

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY  
WASHINGTON, D. C. 20242



LOW-FLOW STUDY FOR SOUTHWEST OHIO STREAMS

By

Earl E. Webber and Ronald I. Mayo

Prepared in cooperation with the U.S.  
Department of the Army, Corps of Engineers

Open-file report

Columbus, Ohio

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### ABSTRACT

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Low-flow discharges at 60 sites on streams in the Little Miami River, Mill Creek, Great Miami River and Wabash River basins are presented in this report. The average annual minimum flows in cubic feet per second (cfs) for a 7-day period of 10-year frequency and a 1-day period of 30-year frequency are computed for each of the 60 sites.

### INTRODUCTION

The magnitudes of the 7-day, 10-year and 1-day, 30-year low flows for 60 locations in southwest Ohio were requested by the Louisville District of the Corps of Engineers, Department of the Army. These sites, listed in table 1 and shown in figure 1, are on streams with drainage areas ranging from 2.24 to 3,662 square miles, covering a wide range of soil types and geologic formations. Twenty-seven of the sites are at gaging stations, 16 are on gaged streams but not at gages, and the remaining 17 are on ungaged streams.

Low-flow magnitude and frequency data for the 27 gaging stations were determined by applying techniques present<sup>ed</sup> by Cross (1965). The gaging station data were extended to cover the nearby 16 ungaged sites on the same streams by correlation analyses. Low-flow discharge

measurements were made at the remaining 17 ungaged sites and correlated with simultaneous discharges, for nearby gaging stations. The 7-day, 10-year and 1-day, 30-year low-flow discharges for the ungaged sites were determined by using methods outlined by Cross (1963, 1965).

#### DATA AVAILABLE

All of the gaging records for naturally-flowing streams and miscellaneous low-flow discharge measurements in southwest Ohio during the period 1914-70 were used. In addition to the low-flow magnitude and frequency studies by Cross (1963 and 1965), Norris, Cross, and Goldthwait (1950), made a study of the water resources of Green County, Ohio. Data are available from the water resources studies by the State of Ohio in a Hydrologic Atlas (1962) and a Water Inventory Report (1964).

#### FIELD WORK

Low-flow discharge measurements were made at the 17 ungaged stream sites during August and September 1970 and simultaneous discharges were determined for all natural-flow gaging stations in southwest Ohio. The measurements were made when the streams were assumed to be at base flow. Base flow varies in magnitude throughout the year and streamflow is generally considered to be "base" when it consists of ground-water runoff with no direct surface runoff.

## ANALYSES

The method of analysis as developed by Cross (1963) was used throughout this study where it could be applied. Modifications were made in analyzing the data for intermittent streams (11 sites) and for streams that were significantly affected by regulation or diversion (7 sites).

The 7-day, 10-year and 1-day, 30-year minimum average discharges for the 11 sites with intermittent streamflow, numbers 7, 8, 10, 12, 13, 14, 17, 18, 35, 42, and 53, were estimated on the basis of discharge measurements made in August and September 1970, and on the geology of the drainage areas. The 7-day, 10-year and 1-day, 30-year minimum average discharges at the seven sites, numbers 3, 15, 16, 19, 20, 21, and 45, affected by regulation or diversion were estimated on the basis of Water Inventory Report 18 (1964) and adjustments for reported diversions.

## CONCLUSIONS

The minimum average 7-day, 10-year discharges shown in table 1 are fairly reliable. The 1-day, 30-year discharges are estimates, at best, as the length of record at most gaging stations in southwest Ohio is less than 30 years. In general, the minimum flows for the 27 gaging station sites are most accurate, those for the 16 sites on gaged streams but not at gaged sites are next in accuracy, and the 17 sites on ungaged streams are least accurate.



During the period of field work for this study, July-September, 1970, some gaging stations in the upper Great Miami River basin and the East Fork Little Miami River basin experienced low flows approaching 90-percent duration. Frequent, and sometimes heavy, rains over the remainder of the study area maintained flows considerably higher than the 90-percent duration flow. This precipitation reduced the reliability of the estimated 90-percent duration discharge for some ungaged sites which in turn reduced the reliability of the resulting low-flow frequencies determined by the Cross method.

The results given in table 1 represent the best estimates of low-flow frequency data that can be made with the streamflow records now available.

