FLOOD FREQUENCY OF STREAMS IN RURAL BASINS OF TENNESSEE

By Jess D. Weaver and Charles R. Gamble

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 92-4165

Prepared in cooperation with the
TENNESSEE DEPARTMENT OF TRANSPORTATION

Nashville, Tennessee
1993

U.S. DEPARTMENT OF THE INTERIOR
MANUEL LUJAN, Jr., Secretary

U.S. GEOLOGICAL SURVEY
Dallas L. Peck, Director

For additional information write to:

District Chief
U.S. Geological Survey
810 Broadway, Suite 500
Nashville, Tennessee 37203

Copies of this report can be purchased from:

U.S. Geological Survey
Books and Open-File Reports Section
Federal Center
Box 25425
Denver, Colorado 80225

CONTENTS

FIGURE

TABLES

CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
inch (in.)	25.4	millimeter
foot (ft)	0.3048	meter
mile (mi)	1.609	kilometer
square mile (mi^2)	2.590	square kilometer
cubic foot per second (ft^3/s)	0.02832	cubic meter per second

Sea level: In this report "sea level" refers to the National Geodetic Vertical Datum of 1929--a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929.

Flood Frequency of Streams in Rural Basins of Tennessee

By Jess D. Weaver *and* Charles R. Gamble

ABSTRACT

Multiple regression equations and other information are presented for estimating the flood frequency of streams in Tennessee. Flood-frequency characteristics are defined for 223 gaging stations in Tennessee having 10 or more years of record through 1986. Regression equations were computed using the generalized least-squares regression procedure. The resulting equations can be used to estimate the magnitude of floods having recurrence intervals of as much as 500 years on ungaged streams, if contributing drainage area is known. At or near gaged sites, a weighted average of the regression results and the gaging station data is recommended. Updated information on peak discharge at miscellaneous sites is given.

INTRODUCTION

Man encroaches upon flood plains for many vital and worthwhile purposes. Intelligent, safe, and economically feasible encroachment demands an understanding and quantitative description of the magnitude and frequency of floods. A knowledge of the flood-frequency characteristics is essential to the design of adequate and economical bridges, culverts, embankments, dams, levees, and other structures near streams. Flood-plain management plans and flood-insurance rates are based on available information on flood magnitude and frequency.

Previous reports by Jenkins (1960), Patterson (1964), Speer and Gamble (1964), and Randolph and Gamble (1976) have presented methods to define flood frequency for streams in Tennessee. The first three of these reports used a graphical fit on Gumbel probability paper for at-site frequency analysis and the index flood method (Dalrymple, 1960) for regional analysis. The first two reports were based on data collected mostly on large streams. Randolph and Gamble (1976) used log-Pearson Type III methods as described in U.S. Water Resources Council, Bulletin 17 (1976) for at-site frequency analysis and ordinary least-squares regression for regional analysis. This report uses log-Pearson Type III methods as recommended by the Interagency Advisory Committee on Water Data, Bulletin 17B (1982) for at-site frequency analysis and generalized least-squares regression for regional analysis. This report uses 16 years of additional data and additional sites representing a larger variety of stream types and sizes as compared to Randolph and Gamble (1976).

The purpose of this report is to update previous flood-frequency reports for Tennessee by providing methods of estimating the magnitude of floods for selected recurrence intervals based on the most recent techniques and data available. The scope of the report is statewide. Data for some streams near Tennessee in adjacent states were incorporated into the analysis.

The report is the result of a cooperative agreement between the U.S. Geological Survey (USGS) and the Tennessee Department of Transportation (TDOT). It is based on gaging-station data collected and published by the USGS for many years as part of cooperative programs with various Federal, State, and municipal agencies, principally the U.S. Army Corps of Engineers (Nashville District), Tennessee Valley Authority (TVA), Tennessee Department of Environment and Conservation, and TDOT. Data at several sites collected and published by the TVA and the U.S. Army Corps of Engineers (Memphis District) also were used.

Description of the Study Area

Tennessee has diverse topography ranging from the Great Smoky Mountains in the east to the Coastal Plain in the west. Parts of eight physiographic provinces (Blue Ridge, Valley and Ridge, Cumberland Plateau, Sequatchie Valley, Central Basin, Highland Rim, Western Valley, and Coastal Plain) are present in Tennessee (Fenneman, 1946; Raisz, 1954; and Miller, 1974) (fig. 1). Elevations range from about 300 feet in the Coastal Plain of West

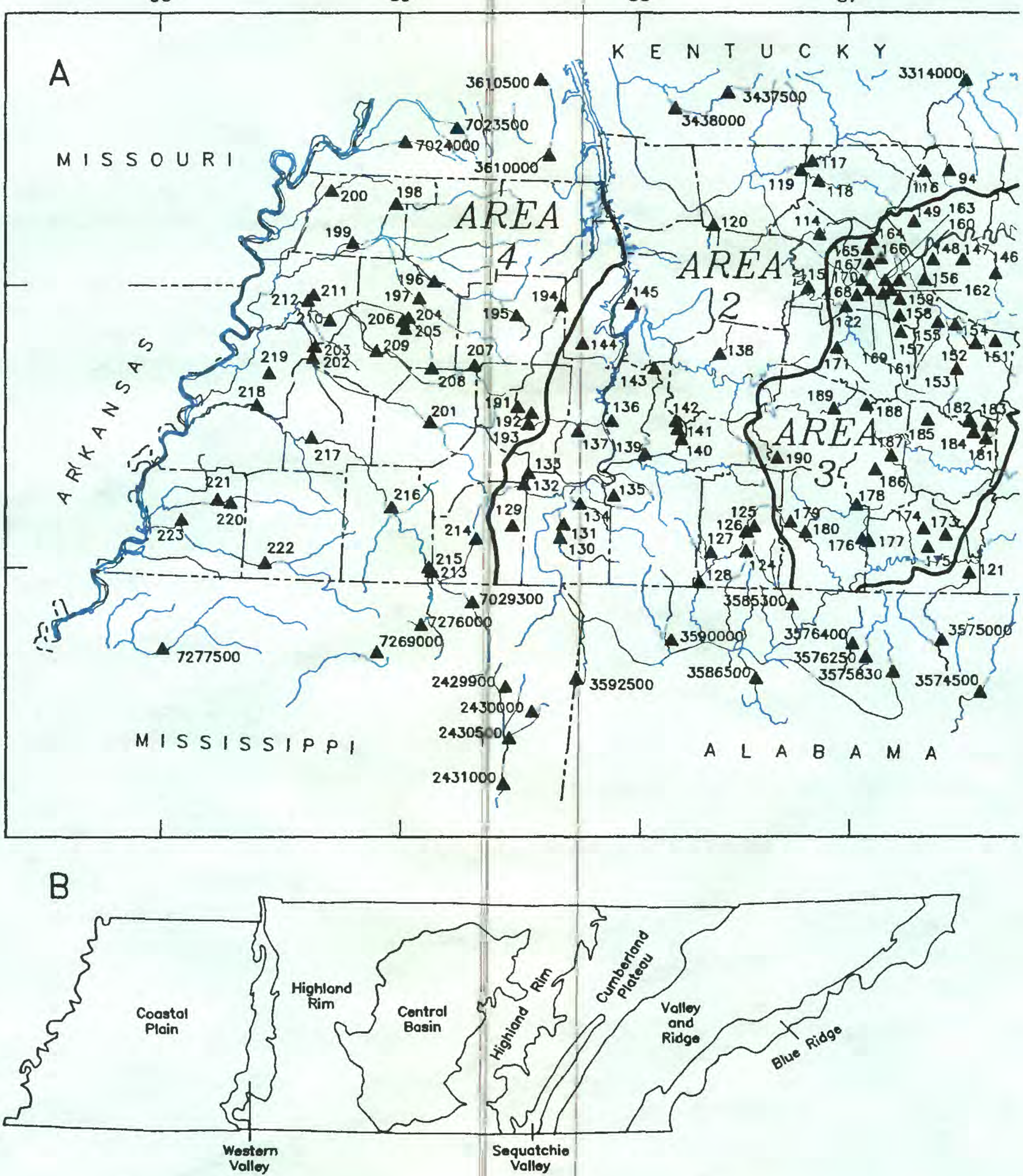
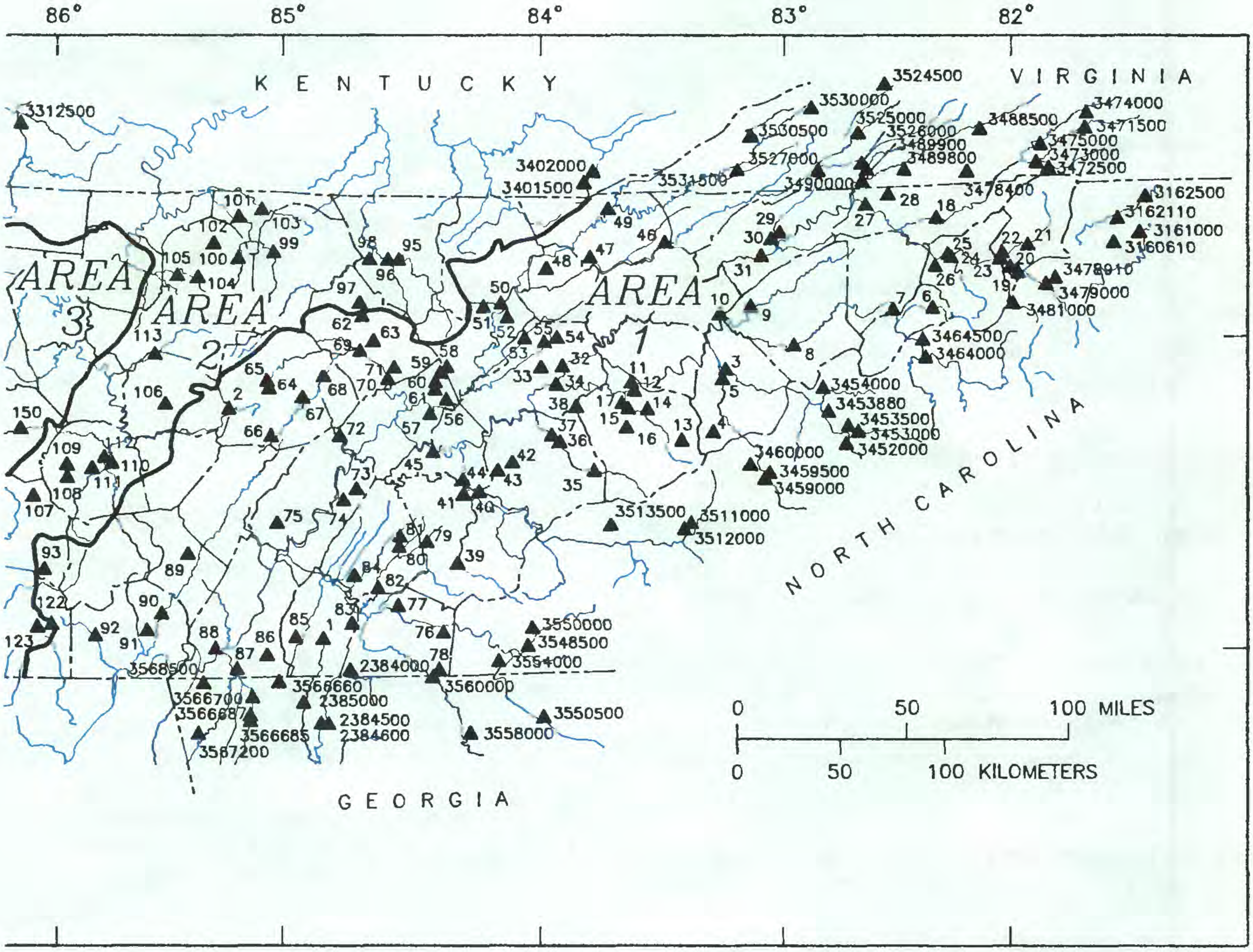


Figure 1. Location of (A) gaging stations used in analysis and hydrologic area boundaries and (B) physiographic provinces.



EXPLANATION

AREA 1 HYDROLOGIC AREA DESIGNATION

HYDROLOGIC AREA BOUNDARY

78▲ GAGING STATION AND NUMBER IN TENNESSEE

▲3558000 GAGING STATION AND NUMBER OUTSIDE OF TENNESSEE

Tennessee to about 6,600 feet in the Blue Ridge province in East Tennessee. Average annual precipitation ranges from about 47 inches in the west to 80 inches in the mountains in the east, and averages about 48 inches statewide (U.S. Geological Survey, 1986). Streams in the Coastal Plain generally have sustained flows during dry periods while those on the Cumberland Plateau often go dry. Many streams in the Central Basin also go dry during long periods of no rainfall. Streams in the Blue Ridge, Valley and Ridge, and Highland Rim have sustained flows that vary between these extremes.

Average annual runoff varies from approximately 18 to 40 inches (U.S. Geological Survey, 1986). This variation is caused by seasonal precipitation patterns and the varied geography and geology of Tennessee. Evapotranspiration averages about 30 inches per year in Tennessee (Tennessee Department of Conservation and Commerce, 1961).

Data Used in the Analysis

This study is based on streamflow data collected through 1986 from 304 gaging stations operated for 10 or more years. Of these, 223 are located within Tennessee and 81 are located in adjacent States near the Tennessee boundary. The streamflow records used were not significantly affected by manmade changes to the natural character of the stream. Records from streams that have been significantly affected by urbanization, channel dredging, or regulation from manmade controls were not used in this study.

FLOOD-FREQUENCY ANALYSIS AT GAGING STATIONS

A flood-frequency relation for a stream where gaging-station data are available can be defined by fitting the array of annual peak discharges (largest instantaneous discharge for each year) to a theoretical frequency distribution. The Interagency Advisory Committee on Water Data (1982) has recommended a uniform technique for determining flood-flow frequencies by fitting the logarithms of the annual peak discharges to a Pearson Type III distribution and has described these calculations in detail. This technique is now generally accepted by most Federal and State agencies and is referred to as the log-Pearson Type III frequency analysis. The logarithms of annual peak discharges for each gaging station used in this study were fitted to the Pearson Type III distribution (Interagency Advisory Committee on Water Data, 1982). Peak discharges for recurrence intervals of 2, 5, 10, 25, 50, 100, and 500 years were determined for each gaging station (table 1). For those streams where regulation now exists, the discharge values presented are based on data collected prior to regulation.

A flood-frequency curve is the relation of flood-peak magnitude to probability of exceedance or recurrence interval. Probability of exceedance is the chance of a given flood magnitude being exceeded in any 1 year. A 5-year flood, for example, has the probability of 0.2 (or 20-percent chance) of being exceeded in any given year. Recurrence interval is the reciprocal of probability of exceedance and is the average number of years between exceedances for a long period of record. Recurrence interval, or average return period, does not mean floods occur at uniformly spaced intervals. For example, a 5-year flood is expected to be exceeded on the average of once in 5 years, or 20 times in 100 years. However, a flood of this magnitude can be exceeded more than once in the same year, or can occur in consecutive years.

