	1962-64	---	7	0	0	0	0	0

See footnotes at end of table.

Table 1 — *Magnitude and Frequency* (continued) . . . . .

Map No. (pl. 1)	Station No.	Station Name and Location	Period of Record	Drainage Area (mi^2)	Period (days)	Annual Low-flow (in cubic feet per second) For Indicated Recurrence Interval (in years) 2	5	10	20	50
71	06893500	Blue River near Kansas City, County Highway W, Jackson County[4]	1941-72	188	7	---	---	---	---	---
					14	---	---	---	---	---
					30	---	---	---	---	---
					60	---	---	---	---	---
72	06893600	Rock Creek at Independence, Jackson County	1967-72	5.20	7	0.0	0.0	0.0	0.0	0.0
73	06893700	Shoal Creek near Liberty, Clay County[1]	1962, 1964, 1967, 1970	---	7	1.0	---	0.1	0	0
74	06893790	Little Blue River at Longview Road in Kansas City, Jackson County	1966-72	47.4	7	0.5	---	0	0	0
75	06893800	Little Blue River at Kansas City, Jackson County	1962, 1964-65, 1967	---	7	1.8	---	---	---	---
76	06893900	Little Blue River near Blue Springs, Jackson County	1962, 1964, 1967, 1970-71	---	7	2.6	---	---	---	---
77	06894000	Little Blue River near Lake City, Jackson County	1948-72	184	7	4.5	0.4	0.1	0.0	0.0
					14	5.6	0.7	0.1	0	0
					30	8.4	1.2	0.3	0	0
					60	14.0	2.2	0.5	0.1	0
78	06894300	Fishing River at Mosby, Clay County	1962-65, 1967	---	7	0.5	---	0	0	0
79	06894400	Williams Creek near Mosby, Clay County	1962-64	---	7	0	0	0	0	0
80	06894500	East Fork Fishing River at Excelsior Springs, Clay County[5]	1952-72	20	7	0	0	0	0	0
					14	0	0	0	0	0
					30	0.1	0	0	0	0
					60	0.7	0.1	0	0	0
81	06894600	Fishing River near Orrick, Ray County	1962-65, 1967	---	7	2.0	---	0.2	---	---
82	06894700	Sni-A-Bar Creek near Grain Valley, Jackson County	1962-65, 1967, 1970	---	7	0.4	---	0	0	0
83	06894800	Sni-A-Bar Creek near Wellington, Lafayette County	1962-65, 1967, 1970-71	---	7	0.2	---	0	0	0
84	06895000	Crooked River near Richmond, Ray County	1948-70	159	7	0.2	0	0	0	0
					14	0.4	0	0	0	0
					30	1.0	0	0	0	0
					60	2.0	0.2	0	0	0
85	06895050	West Fork Crooked River at Richmond, Ray County	1943, 1945-46, 1953, 1962	---	7	0	0	0	0	0
86	06895500	Missouri River at Waverly, Lafayette County[3]	1930-72	491,200	7	---	---	---	---	---
					14	---	---	---	---	---
					30	---	---	---	---	---
					60	---	---	---	---	---
87	06896000	Wakenda Creek at Carrolton, Carroll County	1948-70	248	7	1.6	0.7	0.4	0.3	0.1
					14	1.9	0.8	0.5	0.3	0.2
					30	2.6	1.0	0.6	0.4	0.2
					60	5.1	1.8	1.0	0.6	0.3
88	06896160	Grand River near Grant City, Worth County	1962-70	---	7	3.0	---	1.0	---	---
89	06896170	Grand River near Stanberry, Gentry County	1943, 1946-47, 1953, 1962-70	---	7	3.8	---	1.4	1.0	---
91	06896185	Middle Fork Grand River at Grant City, Worth County	1943, 1946, 1962-65, 1967, 1969-70	---	7	0.1	---	0	0	0
92	06896190	Middle Fork Grand River near Albany, Gentry County	1943, 1946, 1953, 1962-64, 1967-68, 1970	---	7	1.3	---	0.1	---	---

See footnotes at end of table.

Table 1 — *Magnitude and Frequency* (continued). . . . .

Map No. (pl. 1)	Station No.	Station Name and Location	Period of Record	Drainage Area (mi^2)	Period (days)	Annual Low-flow (in cubic feet per second) For Indicated Recurrence Interval (in years) 2	5	10	20	50
93	06896400	East Fork Grand River at Albany, Gentry County----------	1943, 1946, 1953, 1962-70	---	7	1.7	---	0.1	---	---
94	06896500	Thompson Branch near Albany, Gentry County----------	1957-72	5.58	7	0	0	0	0	0
					14	0	0	0	0	0
					30	0	0	0	0	0
					60	0	0	0	0	0
95	06896550	Grand River near Darlington, Gentry County----------	1929-31, 1962-65, 1967, 1970-71	---	7	9.0	---	2.5	---	---
97	06896750	West Fork Lost Creek at Maysville, DeKalb County----------	1943, 1945-46, 1962-64	---	7	0	0	0	0	0
98	06896800	Lost Creek near Weatherby, DeKalb County----------	1943, 1945-47, 1962-64	---	7	0	0	0	0	0
99	06896850	Grindstone Creek near Pattonsburg, Daviess County----------	1962-64	---	7	1.1	---	0.0	0.0	0.0
100	06896900	Grand River near Pattonsburg, Daviess County----------	1958, 1960-64, 1967-68, 1970-71	---	7	17.0	---	3.0	---	---
101	06897000	East Fork Big Creek near Bethany, Harrison County------	1935-72	95	7	0	0	0	0	0
					14	0	0	0	0	0
					30	0.1	0	0	0	0
					60	0.9	0	0	0	0
102	06897100	Big Creek at Bethany, Harrison County----------	1934, 1943, 1946, 1953, 1962-65	---	7	0.4	---	0	0	0
103	06897300	Big Creek near Pattonsburg, Daviess County[6]----------	1964-65, 1967, 1971	---	7	1.2	---	---	---	---
104	06897500	Grand River near Gallatin, Daviess County----------	1921-72	2,250	7	26.0	7.0	4.0	3.0	2.4
					14	32.0	8.4	5.0	3.6	2.8
					30	48.0	12.0	6.4	4.2	3.1
					60	68.0	17.0	9.0	6.4	5.5
106	06898100	Thompson River at Mt. Moriah, Harrison County----------	1960-72	891	7	12.0	---	---	---	---
107	06898110	Panther Creek at Mt. Moriah, Harrison County----------	1962-64	---	7	0	0	0	0	0
108	06898200	Thompson River near Trenton, Grundy County----------	1962-69	---	7	13.0	---	2.6	1.8	---
110	06898500	Weldon River near Mercer, Mercer County----------	1940-58	246	7	0.3	0	0	0	0
					14	0.5	0	0	0	0
					30	0.9	0	0	0	0
					60	2.6	0.4	0.1	0	0
111	06899000	Weldon River at Mill Grove, Mercer County----------	1930-72	494	7	2.7	0.5	0	0	0
					14	3.4	0.6	0.1	0	0
					30	4.8	1.0	0.2	0	0
					60	7.1	2.0	0.6	0.2	0
112	06899100	Weldon River near Trenton, Grundy County----------	1961-65, 1967	---	7	6.5	---	1.8	1.2	---
113	06899500	Thompson River at Trenton, Grundy County----------	1929-72	1,670	7	21.0	8.0	4.6	2.8	1.4
					14	25.0	9.7	5.7	3.6	1.8
					30	33.0	13.0	7.5	4.8	2.5
					60	50.0	20.0	12.0	8.0	5.0
114	06899550	Muddy Creek at Trenton, Grundy County----------	1962-64, 1967	---	7	0.5	---	0	0	0
115	06899570	Honey Creek near Trenton, Grundy County----------	1962-65, 1967	---	7	0	0	0	0	0
116	06899680	Grand River at Chillicothe, Livingston County----------	1934, 1936, 1957-58, 1961-65, 1967	4,850	7	100	---	19.0	15.0	---

Table 1 — *Magnitude and Frequency* (continued) . . . . .

Map No. (pl. 1)	Station No.	Station Name and Location	Period of Record	Drainage Area (mi^2)	Period (days)	Annual Low-flow (in cubic feet per second) For Indicated Recurrence Interval (in years) 2	5	10	20	50
117	06899690	Shoal Creek at Kingston, Caldwell County----------	1942-43, 1945-46, 1962-64, 1967	---	7	0.6	---	0.0	0.0	0.0
118	06899700	Shoal Creek near Braymer, Caldwell County----------	1958-72	391	7	1.3	0.1	0	0	0
					14	2.6	0.2	0	0	0
					30	6.5	0.4	0.1	0	0
					60	20.0	4.0	1.0	0.5	---
119	06899800	Shoal Creek near Chillicothe, Livingston County----------	1942-43, 1945-46, 1962-65, 1967	---	7	2.0	---	0.2	0	0
120	06900000	Medicine Creek near Galt, Sullivan County----------	1930-72	225	7	1.8	0.4	0	0	0
					14	2.1	0.5	0.1	0	0
					30	2.9	0.8	0.2	0.1	0
					60	4.6	1.6	0.9	0.6	0.3
121	06900500	Medicine Creek near Sturges, Livingston County----------	1930-33, 1962-65, 1967, 1971	368	7	4.8	---	1.0	---	---
122	06900600	Medicine Creek near Wheeling, Livingston County----------	1942-43, 1945-47, 1962-65, 1967	---	7	7.0	---	1.0	---	---
123	06900700	Parson Creek at Meadville, Linn County----------	1942-43, 1945-47, 1962-64	---	7	0	0	0	0	0
124	06901000	Locust Creek near Milan, Sullivan County----------	1929-32, 1971	225	7	0.3	---	0	0	0
125	06901500	Locust Creek near Linneus, Linn County----------	1929-72	550	7	4.5	1.5	0.7	0.3	0
					14	5.4	1.6	0.9	0.4	0
					30	7.0	1.8	1.1	0.5	0.1
					60	9.0	3.1	1.7	1.0	0.6
126	06902000	Grand River near Sumner, Chariton County----------	1925-72	6,880	7	135.0	52.0	32.0	20.0	12.0
					14	150.0	58.0	35.0	23.0	14.0
					30	180.0	68.0	44.0	30.0	21.0
					60	260.0	86.0	56.0	42.0	36.0
127	06902200	West Yellow Creek near Brookfield, Linn County-------	1959-72	135	7	0	0	0	0	0
128	06902300	West Yellow Creek below Brookfield, Linn County--------	1942-43, 1945-47, 1953, 1962-64	---	7	0	0	0	0	0
129	06902500	Hamilton Branch near New Boston, Linn County----------	1955-72	2.51	7	0	0	0	0	0
130	06902900	East Yellow Creek near Brookfield, Linn County----------	1942-43, 1945-47, 1953, 1962-64	---	7	0	0	0	0	0
131	06903000	Yellow Creek near Rothville, Chariton County----------	1929-31, 1949-50	405	7	0.5	0.1	0	0	0
					14	0.6	0.1	0	0	0
					30	0.9	0.2	0.1	---	---
					60	1.8	0.3	0.1	---	---
132	06903100	Turkey Creek near Laclede, Linn County----------	1942-43, 1945-47, 1953, 1962-64	---	7	0.0	0.0	0.0	0.0	0.0
133	06903200	Big Creek near Bosworth, Carroll County----------	1962-64	---	7	0.1	---	0	0	0
134	06904050	Chariton River at Livonia, Putnam County[7]----------	1963-71	---	7	6.0	---	1.0	---	---
135	06904300	Shoal Creek near Hartford, Putnam County----------	1963-66, 1968	---	7	0	0	0	0	0
136	06904400	Blackbird Creek near Unionville, Putnam County----------	1942-43, 1945-48, 1962-64	---	7	0	0	0	0	0
137	06904500	Chariton River at Novinger, Adair County[7]----------	1931-51, 1955-72	1,370	7	9.5	3.0	1.3	0.6	0.2
					14	12.0	3.6	1.8	0.9	0.4
					30	14.0	4.8	2.5	1.4	0.6
					60	24.0	7.0	3.5	1.9	0.9

See footnotes at end of table.

Table 1 — *Magnitude and Frequency* (continued). . . . .

Map No. (pl. 1)	Station No.	Station Name and Location	Period of Record	Drainage Area (mi^2)	Period (days)	Annual Low-flow (in cubic feet per second) For Indicated Recurrence Interval (in years) 2	5	10	20	50
138	06905200	Chariton River near Callao, Macon County[7]	1964-65, 1969, 1971	---	7	22.0	---	6.0	---	---
139	06905500	Chariton River near Prairie Hill, Chariton County[7]	1930-72	1,870	7	24.0	12.0	8.6	6.2	4.0
					14	27.0	14.0	9.4	6.9	4.5
					30	35.0	16.0	11.0	8.0	5.2
					60	53.0	23.0	15.0	11.0	6.5
140	06906000	Mussel Fork near Musselfork, Chariton County	1948-51, 1962-72	267	7	0.4	---	0	0	0
141	06906100	Mussel Fork at Keytesville, Chariton County	1942-43, 1946, 1953, 1962-65	---	7	0.4	---	0	0	0
142	06906300	East Fork Chariton River near Huntsville, Randolph County	1962-72	220	7	0.1	---	0	0	0
144	06906600	Burge Branch near Arrow Rock, Cooper County	1959-72	0.33	7	0.0	0.0	0.0	0.0	0.0
145	06906700	Flat Creek near Sedalia, Pettis County	1960-64	148	7	0	0	0	0	0
146	06907000	Lamine River at Clifton City, Cooper County	1923-71	598	7	3.0	0.6	0.2	0	0
					14	3.7	0.9	0.3	0.1	0
					30	7.4	1.9	0.7	0.2	0
					60	14.0	3.2	1.1	0.4	0.1
147	06907100	Muddy Creek near Sedalia, Pettis County	1962, 1964-65, 1967, 1970	---	7	1.8	---	---	---	---
148	06907400	Heath Creek near Blackwater, Cooper County	1964-65, 1967, 1969-70	---	7	0.1	---	0	0	0
149	06907500	South Fork Blackwater River near Elm, Johnson County	1956-72	16.6	7	0	0	0	0	0
					14	0	0	0	0	0
					30	0	0	0	0	0
					60	0	0	0	0	0
150	06907550	Blackwater River near Warrensburg, Johnson County	1942-43, 1946, 1952-53, 1962-64	---	7	0.1	---	0.0	0.0	0.0
151	06907600	Post Oak Creek at Warrensburg, Johnson County	1942-43, 1946, 1953, 1962-64	---	7	0	0	0	0	0
153	06907700	Blackwater River at Valley City, Johnson County	1959-72	547	7	0.9	---	0.1	0	0
154	06907800	Davis Creek at Sweet Springs, Saline County	1942-43, 1945-46, 1953, 1962-64	---	7	0.2	---	0	0	0
155	06907900	Blackwater River at Sweet Springs, Saline County	1942-43, 1946, 1952-53, 1962-65, 1967	---	7	0.9	---	0.1	0	0
156	06908000	Blackwater River at Blue Lick, Saline County	1939-72	1,120	7	1.7	0.5	0.2	0.1	---
					14	2.6	0.6	0.3	0.1	---
					30	6.2	1.0	0.4	0.2	---
					60	17.0	1.9	0.7	0.3	---
157	06908420	Salt Fork Blackwater River near Marshall, Saline County	1967, 1969-71	---	7	0.2	---	---	---	---
158	06908500	Shiloh Branch near Marshall, Saline County	1954-65	2.87	7	0	0	0	0	0
					14	0	0	0	0	0
					30	0	0	0	0	0
					60	0	0	0	0	0
159	06909000	Missouri River at Boonville, Cooper County[3]	1927-72	505,700	7	---	---	---	---	---
					14	---	---	---	---	---
					30	---	---	---	---	---
					60	---	---	---	---	---
160	06909250	Bonne Femme Creek at Fayette, Howard County[8]	1942-43, 1946, 1953, 1962-64	---	7	0.1	---	0	0	0

See footnotes at end of table.

Table 1 — *Magnitude and Frequency* (continued) . . . . .

Map No. (pl. 1)	Station No.	Station Name and Location	Period of Record	Drainage Area (mi^2)	Period (days)	Annual Low-flow (in cubic feet per second) For Indicated Recurrence Interval (in years) 2	5	10	20	50
161	06909350	Bonne Femme Creek at New Franklin, Howard County[8]	1962-64	---	7	0.2	---	0.0	0.0	0.0
162	06909500	Moniteau Creek near Fayette, Howard County	1949-69	81	7	0	0	0	0	0
					14	0	0	0	0	0
					30	0	0	0	0	0
					60	0.2	0	0	0	0
163	06910000	Petite Saline Creek near Boonville, Cooper County	1948-67	182	7	0.2	0	0	0	0
					14	0.3	0	0	0	0
					30	0.4	0.1	0	0	0
					60	1.0	0.2	0.1	0	0
164	06910220	Perche Creek near Columbia, Boone County	1962-64, 1967, 1970	---	7	0.5	---	0	0	0
165	06910230	Hinkson Creek at Columbia, Boone County	1942-43, 1945-46, 1952-53, 1962-64, 1966-71	70.2	7	0.1	---	0	0	0
167	06910410	Cedar Creek near Columbia, Boone County	1964-72	44.8	7	0	0	0	0	0
168	06910415	Cedar Creek near Cedar City, Callaway County	1962-64, 1965	---	7	0.1	---	0.0	0.0	0.0
169	06910420	North Moreau Creek near California, Moniteau County	1962-65, 1967, 1970	---	7	0.3	---	0	0	0
172	06910500	Moreau River near Jefferson City, Cole County	1948-72	531	7	2.7	0.6	0.1	0	0
					14	3.5	0.8	0.2	0	0
					30	6.0	1.7	0.5	0.1	---
					60	18.0	4.3	1.1	0.3	---
173	06916650	Osage River near Rich Hill, Bates County	1962-65, 1967, 1970	---	7	9.5	---	0	0	0
174	06916670	Miami Creek near Butler, Bates County	1943, 1945, 1947, 1949, 1954-55, 1962-64	---	7	0	0	0	0	0
175	06917030	Little Osage River at Stotesbury, Vernon County	1929-32, 1960, 1962-64, 1967-68	427	7	0.1	---	0.0	0.0	0.0
176	06917060	Little Osage River at Horton, Vernon County	1960-65, 1967	---	7	0.3	---	0	0	0
177	06918060	Marmaton River at Nevada, Vernon County	1962-65, 1967, 1970	---	7	4.0	---	---	---	---
178	06918080	Osage River near Schell City, Vernon County	1932-35, 1960-64, 1967, 1970	5,530	7	10.0	---	0	0	0
179	06918320	Clear Creek near Eldorado Springs, Vernon County	1943, 1945, 1946-47, 1949, 1952, 1962-63	---	7	0	0	0	0	0
181	06918410	Pickerel Creek near Republic, Greene County	1968-70	---	7	0.0	0.0	0.0	0.0	0.0
182	06918420	Sac River at Ash Grove, Greene County	1962-65, 1967, 1971	---	7	13.0	---	3.5	2.5	---
183	06918430	Clear Creek near Phenix, Greene County	1962-64, 1967, 1970-71	---	7	5.0	---	1.0	---	---
184	06918440	Sac River near Dadeville, Dade County	1966-72	257	7	18.0	---	6.0	---	---
185	06918444	Chesapeake Spring at Chesapeake, Lawrence County	1926, 1932, 1936, 1954, 1964-69	---	7	0.9	---	0.5	0.3	---
186	06918450	Limestone Creek at South Greenfield, Dade County	1962-64, 1966-67, 1971-72	---	7	2.3	---	0.3	---	---
187	06918460	Turnback Creek above Greenfield, Dade County	1965-72	252	7	22.0	---	4.5	---	---

Table 1 — *Magnitude and Frequency* (continued). . . . .

Map No. (pl. 1)	Station No.	Station Name and Location	Period of Record	Drainage Area (mi^2)	Period (days)	Annual Low-flow (in cubic feet per second) For Indicated Recurrence Interval (in years) 2	5	10	20	50
188	06918470	Turnback Creek near Greenfield, Dade County----------	1943, 1945-46, 1949, 1962-65	---	7	23.0	---	4.5	---	---
189	06918490	Sons Creek near Neola, Dade County----------	1964-65, 1967	---	7	0	0	0	0	0
190	06918700	Oak Grove Branch near Brighton, Greene County----------	1958-72	1.30	7	0	0	0	0	0
					14	0	0	0	0	0
					30	0	0	0	0	0
					60	0	0	0	0	0
191	06918740	Little Sac River near Morrisville, Polk County------	1968-72	237	7	6.0	---	---	---	---
192	06919500	Cedar Creek near Pleasant View, Cedar County----------	1949-72	420	7	0.7	0	0	0	0
					14	0.9	0	0	0	0
					30	1.5	0	0	0	0
					60	4.0	0.1	0	0	0
193	06920500	Osage River at Osceola, St. Clair County[9]----------	1923-28, 1932-72	8,220	7	---	---	---	---	---
					14	---	---	---	---	---
					30	---	---	---	---	---
					60	---	---	---	---	---
196	06921000	Pomme de Terre River near Bolivar, Polk County----------	1951-69	225	7	2.6	0.8	0.4	0.2	---
					14	3.4	1.0	0.5	0.2	---
					30	4.7	1.6	1.0	0.7	---
					60	8.2	3.1	1.9	1.4	---
197	06921070	Pomme de Terre River near Polk, Polk County----------	1968-72	276	7	3.0	---	0.5	---	---
198	06921200	Lindley Creek near Polk, Polk County----------	1959-72	112	7	0	0	0	0	0
					14	0	0	0	0	0
					30	1.5	0	0	0	0
					60	7.0	0.1	0	0	0
199	06921580	South Grand River near Freeman, Cass County----------	1962-65, 1967	---	7	0	0	0	0	0
200	06921590	South Grand River at Archie, Cass County----------	1943, 1945, 1947, 1949, 1952, 1954, 1962-64, 1969-72	256	7	0.1	0.0	0.0	0.0	0.0
201	06921600	South Grand River at Urich, Henry County----------	1961-69	670	7	0.1	---	0	0	0
202	06921680	Big Creek at Pleasant Hill, Cass County----------	1962, 1964	---	7	0	0	0	0	0
203	06921720	Big Creek at Blairstown, Henry County----------	1960-72	414	7	0.2	---	0	0	0
204	06921740	Brushy Creek near Blairstown, Henry County----------	1960-72	1.15	7	0	0	0	0	0
205	06921780	Deepwater Creek near Montrose, Henry County----------	1955, 1962, 1964	---	7	0	0	0	0	0
206	06922000	South Grand River near Brownington, Henry County-----	1922-71	1,660	7	1.1	0.1	0	0	0
					14	1.9	0.1	0	0	0
					30	4.5	0.3	0.1	0	0
					60	22.0	2.1	0.4	0.1	0
207	06922200	Tebo Creek at Leesville, Henry County----------	1962-65	---	7	0.0	0.0	0.0	0.0	0.0
210	06922800	Big Buffalo Creek near Stover, Benton County----------	1965-72	24.2	7	1.7	---	---	---	---
211	06923200	Niangua River near Buffalo, Dallas County----------	1954, 1962-65, 1967, 1970	---	7	17.0	---	8.0	---	---
213	06923500	Bennett Spring at Bennett Spring, Dallas County---------	1916-20, 1928-41, 1965-72	---	7	80.0	---	62.0	57.0	---
215	06924500	Hahatonka Spring at Hahatonka, Camden County----------	1923-25, 1964-66, 1971	---	7	48.0	---	40.0	---	---
216	06925200	Starks Creek at Preston, Hickory County----------	1958-72	4.18	7	0	0	0	0	0
					14	0	0	0	0	0
					30	0	0	0	0	0
					60	0	0	0	0	0

Table 1 — *Magnitude and Frequency* (continued) . . . . .

Map No. (pl. 1)	Station No.	Station Name and Location	Period of Record	Drainage Area (mi^2)	Period (days)	Annual Low-flow (in cubic feet per second) For Indicated Recurrence Interval (in years) 2	5	10	20	50
217	06925250	Little Niangua River near Macks Creek, Camden County----------	1962-64, 1967, 1970-71	---	7	10.0	---	3.6	2.8	---
218	06925430	Wet Glaize Creek near Brumley, Camden County----------	1962-65, 1967, 1970	---	7	20.0	---	12.0	11.0	---
219	06925440	Grandglaize Creek near Brumley, Miller County----------	1934-36	---	7	22.0	---	16.0	14.0	---
220	06926000	Osage River near Bagnell, Miller County[10]----------	1927-72	14,000	7	---	---	---	---	---
					14	---	---	---	---	---
					30	---	---	---	---	---
					60	---	---	---	---	---
221	06926020	Little Gravois Creek at Bagnell, Miller County----------	1931, 1944, 1962-65, 1967, 1970	---	7	0.8	---	0.4	---	---
222	06926160	Saline Creek near Tuscumbia, Miller County----------	1967, 1969-71	---	7	1.2	---	---	---	---
224	06926200	Van Cleve Branch near Meta, Osage County----------	1958-72	0.75	7	0.0	0.0	0.0	0.0	0.0
					14	0	0	0	0	0
					30	0	0	0	0	0
					60	0	0	0	0	0
226	06926300	Tavern Creek near St. Elizabeth, Miller County----------	1962-65, 1967	---	7	2.8	---	0.5	---	---
227	06926500	Osage River near St. Thomas, Cole County[10]----------	1933-72	14,500	7	---	---	---	---	---
					14	---	---	---	---	---
					30	---	---	---	---	---
					60	---	---	---	---	---
230	06927000	Maries River at Westphalia, Osage County----------	1948-70	257	7	1.4	0.4	0.2	0.1	0.1
					14	1.6	0.5	0.3	0.2	0.1
					30	2.5	0.7	0.4	0.3	0.1
					60	4.3	1.3	0.8	0.6	0.4
231	06927050	Middle River near Mokane, Callaway County----------	1962-64	---	7	0.3	---	0	0	0
232	06927150	Stinson Creek at Fulton, Callaway County----------	1942-43, 1946, 1952, 1962-64	---	7	0.1	---	0.0	0.0	0.0
233	06927200	Big Hollow near Fulton, Callaway County----------	1957-72	4.05	7	0	0	0	0	0
234	06927300	Auxvasse Creek near Steedman, Callaway County----------	1962-64, 1967, 1970	---	7	0.1	---	0	0	0
236	06927580	Gasconade River near Hartville, Wright County----------	1953, 1969-71	---	7	3.5	---	1.5	---	---
237	06927650	Beaver Creek near Manes, Wright County----------	1953, 1969-71	---	7	2.6	---	0.8	---	---
238	06927700	Gasconade River near Nebo, Laclede County----------	1942, 1944-47, 1952, 1962-64, 1967	---	7	31.0	---	16.0	14.0	---
240	06927742	Big Spring near Morgan, Laclede County----------	1953, 1965, 1970	---	7	19.0	---	14.0	---	---
241	06927750	Osage Fork near Orla, Laclede County----------	1953, 1962-64, 1967, 1970-71	---	7	25.0	---	14.0	11.0	---
242	06927800	Osage Fork at Drynob, Laclede County---------- (continuous-record station since 1962)	1942, 1944-47, 1952, 1953, 1956, 1961-72	404	7	27.0	---	15.0	---	---
243	06928000	Gasconade River near Hazlegreen, Laclede County----------	1929-71	1,250	7	66.0	39.0	30.0	25.0	18.0
					14	77.0	41.0	33.0	27.0	20.0
					30	86.0	46.0	37.0	31.0	24.0
					60	110.0	60.0	48.0	42.0	35.0
244	06928200	Laquey Branch near Hazlegreen, Pulaski County----------	1958-72	1.58	7	0	0	0	0	0

Table 1 — *Magnitude and Frequency* (continued). . . . .