#### REFERENCES

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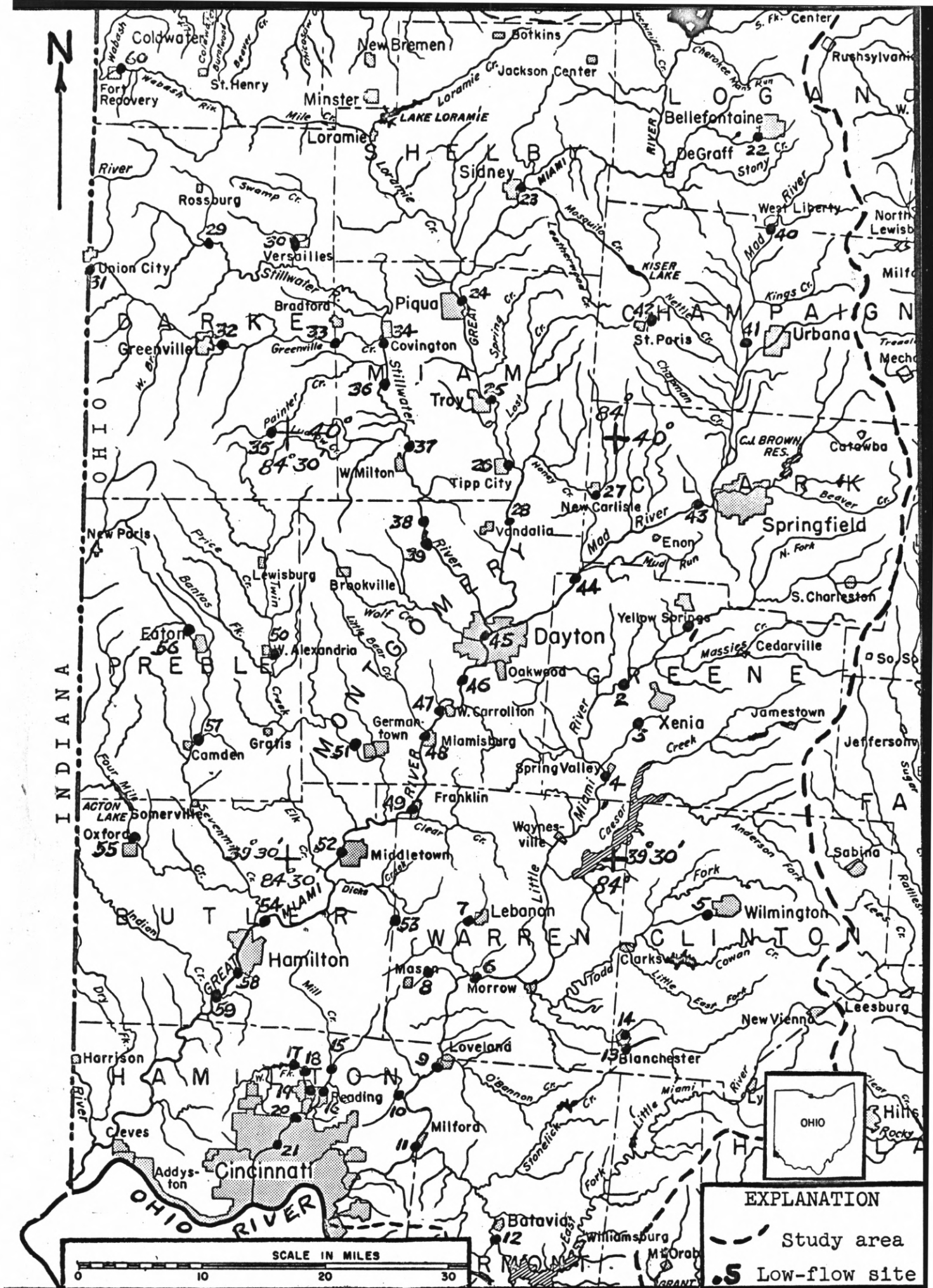


Figure 1.--Map of southwest Ohio showing low-flow sites



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Table 1.--Low-flow data for streams in southwest Ohio.

