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Estimating the Magnitude of Annual Peak Discharges with Recurrence Intervals between 1.1 and 3.0 Years for Rural, Unregulated Streams in West Virginia

By JEFFREY B. WILEY, JOHN T. ATKINS, JR., and DAWN A. NEWELL

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CONTENTS

PLATE
(Plate is in pocket)

FIGURES

TABLE

CONVERSION FACTORS AND VERTICAL DATUM

CONVERSION FACTORS

Multiply	By	To Obtain
acre-foot (acre-ft)	1,233	cubic meters (m^3)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
cubic foot per second per square mile [(ft^3/s)/mi^2]	0.01093	cubic meter per second per square kilometer [(m^3/s)/km^2]
foot (ft)	0.3048	meter (m)
inch (in.)	25.4	millimeter (mm)
mile (mi)	1.609	kilometer (km)
square mile (mi^2)	2.590	square kilometer (km^2)

Temperature in degrees Fahrenheit (°F) can be converted to degrees Celsius (°C) as follows:

$$°C = (°F - 32) / 1.8$$

VERTICAL DATUM

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

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Abstract

Multiple and simple least-squares regression models for the $\log_{10}$-transformed 1.5- and 2-year recurrence intervals of peak discharges with independent variables describing the basin characteristics ($\log_{10}$-transformed and untransformed) for 236 streamflow-gaging stations were evaluated, and the regression residuals were plotted as areal distributions that defined three regions in West Virginia designated as East, North, and South. Regional equations for the 1.1-, 1.2-, 1.3-, 1.4-, 1.5-, 1.6-, 1.7-, 1.8-, 1.9-, 2.0-, 2.5-, and 3-year recurrence intervals of peak discharges were determined by generalized least-squares regression. Log_{10}-transformed drainage area was the most significant independent variable for all regions.

Equations developed in this study are applicable only to rural, unregulated streams within the boundaries of West Virginia. The accuracies of estimating equations are quantified by measuring the average prediction error (from 27.4 to 52.4 percent) and equivalent years of record (from 1.1 to 3.4 years).

INTRODUCTION

Engineers commonly use low-recurrence-interval (between 1.1 and 3.0 years) peak discharges as design components for developing stream-restoration plans. Stream restoration is the moving or stabilizing of the stream channel as a result of pre-existing or anticipated disturbance. Streams may be restored at locations where the stream is not in equilibrium because of natural processes, such as catastrophic flooding and landslides, that affect stream-channel stability. Determining discharge frequencies at locations where streamflow-gaging stations have been present for more than 10 years can be accomplished by analyzing the streamflow record. Determining discharge frequencies at stream locations where gaging stations are not present can be more difficult. Generally, discharge frequencies at an ungaged location are estimated from the streamflow records at nearby gaging stations. This estimating procedure can become time-consuming and expensive. A less expensive method for determining the discharge frequencies at ungaged locations is using regionalized equations. If desirable accuracies are not achievable from regionalized equations, at least cursory estimates are possible.

The U.S. Geological Survey (USGS), in cooperation with the West Virginia Department of Transportation, Division of Highways, the West Virginia Soil Conservation Agency, and the West Virginia Geological and Economic Survey, developed equations for estimating low-recurrence-interval peak discharges for rural, unregulated streams in West Virginia. This report presents peak discharges at gaging stations and equations for estimating the peak discharges at ungaged locations for the 1.1-, 1.2-, 1.3-, 1.4-, 1.5-, 1.6-, 1.7-, 1.8-, 1.9-, 2-, 2.5-, and 3-year recurrence intervals. The statistical methods used in the analyses and the resulting uncertainties in peak discharges are described to support the reliability of the application of the resulting equations to West Virginia streams. This report uses the same data as Wiley and others (2000), where equations were determined for estimating the 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year peak discharges.

The equations should not be applied to urban areas with paved surfaces, concrete channels, or culverts. The equations should not be applied to streams regulated by dams, or large lakes and ponds. Equations are not applicable to heavily mined areas if excessive runoff is diverted into or outside the basin, retained along strip benches, or retained underground. Equations are not applicable to karst areas if excessive runoff is diverted into, outside, or within the basin through solution channels or other cavities in carbonate (limestone and dolomite) rocks.

Description of Study Area

West Virginia is in the mid-Atlantic region of the eastern United States (fig. 1), and can be differentiated by three physiographic provinces and two climatic regions. The three physiographic provinces are the Appalachian Plateaus, Valley and Ridge, and Blue Ridge. Air masses move across the State such that a line defined in this report as the Climatic Divide can identify two climatic regions.

Physiographic Provinces

Generally, the part of the State west of the Climatic Divide is in the Appalachian Plateaus Province, where elevations decrease northwestward from about 3,000–4,860 ft (Spruce Knob) along the Climatic Divide to about 500–700 ft along the Ohio River. The part of West Virginia east of the Climatic Divide is in the Valley and Ridge Province, except for the extreme eastern tip of the State, which is in the Blue Ridge Province. Elevations decrease from the Climatic Divide to about 250 ft (at Harpers Ferry) in the eastern panhandle (U.S. Geological Survey, 1990).

The Appalachian Plateaus Province consists of consolidated, mostly noncarbonate sedimentary rocks that have a gentle slope from southeast to northwest near the Climatic Divide and are nearly flat-lying along the Ohio River. The one exception to this rock type is the northeastern area of the Province (west of the Climatic Divide), where the rocks are gently folded and some carbonate rock crops out (Fenneman, 1938). The rocks in the Appalachian Plateaus Province have been eroded by streams to form steep hills and deeply incised valleys in dendritic patterns.

The Valley and Ridge Province in West Virginia consists of consolidated carbonate and noncarbonate sedimentary rocks that are folded sharply and extensively faulted (Fenneman, 1938). Northeast-trending valleys and ridges parallel the Climatic Divide in a trellis pattern.

The Blue Ridge Province consists of metamorphic rocks. The Province has high relief between mountains and wide valleys that parallel the Climatic Divide. The rocks are predominantly metamorphosed sandstone and shale within West Virginia (Fenneman, 1938).

Climate

The climate of West Virginia is primarily continental, with mild summers and cold winters. Major weather systems generally approach from the west and southwest, although polar continental air masses of cold, dry air that approach from the north and northwest are not unusual throughout the State. Air masses from the Atlantic Ocean sometimes affect the area east of the Climatic Divide. Generally, tropical continental masses of hot, dry air from the southwest affect the climate west of the Climatic Divide. Tropical maritime masses of warm, moist air from the Gulf of Mexico affect the climate east of the Climatic Divide. Land-recycled moisture through evaporation from local and-upwind land surfaces, lakes, and reservoirs also affects the climate of the State (U.S. Geological Survey, 1991).

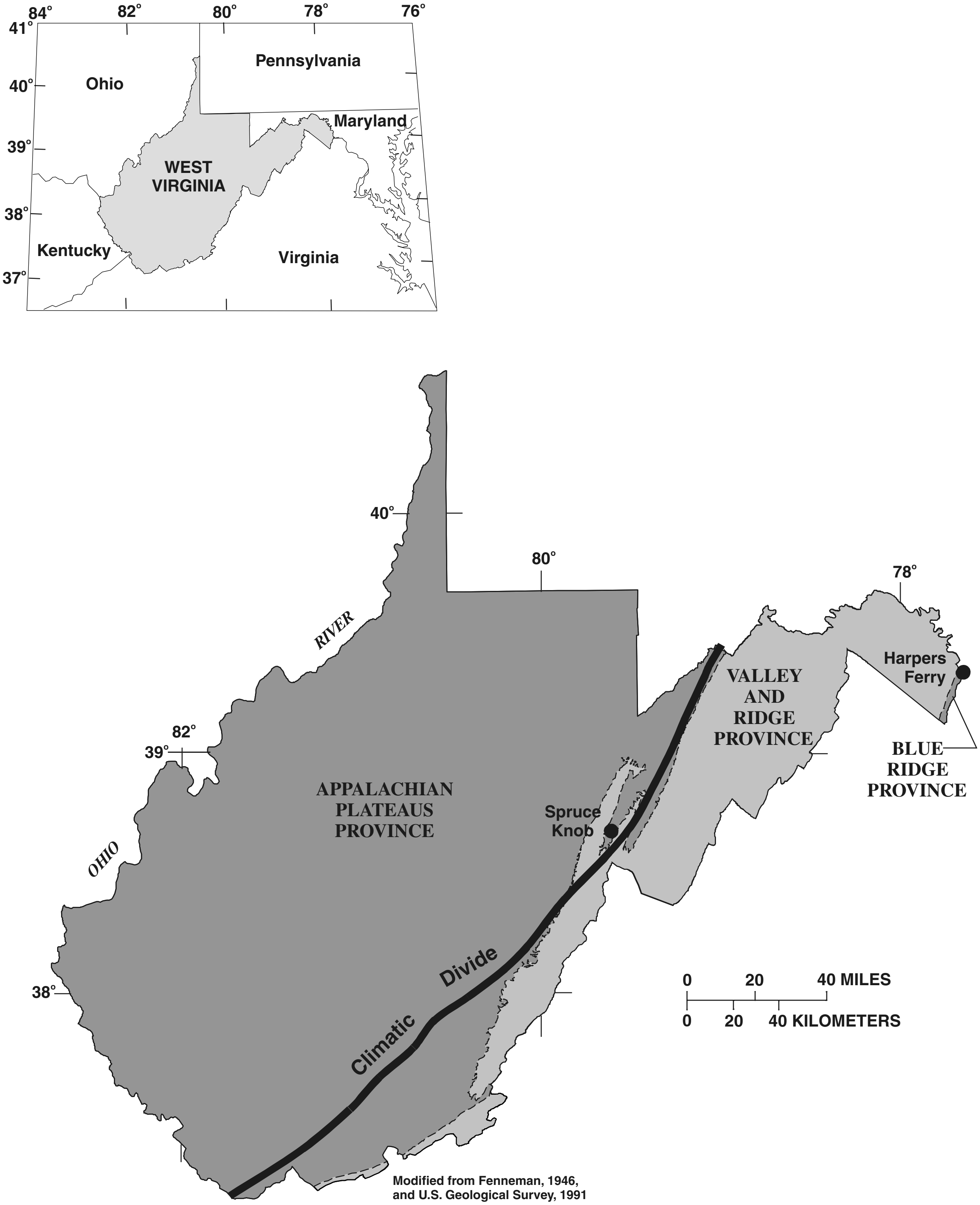

Figure 1. Physiographic provinces and Climatic Divide in West Virginia.

Precipitation: Annual precipitation averages 42 in. statewide with about 60 percent received from March through August. July is the wettest month, and the months from September through November are the driest. Annual precipitation in the State generally decreases northwestward from about 50–60 in. along the Climatic Divide to about 40 in. along the Ohio River, and is about 40 in. east of the Climatic Divide. Greater precipitation along and immediately west of the Climatic Divide is a consequence of the higher elevations along the Divide and the general movement of weather systems approaching from the west and southwest. Annual snowfall follows the general pattern of annual precipitation, decreasing northwestward from about 36–100 in. along the Climatic Divide to about 20–30 in. along the Ohio River. Annual snowfall is about 24–36 in. east of the Climatic Divide (U.S. Geological Survey, 1991; U.S. Department of Commerce, 1960, 1968).

Background

The low-recurrence-interval peak discharges used as design components for making stream-restoration plans can be related to bankfull discharges. There are various definitions of “bankfull” related to both processes and field indicators, and there are many estimates for the recurrence interval for bankfull discharge. Every definition of bankfull can describe a different elevation at each stream cross section (Williams, 1978). Some definitions of bankfull related to processes and field indicators follow.

1. Wolman and Leopold (1957): bankfull is at the elevation of the active floodplain, and is the average elevation of the highest surface of the channel bars;
2. Nixon (1959): bankfull is at the highest elevation of a river that can be contained within the channel without spilling water on the floodplain or washlands;
3. Schumm (1960): bankfull is at the height of the lower limit of perennial vegetation (primarily trees), or is at the height of the low bench;
4. Wolman and Miller (1960): the bankfull discharge represents the upper level of the range of channel-forming flows, which transport the bulk of the available sediment over time;
5. Woodyer (1968): bankfull is at the elevation of the middle bench for rivers with various overflow surfaces;
6. Pickup and Warner (1976): bankfull is at the elevation at which the width/depth ratio becomes a minimum;
7. Dunne and Leopold (1978): bankfull stage corresponds to the discharge at which channel maintenance is the most effective, that is, the discharge at which moving sediment, forming or removing bars, forming or changing bends and meanders, and generally doing the work that results in the average morphological characteristics of channels. Bankfull discharge is associated with a momentary maximum flow, which on the average has a recurrence interval of 1.5 years;
8. Leopold (1994): bankfull discharge is considered to be the channel-forming or effective discharge, with a recurrence interval of about 1.5 years, and occurs on 1 or 2 days each year. Bankfull discharge forms and maintains the channel, and over time, carries the most sediment. Little bedload is moved at discharges less than bankfull. Bankfull stage can be indicated by changes in channel cross-section slopes (particularly at the back of a point bar), by changes in vegetation types, by the highest scour line, or by the top of the bank;
9. Rosgen (1996): bankfull stage originally was used to describe incipient elevation on the bank where flooding begins, and applies primarily to stream types that have an observable floodplain feature. Often, this stage is associated with the flow that just fills the channel to the top of its banks and at a point where water begins to overflow onto a floodplain. Bankfull stage and discharge serve as consistent morphological indices, which can be related to the

formation, maintenance, and dimensions of the channel under the modern climatic regime. Dimension, pattern, and bed features generally are a function of channel width measured at bankfull stage. Bankfull is synonymous with "ordinary high water," a term used by the U.S. Army Corp of Engineers, and is expressed as momentary maximum or instantaneous peak flow rather than a mean daily discharge;

10. The Federal Interagency Stream Restoration Working Group (1998): bankfull discharge is that which fills a stable alluvial channel up to the elevation of the active floodplain. The bankfull discharge is important morphologically because it represents the breakpoint between the processes of channel and floodplain formation. In stable alluvial channels, bankfull discharge corresponds closely with effective discharge and channel-forming discharge. There is no universally accepted definition that can be consistently applied, has general application, and integrates the processes that create the bankfull dimensions of the river, so spell out a clear definition of indicators used to define bankfull for every project;
11. Brunner (1999): bankfull discharge is the fundamental flow in any river that controls the evolution and stability of the dimension, pattern and profile of the stream. This is the discharge that, over time, transports the most sediment throughout a stream, and is sometimes referred to as the effective discharge or dominant discharge. This discharge determines the cross-sectional profile of a stream and could be considered the morphologically forming flow; and,
12. Harman and others (2001): bankfull is at the level corresponding to the top of the channel banks and at the level of the flat, frequently inundated surface adjacent to the channel built under the current hydrologic regime. For example, the most consistent bankfull indicators in North Carolina are the highest scour line and the back of the point bar (it is rarely the top of the bank or the lowest scour or bench).

The recurrence interval of bankfull discharge can have a wide range of values partially because of the different definitions of bankfull related to processes and field indicators. Some of these values are: 1-to-2-year frequency (Wolman and Leopold, 1957); 97 percent of the 1.58-year frequency (Dury, 1973); 1.5-year frequency (Hey, 1975); 4-to-10-year frequency (Pickup and Warner, 1976); 1-year frequency (Richards, 1982); 1.4-to-2.0-year frequency (corresponding to floodplain levels in northern VA streams; Osterkamp and Hupp, 1984); 1.5-to-1.7-year frequency (from 47 rivers in Ontario, Canada; Annable, 1994); 1.0-to-2.5-year frequency, and 1.5-year frequency is a reasonable average (Leopold, 1994; Dunne and Leopold, 1978); 1.01-to-32-year frequency (Williams, 1978); 1.4-to-1.6-year frequency (North American gaging stations with 10 years of record and related to field-determined bankfull; Rosgen, 1996); 1.1-to-4.8-year frequency, and an average of 2.0-year frequency (from 23 headwater gravel-bed streams in snowmelt-dominated parts of central and northern Idaho; Whiting and others, 1999); and, 1.1-to-1.9-year frequency, and a mean of 1.4-year frequency (for rural North Carolina gaging stations; Harman and others, 2001).

Acknowledgments

The USGS; West Virginia Department of Transportation, Division of Highways; West Virginia Soil Conservation Agency; and West Virginia Geological and Economic Survey would like to recognize others that have contributed to the success of this study. The Canaan Valley Institute (CVI) facilitated cooperation for this project through stream-restoration workshops and meetings, and creation of the West Virginia Natural Stream Work Group. The West Virginia Natural Stream Work Group is an association of Federal and State agencies, academic institutions, and others (including private consultants) that share an interest in preserving and restoring stream-channel

stability and stream habitats in West Virginia. Members of the West Virginia Natural Stream Work Group, particularly the CVI; U.S. Department of Agriculture, Natural Resource Conservation Service; and, the West Virginia Department of Natural Resources contributed to the development of the project objectives.