Map No. (pl. 1)	Station No.	Station Name and Location	Period of Record	Drainage Area (mi^2)	Period (days)	Annual Low-flow (in cubic feet per second) For Indicated Recurrence Interval (in years) 2	5	10	20	50
245	06928240	Falling Spring near Waynesville, Pulaski County----------	1925-26, 1932, 1936, 1953, 1956, 1964	---	7	2.5	---	---	---	---
246	06928242	Bartlett Mill Spring near Waynesville, Pulaski County---	1926, 1932, 1936, 1942, 1953, 1956, 1964-66	---	7	2.5	---	0.6	---	---
247	06928300	Roubidoux Creek at Ft. Leonard Wood, Pulaski County----------	1964-65, 1967, 1969-71	---	7	4.5	---	1.5	---	---
248	06928440	Roubidoux Spring at Waynesville, Pulaski County----------	1924, 1932-34, 1936, 1953, 1964, 1970	---	7	9.5	---	3.0	---	---
249	06928450	Roubidoux Creek at Waynesville, Pulaski County----------	1942-43, 1945-47, 1952, 1962-65, 1967	---	7	10.0	---	3.0	1.8	---
250	06928500	Gasconade River near Waynesville, Pulaski County----------	1915-71	1,680	7 14 30 60	130 140 150 170	82.0 92.0 100 115	66.0 74.0 80.0 92.0	56.0 62.0 66.0 75.0	46.0 50.0 52.0 60.0
251	06928700	Beeler Branch near Cabool, Texas County----------	1967-72	7.78	7	0.2	---	---	---	---
252	06928900	Big Piney River near Houston, Texas County----------	1942-43, 1945-46, 1949, 1952, 1962-64, 1967	---	7	24.0	---	17.0	15.0	---
254	06929310	Hazleton Spring at Hazleton, Texas County----------	1925, 1932, 1934, 1964, 1966, 1969-70	---	7	5.0	---	3.9	---	---
255	06929320	Slabtown Spring near Licking, Texas County----------	1925, 1933-34, 1964-66	---	7	11.0	---	9.5	---	---
256	06930000	Big Piney River near Big Piney, Pulaski County----------	1922-72	560	7 14 30 60	115 120 130 140	92.0 98.0 102 110	82.0 88.0 90.0 98.0	75.0 78.0 82.0 88.0	68.0 70.0 74.0 80.0
257	06930030	Stone Mill Spring near Spring Creek, Pulaski County---------	1925, 1932, 1934, 1964-66, 1969-70	---	7	20.0	---	16.0	---	---
258	06930090	Coppedge Spring near Relfe, Phelps County----------	1924-25, 1933-34, 1964-65, 1969-70	---	7	18.0	---	13.0	---	---
259	06930100	Spring Creek at Spring Creek, Phelps County----------	1961-65, 1967, 1969-70	---	7	21.0	---	15.0	9.5	---
260	06930400	Shanghai Spring near Waynesville, Pulaski County----------	1925, 1932, 1934, 1940, 1964, 1966, 1969-71	---	7	9.4	---	7.2	---	---
261	06930900	Little Piney Creek at Yancy Mills, Phelps County----------	1953, 1962-64, 1967-68, 1970	---	7	3.5	---	0.0	0.0	0.0
262	06930920	Lane Spring near Yancy Mills, Phelps County----------	1932, 1934, 1964, 1967-69	---	7	16.0	---	8.0	---	---
263	06931000	Beaver Creek near Rolla, Phelps County----------	1949-54	14	7 14 30 60	0.3 0.4 0.5 0.7	0.2 0.2 0.2 0.3	0.1 0.1 0.2 0.2	0.1 0.1 0.1 0.2	--- --- --- ---
264	06931500	Little Beaver Creek near Rolla, Phelps County----------	1948-72	6.41	7 14 30 60	0.2 0.2 0.2 0.4	0.1 0.1 0.1 0.2	0 0.1 0.1 0.2	0 0 0.1 0.1	0 0 0 0.1
265	06931700	Beaver Creek near Newburg, Phelps County----------	1961-64, 1967-68, 1970	---	7	2.6	---	1.1	0.9	---

Table 1 — *Magnitude and Frequency* (continued) . . . . .

Map No. (pl. 1)	Station No.	Station Name and Location	Period of Record	Drainage Area (mi^2)	Period (days)	Annual Low-flow (in cubic feet per second) For Indicated Recurrence Interval (in years) 2	5	10	20	50
266	06932000	Little Piney Creek at Newburg, Phelps County----------	1929-72	200	7	41.0	28.0	25.0	23.0	22.0
					14	43.0	30.0	26.0	25.0	23.0
					30	47.0	32.0	28.0	26.0	25.0
					60	50.0	34.0	30.0	28.0	27.0
267	06933000	Wilkins Spring near Newburg, Phelps County----------	1954-59, 1964	---	7	5.6	---	4.8	---	---
268	06933300	Mill Creek near Newburg, Phelps County----------	1955-57, 1961-64, 1967	---	7	6.0	---	4.5	4.0	---
269	06933500	Gasconade River at Jerome, Phelps County----------	1923-72	2,840	7	470	370	320	290	260
					14	480	380	330	300	270
					30	500	390	350	310	275
					60	560	420	370	325	285
270	06933600	Nagagomi Spring near Rolla, Maries County----------	1926, 1932, 1948, 1953-54, 1964, 1969-70	---	7	3.8	---	3.0	---	---
272	06933800	Gasconade River near Vienna, Maries County----------	1957, 1967, 1969-70	---	7	480	---	325	290	---
273	06933820	Paydown Spring near Belle, Maries County----------	1924, 1932, 1936, 1942, 1964	---	7	7.0	---	---	---	---
274	06934000	Gasconade River near Rich Fountain, Osage County---------	1922-58	3,180	7	520	380	330	290	260
					14	540	400	340	310	270
					30	580	430	360	320	280
					60	640	470	390	340	290
275	06934100	Mistaken Creek at Cooper Hill, Osage County----------	1964-65, 1967, 1969, 1970	---	7	0	0	0	0	0
276	06934120	Third Creek at Cooper Hill, Osage County----------	1964-65, 1967, 1969-70	---	7	1.1	---	0.5	0.3	---
277	06934300	Second Creek at Bay, Gasconade County----------	1964-65, 1967, 1969-70	---	7	0.1	---	0.0	0.0	0.0
278	06934500	Missouri River at Hermann, Montgomery County[3]----------	1930-72	528,200	7	---	---	---	---	---
					14	---	---	---	---	---
					30	---	---	---	---	---
					60	---	---	---	---	---
279	06934650	Loutre River at Mineola, Montgomery County----------	1948-67	202	7	0.2	0	0	0	0
					14	0.2	0	0	0	0
					30	0.3	0.1	0	0	0
					60	0.5	0.1	0.1	0	0
281	06934950	Big Berger Creek near Berger, Franklin County----------	1964-65, 1967, 1969-70	---	7	0	0	0	0	0
282	06935200	Boeuf Creek near New Haven, Franklin County----------	1964-65, 1967	---	7	0	0	0	0	0
284	06935400	St. Johns Creek near Washington, Franklin County----------	1962-63	---	7	0.2	---	0	0	0
285	06935650	Femme Osage Creek near Weldon Springs, St. Charles County---	1961-64	---	7	0.2	---	0.0	0.0	0.0
286	06935900	Creve Coeur Creek at Creve Coeur, St. Louis County-------	1961-64	---	7	0.3	---	0	0	0
287	06936450	Coldwater Creek at Shoveltown, St. Louis County[11]----------	1961-65	---	7	10.0	---	5.0	---	---
288	07010000	Mississippi River at St. Louis, St. Louis County[2]----------	1934-72	701,000	7	---	---	46,000	---	---
					14	---	---	---	---	---
					30	---	---	---	---	---
					60	---	---	---	---	---
289	07010120	Gravois Creek near Kirkwood, St. Louis County[11]----------	1961-64, 1967-68, 1971	---	7	0.2	---	0	0	0
290	07010300	Meramec River near Salem, Dent County----------	1961-64	---	7	0	0	0	0	0

See footnotes at end of table.

Table 1 — *Magnitude and Frequency* (continued). . . . .

Map No. (pl. 1)	Station No.	Station Name and Location	Period of Record	Drainage Area (mi^2)	Period (days)	Annual Low-flow (in cubic feet per second) For Indicated Recurrence Interval (in years) 2	5	10	20	50
291	07010350	Meramec River at Cook Station, Crawford County----------	1965-72	199	7	8.2	---	---	---	---
292	07010400	Meramec River near St. James, Crawford County----------	1953, 1957, 1962-65, 1967	---	7	22.0	---	12.0	9.2	---
293	07010500	Maramec Spring near St. James, Phelps County----------	1903-06, 1921-29, 1965-71	---	7	70.0	---	60.0	56.0	---
294	07011500	Green Acre Branch near Rolla, Phelps County----------	1949-72	0.62	7	0	0	0	0	0
					14	0	0	0	0	0
					30	0	0	0	0	0
					60	0	0	0	0	0
295	07012050	Dry Fork near St. James, Phelps County----------	1929, 1962-65, 1967, 1969-70	---	7	1.2	---	0.3	---	---
296	07013000	Meramec River near Steelville, Crawford County----------	1923-72	781	7	120	100	90.0	80.0	74.0
					14	130	105	94.0	84.0	76.0
					30	140	110	97.0	86.0	80.0
					60	150	120	100	92.0	84.0
297	07013100	Huzzah Creek at Dillard, Crawford County----------	1943-45, 1961-71	92	7	13.0	---	8.5	8.0	---
298	07013950	James Spring near Steelville, Crawford County----------	1932, 1963-64, 1968-69	---	7	3.0	---	2.0	---	---
299	07013990	Westover Spring at Westover, Crawford County----------	1926, 1932, 1963-64	---	7	11.0	---	7.5	---	---
300	07014000	Huzzah Creek near Steelville, Crawford County----------	1942-43, 1946-47, 1951, 1961-67, 1969	---	7	36.0	---	25.0	21.0	---
301	07014100	Courtois Creek at Courtois, Washington County----------	1968-71	---	7	1.3	---	0.7	---	---
303	07014200	Courtois Creek at Berryman, Washington County----------	1943-45, 1961-64, 1967-68	173	7	22.0	---	15.0	12.0	---
304	07014490	Blue Spring near Bourbon, Crawford County----------	1925, 1953, 1963-64, 1968-69	---	7	5.6	---	4.6	---	---
305	07014500	Meramec River near Sullivan, Crawford County----------	1922-32, 1944-72	1,475	7	230	170	150	130	110
					14	250	180	150	140	120
					30	260	200	170	150	130
					60	290	210	190	170	160
306	07014770	Twin Springs near Stanton, Franklin County----------	1963-72	---	7	1.0	---	---	---	---
307	07014800	Indian Creek near St. Clair, Franklin County----------	1967, 1969-71	---	7	17.0	---	---	---	---
308	07015000	Bourbeuse River near St. James, Phelps County----------	1950-72	21.3	7	0	0	0	0	0
					14	0.1	0	0	0	0
					30	0.1	0	0	0	0
					60	0.2	0	0	0	0
309	07015500	Lanes Fork near Rolla, Phelps County----------	1953-72	0.225	7	0	0	0	0	0
					14	0	0	0	0	0
					30	0	0	0	0	0
					60	0	0	0	0	0
310	07015720	Bourbeuse River near High Gate, Phelps County----------	1963-72	135	7	0.1	---	0	0	0
311	07015750	Bourbeuse River near Owensville, Gasconade County----------	1943, 1946-48, 1962-65, 1967	---	7	1.5	---	0.2	---	---
312	07015760	Dry Fork Creek near Owensville, Gasconade County----------	1962-65, 1967	---	7	0.2	---	0	0	0
314	07016000	Bourbeuse River near Spring Bluff, Franklin County---------	1962-65, 1967	608	7	6.8	---	0.9	0.4	---
315	07016100	Kratz Spring near Stanton, Franklin County----------	1925, 1936, 1963-72	---	7	10.0	---	---	---	---

Table 1 — *Magnitude and Frequency* (continued) . . . . .

Map No. (pl. 1)	Station No.	Station Name and Location	Period of Record	Drainage Area (mi^2)	Period (days)	Annual Low-flow (in cubic feet per second) For Indicated Recurrence Interval (in years) 2	5	10	20	50
316	07016500	Bourbeuse River at Union, Franklin County----------	1922-72	808	7	32.0	23.0	18.0	16.0	13.0
					14	34.0	25.0	21.0	17.0	15.0
					30	38.0	28.0	23.0	19.0	16.0
					60	50.0	33.0	26.0	21.0	18.0
317	07017000	Meramec River at Robertsville, Franklin County----------	1940-50	2,673	7	330	230	190	160	---
					14	350	250	200	170	---
					30	380	280	220	190	---
					60	430	310	250	210	---
318	07017220	Hopewell Spring at Hopewell, Washington County----------	1942, 1963-72	---	7	0.5	---	0.3	---	---
319	07017500	Dry Branch near Bonne Terre, St. Francois County----------	1955-72	3.35	7	0	0	0	0	0
320	07017600	Big River near Bonne Terre, St. Francois County----------	1942-43, 1946-47, 1953, 1961-64, 1967	---	7	32.0	---	12.0	---	---
322	07017800	Mineral Fork near Potosi, Washington County----------	1961-65, 1967, 1969, 1971	---	7	26.0	---	9.5	---	---
323	07017900	Old Mines Creek near Potosi, Washington County----------	1961-65, 1967, 1969, 1971	---	7	1.9	---	0.5	---	---
324	07018000	Big River near DeSoto, Washington County----------	1950-72	718	7	88.0	50.0	35.0	27.0	---
					14	100	58.0	42.0	30.0	---
					30	115	68.0	48.0	35.0	---
					60	125	76.0	55.0	41.0	---
325	07018100	Big River near Richwoods, Jefferson County----------	1942-43, 1946-47, 1951, 1961-64, 1968	---	7	89.0	---	44.0	35.0	---
326	07018500	Big River at Byrnesville, Jefferson County----------	1923-72	917	7	96.0	62.0	50.0	41.0	32.0
					14	110	68.0	53.0	44.0	34.0
					30	120	80.0	64.0	50.0	37.0
					60	140	95.0	74.0	58.0	44.0
327	07019000	Meramec River near Eureka, St. Louis County----------	1922-72	3,788	7	430	320	280	240	200
					14	460	330	290	260	215
					30	500	360	320	290	230
					60	580	405	360	340	260
328	07019050	Joachim Creek at Hematite, Jefferson County----------	1961-65, 1967-71	---	7	3.4	---	0.8	0.4	---
329	07019690	Sandy Creek near Pevely, Jefferson County----------	1966-72	32.5	7	0	0	0	0	0
330	07019790	Plattin Creek at Plattin, Jefferson County----------	1965-72	65.8	7	2.6	---	0.3	---	---
331	07020100	Establishment Creek at Bloomsdale, Ste. Genevieve County----------	1967, 1969-71	---	7	6.5	---	---	---	---
332	07020250	River aux Vases near Ste. Genevieve, Ste. Genevieve County----------	1969-71	---	7	3.5	---	---	---	---
333	07020270	Saline Creek near Minnith, Ste. Genevieve County----------	1969-71	---	7	1.6	---	---	---	---
335	07020600	Apple Creek at Appleton, Perry County line----------	1961-64, 1967-68, 1971	---	7	10.0	---	6.8	6.0	---
336	07020750	Indian Creek near Fruitland, Cape Girardeau County---------	1967, 1969-71	---	7	0.1	---	0	0	0
339	07021000	Castor River at Zalma, Bollinger County----------	1922-72	423	7	46.0	33.0	27.0	23.0	20.0
					14	49.0	35.0	29.0	25.0	21.0
					30	54.0	39.0	32.0	27.0	22.0
					60	62.0	46.0	38.0	33.0	27.0
340	07021150	Crooked Creek at Lutesville, Bollinger County----------	1961-65, 1967, 1969	---	7	2.3	---	0.8	---	---
342	07021400	Whitewater River at Millersville, Cape Girardeau County---------	1961-65, 1967, 1969	---	7	14.0	---	8.2	7.0	---
345	07021600	Whitewater River at Whitewater, Cape Girardeau County---------	1921-26, 1961-65, 1967	---	7	19.0	---	10.0	8.2	---

Table 1 — *Magnitude and Frequency* (continued). . . . .

Map No. (pl. 1)	Station No.	Station Name and Location	Period of Record	Drainage Area (mi^2)	Period (days)	Annual Low-flow (in cubic feet per second) For Indicated Recurrence Interval (in years) 2	5	10	20	50
346	07021800	Headwater Diversion Channel at Allenville, Cape Girardeau County----------	1951-61, 1963-65, 1967, 1969	982	7	78.0	---	42.0	---	---
347	07022000	Mississippi River at Thebes, Illinois[2]----------	1934-72	717,200	7	---	---	47,800	---	---
					14	---	---	---	---	---
					30	---	---	---	---	---
					60	---	---	---	---	---
348	07024100	Wilkerson ditch near East Prairie (formerly Main Ditch Lateral 2), Mississippi County----------	1958-61, 1963-65, 1967, 1969-70	97.3	7	7.0	---	2.5	---	---
349	07024150	St. James Ditch at East Prairie, New Madrid County----------	1958-61, 1963-65, 1967, 1969-70	17.5	7	0.6	---	---	---	---
350	07024170	Maple Slough near East Prairie, New Madrid County----------	1958-64, 1967-68, 1970	25.4	7	1.6	---	0.8	---	---
351	07034000	St. Francis River near Roselle, Madison County----------	1939, 1961-65, 1967	239	7	1.2	---	0.1	0	---
352	07035000	Little St. Francis River at Fredericktown, Madison County----------	1939, 1961	90.5	7	0.4	---	0	0	0
353	07035500	Barnes Creek near Fredericktown, Madison County----------	1955-72	4.03	7	0	0	0	0	0
355	07036100	St. Francis River near Annapolis, Madison County----------	1969-71	---	7	6.0	---	---	---	---
356	07037000	Big Creek at Des Arc, Iron County----------	1939, 1961-64, 1967-68, 1970	99.6	7	9.0	---	4.8	4.5	---
358	07037500	St. Francis River near Patterson, Wayne County----------	1922-72	956	7	32.0	18.0	15.0	11.0	8.8
					14	34.0	20.0	16.0	12.0	10.0
					30	41.0	25.0	20.0	15.0	12.0
					60	54.0	32.0	26.0	20.0	15.0
359	07037700	Clark Creek near Piedmont, Wayne County----------	1956-72	4.39	7	0.4	---	0.2	---	---
360	07038000	Clark Creek at Patterson, Wayne County----------	1939, 1961-65, 1967, 1969-70	37.5	7	2.8	---	1.4	1.0	---
361	07040050	Lick Creek near Dudley, Stoddard County----------	1958, 1960-61, 1964	56.9	7	0	0	0	0	0
362	07040470	Kinnemore ditch at Cardwell, Dunklin County----------	1958-61, 1963-64	11.5	7	0.1	---	0	0	0
363	07040700	Ditch 9 near Gideon, New Madrid County----------	1958-61, 1963-64, 1967-68, 1970	59.6	7	0.3	---	---	---	---
364	07040800	Main ditch 6 east of Malden, New Madrid County----------	1958-61, 1963-65, 1967, 1969-70	28.0	7	0.7	---	0.1	---	---
365	07040850	Main ditch near Bernie, Stoddard County----------	1958-61, 1963-65, 1967	31.7	7	0.4	---	0.2	0.1	---
366	07040900	Main ditch 2 near Malden, New Madrid County----------	1958-61, 1963-65, 1967, 1969-70	---	7	15.0	---	6.0	---	---
367	07041000	Little River ditch 81 near Kennett, Dunklin County-------	1927-72	111	7	45.0	25.0	18.0	13.0	9.0
					14	48.0	27.0	20.0	15.0	11.0
					30	54.0	30.0	22.0	17.0	13.0
					60	58.0	32.0	25.0	20.0	16.0
368	07041050	Main ditch near Malden, Dunklin County----------	1958-61, 1963-64, 1967-68, 1970	28.6	7	6.8	---	3.2	---	---

Table 1 — *Magnitude and Frequency* (continued) . . . . .

Map No. (pl. 1)	Station No.	Station Name and Location	Period of Record	Drainage Area (mi^2)	Period (days)	Annual Low-flow (in cubic feet per second) For Indicated Recurrence Interval (in years) 2	5	10	20	50
369	07041100	Main ditch at Holcomb, Dunklin County----------	1958-61, 1963-65, 1967	96.1	7	28.0	---	6.0	---	---
370	07042000	Little River ditch 1 near Kennett, Dunklin County-------	1927-72	235	7	32.0	21.0	17.0	13.0	9.5
					14	35.0	23.0	20.0	16.0	12.0
					30	38.0	26.0	22.0	18.0	14.0
					60	45.0	28.0	24.0	21.0	18.0
371	07042400	Main ditch 1 near Matthews, New Madrid County----------	1958-61, 1963-65, 1967, 1969-70	62.0	7	38.0	---	15.0	---	---
372	07042500	Little River ditch 251 near Lilbourn, New Madrid County---	1946-72	235	7	87.0	52.0	40.0	33.0	26.0
					14	90.0	55.0	43.0	35.0	28.0
					30	96.0	58.0	46.0	37.0	30.0
					60	105	64.0	50.0	40.0	32.0
373	07043000	Castor River at Aquilla, Stoddard County----------	1946-72	175	7	0.7	0.2	0.1	0	---
					14	1.0	0.2	0.1	0	---
					30	1.6	0.6	0.2	0.1	---
					60	4.6	1.5	0.5	0.1	---
374	07043050	Ditch 24 at Heagy, Stoddard County----------	1958-61, 1963-65, 1967, 1969, 1971	36.8	7	21.0	---	13.0	---	---
375	07043100	Old Channel ditch 1 near Chaffee, Scott County----------	1958-61, 1963-64, 1967-68, 1971	41.4	7	2.2	---	0.4	---	---
376	07043500	Little River ditch 1 near Morehouse, Stoddard County----	1946-72	450	7	68.0	42.0	33.0	27.0	22.0
					14	72.0	45.0	37.0	31.0	25.0
					30	76.0	50.0	41.0	35.0	30.0
					60	88.0	60.0	50.0	43.0	36.0
377	07043900	Meander Line ditch near Portageville, New Madrid County----------	1958-61, 1963-64	51.5	7	0.5	---	---	---	---
378	07046000	Little River ditch 259 near Kennett, Dunklin County----------	1929-72	89	7	3.6	0.3	0.1	0	0
					14	4.5	0.3	0.1	0	0
					30	5.0	0.4	0.1	0	0
					60	5.6	0.9	0.2	0.1	0
379	07046510	Pemiscot Bayou near Holland, Pemiscot County----------	1958-62, 1964-65, 1967, 1969-70	144	7	7.0	---	---	---	---
380	07046520	Main ditch 1 near Deering, Pemiscot County----------	1958-61, 1963-65, 1967, 1969-70	66.4	7	9.0	---	5.0	---	---
381	07046550	Buffalo ditch near Arbyrd, Dunklin County----------	1958-61, 1963-64, 1967-68, 1970	38.7	7	13.0	---	4.1	---	---
382	07050150	Roaring River Spring near Cassville, Barry County-------	1923, 1933-38, 1942, 1964-72	---	7	14.0	---	7.0	---	---
383	07050540	James River near Northview, Webster County----------	1968-70, 1972	---	7	1.5	---	---	---	---
385	07050700	James River near Springfield, Greene County----------	1956-72	246	7	11.0	3.1	1.0	0.3	---
					14	12.0	3.5	1.2	0.4	---
					30	14.0	4.4	1.5	0.5	---
					60	20.0	6.4	2.5	1.0	---
386	07050720	Sequiota Spring near Springfield, Greene County[12]----------	1936, 1942, 1963-64, 1967, 1972	---	7	1.2	---	---	---	---
387	07051500	James River below Battlefield, Christian County----------	1929-32	328	7	16.0	---	5.4	---	---
388	07052260	Finley Creek near Linden, Christian County----------	1969-70, 1972	---	7	7.6	---	---	---	---
389	07052300	Finley Creek near Ozark, Christian County----------	1943, 1946-47, 1952, 1962-67	---	7	16.0	---	5.2	---	---

See footnotes at end of table.

Table 1 — *Magnitude and Frequency* (continued) . . . . .

Map No. (pl. 1)	Station No.	Station Name and Location	Period of Record	Drainage Area (mi^2)	Period (days)	Annual Low-flow (in cubic feet per second) For Indicated Recurrence Interval (in years) 2	5	10	20	50
390	07052360	Crane Creek near Galena, Stone County	1968-70, 1972	---	7	24.0	---	---	---	---
391	07052500	James River at Galena, Stone County	1922-72	987	7	100	60.0	38.0	24.0	13.0
					14	110	68.0	44.0	28.0	14.0
					30	120	74.0	48.0	31.0	17.0
					60	145	88.0	60.0	38.0	22.0
392	07052750	Flat Creek at Cassville, Barry County	1944-46, 1949, 1952, 1956, 1962-67	---	7	4.0	---	1.4	0.8	---
393	07052800	Flat Creek at Jenkins, Barry County	1942, 1962-67	---	7	27.0	---	10.0	6.5	---
394	07052900	Flat Creek near Cape Fair, Stone County	1969-70, 1972, 1974	---	7	32.0	---	11.0	---	---
395	07053800	Bull Creek at Walnut Shade, Taney County	1943, 1945-47, 1949, 1952, 1954, 1962-67	---	7	3.0	---	0.5	0.2	---
397	07053980	Swan Creek at Forsyth, Taney County	1923, 1930-32, 1938, 1941, 1962-67	---	7	5.0	---	0.7	---	---
399	07054040	Beaver Creek near Bradleyville, Taney County	1964-67, 1969-70, 1972	---	7	19.0	---	11.0	---	---
400	07054050	Little Beaver Creek near Bradleyville, Taney County	1964-67, 1969-70	---	7	9.0	---	3.4	2.5	---
401	07054150	Beaver Creek at Kissee Mills, Taney County	1943, 1945-46, 1949, 1952, 1962-67	---	7	38.0	---	14.0	9.0	---
402	07057400	North Fork River at Twin Bridges, Douglas County	1962-67	---	7	42.0	---	24.0	21.0	---
403	07057450	Spring Creek at Twin Bridges, Douglas County	1962-67	---	7	21.0	---	16.0	15.0	---
405	07057471	Blue Spring near Dora, Ozark County	1926, 1932, 1934, 1936, 1964, 1967-68	---	7	13.0	---	8.2	---	---
406	07057474	North Fork Spring near Dora, Ozark County	1964, 1966-71	---	7	70.0	---	66.0	---	---
407	07057475	Double Spring near Dora, Ozark County	1919, 1924-25, 1934, 1936, 1942, 1964-72	---	7	96.0	---	35.0	---	---
408	07057478	Wilder Spring near Elijah, Ozark County	1925-26, 1934, 1936, 1964	---	7	9.0	---	6.0	---	---
410	07057490	Althea Spring near Tecumseh, Ozark County	1926, 1932, 1934, 1936, 1943, 1959, 1964, 1967-68, 1971	---	7	19.0	---	15.0	---	---
411	07057500	North Fork River near Tecumseh, Ozark County	1945-72	561	7	295	240	210	195	165
					14	300	240	215	195	165
					30	305	245	220	200	170
					60	320	255	225	205	180
412	07057670	Crystal Spring near Ava, Douglas County	1925, 1934, 1936, 1954, 1964, 1967-68	---	7	11.0	---	9.5	---	---
414	07057700	Bryant Creek near Evans, Douglas County	1964-67, 1969, 1971	---	7	30.0	---	19.0	16.0	---
415	07057800	Hodgson Mill Spring at Sycamore, Ozark County	1926, 1932, 1934, 1936, 1964-72	---	7	38.0	---	---	---	---

Table 1 — *Magnitude and Frequency* (continued) . . . . .

Map No. (pl. 1)	Station No.	Station Name and Location	Period of Record	Drainage Area (mi^2)	Period (days)	Annual Low-flow (in cubic feet per second) For Indicated Recurrence Interval (in years) 2	5	10	20	50
416	07058000	Bryant Creek near Tecumseh, Ozark County----------	1945-72	570	7	150	120	110	100	94.0
					14	150	120	110	110	95.0
					30	160	120	120	110	96.0
					60	160	130	120	110	98.0
417	07058900	Bennett Bayou at Bakersfield, Ozark County----------	1964-67, 1969-70	---	7	6.5	---	2.2	1.5	---
418	07061150	West Fork Black River at Centerville, Reynolds County[13]-	1942-43, 1945-47, 1952, 1960-67, 1969-70	---	7	25.0	---	15.0	14.0	---
419	07061170	Middle Fork Black River near Lesterville, Reynolds County[13]-	1960-70	---	7	18.0	---	9.0	8.0	---
420	07061300	East Fork Black River at Lesterville, Reynolds County[19]----------	1960-72	94.5	7	2.4	---	0.4	---	---
421	07061500	Black River near Annapolis, Reynolds County----------	1940-72	484	7	98.0	74.0	68.0	66.0	64.0
					14	100	78.0	72.0	68.0	67.0
					30	110	82.0	76.0	72.0	70.0
					60	120	88.0	84.0	82.0	80.0
422	07061900	Logan Creek at Ellington, Reynolds County----------	1956-57, 1962-68	---	7	1.5	---	0.6	0.4	---
423	07061950	Morris Spring near Ellington, Reynolds County----------	1956, 1963-64, 1968-69	---	7	4.2	---	---	---	---
424	07062010	Pittman Spring near Piedmont, Wayne County----------	1942-43, 1948, 1953, 1964, 1966-67	---	7	29.0	---	25.0	---	---
425	07062100	McKenzie Creek near Piedmont, Wayne County----------	1960-64	---	7	2.9	---	1.7	---	---
426	07062550	Mill Spring at Mill Spring, Wayne County----------	1922, 1925-26, 1932, 1934, 1936, 1963-66	---	7	9.6	---	9.0	---	---
427	07062560	Bunyard Spring near Mill Spring, Wayne County----------	1964, 1968-69	---	7	5.0	---	---	---	---
428	07062570	Markham Spring near Williamsville, Wayne County----------	1925, 1932, 1934, 1936, 1964-65	---	7	7.0	---	---	---	---
429	07062590	Keener Spring near Williamsville, Butler County----------	1925, 1932, 1934-36, 1939, 1964, 1966-67	---	7	17.0	---	15.0	---	---
430	07063100	Lake Slough near Qulin, Butler County----------	1958-67, 1969-70	---	7	5.5	---	0.8	---	---
431	07063130	Menorkenut Spring near Qulin, Butler County----------	1958-61, 1963-67, 1969-70	33.5	7	0.9	---	---	---	---
432	07063170	Ditch 22 near Qulin, Butler County----------	1958-61, 1963-68	14.4	7	0	0	0	0	0
433	07063500	Cane Creek at Harviell, Butler County----------	1939-42, 1958-61, 1963-67, 1969	188	7	9.4	---	6.0	5.0	---
434	07064300	Fudge Hollow near Licking, Dent County----------	1956-72	1.72	7	0	0	0	0	0
435	07064400	Montauk Spring at Montauk State Park, Dent County----------	1923, 1932, 1934, 1936, 1939, 1942, 1956, 1963-72	---	7	62.0	---	46.0	42.0	---

Table 1 — *Magnitude and Frequency* (continued). . . . .