REGIONAL FLOOD-FREQUENCY ANALYSIS

Peak discharges were computed from station frequency curves for selected recurrence intervals. They were related to basin and climatic characteristics using linear multiple-regression techniques and generalized least-squares (GLS) regression analysis. These techniques yield equations that can be used to estimate the peak discharge at an ungaged site based on the basin characteristics of that site. The multiple-regression analysis determined basin and climatic characteristics which were statistically significant in estimating peak discharge and therefore warranted inclusion in the estimating equations defined by GLS. The basin and climatic characteristics tested for significance in the multiple-regression analysis were as follows:

- Contributing drainage area (A), in square miles, is the area that contributes directly to surface runoff.
- Main channel slope (S), in feet per mile, measured at points 10 and 85 percent of the stream length upstream from the gage.
- Stream length (L), in miles, measured along stream channel from gage to basin divide.
- Mean basin elevation (E), in feet above sea level, measured from topographic maps by transparent

Table 1. Discharges for selected recurrence intervals at gaging stations in Tennessee

[The first row of values for each station is from gaging-station data only; the second row is from a regionally weighted curve based on equation 1; mi², square miles]

Map no.	Station no.	Station name	Contributing drainage area (mi²)	Period of record (years)	Peak discharge, in cubic feet per second, for indicated recurrence interval: 2-year	5-year	10-year	25-year	50-year	100-year	500-year
		Hydrologic area 1									
1	2384900	Coahulla Creek near Cleveland	4.35	31	526	996	1,420	2,100	2,740	3,490	5,800
					516	955	1,330	1,900	2,410	2,930	4,700
2	3418500	Caney Fork at Clifty	111	19	6,250	9,080	11,300	14,400	17,100	20,000	28,100
					6,080	8,760	10,800	13,600	15,900	17,900	25,200
3	3455000	French Broad River near Newport	1,858	71	27,100	44,300	57,800	77,300	93,500	111,000	160,000
					27,200	44,400	57,900	77,100	93,100	110,000	157,000
4	3461200	Cosby Creek above Cosby	10.2	28	766	1,110	1,360	1,690	1,950	2,210	2,880
					761	1,110	1,360	1,710	1,970	2,250	2,960
5	3461500	Pigeon River at Newport	666	74	15,800	25,300	32,500	42,300	50,300	58,700	80,400
					15,800	25,300	32,200	41,700	49,200	57,300	77,000
6	3465000	North Indian Creek near Unicoi	15.9	39	469	689	840	1,040	1,190	1,340	1,700
					483	721	897	1,130	1.320	1,480	1,990
7	3465500	Nolichucky River at Embreeville	805	66	19,600	32,900	44,300	62,500	79,000	98,500	158,000
					19,600	32,700	43,900	61,300	76,900	93,100	150,000
8	3466500	Nolichucky River below Nolichucky Dam	1,184	38	21,000	32,400	41,300	53,900	64,500	76,000	107,000
					21,100	32,600	41,400	54,000	64,300	75,300	105,000
9	3467000	Lick Creek at Mohawk	220	25	5,490	7,890	9,610	11,900	13,800	15,700	20,600
					5,550	8,060	9,920	12,500	14,500	16,600	21,900
10	3467500	Nolichucky River near Morristown	1,679	61	23,300	35,900	45,900	60,500	72,900	86,800	126,000
					23,500	36,100	46,200	60,900	73,300	87,100	125,000
11	3469000	French Broad River below Douglas Dam	4,543	24	48,700	66,800	77,900	91,200	101,000	110,000	129,000
					49,400	68,500	80,900	96,500	108,000	116,000	145,000
12	3469010	Millican Creek near Douglas Dam	4.20	17	745	1,070	1,290	1,570	1,780	1,990	2,490
					695	984	1,170	1,410	1,600	1,820	2,260
13	3469110	Ramsey Creek near Pitman Center	2.18	16	111	211	295	422	533	657	1,010
					119	227	320	458	576	702	1,050
14	3469160	East Fork Little Pigeon near Sevierville.	64.1	29	2,860	4,630	6,030	8,070	9,790	11,700	16,900
					2,850	4,590	5,940	7,860	9,440	11,100	15,700
15	3469200	Little Pigeon River above West Prong near Sevierville.	201	14	11,300	16,100	19,600	24,500	28,400	32,600	43,500
					10,600	14,800	17,800	21,700	24,800	27,500	36,600
16	3469500	West Prong Little Pigeon River near Pigeon Forge.	76.2	32	5,730	7,840	9,170	10,800	12,000	13,100	15,700
					5,580	7,590	8,840	10,400	11,500	12,800	15,300
17	3470000	Little Pigeon River at Sevierville	353	63	14,700	23,100	29,200	37,500	44,100	51,000	68,600
					14,600	22,800	28,700	36,600	42,800	49,500	65,500
18	3477000	South Fork Holston River at Bluff City.	813	50	12,200	16,600	19,600	23,300	26,200	29,100	35,900
					12,300	16,900	20,100	24,300	27,400	30,500	38,500

Table 1. Discharges for selected recurrence intervals at gaging stations in Tennessee--Continued

[The first row of values for each station is from gaging-station data only; the second row is from a regionally weighted curve based on equation 1; mi², square miles]

Map no.	Station no.	Station name	Contributing drainage area (mi²)	Period of record (years)	Peak discharge, in cubic feet per second, for indicated recurrence interval: 2-year	5-year	10-year	25-year	50-year	100-year	500-year
		Hydrologic area 1--Continued									
19	3479500	Watauga River at North Carolina-Tennessee state line.	152	13	5,280	7,690	9,550	12,200	14,500	17,000	23,900
					5,280	7,720	9,620	12,300	14,600	16,900	23,300
20	3480000	Watauga River at Stump Knob	171	15	5,720	9,190	12,200	16,900	21,100	26,100	41,300
					5,720	9,120	11,900	16,200	19,800	23,000	35,800
21	3482000	Roan Creek near Neva	102	40	2,750	4,300	5,530	7,310	8,820	10,500	15,100
					2,780	4,370	5,640	7,490	9,050	10,800	15,400
22	3482500	Roan Creek at Butler	166	14	2,550	3,490	4,140	4,970	5,610	6,270	7,870
					2,740	3,930	4,880	6,210	7,270	8,360	11,100
23	3483000	Watauga River at Butler	427	28	9,820	13,900	17,300	22,400	26,900	32,100	47,500
					9,900	14,100	17,600	22,800	27,400	33,000	47,500
24	3485500	Doe River at Elizabethton	137	66	3,170	5,260	7,030	9,770	12,200	15,100	23,500
					3,200	5,320	7,120	9,890	12,300	15,200	23,400
25	3486000	Watauga River at Elizabethton	692	23	12,400	18,700	23,400	30,100	35,600	41,500	57,300
					12,500	18,800	23,700	30,500	36,100	42,100	57,800
26	3486225	Powder Branch near Johnson City	3.48	12	121	230	328	488	636	813	1,360
					136	264	383	570	734	938	1,440
27	3487500	South Fork Holston River at Kingsport	1,935	23	25,100	37,600	46,600	59,000	68,800	79,200	106,000
					25,400	38,000	47,400	60,200	70,300	80,900	108,000
28	3487550	Reedy Creek at Orebank	36.3	23	1,330	2,130	2,780	3,750	4,590	5,540	8,250
					1,350	2,180	2,860	3,860	4,710	5,690	8,240
29	3491000	Big Creek near Rogersville	47.3	40	2,600	3,770	4,590	5,640	6,450	7,270	9,250
					2,580	3,750	4,560	5,620	6,430	7,260	9,300
30	3491200	Big Creek tributary near Rogersville	2.00	30	159	330	499	797	1,090	1,470	2,750
					161	330	491	760	1,020	1,290	2,320
31	3491500	Holston River near Rogersville	3,035	40	37,400	53,200	63,300	75,400	84,200	92,600	111,000
					37,700	53,900	64,400	77,600	87,100	95,100	118,000
32	3495500	Holston River near Knoxville	3,747	10	39,200	51,900	60,300	71,000	79,000	87,100	106,000
					39,700	53,200	62,600	75,000	84,400	93,800	117,000
33	3496000	First Creek at Mineral Springs Avenue at Knoxville.	11.9	18	604	903	1,120	1,410	1,640	1,890	2,500
					617	938	1,180	1,520	1,800	2,080	2,810
34	3497000	Tennessee River at Knoxville	8,934	50	97,900	143,000	173,000	213,000	242,000	271,000	341,000
					98,000	143,000	174,000	213,000	242,000	272,000	342,000
35	3497300	Little River above Townsend	106	23	6,950	10,900	13,800	17,400	20,200	23,100	29,900
					6,740	10,400	12,900	16,000	18,400	21,300	26,400

Table 1. Discharges for selected recurrence intervals at gaging stations in Tennessee--Continued

[The first row of values for each station is from gaging-station data only; the second row is from a regionally weighted curve based on equation 1; mi², square miles]

Map no.	Station no.	Station name	Contributing drainage area (mi²)	Period of record (years)	Peak discharge, in cubic feet per second, for indicated recurrence interval: 2-year	5-year	10-year	25-year	50-year	100-year	500-year
		Hydrologic area 1--Continued									
36	3498000	Little River near Walland	192	21	9,390	14,100	17,300	21,400	24,400	27,300	34,200
					9,190	13,700	16,700	20,400	23,100	26,300	32,200
37	3498500	Little River near Maryville	269	36	13,000	19,600	24,200	30,200	34,700	39,300	50,400
					12,800	19,200	23,400	28,900	33,100	37,800	47,300
38	3498700	Nails Creek near Knoxville	0.36	31	66	107	141	193	239	292	448
					65	105	139	188	232	279	423
39	3518500	Tellico River at Tellico Plains	118	57	7,570	11,200	13,600	16,900	19,300	21,800	27,900
					7,480	10,900	13,300	16,300	18,600	21,100	26,600
40	3519500	Little Tennessee River at McGhee	2,443	40	45,500	65,900	79,700	97,300	111,000	124,000	155,000
					45,400	65,700	79,500	97,000	110,000	124,000	155,000
41	3519600	Island Creek at Vonore	11.2	23	621	1,070	1,460	2,110	2,720	3,440	5,740
					628	1,080	1,470	2,080	2,630	3,210	5,200
42	3519610	Baker Creek tributary near Binfield	2.10	18	151	327	496	780	1,050	1,380	2,400
					155	329	487	733	952	1,210	1,920
43	3519640	Baker Creek near Greenback	16.0	21	704	1,410	2,070	3,150	4,160	5,380	9,170
					721	1,420	2,050	3,010	3,860	4,810	7,620
44	3519700	Bat Creek near Vonore	30.7	23	1,390	2,430	3,260	4,440	5,420	6,480	9,300
					1,400	2,440	3,240	4,360	5,270	6,270	8,700
45	3520100	Sweetwater Creek near Loudon	62.2	28	1,350	2,150	2,770	3,660	4,400	5,210	7,410
					1,400	2,260	2,960	3,970	4,810	5,750	8,120
46	3528000	Clinch River above Tazewell	1,474	65	24,300	35,200	42,900	53,300	61,300	69,800	90,800
					24,400	35,400	43,300	53,800	62,000	70,600	92,000
47	3528300	Big Barren Creek near New Tazewell	13.3	10	280	465	606	801	959	1,130	1,560
					326	572	786	1,100	1,360	1,560	2,320
48	3528400	White Creek near Sharps Chapel	2.68	36	117	223	311	442	553	676	1,010
					121	232	326	466	584	708	1,060
49	3532000	Powell River near Arthur	685	63	15,100	21,300	25,800	32,000	37,000	42,400	56,300
					15,100	21,400	26,000	32,400	37,500	43,100	57,000
50	3533000	Clinch River below Norris Dam	2,913	33	41,600	62,700	77,200	95,700	110,000	124,000	157,000
					41,700	62,900	77,500	96,200	110,000	124,000	158,000
51	3534000	Coal Creek at Lake City	24.5	32	2,910	4,510	5,660	7,200	8,400	9,650	12,700
					2,810	4,300	5,310	6,620	7,630	8,850	11,300
52	3534500	Buffalo Creek at Norris	7.82	31	683	971	1,170	1,410	1,600	1,790	2,240
					677	966	1,160	1,420	1,630	1,830	2,330
53	3535000	Bullrun Creek near Halls Crossroads	68.5	29	3,170	6,010	8,620	12,900	17,000	21,800	37,200
					3,150	5,880	8,270	12,000	15,400	18,700	30,800

Table 1. Discharges for selected recurrence intervals at gaging stations in Tennessee--Continued

[The first row of values for each station is from gaging-station data only; the second row is from a regionally weighted curve based on equation 1; mi², square miles]

Map no.	Station no.	Station name	Contributing drainage area (mi²)	Period of record (years)	Peak discharge, in cubic feet per second, for indicated recurrence interval						
					2-year	5-year	10-year	25-year	50-year	100-year	500-year
		Hydrologic area 1--Continued									
54	3535140	South Fork Beaver Creek at Harbison	1.23	12	248	412	528	680	795	911	1,180
					225	359	447	560	648	783	965
55	3535180	Willow Fork near Halls Crossroads	3.23	20	190	368	526	776	1,000	1,270	2,050
					196	378	536	779	999	1,230	1,890
56	3537000	Whiteoak Creek below Oak Ridge National Laboratory near Oak Ridge.	3.62	10	415	528	598	682	742	799	928
					397	524	613	736	834	916	1,180
57	3538130	Caney Creek near Kingston	5.55	24	1,060	1,410	1,640	1,920	2,130	2,340	2,830
					1,000	1,320	1,520	1,780	1,970	2,200	2,670
58	3538200	Poplar Creek near Oliver Springs	55.9	32	3,470	5,380	6,870	9,010	10,800	12,800	18,200
					3,410	5,250	6,650	8,620	10,200	11,900	16,700
59	3538225	Poplar Creek near Oak Ridge	82.5	26	4,250	6,390	8,010	10,300	12,100	14,200	19,500
					4,200	6,290	7,840	9,990	11,700	13,500	18,400
60	3538250	East Fork Poplar Creek near Oak Ridge	19.5	26	1,390	2,130	2,710	3,550	4,260	5,050	7,230
					1,370	2,100	2,650	3,450	4,120	4,800	6,810
61	3538275	Bear Creek near Oak Ridge	7.15	18	469	650	775	940	1,070	1,200	1,520
					474	673	822	1,030	1,190	1,370	1,800
62	3538300	Rock Creek near Sunbright	5.54	17	744	1,040	1,250	1,520	1,720	1,940	2,450
					707	990	1,180	1,440	1,640	1,860	2,380
63	3538500	Emory River near Wartburg	83.2	48	6,890	10,800	13,800	18,200	21,800	25,700	36,400
					6,740	10,400	13,200	17,100	20,200	23,400	32,700
64	3538600	Obed River at Crossville	12.0	31	661	934	1,130	1,380	1,580	1,780	2,290
					667	955	1,170	1,460	1,690	1,930	2,520
65	3538800	Obed River tributary near Crossville	0.72	14	139	215	276	365	442	529	772
					132	203	258	338	405	471	684
66	3538900	Self Creek near Big Lick	3.80	18	276	544	796	1,220	1,620	2,120	3,700
					280	542	775	1,140	1,470	1,800	2,960
67	3539500	Daddys Creek near Crab Orchard	93.5	28	4,830	7,630	9,590	12,100	14,100	16,000	20,700
					4,760	7,460	9,310	11,700	13,500	15,500	19,600
68	3539600	Daddys Creek near Hebbertsburg	139	11	7,840	9,320	10,300	11,400	12,300	13,200	15,200
					7,420	8.990	10,100	11,600	12,700	14,100	16,900
69	3539800	Obed River near Lancing	518	25	31,700	47,100	57,000	69,000	77,500	85,700	104,000
					30,400	44,300	52,600	62,300	69,100	79,300	90,100
70	3540500	Emory River at Oakdale	764	59	45,900	73,500	93,800	121,000	143,000	166,000	224,000
					45,000	71,000	89,300	113,000	132,000	154,000	199,000