Stream and community	Map no.	Location	Drainage area (sq mi)	Average flow (cfs)	
				7-day 10-year	1-day 30-year
		Little Miami River basin			
Little Miami River near Yellow Springs <sup>a/</sup> -----	1	Lat 39°47'04", long 83°52'44", 400 feet above Yellow Springs Creek -----	104	4.5	3.2
Little Miami River near Xenia <sup>a/</sup> -----	2	Lat 39°42'02", long 84°00'00", 500 feet below U.S. Highway 35 -----	239	14.3	10.0
Glady Run near Xenia <sup>b/</sup> -----	3	Lat 39°39'01", long 83°58'32", at Hedges Road, 4,500 feet below sewage plant -----	7.29	<sup>c</sup> .07	<sup>c</sup> .02
Little Miami River at Spring Valley <sup>d/</sup> -----	4	Lat 39°36'21", long 84°00'50", 1,500 feet above U.S. Highway 42 -----	361	29.0	21.5
Lyttle Creek at Wilmington <sup>b/</sup> -----	5	Lat 39°26'18", long 83°51'04", at Nelson Avenue, 500 feet above sewage plant -----	8.56	.03	.01
Little Miami River at South Lebanon <sup>a/</sup> -----	6	Lat 39°22'05", long 84°13'03", at bridge 1,000 feet above Turtle Creek -----	969	38.4	25.0
Turtle Creek at Lebanon <sup>b/</sup> -----	7	Lat 39°25'53", long 84°13'31", at Glosser Road, 200 feet above sewage plant -----	22.4	.01	0
Muddy Creek at Mason <sup>b/</sup> -----	8	Lat 39°22'21", long 84°17'19", at private road, 0.2 mile above sewage plant -----	9.91	0	0

See footnotes at end of table, page 14.

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Table 1.--Low-flow data for streams in southwest Ohio.--Continued

Stream and community	Map no.	Location	Drainage area (sq mi)	Average flow (cfs)	
				7-day 10-year	1-day 30-year
		Little Miami River basin--Continued			
Little Miami River at Loveland <sup>a/</sup> -----	9	Lat 39°16'06", long 84°15'38", at McKinney Road, 600 feet below O'Bannon Creek -----	1,145	36.8	23.1
Sycamore Creek near Madeira <sup>b/</sup> -----	10	Lat 39°13'21", long 84°19'41", 300 feet below North Branch Creek and 3,000 feet above mouth -----	22.8	0	0
Little Miami River at Milford <sup>d/</sup> -----	11	Lat 39°10'17", long 84°17'53", 500 feet below U.S. Highway 50 -----	1,203	38.8	24.3
East Fork Little Miami River near Batavia <sup>d/</sup> -----	12	Lat 39°03'36", long 84°10'32", 1,000 feet above State Highway 222 -----	352	0.1	0
Stonelick Creek at Blanchester <sup>b/</sup> -----	13	Lat 39°16'26", long 83°59'13", at Fayetteville Road -----	2.92	0	0
Second Creek at Blanchester <sup>b/</sup> -----	14	Lat 39°17'46", long 83°59'30", at State Highway 133, 2,500 feet above sewage plant -----	6.88	0	0
		Mill Creek basin			
Mill Creek at Sharonville <sup>a/</sup> -----	15	Lat 39°15'15", long 84°25'33", at U.S. Highway Bypass 50, 1,200 feet below Sharon Creek -----	61.7	0.2	.04
Mill Creek at Reading <sup>d/</sup> -----	16	Lat 39°13'15", long 84°26'50", at Koehler Street -----	73.0	0.6	0.3

See footnotes at end of table, page 14.

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Table 1.--Low-flow data for streams in southwest Ohio.--Continued

Stream and community	Map no.	Location	Drainage area (sq mi)	Average flow (cfs)	
				7-day 10-year	1-day 30-year
		Mill Creek basin--Continued			
West Fork Mill Creek near Greenhills <sup>d/</sup> -----	17	Lat 39°15'34", long 84°29'41", at dam -----	29.9	0	0
West Fork Mill Creek at Woodlawn <sup>d/</sup> -----	18	Lat 39°15'15", long 84°28'15", at Riddle Road -----	32.2	0	0
West Fork Mill Creek at Lockland <sup>d/</sup> -----	19	Lat 39°13'35", long 84°27'20", at Lock Street -----	35.6	0.3	0.2
Mill Creek at Carthage <sup>d/</sup> -----	20	Lat 39°12'05", long 84°28'10", 100 feet below Anthony Wayne Avenue -----	115	2.0	1.2
Mill Creek at Mitchell Avenue, Cincinnati <sup>d/</sup> -----	21	Lat 39°09'50", long 84°30'40", at Mitchell Avenue -----	135	2.7	1.5
		Great Miami River basin			
Blue Jacket Creek at Bellefontaine <sup>b/</sup> -----	22	Lat 40°21'01", long 83°46'28", at Township Road 216, 500 feet above sewage plant -----	2.71	.3	.2
Great Miami River at Sidney <sup>d/</sup> ----	23	Lat 40°17'14", long 84°08'57", 100 feet above North Street-----	541	20.7	13.9
Great Miami River at Piqua <sup>d/</sup> ----	24	Lat 40°09'03", long 84°13'44", at Ash Street, U.S. Highway 36 -----	866	23.2	14.0