Map No. (pl. 1)	Station No.	Station Name and Location	Period of Record	Drainage Area (mi^2)	Period (days)	Annual Low-flow (in cubic feet per second) For Indicated Recurrence Interval (in years) 2	5	10	20	50
437	07064500	Big Creek near Yukon, Texas County----------	1951-72	8.36	7	0.0	0.0	0.0	0.0	0.0
					14	0	0	0	0	0
					30	0	0	0	0	0
					60	0	0	0	0	0
438	07064530	Welch Spring near Akers, Shannon County----------	1923-24, 1932, 1936, 1942, 1953, 1964-69, 1971	---	7	95.0	---	75.0	72.0	---
440	07064555	Pulltite Spring near Round Spring, Shannon County--------	1923-24, 1932, 1964, 1966, 1969-71	---	7	16.0	---	---	---	---
442	07064760	Twin Springs near Shannondale, Shannon County----------	1964, 1968-69	---	7	10.0	---	8.4	---	---
444	07064800	Sinking Creek near Round Spring, Shannon County----------	1942-43, 1945-47, 1952, 1956, 1962-68, 1971	---	7	38.0	---	28.0	26.0	---
445	07064950	Current River at Round Spring, Shannon County----------	1942-43, 1945-47, 1956, 1962-67	---	7	320	---	230	220	---
446	07065000	Round Spring at Round Spring, Shannon County----------	1923-25, 1928-39, 1948, 1954, 1956, 1964-72	---	7	16.0	---	11.0	10.0	---
448	07065200	Jacks Fork near Mountain View, Texas County----------	1942-43, 1945-46, 1952, 1962-67	---	7	20.0	---	14.0	12.0	---
449	07065500	Alley Spring at Alley, Shannon County----------	1922, 1925, 1928-41, 1954-55, 1964-72	---	7	68.0	---	57.0	54.0	---
451	07066000	Jacks Fork at Eminence, Shannon County----------	1922-72	398	7	122	97.0	86.0	78.0	74.0
					14	124	98.0	88.0	80.0	75.0
					30	130	102	91.0	83.0	78.0
					60	137	106	94.0	86.0	80.0
453	07066500	Current River near Eminence, Shannon County----------	1922-72	1,272	7	512	420	382	358	330
					14	517	423	387	363	330
					30	530	433	397	373	340
					60	558	451	412	388	340
455	07066550	Blue Spring near Eminence, Shannon County----------	1923-24, 1932, 1936, 1941-42, 1963-72	---	7	78.0	---	62.0	---	---
456	07066600	Rocky Creek near Eminence, Shannon County----------	1969-71	---	7	0.1	---	0	0	---
458	07066990	Pike Creek at Van Buren, Carter County----------	1969-71	---	7	1.0	---	---	---	---
459	07067000	Current River at Van Buren, Carter County----------	1922-72	1,667	7	700	584	540	510	475
					14	710	590	550	520	475
					30	725	605	560	535	490
					60	750	620	575	548	500
460	07067500	Big Spring near Van Buren, Carter County----------	1921-72	---	7	290	265	254	246	240
					14	293	266	256	248	242
					30	296	269	258	251	245
					60	301	272	261	254	248
461	07067680	Cave Spring near Hunter, Carter County----------	1934, 1936, 1964, 1968-69	---	7	1.6	---	---	---	---
462	07067700	Phillips Spring near Van Buren, Carter County----------	1925, 1936, 1946, 1964, 1967-68	---	7	12.0	---	9.0	---	---

Table 1 — *Magnitude and Frequency* (continued). . . . .

Map No. (pl. 1)	Station No.	Station Name and Location	Period of Record	Drainage Area (mi^2)	Period (days)	Annual Low-flow (in cubic feet per second) For Indicated Recurrence Interval (in years) 2	5	10	20	50
463	07067900	Tucker Spring near Bennett, Ripley County----------	1945-47, 1964	---	7	29.0	---	---	---	---
464	07068000	Current River at Doniphan, Ripley County----------	1922-72	2,038	7	1,170	1,000	940	890	840
					14	1,180	1,010	948	900	840
					30	1,200	1,030	965	916	870
					60	1,250	1,060	988	938	890
465	07068500	Little Black River near Fairdealing, Butler County----------	1939-42, 1962-68, 1970	187	7	23.0	---	14.0	12.0	---
466	07068855	Fourche Creek near Poynor, Ripley County----------	1964-67, 1969-70	---	7	2.8	---	1.0	0.8	---
467	07068860	West Fork Fourche Creek near Ponder, Ripley County---------	1964-67, 1969-70	---	7	1.9	---	1.0	0.9	---
468	07068865	Dry Creek near Poynor, Ripley County----------	1964-67, 1969-70	---	7	0.4	---	0.3	0.2	---
469	07069150	Spring River at Thayer, Oregon County----------	1954, 1962-67	---	7	2.0	---	0.1	0.0	0.0
470	07069260	Myatt Creek near Lanton, Howell County----------	1964-67, 1969-70	---	7	0.2	---	0	0	0
471	07070300	Eleven Point River near Mountain View, Howell County----------	1964-66	---	7	0	0	0	0	0
472	07070450	Eleven Point River at Thomasville, Oregon County----------	1942-43, 1945-46, 1951, 1962-67	---	7	0.2	---	0	0	0
473	07070500	Eleven Point River near Thomasville, Oregon County----------	1951-72	361	7	7.2	5.0	4.1	3.4	2.7
					14	8.0	5.4	4.4	3.5	2.8
					30	8.8	5.8	4.6	3.9	3.0
					60	9.5	6.4	5.0	4.2	3.3
474	07070510	Posey Spring near Thomasville, Oregon County----------	1950-56, 1958-59, 1961, 1963	---	7	0.6	---	---	---	---
475	07070700	Spring Creek near Thomasville, Oregon County----------	1969-70	---	7	0.0	0.0	0.0	0.0	0.0
476	07071000	Greer Spring at Greer, Oregon County----------	1904, 1921-72	---	7	184	140	122	109	100
					14	187	142	123	111	101
					30	192	145	126	113	102
					60	201	151	131	117	105
477	07071030	Turner Mill Spring near Alton, Oregon County----------	1924-25, 1932, 1936, 1964-65	---	7	2.6	---	1.7	---	---
478	07071490	Boze Mill Spring near Bardley, Oregon County--------	1925, 1931-34, 1936, 1964, 1966-67	---	7	18.0	---	12.0	11.0	---
479	07071500	Eleven Point River near Bardley, Oregon County---------	1922-72	793	7	270	210	185	170	150
					14	275	210	188	173	160
					30	282	215	190	175	160
					60	300	225	198	180	160
480	07071850	Frederick Creek near Myrtle, Oregon County----------	1969-71	---	7	0.1	---	0.0	0.0	0.0
481	07071860	Thomasson Mill (Morgan) Spring near Alton, Oregon County------	1925-26, 1932-36, 1963-67	---	7	28.0	---	16.0	13.0	---
482	07071865	Blue Spring near Alton, Oregon County----------	1925, 1932-36, 1942, 1964, 1966-67, 1971	---	7	60.0	---	50.0	48.0	---
483	07185190	Spring River Spring near Verona, Lawrence County----------	1953-54, 1958-60, 1964	---	7	5.0	---	3.2	2.6	---
484	07185400	Williams Creek near Mount Vernon, Lawrence County---------	1954, 1962-65, 1967	---	7	4.7	---	2.0	1.5	---

Table 1 — *Magnitude and Frequency* (continued). . . . .

Map No. (pl. 1)	Station No.	Station Name and Location	Period of Record	Drainage Area (mi^2)	Period (days)	Annual Low-flow (in cubic feet per second) For Indicated Recurrence Interval (in years) 2	5	10	20	50
485	07185410	Big Spring near Mt. Vernon, Lawrence County----------	1925, 1943-44, 1953-54, 1964-66	---	7	16.0	---	9.0	7.0	---
486	07185500	Stahl Creek near Miller, Lawrence County----------	1952-72	3.86	7	0	0	0	0	0
					14	0	0	0	0	0
					30	0	0	0	0	0
					60	0	0	0	0	0
487	07185650	Spring River near Stotts City, Lawrence County----------	1943, 1945-48, 1953-54, 1961-65, 1967	---	7	42.0	---	19.0	15.0	---
488	07185700	Spring River at Larussell, Jasper County----------	1957-72	306	7	47.0	28.0	20.0	15.0	---
					14	48.0	30.0	22.0	17.0	---
					30	53.0	32.0	24.0	18.0	---
					60	55.0	37.0	28.0	22.0	---
489	07185750	White Oak Creek near Avilla, Jasper County----------	1954, 1962-64	---	7	0	0	0	0	0
490	07185765	Spring River at Carthage, Jasper County----------	1951-54, 1966-72	425	7	50.0	---	19.0	13.0	---
491	07185800	Spring River near Neck City, Jasper County----------	1954, 1962-64	---	7	51.0	---	---	---	---
492	07185850	North Fork Spring River at Lamar, Barton County----------	1943, 1946, 1962-63	---	7	0.1	---	0	0	0
493	07185950	North Fork Spring River near Galesburg, Jasper County-------	1947, 1954, 1962-64	---	7	0.8	---	0	0	0
494	07186000	Spring River near Waco, Jasper County----------	1925-72	1,164	7	53.0	30.0	18.0	11.0	5.8
					14	60.0	35.0	22.0	13.0	7.0
					30	68.0	38.0	24.0	15.0	7.8
					60	80.0	47.0	30.0	18.0	9.0
495	07186060	Clarkson Spring near Pierce City, Lawrence County----------	1941, 1963-66	---	7	7.5	---	---	---	---
497	07186100	Center Creek near Sarcoxie, Jasper County----------	1954, 1962-65, 1967	---	7	16.0	---	6.8	---	---
498	07186200	Center Creek near Fidelity, Jasper County----------	1962-65, 1967, 1969-70	---	7	22.0	---	7.6	---	---
500	07186400	Center Creek near Carterville, Jasper County[15]----------	1962-72	232	7	26.0	---	9.4	---	---
501	07186420	Center Creek near Webb City, Jasper County[15]----------	1962-64, 1966	---	7	32.0	---	10.0	---	---
502	07186460	Center Creek near Carl Junction, Jasper County[16]----------	1943, 1946, 1949, 1952, 1954, 1956, 1962-67, 1969-70	---	7	35.0	---	13.0	9.0	---
503	07186700	Shoal Creek near Fairview, Barry County----------	1954, 1962-67	---	7	17.0	---	7.0	5.0	---
504	07186800	Capps Creek near Berwick, Newton County----------	1962-64, 1966-68, 1970	---	7	20.0	---	11.0	---	---
505	07186850	Clear Creek near Ritchey, Newton County----------	1953, 1961-64, 1966-67	---	7	7.0	---	2.2	---	---
506	07186880	Shoal Creek at Ritchey, Newton County----------	1954, 1962-67, 1969-70	---	7	54.0	---	20.0	13.0	---
507	07186890	Shoal Creek at Neosho, Newton County----------	1941-43, 1945-46, 1949, 1952, 1954, 1962-65, 1967	---	7	60.0	---	23.0	16.0	---
508	07186891	Elm Spring near Neosho, Newton County----------	1959-61	---	7	0.4	---	---	---	---

See footnotes at end of table.

Table 1 — *Magnitude and Frequency* (continued) . . . . .

Map No. (pl. 1)	Station No.	Station Name and Location	Period of Record	Drainage Area (mi^2)	Period (days)	Annual Low-flow (in cubic feet per second) For Indicated Recurrence Interval (in years) 2	5	10	20	50
509	07186892	Brickhouse Spring near Neosho, Newton County	1959-61, 1964	---	7	1.3	---	---	---	---
510	07186893	McMahon Spring near Neosho, Newton County	1943, 1960-61, 1964	---	7	1.0	---	---	---	---
511	07186895	Big Spring at Neosho, Newton County	1925, 1936, 1939, 1963-64	---	7	1.2	---	---	---	---
512	07186900	Hickory Creek at Neosho, Newton County	1941, 1962-65, 1967, 1969-70	---	7	9.8	---	3.9	---	---
513	07186910	Ozark Trout Farm Spring near Neosho, Newton County	1954, 1964-65	---	7	1.4	---	0.9	0.7	---
514	07186990	Boy Scout Camp Spring near Joplin, Newton County	1964-66	---	7	0.6	---	---	---	---
515	07187000	Shoal Creek above Joplin, Newton County	1942-72	410	7	92.0	54.0	35.0	22.0	13.0
					14	96.0	56.0	38.0	25.0	15.0
					30	102	60.0	42.0	28.0	18.0
					60	120	70.0	50.0	35.0	25.0
516	07188500	Lost Creek at Seneca, Newton County	1949-58	42	7	5.6	2.2	0.9	0.3	---
					14	6.2	2.6	1.2	0.5	---
					30	6.6	2.9	1.5	0.7	---
					60	7.4	3.4	1.9	1.1	---
517	07188650	Big Sugar Creek at Powell, McDonald County	1964-65, 1969-70	---	7	7.2	---	1.2	---	---
520	07188850	Elk River at Pineville, McDonald County	1942, 1945, 1947, 1949, 1952, 1962-65, 1967, 1969-70	---	7	28.0	---	7.0	---	---
521	07188860	Indian Creek at McNatt, McDonald County	1968-70, 1972	---	7	27.0	---	12.0	---	---
522	07188870	Indian Creek at Anderson, McDonald County	1942, 1945, 1947, 1949, 1952, 1962-65, 1967, 1969-70	---	7	37.0	---	12.0	---	---
523	07188872	Camp Beaver Spring at Anderson, McDonald County	1941, 1963-66	---	7	1.0	---	---	---	---
524	07189000	Elk River near Tiff City, McDonald County	1940-72	872	7	74.0	45.0	26.0	13.0	4.2
					14	82.0	50.0	29.0	14.0	4.8
					30	90.0	56.0	33.0	17.0	5.6
					60	110	68.0	40.0	20.0	7.4
526	07189100	Buffalo Creek at Tiff City, McDonald County	1954, 1962-65, 1967-69	---	7	1.9	---	0	0	0

[1] Low flows augmented by sewage effluent.

[2] Stream regulated by reservoirs, diversions, and navigation dams. 7-day Q_{10} data are from detailed study of low-flow patterns by Singh and Stall (1973).

[3] Stream regulated by reservoirs and diversions. Patterns of regulation were not consistent enough for computation of probability data.

[4] Low flows augmented significantly by commercial plants upstream from station. Computation of probability data was not feasible.

[5] Low and medium flows slightly affected by regulation of Crystal Lakes, a recreation development, since 1970.

[6] Low flows augmented by outflow from Bethany sewage lagoon.

[7] Flow has been partially regulated by Rathbun Reservoir in Iowa since 1969. Minimum release from Rathbun is about 10 ft^3/s during low flow season. Frequency data represent natural conditions prior to regulation.

[8] Low flows augmented by outflow from Fayette sewage lagoon.

[9] Regulated by power plant. Patterns of regulation were not consistent enough for computation of probability data.

[10] Regulated by Lake of the Ozarks. Patterns of regulation were not consistent enough for computation of probability data.

[11] Stream is significantly affected by urbanization. Natural low flows augmented by domestic and municipal wastes. Low-flow estimates cannot be regarded as probablility data, but are useful for comparative purposes.

[12] Spring polluted by domestic wastes.

[13] Low flows augmented at times by pumpage from mines. Data represents natural conditions.

[14] Low flows affected by leakage from Taum Sauk upper reservoir since February 1963. Data represents natural conditions.

[15] Low-flow patterns affected by industrial operations in Grove Creek basin. As much as 10 percent of low-flow results from dewatering of mines and pumpage from wells.

according to size. Figure 2 is a presentation of typical output from the program. This computer fitting of the minimum flow data by a log-Pearson type III frequency analysis saved a great amount of time and provided adequate fits to many sets of low-flow data.

c. Because one theoretical distribution is not adequate to describe low-flow frequency characteristics for all sites, a graphical analysis was also made for many continuous-record stations. The plotting position of the minimum flows was computed by the formula shown in "b", and the data were plotted against their respective recurrence intervals on log-Gumbel paper which has a logarithmic ordinate scale and an abscissa scale based on the theory of extreme values. An example of the graphical analysis is shown in figure 3.

For some continuous-record stations where data had been collected for a short period of time, it was necessary to graphically relate selected low flows to concurrent discharges at nearby continuous-record stations with long periods of record. Several points on the frequency curve for the long-time station were then used to estimate corresponding values for the short-time record. There is no way to determine the accuracy of data obtained by this method; however, these estimates are considered more accurate than those that could be obtained by using only a short period of continuous record.

The tabulation of frequency data in table 1 includes only the 7-, 14-, 30-, and 60-day periods because these data are the most commonly requested and

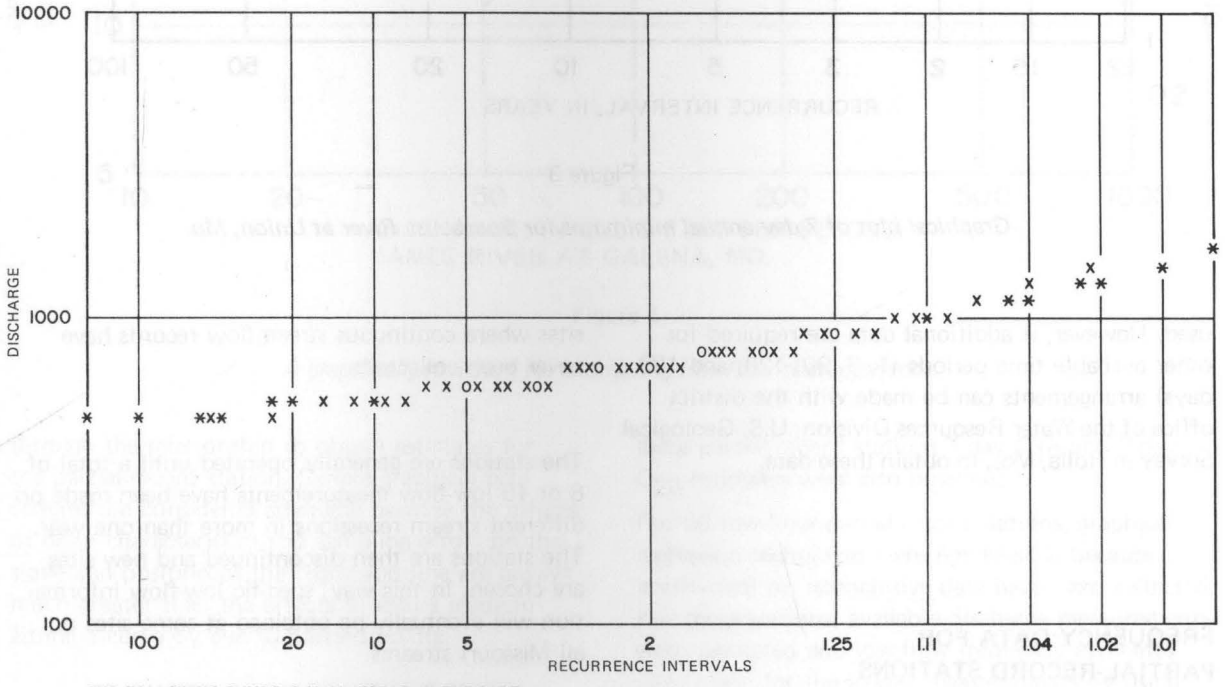

Figure 2

Computer plot of 7-day annual minimums for Current River at Van Buren, Mo. (Discharge in cubic feet per second and recurrence interval in years.)

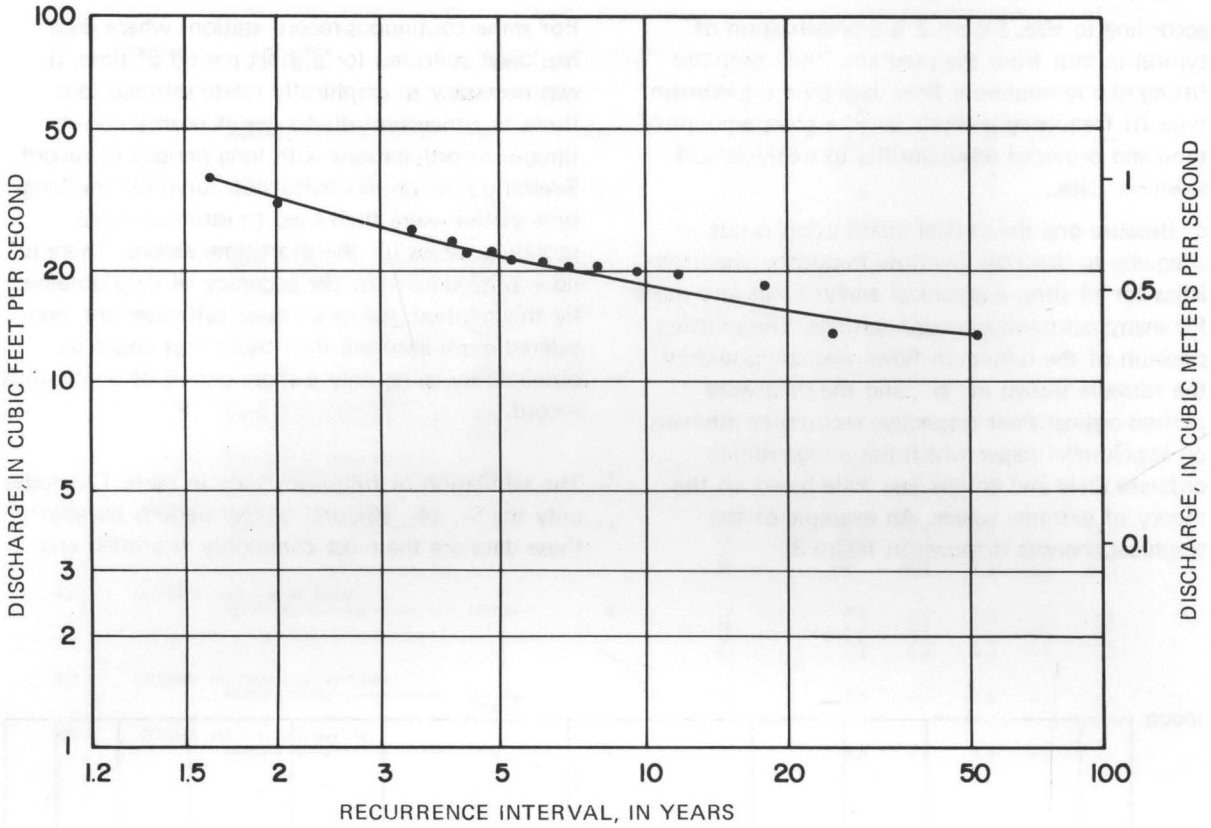

Figure 3

Graphical plot of 7-day annual minimums for Bourbeuse River at Union, Mo.

used. However, if additional data are required for other available time periods (1, 3, 90, 120, and 183 days) arrangements can be made with the district office of the Water Resources Division, U.S. Geological Survey in Rolla, Mo., to obtain these data.

FREQUENCY DATA FOR PARTIAL-RECORD STATIONS

Low-flow partial-record stations have been a part of the U.S. Geological Survey gaging station network in Missouri since the early 1960's. Their purpose is to provide a relatively inexpensive means of defining some low-flow frequency characteristics at numerous sites where continuous streamflow records have never been collected.

The stations are generally operated until a total of 8 or 10 low-flow measurements have been made on different stream recessions in more than one year. The stations are then discontinued and new sites are chosen. In this way, specific low-flow information will eventually be obtained at some sites on all Missouri streams.

After a sufficient range of low-flow discharges have been obtained at the low-flow station, the measurements are related graphically to concurrent discharges at nearby continuous-record stations as shown in figure 4. Then frequency data for two or three recurrence intervals can be transferred

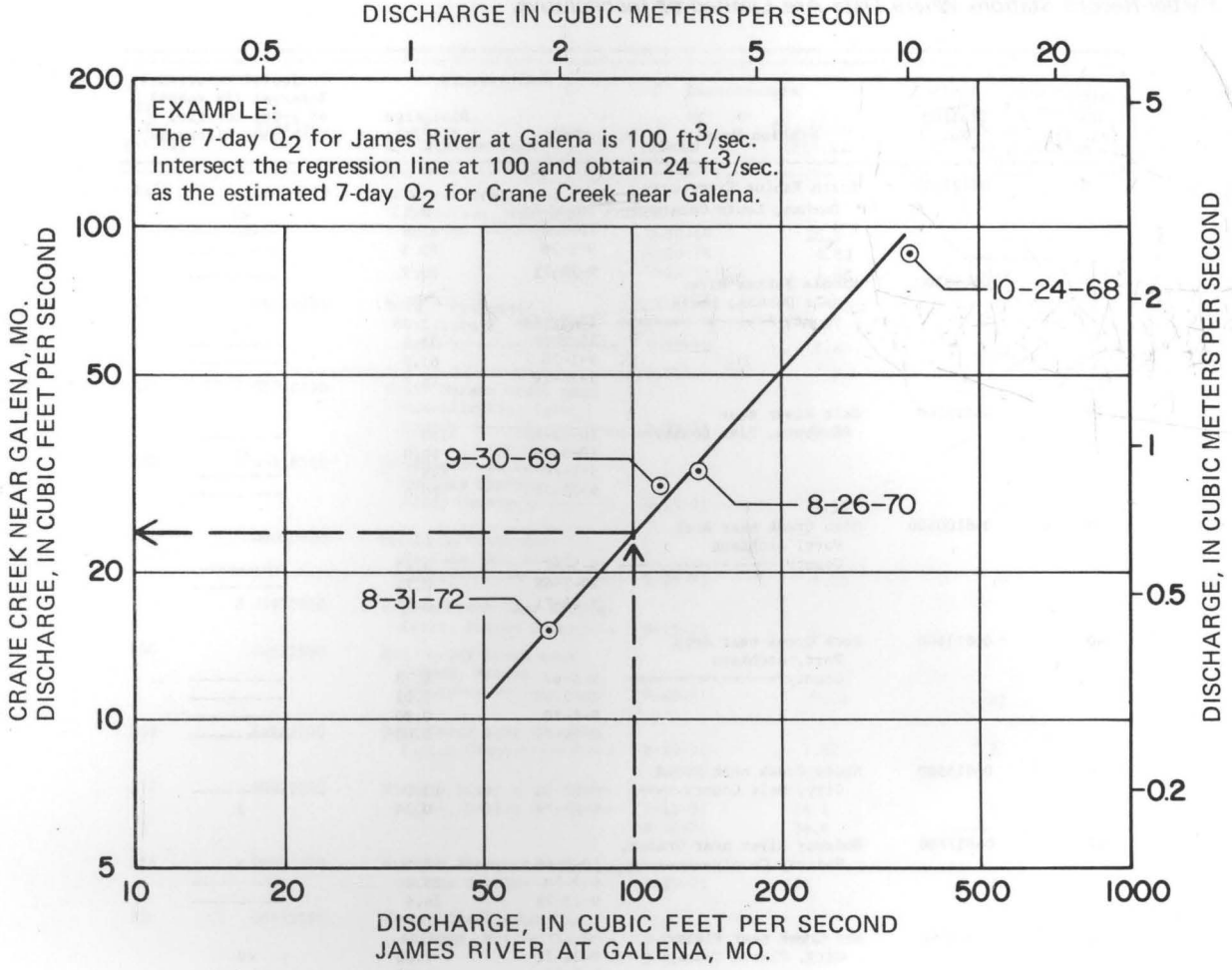

Figure 4

A graphical procedure for estimating low-flow characteristics.

through the relationship to obtain estimates for the partial-record station. Simple graphical procedures are considered adequate because the effects of basin characteristics and sampling errors on the slope and position of the regression line are always much greater than the effects of errors made in fitting a curve by eye to plotted points.

Frequency data for many partial-record stations are included in table 1. For these stations, suitable graphical relationships with nearby continuous-record stations have been established so that the 7-day Q_2 can be reliably estimated. For many of these partial-record stations 7-day Q_{10} and 7-day Q_{20} estimates were also possible.

For 66 low-flow partial-record stations, graphical regression techniques were not feasible because insufficient or inconclusive data have been collected. For these stations, available discharge measurements were tabulated and low-flow frequency estimates were made for the lowest measurements by using methods described in subsequent sections of this report. These data are shown in table 2, page 32. The frequency estimates are the best that can be made at this time; as more data are collected, it is probable that more definitive estimates will be available for these sites.

TABLE 2

Tabulation of Low-Flow Discharge Measurements and Approximate Frequency of Lowest Measurements at Partial-Record Stations Where Data Are Limited or Inconclusive.