Table 1. Discharges for selected recurrence intervals at gaging stations in Tennessee--Continued

[The first row of values for each station is from gaging-station data only; the second row is from a regionally weighted curve based on equation 1; mi², square miles]

Map no.	Station no.	Station name	Contributing drainage area (mi²)	Period of record (years)	Peak discharge, in cubic feet per second, for indicated recurrence interval: 2-year	5-year	10-year	25-year	50-year	100-year	500-year
		Hydrologic area 1--Continued									
71	3541100	Bitter Creek near Camp Austin	5.53	19	1,320	2,620	3,680	5,220	6,490	7,850	11,400
					1,210	2,240	2,950	3,870	4,570	5,920	7,060
72	3541500	Whites Creek near Glen Alice	108	44	11,200	19,200	25,800	35,600	44,100	53,600	80,300
					10,800	18,200	23,900	32,000	38,700	45,700	65,900
73	3543200	Ten Mile Creek near Decatur	26.4	17	2,520	4,010	5,100	6,570	7,740	8,950	12,000
					2,400	3,720	4,630	5,800	6,710	7,850	9,970
74	3543500	Sewee Creek near Decatur	117	52	5,350	8,750	11,300	15,000	17,900	21,100	29,400
					5,320	8,660	11,200	14,600	17,400	20,500	28,000
75	3544500	Richland Creek near Dayton	50.2	52	4,540	7,500	9,640	12,500	14,700	16,900	22,400
					4,440	7,260	9,210	11,700	13,700	16,000	20,300
76	3556000	Turtletown Creek at Turtletown	26.9	37	629	877	1,040	1,230	1,370	1,510	1,820
					650	927	1,120	1,380	1,580	1,700	2,250
77	3557000	Hiwassee River near Reliance	1,223	33	26,800	37,900	45,500	55,500	63,100	70,900	90,000
					26,700	37,800	45,500	55,500	63,200	71,100	90,200
78	3561500	Ocoee River at McHarg	447	13	10,700	14,500	17,000	20,100	22,400	24,800	30,300
					10,700	14,700	17,400	20,900	23,600	26,100	32,900
79	3565040	Chestuee Creek above Englewood	14.8	13	1,190	1,890	2,460	3,300	4,020	4,830	7,110
					1,150	1,810	2,320	3,030	3,630	4,190	6,020
80	3565120	Chestuee Creek at Zion Hill	37.8	17	2,120	3,080	3,720	4,530	5,130	5,730	7,130
					2,090	3,050	3,700	4,550	5,200	5,830	7,450
81	3565160	Middle Creek below Highway 39, near Englewood.	32.7	16	1,430	2,300	2,960	3,880	4,630	5,430	7,510
					1,440	2,330	3,000	3,950	4,700	5,500	7,500
82	3565250	Chestuee Creek at Dentville	114	17	3,280	4,720	5,650	6,780	7,600	8,400	10,200
					3,350	4,890	5,960	7,360	8,420	9,160	12,000
83	3565300	South Chestuee Creek near Benton	31.8	29	2,150	3,670	4,900	6,690	8,210	9,890	14,500
					2,120	3,570	4,700	6,290	7,610	9,060	12,800
84	3565500	Oostanaula Creek near Sanford	57.0	32	1,470	2,850	4,060	5,930	7,590	9,490	15,000
					1,500	2,910	4,120	5,960	7,550	9,330	14,200
85	3566200	Brymer Creek near McDonald	9.68	31	818	1,250	1,610	2,150	2,630	3,180	4,790
					809	1,240	1,580	2,100	2,550	2,990	4,520
86	3566420	Wolftever Creek near Ooltewah	18.8	22	1,480	2,480	3,320	4,610	5,760	7,070	10,900
					1,450	2,390	3,150	4,250	5,200	6,080	9,240
87	3567500	South Chickamauga Creek near Chickamauga.	428	56	12,200	17,500	21,000	25,200	28,200	31,200	34,200
					12,200	17,500	21,000	25,300	28,400	31,600	35,400
88	3568000	Tennessee River at Chattanooga	21,400	63	206,000	265,000	300,000	341,000	370,000	397,000	456,000
					206,000	266,000	302,000	345,000	376,000	402,000	469,000

Table 1. Discharges for selected recurrence intervals at gaging stations in Tennessee--Continued

[The first row of values for each station is from gaging-station data only; the second row is from a regionally weighted curve based on equation 1; mi², square miles]

Map no.	Station no.	Station name	Contributing drainage area (mi²)	Period of record (years)	Peak discharge, in cubic feet per second, for indicated recurrence interval: 2-year	5-year	10-year	25-year	50-year	100-year	500-year
		Hydrologic area 1--Continued									
89	3570800	Little Brush Creek near Dunlap	15.4	28	1,870	2,520	2,940	3,460	3,840	4,220	5,100
					1,800	2,410	2,800	3,290	3,660	4,070	4,950
90	3571000	Sequatchie River near Whitwell	384	66	11,500	17,000	20,700	25,400	29,000	32,500	40,800
					11,500	17,000	20,700	25,400	28,900	32,500	40,900
91	3571600	Brown Spring Branch near Sequatchie	0.67	23	101	145	174	209	234	259	314
					99.8	145	177	217	248	274	357
92	3571800	Battle Creek near Monteagle	50.4	32	3,680	5,020	5,960	7,210	8,190	9,210	11,800
					3,590	4,890	5,790	7,000	7,970	8,930	11,500
		Hydrologic area 2									
93	3578500	Bradley Creek near Prairie Plains	41.3	32	2,530	3,960	4,890	6,030	6,840	7,620	9,340
					2,500	3,890	4,780	5,890	6,690	7,530	9,260
94	3313600	West Fork Drakes Creek tributary near Fountain Head.	0.95	18	210	411	585	853	1,090	1,360	2,120
					211	396	544	761	947	1,530	1,720
95	3408000	New River near New River	314	12	19,800	30,100	37,600	47,600	55,600	63,900	85,000
					18,100	26,600	33,000	41,800	48,800	56,100	74,300
96	3408500	New River at New River	382	51	24,500	34,800	42,300	52,400	60,300	68,700	90,200
					23,700	33,400	40,500	50,300	58,100	66,400	87,300
97	3409000	White Oak Creek at Sunbright	13.5	19	1,950	2,810	3,430	4,260	4,910	5,590	7,310
					1,840	2,680	3,310	4,190	4,890	5,610	7,390
98	3409500	Clear Fork near Robbins	272	52	13,800	21,200	26,500	33,600	39,100	44,900	59,100
					13,700	21,100	26,400	33,500	39,100	44,800	58,900
99	3414500	East Fork Obey River near Jamestown	196	43	16,100	24,400	30,200	37,700	43,300	49,100	62,800
					15,400	22,800	27,900	34,800	40,100	45,600	58,800
100	3415000	West Fork Obey River near Alpins	81.0	31	6,980	10,100	12,100	14,600	16,500	18,200	22,300
					6,720	9,720	11,800	14,500	16,500	18,600	23,300
101	3415500	Obey River near Byrdstown	445	24	16,500	25,900	32,200	40,200	46,000	51,800	64,800
					16,700	26,600	33,600	42,500	49,200	55,800	71,200
102	3415700	Big Eagle Creek near Livingston	4.77	24	726	1,120	1,370	1,670	1,870	2,060	2,450
					718	1,130	1,420	1,780	2,050	2,320	2,920
103	3416000	Wolf River near Byrdstown	106	43	6,830	9,870	11,900	14,400	16,200	18,100	22,300
					6,790	9,960	12,200	15,000	17,100	19,200	24,100
104	3417700	Matthews Branch tributary near Livingston.	0.49	30	133	242	330	456	560	674	974
					133	239	321	439	535	639	911
105	3418000	Roaring River near Hilham	51.6	43	3,370	5,420	6,850	8,700	10,100	11,500	14,800
					3,420	5,560	7,090	9,100	10,600	12,200	15,800

Table 1. Discharges for selected recurrence intervals at gaging stations in Tennessee--Continued

[The first row of values for each station is from gaging-station data only; the second row is from a regionally weighted curve based on equation 1; mi², square miles]

Map no.	Station no.	Station name	Contributing drainage area (mi²)	Period of record (years)	Peak discharge, in cubic feet per second, for indicated recurrence interval: 2-year	5-year	10-year	25-year	50-year	100-year	500-year
		Hydrologic area 2--Continued									
106	3420000	Calfkiller River below Sparta	111	31	7,610	10,900	13,200	16,400	18,900	21,600	28,300
					7,490	10,900	13,400	16,800	19,500	22,300	29,300
107	3420360	Mud Creek tributary Number 2 near Summitville.	2.28	20	395	714	991	1,430	1,820	2,270	3,640
					397	705	957	1,330	1,660	2,040	3,120
108	3420500	Barren Fork near Trousdale	126	51	9,820	16,100	20,700	26,800	31,600	36,500	48,500
					9,570	15,400	19,500	25,100	29,500	34,000	45,100
109	3420600	Owen Branch near Centertown	4.60	32	365	896	1,390	2,170	2,860	3,640	5,800
					396	944	1,410	2,100	2,680	3,310	5,020
110	3421000	Collins River near McMinnville	640	61	23,300	36,500	45,400	56,600	64,800	72,800	91,200
					23,200	36,200	44,900	56,100	64,400	72,500	91,300
111	3421100	Sink tributary at McMinnville	0.47	22	186	278	346	441	517	599	813
					174	260	328	424	502	585	799
112	3421200	Charles Creek near McMinnville	31.1	32	3,230	5,570	7,480	10,300	12,700	15,500	23,000
					3,140	5,230	6,860	9,240	11,300	13,500	19,600
113	3423000	Falling Water River near Cookeville	45.9	24	3,430	4,520	5,150	5,850	6,310	6,740	7,610
					3,440	4,820	5,770	6,970	7,830	8,670	10,500
114	3431800	Sycamore Creek near Ashland City	97.2	25	6,310	10,000	12,800	16,600	19,600	22,900	31,200
					6,270	9,940	12,700	16,400	19,400	22,500	30,400
115	3434500	Harpeth River near Kingston Springs	666	60	20,200	31,200	38,800	48,400	55,700	62,900	80,000
					20,600	32,200	40,600	51,000	59,000	66,800	85,200
116	3435030	Red River near Portland	15.1	20	2,340	4,190	5,770	8,220	10,400	12,900	20,200
					2,170	3,590	4,730	6,460	7,990	9,730	14,700
117	3435500	Red River near Adams	309	49	14,100	21,200	26,300	33,400	39,000	44,800	60,000
					14,100	21,300	26,700	33,900	39,600	45,600	60,600
118	3436000	Sulphur Fork Red River near Adams	165	48	6,900	10,500	13,100	16,900	19,900	23,200	31,800
					7,050	11,000	14,000	18,000	21,300	24,700	33,400
119	3436100	Red River at Port Royal	498	25	20,500	30,500	37,600	47,300	55,000	63,100	83,800
					20,400	30,600	38,100	48,300	56,300	64,500	85,000
120	3436700	Yellow Creek near Shiloh	124	28	5,660	8,930	11,300	14,500	17,000	19,600	26,100
					5,850	9,510	12,200	15,800	18,600	21,500	28,400
121	3574700	Big Huckleberry Creek near Belvidere	2.18	20	386	691	938	1,300	1,610	1,950	2,870
					387	683	913	1,240	1,510	1,810	2,600
122	3579800	Miller Creek near Cowan	4.30	20	1,400	2,010	2,420	2,950	3,340	3,730	4,440
					1,190	1,640	1,980	2,450	2,830	3,210	4,150
123	3579900	Boiling Fork Creek at Cowan	17.0	24	2,030	2,940	3,620	4,570	5,350	6,200	8,450
					1,980	2,910	3,640	4,650	5,470	6,330	8,570

Table 1. Discharges for selected recurrence intervals at gaging stations in Tennessee--Continued

[The first row of values for each station is from gaging-station data only; the second row is from a regionally weighted curve based on equation 1; mi², square miles]

Map no.	Station no.	Station name	Contributing drainage area (mi²)	Period of record (years)	Peak discharge, in cubic feet per second, for indicated recurrence interval: 2-year	5-year	10-year	25-year	50-year	100-year	500-year
		Hydrologic area 2--Continued									
124	3587200	Bluewater Creek tributary near Leoma	0.49	29	148	212	256	314	359	405	517
					146	216	269	339	393	447	580
125	3587500	Shoal Creek above Little Shoal Creek at Lawrenceburg.	27.0	28	2,910	5,130	7,010	9,880	12,400	15,300	23,800
					2,830	4,810	6,400	8,790	10,900	13,200	20,000
126	3588000	Shoal Creek at Lawrenceburg	55.4	19	4,840	8,130	10,900	15,000	18,600	22,800	27,500
					4,670	7,620	9,950	13,400	16,300	19,600	24,400
127	3588400	Chisholm Creek at Westpoint	43.0	24	3,340	6,540	9,350	13,700	17,700	22,200	35,300
					3,350	6,230	8,540	12,000	14,900	18,200	27,600
128	3588500	Shoal Creek at Iron City	348	61	16,900	30,100	40,800	56,500	69,900	84,700	125,000
					16,800	29,300	39,100	53,300	65,200	78,300	114,000
129	3593300	Snake Creek near Adamsville	49.4	20	4,460	6,020	7,130	8,620	9,800	11,000	14,200
					4,310	6,030	7,360	9,170	10,600	12,000	15,500
130	3593800	Horse Creek near Savannah	104	36	4,960	10,500	15,700	24,400	32,600	42,400	73,000
					5,100	10,400	15,000	22,200	28,600	36,100	58,900
131	3594040	Turkey Creek near Savannah	53.7	20	3,070	5,870	8,170	11,600	14,500	17,700	26,300
					3,220	6,040	8,210	11,300	13,700	16,400	23,300
132	3594058	White Oak Creek near Milledgeville	46.1	19	5,100	7,300	8,840	10,900	12,400	14,100	18,100
					4,750	6,760	8,280	10,400	12,000	13,700	17,900
133	3594120	Middleton Creek near Milledgeville	45.5	20	3,850	5,350	6,370	7,690	8,690	9,720	12,200
					3,770	5,460	6,720	8,380	9,640	10,900	13,900
134	3594160	Indian Creek near Cerro Gordo	201	20	10,500	18,900	25,000	33,000	39,000	45,000	59,000
					10,400	18,100	23,400	30,500	35,800	41,200	53,900
135	3594200	Eagle Creek near Clifton Junction	19.0	25	1,830	3,750	5,300	7,480	9,240	11,100	15,600
					1,840	3,550	4,830	6,580	7,960	9,410	13,000
136	3594400	Cypress Creek at Pope	16.8	17	955	2,050	3,020	4,540	5,870	7,390	11,600
					1,120	2,350	3,310	4,660	5,760	6,940	10,100
137	3594480	Turkey Creek near Decaturville	8.40	10	1,010	1,630	2,050	2,560	2,940	3,300	4,090
					1,020	1,680	2,150	2,780	3,260	3,750	4,900
138	3602500	Piney River at Vernon	193	61	9,850	18,100	24,100	32,000	37,900	43,800	57,300
					9,870	17,900	23,600	31,100	36,700	42,300	55,400
139	3604000	Buffalo River near Flat Woods	447	66	14,500	25,900	35,000	48,200	59,200	71,200	103,000
					14,700	26,200	35,300	48,000	58,500	69,800	99,600
140	3604070	Coon Creek tributary near Hohenwald	0.51	19	75	151	212	301	375	454	659
					85	175	245	342	420	503	714
141	3604080	Hugh Hollow Branch near Hohenwald	1.52	18	203	604	1,030	1,790	2,510	3,380	6,030
					220	572	877	1,350	1,760	2,230	3,570