DEVELOPMENT OF LOW-RECURRENCE-INTERVAL PEAK-DISCHARGE ESTIMATING EQUATIONS

Annual peak-discharge data and basin-characteristics data for streamflow-gaging stations in West Virginia were analyzed to determine the magnitude of low-recurrence-interval peak discharges. The equations for the 2-year discharges were regionalized by plotting the areal distribution of residuals from application of multiple and simple least-squares regression models. Independent variables described basin characteristics for each station location. Magnitudes for the 2-year discharges at stations operated by surrounding States (Virginia, Maryland, Pennsylvania, Ohio, and Kentucky) were incorporated into the modeling and regionalization procedure. The low-recurrence-interval peak-discharge estimating equations for all recurrence intervals were computed from a generalized least-squares regression model on the basis of the regions and independent variables determined from the analysis of the multiple and simple least-squares regression models of the 2-year-frequency data.

Peak-Discharge Data

Peak discharges for 160 rural, unregulated West Virginia streamflow-gaging stations with a minimum of 10 years of record through the 1997 water year (the period from October 1 of the previous year through September 30 of the indicated year) were used for this study. The peak data used in this study are identical to those used by Wiley and others (2000), and additional details about the generation and processing of these data, such as quality assurance and peak estimates, can be found in that report.

Annual peak-discharge data are maintained in the USGS's "Peak File" database available on the World Wide Web from the USGS NWIS-WEB Data Retrieval at http://waterdata.usgs.gov/. Multiple years of peak data were published in USGS Water-Supply Papers through the 1960 water year. Peak data have been published annually in the "U.S. Geological Survey Water Resources Data - West Virginia" series of reports since the 1961 water year (series title has changed several times since 1961).

Basin-Characteristics Data

Eleven basin characteristics for 160 rural, unregulated West Virginia streamflow-gaging stations with a minimum of 10 years of record through the 1997 water year were used for this study (plate 1). Information for stations operated by surrounding States was acquired to augment West Virginia data. The basin-characteristics data used in this study are identical to those used by Wiley and others (2000), and additional details about the generation and processing of these data, such as quality assurance, can be found in that report.

The U.S. Geological Survey "Streamflow/Basin Characteristics" database generally contains variables that (1) quantify statistical summaries of daily-mean discharges and peak discharges, and (2) describe the basin at and upstream from a gaging station by quantifying topographic map features and interpreting climatological maps. These are variables that intuitively can be assumed to affect streamflow (Thomas and Benson, 1969). This database is not maintained on an annual basis and is not available on the World Wide Web. Contents from this database for 160 gaging stations in West Virginia and 113 gaging stations from surrounding States are presented in tables 2, 3, and 4 located at the end of this report.

Eleven basin characteristics were used to describe the basins at and upstream from West Virginia gaging stations. The following 11 basin characteristics are listed in table 2 and were considered for the correlation and regression analyses:

1. **Drainage area**, in square miles (mi^2), determined by tracing basin boundaries on a U.S. Geological Survey 1:24,000-scale topographic map and measuring the enclosed area, or by reading from a report of tabulated drainage areas (Mathes, 1977; Wilson, 1979; Mathes and others, 1982; Preston and Mathes, 1984; Stewart and Mathes, 1995; Wiley and Hunt, 1995; Wiley, 1997);
2. **Main-channel slope**, in feet per mile (ft/mi), determined from a U.S. Geological Survey 1:24,000- or 1:62,500-scale topographic map as the slope between the points along the main stream channel at 10 and 85 percent of the distance from the gaging station to the basin divide;
3. **Stream length**, in miles (mi), determined from a U.S. Geological Survey 1:24,000- or 1:62,500-scale topographic map as the length of the main stream channel from the gaging station to the basin divide;
4. **Mean basin elevation**, in feet above sea level, determined by averaging elevations read from a U.S. Geological Survey 1:24,000- or 1:62,500-scale topographic map at 20 to 80 grid crossings selected from the placement of a square grid superimposed on a delineated basin;
5. **Forested area**, in percent, determined by dividing the number of grid crossings at forests (area shaded with green) shown on a U.S. Geological Survey 1:24,000- or 1:62,500-scale topographic map by the total number of grid crossings (20 to 80) selected from a square grid superimposed on a delineated basin, then multiplying by 100;
6. **Mean annual precipitation**, in inches, determined by visual integration of an isohyetal map published by the U.S. Department of Commerce (1960) over the area of a delineated basin (this map was reproduced by Wiley and others, 2000, fig. 3, page 8);
7. **Precipitation intensity**, in inches per 24 hours occurring on an average of once every 2 years, determined by visual integration of an isohyetal map modified from that published by the U.S. Department of Commerce (1961) over the area of a delineated basin. (This isohyetal map was modified by interpolating isohyets for 2.6, 2.7, 2.8, and 2.9 in., and the modified map was published by Wiley and others, 2000, fig. 4, page 9.);
8. **Mean annual snowfall**, in inches, determined by visually integrating an isohyetal map published by the U.S. Department of Commerce (1968) over the area of a delineated basin (this map was reproduced by Wiley and others, 2000, fig. 5, page 10);
9. **Mean minimum January temperature**, in degrees Fahrenheit (°F), determined by visually integrating an isothermal map published by the U.S. Department of Commerce (1960) over the area of a delineated basin (this map was reproduced by Wiley and others, 2000, fig. 6, page 11);
10. **Local station slope**, in feet per mile (ft/mi), determined by measuring the distance between topographic contour-line crossings along the main channel upstream and downstream from a gaging station located on a U.S. Geological Survey 1:24,000-scale topographic map, and dividing the difference in elevations between the contour lines by that distance; and,
11. **Streamflow variability index**, determined either (1) as the standard deviation of the $\log_{10}$ transformations of the 5-, 15-, 25-, 35-, 45-, 55-, 65-, 75-, 85-, and 95-percent flow durations for gaging stations where daily mean discharges already were computed, or (2) by visual integration of a variability-index boundary map published by Friel and others (1989) over the area of a delineated basin for gaging stations with unknown daily mean discharges.

Basin-characteristics data for stations operated by surrounding States (table 2) were obtained from the most recent U.S. Geological Survey flood-frequency studies in these States (Bisese, 1995; Choquette, 1988; Dillow, 1996; Flippo, 1982; and Koltun and Roberts, 1990), from the USGS "Streamflow/Basin Characteristics" database, and other sources (K.J. Ruhl, U.S. Geological Survey, Louisville, Kentucky, written commun., 1997; J.A. Dillow, U.S. Geological Survey, Baltimore, Maryland, written commun., 1997). Not all selected basin-characteristics data were readily available for stations operated by surrounding States, and these data were not determined for the correlation and regression analyses.

Magnitude and Frequency Analysis

The magnitudes and frequencies of peak discharges at 160 streamflow-gaging stations on rural, unregulated streams in West Virginia, for which a minimum of 10 years of record through 1997 was available (pl. 1 in pocket), were determined in accordance with the guidelines (Bulletin 17B) established by the Interagency Advisory Committee on Water Data, Water Resources Council (1982). Discharges at stations operated by surrounding States (85 out of an original 113 stations) were determined as representative of discharges expected in West Virginia by Wiley and others (2000), and were used to augment the West Virginia data in this study. Additional details about the generating and processing of the data from West Virginia and surrounding States, including discussion of stations omitted from consideration here, can be found in Wiley and others (2000).

Recurrence intervals of peak discharges were determined by fitting the Pearson Type III probability curve to the $\log_{10}$ transformed systematic annual-peak series for a given gaging station. General skew for the region was obtained from the national skew map provided in Bulletin 17B. General skew for the region was weighted with station skew to adjust the probability curve. Additionally, high-outlier, low-outlier, and historical peak assessments were made to adjust the annual-peak series. Mixed populations of annual peaks, such as peaks from floods caused by snowmelt and peaks caused by tropical storms or hurricanes, were not analyzed separately.

The PEAKFQ computer program (Thomas, W.O., Jr., Lumb, A.M., Flynn, K.M., and Kirby, W.H., 1998, User's manual for program PEAKFQ, annual flood-frequency analysis using Bulletin 17B guidelines, written commun., 89 p.) used by Wiley and others (2000), does not output peak discharges for all the recurrence intervals needed for this study. Subroutines within PEAKFQ (the HARTIV subroutine with related subroutines and functions, originally developed by Kirby, 1980), however, are used to calculate all the peak discharges for the recurrence intervals needed for this study. The identified subroutines within PEAKFQ do not calculate discharge directly, but determine a frequency factor (K-value) that is used to calculate the discharge. A short Fortran computer program (listed in appendix 1) was used to calculate all the frequency factors (the Bulletin-17B weighted skew was input into the program for all stations used in this study). The short computer program uses the current versions of computer subroutines contained in a library of USGS water-resources application programs (U.S. Geological Survey, 2001), and the subroutines are identical to those used in PEAKFQ (version 4.0, revised December 1, 2000). The frequency factors are used to determine discharge by computing the antilog of discharge from the following equation (Interagency Advisory Committee on Water Data, 1976, equation 1, p. 9–10) given as

$$\text{Log}_{10}\, Q = X_{mean} + KS,$$

where

X_{mean} is the mean of the $\log_{10}$ of annual peak flows (Bulletin-17B adjusted), in cubic feet per second = $\sum X/N$,
where X is the $\log_{10}$ of the annual peak flow, in cubic feet per second; and
N is the number of items in the data set;

K is the frequency factor; and

S is the standard deviation of the $\log_{10}$ of annual peak flows (Bulletin-17B adjusted), in cubic feet per second = $[\sum(X-X_{mean})^2 / (N-1)]^{0.5}$.

The 2-year peak discharges calculated using PEAKFQ for this study at stations 01596000, 01600000, 01632000, 01632900, 01634000, 02014000, 03072000, and 03176500 operated by surrounding States were not equal to the published 2-year discharges (Bisese, 1995; Dillow, 1996; Flippo, 1982) or revised 2-year discharges for stations 01596000 and 01600000 (J.A. Dillow, U.S. Geological Survey, written commun., 1997). The inequality of the 2-year discharges for these stations operated by surrounding States is because insufficient information about the station frequency computations was available from the particular State report or basin-characteristics file to exactly reproduce the 2-year discharge. The published and revised 2-year discharges for these stations operated by surrounding States were accepted because the discharges were less than 6 percent different than the values calculated using PEAKFQ for this study. The accepted 2-year discharges for these stations are identical to those published by Wiley and others (2000).

The 2-year discharge, 3,550 ft^3/s, calculated using PEAKFQ for this study at the station South Fork South Branch Potomac River near Brandywine (01607500) was not equal to the 2-year discharge published by Wiley and others (2000), 5,550 ft^3/s, because of a typographical error in Wiley and others (2000).

Selected statistics from the magnitude and frequency analyses for the 160 gaging stations in West Virginia and 82 of the 113 gaging stations operated by surrounding States are listed in table 3 (at the end of this report). The 1.1-, 1.2-, 1.3-, 1.4-, 1.5-, 1.6-, 1.7-, 1.8-, 1.9-, 2-, 2.5-, and 3-year peak discharges for the 160 gaging stations in West Virginia are listed in table 4 (also at the end of this report). Only the 2-year peak discharges for 82 of the 113 gaging stations operated by surrounding States are presented so as not to establish or supersede other values for discharges that may be determined for those locations (all discharges for the 82 stations were used to develop equations applicable to West Virginia).

The randomness of the systematic annual-peak series (excluding historical peaks) was tested statistically to detect a trend by means of Kendall's test for correlation (Kendall, 1975; Hirsch and others, 1982). The computer program SWSTAT (Surface Water STATistics), version 3.2, dated April 3, 1998 (Lumb and others, 1990; A.M. Lumb, W.O. Thomas, Jr., and K.M. Flynn, "Users manual for SWSTAT, a computer program for interactive computation of surface-water statistics," written commun., 1995) was used to calculate Kendall's tau and the level of significance (the probability or "p-value"). The hypothesis is that there is no trend for the Kendall's test for correlation. The hypothesis of no trend is rejected if the hypothesis fails to attain a particular level of significance. The particular level of significance was selected as 0.05 for this study, so a trend is determined for an annual-peak series if the level of significance is less than 0.05. Kendall's tau and the level of significance were determined for the annual-peak series for 160 gaging stations in West Virginia (table 3). The peak series for 10 gaging stations (6.25 percent of the 160 stations) indicated a trend. By chance, 8 stations would be expected to indicate a trend (5 percent of the 160 stations), so there is little difference between the number of stations analyzed as having a trend and the number of stations expected to show a trend by chance. Thus, no significance could be determined for the trend indicated at the 10 gages, and all 10 gages were retained for consideration in the data-correlation and regional regression analysis.

Data Correlation

The 160 rural, unregulated West Virginia streamflow-gaging stations having a minimum of 10 years of record through the 1997 water year were reduced to 154 for correlation and regional regression analysis. Data from the following six gaging stations were not used for correlation and regional regression analysis: Elk River at Centralia (03195000) because the peak record for this station was used to lengthen the record for Elk River below Webster Springs (03194700); Twelvepole Creek at Wayne (03207000) because the peak record here was used to lengthen the record for Twelvepole Creek below Wayne (03207020); Tug Fork near Kermit (03214000) because the peak record here was used to lengthen the record for Tug Fork at Kermit (03214500); New River at Caperton (03185500) because the peak record here was used to lengthen the record for New River at Fayette (03186000); Cheat River near Morgantown (03071500) because the peak record for this station was used to lengthen the record for Cheat River near Pisgah (03071000); and Tuscarora Creek above Martinsburg (01617000) because the station is located in a karst area of the State. Available data for 113 gaging stations operated by surrounding States augmented West Virginia data.

In order to identify correlated values, 11 basin characteristics describing the basin at and upstream from gaging stations (see Basin-Characteristics Data section of this report) were $\log_{10}$ transformed. Transformed and untransformed data were evaluated for collinearity using a Pearson Coefficient correlation matrix. Additionally, a shape factor, defined as the drainage area divided by the squared basin length, was $\log_{10}$ transformed, and then transformed and untransformed values were evaluated for collinearity. High correlations (absolute value of Pearson correlation coefficient greater than 0.80) were detected among $\log_{10}$ transformed drainage area, main-channel slope, and stream length. High correlations also were detected among $\log_{10}$ transformed main-channel slope, stream length, and local station slope. Additionally, high correlations were detected between the untransformed values of drainage area and main-channel slope, and main-channel slope and local station slope. No high correlations were determined between any $\log_{10}$ transformed and any untransformed value. Should a pair of highly correlated values become part of a regression equation in the regional regression analysis, consideration will be given to eliminate one of the values from the equation. (No pair of highly correlated values became part of a regression equation.)

Regional Regression Analysis

Multiple and simple least-squares regression models for the $\log_{10}$-transformed 2-year recurrence-interval discharge with independent variables that describe the basin characteristics (both $\log_{10}$ transformed and untransformed values) for each gaging station were evaluated, and residuals were plotted as areal distributions to determine regional boundaries. The final regional regression equations for the 1.1-, 1.2-, 1.3-, 1.4-, 1.5-, 1.6-, 1.7-, 1.8-, 1.9-, 2-, 2.5-, and 3-year peak discharges (table 1) were determined by executing a generalized least-squares regression model (Stedinger and Tasker, 1985; Tasker and Stedinger, 1989) (version 2.5) that used the independent variables determined from application of the multiple least-squares regression model.

Regional regression procedures for the 2-year discharge were completed for the entire data set and three regions (fig. 2) were delineated as East, North, and South. A multiple least-squares regression model for the $\log_{10}$-transformed 2-year discharge that used basin characteristics (both $\log_{10}$ transformed and untransformed values) as the independent variables was evaluated. The most significant independent variable was determined as $\log_{10}$-transformed drainage area. Inclusion of additional independent variables did not significantly increase the ability of the model to account for the variation of the dependent variable (R^2) and did not decrease the standard error by more than 5 percent. A simple least-squares regression model was evaluated for the $\log_{10}$-transformed 2-year discharge with $\log_{10}$-transformed drainage area as the only independent variable. Residuals from the simple least-squares regression analysis were plotted by latitude and longitude of the gaging station. The residual plots indicated areas of West Virginia with similar magnitudes of residuals. The multiple and simple regression procedures were repeated for each group of stations with a similar magnitude of residuals ($\log_{10}$-transformed drainage area was the most significant independent variable in all cases), and plots were analyzed until no additional regional boundaries could be identified. Regional analysis in the East Region indicated that four stations with large drainage areas (greater than 2,000 mi^2) leveraged the regression analysis. One of the four stations was in West Virginia, Shenandoah River at Millville (01636500), and the other three stations were in surrounding States (see Wiley and others, 2000, p.15). On the basis of these analyses, three regions were delineated. These three regions are identical to those determined by Wiley and others (2000), for which the 100-year discharges were used in the regional regression procedures.