Map No. (pl. 1)	Station No.	Station Name	Measurements		Estimated Recurrence Interval (in years) of 7-Day Low-Flow With Same Discharge
			Date	Discharge (ft^3/s)	
6	05497300	North Fabius River near Durham, Lewis County-----	10-22-68	9.13	<2
			10-2-69	12.4	----------
			9-1-70	83.5	----------
			9-28-71	20.9	----------
9	05498300	Middle Fabius River near Durham, Lewis County----------	10-22-68	2.85	<2
			10-2-69	33.3	----------
			9-1-70	61.0	----------
			9-28-71	12.7	----------
29	05509300	Salt River near Ashburn, Pike County----	10-23-68	230	----------
			10-3-69	50.0	<2
			9-1-70	243	----------
			9-28-71	76.6	----------
39	068100500	High Creek near Rock Port, Atchison County----------	9-5-67	3.45	----------
			10-2-68	0.71	----------
			9-24-71	0.35	5
40	06811600	Rock Creek near Rock Port, Atchison County[1]----------	9-5-67	4.78	----------
			10-2-68	1.01	----------
			9-1-70	0.90	----------
			9-24-71	0.42	----------
44	06815580	Squaw Creek near Mound City, Holt County------	4-22-65	13.9	----------
			9-23-71	0.74	2
47	06817700	Nodaway River near Graham, Nodaway County---------	10-2-68	17.5	3
			9-2-70	23.4	----------
			9-23-71	24.4	----------
50	06818490	Bee Creek near Platte City, Platte County----	9-21-71	2.86	<2
			9-5-72	9.99	----------
61	06820490	Third Fork Platte River near Easton, Buchanan County----------	9-23-71	0.04	2
			9-5-72	1.01	----------
90	06896182	Wildcat Creek at Stanberry, Gentry County----------	9-23-71	0.10	2
96	06896650	Sampson Creek at Pattonsburg, Daviess County----------	9-24-71	0.15	<2
105	06897520	Marrowbone Creek near Gallatin, Daviess County----------	9-27-71	0.17	<2
109	06898210	Sugar Creek at Brimson, Grundy County----------	9-27-71	0.18	<2
143	06906315	Sweet Spring Creek near Moberly, Randolph County----------	9-24-71	0.49	<2
152	06907650	Clear Creek near Valley City, Johnson County----------	10-18-71	1.05	<2
			9-20-72	1.86	----------

[1]Low-flow patterns affected by effluent from sewage lagoons.

Table 2 — ***Low-Flow Discharge Measurements*** (continued) . . . . .

Map No. (pl. 1)	Station No.	Station Name	Measurements		Estimated Recurrence Interval (in years) of 7-Day Low-Flow With Same Discharge
			Date	Discharge (ft^3/s)	
166	06910270	Moniteau Creek near Jamestown, Moniteau County----------	9-30-69	16.1	----------
			8-26-70	4.82	----------
			9-23-71	1.88	<2
170	06910485	Burris Fork near California, Moniteau County----------	9-23-71	1.88	<2
171	06910490	South Moreau Creek near Russellville, Cole County----------	9-23-71	8.29	<2
180	06918340	Monegaw Creek near Monegaw Springs, St. Clair County----------	9-29-71	1.30	<2
194	06920600	Weaubleau Creek near Osceola, St. Clair County----------	9-29-71	1.20	<2
195	06920850	Hogles Creek near Battlefield, Benton County---	9-29-71	0	2
208	06922580	Big Turkey Creek near Warsaw, Benton County----------	9-29-71	0.20	<2
209	06922780	Deer Creek near Edwards, Benton County----------	9-29-71	1.42	2
212	06923250	Niangua River near Windyville, Dallas County---	7-13-54	14.1	5
			9-28-71	36.6	----------
214	06923900	Niangua River near Eldridge, Dallas County----------	9-29-71	192	<2
223	06926190	Tavern Creek near St. Anthony, Miller County-	9-4-69	11.3	----------
			8-26-70	7.69	<2
225	06926250	Little Tavern Creek near St. Elizabeth, Miller County----------	9-4-69	2.17	----------
			8-26-70	0.82	<2
			9-23-71	0.85	----------
228	06926700	Maries River near Vienna, Maries County----------	9-22-71	5.96	<2
229	06926820	Little Maries River near Vienna, Maries County----------	9-4-69	0.12	2
			8-27-70	0.39	----------
			9-22-71	0.28	----------
235	06927520	Bailey Creek at Morrison, Gasconade County-------	9-22-71	0.54	<2
239	06927730	Osage Fork at Rader, Webster County---------	9-28-71	9.16	----------
			8-31-72	2.46	5
253	06929300	Big Piney River near Licking, Texas County----------	9-17-53	63.0	5
			9-22-71	81.0	---------
271	06933790	Spring Creek near Vichy, Maries County----------	9-10-69	1.98	----------
			8-27-70	0.35	2
			9-22-71	3.05	----------

Table 2 — *Low-Flow Discharge Measurements* (continued) . . . . .

Map No. (pl. 1)	Station No.	Station Name	Measurements		Estimated Recurrence Interval (in years) of 7-Day Low-Flow With Same Discharge
			Date	Discharge (ft^3/s)	
280	06934700	Loutre River at McKittrick, Montgomery County----------	10-1-69	36.5	----------
			9-1-70	16.7	----------
			9-27-71	4.21	<2
283	06935300	Charette Creek near Marthasville, Warren County----------	9-27-71	4.91	<2
302	07014130	Indian Creek at Courtois, Washington County[2]----------	10-23-67	13.7	----------
			10-15-68	8.84	----------
			10-21-68	9.24	----------
			1-15-69	14.9	----------
			4-9-69	41.0	----------
			7-14-69	10.5	----------
			10-28-69	10.2	----------
			1-26-70	25.2	----------
			8-31-70	8.38	----------
			9-27-71	2.17	----------
313	07015780	Little Bourbeuse River near Sullivan, Franklin County--------	9-22-71	0.13	<2
321	07017650	Fourche a Renault Creek near Potosi, Washington County------	9-27-71	9.17	2
334	07020300	Saline Creek near St. Marys, Ste. Genevieve County----------	11-6-63	19.9	----------
			9-9-64	20.5	----------
			10-21-64	19.1	----------
			9-6-67	15.7	----------
			9-30-69	14.8	<2
337	07020950	Castor River near Cascade, Wayne County----------	9-8-67	23.4	2
			10-24-68	23.8	----------
			8-26-70	32.6	----------
			9-27-71	25.2	----------
338	07020970	Bear Creek near Lowndes, Wayne County----------	9-27-71	7.62	<2
341	07021300	Crooked Creek near Whitewater, Cape Girardeau County----------	10-18-61	2.12	----------
			11-14-62	6.95	----------
			9-3-63	7.33	----------
			10-5-63	1.10	2
343	07021500	Little Whitewater Creek near Millersville, Cape Girardeau County-------	10-22-68	10.6	----------
			9-2-70	7.19	----------
			9-28-71	5.20	<2
344	07021530	Byrd Creek near Jackson, Cape Girardeau County----------	9-28-71	2.23	<2
354	07036090	Twelve Mile Creek near Annapolis, Madison County----------	10-21-68	3.94	2
			9-2-70	7.28	----------
			9-27-71	5.42	----------

[2]Significant low-flow augmentation at times from mine pumpage.

Table 2 — ***Low-Flow Discharge Measurements*** (continued) . . . . .

Map No. (pl. 1)	Station No.	Station Name	Measurements		Estimated Recurrence Interval (in years) of 7-Day Low-Flow With Same Discharge
			Date	Discharge (ft^3/s)	
357	07037200	Crane Pond Creek near Annapolis, Iron County----------	10-21-68	1.81	----------
			9-2-70	0.49	<2
			9-27-71	2.06	----------
384	07050560	Panther Creek near Northview, Webster County---	9-1-72	0.32	2
396	07053850	Swan Creek at Garrison, Christian County-------	8-31-72	1.30	2
398	07054020	Beaver Creek near Ava, Douglas County---------	9-24-54	2.74	10
			8-31-72	6.38	----------
404	07057470	North Fork River near Dora, Ozark County-----	10-22-64	59.3	5
			10-28-68	109	----------
			9-24-71	89.7	----------
409	07057480	Spring Creek near Sycamore, Ozark County----------	10-22-64	14.0	----------
			9-24-71	13.1	5
413	07057680	Hunter Creek at Vera Cruz, Douglas County---------	10-19-64	16.5	5
			9-24-71	21.5	----------
436	07064480	Ashley Creek near Montauk State Park, Dent County----------	9-22-71	1.42	2
439	07064540	Gladden Creek at Akers, Shannon County---------	10-18-66	0.90	----------
			9-22-71	0	2
441	07064750	Sinking Creek near Shannondale, Shannon County----------	10-3-67	19.2	----------
			10-22-68	18.1	----------
			9-1-70	13.0	2
			9-22-71	15.1	----------
443	07064770	Barren Creek near Shannondale, Shannon County--	10-3-67	15.9	----------
			10-22-68	14.0	----------
			9-1-70	13.0	----------
			9-22-71	11.2	2
447	07065050	Big Creek near Round Spring, Shannon County----------	10-22-68	5.65	----------
			9-1-70	2.14	2
			9-23-71	3.63	----------
450	07065950	Mahans Creek at West Eminence, Shannon County----------	11-3-66	2.93	2
			10-22-68	5.18	----------
			9-1-70	10.8	----------
			9-22-71	3.89	----------
452	07066100	Shawnee Creek near Eminence, Shannon County----------	9-23-71	2.64	<2
454	07066520	Blair Creek near Round Spring, Shannon County----------	10-22-68	3.05	---------
			9-1-70	1.79	2
			9-23-71	3.04	----------

Table 2 — *Low-Flow Discharge Measurements* (continued) . . . . .

Map No. (pl. 1)	Station No.	Station Name	Measurements Date	Measurements Discharge (ft^3/s)	Estimated Recurrence Interval (in years) of 7-Day Low-Flow With Same Discharge
457	07066750	Pine Valley Creek near Van Buren, Carter County----------	9-23-71	0	----------
496	07186080	Center Creek near Wentworth, Newton County----------	10-23-68	33.9	----------
			9-29-69	19.0	----------
			8-26-70	17.4	----------
			8-30-72	9.57	3
499	07186250	Grove Creek near Scotland, Jasper County[3]---------	10-7-53	4.00	----------
			10-10-61	9.82	----------
			5-23-62	9.98	----------
			8-21-62	7.47	----------
			11-28-62	10.2	----------
			9-4-63	5.26	----------
			10-2-63	4.38	----------
			11-5-63	4.94	----------
			8-5-64	5.21	----------
			10-21-64	4.48	----------
			12-1-64	7.90	----------
			2-16-65	6.34	----------
			6-22-65	10.9	----------
			8-4-66	4.17	----------
518	07188660	Mikes Creek at Powell, McDonald County--------	8-30-72	0	----------
519	07188840	Little Sugar Creek at Pineville, McDonald County----------	8-30-72	14.0	2
525	07189090	Buffalo Creek near Tiff City, McDonald County----------	10-22-68	9.89	----------
			10-29-69	5.83	----------
			8-30-72	3.46	2

[3]Significant low-flow augmentation from industrial operations.

SPRINGS

Low-flow frequency data for Missouri springs were computed by using the methods outlined in "Low-Flow Frequency Characteristics at Gaged Sites" and are tabulated in table 1. These data will be useful to designers, hydrologists, conservationists, and others interested in the optimum utilization and protection of this tremendous natural resource.

The basic spring flow data used in computing low-flow frequency estimates in this report, as well as descriptions of Missouri springs and data describing the quality of the water, can be found in the report "Springs of Missouri", by Vineyard and Feder, 1974.

REGULATED STREAMS

It is possible to compute low-flow frequency data for regulated streams and interpret these data as probability information, provided the pattern of regulation has been consistent for a long enough period of time. In the case of Missouri's regulated stream systems, the patterns of regulation were not considered consistent enough to present these data as probability data. Such information would be of questionable technical value and could be grossly misleading because of the magnitude of error involved. For this reason, low-flow frequency data are not shown in table 1 for most of Missouri's regulated streams.

However, a detailed study of Mississippi River low-flow patterns was recently made by Singh and Stall (1973). In their report they defined the 7-day Q_{10} (stream water quality standards are based on this flow) for selected Mississippi River gaging stations; these data are shown in table 1 for stations along Missouri's border.

Some users of this report may desire to make their own analysis of basic low-flow information on regulated streams by consulting computer output showing lowest mean discharges for 1, 3, 7, 14, 30, 60, 90, 120, and 183 days for each year. These data are too voluminous for publication in this report but may be obtained for specific gaging stations from the district office of the U.S. Geological Survey in Rolla, Mo. These stations are shown in table 1, with applicable footnotes to indicate that probability data are not available.

SEEPAGE-RUN INFORMATION

Seepage-run data, which have been collected systematically since 1964 in Missouri, can be invaluable to regulatory agencies, designers, and hydrologists because seepage runs are an excellent indicator of the magnitude and distribution of low flows within a basin. To the present time (1974), the data have been collected only in the Missouri Ozarks because of the pressing need for low-flow information in carbonate rock terranes. Selected stream reaches in other physiographic regions will be investigated when the need arises.

Seepage runs have generally been made during periods of minimum streamflow (late summer or fall), which is the best time to obtain quantitative low-flow information. However, seepage runs in the winter or spring (during periods when there is no storm runoff) can supply valuable information on areas of excessive water loss to underground solution cavities. In many cases, losing streams will be dry at this time while streams that are normally dry during hot, rainless periods of excessive evapotranspiration will be flowing.

The following maps (figures 5 to 19) present seepage-run results on Ozarks streams. The approximate low-flow recurrence interval of the flows is noted on each map. This frequency information can be a valuable supplement to the low-flow

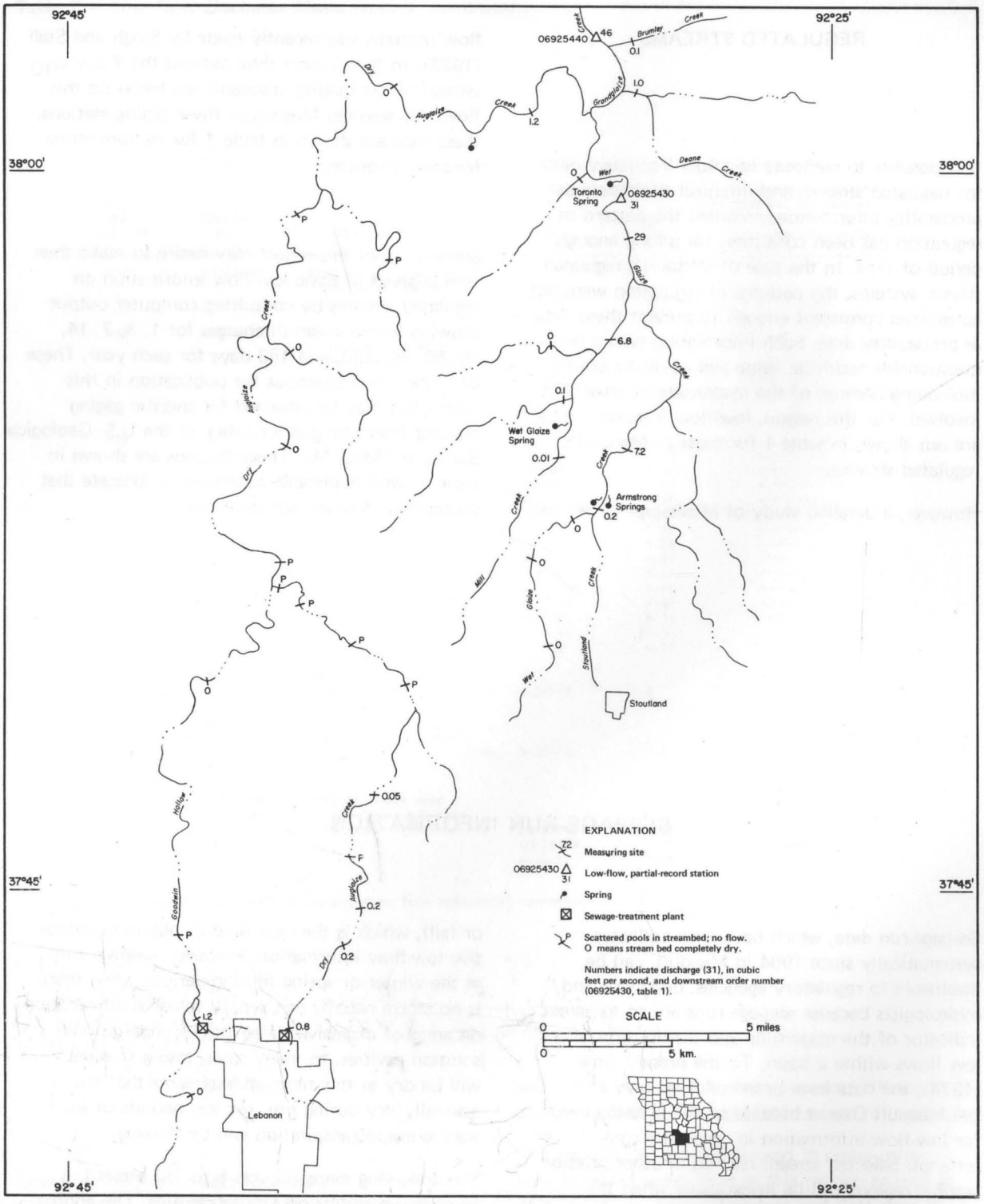

Figure 5

Map showing results of seepage run on Grandglaize Creek, August 11-12, 1970. Recurrence interval of flows is approximately 1 year.

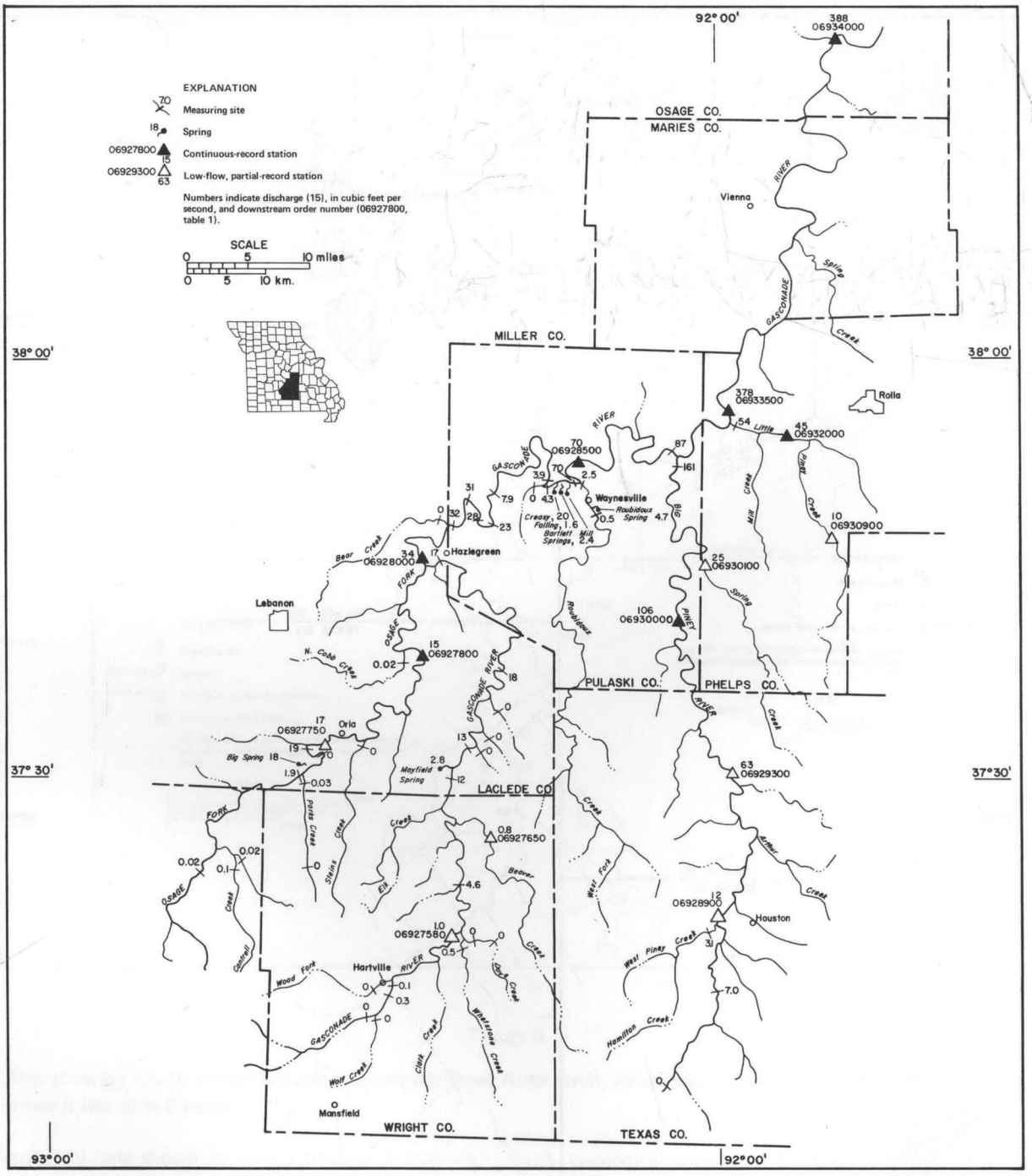

Figure 6

Map showing results of seepage run in Gasconade River basin, September 17-18, 1953. Recurrence interval of streamflows in the basins is estimated as follows: Osage Fork upstream from Orla, 3-5 years; middle and lower Osage Fork, 10 years; Gasconade River upstream from Big Piney River, 8-9 years; Big Piney River upstream from Houston, 25 years; middle reaches of Big Piney from Houston to Station 06930000, 5 years; lower reaches of Big Piney, 2 years; Little Piney Creek, less than 2 years; Gasconade River downstream from Big Piney River, 4-5 years.

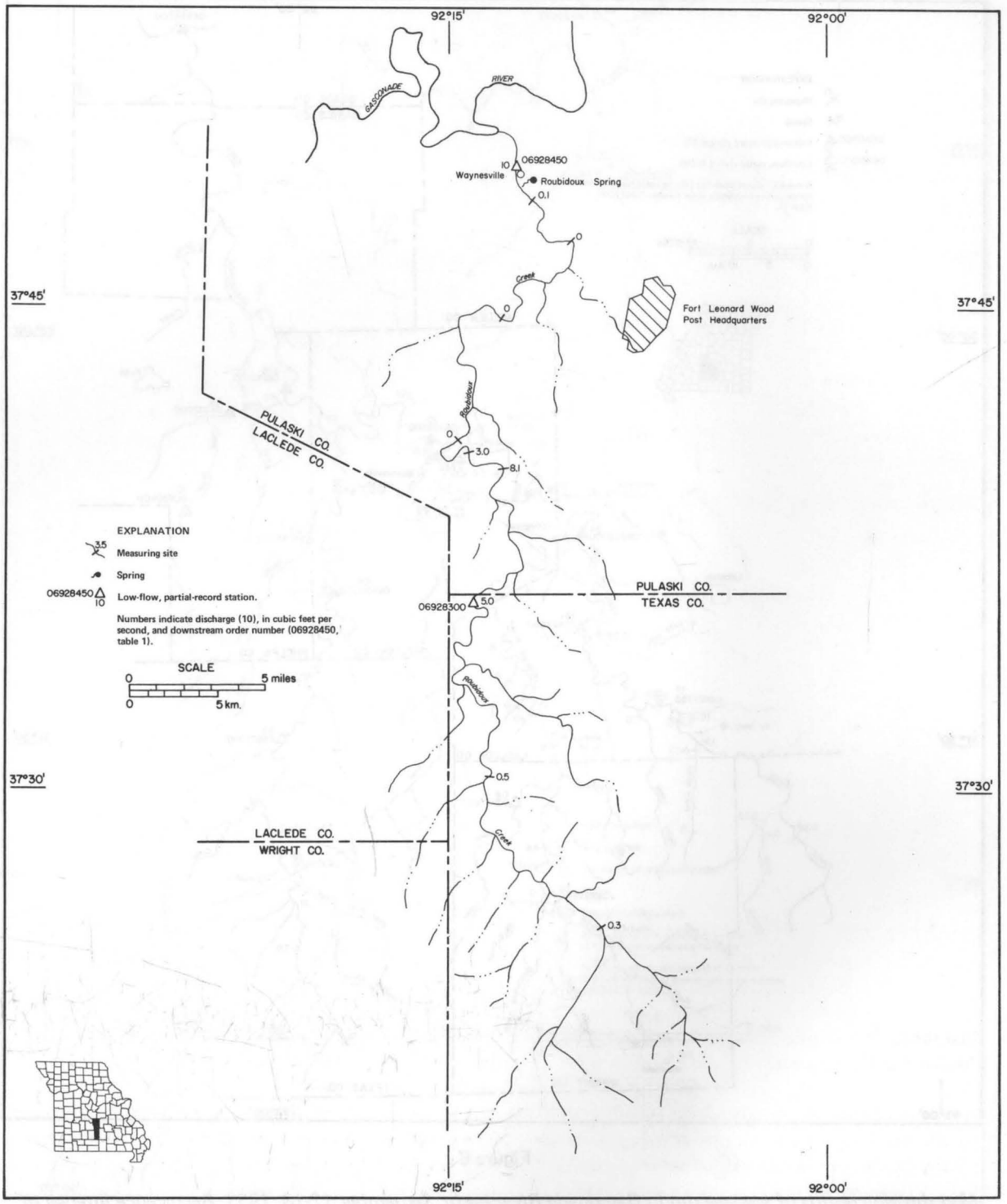

Figure 7

Map showing results of seepage run on Roubidoux Creek, July 13, 1971. Recurrence interval of flows is approximately 2 years.

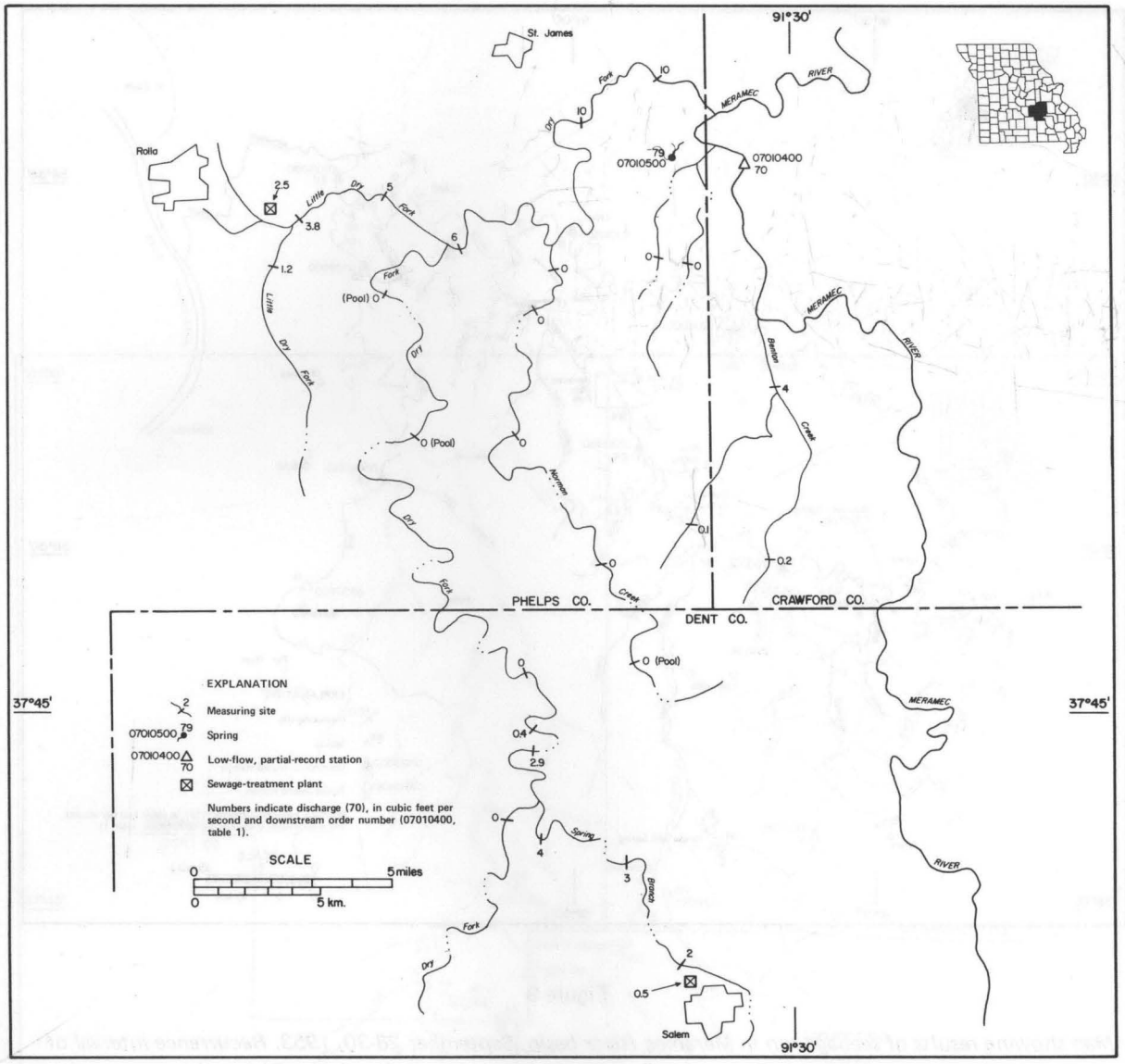

Figure 8

Map showing results of seepage run in upper Meramec River basin, November 7, 1969. Recurrence interval of flows is less than 2 years.

frequency data shown in table 1 because it extends that tabulated frequency data from a few points to many points in the basins (see subsequent section, "Recommended Procedures for Obtaining Low-Flow Frequency Estimates for Missouri Streams").

By use of seepage runs or by visual observations, the U.S. Geological Survey and the Geology & Land Survey Division, Mo. Dept. of Natural Resources, have detected and studied many basins where runoff is deficient or lost entirely during some seasons. The location of these areas is especially important to State and federal agencies that must regulate the location, construction, and use of storage structures and waste treatment facilities.