Table 1. Discharges for selected recurrence intervals at gaging stations in Tennessee--Continued

[The first row of values for each station is from gaging-station data only; the second row is from a regionally weighted curve based on equation 1; mi², square miles]

Map no.	Station no.	Station name	Contributing drainage area (mi^2)	Period of record (years)	Peak discharge, in cubic feet per second, for indicated recurrence interval: 2-year	5-year	10-year	25-year	50-year	100-year	500-year
		Hydrologic area 2--Continued									
142	3604090	Coon Creek above Chop Hollow near Hohenwald.	6.02	20	453	1,150	1,880	3,170	4,450	6,040	11,200
					510	1,220	1,840	2,800	3,670	4,680	7,730
143	3604500	Buffalo River near Lobelville	707	59	15,900	27,300	35,900	47,700	57,100	67,000	91,800
					16,400	28,600	37,800	50,200	59,900	70,000	95,100
144	3604800	Birdsong Creek near Holladay	44.9	28	4,810	7,480	9,190	11,200	12,700	14,100	17,000
					4,570	6,960	8,570	10,600	12,200	13,700	17,100
145	3605555	Trace Creek above Denver	31.9	23	3,540	5,630	7,120	9,110	10,700	12,200	16,100
					3,380	5,250	6,610	8,460	9,920	11,400	15,100
		Hydrologic area 3									
146	3425500	Spring Creek near Lebanon	35.3	32	5,400	7,670	9,160	11,000	12,400	13,800	17,000
					5,310	7,530	9,000	10,900	12,300	13,800	17,100
147	3425700	Spencer Creek near Lebanon	3.32	32	766	1,420	1,930	2,630	3,190	3,770	5,230
					768	1,410	1,890	2,530	3,040	3,610	4,840
148	3425800	Cedar Creek tributary at Green Hill	0.86	28	180	294	374	477	554	632	814
					188	312	403	526	620	698	945
149	3426000	Drakes Creek above Hendersonville	19.2	29	2,710	4,030	4,850	5,830	6,510	7,150	8,520
					2,700	4,040	4,910	5,990	6,780	7,430	9,320
150	3426800	East Fork Stones River at Woodbury	39.1	24	3,820	6,340	8,300	11,100	13,400	15,900	22,700
					3,850	6,380	8,330	11,100	13,300	15,600	21,700
151	3427000	Bradley Creek at Lascassas	37.0	20	7,430	10,800	13,000	15,900	18,100	20,300	25,500
					7,000	10,000	11,900	14,400	16,300	18,400	22,900
152	3427500	East Fork Stones River near Lascassas.	262	31	16,500	22,800	26,800	31,800	35,400	39,000	47,100
					16,400	22,900	27,200	32,800	37,000	40,800	50,800
153	3428000	West Fork Stones River near Murfreesboro.	122	36	12,200	19,300	25,000	33,300	40,400	48,300	70,500
					12,100	18,900	24,200	31,800	38,200	44,000	64,500
154	3429000	Stones River near Smyrna	571	42	27,800	37,900	44,300	51,800	57,200	62,400	73,900
					27,800	38,200	44,900	53,300	59,500	65,000	79,400
155	3429500	Stewart Creek near Smyrna	62.1	28	3,150	5,360	7,050	9,390	11,300	13,300	18,400
					3,300	5,680	7,560	10,200	12,300	14,500	20,000
156	3430100	Stones River below Percy Priest Dam.	892	29	31,000	42,400	50,100	60,100	67,600	75,300	94,000
					31,300	43,400	52,100	63,600	72,500	82,200	103,000
157	3430400	Mill Creek at Nolensville	12.0	22	4,050	6,510	8,300	10,700	12,500	14,500	19,200
					3,800	5,910	7,310	9,110	10,500	12,100	15,400
158	3430600	Mill Creek at Hobson Pike near Antioch.	43.0	11	4,200	6,150	7,490	9,230	10,600	11,900	15,100
					4,260	6,380	7,930	10,000	11,600	13,200	17,300

Table 1. Discharges for selected recurrence intervals at gaging stations in Tennessee--Continued

[The first row of values for each station is from gaging-station data only; the second row is from a regionally weighted curve based on equation 1; mi², square miles]

Map no.	Station no.	Station name	Contributing drainage area (mi²)	Period of record (years)	Peak discharge, in cubic feet per second, for indicated recurrence interval: 2-year	5-year	10-year	25-year	50-year	100-year	500-year
		Hydrologic area 3--Continued									
159	3431000	Mill Creek near Antioch	64.0	33	5,830	9,280	12,100	16,300	20,000	24,200	36,200
					5,840	9,290	12,100	16,200	19,600	23,100	34,300
160	3431080	Sims Branch at Elm Hill Pike near Donelson.	3.92	10	624	1,250	1,790	2,590	3,270	4,020	4,850
					669	1,290	1,790	2,490	3,040	3,620	4,520
161	3431120	West Fork Browns Creek at General Bates Drive at Nashville.	3.30	22	885	1,560	2,030	2,620	3,050	3,470	4,410
					876	1,510	1,950	2,490	2,890	3,340	4,180
162	3431240	East Fork Browns Creek at Baird-Ward Printing Company at Nashville.	1.58	22	254	372	456	569	657	749	979
					268	408	517	668	787	927	1,210
163	3431340	Browns Creek at Factory Street at Nashville..	13.2	20	2,260	3,570	4,560	5,930	7,030	8,210	11,300
					2,240	3,530	4,480	5,770	6,810	7,870	10,600
164	3431520	Claylick Creek at Lickton	4.13	21	1,000	1,760	2,340	3,160	3,830	4,530	6,350
					993	1,720	2,250	2,980	3,550	4,180	5,640
165	3431550	Earthman Fork at Whites Creek	6.29	22	945	1,550	2,030	2,710	3,290	3,910	5,620
					968	1,600	2,090	2,800	3,380	4,010	5,610
166	3431580	Ewing Creek at Knight Road near Bordeaux.	13.3	18	3,000	4,230	5,140	6,380	7,380	8,450	11,200
					2,880	4,050	4,910	6,080	7,030	7,910	10,600
167	3431600	Whites Creek at Tucker Road near Bordeaux.	51.6	11	4,660	7,070	8,790	11,100	12,900	14,700	19,300
					4,750	7,310	9,210	11,800	13,800	15,800	20,800
168	3431650	Vaughns Gap Branch at Percy Warner Boulevard at Belle Meade.	2.66	11	529	797	993	1,260	1,470	1,690	2,260
					553	859	1,100	1,420	1,680	1,980	2,620
169	3431670	Richland Creek at Fransworth Drive at Belle Meade.	12.4	11	1,800	2,300	2,640	3,060	3,380	3,700	4,470
					1,830	2,470	2,970	3,650	4,180	4,910	5,950
170	3431700	Richland Creek at Charlotte Avenue at Nashville.	24.3	22	2,850	4,890	6,460	8,650	10,400	12,300	17,200
					2,870	4,890	6,410	8,490	10,100	11,900	16,200
171	3432500	West Harpeth River near Leipers Fork	66.9	24	5,510	11,900	17,700	27,200	35,900	46,100	76,500
					5,560	11,600	16,700	24,400	30,900	38,000	58,200
172	3433500	Harpeth River at Bellevue	393	64	11,900	17,900	22,200	28,100	32,700	37,500	49,700
					12,100	18,400	23,000	29,400	34,400	39,900	52,800
173	3581500	West Fork Mulberry Creek at Mulberry	41.2	32	7,240	9,980	11,800	14,100	15,900	17,700	21,900
					7,010	9,640	11,400	13,700	15,400	17,100	21,500
174	3582200	Norris Creek tributary near Belleville.	0.03	22	48	69	83	104	120	137	183
					47	67	82	102	118	135	181
175	3582300	Norris Creek near Fayetteville	42.6	28	5,890	9,000	11,300	14,600	17,300	20,200	27,800
					5,780	8,770	11,000	14,000	16,500	18,900	25,800
176	3583000	Bradshaw Creek at Frankewing	36.5	14	4,710	7,080	8,890	11,400	13,600	15,900	22,000
					4,620	6,940	8,690	11,100	13,100	15,000	20,500

Table 1. Discharges for selected recurrence intervals at gaging stations in Tennessee--Continued

[The first row of values for each station is from gaging-station data only; the second row is from a regionally weighted curve based on equation 1; mi², square miles]

Map no.	Station no.	Station name	Contributing drainage area (mi²)	Period of record (years)	Peak discharge, in cubic feet per second, for indicated recurrence interval: 2-year	5-year	10-year	25-year	50-year	100-year	500-year
		Hydrologic area 3--Continued									
177	3583200	Chicken Creek at McBurg	7.66	32	2,680	4,070	4,930	5,950	6,660	7,330	8,740
					2,580	3,840	4,610	5,520	6,160	6,970	8,170
178	3583300	Richland Creek near Cornersville	47.5	24	5,850	8,020	9,340	10,900	12,000	13,000	15,200
					5,760	7,970	9,390	11,200	12,500	13,600	16,800
179	3583500	Weakley Creek near Bodenham	24.4	12	1,460	2,250	2,820	3,590	4,210	4,850	6,480
					1,650	2,670	3,500	4,680	5,610	6,640	8,900
180	3584000	Richland Creek near Pulaski	366	41	16,400	29,500	40,500	57,300	72,000	88,900	137,000
					16,600	29,500	40,300	56,300	69,900	84,300	127,000
181	3597000	Garrison Fork at Fairfield	66.3	31	7,180	11,700	15,200	20,500	24,900	29,800	43,400
					7,110	11,500	14,800	19,600	23,600	27,400	39,500
182	3597300	Wartrace Creek above Bell Buckle	4.99	21	1,070	1,920	2,600	3,560	4,350	5,210	7,450
					1,070	1,890	2,510	3,360	4,050	4,790	6,590
183	3597450	Kelly Creek tributary near Bell Buckle.	0.73	10	412	512	577	658	718	778	920
					385	497	578	690	778	885	1,080
184	3597500	Wartrace Creek at Bell Buckle	16.3	29	4,000	5,520	6,420	7,450	8,150	8,800	10,200
					3,850	5,290	6,150	7,180	7,920	8,690	10,300
185	3598200	Weakly Creek near Rover	9.46	29	979	1,660	2,200	2,990	3,660	4,390	6,400
					1,020	1,740	2,320	3,170	3,870	4,660	52,800
186	3599000	Big Rock Creek at Lewisburg	24.9	15	3,540	5,300	6,750	8,940	10,900	13,100	19,500
					3,500	5,240	6,640	8,700	10,400	11,900	17,900
187	3599200	East Rock Creek at Farmington	43.1	33	4,790	8,190	10,600	13,600	15,800	18,000	23,100
					4,780	8,100	10,400	13,300	15,500	17,700	22,500
188	3599400	Little Flat Creek tributary near Rally Hill.	0.63	21	171	281	363	479	572	671	927
					178	296	388	517	620	728	1,000
189	3600000	Rutherford Creek near Carters Creek	68.8	15	4,840	7,480	9,270	11,500	13,200	14,900	18,800
					5,020	7,890	9,970	12,700	14,800	16,600	22,000
190	3600500	Big Bigby Creek at Sandy Hook	17.5	32	2,230	3,920	5,180	6,860	8,180	9,530	12,800
					2,250	3,920	5,140	6,770	8,030	9,350	12,400
		Hydrologic Area 4									
191	3594415	Beech River near Lexington	15.9	11	999	1,380	1,620	1,900	2,090	2,270	2,670
					1,090	1,540	1,850	2,220	2,480	2,710	3,240
192	3594430	Harmon Creek near Lexington	6.87	18	685	877	985	1,110	1,180	1,260	1,400
					714	929	1,060	1,220	1,320	1,420	1,600
193	3594435	Piney Creek at Highway 104 near Lexington.	19.2	17	1,140	1,820	2,300	2,940	3,440	3,940	5,180
					1,210	1,940	2,470	3,150	3,660	4,190	5,430

Table 1. Discharges for selected recurrence intervals at gaging stations in Tennessee--Continued

[The first row of values for each station is from gaging-station data only; the second row is from a regionally weighted curve based on equation 1; mi², square miles]