Regional regression procedures were conducted for the 1.5-year discharge to determine if different regional boundaries would be determined at a lower discharge than the 2-year discharge. The same three regions were delineated, and $\log_{10}$-transformed drainage area remained the most significant independent variable.

Table 1. Equations and regression statistics determined in the regional regression analysis of peak discharges

[Q(n) is the discharge in cubic feet per second for the (n)-year recurrence interval; A is the drainage area in square miles]

Regression equation	Standard error of the model, in percent	Average standard error of sampling, in percent	Average prediction error, in percent	Equivalent years of record	Number of streamflow stations	Range of drainage area, in square miles
East Region						
$Q(1.1) = 31.7\ A^{0.834}$	51.1	10.1	52.4	1.3		
$Q(1.2) = 37.9\ A^{0.835}$	47.0	9.5	48.2	1.5		
$Q(1.3) = 42.6\ A^{0.836}$	44.7	9.2	45.9	1.7		
$Q(1.4) = 46.5\ A^{0.837}$	43.1	8.9	44.2	1.8		
$Q(1.5) = 49.9\ A^{0.838}$	41.9	8.9	43.0	1.9		
$Q(1.6) = 53.0\ A^{0.838}$	40.9	8.9	42.0	2.0	74	0.22–1,486
$Q(1.7) = 55.8\ A^{0.839}$	40.2	8.6	41.2	2.0		
$Q(1.8) = 58.4\ A^{0.839}$	39.5	8.6	40.5	2.1		
$Q(1.9) = 60.9\ A^{0.840}$	38.9	8.6	40.0	2.2		
$Q(2) = 62.6\ A^{0.842}$	37.7	8.3	38.8	2.3		
$Q(2.5) = 72.9\ A^{0.842}$	36.8	8.3	37.8	2.4		
$Q(3) = 80.2\ A^{0.843}$	35.8	8.3	36.8	2.5		
North Region						
$Q(1.1) = 57.7\ A^{0.789}$	30.8	7.6	31.8	2.6		
$Q(1.2) = 73.2\ A^{0.771}$	28.8	7.3	29.8	3.0		
$Q(1.3) = 85.3\ A^{0.759}$	27.8	7.3	28.8	3.1		
$Q(1.4) = 95.5\ A^{0.751}$	27.2	6.9	28.2	3.3		
$Q(1.5) = 105\ A^{0.744}$	26.9	6.9	27.9	3.3		
$Q(1.6) = 113\ A^{0.738}$	26.7	6.9	27.7	3.4	62	0.13–1,516
$Q(1.7) = 120\ A^{0.733}$	26.6	6.9	27.6	3.4		
$Q(1.8) = 127\ A^{0.728}$	26.5	6.9	27.4	3.4		
$Q(1.9) = 134\ A^{0.725}$	26.5	6.9	27.4	3.4		
$Q(2) = 138\ A^{0.724}$	27.0	6.9	28.0	3.3		
$Q(2.5) = 166\ A^{0.708}$	26.6	6.9	27.6	3.4		
$Q(3) = 188\ A^{0.698}$	26.9	6.9	27.9	3.3		
South Region						
$Q(1.1) = 46.9\ A^{0.804}$	47.4	8.0	48.3	1.1		
$Q(1.2) = 56.9\ A^{0.799}$	44.0	7.6	44.8	1.3		
$Q(1.3) = 64.4\ A^{0.795}$	42.3	7.6	43.1	1.4		
$Q(1.4) = 70.5\ A^{0.792}$	41.1	7.6	41.9	1.4		
$Q(1.5) = 75.8\ A^{0.790}$	40.3	7.3	41.1	1.5		
$Q(1.6) = 80.6\ A^{0.789}$	39.7	7.3	40.5	1.5	100	0.10–8,371
$Q(1.7) = 84.8\ A^{0.787}$	39.2	7.3	40.0	1.5		
$Q(1.8) = 88.8\ A^{0.786}$	38.8	7.3	39.6	1.6		
$Q(1.9) = 92.4\ A^{0.785}$	38.5	7.3	39.3	1.6		
$Q(2) = 95.4\ A^{0.785}$	38.4	7.3	39.2	1.6		
$Q(2.5) = 110\ A^{0.781}$	37.6	7.3	38.4	1.7		
$Q(3) = 121\ A^{0.778}$	37.2	6.9	38.0	1.7		

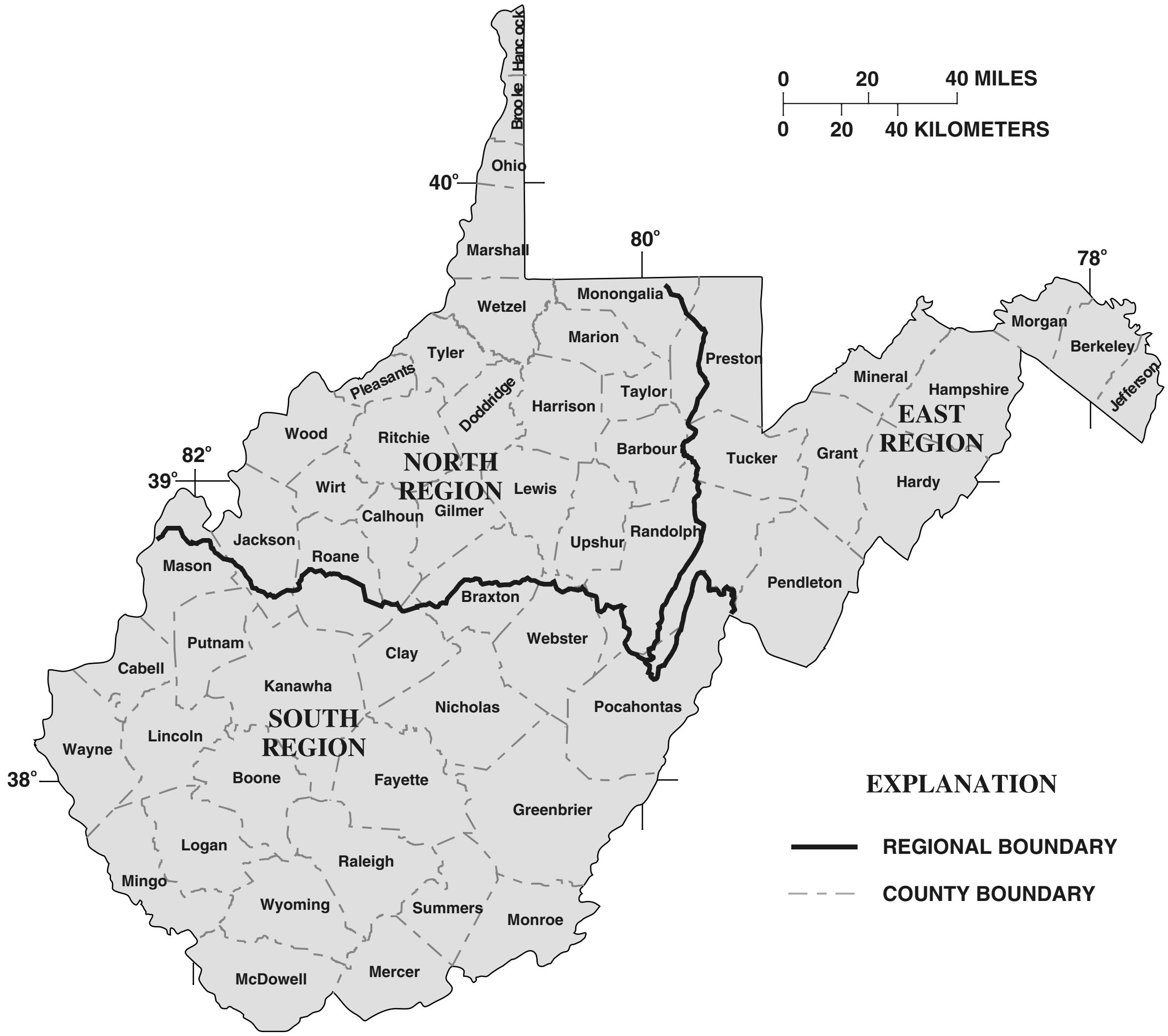

Figure 2. Regional boundaries for the low-recurrence-interval peak-discharge estimating equations for rural, unregulated streams in West Virginia.

ESTIMATING DISCHARGES FOR GAGED AND UNGAGED LOCATIONS

How discharge estimates are made depends on whether the stream location of interest is at a streamflow-gaging station, on an ungaged stream, or on the same stream as a nearby gaging station (where “nearby” means that the drainage area for that location is between 50 and 150 percent of the drainage area at the gaged location). The estimating procedure is not applicable on urbanized and regulated streams, and caution should be used if the stream is heavily affected by mining or located in a karst area.

Discharges at a gaging station are read directly from table 4 (the appropriate equation and weighting factors have been applied). No weighted value is presented in table 4 for one of the two stations on the same stream that were combined into a single time-series record. For this case, the station location listed without a weighted value should be analyzed as “on the same stream as a nearby gaging station.” Discharges on the same stream as a nearby gaging station are determined at the ungaged location from the desired regional regression equation and then adjusted by a factor that related differences between the ungaged and gaged locations. No weighted value is presented in table 4 for Tuscarora Creek above Martinsburg (01617000).

The frequency of the systematic record for Tuscarora Creek (S) should be used directly because the station is located in a karst area of the State. Discharge on an ungaged stream is determined from the desired regression equation for the appropriate region.

At a streamflow-gaging station. A discharge at a gaging station is determined by reading the weighted (W) value directly from table 4. For example, the weighted 2-year discharge at the gaging station Greenbrier River at Alderson (03183500) is given as 34,000 ft^3/s. This discharge was calculated by weighting (1) the discharge determined from the systematic and historical record (S), on the basis of the guidelines established by the Interagency Advisory Committee on Water Data, Water Resources Council (1976; table 3), and (2) the discharge determined by the appropriate regional (R) regression equation (table 4). The weighting technique considered (1) the number of years of peak-discharge record (summation of the number of years of systematic record, the number of historical peaks, and the number of high-outlier peaks from table 3 located at the end of this report), and (2) the number of equivalent years of record (an estimate given in table 1 of the number of systematic years of record needed to calculate discharges with an accuracy equal to that of the regional regression equation). The following equation was used:

$$Q_w = (Q_s N + Q_r E) / (N + E),$$

where

Q_w is the weighted discharge in cubic feet per second;

Q_s is the discharge in cubic feet per second determined from the systematic and historical record on the basis of the guidelines established by the Water Resources Council;

Q_r is the discharge in cubic feet per second determined by the regional regression equation;

N is the number of years of peak-discharge record; and

E is the equivalent years of record.

On an ungaged stream. A discharge on an ungaged stream is determined by applying the desired regional regression equation for the appropriate region (table 1). For example, the 1.5-year discharge for Fishing Creek just downstream from the confluence of North and South Forks of Fishing Creek in Wetzel County (Pine Grove $7^1/_2$-minute U.S. Geological Survey topographic map) can be calculated as follows:

1. The stream is located in the North Region as determined from figure 2;
2. The 1.5-year regression equation for the North Region is selected from table 1 as

$$Q(1.5) = 105\ A^{0.744},$$

where

$Q(1.5)$ is the 1.5-year discharge in cubic feet per second, and

A is the drainage area in square miles.

3. The drainage area is determined by measuring the area on a topographic map or from the U.S. Geological Survey drainage-area report (Wiley, 1997, page 30) as 113.92 mi^2; and
4. The 1.5-year regression equation for the North Region is evaluated as 3,560 ft^3/s.

On the same stream as a nearby gaging station. A discharge on the same stream as a nearby gaging station is determined by adjusting the discharge determined from the regional equation by a factor relating (1) drainage areas, and (2) weighted and regional regression discharges (Hannum, 1976; Glatfelter, 1984). For example, the 3-year discharge for a site on Coal River just downstream from the confluence of the Little Coal and Big Coal Rivers in Kanawha County (Alum Creek $7^1/_2$-minute U.S. Geological Survey topographic map) can be calculated as follows:

1. The drainage area is determined by measuring the area on a topographic map or by reading from the U.S. Geological Survey drainage-area report (Mathes and others, 1982, page 196) as 830.02 mi^2, which is 96 percent (between 50 and 150 percent) of the drainage area given in table 3 (862 mi^2) for the gaging station Coal River at Tornado (03200500);

2. The weighted 3-year discharge for Coal River at Tornado (03200500) is read directly from table 4 as 24,400 ft^3/s (see discussion above for calculations at a gaging station), and the regional 3-year discharge is read directly from table 4 as 23,300 ft^3/s;
3. The 3-year discharge for the Coal River just downstream from the confluence of the Little Coal and Big Coal Rivers is determined from the equation given in table 1 as 22,600 ft^3/s (South Region, drainage area of 830.02 mi^2: see discussion above for an ungaged stream);
4. The correction factor for the gaged location is determined as 1.047 from the following equation:

$$C_g = Q_w / Q_r ,$$

where
- C_g is the correction factor for the gaging-station location;
- Q_w is the weighted frequency discharge in cubic feet per second read from table 4; and
- Q_r is the regional regression discharge in cubic feet per second read from table 4;

5. The correction factor for the ungaged location is determined as 1.044 from the following equation:

$$C_u = C_g - [(2 \, |A_g - A_u|) / A_g] \, (C_g - 1),$$

where
- C_u is the correction factor for the ungaged location;
- C_g is the correction factor for the gaging station location (see previous equation);
- A_g is the drainage area in square miles at the gaging station location read from table 2;
- A_u is the drainage area in square miles at the ungaged location; and
- $|A_g - A_u|$ is the absolute value of the difference between the drainage area in square miles (mi^2) at the gaging station location and the drainage area in square miles (mi^2) at the ungaged location;

6. The adjusted 3-year discharge for the Coal River just downstream from the confluence of the Little Coal and Big Coal Rivers is determined as 23,600 ft^3/s from the following equation:

$$Q_a = C_u Q_u ,$$

where
- Q_a is the adjusted discharge in cubic feet per second;
- C_u is the correction factor for the ungaged location (see previous equation); and
- Q_u is the regional regression discharge at the ungaged location in cubic feet per second.

ACCURACY OF LOW-RECURRENCE-INTERVAL PEAK-DISCHARGE ESTIMATING EQUATIONS

The accuracy of the estimating equations is quantified by measuring the average prediction error and equivalent years of record (Hardison, 1969, 1971). The average prediction error ranged from 27.4 to 52.4 percent, and the equivalent years of record ranged from 1.1 to 3.4. These accuracy measurements are included with the regression statistics summarized in table 1.

Average prediction error. Average prediction error is the square root of the sum of the squared standard error of the model (the portion of the total error due to an imperfect model) and average squared standard error of sampling (the portion of the total error due to estimating model parameters from a sample) in log units. The calculations involved in estimating the average prediction error are explained in Tasker and Stedinger (1989) and in appendix 2 of this report. The average prediction error is within 1.3 percentage points of the standard error of the model for all regression equations presented in table 1. The near equivalence of the average prediction error and the standard error of the model indicate that addition of the average standard error of sampling to the standard error of the model accounts for very little additional unexplained variance of the discharge estimate.

The average prediction error is the square root of the average of individual squared standard errors of prediction. Individual standard errors of prediction for the regression equations can be determined as described in appendix 2 (Koltun and Roberts, 1990, appendix A; and Hodge and Tasker, 1995, p. 37–42). This method was applied to each regression equation shown in table 1 to investigate the variation of the individual standard errors of prediction and to compare the individual standard errors of prediction to the average prediction error. The differences between the individual standard errors of prediction and the average prediction error were insignificant. Thus, computation of individual standard errors of prediction is not necessary when applying the equations.

The variation of the individual standard errors of prediction over the range of drainage areas for the regression equations was compared to the average prediction error (fig. 3). The individual standard errors of prediction increase for drainage areas less than and greater than about 100 mi^2 (where the individual standard errors are less than 1.0 percentage points less than average prediction error) for all regression equations. The maximum individual standard errors of prediction for the maximum drainage areas are within 0.5 percentage points of the average standard error of prediction for all regression equations. The maximum individual standard errors of prediction for the minimum drainage areas are 5.4 percentage points greater than the average prediction error for all regression equations. The individual standard errors of prediction are less than 0.8 percentage points less than the average prediction error for a drainage area of 10 mi^2 for all regression equations. In summary, the individual standard errors of prediction are within 1.0 percentage point of the average prediction error for drainage areas greater than 10 mi^2, and the individual standard errors of prediction increase to a maximum of 2.7 percentage points greater than the average standard error of prediction at the minimum drainage areas.