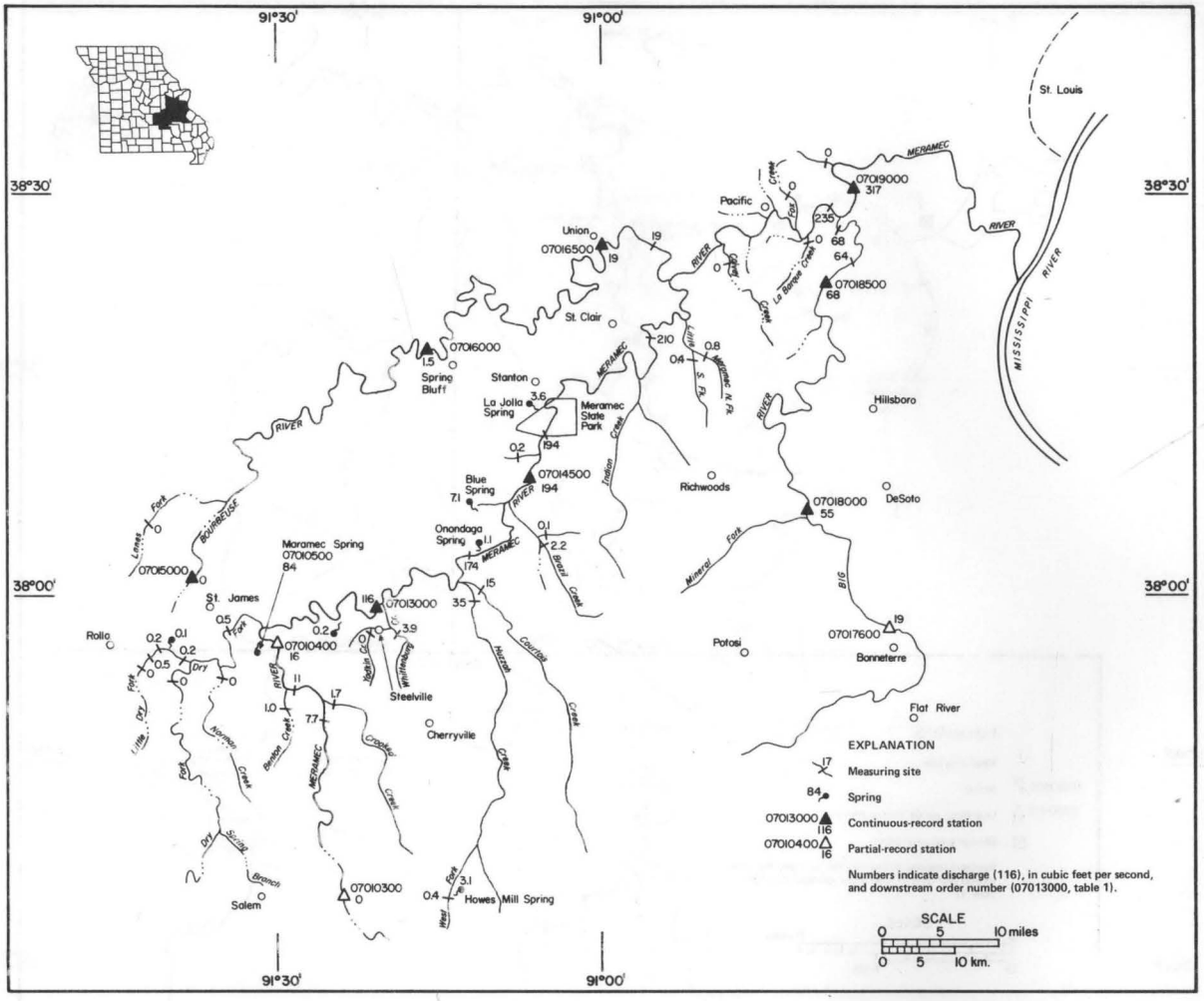

Figure 9

Map showing results of seepage run in Meramec River basin, September 28-30, 1953. Recurrence interval of streamflows is approximately 3 to 5 years in all parts of the area except Bourbeuse River, where recurrence interval of flows is about 10 years.

A map presented in a report by Skelton (1973, pl. 1) shows known areas of anomalous runoff patterns in Missouri including losing or deficient basins. Because the location of losing or deficient basins is especially important in the State, the following tabulation is presented to give some specific basin information that will complement that map presentation. It should be noted that this is only a partial listing; many more losing basins are certain to exist, especially among the smaller tributaries.

a. **BASINS WHERE DEFICIENCIES OR LOSSES ARE DEFINED BY SEEPAGE RUNS**

Bryant Creek (Douglas County)
Dry Auglaize Creek (Camden-Laclede County)
Dry Fork Creek (Phelps County)
Eleven Point River (Howell-Oregon County)
Fishpot Creek (St. Louis County)
Fox Creek (Douglas County)
Gasconade River (Pulaski County)
Goodwin Hollow (Laclede County)

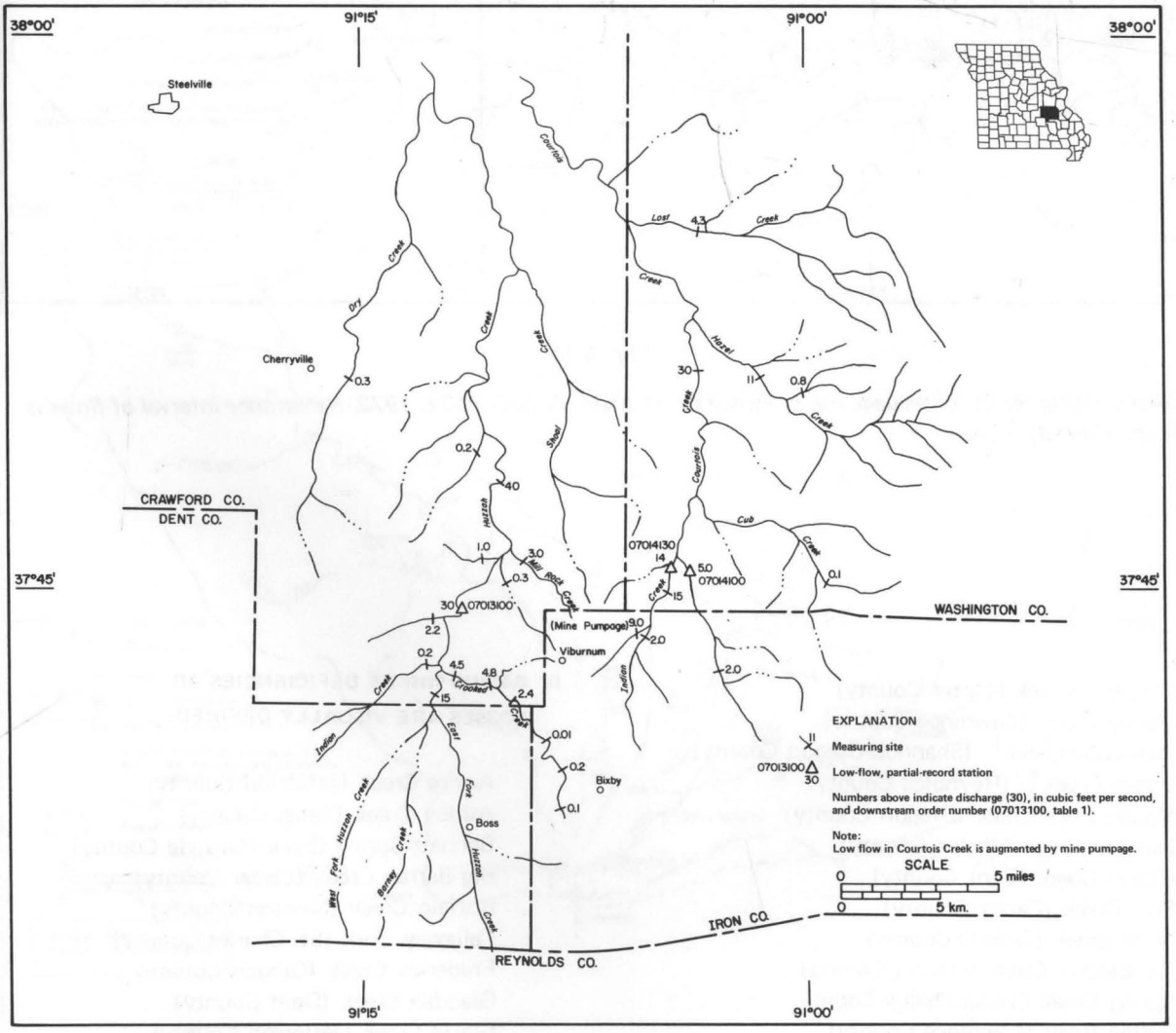

Figure 10

Map showing results of seepage run in Huzzah and Courtois Creek basins, June 20-21, 1968. Recurrence interval of flows is less than 1 year.

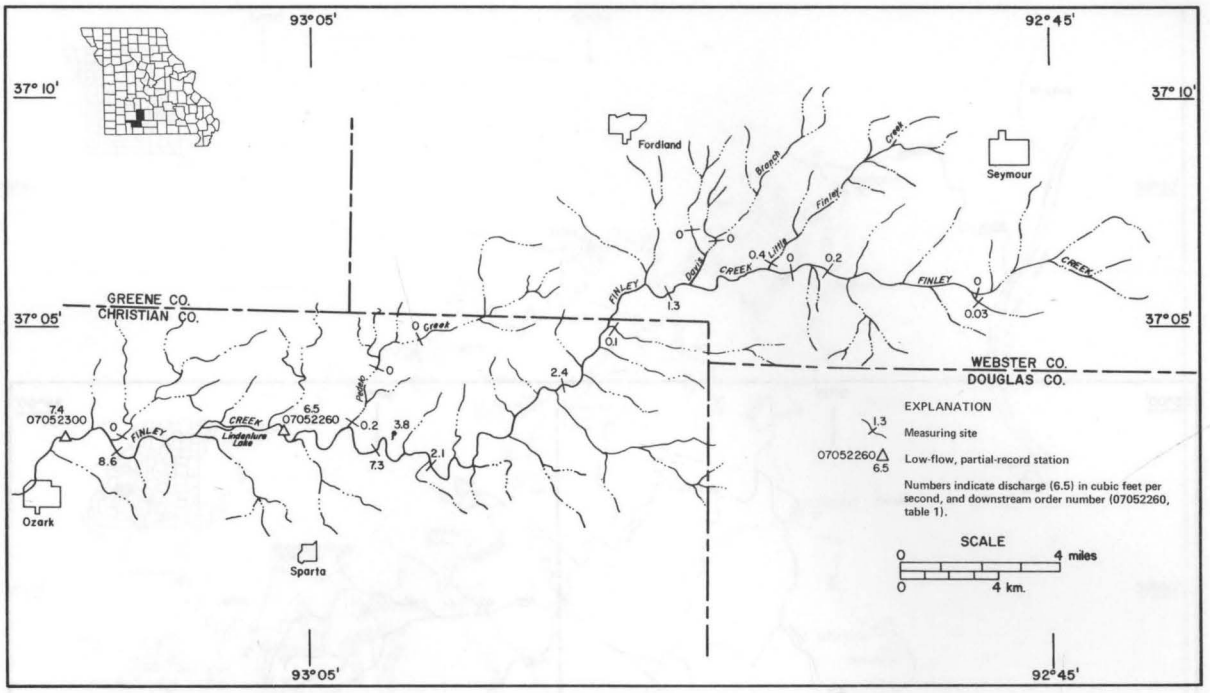

Figure 11

Map showing results of seepage run in Finley Creek basin, August 30-31, 1972. Recurrence interval of flows is approximately 7 years.

Henpeck Creek (Carter County)
Honey Creek (Lawrence County)
Hurricane Creek† (Shannon-Oregon County)
Logan Creek† (Reynolds County)
Middle Fork Creek (Oregon County)
Norman Creek (Phelps County)
Pigeon Creek (Dent County)
Pike Creek (Carter County)
Pond Creek (Greene County)
Roubidoux Creek (Pulaski County)
Spring Creek (Texas-Phelps County)
Spring River (Lawrence County)
Spring Valley Creek (Shannon County)
Wilson Creek (Greene County)

†Also an area where interbasin losses are known to occur. See Feder and Barks (1972) for a description of interbasin losses in Logan Creek area.

b. **BASINS WHERE DEFICIENCIES OR LOSSES ARE VISUALLY DEFINED:**

Antire Creek (Jefferson County)
Ashley Creek (Texas County)
Bennett Spring Creek (Laclede County)
Big Barren Creek (Carter County)
Buffalo Creek (Newton County)
Callaway Fork (St. Charles County)
Frederick Creek (Oregon County)
Gladden Creek (Dent County)
Glaize Creek (Jefferson County)
Heads Creek (Jefferson County)
Piney Creek (Oregon County)
Rock Creek (Jefferson County)
Spring Creek (Shannon-Oregon County)
Tabor Creek (Howell County)

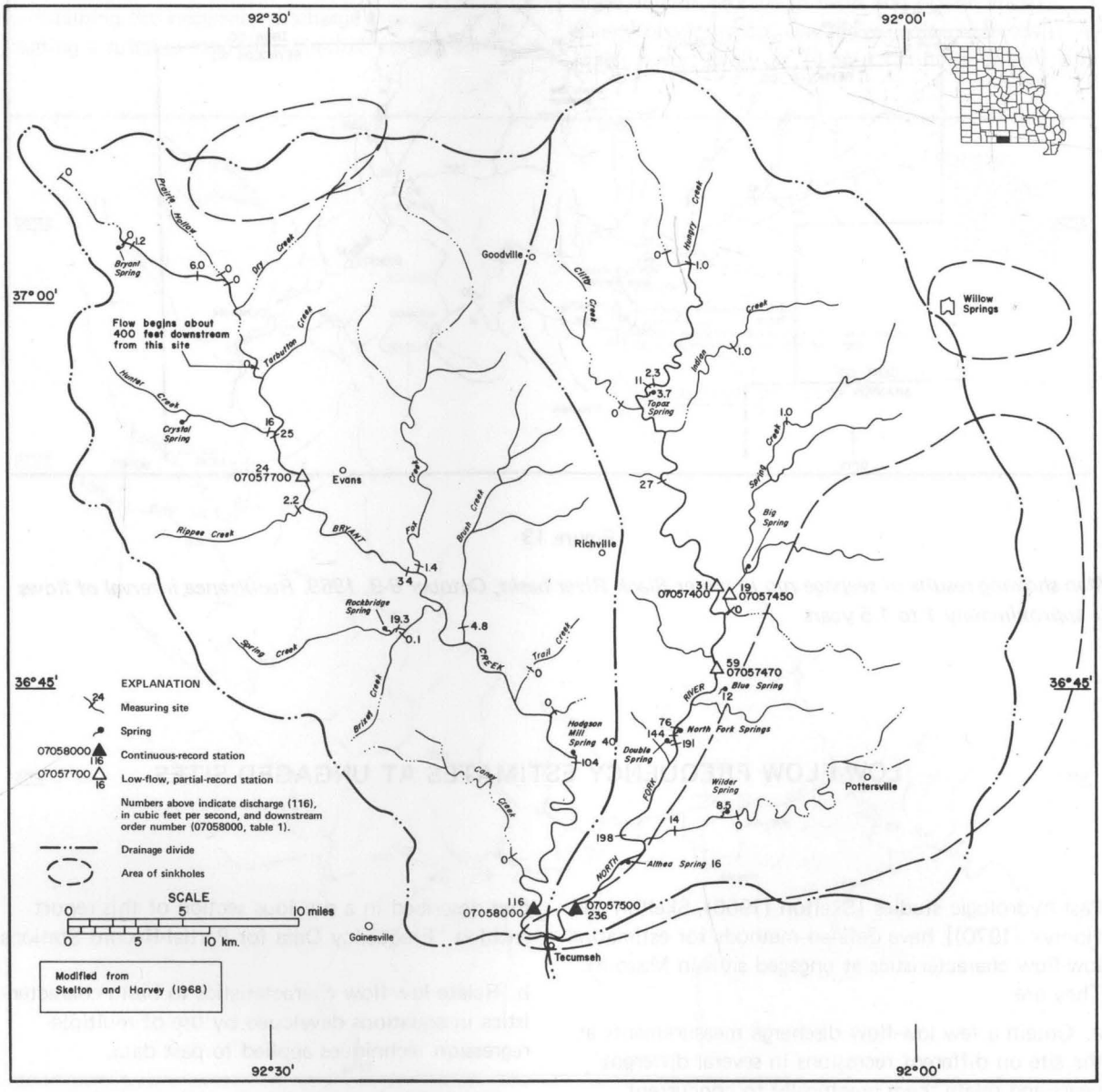

Figure 12

Map showing results of seepage run on North Fork River and Bryant Creek, October 19-22, 1964. Recurrence interval of streamflows is approximately 5 years.

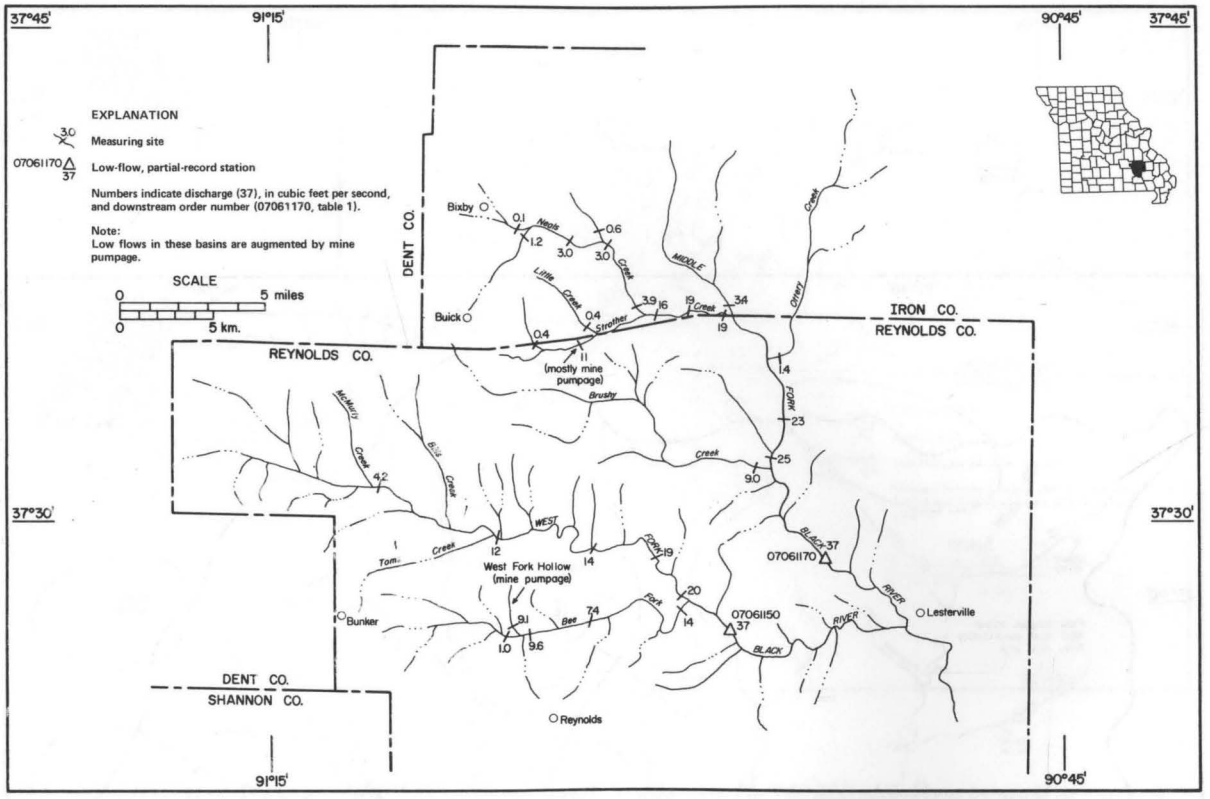

Figure 13

Map showing results of seepage run in upper Black River basin, October 8-9, 1969. Recurrence interval of flows is approximately 1 to 1.5 years.

LOW-FLOW FREQUENCY ESTIMATES AT UNGAGED SITES

Past hydrologic studies [Skelton (1966), Skelton and Homyk (1970)] have defined methods for estimating low-flow characteristics at ungaged sites in Missouri. They are:

a. Obtain a few low-flow discharge measurements at the site on different recessions in several different years and relate them graphically to concurrent discharges at nearby continuous-record stations. Transfer frequency data for the continuous-record station through the relationship to obtain estimates at the ungaged site. This procedure is identical to that described in a previous section of this report entitled "Frequency Data for Partial-Record Stations."

b. Relate low-flow characteristics to basin characteristics in equations developed by use of multiple-regression techniques applied to past data.

c. Interpolate between gaged points on a stream.

d. Where low-flow patterns are fairly homogeneous, estimate frequency data on the basis of drainage-area size.

All of these methods are generally limited to natural streams that are not significantly affected by man's activities.

The procedure outlined in method "a" will produce a reliable estimate of median values (the 2-year recurrence interval on the frequency curves) and estimates of less reliability for more extreme events. However, a considerable amount of time is involved in obtaining the necessary discharge measurements, locating a suitable long-time "index" station for correlative purposes, and defining the regression lines. Also, there is no way to mathematically evaluate the magnitude of the errors involved in the procedure.

Method "b" was used by Skelton and Homyk (1970) to evaluate the streamflow data program for Missouri. The data matrix used in the study included the following drainage basin characteristics: drainage area, slope, length, storage in lakes and ponds, mean annual precipitation, average elevation, percent forest cover, two-year 24-hour rainfall intensity, and

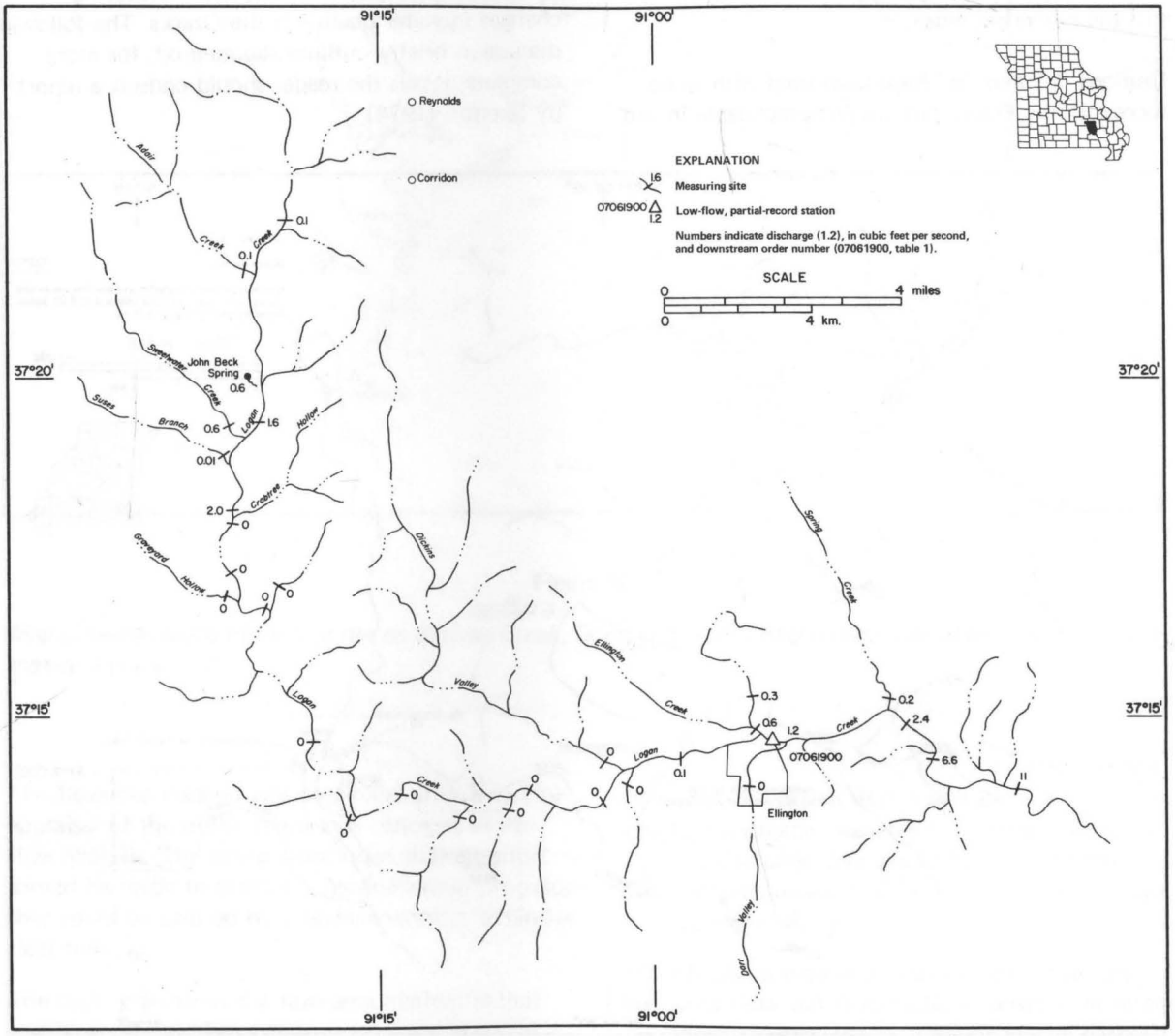

Figure 14

Map showing results of seepage run on Logan Creek, October 8, 1968. Recurrence interval of flows is approximately 2 years.

soils infiltration index. After analyzing the regression equations generated from this extensive data matrix, Skelton and Homyk stated in their report (page 30) that "low-flow characteristics cannot be satisfactorily estimated by regression analysis with the present (linear regression) model." They based this judgment upon the prohibitively high standard errors of estimate. For the Ozarks equations for example, standard errors ranged from 170 percent for the 7-day Q_2 equation to 390 percent for the 7-day Q_{20} equation. Since that time, no improvement in accuracy has been made because of the inability to describe the effect of geology on low flow by a suitable numerical index.

Methods "c" and "d" have been used with some success in the Plains, but are not practicable in the Ozarks because of the heterogeneous low-flow patterns nor in the Southeastern Lowlands because of continuing man-made changes in the flow regimen.

Another regionalization procedure, called the flow-area method, was developed during this study for use by the layman in making field estimates of low-flow frequency characteristics for perennial Ozarks streams. This method can be particularly useful to state and federal regulatory agencies that are responsible for implementing pollution laws, recommending optimum waste disposal sites, and monitoring changes in water quality in the Ozarks. The following discussion briefly outlines the method; for more complete details the reader should consult a report by Skelton (1974).

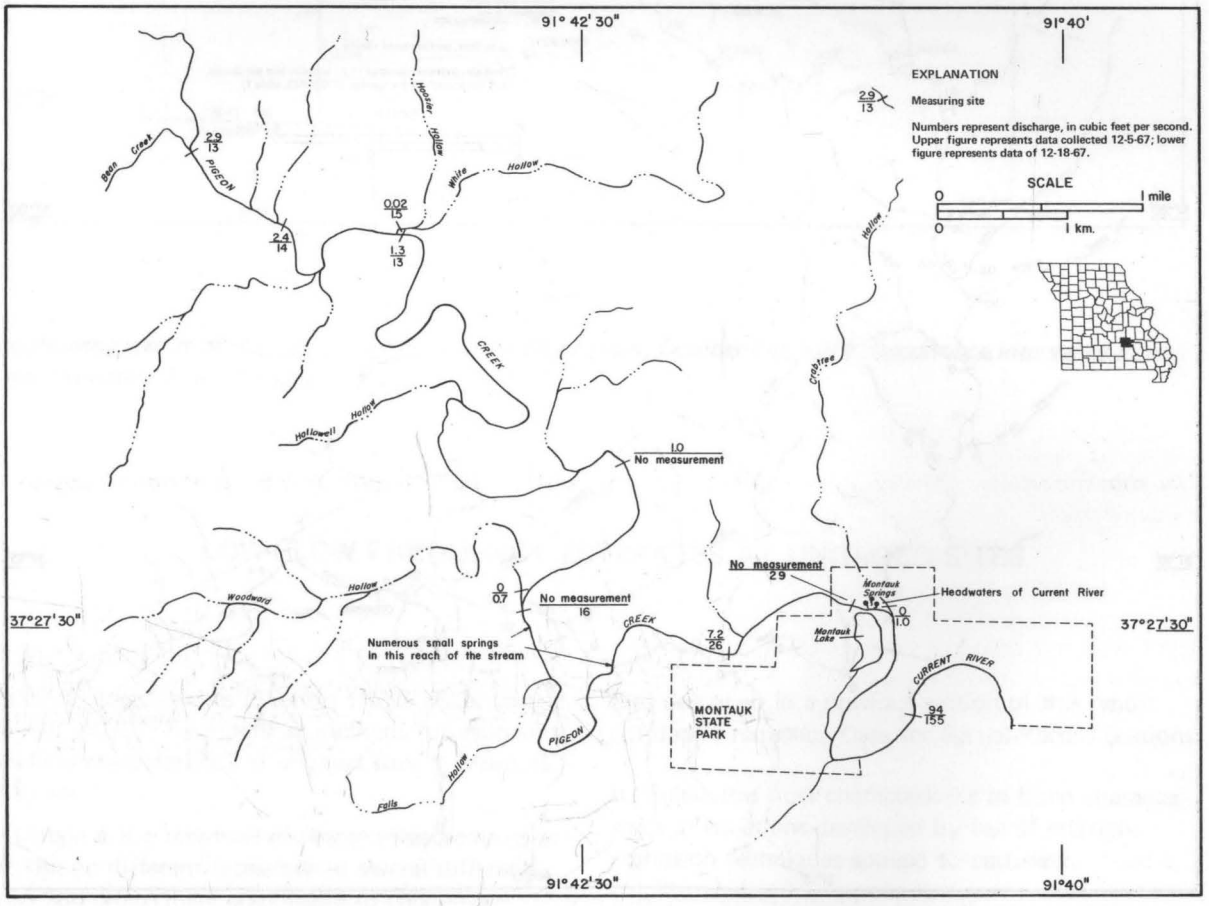

Figure 15

Map showing results of seepage runs in Pigeon Creek basin, December 1967. Measurements made during high base flow conditions; recurrence interval less than 1 year.