Map no.	Station no.	Station name	Contributing drainage area (mi²)	Period of record (years)	Peak discharge, in cubic feet per second, for indicated recurrence interval: 2-year	5-year	10-year	25-year	50-year	100-year	500-year
		Hydrologic area 4--Continued									
194	3606500	Big Sandy River at Bruceton	205	57	5,000	8,760	11,800	16,100	19,700	23,700	34,300
					5,070	8,850	11,800	16,100	19,600	23,400	33,600
195	7024300	Beaver Creek at Huntingdon	55.5	32	3,220	4,820	5,910	7,300	8,350	9,400	11,900
					3,220	4,830	5,940	7,350	8,400	9,440	11,900
196	7024500	South Fork Obion River near Greenfield.	383	57	8,120	13,200	16,600	21,100	24,400	27,700	35,400
					8,190	13,200	16,800	21,300	24,700	28,100	35,900
197	7025000	Rutherford Fork Obion River near Bradford.	201	28	4,860	6,540	7,550	8,720	9,530	10,300	11,900
					5,010	6,890	8,090	9,510	10,500	11,400	13,400
198	7025500	North Fork Obion River near Union City.	480	41	9,590	17,100	22,900	31,200	38,100	45,400	64,600
					9,640	17,000	22,600	30,600	37,100	44,100	62,100
199	7026000	Obion River at Obion	1,852	49	25,200	38,300	47,200	58,700	67,300	75,800	96,000
					24,800	37,900	47,000	58,700	67,500	76,400	97,300
200	7026500	Reelfoot Creek near Samburg	110	22	5,580	9,130	11,900	15,800	19,000	22,500	31,900
					5,480	8,810	11,300	14,700	17,500	20,600	28,600
201	7027500	South Fork Forked Deer River at Jackson.	495	44	8,360	14,200	19,100	26,600	33,200	40,800	62,800
					8,510	14,500	19,500	26,700	33,000	40,100	60,400
202	7027800	South Fork Forked Deer River near Gates.	932	24	10,600	18,400	24,200	32,000	38,200	44,500	59,900
					11,100	19,300	25,300	33,300	39,500	46,000	61,800
203	7028000	South Fork Forked Deer River at Chestnut Bluff.	1,003	28	14,100	23,300	29,900	38,500	45,100	51,700	67,300
					14,200	23,600	30,200	39,000	45,600	52,400	68,400
204	7028500	North Fork Forked Deer River at Trenton.	73.5	21	3,950	6,080	7,600	9,640	11,200	12,900	17,000
					3,940	6,040	7,530	9,480	11,000	12,600	16,400
205	7028600	Cain Creek tributary near Trenton	0.95	30	510	686	803	952	1,060	1,180	1,440
					505	676	787	929	1,030	1,140	1,400
206	7028700	Cain Creek near Trenton	14.4	32	1,450	3,070	4,600	7,120	9,480	12,300	21,000
					1,470	3,000	4,380	6,500	8,430	10,700	17,400
207	7028900	Middle Fork Forked Deer River near Spring Creek.	88.2	24	3,070	5,940	8,510	12,600	16,500	20,900	34,600
					3,180	6,030	8,410	12,100	15,200	18,900	29,600
208	7028940	Turkey Creek near Medina	7.87	15	2,770	3,760	4,350	5,050	5,530	5,980	6,950
					2,520	3,400	3,890	4,470	4,890	5,280	6,220
209	7029000	Middle Fork Forked Deer River near Alamo.	369	44	7,970	11,900	14,900	19,000	22,300	25,900	35,200
					8,040	12,200	15,200	19,500	22,900	26,400	35,700
210	7029050	Nash Creek near Tigrett	7.23	24	1,050	1,380	1,600	1,860	2,060	2,250	2,700
					1,060	1,410	1,640	1,930	2,140	2,340	2,820
211	7029090	Lewis Creek near Dyersburg	25.5	30	2,350	3,560	4,350	5,320	6,010	6,680	8,170
					2,340	3,540	4,320	5,270	5,970	6,640	8,130

Table 1. Discharges for selected recurrence intervals at gaging stations in Tennessee--Continued

[The first row of values for each station is from gaging-station data only; the second row is from a regionally weighted curve based on equation 1; mi², square miles]

Map no.	Station no.	Station name	Contributing drainage area (mi²)	Period of record (years)	Peak discharge, in cubic feet per second, for indicated recurrence interval						
					2-year	5-year	10-year	25-year	50-year	100-year	500-year
		Hydrologic area 4--Continued									
212	7029100	North Fork Forked Deer River at Dyersburg.	939	34	10,900	16,000	19,400	23,600	26,700	29,800	36,700
					11,200	16,900	20,700	25,400	28,900	32,300	40,100
213	7029275	Hatchie River near Pocahontas	310	12	7,230	11,800	15,400	20,400	24,500	29,000	40,800
					7,450	12,200	15,700	20,500	24,300	28,400	38,900
214	7029370	Cypress Creek at Selmer	44.1	21	2,060	3,100	3,880	4,980	5,870	6,820	9,340
					2,140	3,290	4,160	5,330	6,250	7,210	9,660
215	7029400	Hatchie River at Pocahontas	837	35	14,900	24,300	31,400	41,300	49,400	58,000	80,500
					14,800	24,000	30,900	40,500	48,200	56,500	77,800
216	7029500	Hatchie River at Bolivar	1,480	56	17,800	30,300	39,800	53,100	63,900	75,500	105,000
					17,900	30,300	39,600	52,800	63,400	74,600	104,000
217	7030000	Hatchie River near Stanton	1,975	29	23,200	35,800	44,500	56,000	64,700	73,600	95,100
					23,000	35,800	44,900	56,800	65,800	75,200	97,500
218	7030050	Hatchie River at Rialto	2,308	38	21,800	33,300	41,100	50,800	58,100	65,200	81,800
					22,000	34,000	42,300	52,700	60,500	68,200	86,300
219	7030100	Cane Creek at Ripley	33.9	14	2,410	3,450	4,140	5,020	5,670	6,320	7,850
					2,430	3,520	4,260	5,190	5,880	6,560	8,150
220	7030270	Clear Creek near Arlington	60.5	29	3,770	4,260	4,530	4,820	5,010	5,190	5,550
					3,750	4,360	4,730	5,150	5,450	5,700	6,220
221	7030280	Loosahatchie River at Brunswick	505	37	15,100	22,800	28,000	34,800	39,800	44,900	56,800
					14,600	22,100	27,200	33,700	38,700	43,800	55,700
222	7030500	Wolf River at Rossville	503	42	9,730	16,200	20,600	26,000	29,900	33,700	42,100
					9,800	16,300	20,700	26,200	30,200	34,100	42,900
223	7031700	Wolf River at Raleigh	771	37	12,000	19,000	23,600	29,400	33,600	37,700	46,800
					12,100	19,200	24,000	30,000	34,400	38,600	48,300

grid-sampling method (20 to 80 points in basin were sampled).

- Storage (ST), area of lakes, ponds, and swamps in percent of contributing drainage area, measured by the transparent grid-sampling method.

- Precipitation (P), mean annual precipitation, in inches, for period 1935-64 from unpublished map prepared by TVA and based on data published in "Precipitation in Tennessee River Basin" by TVA, an annual series.

- 24-hour, 2-year rainfall (I), in inches, from U.S. Department of Commerce (1961).

Ordinary Least-Squares Regression Analysis

The multiple-regression analysis required several steps to define the best predictive equations. Initially, peak-discharge data from all gaging stations were regressed against their basin and climatic characteristics using ordinary least-squares regression techniques. This yielded an equation whose standard error was considered unacceptably large for reliable estimates of peak discharge. Residuals, in log units, for each gaging station from this regression were plotted on a map of Tennessee. A residual is equal to the log of the actual discharge obtained from the station frequency curve minus the log of the discharge computed from the regression equation. The residuals plot was inspected for geographic trends indicating potential regional groupings of gaging stations. Several regional groupings of gaging stations and combinations of basin characteristics were investigated in order to improve the accuracy of the estimating equations.

The ordinary least-squares (OLS) regression and regional analyses indicated that four regional groupings (fig. 1) provided the most accurate estimating equations. The boundaries of the four areas approximately coincide with some of the physiographic province boundaries that occur within Tennessee.

The Wilcoxon Signed Ranks Test (Tasker, 1982) was used to test the statistical significance of the regional clustering of the regression residuals compared to the whole-sample group for the State. The test results showed that each regional boundary was statistically different from the whole-sample group at the 5-percent level of significance.

Of the basin characteristics found to be significant for use in the estimating equations for each region, contributing drainage area was the only variable within each region that proved to be a consistent predictor of peak flows associated with recurrence intervals ranging from 2 through 500 years (table 2). The standard error of the estimate, which represents a measure of how well the experienced flood peaks agree with those computed by the regression equations, was used as a measure of the prediction accuracy. In table 2, the highest standard error means that the variable was chosen first as the most significant explanatory variable in the regression. The next highest standard error in each category (region and recurrence interval) represents the explanatory variable which was the second most significant variable. The difference in the first and second highest standard errors in each category reflects the improvement by the addition of the new variable.

Table 2. Standard error of estimate for regional (ordinary least-squares) regression equations using basin characteristics having a 5-percent level of significance

[Variables tabulated in decreasing order of significance; A, contributing drainage area, in square miles; I, 24-hour, 2-year rainfall, in inches; P, mean annual precipitation, in inches; E, mean basin elevation, in feet above sea level; S, main channel slope, in feet per mile; and ST, storage, in percent of contributing drainage area]

Hydrologic area	Variable	Recurrence interval						
		2-year	5-year	10-year	25-year	50-year	100-year	500-year
1	A	44.4	43.6	43.8	45.3	47.1	49.2	49.7
	I	**	40.3	41.3	43.6	45.6	48.1	**
	P	40.3	39.8	**	**	**	**	**
	E	39.8	**	**	**	**	**	**
	S	38.4	**	**	**	**	**	**
2	A	28.5	23.7	24.4	27.8	30.9	34.0	55.7
	ST	26.8	22.1	21.8	25.6	29.0	32.3	**
	I	24.9	20.4	**	**	**	**	**
3	A	36.6	35.2	35.4	36.9	38.4	40.1	42.6
	P	35.4	**	**	**	**	**	**
4	A	29.7	30.4	32.3	35.9	38.8	41.9	44.6
	S	28.2	32.3	**	**	**	**	**

** Variable does not meet 5-percent level of significance test.

Generalized Least-Squares Regression Analysis

Generalized least-squares regression analysis was performed on the regional groupings of gaging stations identified by ordinary least-squares regression. Generalized least-squares regression is used to determine the final regional equations because the technique contains an algorithm that accounts for the error inherent in two assumptions necessary when ordinary least-squares regression is used to estimate streamflow characteristics. The two assumptions required when ordinary least-squares regression is used to estimate streamflow characteristics are: (1) the estimates of peak discharges from site-to-site have a constant variance, and (2) the site-to-site streamflow data are statistically independent. Both assumptions are commonly violated because the standard errors associated with the estimates of peak discharges vary depending on the length of observed record, and because the site-to-site concurrent streamflow data are often correlated because they are caused by the same climatic events.

Stedinger and Tasker (1985, 1986) have shown that generalized least-squares regression is superior to ordinary least-squares regression in accounting for the unequal variance of streamflow characteristics and cross-correlated flows for nearby sites. Generalized least-squares procedures use a weighting matrix to ensure that sites in the data set are weighted proportionally to the accuracy of the estimate of the peak discharges and the cross correlation of these events. Possible cross-correlation of streamflow data is included in the weighting matrix as a function of distance between gaged sites. Tasker and Stedinger (1989) describe the operational GLS model that was used in this analysis.

The accuracy of the regression equations is expressed in two ways: (1) standard error of prediction and (2) equivalent years of record (table 3). The standard error of prediction is partitioned into model error and sampling error. Model error is the error associated with assuming an incomplete model form for the prediction equations. Model error cannot be reduced by additional data-collection activities. Sampling error includes both time- and spatial-sampling errors and usually is reduced as more data become available through additional data collection.

Hardison (1971) describes a method of expressing the errors associated with predicting streamflow characteristics as equivalent years of record. Equivalent years of record is defined as the number of years of actual streamflow records needed to provide an estimate of equivalent accuracy to the regression equation estimate.

Prediction errors (table 3) are a measure of how well the regression model, or estimating equations, will perform when applied to ungaged sites. Prediction error provides a more accurate estimate of the predictive error of the estimating equations than the standard error of estimate (measure of how well actual flood peaks agree with those computed by the regression equations) shown in previous flood-frequency publications for Tennessee. This occurs because the weighting matrix in the generalized least-squares algorithm quantifies sampling error in addition to model error. A comparison of the standard error of prediction shown in table 3 to the standard error

Table 3. Summary of generalized least-squares regression equations

[Q, peak discharge in cubic feet per second; <, less than; A, contributing drainage area]

Recurrence interval (years)	Equation	Standard error of prediction (percent)	Equivalent years of record
	Hydrologic area 1		
2	$Q = 118A^{0.753}$	44	<2
5	$Q = 198A^{0.736}$	43	2
10	$Q = 259A^{0.727}$	44	3
25	$Q = 344A^{0.717}$	44	4
50	$Q = 413A^{0.711}$	45	5
100	$Q = 493A^{0.703}$	46	6
500	$Q = 670A^{0.694}$	48	7
	Hydrologic area 2		
2	$Q = 222A^{0.722}$	35	5
5	$Q = 382A^{0.708}$	32	9
10	$Q = 502A^{0.703}$	32	12
25	$Q = 668A^{0.697}$	34	13
50	$Q = 800A^{0.694}$	36	13
100	$Q = 938A^{0.690}$	37	13
500	$Q = 1,282A^{0.682}$	41	13
	Hydrologic area 3		
2	$Q = 353A^{0.682}$	41	2
5	$Q = 562A^{0.678}$	39	3
10	$Q = 716A^{0.676}$	39	5
25	$Q = 924A^{0.673}$	40	6
50	$Q = 1,086A^{0.672}$	41	7
100	$Q = 1,253A^{0.670}$	42	8
500	$Q = 1,656A^{0.666}$	44	8
	Hydrologic area 4		
2	$Q = 411A^{0.523}$	37	3
5	$Q = 556A^{0.550}$	36	4
10	$Q = 648A^{0.563}$	38	5
25	$Q = 757A^{0.577}$	40	5
50	$Q = 833A^{0.586}$	42	5
100	$Q = 905A^{0.595}$	44	5
500	$Q = 1,063A^{0.612}$	48	5

of the estimate reported in the previous flood-frequency publication (Randolph and Gamble, 1976) could mislead the user into the false assumption that the previous equations produce a more accurate prediction. However, standard errors of estimate (table 2) can be compared with those shown in previous reports.

Generalized least-squares regression analysis was used to produce the final regression equations for this report (table 3). These equations can be used to estimate peak discharges for the indicated recurrence intervals for ungaged streams in Tennessee.

METHODS OF ESTIMATING FLOOD FREQUENCY

Methods for estimating peak discharges at desired sites vary depending on the amount of data available at the site. Methods are presented in the following sections that describe procedures in the order of expected reliability.

Gaged Sites

Flood estimates at gaged sites can best be determined by a combined use of the gaging-station frequency curve and the regression equations. The recommended procedure (Interagency Advisory Committee on Water Data, 1982) is to compute the discharge for the desired recurrence interval by weighting the station value and the regression value. The weighted value is based on length of record of the observed station data (table 1) and equivalent years of record for the regression value as determined from table 3. The equation below is used to compute the weighted value:

$$\log Q_w = \frac{(\log Q_g)(N_g) + (\log Q_r)(N_u)}{N_g + N_u} \qquad (1)$$

where

Q_w is the weighted station discharge,
Q_g is the station discharge from the gaging station frequency curve,
Q_r is the regression discharge,
N_g is the number of years of gage record used to compute Q_g, and
N_u is the equivalent years of record for Q_r from table 3.

Discharges as defined by the station frequency curve and regionally weighted discharges for selected recurrence intervals have been determined for each gaging station used in the analysis (table 1). The weighted values shown in the second line for each station are recommended for design purposes at gaged sites.

Ungaged Sites

For computing discharges at ungaged sites, a hierarchal system of methods should be used (table 4). This hierarchy of methods is based on the location of the desired site with respect to gaging stations (flood-frequency information based on observed data). The methods referred to in table 4 are described below.