Equivalent years of record. Equivalent years of record (table 1) is an estimate of the number of systematic years of record needed to calculate discharges with an accuracy equal to that of the regional regression equation. Equivalent years of record is a weighting factor that is applied when determining discharges at gaging stations (see Estimating Procedure section of this report).

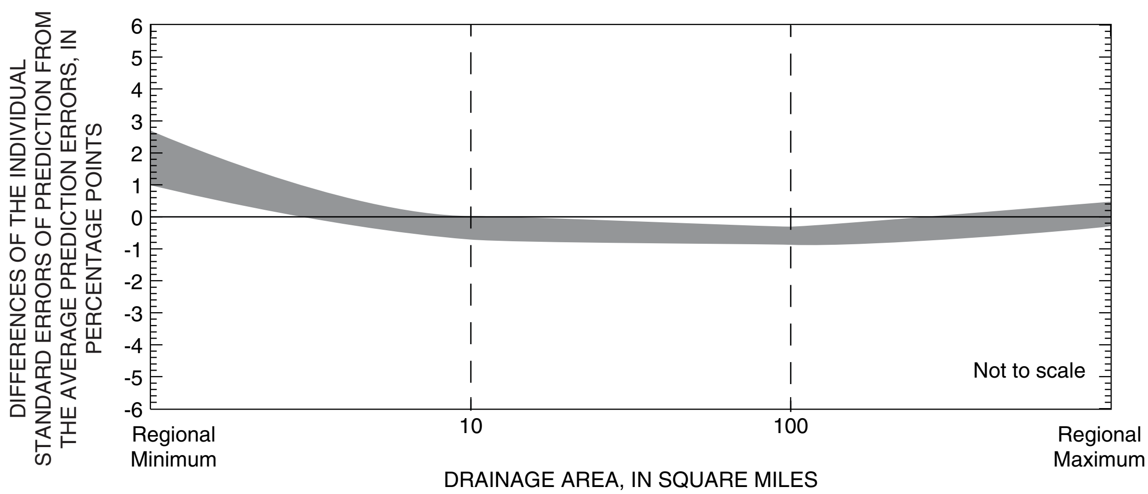

Figure 3. Range of differences for the indicated drainage areas (shaded) of the individual standard errors of prediction from the average prediction errors; graph represents all regional regression equations.

LIMITATIONS OF LOW-RECURRENCE-INTERVAL PEAK-DISCHARGE ESTIMATING EQUATIONS

Equations developed in this study are only applicable to rural, unregulated streams within the boundaries of West Virginia. The equations should not be applied to urban areas with paved surfaces, concrete channels, culverts, and other control structures. The equations should not be applied to streams regulated by dams, or large lakes and ponds. Equations are not applicable to heavily mined areas if excessive runoff is diverted into or outside the basin, retained along strip benches, or retained underground. Equations are not applicable to karst areas if excessive runoff is diverted into, outside, or within the basin through solution channels or other cavities in carbonate (limestone and dolomite) rocks. Jones (1997) describes the locations of karst areas in eastern counties of West Virginia including Monongalia, Preston, Barbour, Tucker, Grant, Mineral, Hardy, Hampshire, Morgan, Berkeley, Jefferson, Randolph, Pendleton, Pocahontas, Greenbrier, Summers, Monroe, and Mercer Counties (counties are presented in fig. 2).

Equations developed in this study should not be applied to stream locations with drainage areas outside the range of values used in equation development (table 1). The Potomac River, downstream from the confluence of the North Branch and South Branch, and the Shenandoah River have drainage areas outside the range of values used to develop the East Region equations. The equations should not be applied to these stream locations, but gaging-station discharges (table 4) may be used in making discharge estimates on these rivers.

SUMMARY

Engineers commonly use low-recurrence-interval (between 1.1 and 3.0 years) peak discharges as design components for developing stream-restoration plans. Determining discharges for various recurrence intervals at stream locations where gaging stations are not present using regional equations can be less expensive and less difficult than determining discharge frequencies by individually studying nearby streamflow-gaging stations for each and every ungaged location. Therefore, the U.S. Geological Survey (USGS), in cooperation with the: West Virginia Department of Transportation, Division of Highways; West Virginia Soil Conservation Agency; and West Virginia Geological and Economic Survey; developed equations for estimating low-recurrence-interval peak discharges for rural, unregulated streams in West Virginia.

The magnitudes of peak discharges with frequencies of exceedences between 1 and 3 years were determined for 160 rural, unregulated West Virginia streamflow-gaging stations with a minimum record of 10 years through the 1997 water year. The randomness of the systematic annual-peak series was tested statistically by means of Kendall's tau to detect monotonic trends.

The 160 rural, unregulated West Virginia gaging stations were reduced to 154 for correlation and regional regression analysis; five gaging stations were excluded from the analysis because peak data were used to lengthen records for other nearby gaging stations, and one gaging station was excluded because it was in a karst area.

Eleven basin characteristics, a shape factor, and flood frequencies from 154 West Virginia gaging stations were considered for regression analysis. West Virginia data were augmented with available basin characteristics and flood-frequency data for 85 stations operated by surrounding States.

Multiple and simple least-squares regression models for the $\log_{10}$-transformed 1.5- and 2-year discharges with independent variables that describe the basin characteristics ($\log_{10}$-transformed and untransformed) were evaluated for 236 streamflow-gaging stations, and the regression residuals were plotted as areal distributions that defined three regions, designated East, North, and South. Four stations with drainage areas greater than 200 mi^2 leveraged the East Region equations and were eliminated from consideration for the final equations. Regional equations for the

1.1-, 1.2-, 1.3-, 1.4-, 1.5-, 1.6-, 1.7-, 1.8-, 1.9-, 2.0-, 2.5-, and 3-year peak discharges were determined by generalized least-squares regression. Log_{10}-transformed drainage area was the most significant independent variable for all regions.

Examples of application of the regional regression equations were presented for three situations: at a gaging station, on an ungaged stream, and on the same stream as a nearby gaging station (where “nearby” means that the drainage area for that location is between 50 and 150 percent of the drainage area at the gaged location).

Accuracies of estimating equations were quantified by measuring the average standard error of prediction and equivalent years of record. The average standard error of prediction ranged from 27.4 to 52.4 percent, and the equivalent years of record ranged from 1.1 to 3.4 years. Equations developed in this study are applicable only to rural, unregulated streams within the boundaries of West Virginia. Caution should be used if equations are applied to heavily mined or karst areas in the State.

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TABLES 2–4

Table 2. Basin-characteristics data used in the regression analysis to develop low-recurrence-interval peak-discharge estimating equations for rural, unregulated streams in West Virginia

[MD, Maryland; OH, Ohio; PA, Pennsylvania; VA, Virginia; WV, West Virginia; --, information not available]

				Basin characteristics										
Station No.	State	Latitude, in decimal degrees	Longitude, in decimal degrees	Drainage area, in square miles	Main channel slope, in feet per mile	Stream length, in miles	Mean basin elevation, in feet above sea level	Forested area, in percent	Mean annual precipitation, in inches	Two-year 24-hour precipitation intensity, in inches	Mean annual snowfall, in inches	Mean minimum January temperature, in degrees Fahrenheit	Local station slope, in feet per mile	Streamflow variability index
01595000	MD	39.260	79.390	73.1	30.5	17.5	2,450	78	48	2.75	77	18.5	--	--
01595300	WV	39.367	79.179	42.6	70.6	16.8	2,670	75	41	2.9	60	20	84.5	0.560
01599500	WV	39.410	79.001	46.5	62.4	14.5	1,830	75	37	2.9	50	21	29.3	.574
01595500	MD	39.390	79.180	225	48.7	26.9	2,820	73	46	2.75	70	20	--	--
01596000	MD	39.480	79.070	287	47.6	43.1	2,670	77	45.5	2.75	60	22	--	--
01596500	MD	39.570	79.100	49.1	65.1	19.1	2,510	81	44	2.75	57	20.5	--	--
01597000	MD	39.500	79.160	16.7	137	9.3	2,510	79	46	2.75	60	21	--	--
01598000	MD	39.480	79.070	115	69.8	24.8	2,407	83	44.5	2.75	56.7	21	--	--
01599000	MD	39.490	79.040	72.4	62.7	17.0	2,166	92	41.5	2.75	49.8	24	--	--
01600000	MD	39.570	78.840	596	36.3	65.6	2,265	74	43	2.75	55	22	--	--
01601500	MD	39.670	78.790	247	55.0	34.7	1,875	70	36	2.75	44.4	23	--	--
01603000	MD	39.620	78.770	877	39.1	82.1	2,155	73	42	2.75	52.5	21	--	--
01604500	WV	39.443	78.822	211	17.0	34.5	1,280	74	36	2.9	35	22	6.72	.565
01605500	WV	38.636	79.338	179	46.9	25.7	2,940	80	40	2.9	40	22	26.7	.379
01605700	WV	38.696	79.388	.45	1,070	1.0	3,700	90	36	2.9	35	22	502	.550
01606000	WV	38.985	79.236	335	39.1	47.7	3,120	80	44	2.9	50	22	29.3	.536
01606500	WV	38.991	79.176	676	27.2	62.8	2,910	80	40	2.9	50	22	16.2	.433
01606800	WV	38.806	79.214	1.43	280	2.5	2,040	75	32	2.9	40	22	132	.450
01607500	WV	38.631	79.244	103	30.1	23.5	2,470	80	38	2.9	32	22	16.1	.522
01608000	WV	39.012	78.956	277	20.5	61.2	2,180	80	33	2.9	32	22	14.7	.477
01608100	WV	39.089	78.899	.24	780	.6	1,770	99	32	2.9	30	22	235	.450
01608500	WV	39.447	78.654	1,486	14.4	122.0	2,250	75	35	2.9	35	23	4.83	.453
01609000	MD	39.550	78.560	148	13.5	40.3	1,310	79	36	2.85	--	23.5	--	--
01609500	MD	39.550	78.560	5.08	61.2	5.4	818	90	36.5	2.85	29	23	--	--

Table 2. Basin-characteristics data used in the regression analysis to develop low-recurrence-interval peak-discharge estimating equations for rural, unregulated streams in West Virginia—*Continued*

[MD, Maryland; OH, Ohio; PA, Pennsylvania; VA, Virginia; WV, West Virginia; --, information not available]

				Basin characteristics										
Station No.	State	Latitude, in decimal degrees	Longitude, in decimal degrees	Drainage area, in square miles	Main channel slope, in feet per mile	Stream length, in miles	Mean basin elevation, in feet above sea level	Forested area, in percent	Mean annual precipitation, in inches	Two-year 24-hour precipitation intensity, in inches	Mean annual snowfall, in inches	Mean minimum January temperature, in degrees Fahrenheit	Local station slope, in feet per mile	Streamflow variability index
01609800	WV	39.499	78.489	108	35.4	27.0	1,220	70	34	2.9	30	23	14.1	0.797
01610000	MD	39.540	78.460	3,129	10.5	158	1,920	76	38	2.6	40	23	--	--
01610150	MD	39.700	78.320	10.4	46.3	8.8	1,060	62.4	37	2.9	30	23	--	--
01610155	MD	39.650	78.340	102	17.5	34.3	1,120	73.4	38	2.85	--	24	--	--
01610500	WV	39.182	78.507	306	18.8	49.7	2,040	75	35	2.9	24	23	6.68	.436
01611500	WV	39.582	78.310	675	10.4	105.1	1,700	75	36	2.9	26	24	6.43	.463
01612500	MD	39.710	78.230	16.9	93.6	5.8	851	74	37.5	2.9	23	21	--	--
01613000	MD	39.700	78.180	4,090	7.93	196	1,803	77	35.5	2.85	36.9	22	--	--
01613150	MD	39.692	78.132	4.80	47.5	6.5	720	27.8	37.5	2.9	35	24	--	--
01613160	MD	39.691	78.127	1.20	132	2.8	683	40	37.5	2.9	26	24	--	--
01613900	VA	39.210	78.290	15.0	167	7.9	1,200	70	37.0	2.80	23.4	24.2	--	--
01614000	WV	39.512	78.038	235	9.20	41.9	890	70	39	3.0	26	24	3.88	.570
01615000	VA	39.180	78.070	57.4	17.4	20.2	760	38	38.4	3.04	22.5	24.8	--	--
01616000	VA	39.180	78.090	16.5	37.8	9.9	800	42	38.3	2.93	22.9	25.1	--	--
01616500	WV	39.424	77.939	273	5.90	50.9	630	30	40	3.0	24	24	3.39	.320
01617000	WV	39.469	77.972	11.3	34.5	7.8	740	30	38	3.0	26	24	17.8	.380
01617800	MD	39.510	77.780	18.9	23.8	9.6	509	11.7	39.5	3.1	--	26	--	--
01618000	MD	39.430	77.800	5,936	5.98	248.5	1,524	68	37	2.59	36.1	23	--	--
01619475	MD	39.470	77.660	.10	401	.54	512	26	39.5	3.15	25	26	--	--
01619500	MD	39.450	77.730	281	10.8	51.8	781	29.8	40	3.1	30.6	26	--	--
01620500	VA	38.340	79.240	17.2	148	9.6	3,330	98	42.1	3.65	24.7	22.0	--	--
01621000	VA	38.500	79.050	72.6	107	15.0	2,870	100	39.1	2.80	24.5	21.5	--	--
01621200	VA	38.470	78.990	9.45	88.2	4.6	1,830	74	35.5	2.80	25.2	22.2	--	--
01621400	VA	38.430	78.880	5.52	37.9	4.4	1,350	2	38.5	3.00	28.0	22.8	--	--
01621450	VA	38.390	78.920	.72	176	1.4	1,290	8	37.4	2.83	27.1	23.4	--	--

Table 2. Basin-characteristics data used in the regression analysis to develop low-recurrence-interval peak-discharge estimating equations for rural, unregulated streams in West Virginia—*Continued*

[MD, Maryland; OH, Ohio; PA, Pennsylvania; VA, Virginia; WV, West Virginia; --, information not available]

Station No.	State	Latitude, in decimal degrees	Longitude, in decimal degrees	Basin characteristics										
				Drainage area, in square miles	Main channel slope, in feet per mile	Stream length, in miles	Mean basin elevation, in feet above sea level	Forested area, in percent	Mean annual precipitation, in inches	Two-year 24-hour precipitation intensity, in inches	Mean annual snowfall, in inches	Mean minimum January temperature, in degrees Fahrenheit	Local station slope, in feet per mile	Streamflow variability index
01622000	VA	38.340	78.910	379	43.2	38.9	2,040	52	39.0	3.09	25.4	22.2	--	--
01622100	VA	38.330	78.940	1.55	100	2.9	1,250	25	39.0	3.24	27.0	24.0	--	--
01622300	VA	38.160	79.270	.55	973	1.5	2,000	95	39.5	2.95	24.3	24.7	--	--
01622400	VA	38.200	79.220	.49	950	1.0	1,800	63	37.8	2.88	24.6	25.0	--	--
01632000	VA	38.640	78.850	210	44.3	25.8	2,020	89	35.8	3.09	24.0	21.0	--	--
01632300	VA	38.580	78.760	8.15	48.8	5.4	1,260	15	37.4	2.90	24.5	24.2	--	--
01632900	VA	38.690	78.640	93.2	20.5	25.1	1,400	50	38.0	3.58	23.8	24.2	--	--
01632950	VA	38.800	78.720	.31	500	1.0	1,450	98	35.2	2.87	23.3	23.8	--	--
01632970	VA	38.760	78.690	6.49	61.8	4.5	1,200	45	35.2	2.78	23.3	23.8	--	--
01633000	VA	38.750	78.640	506	24.3	45.9	1,670	53	37.0	3.14	24.6	22.4	--	--
01633500	VA	38.870	78.630	79.4	28.6	20.4	2,030	86	34.0	2.80	23.2	23.4	--	--
01633650	VA	38.930	78.550	3.66	292.1	2.5	1,510	60	35.2	2.52	22.5	23.9	--	--
01634000	VA	38.980	78.340	768	9.86	103	1,430	50	36.5	3.03	23.9	23.0	--	--
01634500	VA	39.080	78.330	103	33	23.4	1,350	86	34.6	2.87	22.6	23.8	--	--
01636500	WV	39.282	77.789	3,022	6.70	183.8	1,540	50	42	3.0	24	25	5.70	0.334
01637000	MD	39.480	77.540	8.83	210	5.1	1,010	48	42	3.2	34	24	--	--
01637500	MD	39.430	77.560	66.9	47.5	23.9	1,110	37	42.5	3.15	35	23.5	--	--
01638480	VA	39.250	77.580	89.6	14.1	27.5	600	30	41.3	3.19	20.2	23.5	--	--
01638500	MD	39.270	77.540	9,651	5.56	270.9	1,356	59	39.5	3.05	30.6	23	--	--
01643700	VA	38.990	77.800	123	16.8	22.9	700	40	39.8	3.18	20.3	24.3	--	--
01644000	VA	39.020	77.580	332	8.25	40.6	660	35	40.0	3.18	20.4	23.8	--	--
01644100	VA	39.070	77.610	2.05	71.7	3.1	560	17	39.9	3.00	20.5	24.4	--	--
02009500	VA	38.270	79.670	.74	800	2.0	2,380	70	40.8	2.80	24.2	20.7	--	--
02011400	VA	38.042	79.882	158	--	--	--	--	--	--	--	--	--	--
02011460	VA	38.245	79.769	60.1	--	--	--	--	--	--	--	--	--	--

