A Streamflow Statistics (StreamStats) Web Application for Ohio

By G. F. Koltun, Stephanie P. Kula, and Barry M. Puskas

In cooperation with the Ohio Department of Transportation; U.S. Department of Transportation, Federal Highway Administration; Federal Emergency Management Agency; Ohio Environmental Protection Agency; and Ohio Department of Natural Resources

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16. Abstract

A StreamStats Web application was developed for Ohio that implements equations for estimating a variety of streamflow statistics including the 2-, 5-, 10-, 25-, 50-, 100-, and 500-year peak streamflows, mean annual streamflow, mean monthly streamflows, harmonic mean streamflow, and 25th-, 50th-, and 75th-percentile streamflows. StreamStats is a Web-based geographic information system application designed to facilitate the estimation of streamflow statistics at ungaged locations on streams. StreamStats can also serve precomputed streamflow statistics determined from streamflow-gaging station data. The basic structure, use, and limitations of StreamStats are described in this report.

To facilitate the level of automation required for the StreamStats application, the technique used by Koltun (2003) for computing main-channel slope was replaced with a new computationally robust technique. The new channel slope characteristic, referred to as $SL_{10\text{-}85}$, differed from the National Hydrography Data based channel slope values (SL) reported by Koltun (2003) by an average of -28.3 percent, with the median change being -13.2 percent. In spite of the differences, the two slope measures are strongly correlated.

The change in channel slope values necessitated revision of the full-model equations for flood-peak discharges presented by Koltun (2003). Average standard errors of prediction for the revised full-model equations presented in this report increased by a small amount over those reported by Koltun (2003), with increases ranging from 0.7 to 0.9 percent. Mean percentage changes in the revised regression and weighted flood-frequency estimates relative to regression and weighted estimates reported by Koltun (2003) were small, ranging from -0.72 to -0.25 percent and -0.22 to 0.07 percent, respectively.

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Conversion Factors

Multiply	By	To obtain
	Length	
inch (in.)	25.4	millimeter
foot (ft)	0.3048	meter
mile (mi)	1.609	kilometer
	Volume	
ounce, fluid (fl. oz)	0.02957	liter
gallon (gal)	3.785	liter
cubic inch (in^3)	0.01639	liter
	Area	
square mile (mi^2)	2.590	square kilometer
	Flow rate	
cubic foot per second (ft^3/s)	0.02832	cubic meter per second
million gallons per day (Mgal/d)	0.04381	cubic meter per second

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Abstract

A StreamStats Web application was developed for Ohio that implements equations for estimating a variety of streamflow statistics including the 2-, 5-, 10-, 25-, 50-, 100-, and 500-year peak streamflows, mean annual streamflow, mean monthly streamflows, harmonic mean streamflow, and 25th-, 50th-, and 75th-percentile streamflows. StreamStats is a Web-based geographic information system application designed to facilitate the estimation of streamflow statistics at ungaged locations on streams. StreamStats can also serve precomputed streamflow statistics determined from streamflow-gaging station data. The basic structure, use, and limitations of StreamStats are described in this report.

To facilitate the level of automation required for Ohio's StreamStats application, the technique used by Koltun (2003)[1] for computing main-channel slope was replaced with a new computationally robust technique. The new channel-slope characteristic, referred to as SL_{10-85}, differed from the National Hydrography Data based channel slope values (SL) reported by Koltun (2003)[1] by an average of -28.3 percent, with the median change being -13.2 percent. In spite of the differences, the two slope measures are strongly correlated.

The change in channel slope values resulting from the change in computational method necessitated revision of the full-model equations for flood-peak discharges originally presented by Koltun (2003)[1]. Average standard errors of prediction for the revised full-model equations presented in this report increased by a small amount over those reported by Koltun (2003)[1], with increases ranging from 0.7 to 0.9 percent. Mean percentage changes in the revised regression and weighted flood-frequency estimates relative to regression and weighted estimates reported by Koltun (2003)[1] were small, ranging from -0.72 to -0.25 percent and -0.22 to 0.07 percent, respectively.

[1]Koltun, G.F., 2003, Techniques for Estimating Flood-Peak Discharges of Rural, Unregulated Streams in Ohio, Second Edition: U. S. Geological Survey Water-Resources Investigations Report 03-4164, 76 p

Introduction

A variety of streamflow statistics have been determined for Ohio streamflow-gaging stations in recent years and subsequently published in U. S. Geological Survey reports (Koltun, 2003; Koltun and Whitehead, 2002; Sherwood, 1993, and Straub, 2001). Many of those statistics are used by government agencies, engineers, scientists, and watershed groups for purposes of water management, permitting, and (or) design. Because streamflow statistics commonly are needed at locations where there are no stream gages, several studies have been performed to develop equations for estimating streamflow statistics at ungaged locations in Ohio (Koltun, 2003; Koltun and Whitehead, 2002; and Sherwood, 1993). Historically, the estimation equations were based on explanatory variables that were determined from maps or other hard-copy sources; however, recent equations for estimating selected streamflow statistics have been developed for streams in Ohio using digital geospatial datasets and Geographic Information System (GIS) technology (Koltun, 2003; Koltun and Whitehead, 2002) to derive explanatory variables. The use of a GIS can greatly improve the efficiency of estimating streamflow statistics; however, proper application of the equations with GIS-based explanatory variables depends on use of digital datasets and GIS techniques that are equivalent to those used to determine measures of explanatory variables used in the equations. Unfortunately, use of these digital datasets and GIS techniques requires significant data storage and processing, costly proprietary software programs, and a level of familiarity with GIS techniques that many users lack.

The USGS, in cooperation with Environmental Systems Research Institute (ESRI) Inc., has developed a national Web-based GIS application called StreamStats that can serve published streamflow statistics to the public and facilitate the estimation of streamflow statistics for ungaged sites. As described by Ries and others (2004), the StreamStats application consists of five major components: (1) a user interface that displays maps and allows users to select stream locations where they want streamflow statistics information, (2) a database that contains previously published streamflow statistics and descriptive information for USGS data-collection stations, (3) an automated GIS process that determines drainage boundaries for user-selected ungaged sites and measures the basin characteristics for those sites, (4) a GIS database that stores base-map data needed for users to locate sites of interest and other geospatial data needed for measuring basin characteristics[2], and (5) an automated process that takes the measured basin characteristics for ungaged sites as input, solves regression equations to estimate various streamflow statistics, and outputs the estimates for display to the user in a Web browser window.

The availability of StreamStats presented an opportunity to make GIS-based estimation of streamflow statistics easier, faster, and more consistent for the average user than previous manual and semiautomated techniques. Consequently, the U.S. Geological Survey (USGS), in cooperation with the Ohio Department of Transportation; U.S. Department of Transportation, Federal Highway Administration; Federal Emergency Management Agency; Ohio Environmental Protection Agency; and Ohio Department of Natural Resources have implemented StreamStats for Ohio. To facilitate the level of automation required for Ohio's StreamStats application, a new computationally robust technique for estimating channel slope was implemented which, in turn, necessitated revision of the full-model equations for flood-peak discharges presented by Koltun (2003).

Purpose and Scope

The purposes of this report are to (1) present revised flood-frequency equations and estimates determined on the basis of channel slope estimates derived with a different and computationally more robust technique than previously presented by Koltun(2003), and (2) describe the development, characteristics, use, and limitations of the StreamStats application constructed for Ohio that implements the revised flood-frequency equations as well as equations previously published for selected other streamflow characteristics.

Methods

StreamStats incorporates a web-based map and data server, a geographic information system (ArcGIS), and a hydrologic data structure and toolbox (ArcHydro) to form an integrated GIS application. A large part of the effort involved in implementing StreamStats surrounds developing, quality assuring, and preprocessing geospatial datasets required to determine basin characteristic explanatory variables used in the regression models. The main geospatial datasets required for Ohio's implementation of StreamStats include a 10-meter (32.81 ft) digital elevation model (DEM) developed for this study, the 1992 National Landcover Dataset (NLCD) (U.S. Geological Survey, 2000), the medium resolution (1:100,000 scale) National Hydrography Dataset (NHD) U.S. Geological Survey, 2004), a flood-region boundary dataset for Ohio (Quigley, 2003), a mean annual precipitation dataset (Whitehead, 2002a), and a streamflow variability index dataset (Whitehead, 2002b). All geospatial datasets used in this study were projected to Universal Transverse Mercator, zone 17 coordinates.

Processing of Geospatial Datasets

StreamStats uses a DEM to derive the stream network and drainage area contributing to any chosen point. Consequently, the accuracy and resolution of the DEM can greatly influence the accuracy of the derived stream network and drainage area. The 10-meter (32.81 ft) DEM used in this study was, in general, developed by using the TOPOGRID command (Environmental Systems Research Institute, 2005) to convert 1:24,000 scale hypsographic coverages to grid format. Hypsographic coverages were not available for a small area in Southern Michigan that drains into Ohio so the 10-meter (32.81 ft) DEM for that area was created by resampling the 30-meter (92.83 ft) National Elevation Dataset (NED) to a 10-meter (32.81 ft) grid spacing.

Several of the geospatial datasets were preprocessed to facilitate rapid determination of basin characteristics when using StreamStats and to help ensure accurate basin characteristic determinations. The preprocessing steps include (1) selection of primary flow paths in those areas where the NHD indicated split flow (such as might occur when flow splits around an island in a river), (2) "walling" of basin boundaries, (3)"burning in" streams, and (4) elimination of sinks.

In split flow situations, primary flow paths were determined by examining the 1:24,000 scale digital raster graphic (DRG) and(or) orthophotograph(s) of the area where the flow split occurred. The channel that appeared to carry the greatest amount of flow was selected as the primary flow path and the alternate flow path(s) removed.

The process of "walling" of basin boundaries involves artificially increasing elevations of grid cells that are co-located with known basin boundaries. Walling the basin boundaries ensures that known drainage divides are conserved. Like the burning in process, the walling process is most critical to accurate basin delineation in very flat terrain where small differences between DEM elevations and actual land-surface elevations can result in incorrect derivation of basin divides. The basin boundaries used for walling corresponded to the most resolved hydrologic unit or basin-boundary coverages available (Natural Resources Conservation Service, 1999; U.S. Geological Survey, 1999; Michigan Department of Environmental Quality, 1998 Pennsylvania Department of Environmental Protection, 1998).

The process of "burning in" streams involves artificially reducing elevations of grid cells that are co-located with stream

[2] In this report, the term "basin characteristic" refers to a physical or environmental characteristic that is associated with a specific drainage area. StreamStats computes several basin characteristics on the basis of information contained in geospatial datasets.

lines as defined in the medium resolution (1:100,000 scale) NHD dataset. A surface-reconditioning algorithm called AGREE (Hellweger, 1997) was used to burn in streams. In addition to reducing elevations of grid cells that are co-located with stream lines, the AGREE process creates a smooth transition in elevations between the stream-line grid cells and adjacent grid cells extending a fixed distance (in this case 60 m) away and ensures that there are no in-stream elevation depressions along the flow path.

This stream burning process ensures that the stream network derived from the DEM follows the expected flow pathways at those locations where they are defined in the NHD. That becomes most critical in flat terrain where small differences between DEM elevations and actual land-surface elevations can result in derivation of incorrect flow paths. Ideally, a high resolution (1:24,000 scale) NHD dataset would be used for this purpose; however, at the time of this writing (June, 2006), a high resolution NHD was not available for the entire state. Because of scale differences between the 1:100,000 scale medium resolution NHD and the 1:24,000 scale digital raster graphics (DRGs) of the 7.5 minute quadrangle topographic maps, the DEM-based flow pathways may at times be offset somewhat from the blue lines (representing streams) shown on the DRGs.

Once the DEM has been modified as described above, it is processed to remove depressions that result in non-contributing area (sinks) within a drainage. The process of removing sinks commonly is referred to as “filling”. Implicit in the filling process is the assumption that the sinks are not real, but instead are artifacts in the DEM.

The filled DEM is used to develop a flow direction grid which, in turn, is used to develop a flow-accumulation grid.The flow-direction grid contains values that identify the flow direction from each grid cell to one of its 8 adjacent grid cells. The flow direction is assumed to follow the path of steepest descent from one grid cell to the next. The flow-accumulation grid is created from the flow-direction grid by totaling the number of up-gradient grid cells that contribute to each individual grid cell.

A stream grid (representing the location of streams) is created from the flow-accumulation grid by determining where the flow accumulation grid values exceed a set threshold of contributing area (typically, 15 km^2 (5.79 mi^2)). The stream grid is further processed to establish linkages between stream segments and determine locations of outlets from distinct catchments. Ultimately, flow-accumulation and outlet information are used in combination to delineate gridded representations of catchments, which subsequently are vectorized and used as clipping boundaries along with other geospatial datasets to determine basin characteristics.

Determination of Channel Slope

The NHD-based main-channel slope characteristic (SL) used by Koltun (2003) in Ohio’s most recent peak flow estimation report was abandoned in favor of a new channel slope characteristic that is computationally more robust. The new channel slope characteristic (SL_{10-85}) is computed by (a) determining the longest flowpath from the point of interest to a topographic divide, (b) determining the elevation at 10 percent of the distance along the longest flowpath upstream from the point at which the flow statistic is desired (E_{10}), (c) determining the elevation at 85 percent of the distance along the longest flowpath upstream from the point at which the flow statistic is desired (E_{85}), (d) determining the length of the stream segment between points 10- and 85-percent of the distance along the longest flowpath upstream from the point at which the flow statistic is desired (L_{10-85}), and then (e) dividing the change in elevation (E_{85} - E_{10}) by L_{10-85}.

The SL_{10-85} channel slope values computed for this study (table 1) differed from the SL values reported by Koltun (2003) by an average of -28.3 percent, with the median change being -13.2 percent. In spite of the differences (which were expected due to changes in method of computation), the two slope measures are strongly correlated (Pearson’s r = 0.97) and consequently should provide nearly the same information in regression models. The channel slope characteristic was the only explanatory variable that was changed from those described by Koltun (2003).

Table 1. Selected basin characteristics of streamflow-gaging stations

[Bold station numbers indicate peak streamflows at this station presently (2006) are considered regulated. Station names and locations are given in table 5. Abbreviations: DA, drainage area; SL_{10-85}, channel slope determined by 10-85 method; W, percentage of the basin area classified in the National Land Cover Dataset as the sum of water and wetlands; nd, not determined; ft/mi, feet per mile; mi^2, square miles]

Map ID (fig. 1)	Station number	Region	DA (mi^2)	SL_{10-85} (ft/mi)	W (%)
1	03022500	A	629	6.19	3.87
2	03023000	A	90.2	7.94	7.90
3	03086100	A	15.6	45.8	0.02
4	03086500	A	89.2	11.5	2.79
5	03087000	A	17.4	22.1	1.66
6	03088000	A	33.2	11.5	9.70
7	03089500	A	19.1	10.9	3.94
8	**03090500**	A	248	5.12	4.61
9	03092000	A	21.9	14.1	7.12
10	03092090	A	21.8	20.2	10.22
11	03092100	A	10.6	18.8	6.35
12	**03092500**	A	96.3	10.9	7.03

Table 1. Selected basin characteristics of streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2006) are considered regulated. Station names and locations are given in table 5. Abbreviations: DA, drainage area; SL_{10-85}, channel slope determined by 10-85 method; W, percentage of the basin area classified in the National Land Cover Dataset as the sum of water and wetlands; nd, not determined; ft/mi, feet per mile; mi^2, square miles]

Map ID (fig. 1)	Station number	Region	DA (mi^2)	SL_{10-85} (ft/mi)	W (%)
13	03092600	A	0.21	76	4.89
14	03093000	A	97.6	10.5	10.50
15	03094900	A	8.45	15	9.66
16	**03096000**	A	138	4.9	11.48
17	03098500	A	66.3	6.74	5.39
18	03098700	A	14	44.6	6.65
19	03102900	A	1.13	28.1	1.86
20	03102950	A	96.7	5.47	12.94
21	03104760	A	2.26	51.5	3.87
22	03106000	A	356	5.17	0.13
23	**03106500**	A	398	5.79	3.36
24	03108000	B	178	8.11	0.35
25	03109000	A	6.19	53.9	0.40
26	03109500	A	496	7.89	1.42
27	03110000	B	147	9.36	1.12
28	03110980	B	0.04	457	0.00
29	03111150	B	10.3	35.5	0.00
30	03111450	B	1.31	70.4	0.99
31	03111455	B	10.9	35.8	4.33
32	03111470	B	1.57	75.9	1.59
33	03111490	B	0.44	103	1.05
34	03111500	B	123	15.2	2.34
35	03111540	A	0.34	239	0.00
36	03111548	A	97.7	13.4	1.15
37	03112000	A	281	9.84	0.31
38	03113700	A	4.95	127	0.03
39	03114000	A	134	13.6	0.84
40	03114240	A	0.53	206	0.39

Table 1. Selected basin characteristics of streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2006) are considered regulated. Station names and locations are given in table 5. Abbreviations: DA, drainage area; SL_{10-85}, channel slope determined by 10-85 method; W, percentage of the basin area classified in the National Land Cover Dataset as the sum of water and wetlands; nd, not determined; ft/mi, feet per mile; mi^2, square miles]

Map ID (fig. 1)	Station number	Region	DA (mi^2)	SL_{10-85} (ft/mi)	W (%)
41	03114500	A	458	3.65	0.25
42	03114550	A	0.88	131	0.29
43	03114600	A	1.22	126	0.00
44	03115280	A	5.45	83.7	0.22
45	03115400	A	210	5.5	0.30
46	03115410	A	0.13	301	0.00
47	03115500	A	258	4.32	0.38
48	03115510	A	1.52	110	0.02
49	03115600	A	3.46	67.1	0.31
50	03115710	A	0.19	337	0.76
51	03115973	B	3.65	9.82	5.64
52	03116000	B	174	8.11	7.20
53	03116100	B	16.4	10.3	0.78
54	03116200	B	146	6.07	2.41
55	03117000	B	518	5.24	4.76
56	03117500	B	253	3.14	2.57
57	03118000	B	43.1	4.78	4.23
58	03118500	B	175	6.71	2.57
59	03119000	B	481	4.06	2.87
60	03119700	B	14.3	40.8	1.24
61	**03122500**	B	1,405	2.78	3.18
62	03123400	B	0.74	137	1.07
63	03125000	B	1.64	92.2	0.17
64	03125300	A	2.26	78	0.49
65	03125450	A	1.97	105	0.55
66	03127950	B	5.45	85.1	1.76
67	03128650	A	0.55	149	1.45
68	**03129000**	B	2,443	1.82	1.51

Table 1. Selected basin characteristics of streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2006) are considered regulated. Station names and locations are given in table 5. Abbreviations: DA, drainage area; SL_{10-85}, channel slope determined by 10-85 method; W, percentage of the basin area classified in the National Land Cover Dataset as the sum of water and wetlands; nd, not determined; ft/mi, feet per mile; mi^2, square miles]

Map ID (fig. 1)	Station number	Region	DA (mi^2)	SL_{10-85} (ft/mi)	W (%)
69	03129012	A	0.01	674	0.00
70	03129014	A	0.44	250	0.08
71	03129016	A	0.12	337	0.32
72	03129300	A	0.24	55.7	0.44
73	03130500	A	5.44	34.3	2.78
74	03132000	A	136	7.37	2.26
75	03134000	A	120	10.3	1.17
76	**03136000**	A	948	3.03	0.52
77	03136500	A	202	8.1	1.27
78	03137000	A	455	6.35	1.10
79	**03138500**	A	1,505	3.04	0.30
80	03138900	A	0.9	134	0.08
81	03139000	A	464	3.62	2.54
82	03139930	A	0.54	197	0.73
83	03139940	A	1.44	137	0.30
84	03139960	A	2.38	81.8	0.23
85	03139970	A	0.19	245	0.00
86	03139980	A	4.02	67.3	0.20
87	03139990	A	7.16	40.5	0.23
88	03140000	A	27.2	21.8	0.19
89	03140010	A	0.12	305	0.85
90	03140020	A	0.06	489	0.50
91	03140030	A	0.04	386	0.00
92	03142200	A	55.6	6.41	2.00
93	03144000	A	140	10.2	0.33
94	**03144500**	A	5,993	1.82	0.98
95	03144800	A	1.1	27.6	0.82
96	03145500	A	82.7	13.5	0.78

Table 1. Selected basin characteristics of streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2006) are considered regulated. Station names and locations are given in table 5. Abbreviations: DA, drainage area; SL_{10-85}, channel slope determined by 10-85 method; W, percentage of the basin area classified in the National Land Cover Dataset as the sum of water and wetlands; nd, not determined; ft/mi, feet per mile; mi^2, square miles]

Map ID (fig. 1)	Station number	Region	DA (mi^2)	SL_{10-85} (ft/mi)	W (%)
97	03145600	A	3.17	20.1	2.19
98	03146000	A	116	9.57	0.92
99	03146500	A	537	8.66	1.69
100	03147000	A	672	7.74	1.45
101	**03147500**	A	742	6.83	0.41
102	03147900	A	10.1	40	0.23
103	03148300	A	80.6	8.88	2.49
104	03149500	A	75.7	8.29	0.34
105	**03150000**	A	7,422	1.54	1.11
106	03150600	A	0.99	59.3	0.15
107	03154500	A	79.4	4.86	0.06
108	03155500	A	453	4.09	0.15
109	03157000	A	89	8.63	0.25
110	03157500	A	459	5.72	0.81
111	03158100	A	1.04	97.6	0.03
112	03158220	A	1.09	93.1	0.85
113	03159450	A	1.48	73.9	0.24
114	03159500	A	943	4	0.94
115	03159540	A	156	4.09	0.30
116	03159700	A	0.7	150	0.52
117	03201440	A	1.04	82	0.00
118	03201480	A	0.7	118	0.00
119	03201550	A	0.3	206	0.24
120	03201600	A	0.98	109	0.04
121	03201700	A	1.01	104	0.00
122	03202000	A	585	1.9	0.78
123	03204500	A	256	4.74	0.07
124	03205995	A	0.73	119	0.00