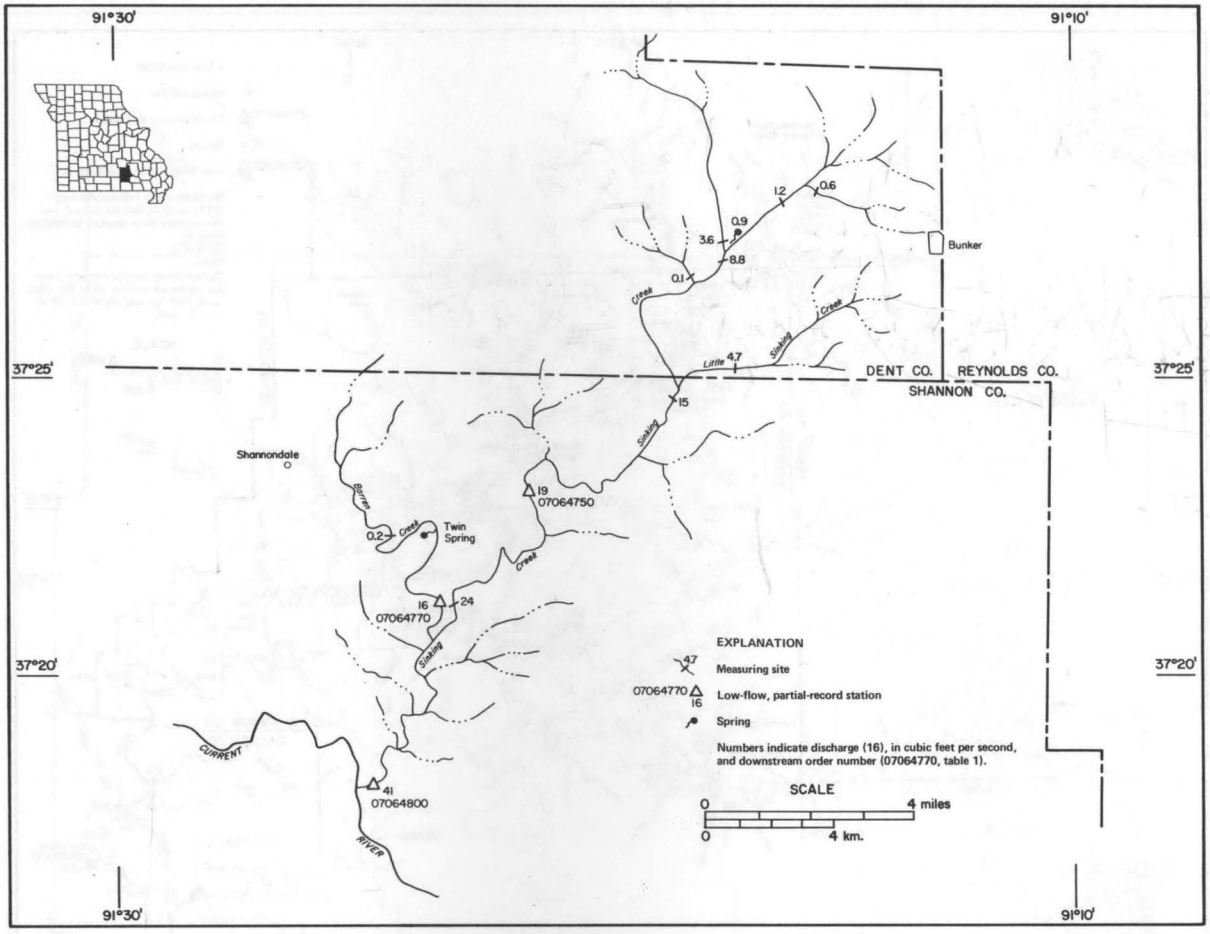

Figure 16

Map showing results of seepage run on Sinking Creek, October 3, 1967. Recurrence interval of flows is approximately 2 years.

The flow-area method was developed after a careful appraisal of the utility of various concepts in low-flow analysis. The author concluded that an effort should be made to develop a generalization procedure that could be utilized by a layman without extensive field training.

The basic premise in the flow-area method is that low-flow characteristics at any point on perennial Ozarks streams are significantly related to the flow area (average width and depth) of the minimum flows. The author reasoned that if the appropriate flow area could be defined as occurring at a cross-section of the stream that is also suitable for making low-flow discharge measurements, then a wealth of area and discharge data would be available from past discharge measurements made by U.S. Geological Survey personnel.

Accordingly, a tabulation was made of low-flow frequency data and cross-sectional areas from recent low-flow measurements at continuous- and partial-record stations in the Ozarks; the data were plotted as shown in figures 20, 21, and 22. These figures illustrate the relationship between average flow areas at gaged sites on Ozarks streams and the

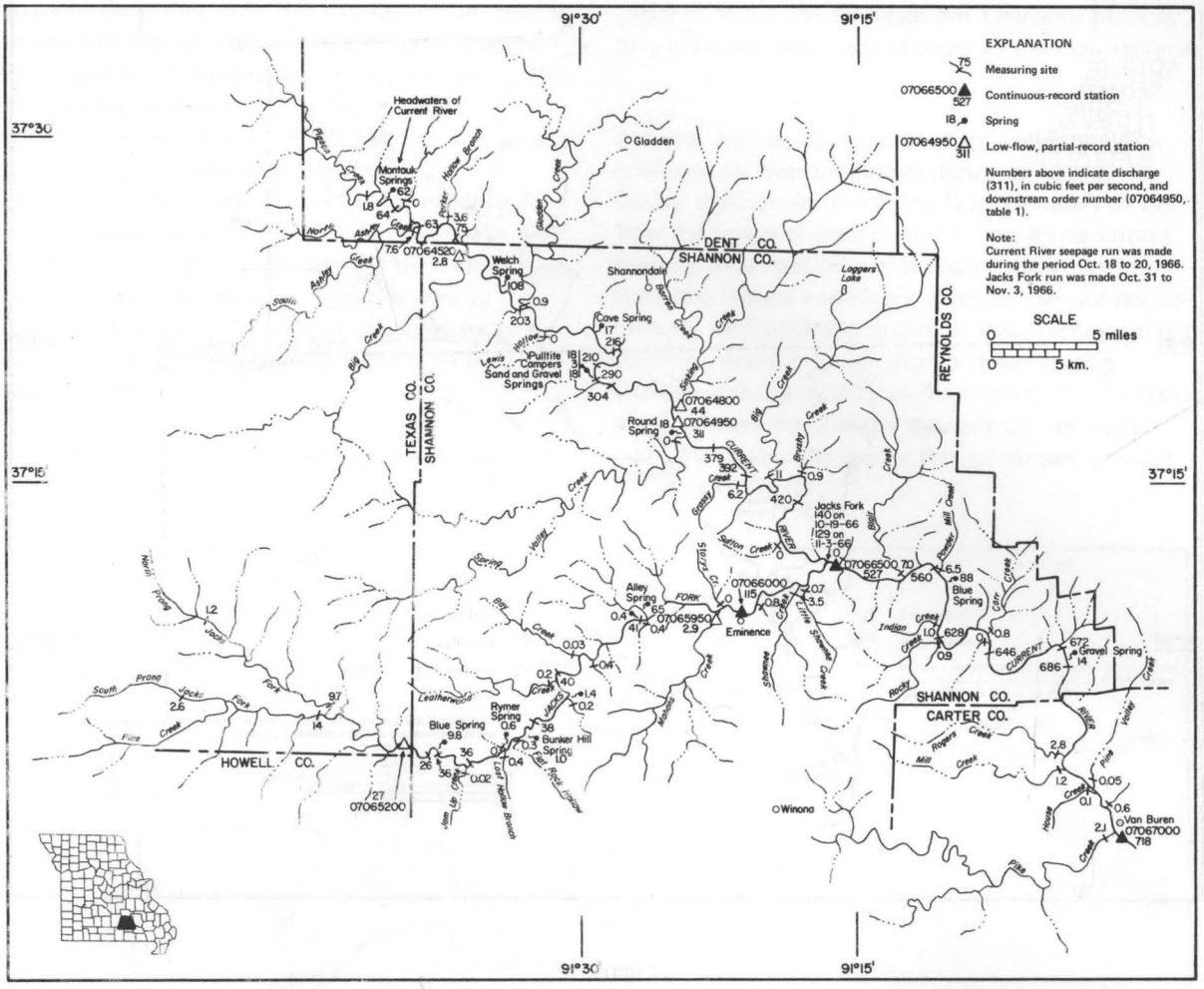

Figure 17

Map showing results of seepage runs on Current River and Jacks Fork during fall of 1966. Recurrence interval of flows is approximately 2 years.

minimum 7-day flow to be expected at average intervals of 2, 10, and 20 years. The regression equations shown on the illustrations were computed mathematically to achieve a "best-fit" line for the data. Standard errors of estimate were also computed and are shown on the figures. Note that scatter of the data points increases somewhat below 10 square feet (0.93 m^2) although the standard error is assumed to be the same throughout the range of data. This indicates that the computed standard error is somewhat excessive for streams with large flow areas.

Table 3 is a summary of the accuracy that can be expected from the various regionalization procedures that have been applied to Ozarks streams. Note that the accuracy of the regression methods can be stated mathematically, which is a distinct advantage. Of the three regression procedures, the one using flow areas results in considerably lower standard errors. In addition, it can be utilized by anyone who follows the procedures outlined in this report. The fact that some field work is involved in using the method is considered an advantage in the Ozarks, where field observations of flow patterns are considered essential to any regionalization procedure.

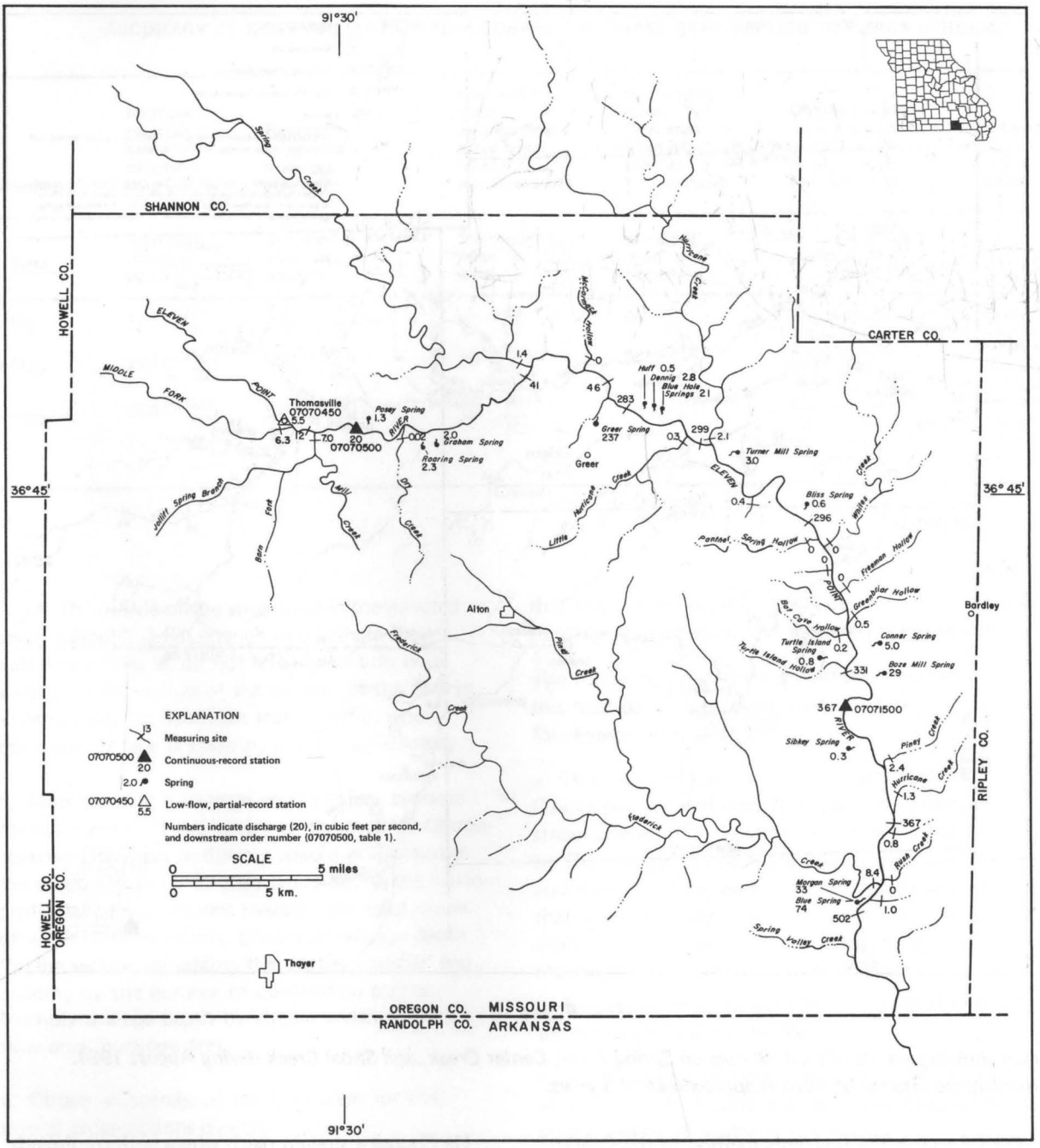

Figure 18

Map showing results of seepage run on Eleven Point River, October 14-17, 1968. Recurrence interval of flows is 1 to 1.5 years.

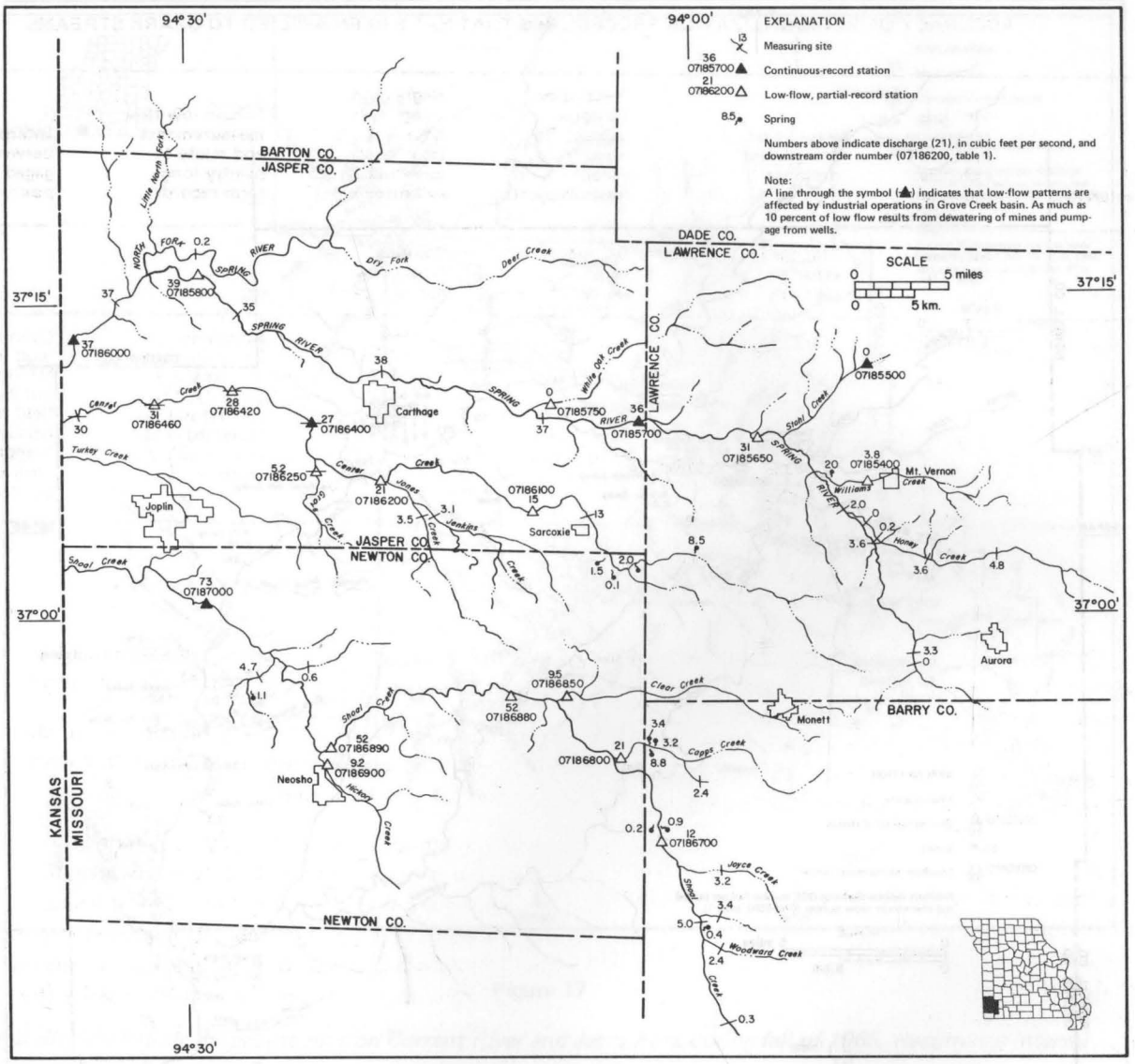

Figure 19

Map showing results of seepage runs on Spring River, Center Creek, and Shoal Creek during August 1964. Recurrence interval of flows is approximately 3 years.

In order to use the flow-area method in the Ozarks region of Missouri, the following procedures should be followed:

a. During late August through November, following several weeks of relatively dry weather, choose two or three cross-sections in the stream reach near the site where low-flow estimates are needed. The cross-sections should be selected as follows:

(1) Choose a straight reach where uniform threads of velocity are generally parallel to each other. Do not choose an unusually wide section with sluggish flow or a very narrow, swift section. A compromise between these two extremes is desirable.

(2) Choose a section of stream that appears to have a stable streambed that is free of large rocks, weeds, and protruding obstructions that cause turbulence.

TABLE 3

ACCURACY OF REGIONALIZATION PROCEDURES THAT HAVE BEEN APPLIED TO OZARK STREAMS

Flow characteristics	Multiple regression, using extensive data matrix	Regression, using basin drainage area only	Regression, using average flow areas from recent measurements	Regression, using flow area from latest low-flow measurement	Obtain low-flow measurements and relate to nearby long-term records	Interpolate between gaged points
	Standard error, in percent	Standard error, in percent	Standard error, in percent	Standard error, in percent		
7-day Q_2	170 ($^{+268}_{-73}$)	230 ($^{+375}_{-79}$)	41 ($^{+49}_{-33}$)	50 ($^{+62}_{-38}$)	Adequate for 7-day Q_2, but less accurate for 7-day Q_{10} and 7-day Q_{20}. Standard error cannot be measured.	Cannot be used in Ozarks without extensive field reconnaissance. Standard error cannot be measured.
7-day Q_{10}	270 ($^{+450}_{-82}$)	480 ($^{+880}_{-80}$)	60 ($^{+76}_{-45}$)	86 ($^{+118}_{-54}$)		
7-day Q_{20}	390 ($^{+690}_{-87}$)	520 ($^{+950}_{-90}$)	76 ($^{+101}_{-51}$)	76 ($^{+101}_{-51}$)		

(3) The profile of the streambed in the selected section should be flat enough to eliminate most turbulence; that is, do not select a section on a shoal or riffle section of the stream. In the Ozarks, a section slightly upstream from a riffle, where the water surface is smooth, is often satisfactory.

b. After locating a suitable cross-section, measure the total width of the stream at the section. Choose approximately ten uniformly spaced points across the section in order to adequately define the bottom profile of the stream and measure the total depth of water at these points. Obtain an average depth for the section by adding the depths together and dividing by the number of observation points. Multiply average depth by stream width to obtain flow area in square feet.

c. Obtain an average of the flow areas for the several cross-sections chosen.

d. Utilize figures 20, 21, or 22 to estimate low-flow frequency data for the site.

This study has indicated that it is preferable to measure flow areas during several low-flow periods in different years and average the results to obtain optimum estimates. Table 3, column 5, indicates that the use of only one flow-area measurement could result in an increase in the expected standard error.

The following limitations should be considered when this method is used to estimate low-flow frequencies for ungaged Ozarks streams:

a. This method is applicable only to perennial Ozarks streams and does not apply to reaches of streams where flow is intermittent in most years.

b. The method is not applicable to regulated streams and should not be used for estimates on any stream that is significantly affected by man's activities (for example, during periods of extensive irrigation withdrawals).

c. Regression lines should not be extended beyond the limits defined by the data.

d. Measurements of flow area in the field must be made from late August through November, following several weeks of relatively dry weather.

e. The relationships of figures 20, 21, and 22 were defined by flow areas that were measured during drought events with recurrence intervals ranging from less than 1 year to approximately 5 years. Thus, if flow areas are measured during a severe drought in a region, frequency estimates at ungaged sites would tend to be conservative (low).

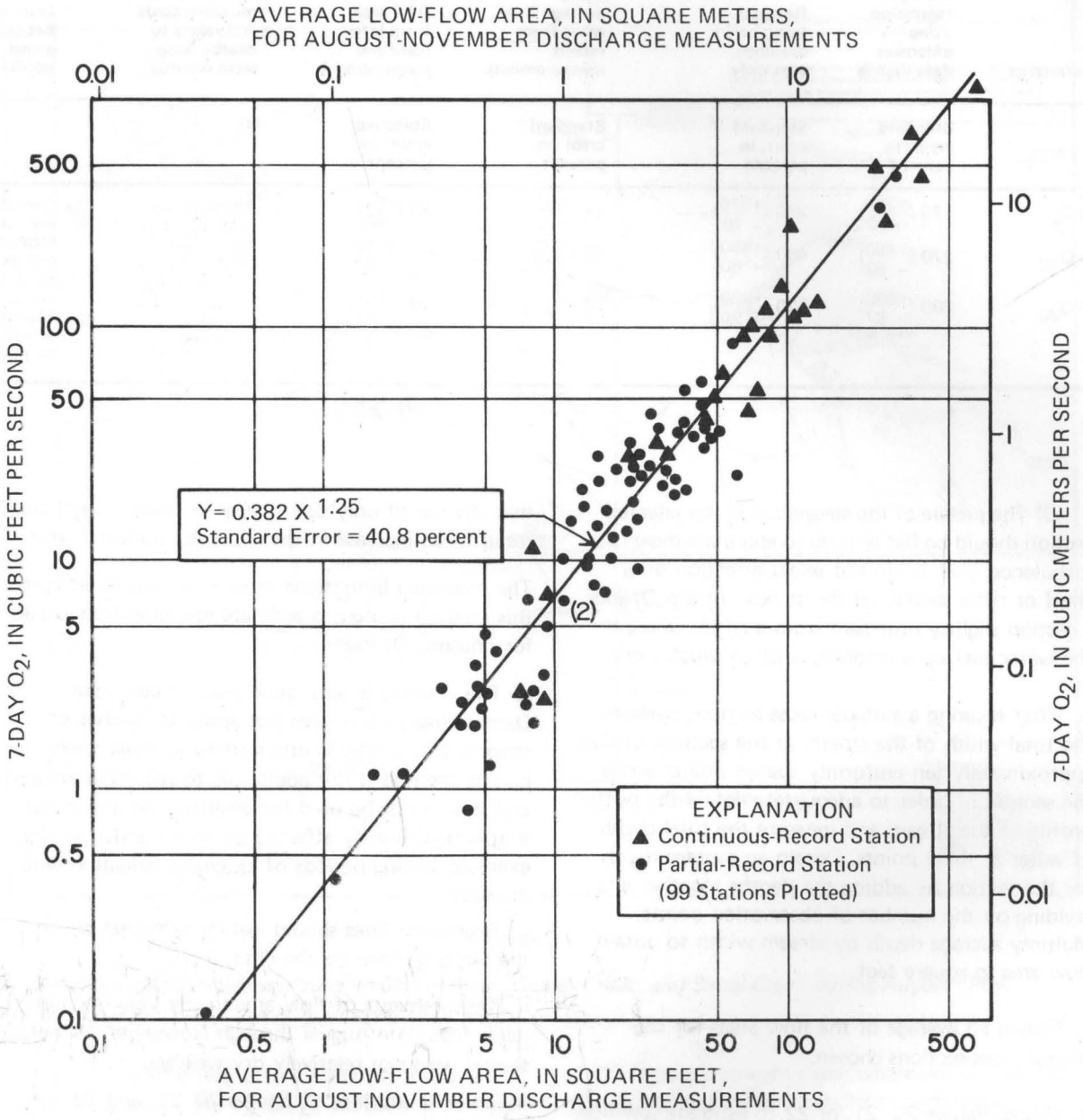

Figure 20

Plot of 7-day Q_2 versus flow area for perennial Ozark streams, showing computed regression line.

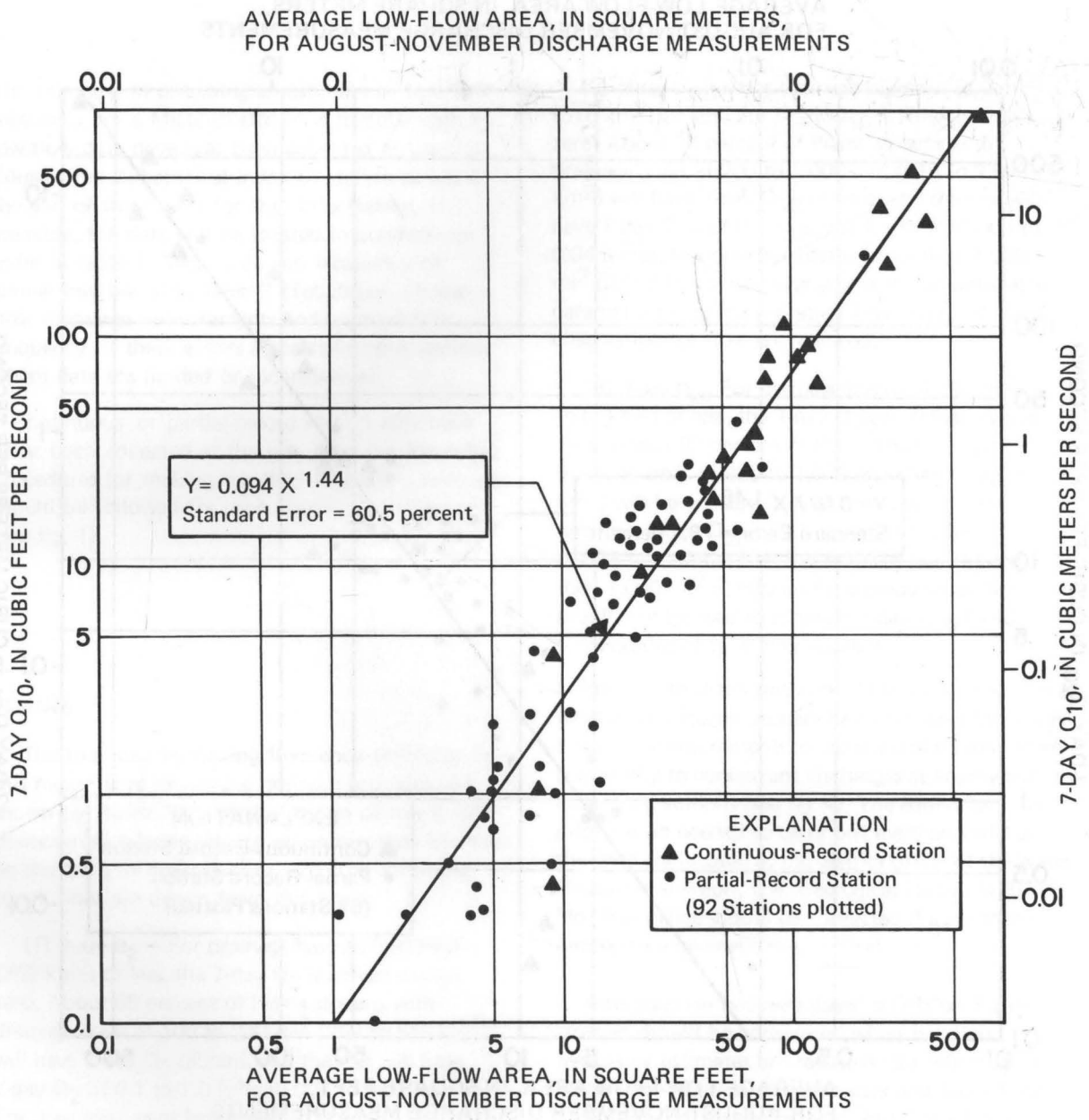

Figure 21

Plot of 7-day Q_{10} versus flow area for perennial Ozark streams, showing computed regression line.