Table 2. Basin-characteristics data used in the regression analysis to develop low-recurrence-interval peak-discharge estimating equations for rural, unregulated streams in West Virginia—*Continued*

[MD, Maryland; OH, Ohio; PA, Pennsylvania; VA, Virginia; WV, West Virginia; --, information not available]

Station No.	State	Latitude, in decimal degrees	Longitude, in decimal degrees	Basin characteristics										
				Drainage area, in square miles	Main channel slope, in feet per mile	Stream length, in miles	Mean basin elevation, in feet above sea level	Forested area, in percent	Mean annual precipitation, in inches	Two-year 24-hour precipitation intensity, in inches	Mean annual snowfall, in inches	Mean minimum January temperature, in degrees Fahrenheit	Local station slope, in feet per mile	Streamflow variability index
02011480	VA	38.135	79.866	85.8	27.0	5.3	--	--	--	--	--	--	--	--
02011500	VA	38.070	79.900	134	44.4	33.4	2,890	90	40.9	2.86	24.0	20.8	--	--
02012500	VA	37.880	79.980	411	25.3	57.6	2,480	80	40.8	2.74	23.4	21.2	--	--
02012950	VA	37.660	80.240	.66	592	1.7	2,330	68	37.8	2.55	19.6	24.0	--	--
02013000	VA	37.800	80.050	164	40.5	27.3	2,230	87	38.5	2.56	20.8	23.4	--	--
02014000	VA	37.730	80.040	153	27.3	39.8	2,320	85	38.6	2.62	19.6	24.4	--	--
03050000	WV	38.809	79.882	185	24.5	37.6	3,110	80	56	2.8	90	21	9.44	0.582
03050500	WV	38.924	79.879	271	13.8	55.0	2,940	80	50	2.8	90	21	1.65	.577
03050650	WV	38.976	79.838	.38	110	1.3	2,025	80	48	2.8	80	23	101	.650
03051000	WV	39.029	79.936	406	11.2	71.8	2,690	80	48	2.8	90	22	4.46	.596
03051500	WV	38.939	80.090	122	43.0	26.6	2,600	80	54	2.8	100	24	4.29	.567
03052000	WV	39.039	80.068	148	25.7	37.9	2,480	80	53	2.8	100	24	47.4	.607
03052340	WV	39.005	80.256	2.33	38.6	2.9	1,550	60	48	2.7	80	25	6.99	.550
03052500	WV	38.964	80.153	14.3	54.0	12.6	1,870	60	48	2.7	90	25	46.5	.642
03053500	WV	39.051	80.115	277	22.5	54.0	2,110	60	52	2.7	90	25	13.0	.558
03054500	WV	39.150	80.039	914	11.2	88.4	2,410	75	50	2.7	90	24	8.29	.559
03055020	WV	39.125	79.997	.60	265	.8	1,790	20	47	2.7	70	25	40.6	.750
03055040	WV	39.153	79.979	3.15	42.3	3.5	1,780	35	47	2.7	70	25	50.3	.750
03056250	WV	39.336	79.994	96.8	28.3	23.0	1,680	60	46	2.7	60	25	9.96	.631
03056500	WV	39.350	80.042	1,304	12.0	114.8	2,220	75	49	2.7	70	24	2.52	.564
03056600	WV	39.379	79.963	2.33	107	2.0	1,470	30	46	2.6	40	25	96.0	.650
03057300	WV	38.869	80.458	28.8	51.0	11.9	1,380	50	48	2.7	80	25	3.94	.943
03057500	WV	38.975	80.444	25.7	19.7	9.5	1,350	50	48	2.7	60	25	5.56	.927
03058000	WV	39.003	80.474	101	13.2	30.4	1,340	55	47	2.7	70	26	2.69	.718
03058500	WV	39.091	80.468	181	5.40	39.4	1,340	55	48	2.7	70	25	2.48	.694

Table 2. Basin-characteristics data used in the regression analysis to develop low-recurrence-interval peak-discharge estimating equations for rural, unregulated streams in West Virginia—*Continued*

[MD, Maryland; OH, Ohio; PA, Pennsylvania; VA, Virginia; WV, West Virginia; --, information not available]

Station No.	State	Latitude, in decimal degrees	Longitude, in decimal degrees	Basin characteristics: Drainage area, in square miles	Main channel slope, in feet per mile	Stream length, in miles	Mean basin elevation, in feet above sea level	Forested area, in percent	Mean annual precipitation, in inches	Two-year 24-hour precipitation intensity, in inches	Mean annual snowfall, in inches	Mean minimum January temperature, in degrees Fahrenheit	Local station slope, in feet per mile	Streamflow variability index
03059000	WV	39.271	80.356	384	3.60	71.4	1,250	30	48	2.7	55	25	2.31	0.758
03059500	WV	39.228	80.297	84.6	8.90	16.4	1,350	30	48	2.7	55	24	6.03	.618
03060500	WV	39.286	80.543	8.32	42.3	3.5	1,220	40	48	2.7	40	24	10.6	.988
03061000	WV	39.422	80.276	759	2.50	89.3	1,260	50	46	2.7	50	25	2.18	.577
03061500	WV	39.504	80.172	116	7.40	23.5	1,300	65	46	2.7	30	24	6.62	.660
03062400	WV	39.608	79.955	11.0	132	8.4	1,420	75	44	2.7	40	26	26.0	.732
03062500	WV	39.629	79.953	63.2	46.0	23.4	1,770	65	44	2.7	50	26	28.6	.605
03063950	WV	38.882	79.596	1.08	265	1.3	3,100	60	57	2.8	70	22	192	.370
03065000	WV	39.072	79.623	349	41.8	37.6	3,310	80	52	2.8	80	22	11.8	.500
03066000	WV	39.127	79.469	85.9	8.10	21.4	3,250	50	52	2.8	70	21	11.6	.430
03068610	WV	38.907	79.697	5.06	451	3.1	3,250	90	52	2.8	80	22	126	.430
03069000	WV	39.096	79.677	213	29.5	84.7	3,300	90	46	2.8	80	22	8.59	.440
03069500	WV	39.123	79.681	722	29.3	87.7	3,250	85	49	2.8	70	22	21.3	.469
03069850	WV	39.259	79.722	.95	305	1.1	2,105	60	50	2.9	80	23	282	.650
03069880	WV	39.289	79.704	12.2	105	8.1	2,290	60	52	2.7	70	24	48.2	.560
03070000	WV	39.346	79.666	974	24.0	118.4	2,950	80	51	2.8	70	23	10.3	.481
03070500	WV	39.616	79.705	200	10.4	24.4	2,070	10	49	2.7	55	22	49.8	.593
03071000	WV	39.607	79.778	1,354	21.5	145.0	2,700	80	50	2.8	70	22	12.8	.502
03071500	WV	39.667	79.862	1,380	21.4	151.7	2690	80	50	2.8	70	22	12.8	.490
03072000	PA	39.760	79.970	229	3.94	42.94	1100	44	41.6	2.3	45	24	- -	- -
03072590	PA	39.800	79.800	16.3	135	6.61	1340	45	41.9	2.45	- -	26	- -	- -
03075450	MD	39.410	79.350	.57	99.4	1.1	2,520	79	47.5	2.75	- -	20	- -	- -
03075500	MD	39.420	79.430	134	6.09	20.0	2,610	64	50	2.7	74	18	- -	- -
03075600	MD	39.490	79.420	.53	204	1.1	2,470	63	49.5	2.7	- -	20	- -	- -
03076505	MD	39.660	79.430	.22	415	.76	1,930	45	48	2.65	- -	20	- -	- -

Table 2. Basin-characteristics data used in the regression analysis to develop low-recurrence-interval peak-discharge estimating equations for rural, unregulated streams in West Virginia—*Continued*

[MD, Maryland; OH, Ohio; PA, Pennsylvania; VA, Virginia; WV, West Virginia; --, information not available]

Station No.	State	Latitude, in decimal degrees	Longitude, in decimal degrees	Basin characteristics										
				Drainage area, in square miles	Main channel slope, in feet per mile	Stream length, in miles	Mean basin elevation, in feet above sea level	Forested area, in percent	Mean annual precipitation, in inches	Two-year 24-hour precipitation intensity, in inches	Mean annual snowfall, in inches	Mean minimum January temperature, in degrees Fahrenheit	Local station slope, in feet per mile	Streamflow variability index
03076600	MD	39.640	79.320	48.9	65.6	15.9	2,460	44	48	2.7	- -	20	- -	- -
03108000	PA	40.630	80.340	178	8.36	42.61	1100	38	38.0	2.3	47	22	- -	- -
03109000	OH	40.780	80.760	6.19	55.6	5.23	1,188	15	39	2.5	34	20	- -	- -
03109500	OH	40.680	80.540	496	8.29	52.0	1,112	15	37.5	2.5	32	22	- -	- -
03110000	OH	40.540	80.730	147	9.81	28.9	1,089	44	40	2.5	36	22	- -	- -
03110980	OH	40.332	80.812	.04	500	.27	1,250	11	39	2.5	- -	22	- -	- -
03111150	PA	40.200	80.410	10.3	34.4	6.36	1190	12	39.2	2.4	- -	22	- -	- -
03111450	OH	40.207	80.923	1.31	95.2	2.24	1,110	8.2	39.5	2.5	- -	21	- -	- -
03111455	OH	40.208	80.920	10.9	37.9	5.98	1,150	11	39.5	2.5	- -	21.5	- -	- -
03111470	OH	40.302	80.849	1.57	78.8	2.20	1,220	11.5	39	2.5	- -	22.5	- -	- -
03111490	OH	40.272	80.847	.44	130	1.63	1,130	14.8	39	2.5	- -	22.5	- -	- -
03111500	OH	40.190	80.730	123	14.4	25.8	1,106	15	39	2.5	38	23	- -	- -
03111540	OH	40.152	80.883	.34	254	.87	1,160	20.6	39.5	2.5	- -	22	- -	- -
03112000	WV	40.044	80.661	281	11.1	34.8	1,230	50	40	2.5	30	24	10.1	0.698
03113700	WV	39.961	80.701	4.95	140	2.8	1,200	60	42	2.5	30	24	59.8	.584
03114000	OH	39.910	80.920	134	16.0	26.2	1,142	8.3	41	2.5	35	23	- -	- -
03114240	OH	39.782	81.056	.53	246	1.63	1,120	36.8	41.5	2.5	- -	24	- -	- -
03114500	WV	39.475	80.997	458	3.90	72.0	1,060	60	46	2.6	32	24	2.33	.748
03114550	WV	39.506	81.028	.88	120	1.4	920	90	43	2.5	28	24	75.4	.650
03114600	WV	39.503	81.016	1.22	110	1.8	960	70	43	2.5	28	24	44.0	.650
03114650	WV	39.487	81.007	4.19	62.7	1.6	900	40	43	2.5	28	24	30.3	.671
03115280	OH	39.625	81.048	5.45	90.3	3.03	985	61.1	42	2.5	- -	25	- -	- -
03115400	OH	39.563	81.204	210	7.0	42.345	974	50	41.5	2.5	- -	25	- -	- -
03115410	OH	39.543	81.209	.13	289	.61	805	52.6	41.5	2.5	- -	25	- -	- -
03115510	OH	39.473	81.314	1.52	114	1.97	865	53.3	40.5	2.5	- -	26	- -	- -

Table 2. Basin-characteristics data used in the regression analysis to develop low-recurrence-interval peak-discharge estimating equations for rural, unregulated streams in West Virginia—*Continued*

[MD, Maryland; OH, Ohio; PA, Pennsylvania; VA, Virginia; WV, West Virginia; --, information not available]

				Basin characteristics										
Station No.	State	Latitude, in decimal degrees	Longitude, in decimal degrees	Drainage area, in square miles	Main channel slope, in feet per mile	Stream length, in miles	Mean basin elevation, in feet above sea level	Forested area, in percent	Mean annual precipitation, in inches	Two-year 24-hour precipitation intensity, in inches	Mean annual snowfall, in inches	Mean minimum January temperature, in degrees Fahrenheit	Local station slope, in feet per mile	Streamflow variability index
03115600	OH	39.770	81.370	3.46	75.5	3.64	1,030	25.2	40	2.5	32	23	--	--
03115710	OH	39.661	81.449	.19	366	.95	960	47.9	40	2.5	--	23.5	--	--
03150600	OH	39.473	81.466	.99	58.0	1.913	721	29	40	2.5	--	25	--	--
03151400	WV	38.743	80.526	112	42.1	30.6	1,770	70	48	2.7	90	25	9.38	0.562
03151500	WV	38.824	80.593	155	33.6	39.3	1,600	70	48	2.7	70	25	1.56	.675
03152000	WV	38.934	80.839	387	17.4	62.8	1,280	65	48	2.7	60	25	1.11	.676
03152200	WV	39.124	80.691	2.91	133	2.5	1,090	50	48	2.6	40	24	43.7	.740
03152500	WV	38.962	80.867	144	6.70	27.8	1,050	55	48	2.6	40	24	3.27	.699
03153000	WV	38.862	81.035	162	10.2	28.7	1,110	75	48	2.6	40	25	3.26	.810
03153500	WV	38.922	81.098	913	11.1	86.2	1,170	65	48	2.7	45	25	1.33	.698
03154000	WV	38.844	81.223	205	5.50	29.1	1,030	50	47	2.6	32	25	5.27	.808
03154250	WV	38.803	81.366	2.82	61.9	2.8	880	40	45	2.6	26	24	32.9	.742
03154500	WV	38.961	81.390	79.4	6.50	22.6	910	45	44	2.6	24	25	4.46	.853
03155000	WV	39.059	81.390	1,516	3.10	138.3	1,090	60	48	2.6	35	25	.914	.651
03155200	WV	39.078	81.190	210	5.60	43.1	1,020	45	46	2.6	34	24	28.2	.713
03155450	WV	39.083	81.261	3.52	89.0	2.6	890	80	43	2.6	24	25	55.6	.850
03155500	WV	39.119	81.278	453	4.30	53.2	990	55	45	2.6	30	24	3.53	.752
03159540	OH	39.064	81.882	1.56	4.00	29.8	749	42	40.5	2.6	--	26	--	--
03159700	WV	38.765	81.678	.70	80.0	1.3	885	30	42	2.6	23	25	48.0	.850
03171500	VA	37.290	80.620	2,941	8.03	199	2,740	51	43.5	2.88	18.8	24.7	--	--
03173000	VA	37.270	80.710	305	20.1	53.7	2,590	64	37.4	2.56	17.9	25.8	--	--
03175500	VA	37.310	80.850	223	35.9	45.0	2,810	71	40.6	2.57	26.2	25.4	--	--
03176500	VA	37.370	80.860	3,768	6.72	225	2,700	53	42.3	2.80	19.5	24.8	--	--
03177000	WV	37.400	80.806	50.6	37.9	12.3	2,400	50	38	2.9	24	26	41.7	.490
03177500	WV	37.532	80.819	189	15.3	40.0	2,310	60	38	2.9	30	26	15.8	.532

Table 2. Basin-characteristics data used in the regression analysis to develop low-recurrence-interval peak-discharge estimating equations for rural, unregulated streams in West Virginia—*Continued*

[MD, Maryland; OH, Ohio; PA, Pennsylvania; VA, Virginia; WV, West Virginia; --, information not available]