Table 1. Selected basin characteristics of streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2006) are considered regulated. Station names and locations are given in table 5. Abbreviations: DA, drainage area; $SL_{10\text{-}85}$, channel slope determined by 10-85 method; W, percentage of the basin area classified in the National Land Cover Dataset as the sum of water and wetlands; nd, not determined; ft/mi, feet per mile; mi^2, square miles]

Table 1. Selected basin characteristics of streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2006) are considered regulated. Station names and locations are given in table 5. Abbreviations: DA, drainage area; $SL_{10\text{-}85}$, channel slope determined by 10-85 method; W, percentage of the basin area classified in the National Land Cover Dataset as the sum of water and wetlands; nd, not determined; ft/mi, feet per mile; mi^2, square miles]

Map ID (fig. 1)	Station number	Region	DA (mi^2)	$SL_{10\text{-}85}$ (ft/mi)	W (%)
125	03207000	A	291	6.95	0.67
126	03216563	A	0.94	117	1.15
127	03217000	C	242	4.03	0.44
128	03217500	A	257	2.56	0.48
129	03218000	B	72.4	3.7	0.41
130	03219500	A	567	1.61	0.75
131	03219590	A	83.2	4.72	0.52
132	03220000	A	178	4.92	0.75
133	03221000	A	980	1.65	0.74
134	03223000	A	157	5.61	0.74
135	03224000	A	25.4	9.48	0.08
136	03224500	A	98.7	11.5	0.74
137	**03225500**	A	393	3.93	0.76
138	03226200	A	5.84	8.12	0.84
139	03226850	A	0.4	50.6	0.99
140	03228000	A	11	28.8	0.65
141	03228300	A	101	6.92	0.89
142	**03228500**	A	190	10.1	0.59
143	**03228805**	A	122	9.6	0.00
144	**03229000**	A	189	6.69	0.46
145	**03229500**	A	544	7.93	1.87
146	03230500	A	534	4.6	0.80
147	03230600	A	5.66	54.1	0.27
148	03230800	A	228	7.03	0.67
149	**03231000**	A	333	5.98	0.54
150	**03231500**	A	3,849	2.41	1.25
151	03231600	A	3.82	10	0.15
152	03232000	A	249	3.96	0.15
153	03232300	A	209	4.78	0.21
154	**03232500**	A	140	9.41	0.41
155	**03234000**	A	807	5.19	0.73
156	03234100	A	9.6	49.5	0.24
157	**03234500**	A	5,131	2.34	1.05
158	03235000	A	11.5	27.2	0.04
159	03235080	A	3.13	55.9	0.21
160	03235200	A	0.89	118	0.04
161	03235400	A	0.3	226	0.00
162	03235500	A	1.35	143	0.00
163	03235995	A	268	11.9	0.35
164	03236090	A	1.28	77.8	0.20
165	03236100	A	3.76	37.9	0.13
166	03237095	A	1.22	117	0.12
167	03237210	A	1.04	172	0.03
168	03237280	C	12.2	68.5	0.01
169	03237300	C	0.89	54.5	0.12
170	03237500	C	387	8.78	0.41
171	03238030	C	1.9	57	0.10
172	03238400	C	0.88	22.9	0.00
173	03238500	C	218	7.41	0.35
174	03239000	A	48.9	11.1	0.20
175	03239500	A	28.9	10	1.45
176	03240000	A	129	13	0.60
177	03240500	A	28.9	6.91	0.21
178	03241000	A	17.1	6.39	0.06
179	03241500	A	63.2	12.3	0.19
180	03241600	A	4.21	24	0.05

Table 1. Selected basin characteristics of streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2006) are considered regulated. Station names and locations are given in table 5. Abbreviations: DA, drainage area; $SL_{10\text{-}85}$, channel slope determined by 10-85 method; W, percentage of the basin area classified in the National Land Cover Dataset as the sum of water and wetlands; nd, not determined; ft/mi, feet per mile; mi^2, square miles]

Map ID (fig. 1)	Station number	Region	DA (mi^2)	$SL_{10\text{-}85}$ (ft/mi)	W (%)
181	03242050	A	366	9.14	0.54
182	03242100	A	1.01	77.5	0.04
183	03242150	A	71.4	11	0.49
184	03242200	A	77.8	6.93	0.25
185	**03242300**	A	209	7.97	0.00
186	**03242500**	A	680	7.19	0.00
187	03244000	C	219	11.1	0.87
188	**03245500**	C	1,203	6.19	0.70
189	03246500	C	237	5.17	0.47
190	03247100	C	3.34	22.8	0.26
191	**03247500**	C	476	6.9	0.52
192	03248000	C	1,713	6.07	1.12
193	03254400	C	13.6	32.9	0.00
194	03255500	C	73	8.58	0.36
195	**03258000**	C	35.6	20.2	0.26
196	03260700	A	36.3	27.3	0.78
197	03260800	A	59.1	23.6	0.78
198	03261500	A	541	2.79	2.10
199	03262750	A	0.83	76.2	0.17
200	03263100	A	3.11	48.5	0.07
201	03263700	A	4.83	18.5	0.14
202	03264000	A	193	5.01	0.92
203	03265000	A	503	5.39	0.58
204	03265100	A	0.46	21.3	0.05
205	03266500	A	7.31	33.2	1.02
206	03267000	A	162	11.3	0.39
207	03267900	A	310	8.95	0.53
208	03268000	A	65.3	18	0.56

Table 1. Selected basin characteristics of streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2006) are considered regulated. Station names and locations are given in table 5. Abbreviations: DA, drainage area; $SL_{10\text{-}85}$, channel slope determined by 10-85 method; W, percentage of the basin area classified in the National Land Cover Dataset as the sum of water and wetlands; nd, not determined; ft/mi, feet per mile; mi^2, square miles]

Map ID (fig. 1)	Station number	Region	DA (mi^2)	$SL_{10\text{-}85}$ (ft/mi)	W (%)
209	03268300	A	3.33	16.6	0.36
210	03268500	A	39.2	14.7	1.36
211	**03269000**	A	139	14.7	0.61
212	**03269500**	A	490	26.1	0.58
213	**03270500**	A	2,511	3.24	1.01
214	03270800	C	22.7	15.6	0.22
215	03271000	C	68.7	16.2	0.33
216	03271800	C	197	9.3	0.26
217	03272695	C	0.33	129	0.11
218	03272700	C	69	15.8	0.23
219	03272800	C	120	15.5	0.57
220	03272900	C	0.94	116	0.08
221	03273500	C	307	13	0.67
222	**03274000**	A	3,630	3.21	0.90
223	03274100	C	0.29	84.3	0.25
224	03274880	C	0.78	52.1	0.13
225	03275500	C	121	12.1	1.05
226	03275600	C	200	11.2	1.13
227	03275800	C	0.3	103	0.00
228	03275900	C	5.39	23.3	0.19
229	03276640	C	0.25	343	0.79
230	03322500	A	262	7.54	7.75
231	03325500	A	133	7.54	1.01
232	04096515	B	48.7	13.5	6.19
233	04099060	B	1.22	18.4	1.67
234	04176000	B	463	5.28	7.78
235	04176900	B	3.52	14.6	4.37
236	04177400	B	1.84	12.1	3.91

Table 1. Selected basin characteristics of streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2006) are considered regulated. Station names and locations are given in table 5. Abbreviations: DA, drainage area; $SL_{10\text{-}85}$, channel slope determined by 10-85 method; W, percentage of the basin area classified in the National Land Cover Dataset as the sum of water and wetlands; nd, not determined; ft/mi, feet per mile; mi^2, square miles]

Map ID (fig. 1)	Station number	Region	DA (mi^2)	$SL_{10\text{-}85}$ (ft/mi)	W (%)
237	04177720	B	37.5	10.9	6.86
238	04178000	B	610	3.54	4.70
239	04179500	B	87.3	7.23	2.38
240	04180000	B	270	5.91	3.57
241	04182590	B	21.9	4.03	1.05
242	04183500	B	2,129	1.72	2.65
243	04183750	B	0.34	34.9	0.85
244	04184500	B	206	6.83	5.16
245	04184750	B	2.58	18.9	0.26
246	04184760	B	0.56	29.2	1.30
247	04185000	B	410	5.28	3.70
248	04185150	B	0.4	41.3	1.90
249	04185440	B	4.23	17.1	1.30
250	04185945	B	0.51	20.1	0.00
251	04186500	B	332	3.45	0.57
252	04186800	B	0.53	45.9	0.34
253	04187100	B	128	4.32	1.58
254	04187500	B	160	3.91	1.51
255	04187945	B	1.45	12.4	1.07
256	04188500	B	55	8.5	0.70
257	04189000	B	346	3.44	1.22
258	04189100	B	4.65	9.89	0.71
259	04189500	B	644	2.7	0.98
260	04190350	B	1.04	5.79	0.25
261	04190500	B	5.14	7.89	0.54
262	04191480	B	1.66	6.61	0.54
263	04191500	B	2,318	1.91	0.80
264	04192500	B	5,545	1.36	1.95

Table 1. Selected basin characteristics of streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2006) are considered regulated. Station names and locations are given in table 5. Abbreviations: DA, drainage area; $SL_{10\text{-}85}$, channel slope determined by 10-85 method; W, percentage of the basin area classified in the National Land Cover Dataset as the sum of water and wetlands; nd, not determined; ft/mi, feet per mile; mi^2, square miles]

Map ID (fig. 1)	Station number	Region	DA (mi^2)	$SL_{10\text{-}85}$ (ft/mi)	W (%)
265	04192900	B	0.98	13.7	0.35
266	04193500	B	6,330	1.21	1.87
267	04195500	B	428	3.8	1.29
268	04196000	B	88.8	6.81	1.42
269	04196500	B	298	5.9	1.26
270	04196700	B	5.29	9.13	0.27
271	04196800	B	229	3	0.90
272	04197000	B	774	3.98	1.06
273	04197100	B	149	4.85	0.99
274	04197170	B	34.6	7.11	0.44
275	04197300	B	66.2	5.59	0.73
276	04197400	B	70.1	6.74	0.67
277	04197500	B	4.28	9.17	1.41
278	04198000	B	1,251	3.75	1.06
279	04198100	A	4.92	15.4	0.12
280	04198500	A	85.5	15.1	0.97
281	04199000	A	371	9.38	1.02
282	04199155	A	22.1	30.9	1.55
283	04199500	A	262	6.93	1.68
284	04199800	A	0.76	29.9	0.81
285	04200000	A	217	6.67	2.04
286	04200100	A	4.83	12.6	3.15
287	04200500	A	396	6.47	2.26
288	04201500	A	267	9.08	2.87
289	**04202000**	A	151	3.54	12.14
290	04206212	A	5.58	48.8	2.51
291	04206220	A	30.7	34.4	4.29
292	04207200	A	83.9	4.69	8.93

Table 1. Selected basin characteristics of streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2006) are considered regulated. Station names and locations are given in table 5. Abbreviations: DA, drainage area; $SL_{10\text{-}85}$, channel slope determined by 10-85 method; W, percentage of the basin area classified in the National Land Cover Dataset as the sum of water and wetlands; nd, not determined; ft/mi, feet per mile; mi^2, square miles]

Map ID (fig. 1)	Station number	Region	DA (mi^2)	$SL_{10\text{-}85}$ (ft/mi)	W (%)
293	04208000	A	707	6.97	9.45
294	04209000	A	246	13.3	5.48
295	04210000	A	25.6	20	12.47
296	04210090	A	0.29	47.9	1.12
297	04210100	A	5.42	25.3	25.84
298	**04211000**	A	69.2	2.46	17.91
299	04211500	A	82	9.08	18.52
300	04212000	A	581	1.53	16.42
301	04212100	A	685	2.33	15.18
302	04212500	A	121	11.4	17.74
303	04212600	A	0.88	101	6.48
304	04213000	A	175	6.71	3.10
305	04213040	A	2.53	55.8	6.27

Generalized Least-Squares Regression Analysis

Generalized least-squares (GLS) regression analyses were done using data from the same 305 streamflow-gaging stations used by Koltun (2003) with the exception that $SL_{10\text{-}85}$ was substituted for the NHD-based main-channel slope characteristic used previously (fig. 1 and table 1). Otherwise, the techniques and streamflow-gaging station data used to develop the revised regression models are identical to those described by Koltun (2003) with the exceptions that no ordinary least-squares regression analyses were done and no attempt was made to reevaluate flood-region boundaries or alternative model forms. Readers who are interested in more information about GLS regression or aspects of model development are referred to Koltun (2003).

Table 2 shows summary statistics of the basin characteristics used to develop the revised equations. Appendix B contains descriptions of the characteristics listed in table 2.

The revised GLS regression full-model equations are shown in table 3. $SL_{10\text{-}85}$ was statistically significant ($p \leq 0.0001$) in the revised equations. Average standard errors of prediction for the full-model equations presented in this report increased by a small amount over those reported by Koltun (2003), with increases ranging from 0.7 to 0.9 percent. The simple-model equations reported by Koltun (2003) (table 4) were not revised because they relate peak streamflows only to drainage area, which did not change.

Flood-frequency estimates determined by means of the revised full-model equations are reported in table 5 (page 17) along with the at-site log-Pearson Type III estimates and estimates determined as a weighted average of the at-site log-Pearson Type III estimate and the regression estimate (see Koltun, 2003, for a discussion of the weighting technique). Mean percentage changes in the revised regression and weighted flood-frequency estimates relative to regression and weighted estimates reported by Koltun (2003) were small, ranging from -0.72 to -0.25 percent and -0.22 to 0.07 percent, respectively (table 6). In the most extreme case (corresponding to the 500-year recurrence interval), 80 percent of the revised weighted estimates changed by no more than 2.54 percent (table 6). The revised weighted estimates reported in table 5 do not necessarily supersede those reported by Koltun (2003). They merely represent alternative estimates based on a different set of explanatory variables.

The revision to the full-model equation necessitated revision of the matrices, model error variances, and maximum mean-square sampling errors required to determine confidence intervals and to test for extrapolation. Those revisions are reported in appendix A.

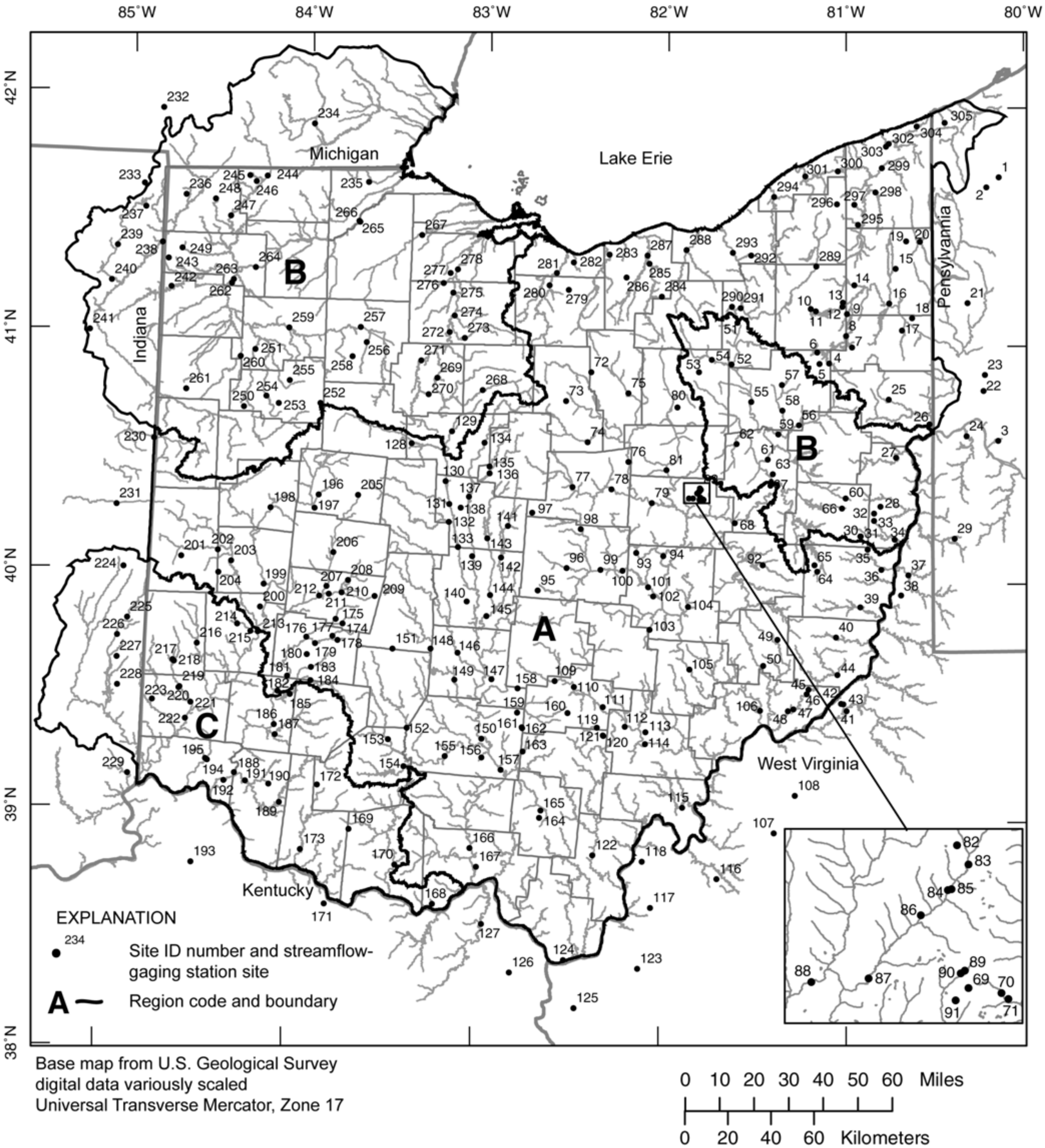

Figure 1. Locations of streamflow-gaging stations used in the analyses.

Table 2. Statistics of selected basin characteristics, by region, for streamflow-gaging stations used in the regression analyses

[*DA*, drainage area; $SL_{10\text{-}85}$, channel slope determined by 10-85 method; *W*, percentage of the basin classified as water and wetlands; mi^2, square miles; ft/mi, feet per mile]

Region	Statistic	DA (mi^2)	$SL_{10\text{-}85}$ (ft/mi)	W (percent)
A	Maximum	7,422	674	25.8
	Minimum	.01	1.53	.00
	Mean	290.5	49.3	2.13
	Median	64.3	11.5	0.67
B	Maximum	6,330	457	7.78
	Minimum	.04	1.21	.00
	Mean	414	25.6	1.95
	Median	60.6	7.17	1.28
C	Maximum	1,713	343	1.13
	Minimum	.25	4.03	.00
	Mean	192.	42.0	.39
	Median	68.7	15.8	.26

Table 3. Full-model equations for estimating flood-peak discharges of rural, unregulated streams in Ohio

[Q_t, flood-peak discharge with a *t*-year recurrence interval, in cubic feet per second; *DA*, drainage area in square miles; $SL_{10\text{-}85}$, channel slope in feet per mile determined from 10-85 method; *W*, percentage of the drainage area classified in the 1992 National Land Cover Dataset as open water and wetlands]

Equation number	Equation	Average standard error of prediction (percent)	Average equivalent years of record
1	$Q_2 = (RC)(DA)^{0.777}(SL_{10\text{-}85})^{0.130}(W+1)^{-0.187}$	37.0	2.1
2	$Q_5 = (RC)(DA)^{0.764}(SL_{10\text{-}85})^{0.170}(W+1)^{-0.232}$	34.6	3.3
3	$Q_{10} = (RC)(DA)^{0.761}(SL_{10\text{-}85})^{0.191}(W+1)^{-0.253}$	34.4	4.4
4	$Q_{25} = (RC)(DA)^{0.758}(SL_{10\text{-}85})^{0.211}(W+1)^{-0.273}$	35.4	5.9
5	$Q_{50} = (RC)(DA)^{0.757}(SL_{10\text{-}85})^{0.222}(W+1)^{-0.285}$	36.5	6.8
6	$Q_{100} = (RC)(DA)^{0.757}(SL_{10\text{-}85})^{0.232}(W+1)^{-0.295}$	37.9	7.5
7	$Q_{500} = (RC)(DA)^{0.756}(SL_{10\text{-}85})^{0.251}(W+1)^{-0.314}$	42.1	8.6

where *RC* is the regression constant for a region taken from the following matrix:

Region	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Q_{500}
A	71.4	111.1	136.8	168.7	191.9	214.7	266.0
B	50.4	75.8	91.1	108.9	121.3	132.9	157.5
C	115.6	171.4	205.4	246.2	275.2	303.1	363.8

Table 4. Simple (drainage-area only) equations for estimating flood-peak discharges of rural, unregulated streams in Ohio

[Q_t, flood-peak discharge with a *t*-year recurrence interval, in cubic feet per second; *DA*, drainage area in square miles]

Equation number	Equation	Average standard error of prediction (percent)	Average equivalent years of record
1	$Q_2 = (RC)(DA)^{0.716}$	39.6	1.9
2	$Q_5 = (RC)(DA)^{0.686}$	39.0	2.6
3	$Q_{10} = (RC)(DA)^{0.674}$	39.5	3.4
4	$Q_{25} = (RC)(DA)^{0.663}$	41.1	4.4
5	$Q_{50} = (RC)(DA)^{0.657}$	42.7	5.1
6	$Q_{100} = (RC)(DA)^{0.652}$	44.4	5.7
7	$Q_{500} = (RC)(DA)^{0.644}$	49.0	6.6

where *RC* is the regression constant for a region taken from the following matrix:

Region	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Q_{500}
A	106.3	186.1	244.4	321.0	379.6	439.1	582.3
B	69.1	114.9	146.1	184.9	213.0	240.5	302.5
C	188.6	322.7	417.5	539.3	630.6	721.9	936.9

StreamStats

The Ohio implementation of StreamStats allows a user to select any point in Ohio (excepts points in the Ohio River and Lake Erie proper) by means of a Web-based GIS interface. Points can not be selected until the display is sufficiently zoomed in so that the “BasinDelineation” button is active (not greyed out). Once the BasinDelineation button is active and has been selected, a point can be selected by left-clicking on it. StreamStats then determines and displays the boundary of the area that drains to that point[3] and requests confirmation that the displayed drainage boundary is correct. If the drainage boundary is not correct because the point selected lies off the intended location, the boundary can be rejected and a new point selected. If instead the drainage boundary is not correct due to other factors (for example, two areas that are separated by what would otherwise be a drainage divide could be connected by a culvert; however, that connection might not be reflected in NHD or the DEM), the derived basin boundary can be confirmed and later modified manually with the “EditBasin” tool built into the StreamStats interface. Once an acceptable drainage boundary has been defined, StreamStats can determine the other basin characteristics required to compute the desired streamflow statistics by selecting the “FlowStats” button on the StreamStats toolbar. After StreamStats computes basin characteristics for a point of interest, the characteristics are passed to the USGS National Streamflow Statistics Program (NSS) (formerly referred to as the National Flood Frequency Program (Ries and others, 2002)), which computes estimates of the streamflow statistics. Depending on how a particular regression model was developed and what information is supplied, NSS may compute confidence limits for a streamflow statistic. The streamflow statistics and confidence limits (if applicable) are returned to the StreamStats Web interface and displayed in a pop-up window.