See footnotes at end of table, page 14.



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Table 1.--Low-flow data for streams in southwest Ohio.--Continued

Stream and community	Map no.	Location	Drainage area (sq mi)	Average flow (cfs)	
				7-day 10-year	1-day 30-year
		Great Miami River basin--Continued			
Great Miami River at Troy <sup>d/</sup> -----	25	Lat 40°02'25", long 84°11'50", 1,300 feet below State Highway 55 -----	926	27.0	17.2
Great Miami River at Tipp City <sup>a/</sup> ----	26	Lat 39°58'04", long 84°10'00", at Tipp-Elizabeth Road -----	969	30.2	19.1
Honey Creek at New Carlisle <sup>b/</sup> -----	27	Lat 39°56'26", long 84°01'02", at New Carlisle Pike -----	35.6	.1	.04
Great Miami River at Vandalia (Taylorsville) <sup>d/</sup> -----	28	Lat 39°52'22", long 84°09'51", 600 feet below Taylorsville Dam -----	1,149	41.2	27.1
Stillwater River at Ansonia <sup>a/</sup> -----	29	Lat 40°13'00", long 84°38'13", at State Highway 118 -----	51.6	.4	.1
Swamp Creek at Versailles <sup>b/</sup> -----	30	Lat 40°13'20", long 84°29'29", 200 feet below the New York Central Railroad, 1,200 feet above sewage plant -----	58.0	.1	.03
Dismal Creek at Union City <sup>b/</sup> -----	31	Lat 40°10'52", long 84°48'23", at State Line Road, 4,500 feet above sewage plant -----	8.91	.04	.01
Greenville Creek near Greenville <sup>d/</sup> -----	32	Lat 40°06'15", long 84°35'55", at highway bridge 1.5 miles east of Greenville -----	142	8.0	5.8
Greenville Creek near Bradford <sup>d/</sup> -----	33	Lat 40°06'08", long 84°25'48", at State Highway 721 -----	193	10.9	7.8

See footnotes at end of table, page 14.

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Table 1.--Low-flow data for streams in southwest Ohio.--Continued

Stream and community	Map no.	Location	Drainage area (sq mi)	Average flow (cfs)	
				7-day 10-year	1-day 30-year
		Great Miami River basin--Continued			
Stillwater River at Covington <sup>d/</sup> -----	34	Lat 40°06'52", long 84°21'27", 100 feet below Bridge Street, 1,300 feet below Greenville Creek -----	437	12.0	7.4
Painter Creek at Arcanum <sup>b/</sup> -----	35	Lat 39°59'35", long 84°33'12", at State Highway Alternate 49, 1,700 feet below Baltimore and Ohio Railroad -----	5.73	0	0
Stillwater River at Pleasant Hill <sup>d/</sup> -----	36	Lat 40°03'28", long 84°21'22", at highway, 0.8 mile northwest of Pleasant Hill -----	503	13.0	7.7
Stillwater River near West Milton <sup>d/</sup> -----	37	Lat 39°59'43", long 84°18'56", at New York Central Railroad, 2.2 miles north of West Milton -----	594	15.0	9.0
Stillwater River at Union <sup>a/</sup> -----	38	Lat 39°53'54", long 84°17'36", at Martindale Road -----	645	16.3	9.7
Stillwater River at Englewood <sup>d/</sup> -----	39	Lat 39°52'10", long 84°16'57", 1,000 feet below Englewood Dam -----	650	16.5	9.8
Mad River at West Liberty <sup>a/</sup> -----	40	Lat 40°14'39", 83°45'51", at Logan-Champaign County line---	59.1	6.8	5.0
Mad River near Urbana <sup>d/</sup> -----	41	Lat 40°06'27", long 83°47'57", at U.S. Highway 36 -----	162	33.1	25.0
Nettle Creek Tributary at St. Paris <sup>b/</sup> -----	42	Lat 40°08'02", long 83°56'58", 100 feet above sewage plant outlet -----	2.24	0	0

See footnotes at end of table, page 14.