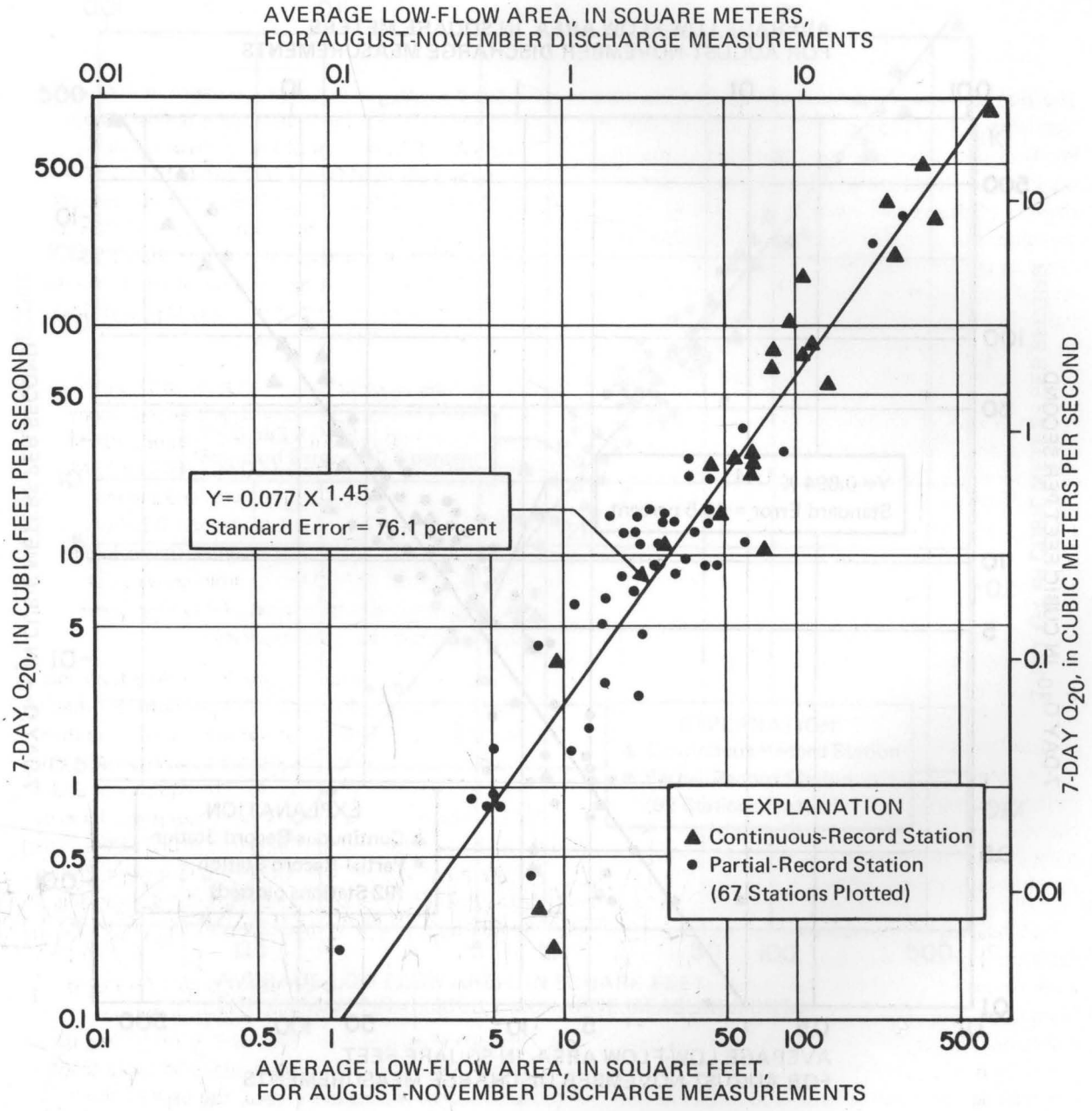

Figure 22

Plot of 7-day Q_{20} versus flow area for perennial Ozark streams, showing computed regression line.

RECOMMENDED PROCEDURES FOR OBTAINING LOW-FLOW FREQUENCY ESTIMATES FOR MISSOURI STREAMS

The first step in obtaining an estimate of low-flow frequency for a Missouri stream is to determine if low-flow data have ever been collected at the site. Consult the alphabetical index of station names at the end of this report for that information. If available, the data will be located in downstream order in table 1 (Magnitude and frequency of annual low flows) or table 2 (Tabulation of low-flow discharge measurements and approximate frequency of these events at partial-record stations where data are limited or inconclusive).

If continuous- or partial-record station data have never been collected at the site, then the following procedures for making low-flow frequency estimates should be followed for each physiographic region (see fig. 1).

PLAINS

a. The first step in making frequency estimates in this region is to determine drainage area size. As shown by figure 23, a generalization of low-flow characteristics in the Plains region can then be made on the basis of drainage area size. The following conclusions are drawn from this figure:

(1) **7-day Q_2** – For drainage basins of 100 mi^2 (259 km^2) or less, the 7-day Q_2 is almost always zero. About 60 percent of Plains streams with drainage areas of 100 to 200 mi^2 (259 to 518 km^2) will have 7-day Q_2 of zero, and the rest will have 7-day Q_2 of 0.1 to 1.0 ft^3/s (0.003 to 0.028 m^3/s). For drainage basins larger than 200 mi^2 (518 km^2), drainage area size is an unreliable parameter to use in estimating 7-day Q_2 and field observations of flow are required.

(2) **7-day Q_{10}** – For drainage basins of 200 mi^2 (518 km^2) or less, the 7-day Q_{10} is almost always zero. About 70 percent of Plains streams with drainage areas of 200 to 1,000 mi^2 (518 to 2,590 km^2) will have 7-day Q_{10} of zero, and the rest will have 7-day Q_{10} of 0.1 to about 1.5 ft^3/s (0.003 to 0.04 m^3/s). For drainage basins larger than 1,000 mi^2 (2,590 km^2), drainage area size is an unreliable parameter to use in estimating 7-day Q_{10} and field observations of flow are required.

(3) **7-day Q_{20}** For drainage basins of 250 mi^2 (648 km^2) or less, the 7-day Q_{20} is almost always zero. About 80 percent of Plains streams with drainage areas of 250 to 1,000 mi^2 (648 to 2,590 km^2) will have 7-day Q_{20} of zero, and the rest will have 7-day Q_{20} of 0.1 to about 1.0 ft^3/s (0.003 to 0.028 m^3/s). For drainage basins larger than 1,000 mi^2 (2,590 km^2), drainage area size should not be used to estimate 7-day Q_{20} (field observations of flow are required).

b. For perennial streams in the Plains, low-flow characteristics at ungaged sites are best estimated by making discharge measurements at the site and relating them graphically to concurrent discharges at nearby continuous-record stations (see fig. 4). The equipment and information needed to carry out these procedures in the state are located at the district office of the Water Resources Division, U.S. Geological Survey in Rolla, Mo. This office should be contacted if assistance is needed to implement this method.

c. Interpolation between gaged points on Plains streams should be considered when low-flow frequency estimates are required. By referring to plate 1 for location of gaged sites and table 1 for tabulations of frequency data, the user of this report can decide if gaged points on the stream are close enough to his area of interest to allow interpolation. As an example of this procedure,

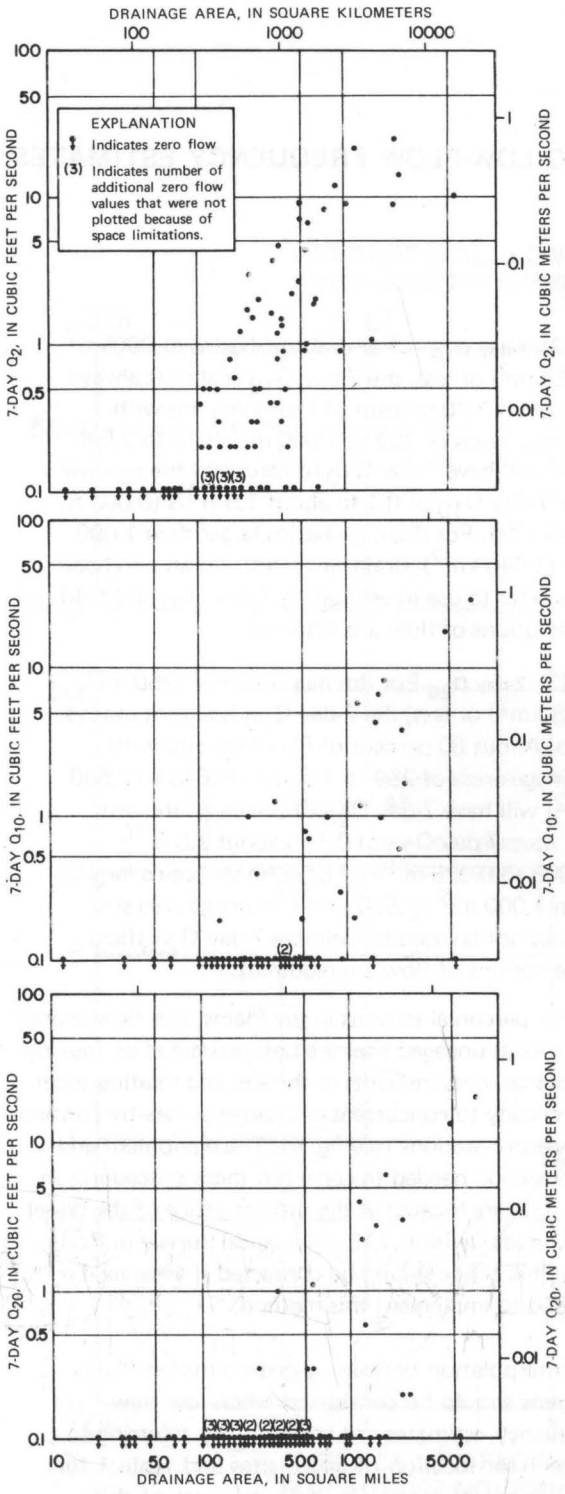

Figure 23

Relationship between drainage area and low-flow frequency in the Plains region of Missouri.

consider the problem of estimating the 7-day Q_{10} at an ungaged site on the Grand River in Gentry County, approximately 4.5 miles (7.2 km) downstream from station 89 (Grand River near Stanberry) and the same distance upstream from station 95 (Grand River near Darlington). An examination of frequency data in table 1 indicates that the 7-day Q_{10} for the Stanberry station is 1.4 ft^3/s (0.040 m^3/s), and the 7-day Q_{10} for the Darlington station is 2.5 ft^3/s (0.071 m^3/s), an increase of 1.1 ft^3/s (0.031 m^3/s) in the 9 mile (14.42 km) reach between the stations. Table 1 shows that tributary inflow from the Middle and East Fork Grand Rivers, which enters the main stem downstream from the ungaged site, amounts to about 0.2 ft^3/s (0.006 m^3/s) during a 10-year drought. It is acceptable in the case of a Plains stream to assume a uniform increase in low-flow discharge between the gaging stations. Thus the estimate of 7-day Q_{10} would be $1.4+(\frac{1.1-0.2}{2})\approx$ 2 ft^3/s (0.057 m^3/s). If an estimate of 7-day Q_2 is desired, the computation would be, $3.8+[5.2-(\frac{1.3+1.7}{2})]\approx$ 7 ft^3/s (0.198 m^3/s).

OZARKS

a. The most definitive method of estimating low-flow frequency at ungaged sites on Ozark streams is to obtain a few low-flow measurements on different recessions in several different years and relate the measured discharges graphically to concurrent discharges at nearby continuous-record stations (see fig. 4). Although no way exists to mathematically measure the accuracy of this method, it is applicable to all streams, whether perennial or not, and provides hydrologic data at the site, which is important in an area of heterogeneous runoff patterns. The Water Resources Division, U.S. Geological Survey, Rolla, Mo., should be contacted when assistance is needed to implement this method.

b. Seepage-run data (see previous section entitled "Seepage-Run Information") are another regionalization tool available for the Ozarks. In this region, the transfer of low-flow data from gaged to ungaged sites has always been risky because of heterogeneous runoff patterns in the carbonate rock terrane. Seepage-run information that is related to a specific low-flow frequency event is a useful means of transferring the

tabulated frequency data of table 1 from a few points to many sites in a basin. For instance, consider the Current River-Jacks Fork seepage run (fig. 17). If estimates of the 7-day Q_2, 7-day Q_{10}, and 7-day Q_{20} are needed at the mouth of Jacks Fork, the following procedure can be used to obtain a reliable estimate:

(1) Note on figure 17 that the recurrence interval of flows measured during the seepage run was about 2 years. The discharge of 129 ft^3/s (3.65 m^3/s) measured at the mouth of Jacks Fork on 11-3-66 can therefore be assumed to approximate the 7-day Q_2.

(2) Figure 17 shows that a gaging station is located on Jacks Fork about 8 miles upstream from the mouth. Table 1 should be examined to determine the extent of low-flow frequency data available at this station.

(3) The relationship between 7-day Q_2, 7-day Q_{10}, and 7-day Q_{20} at the gaging station should be used to estimate these data at the mouth of the stream. Note that 7-day Q_2 at the gaging station is about 35 ft^3/s (0.99 m^3/s) greater than 7-day Q_{10} and about 45 ft^3/s (1.27 m^3/s) greater than 7-day Q_{20}.

(4) Estimate 7-day Q_2, 7-day Q_{10}, and 7-day Q_{20} at the mouth of Jacks Fork to be about 130 ft^3/s (3.68 m^3/s), 95 ft^3/s (2.69 m^3/s), and 85 ft^3/s (2.41 m^3/s), respectively.

Similar procedures can be used on other reaches of streams where seepage-run data are available. However, if gaging station data are not available near the site in question, frequency estimates should not be extrapolated beyond the recurrence interval of flows measured during the seepage run. Also, it is not wise to interpolate between measured points on Ozark streams unless a detailed reconnaissance of the stream reach in question reveals no apparent loss zones or significant increases in flow.

c. The regionalization procedure known as the flow-area method (described in "Low-flow frequency estimates at ungaged sites") can be used to make estimates of the 7-day Q_2, 7-day Q_{10}, and 7-day Q_{20} for Ozarks streams. However, the method is limited to perennial streams, some cross-sectional area data is required at the ungaged site, and the data must be collected during August through November. The procedure is recommended primarily for use by personnel of state and federal regulatory agencies who are often faced with the need for an immediate field estimate of low-flow characteristics at ungaged sites.

SOUTHEASTERN LOWLANDS

For all streams in this region, low-flow characteristics at ungaged sites must be estimated by making discharge measurements at the site and relating them graphically to concurrent discharges at nearby continuous-record stations (see fig. 4). Adequate regionalization of hydrologic data in this region of man-made channels is made extremely tenuous by the difficulty in measuring basin characteristics such as contributing drainage area (it sometimes varies with stage) and the uncertainty associated with frequent and numerous man-made changes. The district office of the Water Resources Division, U.S. Geological Survey in Rolla, Mo., should be contacted when low-flow estimates are required at ungaged sites in the Lowlands.

FLOW DURATION DATA

Flow duration data are used in investigations of stream pollution, water power potential, and other related low-flow studies. As shown by table 4, duration data are related to low-flow frequency data, although the relationships vary somewhat from state to state and from one physiographic region to another in Missouri.

Duration data for continuous-record gaging stations were tabulated by computer and are shown in table 5, page 62. If it is necessary to plot the tabulated values for further study of station data, then logarithmic probability paper should be used, as shown in figure 24.

TABLE 4

COMPARISON OF DURATION AND LOW-FLOW FREQUENCY DATA

STATE	NO. STATIONS	PERCENT DURATION OF 7-DAY MINIMUM FLOW AT INDICATED RECURRENCE INTERVAL –			
		Mean		Range	
		2 years	10 years	2 years	10 years
Illinois*	3	95.2	---	94.7-96	---
Missouri					
Plains	38	90.1	99.27	84-99.2	98.9-99.99
Ozarks	35	89.1	99.28	78-96	98.6-99.92
Southeastern Lowlands	6	89.3	99.4	83-95	99.3-99.5
Kansas*	11	87.8	---	82.8-92	---

*Data from Riggs (1972, table 3).

SUMMARY AND CONCLUSIONS

The streams of the Ozarks generally have the best sustained low flows in the State, except where underground solution cavities divert runoff to adjacent basins or to other parts of the same basin. Low-flow potential of streams in the Plains is poor, and storage reservoirs are usually required where surface water supplies are to be developed. In the Southeastern Lowlands, low flows are well sustained because of inflow from the extensive alluvial aquifer and are second in magnitude to low flows of Ozark streams.

The frequency data of table 1 are defined by a statistical analysis of streamflow data collected from a network of 526 gaging stations. These data constitute the "heart" of the report and are valuable in water supply and management studies, design of storage structures, reservoir operations, implementation of water laws, and in studies of groundwater-surface water relationships. Seepage-run data are presented in a series of maps (figs. 5 to 19) to supplement the low-flow frequency data of table 1 and to extend selected frequency values to many additional stream sites.

Low-flow frequency estimates can be made at ungaged sites by the following methods:

a. Obtain a few low-flow discharge measurements at the site on different recessions in several different years and relate them graphically to concurrent discharges at nearby continuous-record stations. Transfer frequency data for the continuous-record station through the relationship to obtain estimates at the ungaged site.

b. Utilize seepage-run information that is related to a specific low-flow frequency event.

c. Interpolate between gaged points on a stream.

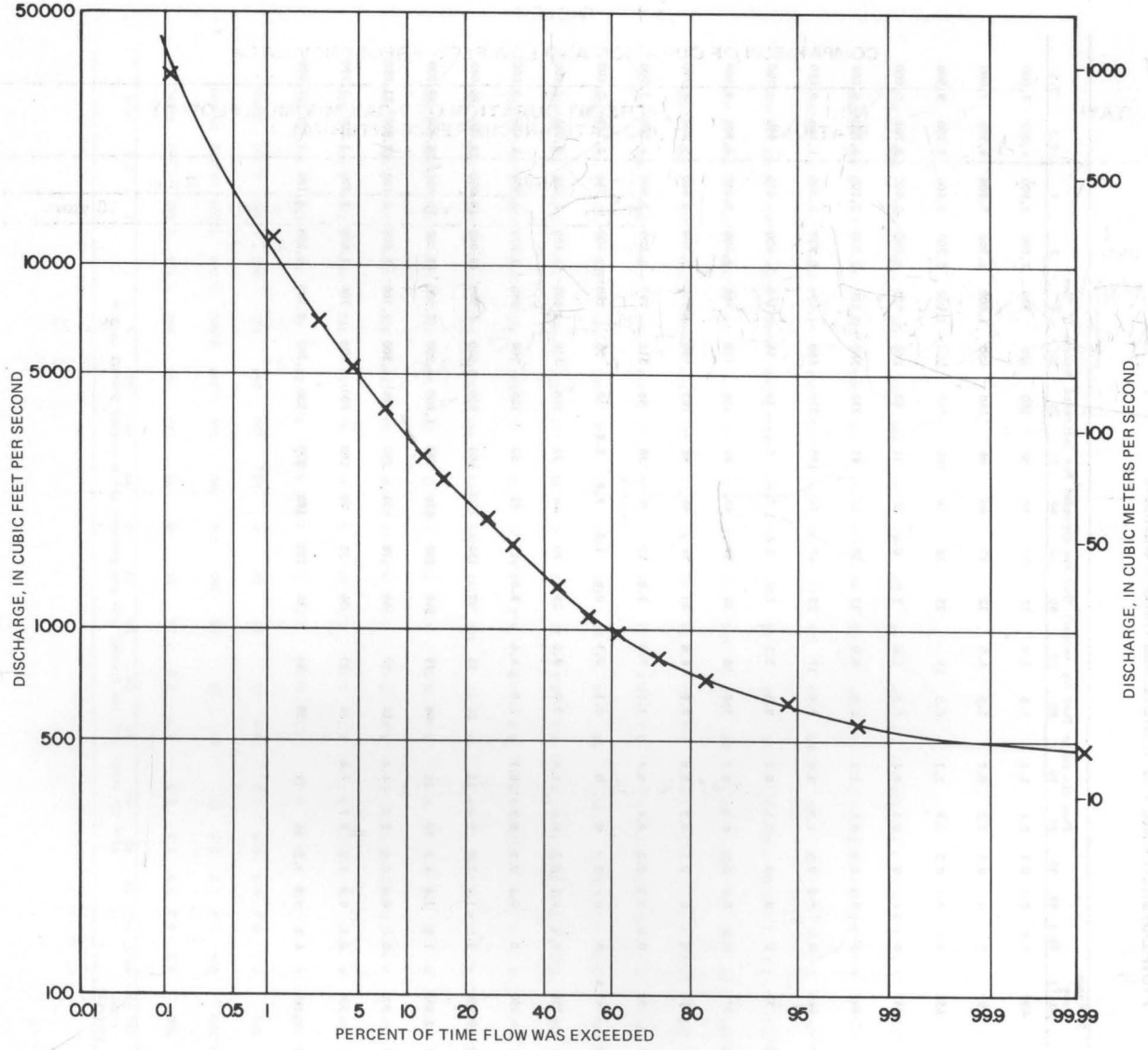

Figure 24

Flow duration curve, Current River at Van Buren, Mo.

d. Where low-flow patterns are fairly homogeneous, estimate frequency data on the basis of drainage-area size.

e. Define flow-area at the site and utilize figures 20 to 22 to estimate low-flow frequency data.

The recommended methods, in the order of preference to be used for making frequency estimates in each physiographic region of the state are:

PLAINS Methods (d), (a), (c).

OZARKS Methods (a), (b), (e).

SOUTHEASTERN LOWLANDS Method (a).

Flow-duration data for continuous-record stations are presented in table 5. These data are often used in studies of stream pollution and water power potential. As shown by table 4, these data are related to low-flow frequency data, but the relationship varies somewhat from state to state and from one physiographic region to another in Missouri.

TABLE 5

Flow-Duration Data For Continuous-Record Stations

Map No. (pl.1)	Station No.	Station Name	Period of Record	Drainage Area ($mi.^2$)	Flow (in cubic feet per second) That Was Exceeded For Indicated Percent Of Time																		
					99.5	99	98	95	90	80	70	60	50	40	30	20	10	5	2	1	0.5	0.1
1	05495000	Fox River at Wayland ------	1923-72	400	0.0	0.1	0.1	0.4	1.1	3.8	8.8	17	30	50	80	160	350	950	2,000	2,900	4,000	7,000
3	05496000	Wyaconda River above Canton ------------------	1932-71	393	0	0	0.1	0.2	0.7	2.5	6.0	12	23	40	68	140	450	1,000	2,100	3,200	4,300	7,000
5	05497000	North Fabius River at Monticello -------------	1922-72	452	0.1	0.1	0.3	0.9	2.2	6.5	13	23	38	58	105	210	510	1,000	2,300	3,600	5,100	9,500
7	05497500	Middle Fabius River near Baring ------------	1936-60	185	0	0	0	0.1	0.1	0.6	1.6	3.8	8.0	16	31	62	220	520	1,200	1,900	2,700	5,000
8	05498000	Middle Fabius River near Monticello ---------	1945-72	393	0	0.1	0.1	0.4	1.2	4.0	9.0	17	30	48	95	210	560	1,100	2,200	3,100	4,100	6,600
11	05500000	South Fabius River near Taylor -------------	1934-72	620	0.1	0.2	0.5	1.3	3.0	8.4	17	29	47	74	130	270	680	1,400	2,900	4,300	5,800	9,600
12	05500500	North River at Bethel ------------------	1937-72	58	0	0	0	0.1	0.1	0.3	0.5	0.9	1.6	3.0	5.8	14	54	160	400	650	950	1,700
13	05501000	North River at Palmyra -----------------	1934-72	373	0.1	0.1	0.2	0.7	1.7	5.0	10	18	30	48	80	150	350	760	1,900	3,200	4,900	9,800
16	05502500	Salt River near Shelbina ----------	1930-72	481	0	0	0.1	0.3	0.9	2.9	6.8	13	24	46	88	185	550	1,300	2,700	3,800	5,200	8,700
22	05505000	South Fork Salt River at Santa Fe ------------	1939-68	298	0.1	0.1	0.2	0.4	0.7	1.6	3.2	5.8	10	19	38	88	310	780	1,800	2,900	4,200	7,500
23	05506000	Youngs Creek near Mexico ------------------	1937-69	67.4	0	0	0	0	0	0.1	0.3	0.8	1.7	3.7	8.0	18	55	140	400	740	1,100	2,100
24	05506500	Middle Fork Salt River at Paris ----------	1939-72	356	0.1	0.1	0.2	0.6	1.4	3.9	8.0	15	26	44	78	160	430	900	1,900	2,800	4,000	7,400
25	05507000	Elk Fork Salt River near Paris ----------	1935-54	262	0	0.1	0.1	0.3	0.7	1.9	4.4	8.8	17	32	60	125	350	800	1,800	2,900	4,400	9,000
26	05507500	Salt River near Monroe City ------------	1939-72	2,230	1.1	1.7	2.7	5.4	11	26	55	92	150	250	450	920	3,000	6,500	13,000	18,000	23,000	36,000
27	05508000	Salt River near New London -------------	1922-72	2,480	1.5	2.6	4.5	10	21	46	79	140	250	430	780	1,600	4,000	7,500	13,000	19,000	24,000	37,000
34	05514500	Cuivre River near Troy --------------------	1922-72	903	0.2	0.3	0.6	2.0	4.8	14	27	48	78	130	250	520	1,300	2,700	5,600	8,500	12,000	21,000
42	06813000	Tarkio River at Fairfax -----------------	1922-72	508	0.5	0.8	1.6	3.7	7.4	14	23	34	52	80	120	200	380	700	1,400	2,200	3,200	7,200
46	06817500	Nodaway River near Burlington Junction -----	1922-72	1,240	4.3	5.8	8.2	14	21	38	58	84	120	180	270	500	1,200	2,200	4,200	6,100	8,600	20,000

Table 5 — *Flow-Duration Data* (continued) . . . . .

Map No. (pl.1)	Station No.	Station Name	Period of Record	Drainage Area ($mi.^2$)	Flow (in cubic feet per second) That Was Exceeded For Indicated Percent Of Time																		
					99.5	99	98	95	90	80	70	60	50	40	30	20	10	5	2	1	0.5	0.1
55	06819500	One Hundred Two River at Maryville	1932-72	500	0.2	0.3	0.5	1.2	2.3	5.0	8.8	15	24	40	70	140	390	850	1,900	3,100	4,500	8,200
62	06820500	Platte River near Agency	1924-72	1,760	0.4	0.9	1.9	5.8	14	34	59	88	145	230	390	700	1,500	2,900	5,700	8,800	13,000	25,000
77	06894000	Little Blue River near Lake City	1948-72	184	0.1	0.1	0.3	0.8	2.0	5.6	11	19	29	44	65	100	240	460	960	1,500	2,300	5,000
80	06894500	East Fork Fishing River at Excelsior Springs	1950-71	20	0	0	0	0	0	0.1	0.3	0.7	1.2	2.2	4.2	8.5	21	40	90	170	300	840
84	06895000	Crooked River near Richmond	1948-70	159	0	0	0	0.1	0.3	1.1	2.7	5.4	10	18	34	64	160	390	980	1,700	2,600	5,800
87	06896000	Wakenda Creek at Carrollton	1948-70	248	0.3	0.4	0.5	0.8	1.1	2.0	3.4	5.8	9.8	17	30	60	180	520	1,500	2,500	3,600	6,500
101	06897000	East Fork Big Creek near Bethany	1934-72	95	0	0	0	0	0	0.1	0.5	1.3	2.8	5.6	12	26	78	200	490	790	1,200	2,500
104	06897500	Grand River near Gallatin	1921-72	2,250	3.1	4.4	6.5	12	20	39	65	100	165	280	500	960	2,300	4,600	10,000	16,000	24,000	45,000
110	06898500	Weldon River near Mercer	1940-59	246	0	0	0	0.1	0.3	0.8	1.9	4.2	8.8	18	35	72	220	540	1,400	2,400	3,800	8,200
111	06899000	Weldon River at Mill Grove	1929-72	494	0.1	0.1	0.2	0.6	1.5	4.4	9.4	17	29	48	80	160	440	980	2,200	3,800	6,000	18,000
113	06899500	Thompson River at Trenton	1921-72	1,670	3.6	4.9	7.0	12	19	36	60	96	150	240	380	700	1,700	3,700	8,200	12,000	16,000	34,000
120	06900000	Medicine Creek near Galt	1921-72	225	0.1	0.2	0.3	0.7	1.5	3.7	7.0	12	20	31	50	84	250	590	1,400	2,200	3,200	6,100
125	06901500	Locust Creek near Linneus	1928-71	550	0.5	0.7	1.1	2.0	3.5	7.2	13	21	35	65	120	225	570	1,400	3,300	5,100	7,000	12,000
126	06902000	Grand River near Sumner	1923-72	6,880	28	34	44	65	98	90	310	480	730	1,100	1,800	3,400	9,400	18,000	33,000	46,000	58,000	88,000
137	06904500	Chariton River at Novinger	1930-72	1,370	1.2	1.8	2.8	5.4	10	21	38	66	110	190	350	740	2,000	3,800	6,200	8,000	10,000	14,000
139	06905500	Chariton River near Prairie Hill	1928-72	1,870	8.4	10	12	17	24	46	80	130	200	330	560	1,200	2,800	5,200	8,600	11,000	13,000	18,000
146	06907000	Lamine River at Clifton City	1922-72	598	0.1	0.2	0.5	1.8	4.8	14	25	40	65	110	200	400	980	1,900	4,000	6,200	8,800	16,500
156	06908000	Blackwater River at Blue Lick	1923-72	1,122	0.3	0.5	0.7	1.5	3.0	7.4	15	28	51	95	190	490	1,800	4,000	7,600	10,000	14,000	20,000

Table 5 — *Flow-Duration Data* (continued) . . . . .