[3]Determination of the drainage boundary involves an on-the-fly delineation using the DEM from the point of interest up to where the dynamically determined boundary intersects with a static predetermined basin boundary. The dynamically determined boundary is merged with the static predetermined boundary to form the total drainage boundary.

Table 6. Statistics of percent differences between old and new flood-frequency estimates

[old flood-frequency estimates are from Koltun (2003); all statistics based on 305 observations]

Estimate type	Statistic	Statistics of differences between old and new flood-frequency estimates expressed as a percentage of the old flood-frequency estimates						
		2-year	5-year	10-year	25-year	50-year	100-year	500-year
Regression estimates	mean	-0.30	-0.25	-0.31	-0.40	-0.54	-0.58	-0.72
	median	0.00	0.00	0.00	-0.20	0.00	-0.24	-0.63
	10th percentile	-7.27	-8.26	-8.95	-9.69	-10.24	-10.44	-11.45
	90th percentile	6.64	7.87	8.33	8.57	8.59	8.78	9.24
Weighted estimates	mean	0.07	0.04	-0.01	-0.03	-0.09	-0.13	-0.22
	median	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10th percentile	-0.74	-1.02	-1.33	-1.56	-1.89	-2.06	-2.54
	90th percentile	0.76	0.98	1.36	1.63	1.81	2.10	2.45

StreamStats has a “Download” button that initiates download of a shapefile[4] of the drainage boundary that can be imported into a local GIS. StreamStats attributes the basin boundary shapefile (called GlobalWatershed) with the computed basin characteristics and streamflow statistic estimates. StreamStats also has a variety of other features such as the ability to (1) trace upstream or downstream from a point on the NHD streamline, (2) zoom to a NHD reach address, and (3) determine the NHD reach address for a user-selected reach. Information on these and other features can be obtained by clicking on the “Help” button in the StreamStats application.

The StreamStats application for Ohio implements the the full-model flood-frequency equations contained in this report. It also implements the best-fit streamflow statistics equations for mean annual streamflow, mean monthly streamflows, harmonic mean streamflow, and 25th-, 50th-, and 75th-percentile streamflows presented by Koltun and Whitehead (2002). Links to the Ohio implementation of StreamStats can be found on the StreamStats Web page at http://streamstats.usgs.gov.

[4]Shapefiles are actually groups of files sharing a common root file name. Shapefiles minimally consist of a main file, an index file, and a database file. Geometric features are stored as a set of vector coordinates with associated attribute information. Shapefiles do not explicitly store topological relationships.

Limitations

Estimates of streamflow statistics provided by StreamStats are based on the assumption that streamflow is not appreciably regulated with respect to the statistic being estimated. It should not be assumed that StreamStats will provide any warning about the presence (or possible presence) of streamflow regulation. Consequently, it is the user’s responsibility to ensure that streamflows are regulated, or to adjust estimates appropriately to account for its effect. Factors other than regulation (significant urbanization, for example) can result in altered streamflows, which can invalidate the estimates provided by StreamStats. Here again, it is the user’s responsibility to evaluate those factors to ensure that the regressions equations are not being misapplied. To that end, users are strongly encouraged to review the original reports on the regression models (Koltun, 2003; Koltun and Whitehead, 2002) which describe the limitations of the equations implemented in StreamStats.

StreamStats compares basin characteristics that it computes against the range of values used to develop the applicable regression equations. If the magnitude of a computed basin characteristic is outside of the range of values used to develop the regression equation, StreamStats displays a warning along with the estimates of the statistics. In those cases, the estimate represents an extrapolation which can result in larger than expected error. Extrapolations should be avoided if possible, particularly if one or more basin characteristics determined by StreamStats lies appreciably outside the range of values used for model development.

The geospatial datasets used by StreamStats represent discrete approximations of continuous spatial characteristics. Although we have attempted to use the best available data, there may be errors in the datasets or other factors that result in determination of inaccurate basin-characteristic measures or incorrect basin boundaries. For example, in extremely low relief areas, the digital elevation model may not be sufficiently resolved to accurately detect some basin divides. Also, it is possible that the geospatial datasets don't reflect the current conditions on the landscape such as might arise if a stream channel had been rerouted subsequent to the creation of the spatial dataset. Another possible scenario that can lead to inaccuracies in basin-characteristic measures and basin boundaries is that in which a sufficiently elevated roadway embankment spans from one point on the topographic divide to another point on the divide within the same basin, resulting in what appears (on the basis of the DEM alone) to be a new topographic divide.

Because map-based drainage areas were used to develop regression estimates presented in this report, streamflow statistic estimates derived by selecting a gage location within StreamStats may differ somewhat from those reported in table 5. Although differences between map-based drainage areas and those determined by StreamStats were generally small (averaging about 0.2 percent of the map-based value), map-based drainage areas were used to develop the regression equations and estimates because it was felt that they were the most accurate drainage areas available. In some cases, the map-based drainage areas were based in part on field inspections or surveys in areas where locations of basin divides could not be ascertained with reasonable certainty from a topographic map.

Acknowledgments

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Summary

StreamStats is a Web-based GIS application for serving predetermined streamflow statistics and computing estimates of streamflow statistics at ungaged locations. A StreamStats application was developed for Ohio that implements the full-model flood-frequency equations contained in this report and best-fit streamflow statistics equations for mean annual streamflow, mean monthly streamflows, harmonic mean streamflow, and 25th-, 50th-, and 75th-percentile streamflows presented by Koltun and Whitehead (2002). Links to the Ohio implementation of StreamStats can be found on the StreamStats Web page at http://streamstats.usgs.gov.

To facilitate the level of automation required for the StreamStats application, a new computationally robust technique for estimating channel slope was implemented. The new channel slope characteristic, referred to as $SL_{10\text{-}85}$, differed from the NHD-based main-channel slope values (SL) reported by Koltun (2003) by an average of -28.3 percent, with the median change being -13.2 percent. In spite of the differences, the two slope measures are strongly correlated and consequently should provide nearly the same information in regression models.

The change in channel slope values necessitated revision of the full-model equations for flood-peak discharges presented by Koltun (2003). Average standard errors of prediction for the revised full-model equations presented in this report increased by a small amount over those reported by Koltun (2003), with increases ranging from 0.7 to 0.9 percent. Mean percentage changes in the revised regression and weighted flood-frequency estimates relative to regression and weighted estimates reported by Koltun (2003) were small, ranging from -0.72 to -0.25 percent and -0.22 to 0.07 percent, respectively.

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FLOOD FREQUENCY TABLE

Table 5. Flood-frequency data for streamflow-gaging stations

[Bold station numbers indicate peak streamflows at this station presently (2003) are considered regulated. For each station, the upper numbers are the log-Pearson Type III estimates, the middle numbers are regression estimates, and the lower numbers are weighted estimates. Streamflow-gaging stations are in Ohio unless indicated otherwise. Abbreviations: ft^3/s, cubic feet per second.]

Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Calendar year	Magnitude (ft^3/s)
1	03022500	French Creek at Saegerstown, Pa.	41°42′50″	80°08′50″	10,500	13,800	15,900	18,500	20,400	22,300	26,600	19	1913, 1922-1939	1913	26,300
					10,000	14,400	17,500	21,300	24,100	26,900	33,500				
					10,400	13,900	16,100	19,000	21,100	23,200	28,000				
2	03023000	Cussewago Creek near Meadville, Pa.	41°40′20″	80°12′55″	1,540	2,110	2,540	3,130	3,610	4,130	5,500	28	1911-1938	1913	5,250
					2,050	2,970	3,590	4,360	4,930	5,490	6,790				
					1,560	2,160	2,620	3,250	3,760	4,300	5,690				
3	03086100	Big Sewickley Creek near Ambridge, Pa.	40°36′27″	80°09′49″	622	1,010	1,320	1,790	2,180	2,630	3,870	16	1963-1978	1975	2,540
					988	1,730	2,280	3,010	3,570	4,140	5,510				
					659	1,110	1,500	2,070	2,540	3,050	4,400				
4	03086500	Mahoning River at Alliance	40°55′58″	81°05′41″	2,120	3,380	4,380	5,840	7,090	8,490	12,400	60	1942-2001	1959	9,740
					2,500	3,820	4,740	5,900	6,770	7,630	9,650				
					2,130	3,390	4,390	5,850	7,070	8,410	12,100				
5	03087000	Beech Creek near Bolton	40°55′50″	81°08′50″	1,080	1,580	1,910	2,310	2,600	2,890	3,530	12	1944-1954, 1959	1950	2,210
					818	1,330	1,690	2,160	2,510	2,860	3,690				
					1,040	1,530	1,850	2,260	2,570	2,880	3,600				
6	03088000	Deer Creek at Limaville	40°58′45″	81°09′35″	1,060	1,340	1,540	1,790	1,990	2,190	2,690	15	1942-1955, 1959	1959	3,660
					956	1,410	1,720	2,100	2,390	2,660	3,310				
					1,050	1,350	1,560	1,840	2,050	2,270	2,800				
7	03089500	Mill Creek near Berlin Center	41°00′01″	80°58′07″	972	1,360	1,620	1,940	2,180	2,420	2,980	36	1942-1977	1946	1,900
					714	1,100	1,360	1,690	1,930	2,170	2,730				
					959	1,340	1,600	1,910	2,150	2,390	2,940				
8	**03090500**	Mahoning River below Berlin Dam near Berlin Center	41°02′54″	81°00′05″	5,560	7,410	8,530	9,850	10,800	11,700	13,600	12	1931-1942	1937	8,630
					4,630	6,640	8,000	9,710	11,000	12,200	15,100				
					5,430	7,260	8,400	9,810	10,800	11,900	14,100				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2003) are considered regulated. For each station, the upper numbers are the log-Pearson Type III estimates, the middle numbers are regression estimates, and the lower numbers are weighted estimates. Streamflow-gaging stations are in Ohio unless indicated otherwise. Abbreviations: ft^3/s, cubic feet per second.]

Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Calendar year	Magnitude (ft^3/s)
9	03092000	Kale Creek near Pricetown	41°08′23″	80°59′43″	1,090	1,660	2,100	2,750	3,300	3,920	5,630	52	1942-1993	1959	3,890
					748	1,130	1,400	1,730	1,970	2,210	2,770				
					1,080	1,630	2,050	2,640	3,140	3,680	5,160				
10	03092090	West Branch Mahoning River near Ravenna	41°09′41″	81°11′50″	922	1,310	1,590	1,960	2,250	2,550	3,300	36	1966-2001	1979	2,810
					736	1,120	1,370	1,700	1,940	2,180	2,730				
					914	1,300	1,570	1,930	2,210	2,500	3,210				
11	03092100	Hinkley Creek near Charlestown	41°09′10″	81°10′05″	334	499	625	805	955	1,120	1,560	23	1947-1969	1959	2,400
					450	700	871	1,090	1,250	1,400	1,770				
					341	516	653	847	1,000	1,170	1,610				
12	**03092500**	West Branch Mahoning River near Newton Falls	41°10′18″	81°01′16″	2,570	3,730	4,530	5,590	6,400	7,230	9,270	40	1927-1966	1959	8,340
					2,290	3,380	4,110	5,040	5,730	6,410	7,980				
					2,560	3,710	4,500	5,540	6,330	7,130	9,090				
13	03092600	Ordnance Creek near Newton Falls	41°11′20″	81°01′05″	37	66	89	121	147	175	246	13	1950-1962	1956	103
					27	47	61	79	93	107	139				
					35	60	78	102	120	139	185				
14	03093000	Eagle Creek at Phalanx Station	41°15′40″	80°57′16″	2,680	3,780	4,500	5,400	6,050	6,700	8,200	72	1927-1934, 1938-2001	1979	8,150
					2,150	3,120	3,770	4,580	5,170	5,760	7,130				
					2,670	3,760	4,470	5,360	6,000	6,640	8,120				
15	03094900	Walnut Creek at Cortland	41°19′49″	80°43′28″	487	816	1,050	1,370	1,610	1,860	2,460	31	1947-1977	1959	1,470
					342	520	640	789	898	1,010	1,260				
					479	789	1,000	1,280	1,480	1,690	2,190				
16	**03096000**	Mosquito Creek at Niles	41°11′02″	80°45′39″	1,580	2,450	3,060	3,840	4,450	5,050	6,510	14	1930-1943	1943	3,080
					2,510	3,500	4,150	4,960	5,550	6,130	7,470				
					1,630	2,540	3,180	4,020	4,640	5,260	6,720				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2003) are considered regulated. For each station, the upper numbers are the log-Pearson Type III estimates, the middle numbers are regression estimates, and the lower numbers are weighted estimates. Streamflow-gaging stations are in Ohio unless indicated otherwise. Abbreviations: ft^3/s, cubic feet per second.]

Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Calendar year	Magnitude (ft^3/s)
17	03098500	Mill Creek at Youngstown	41°04′19″	80°41′26″	1,470	2,410	3,190	4,350	5,360	6,510	9,790	35	1913, 1944-1977	1913	7,140
					1,680	2,470	2,990	3,650	4,140	4,620	5,730				
					1,480	2,420	3,170	4,280	5,220	6,260	9,140				
18	03098700	Crab Creek at Youngstown	41°07′20″	80°38′08″	671	857	982	1,140	1,270	1,390	1,700	24	1959-1982	1959	2,140
					621	993	1,260	1,590	1,840	2,090	2,680				
					668	866	1,010	1,190	1,340	1,490	1,840				
19	03102900	Clear Creek at Dilworth	41°26′45″	80°39′56″	64	123	175	254	324	404	632	31	1947-1977	1958	749
					100	169	218	281	328	375	485				
					66	127	180	258	325	398	595				
20	03102950	Pymatuning Creek at Kinsman	41°26′34″	80°35′18″	1,420	1,960	2,310	2,720	3,010	3,290	3,900	36	1966-2001	1986	2,740
					1,890	2,650	3,150	3,760	4,210	4,650	5,660				
					1,430	1,990	2,360	2,800	3,110	3,420	4,090				
21	03104760	Harthegig Run near Greenfield, Pa.	41°11′10″	80°19′38″	175	273	342	434	505	577	756	12	1969-1980	1980	398
					167	281	362	466	544	622	806				
					174	274	347	444	519	594	777				
22	03106000	Connoquenessing Creek near Zelienople, Pa.	40°49′01″	80°14′33″	7,970	10,700	12,600	15,100	17,000	19,000	23,800	86	1916-2001	1924	23,000
					8,290	12,700	15,800	19,800	22,800	25,800	32,900				
					7,980	10,800	12,800	15,400	17,400	19,500	24,600				
23	**03106500**	Slippery Rock Creek at Wurtemburg, Pa.	40°53′02″	80°14′02″	7,480	10,900	13,200	16,100	18,400	20,600	26,000	57	1912-1932, 1934-1969	1937	19,000
					7,120	10,300	12,500	15,300	17,400	19,400	24,100				
					7,470	10,800	13,100	16,100	18,300	20,500	25,900				
24	03108000	Raccoon Creek at Moffatts Mill, Pa.	40°37′40″	80°20′16″	3,720	5,550	6,820	8,490	9,770	11,100	14,300	76	1916-1932, 1942-1994, 1996-2001	1922	10,000
					3,500	5,290	6,480	7,930	8,970	9,970	12,200				
					3,710	5,540	6,800	8,450	9,700	11,000	14,000				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2003) are considered regulated. For each station, the upper numbers are the log-Pearson Type III estimates, the middle numbers are regression estimates, and the lower numbers are weighted estimates. Streamflow-gaging stations are in Ohio unless indicated otherwise. Abbreviations: ft^3/s, cubic feet per second.]

Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years: 2	5	10	25	50	100	500	Record: Years	Period used	Largest recorded discharge: Calendar year	Magnitude (ft^3/s)
25	03109000	Lisbon Creek at Lisbon	40°46′55″	80°45′53″	382	614	797	1,060	1,290	1,540	2,230	35	1947-1981	1958	1,500
					464	815	1,080	1,420	1,680	1,950	2,590				
					387	630	828	1,110	1,350	1,610	2,300				
26	03109500	Little Beaver Creek near East Liverpool	40°40′33″	80°32′27″	8,980	13,300	16,400	20,600	24,000	27,600	36,800	86	1916-2001	1941	25,000
					9,820	14,800	18,200	22,700	26,000	29,300	37,100				
					8,990	13,300	16,400	20,700	24,100	27,700	36,800				
27	03110000	Yellow Creek near Hammondsville	40°32′16″	80°43′31″	3,020	4,390	5,420	6,840	8,000	9,240	12,500	61	1941-2001	1952	9,580
					2,820	4,220	5,140	6,260	7,050	7,810	9,520				
					3,010	4,390	5,400	6,800	7,910	9,100	12,200				
28	03110980	Consol Run at Bloomingdale	40°19′56″	80°48′44″	6	12	17	24	30	37	55	10	1978-1987	1980	17
					9	18	25	34	41	48	64				
					7	15	21	30	37	44	61				
29	03111150	Brush Run near Buffalo, Pa.	40°11′54″	80°24′28″	533	933	1,240	1,670	2,010	2,380	3,310	21	1961-1978, 1983-1985	1978	1,700
					490	826	1,060	1,350	1,570	1,780	2,250				
					529	917	1,200	1,590	1,880	2,190	2,940				
30	03111450	Branson Run at Georgetown	40°12′26″	80°55′22″	58	102	139	193	239	290	433	11	1978-1987, 1990	1990	190
					95	164	212	272	315	357	453				
					64	117	162	223	272	321	443				
31	03111455	South Fork Short Creek at Georgetown	40°12′27″	80°55′12″	224	360	461	601	714	834	1,140	11	1978-1987, 1990	1990	620
					375	586	727	896	1,020	1,130	1,390				
					244	402	525	691	817	944	1,250				
32	03111470	Little Piney Fork at Parlett	40°18′07″	80°50′55″	63	129	191	291	385	497	839	10	1978-1987	1987	222
					105	179	231	294	340	385	487				
					69	141	204	293	365	441	638				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2003) are considered regulated. For each station, the upper numbers are the log-Pearson Type III estimates, the middle numbers are regression estimates, and the lower numbers are weighted estimates. Streamflow-gaging stations are in Ohio unless indicated otherwise. Abbreviations: ft^3/s, cubic feet per second.]

Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Calendar year	Magnitude (ft^3/s)
33	03111490	Piney Fork tributary near Piney Fork	40°16′18″	80°50′48″	15	26	35	50	63	78	125	10	1978-1987	1978	73
					43	75	99	128	149	169	216				
					20	39	56	81	102	123	175				
34	03111500	Short Creek near Dillonvale	40°11′36″	80°44′04″	2,820	4,120	4,970	6,020	6,780	7,530	9,220	60	1942-2001	1990	8,200
					2,410	3,600	4,390	5,350	6,030	6,680	8,150				
					2,810	4,100	4,940	5,970	6,720	7,450	9,110				
35	03111540	Sloan Run tributary near Harrisville	40°09′07″	80°52′59″	49	133	224	388	551	756	1,430	10	1978-1987	1978	180
					63	124	171	236	286	338	465				
					52	130	199	301	386	478	726				
36	03111548	Wheeling Creek below Blaine	40°04′01″	80°48′31″	2,620	4,040	5,030	6,320	7,300	8,290	10,700	18	1983-1987, 1989-2001	1998	5,470
					3,050	4,800	6,040	7,630	8,830	10,000	12,900				
					2,650	4,140	5,200	6,600	7,660	8,730	11,300				
37	03112000	Wheeling Creek at Elm Grove, W. Va.	40°02′40″	80°39′40″	9,120	13,700	16,800	21,100	24,300	27,700	36,000	60	1941-2000	1943	22,100
					7,290	11,400	14,400	18,200	21,100	24,000	30,900				
					9,040	13,500	16,700	20,800	24,000	27,200	35,300				
38	03113700	Little Grave Creek near Glendale, W. Va.	39°57′40″	80°42′04″	495	940	1,310	1,870	2,340	2,870	4,320	12	1970-1977, 1980, 1994-1996	1976	1,400
					462	853	1,160	1,560	1,870	2,190	2,980				
					489	918	1,260	1,750	2,140	2,560	3,650				
39	03114000	Captina Creek at Armstrongs Mills	39°54′31″	80°55′27″	6,120	9,320	11,600	14,700	17,100	19,600	25,900	52	1927-1935, 1959-2001	1980	21,900
					4,010	6,340	8,000	10,100	11,700	13,400	17,200				
					6,030	9,150	11,300	14,200	16,500	18,800	24,600				
40	03114240	Wood Run near Woodsfield	39°46′56″	81°03′21″	65	133	192	284	365	456	713	10	1978-1987	1981	240
					82	157	215	293	353	414	565				
					69	140	201	288	359	433	624				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2003) are considered regulated. For each station, the upper numbers are the log-Pearson Type III estimates, the middle numbers are regression estimates, and the lower numbers are weighted estimates. Streamflow-gaging stations are in Ohio unless indicated otherwise. Abbreviations: ft^3/s, cubic feet per second.]

Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Calendar year	Magnitude (ft^3/s)
41	03114500	Middle Island Creek at Little, W. Va.	39°28′30″	80°59′50″	13,500	17,600	20,400	23,900	26,600	29,300	35,900	79	1875, 1916-1922, 1926-1995, 1997	1875	30,000
					9,450	14,200	17,500	21,700	24,900	28,000	35,400				
					13,400	17,500	20,300	23,800	26,500	29,200	35,800				
42	03114550	Buffalo Run near Friendly, W. Va.	39°30′23″	81°01′41″	207	369	493	665	804	950	1,320	12	1966-1977	1974	585
					116	218	295	398	478	559	757				
					184	317	411	537	635	737	993				
43	03114600	Little Buffalo Run near Friendly, W. Va.	39°30′10″	81°00′59″	254	416	535	697	825	959	1,290	11	1967-1977	1974	635
					156	294	401	543	653	766	1,040				
					228	375	481	625	739	857	1,150				
44	03115280	Trail Run near Antioch	39°37′29″	81°02′54″	629	979	1,260	1,670	2,030	2,420	3,530	10	1978-1987	1981	2,020
					457	822	1,100	1,470	1,750	2,040	2,730				
					591	934	1,200	1,590	1,900	2,230	3,110				
45	03115400	Little Muskingum River at Bloomfield	39°33′47″	81°12′14″	7,340	10,900	13,600	17,400	20,600	24,000	33,100	29	1959-1981, 1996-2001	1998	32,300
					5,400	8,310	10,400	13,000	14,900	16,900	21,500				
					7,210	10,700	13,200	16,700	19,500	22,500	30,200				
46	03115410	Graham Run near Bloomfield	39°32′36″	81°12′52″	20	40	58	84	106	130	194	10	1978-1987	1979	79
					31	62	86	119	145	172	238				
					23	49	72	104	129	156	223				
47	03115500	Little Muskingum River at Fay	39°28′48″	81°17′09″	7,650	11,200	13,600	16,900	19,500	22,100	28,600	20	1916-1935	1935	16,800
					6,070	9,200	11,400	14,200	16,200	18,300	23,100				
					7,510	10,900	13,300	16,400	18,700	21,200	27,100				
48	03115510	Moss Run near Wingett	39°28′24″	81°18′52″	221	369	493	681	847	1,040	1,590	10	1978-1987	1980	760
					181	338	458	619	743	870	1,180				
					211	359	479	652	794	947	1,350				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2003) are considered regulated. For each station, the upper numbers are the log-Pearson Type III estimates, the middle numbers are regression estimates, and the lower numbers are weighted estimates. Streamflow-gaging stations are in Ohio unless indicated otherwise. Abbreviations: ft^3/s, cubic feet per second.]

Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Calendar year	Magnitude (ft^3/s)
49	03115600	Barnes Run near Summerfield	39°46′20″	81°22′26″	540	1,090	1,580	2,350	3,060	3,870	6,290	33	1947-1979	1957	2,350
					308	551	733	973	1,160	1,340	1,800				
					518	1,010	1,420	2,010	2,520	3,080	4,650				
50	03115710	Buffalo Run tributary near Dexter City	39°39′41″	81°26′58″	44	52	58	64	69	74	86	10	1978-1987	1984	69
					38	74	102	140	169	199	273				
					42	60	75	97	115	134	178				
51	03115973	Schocalog Run at Copley Junction	41°06′11″	81°36′12″	114	134	146	159	168	176	194	10	1992-2001	1997	151
					130	194	234	280	313	344	411				
					117	148	171	199	220	239	280				
52	03116000	Tuscarawas River at Clinton	40°55′40″	81°37′58″	1,320	1,810	2,130	2,530	2,840	3,140	3,850	53	1913, 1927-1978	1935	2,700
					2,450	3,420	4,040	4,770	5,270	5,760	6,820				
					1,340	1,850	2,200	2,640	2,970	3,290	4,050				
53	03116100	Little Chippewa Creek near Smithville	40°53′39″	81°48′46″	739	1,150	1,440	1,820	2,120	2,430	3,180	26	1947-1972	1969	3,930
					538	836	1,030	1,270	1,440	1,600	1,960				
					723	1,110	1,370	1,710	1,960	2,220	2,830				
54	03116200	Chippewa Creek at Easton	40°56′47″	81°44′35″	1,800	3,070	4,250	6,210	8,080	10,400	17,900	23	1959-1981	1969	12,500
					2,430	3,490	4,170	4,990	5,560	6,110	7,310				
					1,830	3,110	4,240	6,000	7,570	9,390	14,800				
55	03117000	Tuscarawas River at Massillon	40°46′13″	81°31′27″	4,120	5,440	6,330	7,480	8,350	9,230	11,400	63	1939-2001	1969	10,700
					5,770	7,940	9,310	10,900	12,100	13,200	15,600				
					4,150	5,500	6,430	7,630	8,540	9,460	11,700				
56	03117500	Sandy Creek at Waynesburg	40°40′21″	81°15′36″	3,400	4,830	5,860	7,240	8,330	9,470	12,400	63	1939-2001	1959	15,000
					3,390	4,700	5,530	6,500	7,190	7,840	9,260				
					3,400	4,830	5,850	7,190	8,240	9,330	12,000				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2003) are considered regulated. For each station, the upper numbers are the log-Pearson Type III estimates, the middle numbers are regression estimates, and the lower numbers are weighted estimates. Streamflow-gaging stations are in Ohio unless indicated otherwise. Abbreviations: ft^3/s, cubic feet per second.]

Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Calendar year	Magnitude (ft^3/s)
57	03118000	Middle Branch Nimishillen Creek at Canton	40°50′29″	81°21′14″	629	935	1,170	1,500	1,780	2,080	2,890	60	1942-2001	1959	2,470
					842	1,200	1,420	1,670	1,850	2,020	2,390				
					634	944	1,180	1,510	1,780	2,070	2,840				
58	03118500	Nimishillen Creek at North Industry	40°44′03″	81°21′08″	3,140	4,410	5,260	6,330	7,130	7,930	9,820	80	1922-2001	1959	8,600
					2,810	4,040	4,830	5,770	6,430	7,070	8,470				
					3,140	4,400	5,240	6,300	7,080	7,870	9,720				
59	03119000	Sandy Creek at Sandyville	40°38′04″	81°22′28″	7,200	10,500	12,700	15,300	17,200	19,000	23,000	24	1924-1947	1937	14,200
					5,680	7,880	9,270	10,900	12,100	13,200	15,700				
					7,100	10,300	12,300	14,600	16,300	17,800	21,400				
60	03119700	Conotton Creek at Jewett	40°21′59″	81°00′13″	491	753	938	1,180	1,370	1,560	2,020	35	1947-1981	1963	1,170
					554	901	1,140	1,430	1,650	1,850	2,320				
					494	764	957	1,210	1,410	1,600	2,070				
61	**03122500**	Tuscarawas River below Dover Dam near Dover	40°31′47″	81°25′48″	15,000	20,800	24,700	29,900	33,900	38,000	47,900	15	1913, 1924-1937	1913	62,000
					12,300	16,500	19,100	22,300	24,500	26,600	31,300				
					14,800	20,300	24,000	28,500	32,000	35,400	43,700				
62	03123400	Dundee Creek at Dundee	40°35′35″	81°36′13″	147	273	369	498	600	704	956	21	1966-1986	1969	340
					66	117	154	200	234	267	343				
					130	227	290	368	425	483	620				
63	03125000	Home Creek near New Philadelphia	40°28′06″	81°24′10″	121	210	274	356	419	481	624	43	1937-1979	1969	378
					129	230	302	393	460	526	678				
					122	213	278	363	427	491	638				
64	03125300	West Branch Spencer Creek at Hendrysburg	40°03′30″	81°09′30″	202	420	596	846	1,050	1,260	1,780	16	1950-1965	1950	740
					220	396	528	702	835	971	1,300				
					204	415	578	797	968	1,140	1,570				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

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Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years: 2	5	10	25	50	100	500	Record: Years	Period used	Largest recorded discharge: Calendar year	Magnitude (ft^3/s)
65	03125450	Robinson Run near Hendrysburg	40°05′08″	81°10′27″	97	130	150	174	191	207	244	10	1978-1987	1978	147
					204	372	499	667	796	927	1,240				
					114	177	231	308	369	431	572				
66	03127950	Clear Fork near Jewett	40°19′28″	81°01′20″	209	380	534	782	1,010	1,290	2,140	11	1978-1987, 1990	1990	1,270
					277	466	598	762	880	996	1,260				
					218	398	551	775	961	1,160	1,700				
67	03128650	Mud Run tributary at Wainwright	40°25′07″	81°24′57″	11	19	26	37	47	58	89	10	1978-1987	1981	38
					73	134	180	241	287	334	448				
					16	35	55	87	114	143	216				
68	**03129000**	Tuscarawas River at Newcomerstown	40°15′41″	81°36′33″	21,300	31,100	38,400	48,500	56,600	65,300	88,200	17	1913, 1922-1937	1913	83,000
					19,600	26,300	30,500	35,600	39,200	42,600	50,100				
					21,100	30,600	37,300	46,100	52,900	60,000	77,800				
69	03129012	White Eyes Creek tributary near Coshocton	40°21′41″	81°47′52″	3	11	20	38	56	80	160	19	1940-1958	1946	35
					5	10	14	20	25	30	42				
					4	10	17	26	34	42	64				
70	03129014	White Eyes Creek tributary near Coshocton	40°21′36″	81°47′04″	99	212	321	507	686	905	1,610	65	1937-2001	1957	1,140
					76	149	206	283	343	405	557				
					97	205	304	462	605	773	1,280				
71	03129016	White Eyes Creek tributary near Coshocton	40°21′29″	81°46′53″	30	68	105	170	233	311	559	25	1938-1955, 1957-1963	1946	193
					28	55	77	107	130	153	211				
					29	65	97	147	190	238	376				
72	03129300	Whetstone Creek tributary near Olivesburg	40°53′15″	82°24′25″	42	71	93	124	150	177	249	28	1950-1977	1969	310
					37	68	91	121	143	166	221				
					42	71	93	123	148	174	239				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2003) are considered regulated. For each station, the upper numbers are the log-Pearson Type III estimates, the middle numbers are regression estimates, and the lower numbers are weighted estimates. Streamflow-gaging stations are in Ohio unless indicated otherwise. Abbreviations: ft^3/s, cubic feet per second.]

Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Calendar year	Magnitude (ft^3/s)
73	03130500	Touby Run at Mansfield	40°45′53″	82°32′43″	403	627	788	1,010	1,180	1,350	1,790	33	1947-1978, 1987	1987	1,030
					329	543	696	892	1,040	1,190	1,530				
					398	619	777	988	1,150	1,320	1,740				
74	03132000	Clear Fork at Butler	40°35′37″	82°25′20″	3,310	5,430	7,250	10,100	12,700	15,800	25,100	31	1946-1975, 1987	1987	21,300
					3,370	5,070	6,240	7,720	8,820	9,910	12,500				
					3,310	5,400	7,160	9,830	12,200	14,800	22,600				
75	03134000	Jerome Fork at Jeromeville	40°48′07″	82°12′01″	2,540	4,090	5,430	7,590	9,570	11,900	19,200	31	1913, 1926-1949, 1959, 1962-1964, 1966, 1969	1969	27,000
					3,450	5,360	6,700	8,420	9,700	11,000	14,000				
					2,580	4,160	5,540	7,680	9,590	11,800	18,300				
76	**03136000**	Mohican River at Greer	40°30′53″	82°11′44″	10,700	15,100	18,200	22,300	25,500	28,800	37,200	17	1913, 1922-1937	1913	55,000
					15,700	22,900	28,000	34,400	39,200	43,900	55,100				
					11,000	15,800	19,300	24,100	27,800	31,600	40,900				
77	03136500	Kokosing River at Mount Vernon	40°24′20″	82°30′00″	4,350	6,750	8,710	11,700	14,300	17,200	25,800	48	1954-2001	1959	38,000
					4,960	7,570	9,400	11,700	13,500	15,200	19,300				
					4,380	6,800	8,770	11,700	14,200	16,900	24,600				
78	03137000	Kokosing River at Millwood	40°23′51″	82°17′09″	9,730	16,300	21,700	29,600	36,400	44,000	65,400	54	1913, 1922-1974	1959	75,900
					9,170	13,800	17,000	21,100	24,100	27,200	34,400				
					9,710	16,200	21,300	28,700	34,900	41,600	60,200				
79	**03138500**	Walhonding River below Mohawk Dam at Nellie	40°20′29″	82°03′56″	19,600	28,900	34,900	42,200	47,500	52,600	63,900	17	1913, 1922-1937	1913	102,000
					23,100	33,800	41,300	50,900	58,000	65,200	81,900				
					19,900	29,400	35,800	43,700	49,500	55,100	67,900				
80	03138900	Jennings Ditch tributary near Wooster	40°44′45″	81°55′48″	76	195	331	600	895	1,300	2,830	18	1946, 1966-1982	1946	1,880
					123	232	315	428	514	603	819				
					81	202	327	541	742	983	1,740				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

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Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Calendar year	Magnitude (ft^3/s)
81	03139000	Killbuck Creek at Killbuck	40°28′53″	81°59′10″	3,340	5,370	7,210	10,300	13,100	16,700	28,100	71	1931-2001	1969	47,500
					7,840	11,200	13,600	16,500	18,600	20,800	25,700				
					3,410	5,510	7,420	10,600	13,500	16,900	27,900				
82	03139930	Little Mill Creek tributary near Coshocton	40°24′23″	81°48′11″	63	135	203	315	421	546	933	35	1937-1971	1957	382
					79	150	204	277	333	390	529				
					65	137	203	307	399	503	801				
83	03139940	Little Mill Creek near Coshocton	40°24′01″	81°47′54″	155	306	434	626	790	972	1,470	35	1937-1971	1969	724
					171	319	432	583	700	819	1,110				
					156	308	434	618	770	935	1,370				
84	03139960	Little Mill Creek near Coshocton	40°23′32″	81°48′24″	301	591	836	1,210	1,520	1,880	2,850	35	1937-1971	1957	1,404
					239	435	582	778	928	1,080	1,450				
					296	572	795	1,120	1,380	1,670	2,420				
85	03139970	Little Mill Creek tributary near Coshocton	40°23′33″	81°48′19″	26	65	105	173	237	315	552	34	1938-1971	1957	216
					40	80	111	152	185	219	301				
					27	67	106	168	221	282	452				
86	03139980	Little Mill Creek near Coshocton	40°23′03″	81°49′04″	414	810	1,140	1,620	2,020	2,470	3,650	35	1937-1971	1957	1,590
					352	631	841	1,120	1,330	1,550	2,070				
					409	790	1,090	1,520	1,870	2,240	3,200				
87	03139990	Little Mill Creek near Coshocton	40°21′51″	81°50′20″	701	1,420	2,080	3,180	4,210	5,440	9,290	36	1935, 1937-1971	1935	9,020
					513	894	1,180	1,550	1,830	2,110	2,800				
					689	1,360	1,960	2,880	3,700	4,640	7,410				
88	03140000	Mill Creek near Coshocton	40°21′46″	81°51′45″	1,230	2,360	3,440	5,250	7,000	9,150	16,200	65	1937-2001	1969	8,720
					1,340	2,250	2,910	3,770	4,420	5,070	6,640				
					1,230	2,360	3,390	5,090	6,660	8,530	14,400				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

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Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Calendar year	Magnitude (ft^3/s)
89	03140010	Spoon Creek tributary near Coshocton	40°22′01″	81°47′58″	22	57	92	154	212	283	503	31	1940-1970	1957	240
					26	50	70	95	115	136	185				
					22	56	87	135	177	224	356				
90	03140020	Spoon Creek tributary near Coshocton	40°21′58″	81°48′04″	7	16	26	44	62	84	162	61	1939-1972, 1975-2001	1957	116
					17	34	47	66	80	95	132				
					7	18	29	47	65	87	154				
91	03140030	Spoon Creek tributary near Coshocton	40°21′27″	81°48′11″	14	33	50	78	104	133	214	30	1940-1969	1957	76
					13	26	37	51	63	75	104				
					13	31	46	68	86	106	157				
92	03142200	Salt Fork near Cambridge	40°05′05″	81°27′20″	1,740	2,590	3,220	4,080	4,780	5,520	7,430	11	1957-1967	1963	3,890
					1,680	2,550	3,140	3,890	4,450	5,000	6,280				
					1,730	2,580	3,200	4,020	4,670	5,330	6,970				
93	03144000	Wakatomika Creek near Frazeysburg	40°07′57″	82°08′53″	4,270	7,070	9,190	12,100	14,500	17,100	23,600	65	1937-2001	1979	16,800
					4,250	6,730	8,500	10,800	12,500	14,200	18,300				
					4,270	7,050	9,140	12,000	14,300	16,700	22,900				
94	**03144500**	Muskingum River at Dresden	40°07′13″	81°59′59″	46,100	68,600	84,800	106,000	123,000	141,000	186,000	17	1913, 1922-1937	1913	228,000
					58,400	80,900	96,400	116,000	131,000	146,000	180,000				
					46,800	69,800	86,200	108,000	125,000	142,000	184,000				
95	03144800	Etna Creek at Etna	39°58′08″	82°40′55″	108	191	259	359	444	538	799	18	1966-1982, 1990	1979	365
					106	183	238	310	363	417	545				
					107	189	252	339	409	482	667				
96	03145500	Raccoon Creek at Granville	40°03′50″	82°31′35″	4,060	6,090	7,290	8,640	9,520	10,300	11,900	10	1940-1948, 1959	1959	8,700
					2,780	4,420	5,590	7,100	8,230	9,360	12,100				
					3,910	5,830	6,950	8,260	9,180	10,100	11,900				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

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Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Calendar year	Magnitude (ft^3/s)
97	03145600	Otter Fork near Centerburg	40°17′35″	82°43′09″	125	208	272	364	440	523	747	31	1947-1977	1959	445
					208	342	435	555	644	732	940				
					131	222	294	398	482	571	797				
98	03146000	North Fork Licking River at Utica	40°13′41″	82°27′06″	4,910	6,360	7,310	8,500	9,380	10,300	12,400	24	1940-1948, 1956, 1959, 1970-1982	1979	10,200
					3,400	5,300	6,640	8,360	9,640	10,900	13,900				
					4,780	6,240	7,210	8,470	9,430	10,400	12,700				
99	03146500	Licking River near Newark	40°03′33″	82°20′23″	11,800	17,800	22,100	27,700	32,100	36,700	48,000	62	1940-2001	1959	45,000
					10,400	15,600	19,200	23,800	27,300	30,800	39,000				
					11,800	17,700	21,900	27,400	31,700	36,100	46,900				
100	03147000	Licking River at Toboso	40°03′26″	82°13′12″	12,800	20,100	25,200	31,800	36,700	41,700	53,300	45	1903-1906, 1913, 1922-1961	1959	49,800
					12,400	18,500	22,800	28,300	32,400	36,500	46,200				
					12,800	20,100	25,100	31,500	36,300	41,100	52,400				
101	**03147500**	Licking River below Dillon Dam near Dillon Falls	39°59′18″	82°04′50″	13,900	24,200	32,300	43,900	53,400	63,700	90,800	22	1913, 1940-1960	1959	47,000
					14,600	22,300	27,700	34,700	40,000	45,300	57,700				
					14,000	24,000	31,500	41,700	49,700	58,200	79,500				
102	03147900	Timber Run near Zanesville	39°57′00″	82°03′07″	803	1,340	1,730	2,260	2,670	3,090	4,130	31	1947-1977	1976	2,430
					670	1,160	1,530	2,000	2,370	2,740	3,620				
					790	1,320	1,690	2,200	2,590	2,990	3,970				
103	03148300	Moxahala Creek at Roseville	39°48′38″	82°04′13″	2,350	3,390	4,150	5,200	6,050	6,960	9,340	25	1963-1987	1963	5,600
					2,270	3,450	4,260	5,300	6,060	6,820	8,600				
					2,350	3,390	4,170	5,220	6,060	6,930	9,160				
104	03149500	Salt Creek near Chandlersville	39°54′31″	81°51′38″	3,180	4,130	4,720	5,430	5,940	6,440	7,560	14	1935-1947, 2001	1940	5,240
					2,570	4,060	5,120	6,470	7,490	8,510	10,900				
					3,100	4,120	4,810	5,710	6,390	7,080	8,660				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2003) are considered regulated. For each station, the upper numbers are the log-Pearson Type III estimates, the middle numbers are regression estimates, and the lower numbers are weighted estimates. Streamflow-gaging stations are in Ohio unless indicated otherwise. Abbreviations: ft^3/s, cubic feet per second.]

Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Calendar year	Magnitude (ft^3/s)
105	**03150000**	Muskingum River at Mcconnelsville	39°38′42″	81°51′00″	55,800	85,800	107,000	135,000	156,000	178,000	232,000	17	1913, 1922-1937	1913	270,000
					66,600	91,200	108,000	130,000	146,000	162,000	199,000				
					56,500	86,300	107,000	134,000	154,000	175,000	224,000				
106	03150600	Tupper Creek at Devola	39°28′24″	81°27′58″	139	224	292	391	475	569	828	15	1966-1980	1980	470
					118	214	286	381	454	527	704				
					134	221	290	387	466	549	764				
107	03154500	Reedy Creek near Reedy, W. Va.	38°57′40″	81°23′25″	3,620	4,920	5,790	6,920	7,780	8,660	10,800	30	1952-1978, 1997, 2000, 2002	2000	8,700
					2,600	4,060	5,080	6,390	7,370	8,350	10,600				
					3,560	4,840	5,710	6,850	7,720	8,600	10,800				
108	03155500	Hughes River at Cisco, W. Va.	39°07′07″	81°16′39″	14,300	19,500	22,900	27,100	30,200	33,300	40,500	59	1930-1931, 1939-1994, 1997	1950	28,100
					9,660	14,600	18,100	22,600	25,900	29,200	37,100				
					14,200	19,300	22,600	26,700	29,800	32,900	40,100				
109	03157000	Clear Creek near Rockbridge	39°35′18″	82°34′43″	2,630	4,100	5,310	7,160	8,790	10,700	16,200	62	1940-2001	1948	16,000
					2,960	4,700	5,930	7,520	8,710	9,910	12,700				
					2,640	4,130	5,360	7,200	8,780	10,600	15,600				
110	03157500	Hocking River at Enterprise	39°33′54″	82°28′29″	7,010	10,900	14,100	19,000	23,300	28,300	42,800	71	1907, 1932-2001	1907	36,000
					9,360	14,100	17,400	21,600	24,800	27,900	35,300				
					7,060	11,000	14,300	19,200	23,400	28,300	42,000				
111	03158100	Hayden Run near Haydenville	39°28′57″	82°19′06″	83	149	207	298	381	477	765	12	1966-1977	1968	370
					133	247	335	452	541	633	855				
					91	173	246	355	447	547	811				
112	03158220	Glen Run near Doanville	39°24′06″	82°11′44″	106	171	219	283	334	387	520	11	1977-1987	1981	250
					123	223	297	396	471	547	730				
					109	184	244	326	390	457	619				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2003) are considered regulated. For each station, the upper numbers are the log-Pearson Type III estimates, the middle numbers are regression estimates, and the lower numbers are weighted estimates. Streamflow-gaging stations are in Ohio unless indicated otherwise. Abbreviations: ft^3/s, cubic feet per second.]

Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Calendar year	Magnitude (ft^3/s)
113	03159450	Mill Creek near Chauncey	39°22′46″	82°05′04″	120	197	256	340	409	483	679	10	1978-1987	1981	265
					163	296	397	529	631	734	983				
					128	223	302	414	504	598	830				
114	03159500	Hocking River at Athens	39°19′44″	82°05′16″	12,200	17,700	22,000	28,200	33,300	39,000	54,500	90	1873, 1884, 1907, 1913, 1916-2001	1907	50,000
					15,400	22,600	27,600	33,900	38,600	43,400	54,400				
					12,200	17,900	22,200	28,400	33,600	39,200	54,500				
115	03159540	Shade River near Chester	39°03′49″	81°52′55″	3,540	5,080	6,290	8,050	9,550	11,200	15,900	36	1966-2001	1997	15,600
					4,130	6,300	7,810	9,730	11,200	12,600	15,900				
					3,570	5,170	6,430	8,250	9,760	11,400	15,900				
116	03159700	Grasslick Run near Ripley, W. Va.	38°45′53″	81°40′40″	149	243	321	442	549	672	1,030	13	1965-1977	1971	615
					96	180	244	329	395	462	625				
					137	224	293	393	476	566	807				
117	03201440	Sixteenmile Creek near Pliny, W. Va.	38°38′39″	82°02′53″	298	474	617	831	1,020	1,220	1,820	13	1965-1977	1973	870
					131	242	327	439	526	614	828				
					253	394	498	642	761	888	1,230				
118	03201480	Threemile Creek Tributary near Pt. Pleasant, W. Va.	38°50′15″	82°05′42″	134	243	326	438	526	617	839	13	1965-1977	1965	299
					101	190	259	351	422	495	672				
					126	227	301	399	476	555	749				
119	03201550	Starr Run near New Plymouth	39°23′46″	82°20′49″	52	83	106	139	166	194	268	10	1978-1987	1983	125
					54	104	143	196	237	279	381				
					53	90	121	166	201	238	331				
120	03201600	Sandy Run above Big Four Hollow Creek near Lake Hope	39°21′45″	82°18′47″	109	269	446	783	1,140	1,610	3,340	11	1971-1981	1974	990
					129	241	327	441	530	620	840				
					113	260	397	607	789	994	1,590				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2003) are considered regulated. For each station, the upper numbers are the log-Pearson Type III estimates, the middle numbers are regression estimates, and the lower numbers are weighted estimates. Streamflow-gaging stations are in Ohio unless indicated otherwise. Abbreviations: ft^3/s, cubic feet per second.]

Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years: 2	5	10	25	50	100	500	Record: Years	Record: Period used	Largest recorded discharge: Calendar year	Largest recorded discharge: Magnitude (ft^3/s)
121	03201700	Big Four Hollow Creek near Lake Hope	39°21′48″	82°18′51″	118	308	528	970	1,460	2,130	4,760	13	1971-1983	1974	1,200
					132	247	334	452	542	635	859				
					121	289	452	712	945	1,210	2,030				
122	03202000	Raccoon Creek at Adamsville	38°51′32″	82°21′43″	6,090	8,990	11,100	14,100	16,500	19,100	25,900	78	1916-1935, 1937, 1939-1985, 1992-2001	1968	20,000
					9,820	14,100	17,000	20,700	23,400	26,100	32,300				
					6,150	9,120	11,300	14,400	16,900	19,500	26,300				
123	03204500	Mud River near Milton, W. Va.	38°23′18″	82°06′48″	6,260	9,930	12,900	17,200	20,900	25,000	36,500	44	1938-1980, 1997	1979	20,700
					6,410	9,860	12,300	15,400	17,700	20,100	25,500				
					6,270	9,920	12,800	17,000	20,500	24,300	34,700				
124	03205995	Sandusky Creek near Burlington	38°25′03″	82°30′36″	100	143	175	219	254	291	388	10	1978-1987	1979	242
					104	197	268	364	437	513	696				
					101	160	209	279	336	396	543				
125	03207000	Twelvepole Creek at Wayne, W. Va.	38°13′05″	82°26′55″	6,470	10,100	12,800	16,400	19,300	22,300	30,000	32	1916-1922, 1928-1931, 1939, 1947-1966	1939	22,000
					6,840	10,500	13,000	16,300	18,700	21,200	26,900				
					6,490	10,100	12,800	16,400	19,200	22,100	29,500				
126	03216563	Mile Branch near Rush, Ky.	38°21′50″	82°47′45″	192	273	327	395	445	495	613	12	1976-1987	1980	378
					110	199	267	356	423	492	659				
					172	251	306	379	436	494	635				
127	03217000	Tygarts Creek near Greenup, Ky.	38°33′51″	82°57′08″	7,090	11,600	15,200	20,300	24,700	29,400	42,500	62	1934, 1937, 1941-2000	1997	34,400
					9,180	13,200	15,900	19,200	21,600	23,900	29,200				
					7,140	11,700	15,200	20,300	24,400	28,900	40,900				
128	03217500	Scioto River at Larue	40°34′28″	83°23′15″	5,300	7,960	9,640	11,600	13,000	14,300	17,200	25	1913, 1927-1935, 1938-1951, 1959	1959	16,300
					5,590	8,270	10,100	12,400	14,200	15,900	19,800				
					5,310	7,990	9,690	11,700	13,200	14,600	17,600				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2003) are considered regulated. For each station, the upper numbers are the log-Pearson Type III estimates, the middle numbers are regression estimates, and the lower numbers are weighted estimates. Streamflow-gaging stations are in Ohio unless indicated otherwise. Abbreviations: ft^3/s, cubic feet per second.]

Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years: 2	5	10	25	50	100	500	Record: Years	Record: Period used	Largest recorded discharge: Calendar year	Largest recorded discharge: Magnitude (ft^3/s)
129	03218000	Little Scioto River above Marion	40°37′43″	83°10′11″	1,090	1,710	2,200	2,900	3,500	4,140	5,920	38	1939-1976	1959	5,160
					1,560	2,300	2,780	3,360	3,760	4,150	5,010				
					1,100	1,750	2,250	2,950	3,530	4,150	5,760				
130	03219500	Scioto River near Prospect	40°25′10″	83°11′50″	6,000	8,100	9,400	10,900	12,000	13,100	15,400	88	1913, 1915-2001	1913	27,000
					9,420	13,500	16,200	19,600	22,200	24,700	30,500				
					6,050	8,210	9,580	11,200	12,400	13,600	16,100				
131	03219590	Bokes Creek near Warrensburg	40°19′20″	83°10′30″	2,010	2,990	3,640	4,460	5,070	5,660	7,030	16	1982-1997	1987	4,420
					2,500	3,850	4,780	5,960	6,840	7,710	9,760				
					2,050	3,100	3,840	4,780	5,490	6,190	7,800				
132	03220000	Mill Creek near Belle-point	40°14′54″	83°10′26″	4,640	6,900	8,600	11,000	13,000	15,100	20,900	60	1913, 1943-2001	1997	21,800
					4,430	6,710	8,290	10,300	11,800	13,300	16,800				
					4,630	6,890	8,580	11,000	12,900	15,000	20,400				
133	03221000	Scioto River below O'Shaughnessy Dam near Dublin	40°08′36″	83°07′14″	12,900	19,600	24,500	31,300	36,700	42,500	57,400	81	1913, 1922-2001	1913	74,500
					14,200	20,200	24,200	29,200	33,000	36,700	45,200				
					12,900	19,600	24,500	31,200	36,500	42,100	56,400				
134	03223000	Olentangy River at Claridon	40°34′58″	82°59′20″	3,110	4,690	5,950	7,780	9,330	11,100	15,900	55	1947-2001	1959	14,900
					4,090	6,240	7,740	9,650	11,100	12,500	15,800				
					3,130	4,760	6,050	7,910	9,480	11,200	15,900				
135	03224000	Shaw Creek at Shaw-town	40°29′00″	82°57′25″	807	1,120	1,340	1,650	1,890	2,150	2,830	10	1947-1955, 1959	1959	4,120
					1,160	1,900	2,420	3,090	3,590	4,090	5,280				
					840	1,220	1,520	1,940	2,270	2,620	3,490				
136	03224500	Whetstone Creek near Ashley	40°27′18″	82°57′28″	2,810	4,210	5,320	6,980	8,390	9,990	14,500	20	1955-1974	1959	19,100
					3,130	4,950	6,230	7,890	9,130	10,400	13,300				
					2,840	4,290	5,460	7,150	8,550	10,100	14,200				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

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Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Calendar year	Magnitude (ft^3/s)
137	**03225500**	Olentangy River near Delaware	40°21′18″	83°04′02″	7,360	10,800	13,100	16,200	18,500	20,800	26,400	39	1911-1935, 1938-1951	1913	41,600
					7,880	11,700	14,300	17,700	20,200	22,700	28,400				
					7,390	10,900	13,300	16,400	18,700	21,100	26,700				
138	03226200	Delaware Run near Delaware	40°18′28″	83°06′35″	340	572	741	966	1,140	1,320	1,760	32	1947-1978	1959	1,050
					329	530	669	846	977	1,110	1,410				
					340	567	730	944	1,110	1,270	1,670				
139	03226850	Linworth Run near Linworth	40°06′24″	83°02′35″	78	163	234	337	422	514	750	12	1966-1977	1969	250
					51	92	121	159	188	217	287				
					71	137	184	244	290	336	452				
140	03228000	Scioto Big Run at Briggsdale	39°54′56″	83°03′55″	1,200	1,850	2,350	3,060	3,650	4,280	5,980	33	1947-1979	1973	3,670
					648	1,090	1,420	1,840	2,160	2,480	3,240				
					1,150	1,750	2,200	2,800	3,290	3,820	5,180				
141	03228300	Big Walnut Creek at Sunbury	40°14′10″	82°51′05″	3,970	5,470	6,360	7,400	8,110	8,770	10,200	13	1989-2001	1997	6,700
					2,940	4,530	5,640	7,060	8,110	9,160	11,600				
					3,810	5,270	6,180	7,290	8,110	8,910	10,700				
142	**03228500**	Big Walnut Creek at Central College	40°06′13″	82°53′03″	7,030	10,500	12,900	16,000	18,300	20,600	26,200	17	1939-1954, 1959	1959	23,800
					5,210	8,150	10,200	12,900	15,000	17,000	21,800				
					6,790	10,100	12,300	15,100	17,200	19,400	24,500				
143	**03228805**	Alum Creek at Africa	40°10′56″	82°57′42″	4,360	5,670	6,410	7,240	7,800	8,310	9,350	11	1963-1973	1963	6,460
					4,000	6,410	8,140	10,400	12,100	13,800	17,800				
					4,290	5,860	6,940	8,350	9,410	10,500	12,800				
144	**03229000**	Alum Creek at Columbus	39°56′42″	82°56′28″	4,560	6,850	8,570	11,000	12,900	15,000	20,500	49	1924-1936, 1938-1973	1959	26,400
					4,990	7,720	9,630	12,100	13,900	15,800	20,100				
					4,570	6,900	8,640	11,100	13,000	15,100	20,400				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2003) are considered regulated. For each station, the upper numbers are the log-Pearson Type III estimates, the middle numbers are regression estimates, and the lower numbers are weighted estimates. Streamflow-gaging stations are in Ohio unless indicated otherwise. Abbreviations: ft^3/s, cubic feet per second.]

Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Calendar year	Magnitude (ft^3/s)
145	**03229500**	Big Walnut Creek at Rees	39°51′24″	82°57′26″	12,000	17,400	21,000	25,500	28,800	32,100	39,700	32	1913, 1922-1936, 1939-1954, 1959	1959	59,800
					10,200	15,200	18,800	23,200	26,600	29,900	37,700				
					11,900	17,300	20,800	25,200	28,500	31,800	39,400				
146	03230500	Big Darby Creek at Darbyville	39°42′02″	83°06′37″	8,380	13,100	16,800	22,100	26,500	31,300	44,300	79	1922-1936, 1938-2001	1959	49,000
					10,300	15,300	18,700	23,200	26,500	29,800	37,500				
					8,410	13,200	16,900	22,100	26,500	31,200	43,700				
147	03230600	Hominy Creek at Circleville	39°35′26″	82°55′25″	606	1,010	1,350	1,880	2,350	2,890	4,520	31	1947-1977	1968	3,820
					441	779	1,030	1,360	1,620	1,870	2,490				
					593	981	1,300	1,770	2,180	2,630	3,910				
148	03230800	Deer Creek at Mount Sterling	39°42′54″	83°15′26″	5,730	8,570	10,400	12,800	14,400	16,100	19,800	21	1967-1981, 1996-2001	1968	11,600
					5,670	8,700	10,800	13,600	15,600	17,600	22,400				
					5,720	8,590	10,500	12,900	14,700	16,400	20,500				
149	**03231000**	Deer Creek at Williamsport	39°35′09″	83°07′22″	8,430	15,500	21,600	31,100	39,500	49,300	77,900	36	1927-1935, 1938-1956, 1959, 1961-1967	1959	39,600
					7,570	11,500	14,300	17,900	20,500	23,200	29,500				
					8,400	15,200	20,900	29,400	36,600	44,700	67,600				
150	**03231500**	Scioto River at Chillicothe	39°20′29″	82°58′16″	41,500	66,900	85,200	110,000	129,000	149,000	197,000	60	1908-1967	1913	260,000
					41,900	58,700	70,300	85,100	96,100	107,000	133,000				
					41,500	66,600	84,500	108,000	126,000	145,000	191,000				
151	03231600	East Fork Paint Creek near Sedalia	39°42′36″	83°27′48″	213	340	432	558	656	759	1,020	35	1947-1981	1979	710
					266	443	568	728	848	969	1,250				
					217	349	449	584	690	799	1,070				
152	03232000	Paint Creek near Greenfield	39°22′45″	83°22′32″	5,170	8,770	11,400	15,000	17,800	20,700	27,800	56	1926-1935, 1940-1956, 1959-1981, 1996-2001	1968	21,700
					6,050	9,210	11,400	14,200	16,400	18,500	23,400				
					5,200	8,800	11,400	14,900	17,600	20,400	27,200				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

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Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years: 2	5	10	25	50	100	500	Record: Years	Record: Period used	Largest recorded discharge: Calendar year	Largest recorded discharge: Magnitude (ft^3/s)
153	03232300	Rattlesnake Creek at Centerfield	39°19′44″	83°28′32″	5,170	7,140	8,320	9,670	10,600	11,500	13,300	10	1972-1981	1979	7,550
					5,350	8,210	10,200	12,800	14,700	16,600	21,100				
					5,190	7,360	8,790	10,600	11,900	13,200	16,100				
154	**03232500**	Rocky Fork near Barretts Mills	39°13′06″	83°23′08″	6,380	9,350	11,400	14,000	16,000	18,000	22,800	12	1940-1951	1964	13,400
					4,160	6,550	8,250	10,400	12,100	13,700	17,600				
					5,950	8,610	10,400	12,600	14,300	16,100	20,300				
155	**03234000**	Paint Creek near Bourneville	39°15′49″	83°10′01″	20,000	31,600	40,500	53,000	63,300	74,400	104,000	49	1922-1970	1964	56,900
					14,500	21,600	26,500	32,900	37,600	42,400	53,600				
					19,800	31,000	39,300	50,800	60,000	69,900	95,600				
156	03234100	Indian Creek at Massieville	39°15′42″	82°58′08″	1,380	2,510	3,510	5,110	6,580	8,310	13,600	32	1947-1977, 1992	1992	8,200
					661	1,160	1,530	2,010	2,380	2,760	3,670				
					1,320	2,330	3,170	4,430	5,510	6,750	10,300				
157	**03234500**	Scioto River at Higby	39°12′44″	82°51′50″	47,700	77,300	100,000	133,000	161,000	191,000	271,000	43	1913, 1931-1973	1937	177,000
					53,100	74,400	89,100	108,000	122,000	136,000	168,000				
					47,900	77,100	99,300	130,000	155,000	182,000	252,000				
158	03235000	Salt Creek at Tarlton	39°33′20″	82°46′51″	996	1,600	2,070	2,770	3,350	4,000	5,790	31	1947-1977	1968	5,360
					727	1,250	1,630	2,130	2,510	2,900	3,820				
					973	1,560	2,010	2,640	3,170	3,730	5,240				
159	03235080	Bull Creek near Adelphi	39°27′11″	82°46′46″	348	660	928	1,340	1,700	2,120	3,310	11	1977-1987	1983	1,560
					282	504	670	888	1,050	1,220	1,630				
					334	613	832	1,140	1,380	1,640	2,330				
160	03235200	Little Blackjack Branch near South Bloomingville	39°27′23″	82°30′25″	174	356	507	727	909	1,110	1,610	17	1966-1982	1966	683
					120	227	308	417	501	587	796				
					164	320	438	596	720	849	1,170				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2003) are considered regulated. For each station, the upper numbers are the log-Pearson Type III estimates, the middle numbers are regression estimates, and the lower numbers are weighted estimates. Streamflow-gaging stations are in Ohio unless indicated otherwise. Abbreviations: ft³/s, cubic feet per second.]

Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft³/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Calendar year	Magnitude (ft³/s)
161	03235400	West Branch Tar Hollow Creek at Tar Hollow State Park	39°23′35″	82°45′12″	19	33	45	64	80	98	150	28	1950-1977	1968	72
					57	111	154	212	257	303	417				
					22	41	60	89	115	143	218				
162	03235500	Tar Hollow Creek at Tar Hollow State Park	39°23′22″	82°45′03″	109	213	307	462	607	780	1,320	32	1947-1978	1968	957
					172	325	443	602	726	852	1,160				
					114	224	326	488	632	797	1,270				
163	03235995	Salt Creek near Londonderry	39°17′26″	82°44′45″	10,800	16,100	20,300	26,500	31,800	37,700	54,500	30	1963-1979, 1938-1950	1968	59,000
					7,170	11,300	14,300	18,200	21,100	24,000	31,000				
					10,600	15,700	19,600	25,200	29,800	35,000	49,000				
164	03236090	South Branch Little Salt Creek near Jackson	39°00′50″	82°39′01″	170	316	444	645	826	1,040	1,660	11	1975, 1978-1987	1980	555
					147	270	362	485	578	674	904				
					165	302	412	570	699	838	1,210				
165	03236100	South Branch Little Salt Creek at Jackson	39°02′38″	82°38′35″	660	886	1,030	1,190	1,310	1,420	1,680	31	1947-1977	1968	1,400
					313	551	726	956	1,130	1,310	1,730				
					622	839	974	1,140	1,270	1,400	1,690				
166	03237095	Devers Run at Lucasville	38°52′54″	83°01′13″	190	242	275	316	346	375	444	10	1978-1987	1982	330
					152	283	384	518	622	728	986				
					180	255	316	401	469	538	704				
167	03237210	Rose Run near Portsmouth	38°48′07″	82°59′03″	96	137	163	194	216	237	283	16	1966-1981	1976	187
					143	273	373	509	614	722	986				
					103	161	207	272	323	374	491				
168	03237280	Upper Twin Creek at Mcgaw	38°38′37″	83°12′57″	1,240	2,160	2,810	3,640	4,250	4,850	6,190	39	1960, 1964-2001	1960	7,320
					1,400	2,370	3,080	3,990	4,670	5,350	6,960				
					1,250	2,180	2,840	3,690	4,310	4,930	6,330				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2003) are considered regulated. For each station, the upper numbers are the log-Pearson Type III estimates, the middle numbers are regression estimates, and the lower numbers are weighted estimates. Streamflow-gaging stations are in Ohio unless indicated otherwise. Abbreviations: ft^3/s, cubic feet per second.]

Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years: 2	5	10	25	50	100	500	Record: Years	Record: Period used	Largest recorded discharge: Calendar year	Largest recorded discharge: Magnitude (ft^3/s)
169	03237300	West Branch Turkey Run near Winchester	38°56′56″	83°40′19″	200	350	477	672	846	1,050	1,630	22	1956-1977	1956	720
					174	301	392	507	592	678	876				
					196	340	454	618	753	898	1,290				
170	03237500	Ohio Brush Creek near West Union	38°48′13″	83°25′16″	20,700	30,600	38,100	48,600	57,200	66,500	91,200	70	1927-1935, 1941-2001	1997	77,700
					14,700	21,800	26,500	32,500	36,900	41,200	51,100				
					20,500	30,100	37,300	47,100	55,000	63,400	85,500				
171	03238030	Lawrence Creek near Maysville, Ky.	38°38′04″	83°47′32″	276	458	602	813	992	1,190	1,730	12	1975-1986	1982	790
					316	545	708	916	1,070	1,220	1,580				
					284	481	637	854	1,030	1,210	1,660				
172	03238400	Harwood Creek near Fayetteville	39°07′50″	83°51′00″	133	221	286	375	445	519	701	12	1966-1977	1970	385
					157	265	339	432	501	569	725				
					137	233	304	398	470	542	713				
173	03238500	Whiteoak Creek near Georgetown	38°51′29″	83°55′43″	10,200	13,900	16,300	19,300	21,500	23,600	28,700	74	1924-1935, 1940-2001	1964	22,400
					9,290	13,800	16,800	20,500	23,300	26,000	32,200				
					10,200	13,900	16,300	19,400	21,600	23,900	29,100				
174	03239000	Little Miami River near Selma	39°48′36″	83°44′21″	1,390	2,930	4,270	6,300	8,060	10,000	15,400	25	1953-1977	1959	7,920
					1,940	3,130	3,980	5,080	5,910	6,740	8,700				
					1,430	2,950	4,220	6,060	7,570	9,180	13,400				
175	03239500	North Fork Little Miami River near Pitchin	39°49′40″	83°46′38″	379	842	1,310	2,150	2,980	4,040	7,630	25	1953-1977	1959	3,350
					1,110	1,750	2,190	2,750	3,170	3,580	4,560				
					409	910	1,410	2,240	3,020	3,940	6,750				
176	03240000	Little Miami River near Oldtown	39°44′54″	83°55′53″	2,620	4,790	6,590	9,260	11,600	14,100	21,200	49	1953-2001	1959	14,800
					3,980	6,320	8,000	10,200	11,800	13,400	17,300				
					2,660	4,870	6,680	9,340	11,600	14,000	20,600				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2003) are considered regulated. For each station, the upper numbers are the log-Pearson Type III estimates, the middle numbers are regression estimates, and the lower numbers are weighted estimates. Streamflow-gaging stations are in Ohio unless indicated otherwise. Abbreviations: ft^3/s, cubic feet per second.]

Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Calendar year	Magnitude (ft^3/s)
177	03240500	North Fork Massie Creek at Cedarville	39°45′25″	83°47′25″	701	1,500	2,240	3,460	4,600	5,940	10,000	14	1955-1968	1963	3,030
					1,210	1,930	2,440	3,090	3,570	4,050	5,190				
					752	1,570	2,290	3,350	4,240	5,210	7,840				
178	03241000	South Fork Massie Creek near Cedarville	39°44′20″	83°45′50″	718	1,370	1,960	2,890	3,740	4,750	7,780	14	1955-1968	1963	3,470
					816	1,310	1,660	2,110	2,450	2,780	3,560				
					731	1,360	1,880	2,630	3,250	3,920	5,740				
179	03241500	Massies Creek at Wilberforce	39°43′22″	83°52′58″	1,490	2,700	3,680	5,110	6,310	7,630	11,200	49	1953-2001	1959	7,300
					2,400	3,880	4,940	6,320	7,360	8,400	10,900				
					1,520	2,760	3,760	5,220	6,430	7,730	11,200				
180	03241600	Shawnee Creek at Xenia	39°40′32″	83°55′32″	383	675	873	1,120	1,290	1,460	1,820	30	1948-1977	1968	1,820
					327	566	740	966	1,140	1,310	1,720				
					379	661	851	1,090	1,260	1,420	1,790				
181	03242050	Little Miami River near Spring Valley	39°35′00″	84°01′49″	7,300	12,100	15,900	21,200	25,500	30,100	42,400	41	1926-1935, 1940-1952, 1959, 1963-1964, 1969-1983	1963	38,000
					8,610	13,300	16,700	21,000	24,300	27,500	35,200				
					7,340	12,200	15,900	21,100	25,300	29,800	41,400				
182	03242100	Wayne Creek at Waynesville	39°31′08″	84°04′47″	258	448	596	806	980	1,170	1,660	16	1966-1981	1974	880
					126	233	313	421	503	587	790				
					228	381	489	634	748	869	1,180				
183	03242150	Caesar Creek near Xenia	39°37′25″	83°54′09″	3,060	3,980	4,550	5,240	5,730	6,200	7,260	15	1969-1983	1975	5,170
					2,490	3,970	5,020	6,370	7,380	8,400	10,800				
					2,990	3,980	4,650	5,510	6,160	6,800	8,290				
184	03242200	Anderson Fork near New Burlington	39°33′59″	83°54′10″	2,520	3,410	3,970	4,650	5,130	5,590	6,620	15	1969-1983	1975	5,510
					2,590	4,080	5,130	6,480	7,480	8,490	10,900				
					2,530	3,510	4,190	5,060	5,720	6,360	7,830				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2003) are considered regulated. For each station, the upper numbers are the log-Pearson Type III estimates, the middle numbers are regression estimates, and the lower numbers are weighted estimates. Streamflow-gaging stations are in Ohio unless indicated otherwise. Abbreviations: ft^3/s, cubic feet per second.]

Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years: 2	5	10	25	50	100	500	Record: Years	Record: Period used	Largest recorded discharge: Calendar year	Largest recorded discharge: Magnitude (ft^3/s)
185	**03242300**	Caesar Creek at Harveysburg	39°30′27″	84°00′42″	6,990	11,200	14,700	20,300	25,300	31,200	48,900	16	1959, 1961-1975	1959	26,000
					5,930	9,370	11,800	15,000	17,400	19,800	25,500				
					6,910	11,000	14,300	19,200	23,500	28,200	41,700				
186	**03242500**	Little Miami River near Fort Ancient	39°22′42″	84°05′32″	19,300	31,100	39,700	51,200	60,300	69,700	92,900	17	1939-1952, 1959, 1963-1964	1959	67,000
					14,600	22,700	28,500	35,900	41,500	47,200	60,600				
					18,900	30,100	38,000	48,300	56,300	64,400	84,400				
187	03244000	Todd Fork near Roachester	39°20′07″	84°05′12″	10,500	16,100	20,200	25,800	30,300	35,000	47,100	22	1953-1974	1959	25,500
					9,240	13,700	16,700	20,500	23,300	26,000	32,300				
					10,400	15,800	19,700	24,800	28,800	33,000	43,300				
188	**03245500**	Little Miami River at Milford	39°10′17″	84°17′53″	30,500	44,000	53,400	65,800	75,300	85,200	110,000	54	1913, 1916-1917, 1926-1976	1959	84,100
					32,700	46,700	56,100	67,800	76,400	84,800	104,000				
					30,600	44,100	53,600	65,900	75,400	85,100	109,000				
189	03246500	East Fork Little Miami River at Williamsburg	39°03′09″	84°03′02″	10,700	14,400	16,800	19,600	21,700	23,700	28,200	21	1950-1953, 1959, 1961-1975, 2000	1964	19,800
					9,300	13,500	16,300	19,800	22,300	24,800	30,500				
					10,600	14,300	16,700	19,600	21,800	23,900	28,700				
190	03247100	Paterson Run near Owensville	39°07′38″	84°06′44″	583	721	799	886	944	997	1,110	31	1947-1977	1962	952
					424	695	881	1,110	1,290	1,460	1,850				
					569	718	811	924	1,010	1,080	1,250				
191	**03247500**	East Fork Little Miami River at Perintown	39°08′13″	84°14′17″	19,700	27,400	32,200	38,000	42,200	46,200	55,100	57	1913, 1916-1920, 1925-1973, 1975-1977	1964	42,400
					16,500	24,000	29,100	35,400	40,000	44,500	54,900				
					19,600	27,200	32,000	37,800	42,000	46,000	55,100				
192	03248000	Little Miami River at Plainville	39°08′13″	84°21′11″	38,300	52,200	62,000	75,000	85,100	95,600	122,000	14	1964, 1966-1978	1964	93,000
					41,200	57,900	69,100	83,000	93,200	103,000	126,000				
					38,500	53,000	63,200	76,700	87,000	97,600	123,000				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

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Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Calendar year	Magnitude (ft^3/s)
193	03254400	North Fork Grassy Creek near Piner, Ky.	38°47′31″	84°30′50″	2,620	4,980	7,180	10,900	14,400	18,700	32,600	16	1968-1983	1970	20,200
					1,380	2,280	2,910	3,720	4,310	4,910	6,290				
					2,420	4,340	5,870	8,080	9,950	12,100	18,100				
194	03255500	Mill Creek at Reading	39°13′14″	84°26′49″	3,300	4,260	4,850	5,570	6,080	6,570	7,670	53	1939-1991	1945	5,780
					4,040	6,100	7,480	9,200	10,500	11,700	14,500				
					3,330	4,350	5,030	5,870	6,480	7,070	8,410				
195	**03258000**	West Fork Mill Creek at Lockland	39°13′35″	84°27′22″	3,520	5,010	5,940	7,040	7,820	8,550	10,200	14	1939-1952	1947	6,310
					2,620	4,150	5,200	6,530	7,510	8,480	10,700				
					3,400	4,860	5,770	6,900	7,720	8,530	10,300				
196	03260700	Bokengehalas Creek near De Graff	40°20′50″	83°53′28″	672	951	1,140	1,380	1,560	1,750	2,190	44	1958-2001	1959	1,780
					1,600	2,650	3,410	4,400	5,150	5,900	7,700				
					698	1,020	1,260	1,580	1,820	2,080	2,670				
197	03260800	Stony Creek near De Graff	40°17′27″	83°54′36″	1,040	1,750	2,280	3,000	3,580	4,170	5,670	18	1958-1975	1959	2,770
					2,300	3,760	4,810	6,180	7,220	8,260	10,700				
					1,120	1,940	2,600	3,520	4,250	5,000	6,830				
198	03261500	Great Miami River at Sidney	40°17′13″	84°09′00″	6,830	10,700	13,600	17,800	21,200	25,000	35,000	89	1913-2001	1913	44,000
					8,760	12,500	15,000	18,200	20,500	22,800	28,200				
					6,860	10,700	13,700	17,800	21,200	24,800	34,500				
199	03262750	Millers Ditch at Tipp City	39°57′59″	84°10′22″	108	200	276	390	488	596	897	17	1966-1982	1981	625
					105	194	261	349	417	486	652				
					108	199	272	376	460	549	781				
200	03263100	Poplar Creek near Vandalia	39°52′10″	84°11′21″	400	658	851	1,120	1,330	1,560	2,130	31	1947-1977	1959	1,130
					282	504	669	887	1,050	1,220	1,630				
					389	637	820	1,070	1,260	1,470	1,990				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2003) are considered regulated. For each station, the upper numbers are the log-Pearson Type III estimates, the middle numbers are regression estimates, and the lower numbers are weighted estimates. Streamflow-gaging stations are in Ohio unless indicated otherwise. Abbreviations: ft^3/s, cubic feet per second.]

Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Cal-endar year	Magni-tude (ft^3/s)
201	03263700	Bridge Creek near Greenville	40°04′13″	84°37′45″	350	550	673	816	912	1,000	1,180	31	1947-1977	1958	754
					346	589	765	992	1,160	1,340	1,750				
					350	554	686	846	959	1,070	1,300				
202	03264000	Greenville Creek near Bradford	40°06′08″	84°25′48″	3,070	4,790	6,060	7,820	9,240	10,800	14,700	71	1913, 1932-2001	1913	18,200
					4,640	7,000	8,640	10,700	12,300	13,800	17,400				
					3,100	4,850	6,160	7,970	9,430	11,000	14,900				
203	03265000	Stillwater River at Pleasant Hill	40°03′28″	84°21′22″	9,840	15,100	18,800	23,900	27,800	31,800	42,000	86	1913, 1917-2001	1913	51,400
					10,200	15,400	19,100	23,700	27,200	30,700	38,900				
					9,850	15,100	18,800	23,800	27,700	31,800	41,700				
204	03265100	Hog Run tributary at Laura	40°00′30″	84°25′26″	36	61	80	106	127	150	207	28	1950-1977	1953	204
					58	102	134	176	207	239	313				
					38	66	89	121	146	173	238				
205	03266500	Mad River at Zanes-field	40°21′01″	83°40′28″	409	725	989	1,390	1,730	2,120	3,230	33	1947-1979	1972	2,100
					463	783	1,020	1,320	1,540	1,770	2,320				
					412	731	992	1,380	1,700	2,050	3,010				
206	03267000	Mad River near Urbana	40°06′27″	83°47′57″	2,480	3,730	4,590	5,730	6,600	7,490	9,640	68	1926-1931, 1940-2001	1959	8,000
					4,790	7,580	9,580	12,200	14,100	16,100	20,700				
					2,520	3,830	4,780	6,040	7,010	8,000	10,400				
207	03267900	Mad River at St. Paris Pike at Eagle City	39°57′51″	83°49′54″	5,360	7,130	8,190	9,410	10,300	11,000	12,700	34	1959, 1966-1995, 1999-2001	1959	18,300
					7,550	11,700	14,700	18,500	21,300	24,200	30,900				
					5,450	7,410	8,680	10,300	11,400	12,500	14,900				
208	03268000	Buck Creek at New Moorefield	39°59′31″	83°42′53″	1,840	2,520	3,060	3,830	4,490	5,220	7,240	17	1943-1959	1959	8,130
					2,460	3,990	5,100	6,530	7,610	8,700	11,300				
					1,890	2,700	3,360	4,340	5,150	6,020	8,300				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

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Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Calendar year	Magnitude (ft^3/s)
209	03268300	Beaver Creek at Brighton	39°55′46″	83°34′04″	253	469	631	851	1,020	1,200	1,620	19	1959-1977	1959	1,000
					248	419	541	698	817	936	1,220				
					252	459	609	805	953	1,100	1,460				
210	03268500	Beaver Creek near Springfield	39°56′26″	83°44′56″	1,850	2,870	3,590	4,540	5,280	6,030	7,870	21	1943-1959, 1973-1976	1948	4,980
					1,490	2,370	3,000	3,800	4,390	4,990	6,400				
					1,820	2,810	3,490	4,390	5,070	5,770	7,460				
211	**03269000**	Buck Creek at Springfield	39°55′57″	83°49′02″	3,180	5,440	7,200	9,730	11,800	14,100	20,200	56	1913, 1915-1921, 1924-1956, 1959-1973	1929	13,000
					4,280	6,820	8,650	11,000	12,800	14,600	18,800				
					3,210	5,490	7,280	9,820	11,900	14,100	20,000				
212	**03269500**	Mad River near Springfield	39°55′23″	83°52′13″	7,770	12,600	16,400	21,600	25,800	30,400	42,300	63	1904-1905, 1913-1973	1913	55,400
					12,300	19,800	25,300	32,400	37,900	43,400	56,600				
					7,860	12,900	16,700	22,100	26,600	31,300	43,500				
213	**03270500**	Great Miami River at Dayton	39°45′55″	84°11′51″	36,700	57,200	70,500	86,800	98,500	110,000	135,000	29	1893-1921	1913	250,000
					31,900	45,700	55,300	67,500	76,700	85,700	107,000				
					36,600	56,600	69,500	85,100	96,300	107,000	131,000				
214	03270800	Wolf Creek at Trotwood	39°47′39″	84°18′36″	1,570	2,410	2,960	3,650	4,160	4,670	5,810	25	1959, 1963-1986	1959	3,900
					1,800	2,840	3,550	4,440	5,100	5,740	7,230				
					1,590	2,460	3,050	3,800	4,360	4,910	6,170				
215	03271000	Wolf Creek at Dayton	39°46′00″	84°14′12″	4,370	6,460	7,940	9,920	11,500	13,100	17,100	28	1939-1950, 1959, 1987-2001	1959	12,500
					4,200	6,530	8,120	10,100	11,600	13,100	16,400				
					4,360	6,460	7,970	9,960	11,500	13,100	16,900				
216	03271800	Twin Creek near Ingomar	39°42′28″	84°31′30″	7,580	10,900	13,400	17,000	20,100	23,400	32,600	38	1959, 1963-1999	1959	30,300
					8,960	13,500	16,500	20,300	23,100	25,900	32,300				
					7,640	11,000	13,700	17,400	20,500	23,800	32,600				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2003) are considered regulated. For each station, the upper numbers are the log-Pearson Type III estimates, the middle numbers are regression estimates, and the lower numbers are weighted estimates. Streamflow-gaging stations are in Ohio unless indicated otherwise. Abbreviations: ft^3/s, cubic feet per second.]

Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years: 2	5	10	25	50	100	500	Record: Years	Record: Period used	Largest recorded discharge: Calendar year	Largest recorded discharge: Magnitude (ft^3/s)
217	03272695	Trippetts Branch at Camden	39°38′03″	84°39′08″	100	179	236	313	373	433	578	10	1978-1987	1983	247
					90	164	218	287	340	392	516				
					97	173	228	300	355	410	540				
218	03272700	Sevenmile Creek at Camden	39°37′45″	84°38′40″	3,200	5,260	6,960	9,520	11,800	14,300	21,500	31	1971-2001	1989	20,200
					4,270	6,640	8,270	10,300	11,800	13,300	16,800				
					3,260	5,380	7,110	9,640	11,800	14,100	20,400				
219	03272800	Sevenmile Creek at Collinsville	39°31′23″	84°36′39″	6,130	9,760	12,500	16,300	19,300	22,600	31,100	17	1959, 1961-1976	1968	16,800
					6,250	9,540	11,800	14,600	16,700	18,800	23,500				
					6,140	9,730	12,400	15,900	18,700	21,500	28,700				
220	03272900	Collins Creek at Collinsville	39°31′05″	84°36′53″	241	351	420	502	559	614	730	17	1966-1982	1968	409
					202	361	477	627	739	852	1,120				
					234	353	436	542	622	700	879				
221	03273500	Fourmile Creek near Hamilton	39°27′30″	84°32′50″	14,500	21,300	25,300	29,900	33,000	35,800	41,400	23	1938-1960	1959	44,500
					12,500	18,700	23,000	28,300	32,200	36,000	44,900				
					14,400	21,000	25,000	29,600	32,800	35,800	42,100				
222	**03274000**	Great Miami River at Hamilton	39°23′28″	84°34′20″	43,400	60,700	73,600	91,700	107,000	123,000	165,000	15	1907-1921	1913	352,000
					42,900	61,300	74,100	90,600	103,000	115,000	144,000				
					43,400	60,700	73,700	91,500	106,000	121,000	160,000				
223	03274100	Blake Run near Reily	39°27′59″	84°45′22″	61	111	149	202	244	287	395	36	1939-1940, 1942-1943, 1947-1978	1960	307
					76	134	177	231	271	311	405				
					62	115	155	209	252	295	399				
224	03274880	Greens Fork Tributary near Lynn, Ind.	40°01′14″	84°56′24″	95	167	222	299	360	426	592	10	1973-1982	1979	240
					156	270	350	453	529	605	781				
					107	195	266	362	437	512	691				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2003) are considered regulated. For each station, the upper numbers are the log-Pearson Type III estimates, the middle numbers are regression estimates, and the lower numbers are weighted estimates. Streamflow-gaging stations are in Ohio unless indicated otherwise. Abbreviations: ft^3/s, cubic feet per second.]

Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years: 2	5	10	25	50	100	500	Record: Years	Record: Period used	Largest recorded discharge: Calendar year	Largest recorded discharge: Magnitude (ft^3/s)
225	03275500	East Fork Whitewater River at Richmond, Ind.	39°48′24″	84°54′26″	5,250	8,850	11,600	15,400	18,400	21,600	29,900	30	1913, 1950-1978	1969	15,000
					5,790	8,660	10,600	13,000	14,800	16,500	20,500				
					5,270	8,830	11,500	15,000	17,800	20,700	27,900				
226	03275600	East Fork Whitewater River at Abington, Ind.	39°43′57″	84°57′35″	7,140	10,300	12,400	15,000	16,900	18,800	23,300	36	1966-2001	1999	16,700
					8,410	12,400	15,200	18,500	21,000	23,400	29,000				
					7,190	10,400	12,600	15,300	17,400	19,400	24,100				
227	03275800	West Run near Liberty, Ind.	39°38′24″	84°57′18″	73	130	176	244	302	365	539	17	1973-1989	1989	255
					83	150	199	262	309	357	468				
					75	135	184	251	305	361	503				
228	03275900	Templeton Creek near Fairfield, Ind.	39°31′20″	84°56′51″	387	790	1,150	1,740	2,270	2,890	4,750	10	1973-1982	1980	1,900
					623	1,020	1,290	1,630	1,890	2,140	2,710				
					425	846	1,200	1,700	2,100	2,520	3,610				
229	03276640	Tanners Creek Tributary near Lawrenceburg, Ind.	39°09′18″	84°52′20″	93	164	223	308	381	462	683	17	1973-1989	1974	300
					75	140	188	251	298	346	459				
					89	158	211	285	344	406	565				
230	03322500	Wabash River near New Corydon, Ind.	40°33′50″	84°48′10″	4,040	5,320	6,030	6,800	7,300	7,740	8,620	37	1952-1988	1959	8,720
					4,670	6,680	8,030	9,740	11,000	12,200	15,100				
					4,050	5,380	6,150	7,010	7,600	8,130	9,220				
231	03325500	Mississinewa River near Ridgeville, Ind.	40°16′48″	84°59′33″	3,910	5,910	7,300	9,120	10,500	11,900	15,400	55	1947-2001	1958	13,900
					3,640	5,590	6,950	8,700	9,990	11,300	14,300				
					3,900	5,890	7,280	9,090	10,500	11,900	15,300				
232	04096515	South Branch Hog Creek near Allen, Mich.	41°56′55″	84°49′40″	271	405	496	612	700	788	996	31	1970-2000	1985	664
					998	1,450	1,750	2,090	2,340	2,570	3,080				
					288	442	556	707	821	935	1,200				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

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Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Calendar year	Magnitude (ft^3/s)
233	04099060	Pigeon Creek. Tributary near Ellis, Ind.	41°37′43″	84°54′56″	45	77	100	134	160	189	262	10	1973-1982	1981	110
					71	115	144	179	203	227	279				
					50	86	114	151	179	206	271				
234	04176000	River Raisin near Adrian, Mich.	41°54′15″	83°58′50″	2,830	3,980	4,700	5,570	6,190	6,790	8,120	47	1954-2000	1982	6,660
					4,890	6,620	7,700	8,980	9,870	10,700	12,600				
					2,870	4,060	4,820	5,750	6,420	7,060	8,460				
235	04176900	Hill Ditch near Richards	41°39′54″	83°40′05″	81	161	230	334	425	527	812	35	1947-1981	1972	340
					138	212	259	314	353	391	472				
					84	166	234	331	410	495	717				
236	04177400	Eagle Creek tributary near Montpelier	41°35′10″	84°40′50″	71	110	137	173	199	227	292	26	1950-1975	1956	195
					83	128	156	189	213	235	283				
					72	112	140	176	202	229	290				
237	04177720	Fish Creek at Hamilton, Ind.	41°31′55″	84°54′12″	384	574	716	914	1,070	1,250	1,700	32	1970-2001	1996	1,510
					779	1,130	1,340	1,600	1,780	1,950	2,330				
					396	601	759	976	1,150	1,330	1,790				
238	04178000	St. Joseph River near Newville, Ind.	41°23′08″	84°48′06″	4,390	6,330	7,680	9,440	10,800	12,200	15,500	54	1947-1996, 1998-2001	1996	10,400
					6,240	8,440	9,810	11,400	12,600	13,700	16,000				
					4,420	6,400	7,770	9,550	10,900	12,300	15,600				
239	04179500	Cedar Creek at Auburn, Ind.	41°21′57″	85°03′08″	882	1,170	1,350	1,570	1,730	1,890	2,250	39	1943-1978, 1980-1982	1982	2,100
					1,670	2,430	2,930	3,510	3,930	4,320	5,190				
					905	1,220	1,430	1,700	1,900	2,100	2,540				
240	04180000	Cedar Creek near Cedarville, Ind.	41°13′08″	85°04′35″	3,250	4,160	4,690	5,300	5,710	6,090	6,900	55	1947-2001	1991	5,580
					3,690	5,200	6,160	7,300	8,100	8,870	10,600				
					3,260	4,200	4,760	5,410	5,860	6,290	7,180				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

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Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Calendar year	Magnitude (ft^3/s)
241	04182590	Harber Ditch at Fort Wayne, Ind.	41°00′27″	85°10′58″	688	865	969	1,090	1,170	1,250	1,410	27	1965-1991	1991	1,100
					580	860	1,040	1,250	1,400	1,540	1,840				
					680	865	977	1,110	1,210	1,300	1,500				
242	04183500	Maumee River at Antwerp	41°11′56″	84°44′40″	14,000	18,200	20,900	24,400	26,900	29,500	35,600	71	1912-1982	1913	40,000
					16,300	21,500	24,800	28,700	31,400	34,000	39,600				
					14,100	18,300	21,100	24,600	27,200	29,800	35,900				
243	04183750	Racetrack Run at Hicksville	41°18′58″	84°46′00″	50	93	126	173	211	251	352	10	1978-1987	1981	173
					31	53	68	86	99	112	140				
					44	77	98	123	142	161	207				
244	04184500	Bean Creek at Powers	41°40′39″	84°13′56″	2,180	3,130	3,720	4,420	4,900	5,370	6,370	43	1941-1982, 2001	1982	4,900
					2,880	4,040	4,780	5,650	6,260	6,840	8,120				
					2,200	3,170	3,780	4,500	5,020	5,500	6,550				
245	04184750	Spring Creek at Fayette	41°40′32″	84°19′47″	268	325	356	389	411	430	469	10	1978-1987	1982	395
					148	244	309	389	446	502	626				
					236	299	338	389	427	464	545				
246	04184760	Bean Creek tributary near Fayette	41°39′08″	84°17′34″	58	73	81	91	98	105	119	10	1978-1987	1985	91
					43	71	90	114	130	147	182				
					54	72	85	101	113	125	150				
247	04185000	Tiffin River at Stryker	41°30′16″	84°25′47″	3,480	4,930	5,820	6,860	7,580	8,260	9,710	70	1913, 1922-1928, 1937, 1941-2001	1982	7,800
					5,010	6,970	8,220	9,710	10,800	11,800	13,900				
					3,520	5,000	5,920	7,020	7,790	8,510	10,100				
248	04185150	Beaver Creek tributary near Montpelier	41°34′19″	84°31′03″	96	125	143	164	179	194	225	10	1978-1987	1980	150
					33	55	71	89	102	115	143				
					75	96	109	124	136	148	175				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

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Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years: 2	5	10	25	50	100	500	Record: Years	Period used	Largest recorded discharge: Calendar year	Magnitude (ft^3/s)
249	04185440	Unnamed Tributary to Lost Creek near Farmers	41°21′42″	84°41′28″	425	675	868	1,140	1,370	1,610	2,260	16	1986-2001	1998	1,770
					191	305	380	471	535	598	736				
					380	576	704	867	991	1,120	1,450				
250	04185945	Auglaize River tributary near Spencerville	40°42′27″	84°19′06″	87	135	168	210	241	272	344	10	1978-1987	1986	180
					44	76	97	123	142	160	201				
					73	110	133	162	182	203	251				
251	04186500	Auglaize River near Fort Jennings	40°56′55″	84°15′58″	5,130	7,480	8,920	10,600	11,800	12,900	15,200	76	1922-1936, 1941-2001	1992	12,800
					4,940	7,110	8,510	10,200	11,400	12,500	15,100				
					5,130	7,460	8,900	10,600	11,800	12,900	15,200				
252	04186800	King Run near Harrod	40°43′56″	83°53′47″	94	125	145	167	183	199	232	21	1966-1986	1982	167
					48	84	108	139	161	183	232				
					86	116	135	158	176	193	232				
253	04187100	Ottawa River at Lima	40°43′29″	84°07′35″	2,900	3,620	4,070	4,610	4,990	5,370	6,220	11	1989-1999	1991	4,590
					2,210	3,180	3,800	4,530	5,050	5,550	6,630				
					2,800	3,540	4,000	4,580	5,010	5,430	6,370				
254	04187500	Ottawa River at Allentown	40°45′18″	84°11′41″	3,110	4,470	5,310	6,290	6,970	7,620	8,990	52	1924-1935, 1939, 1943-1981	1959	7,740
					2,610	3,730	4,450	5,300	5,900	6,470	7,720				
					3,100	4,430	5,250	6,210	6,870	7,490	8,840				
255	04187945	Rattlesnake Creek near Cairo	40°49′20″	84°04′16″	130	188	225	268	298	326	388	10	1978-1987	1981	280
					81	130	162	201	228	254	312				
					118	169	200	237	264	289	346				
256	04188500	Eagle Creek near Findlay	40°59′35″	83°39′05″	2,100	2,870	3,350	3,900	4,280	4,650	5,430	13	1947-1957, 1959, 1981	1981	6,500
					1,350	2,060	2,530	3,090	3,490	3,870	4,730				
					2,030	2,770	3,220	3,740	4,110	4,470	5,250				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

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Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Cal-endar year	Magni-tude (ft^3/s)
257	04189000	Blanchard River near Findlay	41°03′21″	83°41′17″	5,150	7,610	9,200	11,100	12,500	13,800	16,800	75	1913, 1924-1936, 1941-2001	1913	22,000
					4,780	6,770	8,050	9,570	10,700	11,700	13,900				
					5,140	7,580	9,130	11,000	12,300	13,600	16,500				
258	04189100	Tiderishi Creek near Jenera	40°55′53″	83°43′39″	200	309	375	450	501	547	640	31	1947-1977	1959	480
					203	320	397	489	555	618	757				
					200	310	378	457	511	562	666				
259	04189500	Blanchard River at Glandorf	41°02′40″	84°04′55″	8,020	11,300	13,500	16,300	18,400	20,500	25,500	13	1922-1928, 1947-1951, 1959	1959	17,700
					7,660	10,700	12,700	15,000	16,700	18,300	21,700				
					8,000	11,200	13,400	16,000	18,000	20,000	24,600				
260	04190350	Little Auglaize River tributary at Ottoville	40°55′05″	84°20′47″	53	80	97	117	131	144	173	10	1978-1987	1981	109
					63	100	124	153	173	193	235				
					55	86	106	132	150	167	204				
261	04190500	Roller Creek Atio City	40°46′16″	84°38′15″	211	310	378	466	534	603	771	31	1947-1977	1959	890
					217	340	421	517	586	652	796				
					212	313	383	475	544	613	777				
262	04191480	Beetree Run near Junction	41°13′21″	84°24′33″	95	132	154	180	198	214	249	11	1977-1987	1985	165
					88	139	172	212	240	266	324				
					93	134	160	192	215	237	284				
263	04191500	Auglaize River near Defiance	41°14′15″	84°23′57″	25,700	36,900	44,300	53,500	60,200	67,000	82,400	88	1913, 1915-2001	1913	120,000
					20,200	27,500	32,200	37,900	41,900	45,700	54,100				
					25,600	36,600	43,700	52,500	58,900	65,300	79,800				
264	04192500	Maumee River near Defiance	41°17′31″	84°16′52″	45,400	61,000	70,800	82,700	91,400	99,800	119,000	72	1925-1936, 1939-1975, 1979-2001	1982	104,000
					34,600	45,200	51,800	59,800	65,400	70,700	82,500				
					45,200	60,400	69,900	81,300	89,500	97,500	116,000				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

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Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Calendar year	Magnitude (ft^3/s)
265	04192900	Reitz Run at Waterville	41°29′50″	83°42′35″	34	65	92	135	173	217	343	21	1966-1986	1969	165
					66	109	137	171	196	219	272				
					37	71	101	144	180	218	315				
266	04193500	Maumee River at Waterville	41°30′00″	83°42′46″	51,700	69,900	82,300	98,200	110,000	123,000	153,000	81	1900-1901, 1913, 1922-1936, 1939-2001	1913	180,000
					38,000	49,200	56,300	64,800	70,800	76,600	89,100				
					51,400	69,200	81,000	96,100	108,000	119,000	147,000				
267	04195500	Portage River at Woodville	41°26′58″	83°21′41″	6,440	8,700	10,100	11,700	12,800	13,800	16,100	70	1913, 1929-1935, 1940-2001	1913	17,000
					5,670	8,040	9,560	11,400	12,700	13,900	16,600				
					6,430	8,680	10,100	11,700	12,800	13,800	16,100				
268	04196000	Sandusky River near Bucyrus	40°48′13″	83°00′21″	2,600	3,920	4,890	6,230	7,310	8,460	11,500	49	1926-1935, 1939-1951, 1959, 1964-1981, 1987, 1996-2001	1959	13,500
					1,790	2,640	3,190	3,850	4,320	4,760	5,750				
					2,570	3,850	4,760	6,000	6,970	7,990	10,600				
269	04196500	Sandusky River near Upper Sandusky	40°51′02″	83°15′23″	4,770	6,760	8,000	9,480	10,500	11,500	13,700	60	1922-1936, 1938-1981, 2001	1959	10,000
					4,550	6,600	7,920	9,530	10,700	11,800	14,200				
					4,760	6,750	7,990	9,480	10,500	11,500	13,800				
270	04196700	St. James River near Upper Sandusky	40°46′51″	83°18′12″	208	302	358	419	460	497	570	31	1947-1977	1959	408
					234	373	464	575	653	729	897				
					210	309	371	443	493	540	636				
271	04196800	Tymochtee Creek at Crawford	40°55′22″	83°20′56″	3,680	4,970	5,720	6,550	7,110	7,620	8,660	41	1961-2001	1991	6,700
					3,510	5,000	5,950	7,090	7,890	8,660	10,300				
					3,680	4,970	5,730	6,610	7,200	7,740	8,880				
272	04197000	Sandusky River near Mexico	41°02′39″	83°11′42″	8,700	12,200	14,500	17,200	19,100	20,900	25,000	60	1922-1937, 1939-1982	1937	19,000
					9,220	13,100	15,500	18,500	20,700	22,700	27,200				
					8,710	12,300	14,500	17,300	19,200	21,100	25,200				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2003) are considered regulated. For each station, the upper numbers are the log-Pearson Type III estimates, the middle numbers are regression estimates, and the lower numbers are weighted estimates. Streamflow-gaging stations are in Ohio unless indicated otherwise. Abbreviations: ft³/s, cubic feet per second.]

Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft³/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Cal-endar year	Magni-tude (ft³/s)
273	04197100	Honey Creek at Mel-more	41°01′20″	83°06′35″	2,600	3,450	3,940	4,470	4,820	5,140	5,770	41	1961-2001	1981	4,400
					2,650	3,870	4,650	5,590	6,260	6,900	8,310				
					2,600	3,480	3,990	4,580	4,970	5,340	6,090				
274	04197170	Rock Creek at Tiffin	41°06′49″	83°10′06″	1,270	1,850	2,190	2,570	2,830	3,060	3,530	19	1983-2001	1998	2,640
					953	1,460	1,790	2,190	2,480	2,750	3,360				
					1,230	1,780	2,100	2,470	2,730	2,970	3,480				
275	04197300	Wolf Creek at Betts-ville	41°14′58″	83°14′08″	1,600	2,060	2,350	2,710	2,980	3,250	3,860	21	1961-1981	1962	4,280
					1,480	2,200	2,670	3,240	3,640	4,020	4,870				
					1,590	2,070	2,400	2,810	3,110	3,410	4,100				
276	04197400	East Branch Wolf Creek at Ft Seneca	41°12′40″	83°10′50″	1,760	2,220	2,500	2,840	3,080	3,310	3,830	15	1961-1975	1969	2,780
					1,590	2,400	2,920	3,550	4,000	4,430	5,390				
					1,740	2,240	2,580	3,000	3,310	3,610	4,290				
277	04197500	Havens Creek at Havens	41°17′36″	83°11′50″	139	207	249	299	333	365	434	31	1947-1977	1956	312
					176	274	336	411	464	515	626				
					142	213	259	315	354	392	471				
278	04198000	Sandusky River near Fremont	41°18′28″	83°09′32″	15,500	20,800	24,000	27,600	30,100	32,500	37,400	76	1924-1936, 1939-2001	1978	36,500
					13,300	18,700	22,200	26,400	29,300	32,200	38,500				
					15,400	20,700	23,900	27,600	30,100	32,400	37,500				
279	04198100	Norwalk Creek near Norwalk	41°13′58″	82°32′28″	346	607	810	1,100	1,330	1,580	2,230	36	1947-1982	1969	1,880
					344	582	753	974	1,140	1,310	1,700				
					346	605	803	1,080	1,290	1,520	2,100				
280	04198500	East Branch Huron River near Norwalk	41°14′58″	82°38′52″	2,650	4,350	5,640	7,460	8,940	10,500	14,700	14	1924-1935, 1959, 1969	1969	22,000
					2,840	4,510	5,710	7,250	8,400	9,560	12,300				
					2,670	4,370	5,650	7,410	8,820	10,300	14,000				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2003) are considered regulated. For each station, the upper numbers are the log-Pearson Type III estimates, the middle numbers are regression estimates, and the lower numbers are weighted estimates. Streamflow-gaging stations are in Ohio unless indicated otherwise. Abbreviations: ft^3/s, cubic feet per second.]

Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Cal-endar year	Magni-tude (ft^3/s)
281	04199000	Huron River at Milan	41°18′06″	82°36′25″	8,170	12,100	14,900	18,900	22,200	25,700	34,800	46	1950-1981, 1988-2001	1969	49,600
					8,290	12,700	15,800	19,800	22,800	25,800	32,900				
					8,170	12,100	15,000	19,000	22,200	25,700	34,500				
282	04199155	Old Womans Creek at Berlin Road near Huron	41°20′54″	82°30′50″	926	1,230	1,430	1,690	1,880	2,080	2,560	13	1988-1994, 1996-2001	1997	1,940
					1,040	1,710	2,190	2,810	3,280	3,760	4,880				
					941	1,320	1,600	1,990	2,290	2,600	3,330				
283	04199500	Vermilion River near Vermilion	41°22′55″	82°19′01″	5,770	8,800	11,200	14,700	17,600	20,900	30,100	33	1950-1981, 2001	1969	40,800
					5,770	8,660	10,700	13,200	15,100	17,000	21,400				
					5,770	8,790	11,100	14,500	17,300	20,300	28,500				
284	04199800	Neff Run near Litch-field	41°12′33″	82°01′26″	71	97	115	138	156	175	220	17	1966-1982	1969	152
					80	140	183	238	280	322	421				
					72	105	130	165	193	221	289				
285	04200000	East Branch Black River at Elyria	41°20′51″	82°05′40″	4,610	7,500	9,810	13,200	16,100	19,300	28,100	15	1923-1935, 1959, 1969	1969	23,100
					4,850	7,240	8,890	11,000	12,500	14,100	17,700				
					4,620	7,470	9,680	12,800	15,300	18,100	25,300				
286	04200100	Plum Creek at Oberlin	41°17′15″	82°13′12″	298	501	652	861	1,030	1,200	1,640	31	1947-1977	1969	1,560
					259	410	513	644	740	836	1,060				
					296	492	634	823	970	1,120	1,500				
287	04200500	Black River at Elyria	41°22′49″	82°06′17″	7,300	10,800	13,700	17,900	21,500	25,700	37,400	57	1945-2001	1969	51,700
					7,600	11,200	13,700	16,900	19,200	21,600	27,100				
					7,310	10,900	13,700	17,800	21,400	25,300	36,300				
288	04201500	Rocky River near Berea	41°24′24″	81°53′14″	8,110	11,100	13,000	15,500	17,300	19,100	23,300	70	1924-1935, 1944-2001	1959	21,400
					5,660	8,440	10,400	12,800	14,700	16,500	20,700				
					8,050	11,000	12,900	15,300	17,100	18,900	23,100				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2003) are considered regulated. For each station, the upper numbers are the log-Pearson Type III estimates, the middle numbers are regression estimates, and the lower numbers are weighted estimates. Streamflow-gaging stations are in Ohio unless indicated otherwise. Abbreviations: ft^3/s, cubic feet per second.]

Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Cal-endar year	Magni-tude (ft^3/s)
289	**04202000**	Cuyahoga River at Hiram Rapids	41°20′26″	81°10′01″	1,580	2,310	2,770	3,320	3,700	4,070	4,860	24	1928-1935, 1945-1960	1959	3,670
					2,560	3,510	4,130	4,890	5,450	6,000	7,250				
					1,610	2,360	2,850	3,440	3,860	4,250	5,120				
290	04206212	North Fork at Bath Center	41°10′08″	81°38′04″	366	570	719	922	1,080	1,250	1,680	10	1992-2001	1992	885
					356	598	774	1,000	1,170	1,340	1,750				
					364	578	738	953	1,120	1,290	1,710				
291	04206220	Yellow Creek at Botzum	41°09′47″	81°35′02″	1,010	1,200	1,300	1,410	1,480	1,550	1,690	10	1992-2001	1993	1,340
					1,180	1,890	2,390	3,020	3,500	3,980	5,110				
					1,040	1,330	1,550	1,850	2,070	2,290	2,770				
292	04207200	Tinkers Creek at Bed-ford	41°23′04″	81°31′39″	2,750	3,890	4,730	5,880	6,810	7,800	10,400	39	1963-2001	1969	7,220
					1,770	2,510	2,990	3,590	4,030	4,460	5,440				
					2,700	3,780	4,550	5,570	6,380	7,230	9,410				
293	04208000	Cuyahoga River at Independence	41°23′43″	81°37′48″	8,850	11,700	13,600	16,000	17,800	19,600	24,100	73	1922-1923, 1928-1936, 1940-2001	1959	24,800
					9,670	13,500	16,100	19,400	21,800	24,200	29,700				
					8,860	11,700	13,600	16,100	18,000	19,900	24,400				
294	04209000	Chagrin River at Wil-loughby	41°37′51″	81°24′13″	8,850	13,500	17,000	22,100	26,300	31,000	43,600	66	1913, 1926-1935, 1940-1984, 1988-1993, 1996-1999	1948	28,000
					5,070	7,510	9,210	11,400	13,000	14,500	18,200				
					8,750	13,200	16,600	21,300	25,200	29,500	40,800				
295	04210000	Phelps Creek near Windsor	41°30′56″	80°56′07″	1,860	2,690	3,190	3,770	4,160	4,510	5,260	18	1942-1959	1959	4,600
					804	1,210	1,480	1,820	2,070	2,320	2,900				
					1,760	2,480	2,880	3,320	3,630	3,930	4,580				
296	04210090	Montville Ditch at Montville	41°36′04″	81°03′03″	28	54	76	107	132	160	233	12	1966-1977	1977	95
					39	70	92	121	143	165	218				
					30	59	81	113	137	163	225				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2003) are considered regulated. For each station, the upper numbers are the log-Pearson Type III estimates, the middle numbers are regression estimates, and the lower numbers are weighted estimates. Streamflow-gaging stations are in Ohio unless indicated otherwise. Abbreviations: ft^3/s, cubic feet per second.]

Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years: 2	5	10	25	50	100	500	Record: Years	Record: Period used	Largest recorded discharge: Calendar year	Largest recorded discharge: Magnitude (ft^3/s)
297	04210100	Hoskins Creek at Hartsgrove	41°36′00″	80°57′12″	201	324	419	553	663	783	1,100	36	1947-1977, 1982-1986	1959	700
					219	329	402	493	559	624	774				
					202	324	417	547	651	762	1,050				
298	**04211000**	Rock Creek near Rock Creek	41°39′05″	80°50′10″	2,510	3,670	4,420	5,340	6,010	6,670	8,160	25	1942-1966	1959	8,000
					1,240	1,670	1,940	2,270	2,510	2,740	3,270				
					2,440	3,480	4,110	4,860	5,390	5,910	7,090				
299	04211500	Mill Creek near Jefferson	41°45′11″	80°48′03″	3,320	4,600	5,510	6,740	7,720	8,750	11,400	33	1942-1974	1959	9,810
					1,670	2,360	2,810	3,370	3,780	4,180	5,110				
					3,250	4,440	5,270	6,350	7,200	8,080	10,300				
300	04212000	Grand River near Madison	41°44′26″	81°02′48″	8,780	11,600	13,300	15,500	17,100	18,700	22,300	51	1923-1936, 1938-1974	1959	21,100
					6,200	7,980	9,130	10,600	11,600	12,600	14,900				
					8,720	11,400	13,100	15,200	16,700	18,200	21,600				
301	04212100	Grand River near Painesville	41°43′08″	81°13′41″	12,700	15,700	17,300	19,100	20,200	21,300	23,300	27	1975-2001	1986	18,700
					7,540	9,880	11,400	13,300	14,700	16,100	19,200				
					12,500	15,300	16,800	18,400	19,500	20,500	22,700				
302	04212500	Ashtabula River near Ashtabula	41°51′20″	80°45′44″	4,440	6,400	7,720	9,430	10,700	12,000	15,200	54	1925-1936, 1939-1947, 1950-1979, 1994-1996	1959	11,600
					2,350	3,330	3,990	4,800	5,400	5,990	7,360				
					4,390	6,270	7,510	9,090	10,300	11,500	14,300				
303	04212600	Hubbard Run tributary at Ashtabula	41°50′38″	80°46′42″	105	143	170	206	235	264	341	17	1966-1982	1969	270
					81	138	180	233	273	313	409				
					101	142	172	213	246	280	364				
304	04213000	Conneaut Creek at Conneaut	41°55′37″	80°36′15″	6,130	8,950	10,800	13,200	14,900	16,600	20,500	66	1923-1936, 1950-2001	1959	17,000
					3,880	5,730	7,000	8,600	9,790	11,000	13,700				
					6,060	8,820	10,600	12,800	14,500	16,100	19,800				

Table 5. Flood-frequency data for streamflow-gaging stations—Continued

[Bold station numbers indicate peak streamflows at this station presently (2003) are considered regulated. For each station, the upper numbers are the log-Pearson Type III estimates, the middle numbers are regression estimates, and the lower numbers are weighted estimates. Streamflow-gaging stations are in Ohio unless indicated otherwise. Abbreviations: ft^3/s, cubic feet per second.]

Map ID (fig. 1)	Station number	Station name	Latitude	Longitude	Flood-peak discharge (ft^3/s) for indicated recurrence interval, in years							Record		Largest recorded discharge	
					2	5	10	25	50	100	500	Years	Period used	Calendar year	Magnitude (ft^3/s)
305	04213040	Raccoon Creek near West Springfield, Pa.	41°56′42″	80°26′51″	131	219	284	374	445	520	708	35	1961-1995	1969	408
					171	283	362	463	538	613	791				
					133	223	292	385	459	535	723				

APPENDIXES

Appendix A—Statistical Techniques for Determining Confidence Intervals and Testing for Extrapolation

The linear model relating basin characteristics to *t*-year peak flows can be written in matrix form as:

$$\boldsymbol{Y}=\boldsymbol{XB}$$

where

- ***Y*** is a column vector of logarithms of the n observed peak discharges,
- ***X*** is a (*n* by *p)* matrix of consisting of *p*-1 basin characteristics augmented by a column of ones in the first column, and
- **B** is a column vector of *p* regression coefficients.

For example, the matrix form of the simple equation for the 2-year peak discharge (Q_2) is

$$\begin{bmatrix} \log(Q_{2,1}) \\ \log(Q_{2,2}) \\ '''' \\ \log(Q_{2,305}) \end{bmatrix} = \begin{bmatrix} 1 & \log(DA_1) & R1_1 & R2_1 \\ 1 & \log(DA_2) & R1_2 & R2_2 \\ '''' & '''' & '''' & '''' \\ 1 & \log(DA_{305}) & R1_{305} & R2_{305} \end{bmatrix} \begin{bmatrix} 1.84 \\ 0.72 \\ 0.44 \\ 0.19 \end{bmatrix}$$

where

- $Q_{2,i}$ is the observed 2-year peak discharge for the *i*th gage site;
- DA_i is the drainage area for the *i*th site;
- $R1_i$ equals 1 if site is in region C, otherwise 0; and
- $R2_i$ equals 1 if site is in region A, otherwise 0.

The mean square sampling error for an ungaged site ($MSE_{s,0}$) with basin characteristics given by the row vector

$$x_0 = \begin{bmatrix} 1 & \log(DA_0) & R1_0 & R2_0 \end{bmatrix} ,$$

is calculated as

$$MSE_{s,0} = x_0\{X^T\Lambda^{-1}X\}^{-1}x_0^T , \qquad (1A)$$

where Λ is the (n by n) covariance matrix associated with ***Y***. The off-diagonal elements of Λ are the sample covariance of the estimated *t*-year peaks at sites *i* and *j*. The diagonal elements of Λ are the sums of model error variance, γ^2, and the time-sampling error for each site. Appendix tables 7 and 8 list the (*p* by *p*) matrices $\{X^T\Lambda^{-1}X\}^{-1}$ for the simple- and full-model equations, respectively, and appendix table 9 lists the model error variances for both models. The mean square error of a prediction (MSE_p), in base-10 logarithmic units, at a specific ungaged site can be estimated as

$$MSE_{p,0} = (\gamma^2 + MSE_{s,0}) . \qquad (2A)$$

With $MSE_{p,0}$ known, the standard error of prediction, in percent, can be calculated as

$$SE_{\text{prediction}} = 100\left\{e^{5.302(MSE_{p,0})} - 1\right\}^{\frac{1}{2}} . \qquad (3A)$$

Confidence limits for a predicted peak discharge, $\hat{y}$, can be calculated as

$$\hat{y}_u = C\hat{y} \text{ and } \hat{y}_u = \frac{1}{C}\hat{y} , \qquad (4A)$$

where $\hat{y}_u$ and $\hat{y}_l$ are the upper and lower confidence limits, respectively, for the prediction, and

$$C = 10^{\left[t_{\frac{\alpha}{2}, n-p}(MSE_{p,0})^{\frac{1}{2}}\right]} , \qquad (5A)$$

where

- $t_{\frac{\alpha}{2}, n-p}$ is Student's *t* with a specified alpha (α) level and *n-p* degrees of freedom.

The applicability of the regression equations presented in this report is unknown when the basin-characteristic values associated with an ungaged site are outside a space defined by the basin characteristics of the calibration data set. This space, called a regressor variable hull (RVH), contains as many dimensions as there are regressor (explanatory) variables in the regression equation (Montgomery and Peck, 1982). When points defined by the basin characteristics of the ungaged site lie within or on the boundary of the RVH, then the estimation generally can be determined by interpolation. If the point lies outside of the RVH, then estimation will require extrapolation, which may lead to poor performance of the regression equation.

Tests for extrapolation can be performed by comparing the basin-characteristic values of the ungaged site to the ranges of values observed in the calibration data set for the appropriate region (table 2, in the body of this report). In addition, one can test for extrapolation by computing the mean-square sampling error for the ungaged site ($MSE_{s,0}$), as described earlier in the appendix, and comparing it to the maximum mean-square sampling error (appendix table 9) of the calibration data set for the appropriate model and recurrence interval. If one or more basin characteristic values lies outside of the range of values of the

Table 7. Matrix $\{X^T \Lambda^{-1} X\}^{-1}$ for the simple equations in table 4

[Numbers are in scientific notation. Order of variables in matrix is constant, *DA*, *R1*, *R2*]

2-year recurrence interval			
1.16710E-03	-2.31670E-04	-5.30300E-04	-5.01710E-04
-2.31670E-04	1.03160E-04	1.74400E-05	1.30820E-05
-5.30300E-04	1.74400E-05	1.71270E-03	5.12540E-04
-5.01710E-04	1.30820E-05	5.12540E-04	6.56310E-04
5-year recurrence interval			
1.17960E-03	-2.34730E-04	-5.33260E-04	-4.88860E-04
-2.34730E-04	1.04780E-04	1.63510E-05	9.40110E-06
-5.33260E-04	1.63510E-05	1.78330E-03	5.24120E-04
-4.88860E-04	9.40110E-06	5.24120E-04	6.71170E-04
10-year recurrence interval			
1.28500E-03	-2.55830E-04	-5.82840E-04	-5.24160E-04
-2.55830E-04	1.13710E-04	1.79100E-05	9.04120E-06
-5.82840E-04	1.79100E-05	1.97620E-03	5.74110E-04
-5.24160E-04	9.04120E-06	5.74110E-04	7.32470E-04
25-year recurrence interval			
1.46910E-03	-2.92510E-04	-6.69420E-04	-5.91950E-04
-2.92510E-04	1.29290E-04	2.08500E-05	9.67320E-06
-6.69420E-04	2.08500E-05	2.29640E-03	6.59040E-04
-5.91950E-04	9.67320E-06	6.59040E-04	8.37500E-04
50-year recurrence interval			
1.62750E-03	-3.24120E-04	-7.44240E-04	-6.52590E-04
-3.24120E-04	1.42860E-04	2.34350E-05	1.05400E-05
-7.44240E-04	2.34350E-05	2.56860E-03	7.31950E-04
-6.52590E-04	1.05400E-05	7.31950E-04	9.28360E-04
100-year recurrence interval			
1.79710E-03	-3.58020E-04	-8.24900E-04	-7.18950E-04
-3.58020E-04	1.57550E-04	2.62470E-05	1.15790E-05
-8.24900E-04	2.62470E-05	2.86010E-03	8.10390E-04
-7.18950E-04	1.15790E-05	8.10390E-04	1.02670E-03
500-year recurrence interval			
2.22320E-03	-4.43540E-04	-1.03090E-03	-8.90890E-04
-4.43540E-04	1.95290E-04	3.35310E-05	1.43470E-05
-1.03090E-03	3.35310E-05	3.59990E-03	1.01060E-03
-8.90890E-04	1.43470E-05	1.01060E-03	1.28010E-03

Table 8. Matrix $\{X^T \Lambda^{-1} X\}^{-1}$ for the full-model equations in table 3

[Numbers are in scientific notation. Order of variables in matrix is the constant, *DA*, *R1*, *R2*, $SL_{10\text{-}85}$, *W*]

2-year recurrence interval					
5.43490E-03	-1.21280E-03	1.35390E-04	2.95600E-05	-2.55660E-03	-7.09400E-04
-1.21280E-03	3.43990E-04	-1.64750E-04	-1.11530E-04	6.23090E-04	6.50510E-06
1.35390E-04	-1.64750E-04	1.69680E-03	5.51590E-04	-4.27650E-04	1.93550E-04
2.95600E-05	-1.11530E-04	5.51590E-04	6.44850E-04	-3.03770E-04	2.45230E-05
-2.55660E-03	6.23090E-04	-4.27650E-04	-3.03770E-04	1.56490E-03	1.50660E-04
-7.09400E-04	6.50510E-06	1.93550E-04	2.45230E-05	1.50660E-04	1.24330E-03
5-year recurrence interval					
5.00650E-03	-1.11020E-03	1.26980E-04	2.88540E-05	-2.35920E-03	-6.46450E-04
-1.11020E-03	3.15560E-04	-1.53760E-04	-1.02710E-04	5.73210E-04	-1.44920E-06
1.26980E-04	-1.53760E-04	1.65110E-03	5.22430E-04	-4.05020E-04	1.75010E-04
2.88540E-05	-1.02710E-04	5.22430E-04	6.10640E-04	-2.78100E-04	1.60280E-05
-2.35920E-03	5.73210E-04	-4.05020E-04	-2.78100E-04	1.46640E-03	1.25790E-04
-6.46450E-04	-1.44920E-06	1.75010E-04	1.60280E-05	1.25790E-04	1.18860E-03
10-year recurrence interval					
5.22920E-03	-1.15310E-03	1.18930E-04	1.71590E-05	-2.46010E-03	-6.66980E-04
-1.15310E-03	3.27530E-04	-1.58620E-04	-1.04110E-04	5.95330E-04	-6.92150E-06
1.18930E-04	-1.58620E-04	1.78740E-03	5.54770E-04	-4.23080E-04	1.82480E-04
1.71590E-05	-1.04110E-04	5.54770E-04	6.47310E-04	-2.83670E-04	1.50820E-05
-2.46010E-03	5.95330E-04	-4.23080E-04	-2.83670E-04	1.53810E-03	1.21370E-04
-6.66980E-04	-6.92150E-06	1.82480E-04	1.50820E-05	1.21370E-04	1.26450E-03
25-year recurrence interval					
5.80040E-03	-1.27200E-03	1.12240E-04	1.19220E-06	-2.72190E-03	-7.30500E-04
-1.27200E-03	3.61090E-04	-1.73050E-04	-1.11500E-04	6.56030E-04	-1.38440E-05
1.12240E-04	-1.73050E-04	2.05360E-03	6.25590E-04	-4.67110E-04	2.03450E-04
1.19220E-06	-1.11500E-04	6.25590E-04	7.28820E-04	-3.06680E-04	1.63900E-05
-2.72190E-03	6.56030E-04	-4.67110E-04	-3.06680E-04	1.70910E-03	1.23790E-04
-7.30500E-04	-1.38440E-05	2.03450E-04	1.63900E-05	1.23790E-04	1.42710E-03

Table 8. Matrix $\{X^T\Lambda^{-1}X\}^{-1}$ for the full-model equations in table 3—Continued

[Numbers are in scientific notation. Order of variables in matrix is the constant, *DA*, *R1*, *R2*, $SL_{10\text{-}85}$, *W*]

50-year recurrence interval					
6.35750E-03	-1.39030E-03	1.10720E-04	-9.62360E-06	-2.97990E-03	-7.95230E-04
-1.39030E-03	3.94670E-04	-1.87980E-04	-1.19940E-04	7.16680E-04	-1.89980E-05
1.10720E-04	-1.87980E-04	2.29440E-03	6.92140E-04	-5.10660E-04	2.24210E-04
-9.62360E-06	-1.19940E-04	6.92140E-04	8.05960E-04	-3.31890E-04	1.81740E-05
-2.97990E-03	7.16680E-04	-5.10660E-04	-3.31890E-04	1.87490E-03	1.29540E-04
-7.95230E-04	-1.89980E-05	2.24210E-04	1.81740E-05	1.29540E-04	1.57940E-03
100-year recurrence interval					
6.99390E-03	-1.52680E-03	1.12260E-04	-1.90370E-05	-3.27710E-03	-8.70490E-04
-1.52680E-03	4.33500E-04	-2.05610E-04	-1.30320E-04	7.86960E-04	-2.41680E-05
1.12260E-04	-2.05610E-04	2.56100E-03	7.67050E-04	-5.61250E-04	2.48060E-04
-1.90370E-05	-1.30320E-04	7.67050E-04	8.93180E-04	-3.62280E-04	2.02510E-05
-3.27710E-03	7.86960E-04	-5.61250E-04	-3.62280E-04	2.06490E-03	1.37810E-04
-8.70490E-04	-2.41680E-05	2.48060E-04	2.02510E-05	1.37810E-04	1.75130E-03
500-year recurrence interval					
8.71250E-03	-1.89890E-03	1.26980E-04	-3.53530E-05	-4.09030E-03	-1.07690E-03
-1.89890E-03	5.39830E-04	-2.55190E-04	-1.60550E-04	9.80360E-04	-3.65050E-05
1.26980E-04	-2.55190E-04	3.26020E-03	9.66720E-04	-7.01460E-04	3.12890E-04
-3.53530E-05	-1.60550E-04	9.66720E-04	1.12710E-03	-4.49070E-04	2.54990E-05
-4.09030E-03	9.80360E-04	-7.01460E-04	-4.49070E-04	2.58310E-03	1.64610E-04
-1.07690E-03	-3.65050E-05	3.12890E-04	2.54990E-05	1.64610E-04	2.21160E-03

Table 9. Model error variances and maximum mean-square sampling errors for regression models

Recurrence interval (years)	Model error variance (γ^2) for indicated model		Maximum mean-square sampling error (MSE_s) for indicated model	
	Simple	Full	Simple	Full
2	0.02684	0.02329	0.00211	0.00234
5	.02590	.02045	.00222	.00229
10	.02664	.02023	.00242	.00246
25	.02854	.02114	.00280	.00280
50	.03047	.02241	.00312	.00310
100	.03272	.02407	.00346	.00343
500	.03906	.02910	.00433	.00431

calibration data set, or if the mean-square sampling error for the ungaged site is larger than the maximum mean square sampling error of the calibration data set, then the estimate is an extrapolation.

References

Montgomery, D.C., and Peck, E.A., 1982, Introduction to linear regression analysis: New York, Wiley, 504 p.

Appendix B—Basin Characteristics used as Regressor Variables

DA, drainage area (square miles)—the area, measured from a USGS 7.5 minute topographic map, in a horizontal plane, that is contained within the topographic divide for a specified location on a stream. Although the regression models were developed using manually-determined map-based drainage area as an explanatory variable, StreamStats uses a specially processed digital elevation model to determine drainage areas. StreamStats will compute drainage areas that are comparable to map-based determinations in most cases; however, limitations associated with DEM resolution and/or scale, as well as other possible factors, may result in erroneous drainage area determinations. It is the user's responsibility to verify that the drainage boundaries (and consequently the drainage area) derived by StreamStats are correct.

$SL_{10\text{-}85}$, channel slope (feet per mile)—computed by (a) determining the longest flowpath from the point of interest to a topographic divide (which generally corresponded to the basin divide), (b) determining the elevation at 10 percent of the distance along the longest flowpath upstream from the point at which the flow statistic is desired (E_{10}), (c) determining the elevation at 85 percent of the distance along the longest flowpath upstream from the point at which the flow statistic is desired (E_{85}), (d) determining the length of the stream segment between points 10- and 85-percent of the distance along the longest flowpath upstream from the point at which the flow statistic is desired ($L_{10\text{-}85}$), and then (e) dividing the change in elevation (E_{85} - E_{10}) by $L_{10\text{-}85}$.

W, percentage of the basin classified as open water and wetlands[1] (percent)—determined by (1) summing the areas of the 1992 National Land Cover Dataset (NLCD) grid cells (U.S. Geological Survey, 2000) contained within the basin boundary that are classified as open water, woody wetlands, or emergent herbaceous wetlands (land-cover class codes 11, 91, and 92, respectively), (2) dividing by the area of the basin, and then (3) multiplying by 100.

[1]The 1992 NLCD data reflect land cover characteristics during the early 1990's. Some of the gaging stations whose data were used in this study are located on streams that are presently regulated. In many cases, the regulation resulted from completion of one or more in-channel reservoirs. To better reflect land cover conditions during the unregulated period associated with the data used in this analysis, water areas used to compute *W* were reduced by the surface areas of in-channel reservoirs whose construction resulted in the regulated designation for streamflow at a gaging station, as well as all upstream in-channel reservoirs built thereafter.

References

U.S. Geological Survey, 2000, National Land Cover Dataset (version 03-16-2000): U.S. Geological Survey, accessed on June 3, 2006, at http://landcover.usgs.gov/natlland-cover.php