				Basin characteristics									
Station No.	State	Latitude, in decimal degrees	Longitude, in decimal degrees	Drainage area, in square miles	Main channel slope, in feet per mile	Stream length, in miles	Mean basin elevation, in feet above sea level	Forested area, in percent	Mean annual precipitation, in inches	Two-year 24-hour precipitation intensity, in inches	Mean annual snowfall, in inches	Mean minimum January temperature, in degrees Fahrenheit	Local station slope, in feet per mile	Streamflow variability index
03177700	VA	37.260	81.280	39.8	31.6	15.2	2,800	90	43.2	2.50	31.1	25.0	- -	- -
03178500	WV	37.504	81.128	32.0	87.3	9.5	2,710	90	44	2.8	40	25	84.1	0.772
03179000	WV	37.544	81.011	395	5.90	100.0	2,570	60	40	2.8	40	26	12.2	.522
03179500	WV	37.585	80.965	438	8.00	103.0	2,560	60	40	2.8	40	26	16.6	.568
03180000	WV	37.645	80.884	4,602	5.40	262.3	2,690	60	40	2.9	24	25	11.7	.287
03180350	WV	38.558	79.831	1.13	740	1.8	3,535	95	42	2.8	80	20	264	.550
03180500	WV	38.544	79.833	133	23.8	19.1	3,620	80	42	2.8	70	21	15.4	.535
03180530	WV	38.508	79.784	1.28	109	3.1	3,120	70	42	2.8	70	21	48.0	.550
03180680	WV	38.409	79.812	1.52	488	3.2	3,350	90	42	2.8	60	21	48.0	.550
03181900	WV	38.236	79.974	.10	528	.6	2,620	99	40	2.9	45	22	111	.550
03182000	WV	38.211	80.075	108	28.3	25.4	2,910	80	40	2.9	40	22	11.1	.514
03182500	WV	38.186	80.131	540	16.1	66.1	3,180	80	42	2.8	55	21	6.93	.549
03182700	WV	37.908	80.291	144	19.9	27.5	2,480	95	40	2.9	40	23	18.3	.535
03183000	WV	37.685	80.457	80.8	37.5	19.2	2,630	70	38	2.9	35	24	20.2	.524
03183500	WV	37.724	80.642	1,364	9.20	140.8	2,840	80	41	2.8	50	22	5.78	.527
03183550	WV	37.738	80.710	3.84	544	3.5	2,705	95	36	2.9	45	25	192	.650
03183570	WV	37.684	80.717	2.71	280	2.5	1,950	60	36	2.9	45	25	35.2	.650
03184000	WV	37.640	80.805	1,619	9.00	164.0	2,770	75	40	2.8	50	23	4.91	.538
03184500	WV	37.670	80.893	6,256	7.80	264.0	2,670	60	40	2.9	30	24	11.7	.308
03185000	WV	37.761	81.162	52.7	12.3	20.6	2,570	80	44	2.8	45	24	36.8	.550
03185020	WV	37.725	81.101	.62	350	1.0	2,680	60	43	2.8	50	24	46.9	.650
03185500	WV	38.022	81.029	6,826	6.60	309.9	2,700	65	40	2.9	35	24	16.8	.350
03186000	WV	38.065	81.078	6,850	6.60	314.9	2,700	65	40	2.9	35	24	17.2	.329
03186500	WV	38.379	80.484	128	41.9	31.4	3,410	99	52	2.8	100	21	13.5	.542
03187000	WV	38.366	80.601	236	27.7	37.0	3,180	95	50	2.8	100	22	8.33	.541

Table 2. Basin-characteristics data used in the regression analysis to develop low-recurrence-interval peak-discharge estimating equations for rural, unregulated streams in West Virginia—*Continued*

[MD, Maryland; OH, Ohio; PA, Pennsylvania; VA, Virginia; WV, West Virginia; --, information not available]

				Basin characteristics										
Station No.	State	Latitude, in decimal degrees	Longitude, in decimal degrees	Drainage area, in square miles	Main channel slope, in feet per mile	Stream length, in miles	Mean basin elevation, in feet above sea level	Forested area, in percent	Mean annual precipitation, in inches	Two-year 24-hour precipitation intensity, in inches	Mean annual snowfall, in inches	Mean minimum January temperature, in degrees Fahrenheit	Local station slope, in feet per mile	Streamflow variability index
03187300	WV	38.258	80.324	9.78	126	6.5	3,950	99	53	2.8	80	21	93.3	0.408
03187500	WV	38.295	80.527	80.4	52.5	27.2	3,270	99	49	2.8	90	22	45.8	.486
03189000	WV	38.229	80.583	150	76.6	20.6	3,320	95	49	2.8	80	22	37.7	.624
03189100	WV	38.291	80.641	529	21.9	46.6	3,050	92	49	2.8	80	23	23.8	.485
03189500	WV	38.271	80.819	680	18.0	62.8	2,960	90	49	2.8	80	24	19.3	.557
03189650	WV	38.176	80.869	2.78	143	2.8	2,080	95	49	2.7	70	23	31.0	.707
03190000	WV	38.112	80.876	287	15.1	44.9	2,880	75	48	2.8	70	22	17.4	.629
03190400	WV	38.190	80.947	365	17.3	55.7	2,700	80	48	2.8	70	23	49.2	.513
03190500	WV	38.225	80.932	4.22	35.0	3.8	1,750	25	48	2.7	60	24	18.3	.650
03191400	WV	38.258	80.990	4.28	110	3.5	1,500	60	48	2.7	60	24	111	.650
03191500	WV	38.262	81.023	40.2	53.1	13.1	1,700	80	48	2.7	55	25	18.7	.607
03192000	WV	38.233	81.181	1,317	19.2	99.9	2,690	85	48	2.8	70	24	4.41	.599
03192500	WV	38.225	81.192	1,402	19.2	100.9	2,690	85	48	2.8	70	24	4.41	.507
03193000	WV	38.138	81.214	8,371	6.30	329.0	2,690	65	42	2.8	35	24	4.41	.361
03193725	WV	37.981	81.274	.42	533	1.0	1,800	65	44	2.7	40	25	151	.450
03194700	WV	38.597	80.491	266	45.0	54.1	3,000	88	54	2.8	100	22	11.4	.476
03195000	WV	38.617	80.556	281	34.8	65.4	2,900	90	52	2.8	100	22	11.4	.540
03195100	WV	38.635	80.466	51.9	67.5	16.8	2,090	89	50	2.7	100	24	23.2	.557
03195250	WV	38.689	80.432	46.5	125	15.2	2,240	81	50	2.7	100	24	55.3	.550
03195500	WV	38.663	80.710	542	29.2	81.6	2,430	90	50	2.8	90	24	3.30	.571
03195600	WV	38.677	80.713	6.98	71.0	4.7	1,180	50	48	2.7	60	25	22.9	.629
03197000	WV	38.471	81.284	1,145	12.6	155.9	1,840	85	47	2.7	60	25	2.26	.600
03197150	WV	38.626	81.234	2.01	100	2.0	1,010	60	44	2.7	30	26	48.0	.950
03197900	WV	38.354	81.523	.49	242	1.1	1,015	70	44	2.7	24	26	88.0	.850
03198450	WV	38.125	81.692	7.75	49.0	4.8	1,230	50	43	2.7	24	26	28.1	.947

Table 2. Basin-characteristics data used in the regression analysis to develop low-recurrence-interval peak-discharge estimating equations for rural, unregulated streams in West Virginia—*Continued*

[MD, Maryland; OH, Ohio; PA, Pennsylvania; VA, Virginia; WV, West Virginia; --, information not available]

				Basin characteristics										
Station No.	State	Latitude, in decimal degrees	Longitude, in decimal degrees	Drainage area, in square miles	Main channel slope, in feet per mile	Stream length, in miles	Mean basin elevation, in feet above sea level	Forested area, in percent	Mean annual precipitation, in inches	Two-year 24-hour precipitation intensity, in inches	Mean annual snowfall, in inches	Mean minimum January temperature, in degrees Fahrenheit	Local station slope, in feet per mile	Streamflow variability index
03198500	WV	38.180	81.712	391	28.1	63.0	1,750	95	43	2.7	28	26	3.21	0.600
03198780	WV	38.006	81.815	1.97	330	2.5	1,410	95	44	2.7	24	26	117	.650
03198800	WV	38.028	81.834	1.28	167	2.0	1,130	90	44	2.7	24	26	132	.650
03199000	WV	38.080	81.836	269	19.7	32.3	1,630	95	44	2.7	26	26	5.13	.609
03199400	WV	38.155	81.852	318	15.5	40.4	1,540	95	44	2.7	24	26	3.25	.485
03200500	WV	38.339	81.842	862	10.5	106.9	1,450	90	44	2.7	24	26	1.72	.493
03200600	WV	38.451	81.854	.87	180	1.5	835	50	42	2.7	23	26	70.4	.850
03201000	WV	38.526	81.631	238	3.90	44.5	940	45	45	2.6	24	25	2.19	.875
03201410	WV	38.450	81.932	8.47	25.0	5.9	820	25	42	2.7	22	26	16.4	.602
03201420	WV	38.479	81.930	2.05	93.0	2.0	820	50	42	2.7	22	26	40.6	.850
03201440	WV	38.644	82.048	1.04	108	1.6	810	60	42	2.6	22	28	42.2	.850
03201480	WV	38.838	82.095	.70	128	1.3	710	90	40	2.6	22	27	52.8	.850
03202000	OH	38.870	82.360	585	2.81	71.6	829	21.9	40	2.6	21	26	--	--
03202400	WV	37.604	81.645	306	35.2	37.5	2,080	91	46	2.8	35	25	4.60	.398
03202480	WV	37.563	81.652	7.34	94.3	4.9	1,710	85	45	2.8	32	27	40.8	.592
03202750	WV	37.623	81.707	126	32.0	25.8	1,150	80	46	2.8	32	26	8.40	.512
03203000	WV	37.740	81.877	758	12.9	86.9	1,950	90	45	2.8	34	26	5.44	.586
03203600	WV	37.842	81.976	833	10.4	99.2	1,900	90	45	2.8	30	26	5.83	.480
03204000	WV	38.221	82.203	1,224	7.70	144.7	1,790	90	44	2.8	26	26	1.17	.566
03204500	WV	38.388	82.113	256	4.10	48.5	950	80	43	2.7	23	26	1.55	.819
03205995	OH	38.418	82.510	.73	124	1.52	740	84.9	42.5	2.7	--	28	--	--
03206600	WV	38.017	82.296	38.5	21.7	17.2	1,080	92	43	2.7	22	27	8.84	.694
03206800	WV	38.154	82.385	139	8.14	39.3	1,040	85	43	2.7	22	27	4.04	1.029
03207000	WV	38.217	82.449	291	6.57	48.3	1,020	80	43	2.7	22	27	2.51	.806
03207020	WV	38.249	82.434	300	5.70	52.3	1,020	80	43	2.7	22	27	2.51	.873

Table 2. Basin-characteristics data used in the regression analysis to develop low-recurrence-interval peak-discharge estimating equations for rural, unregulated streams in West Virginia—*Continued*

[MD, Maryland; OH, Ohio; PA, Pennsylvania; VA, Virginia; WV, West Virginia; --, information not available]

				Basin characteristics										
Station No.	State	Latitude, in decimal degrees	Longitude, in decimal degrees	Drainage area, in square miles	Main channel slope, in feet per mile	Stream length, in miles	Mean basin elevation, in feet above sea level	Forested area, in percent	Mean annual precipitation, in inches	Two-year 24-hour precipitation intensity, in inches	Mean annual snowfall, in inches	Mean minimum January temperature, in degrees Fahrenheit	Local station slope, in feet per mile	Streamflow variability index
03207400	VA	37.220	82.100	19.8	119	6.3	1,700	95	40.5	2.78	20.5	29.2	--	--
03207500	VA	37.300	82.130	235	36.6	23.5	2,040	92	41.6	2.71	21.8	27.6	--	--
03207800	VA	37.350	82.200	297	26.5	31.8	2,000	90	43.5	2.60	22.2	26.6	--	--
03207962	KY	37.449	82.338	.82	510	1.46	--	82	44	2.8	22	28	--	--
03208000	KY	37.416	82.421	392	16.9	52.7	1,900	--	44	2.8	22	28	--	--
03208500	VA	37.210	82.300	286	19.3	23.5	2,120	97	42.6	2.82	19.2	28.7	--	--
03208950	VA	37.120	82.440	66.5	42.5	17.0	2,090	95	46.0	2.84	19.6	28.0	--	--
03209000	VA	37.230	82.340	221	10.2	41.3	2,000	92	46.9	2.82	19.3	27.6	--	--
03209575	KY	37.311	82.816	3.17	181	2.59	--	--	42	2.8	22	28	--	--
03210000	KY	37.567	82.458	56.3	24.3	21.5	1,400	82	44	2.8	22	28	--	--
03211500	KY	37.744	82.724	206	6.4	55.1	1,200	82	44	2.8	22	28	--	--
03212000	KY	37.835	82.871	103	8.3	21.0	1,000	79	45	2.8	20	28	--	--
03212750	WV	37.441	81.600	174	24.5	23.9	2,120	75	43	2.8	40	26	9.78	0.349
03212980	WV	37.395	81.803	209	24.1	39.3	2,070	85	43	2.8	35	27	25.1	.439
03213000	WV	37.486	81.844	504	16.8	49.2	2,030	90	43	2.8	32	27	4.98	.470
03213500	WV	37.445	81.871	31.0	61.4	11.7	1,830	90	44	2.8	26	27	32.2	.652
03213700	WV	37.673	82.280	936	10.2	99.6	1,800	90	43	2.8	28	27	2.37	.436
03214000	WV	37.818	82.389	1,188	8.50	117.1	1,700	90	43	2.8	26	28	1.60	.512
03214500	WV	37.837	82.409	1,280	8.00	125.6	1,660	90	43	2.8	26	28	1.60	.531
03214900	WV	38.006	82.515	1,507	6.50	144.6	1,550	90	43	2.8	24	28	1.32	.432
03215500	KY	38.144	82.685	217	3.5	40.1	800	75	44	2.7	20	28	--	--
03216500	KY	38.330	82.939	400	3.7	47.2	900	68	44	2.8	20	28	--	--
03216540	KY	38.234	82.709	12.2	18.3	8.73	--	--	41	2.7	20	29	--	--
03216563	KY	38.364	82.796	.94	85.0	1.57	--	--	42	--	20	--	--	--

Table 3. Peak-discharge statistics from the frequency analysis of the gaging station's systematic and historical record used to develop low-recurrence-interval peak-discharge estimating equations for rural, unregulated streams in West Virginia

[MD, Maryland; OH, Ohio; PA, Pennsylvania; VA, Virginia; WV, West Virginia; --, information not available]

Station No.	State	Water years bounding systematic peaks	Number of years of record		Number of peaks			Skew			Trend analysis	
			Systematic	Historical	Historical	High outlier	Low outlier	General-ized	Systematic	Weighted	Kendall's tau	Significance level
01595000	MD	1955–1990	36	0	0	--	--	--	0.400	0.377	--	--
01595300	WV	1955–1982	27	73	1	1	0	0.348	.355	1.090	-0.239	0.083
01595500	MD	1950–1990	41	0	0	--	--	--	1.633	.877	--	--
01596000	MD	1924–1950	25	32	1	--	--	--	.378	.434	--	--
01596500	MD	1949–1990	42	0	0	--	--	--	.610	.511	--	--
01597000	MD	1949–1981	33	0	0	--	--	--	.925	.659	--	--
01598000	MD	1925–1950	24	0	0	--	--	--	.723	.545	--	--
01599000	MD	1931–1990	60	0	0	--	--	--	.492	.453	--	--
01599500	WV	1948–1969	21	0	0	0	0	.371	-.463	-.064	-.100	.546
01600000	MD	1936–1950	15	27	1	--	--	--	.472	.433	--	--
01601500	MD	1930–1990	61	0	0	--	--	--	.983	.756	--	--
01603000	MD	1930–1981	52	102	2	--	--	--	.823	.756	--	--
01604500	WV	1939–1997	59	0	0	0	0	.383	-.264	-.098	-.196	.028
01605500	WV	1936–1997	51	120	0	1	0	.419	.604	.436	.129	.185
01605700	WV	1965–1977	13	0	0	0	0	.404	.360	.385	.461	.033
01606000	WV	1940–1980	41	120	2	1	0	.389	.466	.777	.163	.135
01606500	WV	1924–1997	70	120	1	3	0	.396	.961	.703	.063	.447
01606800	WV	1965–1977	13	0	0	0	0	.415	.305	.367	.308	.161
01607500	WV	1944–1997	54	120	2	2	0	.433	.777	.678	-.117	.213
01608000	WV	1924–1997	68	120	0	1	0	.423	.898	.640	-.054	.512
01608100	WV	1965–1977	13	0	0	0	0	.419	-.358	.084	.153	.017
01608500	WV	1900–1997	74	120	1	3	0	.398	.667	.533	.091	.253
01609000	MD	1928–1981	22	0	0	--	--	--	.165	.265	--	--
01609500	MD	1948–1976	25	0	0	--	--	--	-.760	.583	--	--
01609800	WV	1967–1977	11	0	0	0	0	.406	.328	.375	.309	.213
01610000	MD	1936–1981	43	101	1	--	--	--	-.413	.010	--	--
01610150	MD	1965–1983	18	0	0	--	--	--	-.091	.141	--	--
01610155	MD	1968–1977	10	0	0	--	--	--	.101	.283	--	--
01610500	WV	1936–1951	14	67	0	[a]1	0	.446	.049	.115	-.142	.511
01611500	WV	1923–1997	74	109	1	1	0	.411	-.074	-.019	.041	.604