Table 4. Hierarchy of discharge computation methods for ungaged sites

[≤, equal to or less than; >, greater than]

METHOD A	Desired site is located between two gages and the ratio of the drainage area size of the two gages is $\frac{\text{Drainage area of downstream gage}}{\text{Drainage area of upstream gage}} \leq 3$
METHOD B	Desired site is located between two gages and the ratio of the drainage area size of the two gages is $\frac{\text{Drainage area of downstream gage}}{\text{Drainage area of upstream gage}} > 3$ or The desired site is relatively near a gaging station on the same stream and the drainage area is within 50 percent of the gage drainage area
REGRESSION EQUATION	Desired site drainage area is not within 50 percent of drainage area for a gaged site or No gage is available
METHOD C	Desired site is on a stream which crosses a hydrologic area boundary or a state line

Method A

When flood magnitudes are desired between two gages on the same stream, select the regionally weighted discharge for the desired recurrence interval (table 1) for each gage. Estimate discharge at the site of interest by interpolation on the basis of contributing drainage area. Interpolation can be done by plotting discharge and contributing drainage area on logarithmic paper for the two gaged sites and connecting the points with a straight line. Enter the straight-line relation with the value of the contributing drainage area for the site of interest and select corresponding discharge. If the contributing drainage area at the downstream gage is more than three times that at the upstream gage, use the procedure described in the next paragraph or the regression equations.

Method B

Flood discharges estimates for a desired recurrence interval for sites which: (1) are located between two gages or (2) are located relatively near a gaging station on the same stream can be calculated by a combined use of the weighted station data (table 1) and the regression equations (table 3). Method B should be used for condition 1 described above if the drainage area of the downstream gage divided by the drainage area of the upstream gage is greater than 3. In this case, only data for the gage nearest in drainage area size to the site of interest should be used. Furthermore, the drainage areas of the nearest gage and the site of interest should be within 50 percent. For condition 2 described above, the drainage areas of the gage and the site of interest should be within 50 percent.

The calculation procedure for this method involves transferring the weighted station discharge value from table 1 upstream or downstream and weighting the result with the regression discharge computed using table 3. The weighted station value can be transferred upstream or downstream by the equation,

$$Q'_w = \left(\frac{A_u}{A_g}\right)^b Q_w \qquad (2)$$

and a weighted value at the ungaged site can be calculated by the equation,

$$Q''_w = \left(\frac{2\Delta A}{A_g}\right) Q_r + \left[1 - \left(\frac{2\Delta A}{A_g}\right)\right] Q'_w \qquad (3)$$

where

Q_w is the weighted station value from table 1;
Q'_w is the weighted station discharge from table 1, transferred upstream or downstream to the ungaged site, defined by equation 2;
Q''_w is the final weighted discharge at the ungaged site;
Q_r is the regression discharge at the ungaged site;
A_u is the drainage area of the ungaged site;
A_g is the drainage area of the gaged site;
ΔA is the absolute difference between A_u and A_g; and
b is the regression coefficient (exponent) of drainage area of the gaged site from table 3.

If the drainage area for the ungaged site lies within more than one hydrologic area, use method C for computation of Q_r in equation 3.

Method C

In some cases, streams cross hydrologic area boundaries. For a site downstream from this crossing, compute the desired discharge as if the total drainage area lies in each hydrologic area and weight the discharges on percentage of drainage area in each hydrologic area. This same procedure can also be used at sites on streams that cross state lines where different estimating techniques apply.

In summary, suggested procedures for estimating peak discharges for selected recurrence intervals at a desired site are as follows:

1. Determine that the stream is not appreciably affected by manmade changes.
2. From figure 1 determine hydrologic area in which the site is located.
3. Search for stream-gaging information at the site using figure 1 and table 1.
4. Search for stream-gaging information for nearby sites on the same stream.
5. Measure the contributing drainage area, in square miles, from the best map available.
6. Estimate desired discharges using method A, B, C, or the appropriate regression equations.

Computation Examples

Example 1:

Assume the discharge is desired for a flood with a recurrence interval of 50 years at the ungaged site, Buffalo River at Natchez Trace (Lewis County). Desired site does not meet criteria from table 4, method A, B, or C, therefore, use regression formulas in table 3.

From figure 1, site is in hydrologic area 2.

From table 3, the equation to use is:
$Q50 = 800\ A^{0.694}$.

From $7^1/_2$-minute topographic maps, the drainage area is 99.8 mi^2.

Final equation is: $Q50 = 800\ (99.8)^{0.694} = 19{,}500$ cubic feet per second.

Example 2:

The discharge for a flood with a recurrence interval of 50 years is desired for an ungaged site on Collins River upstream from Hills Creek. The drainage area at the site is 232 mi^2 of which 175 mi^2 (75 percent) lies in hydrologic area 1 and 57 mi^2 (25 percent) lies in hydrologic area 2. Desired site does not meet criteria for methods A or B (table 4), but does meet method C criteria. The 50-year flood discharge should be computed using the equations for both hydrologic areas 1 and 2 from table 3 for 232 mi^2. The final discharge is a weighted value based on percent of drainage area in each hydrologic area.

From table 3, the equation to use for hydrologic area 1 is: $Q50 = 413\ A^{0.711}$.

For hydrologic area 2: $Q50 = 800\ A^{0.694}$.

Final equations adjusted for drainage area in each hydrologic area are:

For area 1, $Q50(1) = 413\ (232)^{0.711} x\ 0.75 = 14{,}900$ cubic feet per second;

For area 2, $Q50(2) = 800\ (232)^{0.694} x\ 0.25 = 8{,}760$ cubic feet per second.

Final Q50 = 23,660 cubic feet per second.

Use Q50 = 23,700 cubic feet per second.

Example 3:

The discharge for a flood with a recurrence interval of 50 years is desired for a site on Piney River upstream from the gaging station at Vernon (03602500). The site is in hydrologic area 2 and has a drainage area of 160 mi^2. The drainage area of Piney River at the gage is 193 mi^2. Because the drainage area at the site is within 50 percent of that at the gaged site, the criteria for method B, table 4, is satisfied and should be followed.

From table 3, the equation to use is:
$Q50 = 800\ (A)^{0.694}$.

At the site $Q_r = 800(160)^{0.694} = 27{,}100$ cubic feet per second.

From table 1, the 50-year weighted discharge, Q_w, for the gaging station near Vernon is 36,700 cubic feet per second. This discharge is transferred upstream to the site by the equation:

$Q'_w = (A_u/A_g)^b\ Q_w$.

$Q'_w = (160/193)^{0.694}\ (36{,}700) = 32{,}200$ cubic feet per second

The equation for the final discharge is:

$$Q''_w = \left(\frac{2\Delta A}{A_g}\right) Q_r + \left[1 - \left(\frac{2\Delta A}{A_g}\right) Q'_w\right]$$

Final 50-year peak discharge is:

$Q''_w = (2(42)/193)(27{,}100)$
$+ (1 - (2(42)/193))(32{,}200)$
$= 29{,}980$ cubic feet per second.

Accuracy and Limitations of Flood-Frequency Estimates

The regression equations are known to be applicable only within the range of drainage basin size in the sample used in the analysis. Reliability of the equations for estimating discharges at sites outside the sample range is unknown. Consequently, the regression equations might only be reliable for streams in Tennessee whose basin sizes fall within the following ranges:

Hydrologic area 1	0.36 to 21,400 mi^2
Hydrologic area 2	0.47 to 707 mi^2
Hydrologic area 3	0.03 to 892 mi^2
Hydrologic area 4	0.76 to 2,308 mi^2

The degree of regulation of streams in Tennessee has varied from the negligible effect of the grist mill dams of the early settlers to nearly complete regulation of most major streams at present (1992). The methods for estimating peak discharges described in this report are not applicable to streams downstream of reservoirs. Major dams, streams affected, and date of closure are listed below:

Dam	Streams affected	Date of closure
Wolf Creek	Cumberland	1959
Dale Hollow	Obey, Cumberland	1943
Cordell Hull	Cumberland	1967
Center Hill	Caney Fork, Cumberland	1948
Old Hickory	Cumberland	1954
J. Percy Priest	Stones, Cumberland	1967
Douglas	French Broad, Tennessee	1943
South Holston	South Fork Holston, Holston, Tennessee	1950
Watauga	Watauga, South Fork Holston, Holston, Tennessee	1948
Cherokee	Tennessee	1941
Fort Loudon	Tennessee	1943
Fontana	Little Tennessee, Tennessee	1944
Tellico	Little Tennessee, Tennessee	1979
Norris	Clinch, Tennessee	1936
Melton Hill	Clinch, Tennessee	1963
Watts Bar	Tennessee	1942
Chatuge	Hiwassee, Tennessee	1942
Nottely	Nottely, Hiwassee, Tennessee	1942
Hiwassee	Hiwassee, Tennessee	1940
Chickamauga	Tennessee	1940
Nickajack	Tennessee	1967
Elk River	Elk, Tennessee	1952
Tims Ford	Elk, Tennessee	1970
Wheeler	Tennessee	1936
Pickwick Landing	Tennessee	1938
Normandy	Duck, Tennessee	1976
Kentucky	Tennessee	1944

Flood-frequency data for most of the streams listed can be obtained either from the U.S. Army Corps of Engineers (Nashville District) for streams in the Cumberland River basin or from the Tennessee Valley Authority for streams in the Tennessee River basin. In addition to regulation on major streams, flood characteristics in several small basins across the State have been altered by Soil Conservation Service watershed projects. Information concerning the location of these projects can be obtained from that agency.

In West Tennessee, construction of levees and dredging of the low-water channels have undoubtedly affected flood flows. The effect of this work cannot be evaluated quantitatively since most of the work was done before streamflow records were collected systematically or was done on streams where little or no streamflow records are available.

The user is cautioned to look for manmade changes in the basin upstream from the site where an estimate is to be made. Reservoirs, urban development, levees, channel improvements, and transfer of flows between basins for such purposes as storage, water supply, irrigation, hydroelectric plants, and storm drainage might alter flood flows.

MISCELLANEOUS FLOOD DISCHARGE INFORMATION

Flood records covering various periods of time have been collected at gaging stations in Tennessee. Data for maximum known flood at these gaging stations (table 5) might be of interest to the user of this report as a comparison to calculated peak discharges for various recurrence intervals.

Flood-discharge measurements have been made at a number of miscellaneous sites since publication of the last (1976) flood-frequency report for Tennessee. Miscellaneous measurements of flood flow are usually made when a notable flood occurs at a site where a stream gage does not exist. The discharge information (table 6) is a compilation of all the miscellaneous measurements since 1972 in the U.S. Geological Survey Water Resources Data for Tennessee, published annually. It is intended to supplement the miscellaneous peak-discharge information compiled in the previous (1976) flood-frequency report.

Table 5. Maximum known discharges at gaging stations in Tennessee

[ft^3/s, cubic feet per second; $ft^3/s/(mi^2)$, cubic feet per second per square mile; mi^2, square miles; --, no data]

Map no.	Station no.	Station name	Contributing drainage area (mi^2)	Years of record	Maximum known discharge: Date	Maximum known discharge: Peak discharge (ft^3/s)	Maximum known discharge: Unit discharge [$ft^3/s/(mi^2)$]
				Hydrologic area 1			
1	2384900	Coahulla Creek near Cleveland	4.35	31	03/16/1973	2,620	602
2	3418500	Caney Fork at Clifty	111	19	02/13/1948	15,500	140
3	3455000	French Broad River near Newport	1,858	71	03/07/1867	110,000	59.2
4	3461200	Cosby Creek above Cosby	10.2	28	03/16/1973	1,720	169
5	3461500	Pigeon River at Newport	666	74	02/28/1902	50,000	75.1
6	3465000	North Indian Creek near Unicoi	15.9	39	11/06/1977	980	61.6
7	3465500	Nolichucky River at Embreeville	805	66	05/21/1901	120,000	149
8	3466500	Nolichucky River below Nolichucky Dam	1,184	38	01/23/1906	73,500	62.1
9	3467000	Lick Creek at Mohawk	220	25	03/12/1963	12,200	55.5
10	3467500	Nolichucky River near Morristown	1,679	61	05/--/1901	85,000	50.6
11	3469000	French Broad River below Douglas Dam	4,543	24	08/31/1940	95,600	21.0
12	3469010	Millican Creek near Douglas Dam	4.20	17	04/08/1957	1,600	381
13	3469110	Ramsey Creek near Pitman Center	2.18	16	03/16/1973	424	195
14	3469160	East Fork Little Pigeon near Sevierville.	64.1	29	03/12/1963	7,950	124
15	3469200	Little Pigeon River above West Prong near Sevierville.	201	14	03/26/1965	24,100	120
16	3469500	West Prong Little Pigeon River near Pigeon Forge.	76.2	32	03/16/1973	11,000	144
17	3470000	Little Pigeon River at Sevierville	353	63	02/25/1875	55,000	156
18	3477000	South Fork Holston River at Bluff City.	813	50	05/22/1901	30,700	37.8
19	3479500	Watauga River at North Carolina-Tennessee state line.	152	13	12/07/1950	14,700	96.7
20	3480000	Watauga River at Stump Knob	171	15	08/13/1940	50,000	292

Table 5. Maximum known discharges at gaging stations in Tennessee--Continued

[ft^3/s, cubic feet per second; $ft^3/s/(mi^2)$, cubic feet per second per square mile; mi^2, square miles; --, no data]

Map no.	Station no.	Station name	Contributing drainage area (mi^2)	Years of record	Maximum known discharge: Date	Maximum known discharge: Peak discharge (ft^3/s)	Maximum known discharge: Unit discharge [$ft^3/s/(mi^2)$]
		Hydrologic area 1--Continued					
21	3482000	Roan Creek near Neva	102	40	10/02/1977	11,000	108
22	3482500	Roan Creek at Butler	166	14	03/26/1935	4,940	29.8
23	3483000	Watauga River at Butler	427	28	08/13/1940	71,500	167
24	3485500	Doe River at Elizabethton	137	66	05/21/1901	25,000	182
25	3486000	Watauga River at Elizabethton	692	23	05/21/1901	76,000	110
26	3486225	Powder Branch near Johnson City	3.48	12	04/25/1973	563	162
27	3487500	South Fork Holston River at Kingsport	1,935	23	05/--/1901	110,000	56.8
28	3487550	Reedy Creek at Orebank	36.3	23	05/30/1927	11,000	303
29	3491000	Big Creek near Rogersville	47.3	40	03/12/1963	5,760	122
30	3491200	Big Creek tributary near Rogersville	2.00	30	07/25/1977	1,180	590
31	3491500	Holston River near Rogersville	3,035	40	01/29/1918	70,900	23.4
32	3495500	Holston River near Knoxville	3,747	10	03/28/1935	62,900	16.8
33	3496000	First Creek at Mineral Springs Avenue at Knoxville.	11.9	18	11/18/1957	1,310	110
34	3497000	Tennessee River at Knoxville	8,934	50	03/08/1867	290,000	32.5
35	3497300	Little River above Townsend	106	23	03/16/1973	16,000	151
36	3498000	Little River near Walland	192	21	02/--/1875	40,000	208
37	3498500	Little River near Maryville	269	36	02/25/1875	50,000	186
38	3498700	Nails Creek near Knoxville	0.36	31	07/31/1982	240	667

Table 5. Maximum known discharges at gaging stations in Tennessee--Continued

[ft^3/s, cubic feet per second; $ft^3/s/(mi^2)$, cubic feet per second per square mile; mi^2, square miles; --, no data]