Map No. (pl.1)	Station No.	Station Name	Period of Record	Drainage Area ($mi.^2$)	Flow (in cubic feet per second) That Was Exceeded For Indicated Percent Of Time																		
					99.5	99	98	95	90	80	70	60	50	40	30	20	10	5	2	1	0.5	0.1
162	06909500	Moniteau Creek near Fayette	1948-69	81	0	0	0	0	0	0.1	0.4	1.0	2.2	4.8	10	22	59	145	360	600	900	1,700
163	06910000	Petite Saline Creek near Boonville	1948-67	182	0	0	0	0.1	0.3	1.1	2.6	5.2	9.6	17	30	50	170	410	1,000	1,700	2,600	5,400
172	06910500	Moreau River near Jefferson City	1947-71	561	0.5	0.7	1.0	2.0	3.7	8.0	15	26	46	76	130	240	600	1,400	3,200	5,100	7,200	13,000
196	06921000	Pomme de Terre River near Bolivar	1950-67	225	0.5	0.8	1.2	2.2	4.0	8.8	16	26	41	65	100	170	340	570	1,300	2,200	3,400	7,600
206	06922000	South Grand River near Brownington	1921-72	1,660	0.1	0.1	0.2	0.6	1.8	8.8	27	58	120	230	450	980	2,500	4,900	9,200	13,000	18,000	28,000
230	06927000	Maries River at Westphalia	1947-70	257	0.4	0.5	0.8	1.5	2.8	6.0	11	18	30	50	88	170	410	840	1,900	2,900	4,200	7,300
243	06928000	Gasconade River at Hazlegreen	1928-71	1,250	30	35	43	60	80	120	170	230	330	470	690	1,100	2,000	3,400	6,000	9,000	13,000	27,000
250	06928500	Gasconade River near Waynesville	1914-71	1,680	69	78	90	110	145	200	260	360	500	720	1,000	1,600	3,000	4,900	8,600	13,000	17,000	31,000
256	06930000	Big Piney River near Big Piney	1921-72	560	82	88	94	105	120	140	160	195	240	290	380	540	1,000	1,700	3,000	4,400	6,400	13,000
264	06931500	Little Beaver Creek near Rolla	1947-72	6.41	0	0.1	0.1	0.1	0.2	0.4	0.5	0.8	1.1	1.6	2.4	4.0	9.0	19	44	75	110	200
266	06932000	Little Piney Creek at Newburg	1928-72	200	27	29	31	35	39	46	53	62	74	90	110	150	240	390	750	1,200	1,900	5,700
269	06933500	Gasconade River at Jerome	1925-72	2,840	290	310	340	400	480	600	720	890	1,150	1,500	2,000	2,800	5,200	8,600	15,000	20,000	27,000	44,000
274	06934000	Gasconade River at Rich Fountain	1923-59	3,180	310	340	370	440	510	650	820	1,050	1,300	1,700	2,300	3,500	6,400	10,500	17,000	23,000	30,000	48,000
279	06934650	Loutre River at Mineola	1949-65	202	0	0	0.1	0.1	0.2	0.6	1.7	4.0	8.2	16	32	66	190	450	1,000	1,700	2,500	4,800
294	07011500	Green Acre Branch near Rolla	1947-72	0.62	0	0	0	0	0	0	0	0	0	0	0.1	0.2	0.6	1.7	4.3	7.4	11	23
296	07013000	Meramec River near Steelville	1922-72	781	90	94	100	110	125	145	170	200	230	300	400	570	1,000	1,700	3,500	5,400	7,800	16,000
305	07014500	Meramec River near Sullivan	1921-72	1,475	160	170	190	220	250	300	360	430	520	670	900	1,300	2,200	3,400	5,700	8,200	12,000	27,000

Table 5 – *Flow-Duration Data* (continued) . . . . .

Map No. (pl.1)	Station No.	Station Name	Period of Record	Drainage Area ($mi.^2$)	Flow (in cubic feet per second) That Was Exceeded For Indicated Percent Of Time																		
					99.5	99	98	95	90	80	70	60	50	40	30	20	10	5	2	1	0.5	0.1
308	07015000	Bourbeuse River near St. James	1947-72	21.3	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.8	1.5	2.7	5.2	11	29	63	150	250	390	820
316	07016500	Bourbeuse River at Union	1922-72	808	18	21	24	29	36	50	67	98	140	210	320	550	1,200	2,800	5,900	8,400	11,000	17,000
324	07018000	Big River near DeSoto	1950-72	718	40	45	53	66	83	110	140	180	230	300	420	640	1,200	2,100	3,900	5,800	8,200	16,000
326	07018500	Big River at Byrnesville	1924-72	917	50	58	67	85	105	145	185	240	300	410	580	880	1,700	3,100	6,000	8,600	11,000	18,000
327	07019000	Meramec River near Eureka	1922-72	3,788	250	280	330	410	500	670	840	1,000	1,300	1,700	2,300	3,500	6,400	11,000	20,000	28,000	37,000	62,000
339	07021000	Castor River at Zalma	1922-72	423	27	31	35	44	55	74	95	120	160	220	310	470	970	1,900	3,800	5,600	7,600	13,000
358	07037500	St. Francis River near Patterson	1922-72	956	15	19	24	36	52	85	130	200	300	450	700	1,200	2,400	4,200	8,400	13,000	18,000	34,000
367	07041000	Little River ditch 81 near Kennett	1926-72	111	17	20	24	32	40	55	70	86	105	130	160	225	390	680	1,200	1,600	2,000	3,000
370	07042000	Little River ditch 1 near Kennett	1926-72	235	16	19	23	30	40	58	76	100	140	190	260	400	840	1,800	3,300	4,600	6,000	9,000
372	07042500	Little River ditch 251 near Lilbourn	1945-72	235	39	44	50	62	76	100	125	150	190	230	290	380	600	940	1,500	2,000	2,600	4,000
373	07043000	Castor River at Aquilla	1946-72	175	0.1	0.2	0.3	0.7	1.5	4.0	8.2	15	26	43	74	150	380	800	1,400	1,900	2,300	3,000
376	07043500	Little River ditch 1 near Morehouse	1945-72	450	34	39	46	58	72	98	120	150	190	240	320	480	950	1,900	3,400	4,400	5,400	6,900
378	07046000	Little River ditch 259 near Kennett	1926-72	89	0.1	0.1	0.3	0.7	1.7	4.7	9.0	15	23	36	56	92	220	450	940	1,400	2,100	3,800
385	07050700	James River near Springfield	1955-72	246	1.1	1.6	2.4	4.2	7.2	14	23	35	53	78	120	200	390	670	1,300	2,000	3,100	6,600
391	07052500	James River at Galena	1921-72	987	31	39	50	72	100	155	215	285	375	500	700	1,100	2,000	3,400	5,800	8,200	11,000	21,000
411	07057500	North Fork River near Tecumseh	1944-72	561	200	210	220	240	260	300	340	390	460	540	650	810	1,200	1,600	2,600	3,700	5,200	11,000
416	07058000	Bryant Creek near Tecumseh	1944-72	570	105	108	112	120	135	155	180	210	250	310	405	560	940	1,600	2,900	4,200	5,800	11,000

Table 5 — *Flow-Duration Data* (continued) . . . . .

Map No. (pl.1)	Station No.	Station Name	Period of Record	Drainage Area ($mi.^2$)	Flow (in cubic feet per second) That Was Exceeded For Indicated Percent Of Time																		
					99.5	99	98	95	90	80	70	60	50	40	30	20	10	5	2	1	0.5	0.1
421	07061500	Black River near Annapolis	1939-72	484	76	80	86	96	110	130	160	190	240	320	430	610	1,000	1,600	3,000	5,000	7,600	17,000
437	07064500	Big Creek near Yukon	1949-72	8.36	0	0	0	0	0	0.1	0.4	0.7	1.2	1.9	3.0	5.4	12	25	64	110	150	340
451	07066000	Jacks Fork at Eminence	1921-72	398	82	86	92	105	115	140	160	185	220	275	360	490	790	1,200	2,200	3,400	4,900	9,800
453	07066500	Current River near Eminence	1921-72	1,272	370	380	400	430	470	540	620	710	840	1,000	1,200	1,600	2,600	3,800	6,000	8,400	12,000	26,000
459	07067000	Current River at Van Buren	1912-72	1,667	520	540	560	610	660	760	860	980	1,150	1,400	1,700	2,200	3,300	4,900	7,800	11,000	15,000	35,000
460	07067500	Big Spring near Van Buren	1921-72	---	245	250	252	262	280	300	320	345	375	410	465	550	680	780	900	980	1,050	1,150
464	07068000	Current River at Doniphan	1918-72	2,038	900	920	960	1,020	1,100	1,250	1,400	1,600	1,800	2,100	2,500	3,100	4,600	6,600	9,800	13,000	18,000	38,000
473	07070500	Eleven Point River near Thomasville	1950-72	361	4.1	4.5	4.9	5.8	7.0	9.0	12	17	23	34	54	88	160	270	500	760	1,200	3,500
476	07071000	Greer Spring at Greer	1921-72	---	115	120	125	140	160	200	235	270	305	340	385	440	520	600	680	730	770	850
479	07071500	Eleven Point River near Bardley	1921-72	793	170	180	190	220	240	290	350	420	500	600	740	930	1,300	1,800	2,700	3,800	5,400	13,000
494	07186000	Spring River near Waco	1924-72	1,164	13	17	22	34	50	80	115	160	220	310	470	820	1,800	3,300	6,500	10,000	15,000	26,000
515	07187000	Shoal Creek above Joplin	1941-72	427	31	37	44	58	74	100	130	160	195	240	310	410	640	1,000	1,800	2,700	4,200	12,000
516	07188500	Lost Creek at Seneca	1948-72	42	0.8	1.1	1.4	2.1	3.1	5.2	7.5	10	14	18	25	34	57	88	150	220	330	1,000
524	07189000	Elk River near Tiff City	1939-72	872	16	21	28	42	62	100	140	200	270	370	540	820	1,400	2,400	4,400	7,000	11,000	23,000

REFERENCES CITED

Feder, G.L., and Barks, J.H., *1972, A losing drainage basin in the Missouri Ozarks identified on side-looking radar imagery, in Geol. Survey Research, 1972, Chap. C: U.S. Geol. Survey Prof. Paper 800-C, p. 249-252.*

Harvey, E.J., and Skelton, John, *1968, Hydrologic study of a waste disposal problem in a karst area at Springfield, Missouri, in Geol. Survey Research, 1968, Chap. C: U.S. Geol. Survey Prof. Paper 600-C, p. 217-220.*

_____ *1972, Evaluation of anomalous streamflow patterns by seepage runs and radar imagery in the Missouri Ozarks, in Transactions, Am. Inst. Min., Met., and Pet. Engrs: SME transactions, June 1972, v. 252, p. 113-118.*

Missouri Geological Survey and Water Resources, *1967, Physiography, in Mineral and Water Resources of Missouri: Mo. Geol. Survey and Water Resources, ser. 2, v. 43, p. 14.*

Riggs, H.C., *1972, Low-flow investigations: U.S. Geological Survey Techniques Water Resources Inv., book 4, chap. B 1, 18 p.*

Singh, Krishan P., and Stall, John B., *1973, The 7-day 10-year low flows of Illinois streams: Bulletin 57, Illinois State Water Survey, 24 p., 11 maps.*

Skelton, John, *1966, Low-flow characteristics of Missouri streams: Mo. Geol. Survey and Water Resources, WR Rept. 20, 95 p.*

_____ *1970, Base-flow recession characteristics and seasonal low-flow frequency characteristics for Missouri streams: Mo. Geol. Survey and Water Resources, WR Rept. 25, 43 p.*

_____ *1973, Flood-volume design data for Missouri streams: Mo. Geol. Survey and Water Resources, WR Rept. 28, 28 p., 2 figs., 4 tbls., 1 pl., 1 app.*

_____ *1974, Estimating low-flow frequency for perennial Missouri Ozarks streams: U.S. Geol. Survey, Rolla, Mo., Water Resources Inv. 59-73, 19 p.*

Skelton, John, and Harvey, E.J., *1968, Structural controls on streamflow in the North Fork River and Bryant Creek basins, Missouri, in Geol. Survey Research, 1968, Chap. C: U.S. Geol. Survey Prof. Paper 600-C, p. 153-157.*

Skelton, John, and Homyk, Anthony, *1970, A proposed streamflow data program for Missouri: U.S. Geol. Survey open-file report, 77 p.*

Vineyard, Jerry D., and Feder, G.L., *1974, Springs of Missouri: Mo. Geol. Survey and Water Resources, WR Rept. 29, 267 p., 94 figs., 26 tbls.*

APPENDIX

INDEX OF STATION NAMES

(*Indicates Continuous-record Station)

Station Name	Station Number
Current River near Eminence*	07066500
Dardenne Creek near Weldon Spring	05514720
Davis Creek at Sweet Springs	06907800
Davis Creek near Mexico*	05504500
Deepwater Creek near Montrose	06921780
Deer Creek near Edwards	06922780
Double Spring near Dora	07057475
Ditch 9 near Gideon	07040700
Ditch 24 at Heagy	07043050
Ditch 22 near Qulin	07063170
Dry Branch near Bonne Terre*	07017500
Dry Creek near Poynor	07068865
Dry Fork near St. James	07012050
Dry Fork Creek near Ownesville	07015760
East Fork Big Creek near Bethany	06897000
East Fork Black River at Lesterville*	07061300
East Fork Chariton River near Huntsville*	06906300
East Fork Fishing River at Excelsior Springs*	06894500
East Fork Grand River at Albany	06896400
East Yellow Creek near Brookfield	06902900
Eleven Point River at Thomasville	07070450
Eleven Point River near Bardley*	07071500
Eleven Point River near Mountain View	07070300
Eleven Point River near Thomasville*	07070500
Elk Fork Salt River near Paris*	05507000
Elk River at Pineville	07188850
Elk River near Tiff City*	07189000
Elm Spring near Neosho	07186891
Establishment Creek at Bloomsdale	07020100
Falling Spring near Waynesville	06928240
Femme Osage Creek near Weldon Springs	06935650
Finley Creek near Linden	07052260
Finley Creek near Ozark	07052300
Fishing River at Mosby	06894300
Fishing River near Orrick	06894600
Flat Creek at Cassville	07052750
Flat Creek at Jenkins	07052800
Flat Creek near Cape Fair	07052900
Flat Creek near Sedalia*	06906700
Fourche a Renault Creek near Potosi	07017650
Fourche Creek near Poynor	07068855
Fox River at Wayland*	05495000
Frederick Creek near Myrtle	07071850
Fudge Hollow near Licking	07064300
Gasconade River at Jerome*	06933500
Gasconade River near Hartville	06927580
Gasconade River near Hazlegreen	06928000
Gasconade River near Nebo	06927700
Gasconade River near Rich Fountain*	06934000
Gasconade River near Vienna	06933800
Gasconade River near Waynesville*	06928500
Gladden Creek at Akers	07064540
Grand River at Chillicothe	06899680
Grand River near Darlington	06896550
Grand River near Gallatin*	06897500
Grand River near Grant City	06896160
Grand River near Pattonsburg	06896900
Grand River near Stanberry	06896170
Grand River near Sumner*	06902000
Grandglaize Creek near Brumley	06925440
Gravois Creek near Kirkwood	07010120
Green Acre Branch near Rolla*	07011500
Greer Spring at Greer*	07071000
Grindstone Creek near Pattonsburg	06896850
Grove Creek near Scotland	07186250
Hahatonka Spring at Hahatonka	06924500
Hamilton Branch near New Boston	06902500
Hazleton Spring at Hazleton	06929310
Headwater Diversion Channel at Allenville	07021800
Heath Creek near Blackwater	06907400
Hickory Creek at Neosho	07186900
High Creek near Rock Port	06810050
Hinkson Creek at Columbia*	06910230
Hodgson Mill Spring at Sycamore	07057800
Hogles Creek near Fairfield	06920850
Honey Creek near Trenton	06899570
Hopewell Spring at Hopewell	07017220
Hunter Creek at Vera Cruz	07057680
Huzzah Creek at Dillard	07013100
Huzzah Creek near Steelville	07014000
Indian Creek at Anderson	07188870
Indian Creek at Courtois	07014130
Indian Creek at McNatt	07188860
Indian Creek near Fruitland	07020750
Indian Creek near St. Clair	07014800
Jacks Fork at Eminence*	07066000
Jacks Fork near Mountain View	07065200
James River at Galena*	07052500
James River below Battlefield	07051500
James River near Northview	07050540
James River near Springfield*	07050700
James Spring near Steelville	07013990
Jenkins Branch at Gower*	06821000
Joachim Creek at Hematite	07019050
Keener Spring near Williamsville	07062590
Kinnemore ditch at Cardwell	07040470
Kratz Spring near Stanton	07016100
Lake Slough near Qulin	07063100
Lamine River at Clifton City*	06907000
Lanes Fork near Rolla*	07015500
Lane Spring near Yancy Mills	06930920
Laquey Branch near Hazlegreen*	06928200
Lick Creek near Dudley	07040050
Limestone Creek at South Greenfield	06918450
Lindley Creek near Polk*	06921200
Little Beaver Creek near Bradleyville	07054050
Little Beaver Creek near Rolla*	06931500
Little Black River near Fairdealing	07068500
Little Blue River at Kansas City	06893800
Little Blue River at Longview Road in Kansas City*	06893790
Little Blue River near Blue Springs	06893900
Little Blue River near Lake City*	06894000
Little Bourbeuse River near Sullivan	07015780
Little Gravois Creek at Bagnell	06926020
Little Maries River near Vienna	06926820
Little Niangua River near Macks Creek	06925250
Little Osage River at Horton	06917060
Little Osage River at Stotesbury	06917030
Little Piney Creek at Newburg*	06932000
Little Piney Creek at Yancy Mills	06930900
Little Platte River at Smithville	06821150
Little Platte River near Trimble	06821100
Little River ditch 1 near Kennett*	07042000
Little River ditch 81 near Kennett*	07041000
Little River ditch 259 near Kennett*	07046000
Little River ditch 251 near Lilbourn*	07042500
Little River ditch 1 near Morehouse*	07043500
Little Sac River near Morrisville	06918740
Little St. Francis River at Fredericktown	07035000
Little Sugar Creek at Pineville	07188840
Little Tarkio River near Mound City	06815570
Little Tavern Creek near St. Elizabeth	06926250
Little Whitewater Creek near Millersville	07021500
Locust Creek near Linneus*	06901500
Locust Creek near Milan	06901000
Logan Creek at Ellington	07061900
Long Creek near Guilford	06819010
Lost Creek at Elsberry*	05513500
Lost Creek at Seneca*	07188500
Lost Creek near Weatherby	06896800
Loutre River at McKittrick	06934700
Loutre River at Mineola*	06934650
Mahans Creek at West Eminence	07065950

Station Name	Station Number
Main ditch at Holcomb	07041100
Main ditch near Bernie	07040850
Main ditch 6 east of Malden	07040800
Main ditch near Malden	07041050
Main ditch 2 near Malden	07040900
Main ditch 1 near Deering	07046520
Main ditch 1 near Matthews	07042400
Maple Slough near East Prairie	07024170
Maramec Spring near St. James	07010500
Maries River at Westphalia*	06927000
Maries River near Vienna	06926700
Markham Spring near Williamsville	07062570
Marmaton River at Nevada	06918060
Marrowbone Creek near Gallatin	06897520
McKinzie Creek near Piedmont	07062100
McMahon Spring near Neosho	07186893
Meander Line ditch near Portageville	07043900
Medicine Creek near Galt	06900000
Medicine Creek near Sturges	06900500
Medicine Creek near Wheeling	06900600
Menorkenut Slough near Qulin	07063170
Meramec River at Cook Station	07010350
Meramec River at Robertsville*	07017000
Meramec River near Eureka*	07019000
Meramec River near St. James	07010400
Meramec River near Salem	07010300
Meramec River near Steelville*	07013000
Meramec River near Sullivan*	07014500
Miami Creek near Butler	06916670
Middle Fabius River near Baring*	04597500
Middle Fabius River near Durham	05498300
Middle Fabius River near Monticello*	05498000
Middle Fork Black River near Lesterville	07061170
Middle Fork Grand River at Grant City	06896185
Middle Fork Grand River near Albany	06896190
Middle Fork Salt River at Paris*	05506500
Middle River near Mokane	06927050
Mikes Creek at Powell	07188660
Mill Creek at Oregon*	06816000
Mill Creek near Newburg	06933300
Mill Spring at Mill Spring	07062550
Mineral Fork near Potosi	07017800
Mississippi River at Alton*	05587500
Mississippi River at St. Louis*	07010000
Mississippi River at Thebes*	07022000
Missouri River at Boonville*	06909000
Missouri River at Hermann*	06934500
Missouri River at Kansas City*	06893000
Missouri River at St. Joseph*	06818000
Missouri River at Waverly*	06895500
Mistaken Creek at Cooper Hill	06934100
Monegaw Creek near Monegaw Springs	06918340
Moniteau Creek near Fayette*	06909500
Moniteau Creek near Jamestown	06910270
Montauk Spring at Montauk State Park	07064400
Moreau River near Jefferson City*	06910500
Morris Spring near Ellington	07061950
Muddy Creek at Trenton	06899550
Muddy Creek near Sedalia	06907100
Mussel Fork at Keytesville	06906100
Mussel Fork near Mussel Fork	06906000
Myatt Creek near Lanton	07069260
Nagogami Spring near Rolla	06933600
Niangua River near Buffalo	06923200
Niangua River near Eldridge	06923900
Niangua River near Windyville	06923250
Nodaway River near Burlington Junction*	06817500
Nodaway River near Graham	06817700
Nodaway River near Oregon	06817800
North Fabius River at Memphis	05496950
North Fabius River at Monticello*	05497000
North Fabius River at Taylor*	05498500
North Fabius River near Durham	05497300
North Fork Cuivre River at Silex	05514300
North Fork River near Dora	07057470
North Fork River near Tecumseh*	07057500
North Fork River at Twin Bridges	07057400
North Fork Spring near Dora	07057474
North Fork Spring River at Lamar	07185850
North Fork Spring River near Galesburg	07185950
North Moreau Creek near California	06910420
North River at Bethel*	05500500
North River at Palmyra*	05501000
North Wyaconda River near Granger	05495800
Oak Dale Branch near Emden*	05503000
Oak Grove Branch near Brighton*	06918700
Old Channel ditch 1 near Chaffee	07043100
Old Mines Creek near Potosi	07017900
102 River at Avenue City	06820460
102 River at Rosendale	06820420
102 River near Maryville*	06819500
102 River near St. Joseph	06820480
Osage Fork at Drynob*	06927800
Osage Fork at Rader	06927730
Osage Fork near Orla	06927750
Osage River at Osceola*	06920500
Osage River near Bagnell*	06926000
Osage River near Rich Hill	06916650
Osage River near St. Thomas*	06926500
Osage River near Schell City	06918080
Ozark Trout Farm Spring near Neosho	07186910
Panther Creek at Mt. Moriah	06898110
Panther Creek near Northview	07050560
Parson Creek at Meadville	06900700
Paydown Spring near Belle	06933820
Pemiscot Bayou near Holland	07046510
Perche Creek near Columbia	06910220
Peruque Creek near Wentzville	05514710
Petite Saline Creek near Boonville*	06910000
Phillips Spring near Van Buren	07067700
Pickerel Creek near Republic	06918410
Pike Creek at Van Buren	07066990
Pine Valley Creek near Van Buren	07066750
Pittman Spring near Redmont	07062010
Platte River at Platte City	06821200
Platte River at Ravenwood*	06818900
Platte River at Whitesville	06819020
Platte River near Agency*	06820500
Platte River near St. Joseph	06819090
Plattin Creek at Plattin*	07019790
Pomme de Terre River near Bolivar*	06921000
Pomme de Terre River near Polk	06921070
Posey Spring near Thomasville	07070510
Post Oak Creek at Warrensburg	06907600
Pulltite Spring near Round Spring	07064555
River aux Vases near Ste. Genevieve	07020550
Roaring River Spring near Cassville	07050150
Rock Creek at Independence*	06893600
Rock Creek near Rock Port	06811600
Rocky Creek near Eminence	07066600
Roubidoux Creek at Ft. Leonard Wood	06928300
Roubidoux Creek at Waynesville	06928450
Roubidoux Spring at Waynesville	06928440
Round Spring at Round Spring	07065000
Sac River at Ash Grove	06918420
Sac River near Dadeville*	06918440
St. Francis River near Annapolis	07036100
St. Francis River near Patterson*	07037500
St. Francis River near Roselle	07034000
St. James ditch at East Prairie	07024150
St. Johns Creek near Washington	06935400
Saline Creek near Minnith	07020270
Saline Creek near St. Marys	07020300
Saline Creek near Tuscumbia	06926160
Salt Fork Blackwater River near Marshall	06908420

Station Name	Station Number
Salt River near Ashburn	05509300
Salt River near Hunnewell	05503500
Salt River near Monroe City*	05507500
Salt River near New London*	05508000
Salt River near Novelty	05502200
Salt River near Shelbina*	05502500
Sampson Creek at Pattonsburg	06896650
Sandy Creek near Pevely*	07019690
Second Creek at Bay	06934300
Sequiota Spring near Springfield	07050720
Shawnee Creek near Eminence	07066100
Shanghai Spring near Waynesville	06930400
Shiloh Branch near Marshall*	06908500
Shoal Creek above Joplin*	07187000
Shoal Creek at Kingston	06899690
Shoal Creek at Neosho	07186890
Shoal Creek at Ritchey	07186880
Shoal Creek near Braymer*	06899700
Shoal Creek near Chillitcothe	06899800
Shoal Creek near Fairview	07186700
Shoal Creek near Hartford	06904300
Shoal Creek near Liberty	06893700
Sinking Creek near Round Spring	07064800
Sinking Creek near Shannondale	07064750
Slabtown Spring near Licking	06929320
Sni-A-Bar Creek near Grain Valley	06894700
Sni-A-Bar Creek near Wellington	06894800
Sons Creek near Neola	06918490
South Fabius River near Taylor*	05500000
South Fork Blackwater River near Elm*	06907500
South Fork Salt River at Mexico	05504400
South Fork Salt River at Sante Fe*	05505000
South Grand River at Archie	06921590
South Grand River at Urich*	06921600
South Grand River near Brownington*	06922090
South Grand River near Freeman	06921580
South Moreau Creek near Russellville	06910490
Spencer Creek near Frankford	05508800
Spring Creek at Spring Creek	06930100
Spring Creek at Twin Bridges	07057450
Spring Creek near Sycamore	07057480
Spring Creek near Thomasville	07070700
Spring Creek near Vichy	06933790
Spring River at Carthage*	07185765
Spring River at Larussell*	07185700
Spring River at Thayer	07069150
Spring River near Neck City	07185800
Spring River near Stotts City	07185650
Spring River near Waco*	07186000
Spring River Spring near Verona	07185190
Squaw Creek near Mound City	06815580
Stahl Creek near Miller*	07185500
Starks Creek at Preston*	06925200
Stinson Creek at Fulton	06927150
Stone Mill Spring near Spring Creek	06930030
Sugar Creek at Brimson	06898210
Swan Creek at Forsyth	07053980
Swan Creek at Garrison	07053850
Sweet Spring Creek near Moberly	06906315
Tarkio River at Fairfax*	06813000
Tavern Creek near St. Anthony	06926190
Tavern Creek near St. Elizabeth	06926300
Tebo Creek at Leesville	06922200
Third Creek at Cooper Hill	06934120
Third Fork Platte River near Easton	06820490
Thomasson Mill (Morgan) Spring near Alton	07071860
Thompson Branch near Albany*	06896500
Thompson River at Mt. Moriah*	06898100
Thompson River at Trenton*	06899500
Thompson River near Trenton	06898200
Tucker Spring near Bennett	07067900
Turkey Creek near Laclede	06903100
Turnback Creek above Greenfield*	06918460
Turnback Creek near Greenfield	06918470
Turner Mill Spring near Alton	07071030
Twelve Mile Creek near Annapolis	07036090
Twin Springs near Shannondale	07064760
Twin Springs near Stanton	07014770
Van Cleve Branch near Meta*	06926200
Wakenda Creek at Carrollton*	06896000
Weaubleau Creek near Osceola	06920600
Welch Spring near Akers	07064530
Weldon River at Mill Grove*	06899000
Weldon River near Mercer*	06898500
Weldon River near Trenton	06899100
West Fork Black River at Centerville	07061150
West Fork Crooked River at Richmond	06895050
West Fork Cuivre River near Troy	05514100
West Fork Fourche Creek near Ponder	07068860
West Fork Lost Creek at Maysville	06896750
West Tarkio Creek near Westboro*	06812500
West Yellow Creek below Brookfield	06902300
West Yellow Creek near Brookfield*	06902200
Westover Spring at Westover	07013950
Wet Glaize Creek near Brumley	06925430
White Cloud Creek near Barnard	06820400
White Cloud Creek near Maryville*	06820000
White Oak Creek near Avilla	07185750
Whitewater River at Millersville	07021400
Whitewater River at Whitewater	07021600
Wildcat Creek at Stanberry	06896182
Wilder Spring near Elijah	07057478
Wilkerson ditch near East Prairie	07024100
Wilkins Spring near Newburg	06933000
Williams Creek near Mosby	06894400
Williams Creek near Mt. Vernon	07185400
Wyaconda River above Canton*	05496000
Yellow Creek near Rothville	06903000
Youngs Creek near Mexico*	05506000

LOCATIONS OF GAGING STATIONS AND 7-DAY Q_{10} DISCHARGES IN MISSOURI

SCALE
0 40 miles
0 50 km

EXPLANATION

- ▲ Continuous-record stream-flow station
- △ Partial-record stream-flow station
- ● Continuous-record spring-flow station
- ○ Partial-record spring-flow station
- 300/25 Upper number is that used in text tables to locate stations in downstream order; lower number is 7-day Q_{10}, in cubic feet per second.
- ? Indicates estimate of 7-day Q_{10} is not available.

Note:
A line through the symbol (▲) indicates that low flows are regulated or continuously affected by man's activities. See footnotes in table 1 for further explanation.

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missouri stream and springflow characteristics low-flow frequency and flow duration

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