Table 3. Peak-discharge statistics from the frequency analysis of the gaging station's systematic and historical record used to develop low-recurrence-interval peak-discharge estimating equations for rural, unregulated streams in West Virginia—*Continued*

[MD, Maryland; OH, Ohio; PA, Pennsylvania; VA, Virginia; WV, West Virginia; --, information not available]

Station No.	State	Water years bounding systematic peaks	Number of years of record		Number of peaks			Skew			Trend analysis	
			Systematic	Historical	Historical	High outlier	Low outlier	General-ized	Systematic	Weighted	Kendall's tau	Significance level
01612500	MD	1948–1964	17	0	0	--	--	--	0.196	0.298	--	--
01613000	MD	1929–1994	63	0	0	--	--	--	.502	.475	--	--
01613150	MD	1965–1986	22	0	0	--	--	--	.244	.319	--	--
01613160	MD	1965–1976	12	0	0	--	--	--	.643	.504	--	--
01613900	VA	1961–1991	31	0	0	--	--	--	--	--	--	--
01614000	WV	1929–1997	46	0	0	0	1	0.445	-.531	.467	0.043	0.683
01615000	VA	1944–1991	48	0	0	--	--	--	--	--	--	--
01616000	VA	1950–1991	24	0	0	--	--	--	--	--	--	--
01616500	WV	1948–1997	50	62	1	1	0	.470	.176	.244	.300	.002
01617000	WV	1949–1977	24	0	0	0	1	.459	-1.046	.334	.197	.175
01617800	MD	1964–1990	27	0	0	--	--	--	.584	.538	--	--
01618000	MD	1929–1990	62	0	0	--	--	--	.288	.349	--	--
01619475	MD	1966–1976	11	0	0	--	--	--	.628	.553	--	--
01619500	MD	1928–1990	63	0	0	--	--	--	.323	.367	--	--
01620500	VA	1947–1991	45	0	0	--	--	--	--	--	--	--
01621000	VA	--	--	55	--	--	--	--	--	--	--	--
01621200	VA	1949–1976	27	0	0	--	--	--	--	--	--	--
01621400	VA	--	--	40	--	--	--	--	--	--	--	--
01621450	VA	--	--	25	--	--	--	--	--	--	--	--
01622000	VA	--	--	130	--	--	--	--	--	--	--	--
01622100	VA	1966–1975	10	0	0	--	--	--	--	--	--	--
01622300	VA	1967–1976	10	0	0	--	--	--	--	--	--	--
01622400	VA	1967–1991	21	0	0	--	--	--	--	--	--	--
01632000	VA	--	--	155	--	--	--	--	--	--	--	--
01632300	VA	1950–1977	24	0	0	--	--	--	--	--	--	--
01632900	VA	1961–1991	30	0	0	--	--	--	--	--	--	--
01632950	VA	1966–1975	10	0	0	--	--	--	--	--	--	--
01632970	VA	1972–1991	19	0	0	--	--	--	--	--	--	--
01633000	VA	--	--	155	--	--	--	--	--	--	--	--
01633500	VA	--	--	63	--	--	--	--	--	--	--	--

Table 3. Peak-discharge statistics from the frequency analysis of the gaging station's systematic and historical record used to develop low-recurrence-interval peak-discharge estimating equations for rural, unregulated streams in West Virginia—*Continued*

[MD, Maryland; OH, Ohio; PA, Pennsylvania; VA, Virginia; WV, West Virginia; --, information not available]

Station No.	State	Water years bounding systematic peaks	Number of years of record		Number of peaks			Skew			Trend analysis	
			Systematic	Historical	Historical	High outlier	Low outlier	Generalized	Systematic	Weighted	Kendall's tau	Significance level
01633650	VA	1971–1991	21	0	0	--	--	--	--	--	--	--
01634000	VA	--	--	120	--	--	--	--	--	--	--	--
01634500	VA	1936–1991	55	0	0	--	--	--	--	--	--	--
01636500	WV	1896–1997	80	128	2	4	0	0.515	0.146	0.134	0.033	0.662
01637000	MD	1948–1977	30	0	0	--	--	--	.355	.422	--	--
01637500	MD	1948–1990	43	0	0	--	--	--	.664	.615	--	--
01638480	VA	--	--	40	--	--	--	--	--	--	--	--
01638500	MD	1895–1990	96	102	1	--	--	--	.187	.326	--	--
01643700	VA	--	--	100	--	--	--	--	--	--	--	--
01644000	VA	1889–1991	65	0	0	--	--	--	--	--	--	--
01644100	VA	--	--	25	--	--	--	--	--	--	--	--
02009500	VA	1966–1975	10	0	0	--	--	--	--	--	--	--
02011400	VA	--	--	75	--	--	--	--	--	--	--	--
02011460	VA	--	--	75	--	--	--	--	--	--	--	--
02011480	VA	1974–1984	11	0	0	--	--	--	--	--	--	--
02011500	VA	--	--	75	--	--	--	--	--	--	--	--
02012500	VA	--	--	75	--	--	--	--	--	--	--	--
02012950	VA	--	--	25	--	--	--	--	--	--	--	--
02013000	VA	--	--	75	--	--	--	--	--	--	--	--
02014000	VA	--	--	122	--	--	--	--	--	--	--	--
03050000	WV	1916–1997	70	110	1	0	0	.320	.334	.436	.130	.113
03050500	WV	1945–1997	53	110	0	1	0	.306	.715	.469	.104	.275
03050650	WV	1964–1977	14	0	0	0	0	.306	-.094	.120	-.274	.189
03051000	WV	1908–1997	90	110	1	2	0	.284	.289	.269	.027	.709
03051500	WV	1916–1942	27	110	2	0	0	.276	.176	.251	.157	.260
03052000	WV	1943–1997	46	110	1	0	0	.265	.227	.276	.166	.105
03052340	WV	1966–1975	10	0	0	1	0	.246	.788	.440	-.222	.418
03052500	WV	1947–1997	51	0	0	0	0	.265	.402	.361	.121	.211
03053500	WV	1908–1997	83	0	0	0	0	.257	-.349	-.219	-.002	.978
03054500	WV	1941–1997	57	110	0	[b]1	0	.251	.352	.261	.143	.118

Table 3. Peak-discharge statistics from the frequency analysis of the gaging station's systematic and historical record used to develop low-recurrence-interval peak-discharge estimating equations for rural, unregulated streams in West Virginia—*Continued*

[MD, Maryland; OH, Ohio; PA, Pennsylvania; VA, Virginia; WV, West Virginia; --, information not available]

Station No.	State	Water years bounding systematic peaks	Number of years of record		Number of peaks			Skew			Trend analysis	
			Systematic	Historical	Historical	High outlier	Low outlier	General-ized	Systematic	Weighted	Kendall's tau	Significance level
03055020	WV	1966–1997	12	0	0	0	0	0.260	-0.516	-0.054	-0.091	0.730
03055040	WV	1964–1977	14	0	0	0	0	.259	.334	.292	-.121	.584
03056250	WV	1985–1997	13	0	0	0	0	.227	.313	.265	-.051	.855
03056500	WV	1908–1938	31	0	0	0	0	.219	.251	.239	-.026	.852
03056600	WV	1965–1977	13	0	0	0	0	.225	-.280	.005	.077	.760
03057300	WV	1985–1997	13	0	0	0	0	.238	-.013	.125	.205	.360
03057500	WV	1946–1985	40	0	0	0	0	.226	-.295	-.123	-.072	.521
03058000	WV	1947–1989	43	102	0	1	0	.218	.337	.162	-.128	.229
03058500	WV	1916–1989	74	102	0	[c]1	0	.205	-.085	-.074	-.123	.124
03059000	WV	1924–1983	60	102	1	0	0	.191	-.488	-.286	-.016	.858
03059500	WV	1944–1970	27	0	0	0	0	.206	-.062	.041	-.078	.588
03060500	WV	1952–1969	18	0	0	0	0	.165	-.347	-.091	.013	.970
03061000	WV	1908–1989	65	102	0	[d]1	0	.178	-.183	-.140	-.002	.986
03061500	WV	1916–1997	73	90	1	0	0	.178	-.178	-.041	-.024	.768
03062400	WV	1966–1997	32	0	0	1	0	.190	.854	.562	-.123	.330
03062500	WV	1947–1997	30	51	1	0	0	.187	.324	.368	-.172	.187
03063950	WV	1965–1977	12	0	0	1	0	.351	1.487	.674	.030	.945
03065000	WV	1941–1997	57	110	0	1	0	.322	1.310	.859	.167	.068
03066000	WV	1922–1997	76	110	0	1	0	.337	.746	.596	.181	.021
03068610	WV	1974–1997	15	0	0	0	0	.334	-.032	.157	.162	.428
03069000	WV	1911–1996	72	110	2	1	0	.311	.992	.721	.064	.428
03069500	WV	1914–1997	84	154	2	4	0	.307	1.144	.791	.134	.071
03069850	WV	1966–1977	12	0	0	1	0	.280	.609	.412	-.030	.945
03069880	WV	1968–1997	14	30	1	0	0	.279	-.464	.642	-.253	.227
03070000	WV	1921–1996	74	154	2	2	0	.276	.796	.527	.178	.024
03070500	WV	1910–1997	83	110	1	0	0	.230	.692	.711	-.066	.376
03071000	WV	1903–1958	47	142	1	0	0	.291	.130	.210	-.004	.978
03071500	WV	1903–1926	16	142	1	0	0	.196	-.284	-.091	.017	.964
03072000	PA	1941–1975	35	0	0	- -	- -	- -	-.277	.093	- -	- -
03072590	PA	1964–1978	15	0	0	- -	- -	- -	.132	.161	- -	- -

Table 3. Peak-discharge statistics from the frequency analysis of the gaging station's systematic and historical record used to develop low-recurrence-interval peak-discharge estimating equations for rural, unregulated streams in West Virginia—*Continued*

[MD, Maryland; OH, Ohio; PA, Pennsylvania; VA, Virginia; WV, West Virginia; --, information not available]

Station No.	State	Water years bounding systematic peaks	Number of years of record		Number of peaks			Skew			Trend analysis	
			Systematic	Historical	Historical	High outlier	Low outlier	General-ized	Systematic	Weighted	Kendall's tau	Significance level
03075450	MD	1965–1976	12	0	0	- -	- -	- -	-1.024	-0.164	- -	- -
03075500	MD	1942–1990	49	0	0	- -	- -	- -	.095	.151	- -	- -
03075600	MD	1965–1986	22	0	0	- -	- -	- -	.599	.452	- -	- -
03076505	MD	1965–1976	12	0	0	- -	- -	- -	-.475	-.034	- -	- -
03076600	MD	1965–1990	26	0	0	- -	- -	- -	.214	.239	- -	- -
03108000	PA	1916–1975	50	0	0	- -	- -	- -	-.216	-.072	- -	- -
03109000	OH	1947–1981	35	0	0	- -	- -	- -	.441	.256	- -	- -
03109500	OH	1916–1987	72	0	0	- -	- -	- -	.214	.162	- -	- -
03110000	OH	1941–1987	47	0	0	- -	- -	- -	.296	.200	- -	- -
03110980	OH	1978–1987	10	0	0	- -	- -	- -	-.105	-.048	- -	- -
03111150	PA	1961–1975	15	0	0	- -	- -	- -	-.135	.050	- -	- -
03111450	OH	1978–1987	10	0	0	- -	- -	- -	-.031	-.019	- -	- -
03111455	OH	1978–1987	10	0	0	- -	- -	- -	-.769	-.284	- -	- -
03111470	OH	1978–1987	10	0	0	- -	- -	- -	.400	.142	- -	- -
03111490	OH	1978–1987	10	0	0	- -	- -	- -	1.568	.324	- -	- -
03111500	OH	1942–1987	46	0	0	--	--	--	-.735	-.261	--	--
03111540	OH	1978–1987	10	0	0	--	--	--	-.118	-.047	--	--
03112000	WV	1941–1986	46	0	0	0	0	0.036	-.031	-.013	-0.014	0.902
03113700	WV	1970–1996	12	0	0	0	0	.042	-.143	-.037	-.182	.451
03114000	OH	1927–1987	38	0	0	- -	- -	- -	.061	.049	- -	- -
03114240	OH	1978–1987	10	0	0	- -	- -	- -	-.254	-.080	- -	- -
03114500	WV	1916–1997	78	123	1	0	0	.079	.157	.199	.095	.219
03114550	WV	1966–1977	12	0	0	0	0	.071	-.547	-.179	.212	.373
03114600	WV	1967–1977	11	0	0	0	0	.073	-.362	-.100	-.018	1.000
03114650	WV	1969–1997	13	0	0	0	0	.076	.005	.044	.256	.246
03115280	OH	1978–1987	10	0	0	- -	- -	- -	1.257	.404	- -	- -
03115400	OH	1959–1981	23	75	0	1	- -	- -	.188	-.204	- -	- -
03115410	OH	1978–1987	10	0	0	- -	- -	- -	-.667	-.216	- -	- -
03115510	OH	1978–1987	10	0	0	- -	- -	- -	.937	.348	- -	- -
03115600	OH	1947–1979	33	0	0	- -	- -	- -	.121	.076	- -	- -

Table 3. Peak-discharge statistics from the frequency analysis of the gaging station's systematic and historical record used to develop low-recurrence-interval peak-discharge estimating equations for rural, unregulated streams in West Virginia—*Continued*

[MD, Maryland; OH, Ohio; PA, Pennsylvania; VA, Virginia; WV, West Virginia; --, information not available]

Station No.	State	Water years bounding systematic peaks	Number of years of record		Number of peaks			Skew			Trend analysis	
			Systematic	Historical	Historical	High outlier	Low outlier	General-ized	Systematic	Weighted	Kendall's tau	Significance level
03115710	OH	1978–1987	10	0	0	- -	- -	- -	1.180	0.361	- -	- -
03150600	OH	1966–1980	15	0	0	- -	- -	- -	.567	.264	- -	- -
03151400	WV	1975–1997	21	80	0	[e]1	0	0.247	.521	.273	0.247	0.124
03151500	WV	1939–1973	35	79	1	0	0	.227	-.427	-.224	.045	.712
03152000	WV	1929–1978	50	0	0	0	0	.181	-.008	.040	-.050	.616
03152200	WV	1970–1997	12	0	0	0	0	.171	-.153	.033	.151	.537
03152500	WV	1938–1951	14	0	0	0	0	.173	-.597	-.158	.461	.025
03153000	WV	1939–1975	37	0	0	0	1	.166	-.878	-.207	.087	.456
03153500	WV	1929–1978	50	0	0	0	0	.147	-.354	-.205	.038	.707
03154000	WV	1929–1997	63	0	0	0	0	.141	-.200	-.119	-.124	.151
03154250	WV	1970–1997	12	0	0	0	0	.127	.044	.091	.182	.451
03154500	WV	1952–1978	27	0	0	0	0	.098	-.596	-.290	.168	.227
03155000	WV	1939–1978	40	0	0	0	1	.084	-.738	-.134	.024	.834
03155200	WV	1938–1951	14	0	0	0	0	.111	-.548	-.175	.330	.111
03155450	WV	1965–1997	16	0	0	0	0	.099	-.331	-.106	.117	.558
03155500	WV	1930–1997	59	0	0	0	0	.092	-.092	-.049	-.043	.638
03159540	OH	1966–1987	22	0	0	- -	- -	- -	.982	.463	- -	- -
03159700	WV	1965–1977	13	0	0	1	0	.088	1.189	.465	-.141	.541
03171500	VA	- -	- -	150	- -	- -	- -	- -	- -	- -	- -	- -
03173000	VA	- -	- -	115	- -	- -	- -	- -	- -	- -	- -	- -
03175500	VA	1909–1991	62	0	0	- -	- -	- -	- -	- -	- -	- -
03176500	VA	- -	- -	150	- -	- -	- -	- -	- -	- -	- -	- -
03177000	WV	1942–1951	10	0	0	0	0	.381	-.408	.085	.156	.588
03177500	WV	1942–1951	10	0	0	0	1	.366	-1.599	-.081	.178	.530
03177700	VA	1966–1980	15	0	0	--	--	--	--	--	--	--
03178500	WV	1947–1997	28	51	0	[f]1	0	.335	-.122	-.058	-.020	.895
03179000	WV	1951–1997	47	0	0	0	2	.344	-1.000	.035	.092	.369
03179500	WV	1909–1948	27	0	0	0	0	.345	-.191	.022	.217	.118
03180000	WV	1924–1948	25	71	1	1	0	.347	1.218	.800	.100	.498
03180350	WV	1966–1977	12	0	0	0	0	.357	.391	.371	.167	.492