Map no.	Station no.	Station name	Contributing drainage area (mi^2)	Years of record	Maximum known discharge		
					Date	Peak discharge (ft^3/s)	Unit discharge [$ft^3/s/(mi^2)$]
			Hydrologic area 1--Continued				
39	3518500	Tellico River at Tellico Plains	118	57	05/--/1840	21,500	182
40	3519500	Little Tennessee River at McGhee	2,443	40	11/19/1906	104,000	42.6
41	3519600	Island Creek at Vonore	11.2	23	03/12/1963	4,850	433
42	3519610	Baker Creek tributary near Binfield	2.10	18	06/23/1981	--	--
43	3519640	Baker Creek near Greenback	16.0	21	05/30/1974	2,900	181
44	3519700	Bat Creek near Vonore	30.7	23	03/12/1963	5,060	165
45	3520100	Sweetwater Creek near Loudon	62.2	28	03/16/1973	4,500	72.3
46	3528000	Clinch River above Tazewell	1,474	65	04/05/1977	98,100	66.6
47	3528300	Big Barren Creek near New Tazewell	13.3	10	03/25/1935	550	41.4
48	3528400	White Creek near Sharps Chapel	2.68	36	03/25/1935	805	300
49	3532000	Powell River near Arthur	685	63	04/06/1977	59,500	86.9
50	3533000	Clinch River below Norris Dam	2,913	33	03/11/1826	130,000	44.6
51	3534000	Coal Creek at Lake City	24.5	32	03/23/1929	8,400	343
52	3534500	Buffalo Creek at Norris	7.82	31	02/16/1964	1,460	187
53	3535000	Bullrun Creek near Halls Crossroads	68.5	29	04/04/1977	18,300	267
54	3535140	South Fork Beaver Creek at Harbison	1.23	12	04/12/1972	514	418
55	3535180	Willow Fork near Halls Crossroads	3.23	20	03/16/1973	878	272
56	3537000	Whiteoak Creek below Oak Ridge National Laboratory near Oak Ridge.	3.62	10	02/01/1951	594	164

Table 5. Maximum known discharges at gaging stations in Tennessee--Continued

[ft^3/s, cubic feet per second; $ft^3/s/(mi^2)$, cubic feet per second per square mile; mi^2, square miles; --, no data]

Map no.	Station no.	Station name	Contributing drainage area (mi^2)	Years of record	Maximum known discharge: Date	Maximum known discharge: Peak discharge (ft^3/s)	Maximum known discharge: Unit discharge [$ft^3/s/(mi^2)$]
		Hydrologic area 1--Continued					
57	3538130	Caney Creek near Kingston	5.55	24	12/10/1972	1,930	348
58	3538200	Poplar Creek near Oliver Springs	55.9	32	06/29/1928	14,000	250
59	3538225	Poplar Creek near Oak Ridge	82.5	26	04/05/1977	11,400	138
60	3538250	East Fork Poplar Creek near Oak Ridge	19.5	26	11/28/1973	4,100	210
61	3538275	Bear Creek near Oak Ridge	7.15	18	11/28/1973	--	--
62	3538300	Rock Creek near Sunbright	5.54	17	03/21/1955	1,560	282
63	3538500	Emory River near Wartburg	83.2	48	03/23/1929	30,000	361
64	3538600	Obed River at Crossville	12.0	31	04/04/1977	--	--
65	3538800	Obed River tributary near Crossville	0.72	14	07/11/1967	385	535
66	3538900	Self Creek near Big Lick	3.80	18	05/27/1973	1,760	463
67	3539500	Daddys Creek near Crab Orchard	93.5	28	03/--/1929	22,000	235
68	3539600	Daddys Creek near Hebbertsburg	139	11	03/12/1963	11,200	80.6
69	3539800	Obed River near Lancing	518	25	05/27/1973	105,000	203
70	3540500	Emory River at Oakdale	764	59	03/23/1929	195,000	255
71	3541100	Bitter Creek near Camp Austin	5.53	19	11/26/1973	3,710	671
72	3541500	Whites Creek near Glen Alice	108	44	03/23/1929	66,000	611
73	3543200	Ten Mile Creek near Decatur	26.4	17	03/12/1963	5,890	223
74	3543500	Sewee Creek near Decatur	117	52	01/07/1946	23,900	204

Table 5. Maximum known discharges at gaging stations in Tennessee--Continued

[ft^3/s, cubic feet per second; $ft^3/s/(mi^2)$, cubic feet per second per square mile; mi^2, square miles; --, no data]

Map no.	Station no.	Station name	Contributing drainage area (mi^2)	Years of record	Maximum known discharge: Date	Maximum known discharge: Peak discharge (ft^3/s)	Maximum known discharge: Unit discharge [$ft^3/s/(mi^2)$]
		Hydrologic area 1--Continued					
75	3544500	Richland Creek near Dayton	50.2	52	02/27/1903	14,000	279
76	3556000	Turtletown Creek at Turtletown	26.9	37	06/21/1961	1,260	46.8
77	3557000	Hiwassee River near Reliance	1,223	33	11/19/1906	69,000	56.4
78	3561500	Ocoee River at McHarg	447	13	07/22/1938	17,300	38.7
79	3565040	Chestuee Creek above Englewood	14.8	13	01/07/1946	4,110	278
80	3565120	Chestuee Creek at Zion Hill	37.8	17	01/07/1946	4,730	125
81	3565160	Middle Creek below Highway 39, near Englewood.	32.7	16	03/27/1959	3,520	108
82	3565250	Chestuee Creek at Dentville	114	17	01/08/1946	5,930	52.0
83	3565300	South Chestuee Creek near Benton	31.8	29	03/16/1973	12,000	377
84	3565500	Oostanaula Creek near Sanford	57.0	32	03/16/1973	8,000	140
85	3566200	Brymer Creek near McDonald	9.68	31	03/16/1973	4,300	444
86	3566420	Wolftever Creek near Ooltewah	18.8	22	03/16/1973	7,300	388
87	3567500	South Chickamauga Creek near Chickamauga.	428	56	03/17/1973	30,000	70.1
88	3568000	Tennessee River at Chattanooga	21,400	63	03/11/1867	459,000	21.4
89	3570800	Little Brush Creek near Dunlap	15.4	28	03/16/1973	3,420	222
90	3571000	Sequatchie River near Whitwell	384	66	12/23/1990	35,400	92.2
91	3571600	Brown Spring Branch near Sequatchie	0.67	23	03/16/1973	234	349
92	3571800	Battle Creek near Monteagle	50.4	32	03/12/1963	10,200	202
93	3578500	Bradley Creek near Prairie Plains	41.3	32	03/17/1973	5,660	137

Table 5. Maximum known discharges at gaging stations in Tennessee--Continued

[ft^3/s, cubic feet per second; $ft^3/s/(mi^2)$, cubic feet per second per square mile; mi^2, square miles; --, no data]

Map no.	Station no.	Station name	Contributing drainage area (mi^2)	Years of record	Maximum known discharge		
					Date	Peak discharge (ft^3/s)	Unit discharge [$ft^3/s/(mi^2)$]
		Hydrologic area 2					
94	3313600	West Fork Drakes Creek tributary near Fountain Head.	0.95	18	05/06/1984	742	781
95	3408000	New River near New River	314	12	03/23/1929	70,000	223
96	3408500	New River at New River	382	51	03/23/1929	74,700	196
97	3409000	White Oak Creek at Sunbright	13.5	19	05/27/1973	5,560	412
98	3409500	Clear Fork near Robbins	272	52	03/16/1973	35,700	131
99	3414500	East Fork Obey River near Jamestown	196	43	05/27/1973	44,800	229
100	3415000	West Fork Obey River near Alpins	81.0	31	03/21/1955	15,100	186
101	3415500	Obey River near Byrdstown	445	24	06/29/1928	35,000	78.6
102	3415700	Big Eagle Creek near Livingston	4.77	24	03/12/1975	1,740	365
103	3416000	Wolf River near Byrdstown	106	43	09/02/1982	23,500	222
104	3417700	Matthews Branch tributary near Livingston.	0.49	30	09/28/1979	480	980
105	3418000	Roaring River near Hilham	51.6	43	03/17/1963	9,770	189
106	3420000	Calfkiller River below Sparta	111	31	03/24/1929	25,000	225
107	3420360	Mud Creek tributary Number 2 near Summitville.	2.28	20	05/27/1973	1,760	772
108	3420500	Barren Fork near Trousdale	126	51	02/13/1948	32,000	254
109	3420600	Owen Branch near Centertown	4.60	32	06/22/1989	7,500	1,630
110	3421000	Collins River near McMinnville	640	61	03/23/1929	75,300	118

Table 5. Maximum known discharges at gaging stations in Tennessee--Continued

[ft^3/s, cubic feet per second; $ft^3/s/(mi^2)$, cubic feet per second per square mile; mi^2, square miles; --, no data]

Map no.	Station no.	Station name	Contributing drainage area (mi^2)	Years of record	Maximum known discharge: Date	Maximum known discharge: Peak discharge (ft^3/s)	Maximum known discharge: Unit discharge [$ft^3/s/(mi^2)$]
		Hydrologic area 2--Continued					
111	3421100	Sink tributary at McMinnville	0.47	22	08/31/1961	520	1,106
112	3421200	Charles Creek near McMinnville	31.1	32	06/22/1989	24,800	797
113	3423000	Falling Water River near Cookeville	45.9	24	06/28/1928	5,630	123
114	3431800	Sycamore Creek near Ashland City	97.2	25	02/21/1989	18,500	190
115	3434500	Harpeth River near Kingston Springs	666	60	01/07/1946	60,000	90.1
116	3435030	Red River near Portland	15.1	20	06/10/1981	10,400	689
117	3435500	Red River near Adams	309	49	03/12/1975	60,000	194
118	3436000	Sulphur Fork Red River near Adams	165	48	03/12/1975	35,400	215
119	3436100	Red River at Port Royal	498	25	03/13/1975	60,300	121
120	3436700	Yellow Creek near Shiloh	124	28	05/06/1984	16,200	131
121	3574700	Big Huckleberry Creek near Belvidere	2.18	20	03/12/1963	1,470	674
122	3579800	Miller Creek near Cowan	4.30	20	03/12/1968	--	--
123	3579900	Boiling Fork Creek at Cowan	17.0	24	03/12/1963	4,590	270
124	3587200	Bluewater Creek tributary near Leoma	0.49	29	03/21/1955	369	753
125	3587500	Shoal Creek above Little Shoal Creek at Lawrenceburg.	27.0	28	03/28/1902	11,200	415
126	3588000	Shoal Creek at Lawrenceburg	55.4	19	03/28/1902	23,000	415
127	3588400	Chisholm Creek at Westpoint	43.0	24	03/15/1973	17,900	416
128	3588500	Shoal Creek at Iron City	348	61	03/21/1955	132,000	379

Table 5. Maximum known discharges at gaging stations in Tennessee--Continued

[ft^3/s, cubic feet per second; $ft^3/s/(mi^2)$, cubic feet per second per square mile; mi^2, square miles; --, no data]

Map no.	Station no.	Station name	Contributing drainage area (mi^2)	Years of record	Maximum known discharge		
					Date	Peak discharge (ft^3/s)	Unit discharge [$ft^3/s/(mi^2)$]
			Hydrologic area 2--Continued				
129	3593300	Snake Creek near Adamsville	49.4	20	02/13/1948	10,000	202
130	3593800	Horse Creek near Savannah	104	36	03/15/1973	37,000	356
131	3594040	Turkey Creek near Savannah	53.7	20	01/07/1946	10,500	196
132	3594058	White Oak Creek near Milledgeville	46.1	19	04/04/1957	11,900	258
133	3594120	Middleton Creek near Milledgeville	45.5	20	04/04/1957	7,490	165
134	3594160	Indian Creek near Cerro Gordo	201	20	02/13/1948	30,000	149
135	3594200	Eagle Creek near Clifton Junction	19.0	25	03/12/1975	5,600	295
136	3594400	Cypress Creek at Pope	16.8	17	04/04/1957	4,580	273
137	3594480	Turkey Creek near Decaturville	8.40	10	04/04/1957	1,760	210
138	3602500	Piney River at Vernon	193	61	05/27/1991	49,400	256
139	3604000	Buffalo River near Flat Woods	447	66	02/13/1948	90,000	201
140	3604070	Coon Creek tributary near Hohenwald	0.51	19	05/08/1984	301	590
141	3604080	Hugh Hollow Branch near Hohenwald	1.52	18	05/08/1984	1,400	921
142	3604090	Coon Creek above Chop Hollow near Hohenwald.	6.02	20	12/09/1972	3,150	523
143	3604500	Buffalo River near Lobelville	707	59	02/14/1948	100,000	141
144	3604800	Birdsong Creek near Holladay	44.9	28	05/13/1967	10,200	227
145	3605555	Trace Creek above Denver	31.9	23	05/06/1984	11,700	367

Table 5. Maximum known discharges at gaging stations in Tennessee--Continued

[ft^3/s, cubic feet per second; $ft^3/s/(mi^2)$, cubic feet per second per square mile; mi^2, square miles; --, no data]

Map no.	Station no.	Station name	Contributing drainage area (mi^2)	Years of record	Maximum known discharge		
					Date	Peak discharge (ft^3/s)	Unit discharge [$ft^3/s/(mi^2)$]
		Hydrologic area 3					
146	3425500	Spring Creek near Lebanon	35.3	32	09/13/1979	13,500	382
147	3425700	Spencer Creek near Lebanon	3.32	32	09/04/1986	2,880	867
148	3425800	Cedar Creek tributary at Green Hill	0.86	28	12/08/1978	529	615
149	3426000	Drakes Creek above Hendersonville	19.2	29	03/29/1975	6,500	339
150	3426800	East Fork Stones River at Woodbury	39.1	24	03/15/1973	13,200	338
151	3427000	Bradley Creek at Lascassas	37.0	20	05/27/1965	14,700	397
152	3427500	East Fork Stones River near Lascassas.	262	31	03/13/1975	41,200	157
153	3428000	West Fork Stones River near Murfreesboro.	122	36	03/--/1902	50,000	410
154	3429000	Stones River near Smyrna	571	42	03/--/1902	60,000	105
155	3429500	Stewart Creek near Smyrna	62.1	28	03/21/1955	8,700	140
156	3430100	Stones River below Percy Priest Dam.	892	29	03/--/1902	73,000	81.8
157	3430400	Mill Creek at Nolensville	12.0	22	05/04/1979	11,400	950
158	3430600	Mill Creek at Hobson Pike near Antioch.	43.0	11	06/21/1970	8,400	195
159	3431000	Mill Creek near Antioch	64.0	33	05/04/1979	30,100	470
160	3431080	Sims Branch at Elm Hill Pike near Donelson.	3.92	10	07/01/1973	2,060	526
161	3431120	West Fork Browns Creek at General Bates Drive at Nashville.	3.30	22	03/29/1975	2,110	639
162	3431240	East Fork Browns Creek at Baird-Ward Printing Company at Nashville.	1.58	22	06/13/1973	610	386
163	3431340	Browns Creek at Factory Street at Nashville.	13.2	20	09/13/1979	7,800	591