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Table 1.--Low-flow data for streams in southwest Ohio.--Continued

Stream and community	Map no.	Location	Drainage area (sq mi)	Average flow (cfs)	
				7-day 10-year	1-day 30-year
		Great Miami River basin--Continued			
Mad River near Springfield <sup>d/</sup> ----	43	Lat 39°55'23", long 83°52'13", 300 feet below Lower Valley Pike -----	490	108	80.3
Mad River at Fairborn <sup>a/</sup> -----	44	Lat 39°50'32", long 84°03'02", below Mud Run -----	608	121	90.8
Great Miami River at Dayton <sup>d/</sup> ---	45	Lat 39°45'55", long 84°11'51", 1,000 feet below Main Street -----	2,511	195	141
Great Miami River at Moraine City <sup>a/</sup> -----	46	Lat 39°41'16", long 84°13'53", at Sellars Road -----	2,605	207	150
Great Miami River at West Carrollton <sup>a/</sup> -----	47	Lat 39°40'28", long 84°15'42", at Farmersville-West Carrollton Road -----	2,647	212	154
Great Miami River at Miamisburg <sup>d/</sup> -----	48	Lat 39°38'45", long 84°17'20", 600 feet below State Highway 725 -----	2,711	218	159
Great Miami River at Franklin <sup>d/</sup> ---	49	Lat 39°33'48", long 84°18'18", at bridge 2 miles above Clear Creek -----	2,727	219	160
Twin Creek at West Alexandria <sup>a/</sup> -----	50	Lat 39°44'40", long 84°31'19", at U.S. Highway 35 -----	142	2.1	1.1
Twin Creek near Germantown <sup>d/</sup> ----	51	Lat 39°38'10", long 84°23'48", 0.3 mile below Germantown Dam -----	275	4.2	2.2

See footnotes at end of table, page 14.



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Table 1.--Low-flow data for streams in southwest Ohio.--Continued

Stream and community	Map no.	Location	Drainage area (sq mi)	Average flow (cfs)	
				7-day 10-year	1-day 30-year
		Great Miami River basin--Continued			
Great Miami River at Middletown <sup>d/</sup> -----	52	Lat 39°31'13", long 84°24'47", at State Highway 122 -----	3,134	241	174
Millers Creek at Monroe <sup>b/</sup> -----	53	Lat 39°26'23", long 84°19'36", at State Highway 63 -----	4.76	0	0
Great Miami River at New Miami <sup>a/</sup> -----	54	Lat 39°25'32", long 84°32'37", 900 feet below U.S. Highway 127, above Four Mile Creek -----	3,298	245	180
Four Mile Creek at Oxford <sup>b/</sup> -----	55	Lat 39°31'24", long 84°44'04" , at State Highway 732 -----	106	.1	.02
Sevenmile Creek at Eaton <sup>b/</sup> -----	56	Lat 39°45'57", long 84°39'13", at Washington-Jackson Road -----	22.5	.3	.2
Sevenmile Creek near Camden <sup>a/</sup> ---	57	Lat 39°38'48", long 84°37'47", at Barnets Mill Road -----	54.4	.5	.2
Great Miami River at Hamilton <sup>d/</sup> -	58	Lat 39°23'28", long 84°34'20", 1,000 feet below Columbia Bridge on Pershing Avenue -----	3,630	267	195
Great Miami River at Fairfield <sup>a/</sup>	59	Lat 39°20'26", long 84°35'34", below Pleasant Run -----	3,662	269	197

See footnotes at end of table. page 14.

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Table 1.--Low-flow data for streams in southwest Ohio.--Continued

Stream and community	Map no.	Location	Drainage area (sq mi)	Average flow (cfs)	
				7-day 10-year	1-day 30-year
Wabash River at Fort Recovery <sup>b/-</sup>	60	Wabash River basin Lat 40°25'05", long 84°45'37", at State Highway 119 -----	71.6	0.3	0.1

- a/ Nearby site on gaged stream.  
b/ Ungaged stream.  
c/ Sewage effluent not included.  
d/ Gaging station.