Table 5. Maximum known discharges at gaging stations in Tennessee--Continued

[ft^3/s, cubic feet per second; $ft^3/s/(mi^2)$, cubic feet per second per square mile; mi^2, square miles; --, no data]

Map no.	Station no.	Station name	Contributing drainage area (mi^2)	Years of record	Maximum known discharge: Date	Peak discharge (ft^3/s)	Unit discharge [$ft^3/s/(mi^2)$]
		Hydrologic area 3--Continued					
164	3431520	Claylick Creek at Lickton	4.13	21	05/22/1974	2,700	654
165	3431550	Earthman Fork at Whites Creek	6.29	22	09/15/1981	2,450	390
166	3431580	Ewing Creek at Knight Road near Bordeaux.	13.3	18	02/23/1975	7,220	543
167	3431600	Whites Creek at Tucker Road near Bordeaux.	51.6	11	02/23/1975	12,200	236
168	3431650	Vaughns Gap Branch at Percy Warner Boulevard at Belle Meade.	2.66	11	03/29/1975	1,280	481
169	3431670	Richland Creek at Fransworth Drive at Belle Meade.	12.4	11	03/29/1975	3,400	274
170	3431700	Richland Creek at Charlotte Avenue at Nashville.	24.3	22	09/13/1979	9,470	390
171	3432500	West Harpeth River near Leipers Fork	66.9	24	06/17/1960	25,000	374
172	3433500	Harpeth River at Bellevue	393	64	02/13/1948	40,000	102
173	3581500	West Fork Mulberry Creek at Mulberry	41.2	32	05/12/1967	14,200	345
174	3582200	Norris Creek tributary near Belleville.	0.03	22	05/13/1967	--	--
175	3582300	Norris Creek near Fayetteville	42.6	28	03/16/1973	16,000	376
176	3583000	Bradshaw Creek at Frankewing	36.5	14	03/21/1955	12,600	345
177	3583200	Chicken Creek at McBurg	7.66	32	05/28/1986	5,050	659
178	3583300	Richland Creek near Cornersville	47.5	24	07/11/1989	11,400	240
179	3583500	Weakley Creek near Bodenham	24.4	12	03/08/1961	3,760	154
180	3584000	Richland Creek near Pulaski	366	41	03/29/1902	100,000	273
181	3597000	Garrison Fork at Fairfield	66.3	31	03/21/1955	25,300	382

Table 5. Maximum known discharges at gaging stations in Tennessee--Continued

[ft³/s, cubic feet per second; ft³/s/(mi²), cubic feet per second per square mile; mi², square miles; --, no data]

Map no.	Station no.	Station name	Contributing drainage area (mi²)	Years of record	Maximum known discharge: Date	Peak discharge (ft³/s)	Unit discharge [ft³/s/(mi²)]
			Hydrologic area 3--Continued				
182	3597300	Wartrace Creek above Bell Buckle	4.99	21	03/15/1973	3,220	645
183	3597450	Kelly Creek tributary near Bell Buckle.	0.73	10	01/03/1982	667	914
184	3597500	Wartrace Creek at Bell Buckle	16.3	29	03/21/1955	8,240	506
185	3598200	Weakly Creek near Rover	9.46	29	03/15/1973	5,380	569
186	3599000	Big Rock Creek at Lewisburg	24.9	15	03/21/1955	16,700	671
187	3599200	East Rock Creek at Farmington	43.1	33	12/09/1966	13,700	318
188	3599400	Little Flat Creek tributary near Rally Hill.	0.63	21	04/03/1974	530	841
189	3600000	Rutherford Creek near Carters Creek	68.8	15	03/22/1955	11,800	172
190	3600500	Big Bigby Creek at Sandy Hook	17.5	32	03/15/1973	7,700	440
			Hydrologic Area 4				
191	3594415	Beech River near Lexington	15.9	11	01/29/1956	1,700	107
192	3594430	Harmon Creek near Lexington	6.87	18	04/01/1970	1,000	146
193	3594435	Piney Creek at Highway 104 near Lexington.	19.2	17	02/14/1959	2,440	127
194	3606500	Big Sandy River at Bruceton	205	57	03/--/1897	25,000	122
195	7024300	Beaver Creek at Huntingdon	55.5	32	09/09/1970	8,350	150
196	7024500	South Fork Obion River near Greenfield.	383	57	01/22/1937	25,600	66.8
197	7025000	Rutherford Fork Obion River near Bradford.	201	28	01/22/1937	9,730	48.4

Table 5. Maximum known discharges at gaging stations in Tennessee--Continued

[ft^3/s, cubic feet per second; $ft^3/s/(mi^2)$, cubic feet per second per square mile; mi^2, square miles; --, no data]

Map no.	Station no.	Station name	Contributing drainage area (mi^2)	Years of record	Maximum known discharge		
					Date	Peak discharge (ft^3/s)	Unit discharge [$ft^3/s/(mi^2)$]
			Hydrologic area 4--Continued				
198	7025500	North Fork Obion River near Union City.	480	41	01/22/1937	49,200	103
199	7026000	Obion River at Obion	1,852	49	01/24/1937	99,500	53.7
200	7026500	Reelfoot Creek near Samburg	110	22	06/13/1970	16,600	151
201	7027500	South Fork Forked Deer River at Jackson.	495	44	01/21/1935	43,600	88.1
202	7027800	South Fork Forked Deer River near Gates.	932	24	03/16/1975	35,300	37.9
203	7028000	South Fork Forked Deer River at Chestnut Bluff.	1,003	28	01/22/1935	45,000	44.9
204	7028500	North Fork Forked Deer River at Trenton.	73.5	21	09/13/1982	--	--
205	7028600	Cain Creek tributary near Trenton	0.95	30	09/13/1982	1,330	1,400
206	7028700	Cain Creek near Trenton	14.4	32	09/13/1982	15,600	1,083
207	7028900	Middle Fork Forked Deer River near Spring Creek.	88.2	24	01/21/1973	16,200	184
208	7028940	Turkey Creek near Medina	7.87	15	09/13/1982	--	--
209	7029000	Middle Fork Forked Deer River near Alamo.	369	44	01/30/1956	34,300	93.0
210	7029050	Nash Creek near Tigrett	7.23	24	09/05/1970	2,030	281
211	7029090	Lewis Creek near Dyersburg	25.5	30	03/09/1964	5,450	214
212	7029100	North Fork Forked Deer River at Dyersburg.	939	34	11/20/1957	22,400	23.8
213	7029275	Hatchie River near Pocahontas	310	12	02/14/1948	21,900	70.6
214	7029370	Cypress Creek at Selmer	44.1	21	03/12/1975	6,550	149
215	7029400	Hatchie River at Pocahontas	837	35	02/14/1948	47,600	56.9

Table 5. Maximum known discharges at gaging stations in Tennessee--Continued

[ft^3/s, cubic feet per second; $ft^3/s/(mi^2)$, cubic feet per second per square mile; mi^2, square miles; --, no data]

Map no.	Station no.	Station name	Contributing drainage area (mi^2)	Years of record	Maximum known discharge		
					Date	Peak discharge (ft^3/s)	Unit discharge [$ft^3/s/(mi^2)$]
		Hydrologic area 4--Continued					
216	7029500	Hatchie River at Bolivar	1,480	56	03/18/1973	61,600	41.6
217	7030000	Hatchie River near Stanton	1,975	29	01/22/1935	59,000	29.9
218	7030050	Hatchie River at Rialto	2,308	38	01/13/1946	55,700	24.1
219	7030100	Cane Creek at Ripley	33.9	14	07/01/1989	6,360	188
220	7030270	Clear Creek near Arlington	60.5	29	03/13/1975	5,070	83.8
221	7030280	Loosahatchie River at Brunswick	505	37	01/09/1946	39,700	78.6
222	7030500	Wolf River at Rossville	503	42	01/20/1935	40,000	79.5
223	7031700	Wolf River at Raleigh	771	37	01/09/1946	41,400	53.7

Table 6. Peak discharge at miscellaneous sites in Tennessee since 1972

[mi², square miles; ft³/s, cubic feet per second]

Stream and place of determination	Drainage area (mi²)	Date	Peak discharge (ft³/s)
Hydrologic area 1			
Emory River above Wartburg	49.2	May 28, 1973	15,500
Gallagher Creek at Friendsville	10.6	May 30, 1974	4,040
Soddy Creek at Soddy	49.0	Aug. 17, 1982	16,000
North Chickamauga Creek at Mile Straight.	74.0	Aug. 17, 1982	26,800
Suck Creek at Chattanooga	22.6	Aug. 17, 1982	43,600
Running Water Creek at Whiteside	4.77	Aug. 17, 1982	8,790
Hydrologic area 2			
Brimstone Creek near Robbins	48.7	May 27, 1973	6,540
Moss Spring Hollow at Centerville	3.68	May 4, 1979	1,930
Beaverdam Creek at Coble	74.0	May 4, 1979	14,700
Cow Hollow Creek above Coble	1.36	May 4, 1979	1,140
Lower Sinking Creek near Coble	2.45	May 4, 1979	1,300
Wells Creek above Erin	19.1	June 6, 1981	11,200
Erin Branch at Erin	7.42	June 6, 1981	5,620
Wells Creek below Erin	32.0	June 6, 1981	14,300
Red River near Portland	15.1	June 10, 1981	10,400
Hydrologic area 3			
Smith Fork near Auburntown	31.1	April 3, 1974	22,100
Mill Creek at Nolensville	12.0	May 4, 1979	11,400
Mill Creek near Antioch	64.0	May 4, 1979	30,100
Mill Creek at I-40, at Nashville	99.6	May 4, 1979	28,800
Little Harpeth River at Granny White Pike at Brentwood.	22.0	May 4, 1979	9,260
McCrory Creek at Ironwood Drive at Donelson.	7.31	Sept. 13, 1979	2,760
Hickman Creek at Hickman	33.3	Aug. 16, 1982	17,400
Mulherrin Creek near Gordonsville	26.9	Aug. 16, 1982	24,000
Peyton Creek below Pleasant Shade	27.4	Aug. 16, 1982	21,600
Peyton Creek at Riddleton	49.8	Aug. 16, 1982	31,500
Bradley Creek at Loftin	30.1	Sept. 4, 1986	20,500
Bushman Creek near Murfreesboro	10.5	Sept. 4, 1986	4,610
Bear Branch near Compton	2.26	Sept. 4, 1986	3,270
Hydrologic area 4			
Turkey Creek at Fairview	13.3	Sept. 13, 1982	14,600

SUMMARY

This report provides peak discharges for selected recurrence intervals ranging from 2 to 500 years for 223 gaging stations in Tennessee. The report also provides predictive equations for use in estimating peak discharges for these selected recurrence intervals for ungaged, unregulated, rural streams in Tennessee. The predictive equations are based on data from 304 gaging stations, 81 of which are located near the Tennessee boundary in adjoining States. Streamflow records from these gages are not significantly affected by manmade changes to the natural character of the streams.

Regression analyses were used to define hydrologic areas having similar flood characteristics and to develop predictive equations that relate peak discharge to one or more drainage basin characteristics. Ordinary least-squares regression was used to divide the State into four hydrologic areas that exhibited within-area flood-characteristic homogeneity. These hydrologic areas generally follow physiographic province boundaries. Ordinary least-squares regression also was used to determine the significance of each drainage basin characteristic in predicting peak discharge. Drainage basin size was determined to be the only significant basin characteristic for use in predicting peak discharge for each hydrologic area. Generalized least-squares regression was used to define the final values of the regression coefficients used in the predictive equations, the model error, and the prediction error, after the hydrologic areas and the significant drainage basin characteristics had been determined. The predictive equations defined by the generalized least-squares analysis are recommended for use in estimating peak discharge at ungaged sites.

Methods are presented for determining peak discharges at sites near gaging stations where a combination of gaging station data and predictive equation results might be warranted. A hierarchal table depicting estimating techniques dependent on proximity of the site to a gaging station assists the reader in selecting the most appropriate estimating technique. Computation examples demonstrating these techniques are provided. A table showing peak discharges at miscellaneous sites since 1972 (date of last flood-frequency report) also is presented.

REFERENCES CITED

Dalrymple, Tate, 1960, Flood frequency analysis: U.S. Geological Survey Water-Supply Paper 1543-A, 80 p.

Fenneman, N.M., 1946, Physical divisions of the United States: U.S. Geological Survey special map, scale 1:7,000,000.

Hardison, C.H., 1971, Prediction error of regression estimates of streamflow characteristics at ungaged sites, *in* Geological Survey Research 1971: U.S. Geological Survey Professional Paper 750-C, p. C228-C235.

Interagency Advisory Committee on Water Data, 1982, Guidelines for determining floodflow frequency: U.S. Geological Survey, Office of Water Data Coordination Bulletin 17B, 28 p.

Jenkins, C.T., 1960, Floods in Tennessee, magnitude and frequency: Tennessee Department of Highways, 68 p.

Miller, R.A., 1974, The geologic history of Tennessee: Tennessee Division of Geology Bulletin 74, 63 p.

Patterson, J.L., 1964, Magnitude and frequency of floods in the United States, Part 7, Lower Mississippi River basin: U.S. Geological Survey Water-Supply Paper 1961, 636 p.

Raisz, Erwin, 1954, Physiographic diagram, *in* U.S. Geological Survey, 1970, National atlas of the United States: Washington, D.C., U.S. Geological Survey, 417 p.

Randolph, W.J., and Gamble, C.R., 1976, Technique for estimating magnitude and frequency of floods in Tennessee: Tennessee Department of Transportation, 52 p.

Speer, P.R., and Gamble, C.R., 1964, Magnitude and frequency of floods in the United States, Part 3B, Cumberland and Tennessee River basins: U.S. Geological Survey Water-Supply Paper 1676, 340 p.

Stedinger, J.R., and Tasker, G.D., 1985, Regional hydrologic regression, 1. Ordinary, weighted and generalized least squares compared: Water Resources Research, v. 21, no. 9, p. 1421-32.

___1986, Correlation to regional hydrologic analysis, 1. Ordinary, weighted and generalized least squares compared: Water Resources Research, v. 22, no. 5, 844 p.

Tasker, G.D., 1982, Simplified testing of hydrologic regression regions: Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, v. 108, no. HY10, p. 1218-1222.

Tasker, G.D., and Stedinger, J.R., 1989, An operational GLS model for hydrologic regression: Journal of Hydrology, v. 111, p. 361-375.

Tennessee Department of Conservation and Commerce, 1961, Tennessee's water resources: Division of Water Resources, 128 p.

U.S. Department of Commerce, 1961, Rainfall frequency atlas of the United States for durations from 30 minutes to 24 hours and return periods from 1 to 100 years: U.S. Weather Bureau Technical Paper no. 40, 115 p.

U.S. Geological Survey, 1986, National water summary 1985—Hydrologic events and surface-water resources: U.S. Geological Survey Water-Supply Paper 2300, 506 p.

U.S. Water Resources Council, 1976, Guidelines for determining flood flow frequency: U.S. Water Resources Council Bulletin 17, 26 p.

*USGPO: 1993-750-232/80009