Table 3. Peak-discharge statistics from the frequency analysis of the gaging station's systematic and historical record used to develop low-recurrence-interval peak-discharge estimating equations for rural, unregulated streams in West Virginia—*Continued*

[MD, Maryland; OH, Ohio; PA, Pennsylvania; VA, Virginia; WV, West Virginia; --, information not available]

Station No.	State	Water years bounding systematic peaks	Number of years of record		Number of peaks			Skew			Trend analysis	
			Systematic	Historical	Historical	High outlier	Low outlier	General-ized	Systematic	Weighted	Kendall's tau	Significance level
03180500	WV	1944–1997	54	102	0	2	0	0.359	1.624	0.972	0.188	0.046
03180530	WV	1966–1977	11	0	0	0	0	.370	-.155	.157	.236	.350
03180680	WV	1965–1977	13	0	0	0	0	.378	-.134	.151	.205	.360
03181900	WV	1965–1977	13	0	0	0	1	.376	-.768	.086	-.167	.459
03182000	WV	1946–1997	18	80	1	1	0	.367	1.499	.901	.124	.495
03182500	WV	1930–1997	68	102	0	1	0	.364	.609	.473	.144	.084
03182700	WV	1972–1982	11	80	1	0	0	.381	.775	.654	-.309	.213
03183000	WV	1946–1997	29	0	0	0	0	.388	.107	.212	.121	.367
03183500	WV	1896–1997	102	0	0	0	0	.364	-.223	-.122	-.014	.842
03183550	WV	1966–1977	12	0	0	0	1	.356	-1.136	-.089	.136	.582
03183570	WV	1966–1977	12	0	0	0	0	.361	.436	.392	.076	.783
03184000	WV	1936–1997	62	0	0	0	0	.356	.139	.190	.103	.241
03184500	WV	1937–1948	12	41	0	1	0	.344	.602	.041	.000	1.000
03185000	WV	1952–1982	31	0	0	0	0	.305	.340	.326	-.075	.563
03185020	WV	1966–1977	12	0	0	0	0	.316	-.703	-.086	.167	.492
03185500	WV	1929–1948	20	0	0	0	0	.293	-.167	.045	-.032	.871
03186000	WV	1896–1948	35	71	1	0	0	.281	-.434	-.128	-.040	.744
03186500	WV	1930–1997	68	0	0	0	0	.301	.522	.463	.058	.485
03187000	WV	1930–1997	66	0	0	0	0	.289	.227	.241	-.008	.925
03187300	WV	1969–1997	18	0	0	0	0	.334	.637	.478	.241	.173
03187500	WV	1945–1997	39	66	1	0	0	.307	.436	.411	.096	.397
03189000	WV	1930–1982	43	71	0	1	0	.310	1.077	.769	.171	.109
03189100	WV	1965–1997	31	66	2	1	0	.295	-.035	.047	-.019	.892
03189500	WV	1929–1965	37	0	0	1	0	.279	.912	.641	-.117	.314
03189650	WV	1966–1977	12	0	0	0	0	.287	-.519	-.039	.000	1.000
03190000	WV	1909–1971	51	0	0	0	0	.296	.029	.097	.073	.455
03190400	WV	1967–1997	29	0	0	0	0	.277	-.028	.083	.113	.398
03190500	WV	1966–1976	11	0	0	0	0	.273	-.731	-.106	.291	.241
03191400	WV	1966–1997	16	52	0	[g]1	0	.262	.384	.109	.283	.137
03191500	WV	1946–1997	31	52	0	[h]1	0	.258	.400	.287	-.071	.586

Table 3. Peak-discharge statistics from the frequency analysis of the gaging station's systematic and historical record used to develop low-recurrence-interval peak-discharge estimating equations for rural, unregulated streams in West Virginia—*Continued*

[MD, Maryland; OH, Ohio; PA, Pennsylvania; VA, Virginia; WV, West Virginia; --, information not available]

Station No.	State	Water years bounding systematic peaks	Number of years of record		Number of peaks			Skew			Trend analysis	
			Systematic	Historical	Historical	High outlier	Low outlier	General-ized	Systematic	Weighted	Kendall's tau	Significance level
03192000	WV	1929–1964	36	55	1	0	0	0.242	0.444	0.451	-0.081	0.496
03192500	WV	1909–1930	14	56	2	1	0	.242	.410	.030	.341	.098
03193000	WV	1878–1948	71	0	0	0	0	.253	-.075	-.008	-.108	.183
03193725	WV	1966–1977	12	0	0	0	1	.269	-.478	.350	.242	.301
03194700	WV	1930–1997	66	102	0	1	0	.270	.769	.615	.107	.205
03195000	WV	1935–1963	29	0	0	0	0	.260	-.043	.068	.121	.367
03195100	WV	1975–1987	10	0	0	1	0	.268	1.062	.526	.022	1.000
03195250	WV	1975–1997	20	0	0	0	0	.265	.560	.413	.337	.041
03195500	WV	1939–1960	22	0	0	0	0	.235	-.127	.031	.056	.735
03195600	WV	1966–1997	16	0	0	0	0	.233	.271	.251	.200	.300
03197000	WV	1929–1960	32	43	0	1	0	.191	.654	.451	-.181	.149
03197150	WV	1966–1977	12	0	0	0	1	.174	-1.608	.044	-.152	.537
03197900	WV	1964–1975	12	0	0	0	0	.179	.326	.240	.030	.945
03198450	WV	1965–1997	17	0	0	0	0	.196	.949	.519	.147	.434
03198500	WV	1909–1997	75	0	0	0	0	.184	.124	.136	.059	.453
03198780	WV	1966–1977	12	0	0	0	0	.201	-.087	.077	-.152	.537
03198800	WV	1963–1977	14	0	0	0	0	.195	-.408	-.072	-.022	.956
03199000	WV	1931–1984	54	0	0	0	0	.186	-.028	.024	-.020	.835
03199400	WV	1975–1984	10	0	0	0	0	.171	.728	.372	.067	.858
03200500	WV	1909–1997	42	0	0	0	0	.140	-.471	-.262	-.082	.448
03200600	WV	1966–1977	12	0	0	0	1	.118	-.541	.173	.258	.271
03201000	WV	1909–1997	52	0	0	0	0	.135	-.223	-.125	-.038	.693
03201410	WV	1967–1997	18	0	0	0	0	.108	-.060	.020	-.203	.256
03201420	WV	1965–1977	13	0	0	0	1	.103	-1.307	-.270	-.346	.112
03201440	WV	1965–1977	13	0	0	0	0	.058	.995	.402	-.026	.951
03201480	WV	1965–1977	13	0	0	0	0	.019	-.768	-.300	-.436	.044
03202000	OH	1916–1985	68	0	0	- -	- -	- -	.314	.235	- -	- -
03202400	WV	1969–1997	29	0	0	0	0	.265	-.156	.003	-.150	.260
03202480	WV	1970–1997	12	0	0	0	0	.268	.086	.190	-.061	.837
03202750	WV	1975–1997	23	0	0	0	1	.255	-1.111	.206	-.107	.492

Table 3. Peak-discharge statistics from the frequency analysis of the gaging station's systematic and historical record used to develop low-recurrence-interval peak-discharge estimating equations for rural, unregulated streams in West Virginia—*Continued*

[MD, Maryland; OH, Ohio; PA, Pennsylvania; VA, Virginia; WV, West Virginia; --, information not available]

Station No.	State	Water years bounding systematic peaks	Number of years of record		Number of peaks			Skew			Trend analysis	
			Systematic	Historical	Historical	High outlier	Low outlier	General-ized	Systematic	Weighted	Kendall's tau	Significance level
03203000	WV	1929–1979	51	0	0	0	0	0.223	-0.413	-0.222	0.064	0.516
03203600	WV	1961–1979	19	0	0	0	0	.200	-.641	-.208	.094	.600
03204000	WV	1916–1979	58	73	1	1	0	.107	-.637	-.430	.065	.477
03204500	WV	1938–1980	43	70	1	2	0	.093	.462	.345	.078	.470
03205995	OH	1978–1987	10	0	0	- -	- -	- -	.745	.288	- -	- -
03206600	WV	1965–1997	33	0	0	0	1	.124	-.156	.282	.182	.141
03206800	WV	1962–1971	10	59	1	1	0	.088	.734	.248	-.156	.591
03207000	WV	1916–1966	31	59	1	0	0	.068	-.138	.012	-.138	.284
03207020	WV	1916–1971	36	59	1	0	0	.066	-.185	-.010	-.108	.361
03207400	VA	- -	- -	40	- -	- -	- -	- -	- -	- -	- -	- -
03207500	VA	1929–1991	42	0	0	- -	- -	- -	- -	- -	- -	- -
03207800	VA	- -	- -	63	- -	- -	- -	- -	- -	- -	- -	- -
03207962	KY	1975–1984	10	0	0	- -	- -	- -	-.442	-.048	- -	- -
03208000	KY	1938–1968	30	107	0	[i]1	--	--	-.134	-.177	--	--
03208500	VA	1927–1991	65	0	0	--	--	--	--	--	--	--
03208950	VA	--	65	--	--	--	--	--	--	--	--	--
03209000	VA	- -	- -	75	- -	- -	- -	- -	- -	- -	- -	- -
03209575	KY	1976–1985	10	0	0	- -	- -	- -	1.460	.478	- -	- -
03210000	KY	1938–1985	46	0	0	- -	- -	- -	-.541	-.308	- -	- -
03211500	KY	1938–1949	12	32	2	- -	- -	- -	-1.027	-.130	- -	- -
03212000	KY	1950–1981	32	0	0	- -	- -	- -	-.615	-.343	- -	- -
03212750	WV	1986–1997	12	0	0	0	1	.287	-.727	.122	.182	.451
03212980	WV	1986–1997	12	0	0	0	1	.269	-2.111	-.135	.273	.244
03213000	WV	1931–1986	56	0	0	0	0	.255	-.276	-.134	.062	.506
03213500	WV	1947–1985	39	0	0	0	0	.256	-.353	-.145	.162	.150

Table 3. Peak-discharge statistics from the frequency analysis of the gaging station's systematic and historical record used to develop low-recurrence-interval peak-discharge estimating equations for rural, unregulated streams in West Virginia—*Continued*

[MD, Maryland; OH, Ohio; PA, Pennsylvania; VA, Virginia; WV, West Virginia; --, information not available]

Station No.	State	Water years bounding systematic peaks	Number of years of record		Number of peaks			Skew			Trend analysis	
			Systematic	Historical	Historical	High outlier	Low outlier	General-ized	Systematic	Weighted	Kendall's tau	Significance level
03213700	WV	1968–1997	30	0	0	0	1	0.169	-0.328	0.247	-0.060	0.656
03214000	WV	1935–1985	51	0	0	0	0	.133	.006	.038	.123	.205
03214500	WV	1916–1997	71	0	0	0	1	.127	-.145	.126	-.012	.889
03214900	WV	1977–1995	12	0	0	0	0	.087	.204	.136	-.182	.451
03215500	KY	1916–1984	52	0	0	- -	- -	- -	.140	.113	- -	- -
03216500	KY	1937–1967	30	84	0	[j]1	- -	- -	-.523	.065	- -	- -
03216540	KY	1973–1985	13	0	0	- -	- -	- -	.726	.310	- -	- -
03216563	KY	1976–1985	10	0	0	- -	- -	- -	-1.144	.181	- -	- -

[a] High-outlier threshold was set to 36,000 cubic feet per second.
[b] High-outlier threshold was set to 60,000 cubic feet per second.
[c] High-outlier threshold was set to 17,000 cubic feet per second.
[d] High-outlier threshold was set to 41,000 cubic feet per second.
[e] High-outlier threshold was set to 19,000 cubic feet per second.
[f] High-outlier threshold was set to 5,600 cubic feet per second.
[g] High-outlier threshold was set to 1,900 cubic feet per second.
[h] High-outlier threshold was set to 11,000 cubic feet per second.
[i] High-outlier threshold was set to 32,000 cubic feet per second.
[j] High-outlier threshold was set to 24,000 cubic feet per second.

Table 4. Magnitude and frequency of peak discharges for gaging stations in West Virginia and surrounding States

Peak discharges for the indicated recurrence interval are presented in the following order: first line (S), from the systematic and historical record on the basis of the guidelines established by the Water Resources Council; second line (R), from the regionalized regression equation; and, third line (W), from weighting (1) the systematic and historical record on the basis of the guidelines established by the

Station No.	Station name and State	Region	Esti-mate type	Peak discharge for the indicated recurrence interval, in cubic feet per second											
				1.1-year	1.2-year	1.3-year	1.4-year	1.5-year	1.6-year	1.7-year	1.8-year	1.9-year	2-year	2.5-year	3-year
01595000	North Branch Potomac River at Steyer, MD	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	3,320	- -	- -
01595300	Abram Creek at Oakmont, WV	East	S	800	882	944	998	1,050	1,090	1,130	1,170	1,210	1,240	1,390	1,490
			R	724	871	981	1,070	1,160	1,230	1,300	1,360	1,420	1,480	1,720	1,890
			W	797	881	946	1,000	1,050	1,100	1,140	1,180	1,220	1,250	1,410	1,510
01595500	North Branch Potomac River at Kitzmiller, MD	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	7,470	- -	- -
01596000	North Branch Potomac River at Bloomington, MD	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	8,040	- -	--
01596500	Savage River near Barton, MD	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	1,460	- -	- -
01597000	Crabtree Creek near Swanton, MD	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	484	- -	- -
01598000	Savage River at Bloomington, MD	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	3,450	- -	--
01599000	Georges Creek at Franklin, MD	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	1,860	- -	- -
01599500	New Creek near Keyser, WV	East	S	405	526	620	699	769	832	889	943	992	1,040	1,240	1,400
			R	779	937	1,060	1,160	1,250	1,330	1,400	1,470	1,530	1,590	1,850	2,040
			W	421	547	644	727	799	865	925	980	1,030	1,080	1,290	1,460
01600000	North Branch Potomac River at Pinto, MD	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	16,100	- -	--
01601500	Wills Creek near Cumberland, MD	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	5,930	- -	--
01603000	North Branch Potomac River near Cumberland, MD	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	17,700	- -	--
01604500	Patterson Creek near Headsville, WV	East	S	1,520	1,980	2,340	2,650	2,910	3,160	3,380	3,580	3,770	3,950	4,710	5,340
			R	2,750	3,310	3,740	4,100	4,420	4,710	4,970	5,220	5,450	5,670	6,610	7,300
			W	1,540	2,010	2,370	2,680	2,950	3,200	3,420	3,630	3,820	4,000	4,780	5,420
01605500	South Branch Potomac River at Franklin, WV	East	S	1,930	2,400	2,760	3,070	3,350	3,610	3,840	4,070	4,280	4,480	5,360	6,020
			R	2,400	2,890	3,260	3,570	3,850	4,100	4,330	4,550	4,750	4,940	5,750	6,350
			W	1,940	2,410	2,770	3,090	3,370	3,630	3,860	4,090	4,300	4,500	5,380	6,030

Table 4. Magnitude and frequency of peak discharges for gaging stations in West Virginia and surrounding States—*Continued*

Peak discharges for the indicated recurrence interval are presented in the following order: first line (S), from the systematic and historical record on the basis of the guidelines established by the Water Resources Council; second line (R), from the regionalized regression equation; and, third line (W), from weighting (1) the systematic and historical record on the basis of the guidelines established by the

Station No.	Station name and State	Region	Estimate type	Peak discharge for the indicated recurrence interval, in cubic feet per second											
				1.1-year	1.2-year	1.3-year	1.4-year	1.5-year	1.6-year	1.7-year	1.8-year	1.9-year	2-year	2.5-year	3-year
01605700	Reeds Creek Tributary near Franklin, WV	East	S	10.7	12.6	14.1	15.3	16.3	17.2	18.1	18.9	19.6	20.3	23.2	25.3
			R	17.8	21.2	23.8	26.0	27.9	29.7	31.2	32.7	34.0	35.3	40.7	44.7
			W	11.1	13.2	14.8	16.1	17.3	18.3	19.2	20.1	20.9	21.7	25.0	27.4
01606000	North Fork South Branch Potomac River at Cabins, WV	East	S	4,470	5,190	5,740	6,220	6,650	7,030	7,390	7,730	8,050	8,340	9,670	10,600
			R	4,040	4,870	5,500	6,040	6,510	6,940	7,330	7,690	8,040	8,360	9,760	10,800
			W	4,460	5,180	5,740	6,210	6,640	7,030	7,390	7,730	8,050	8,340	9,670	10,600
01606500	South Branch Potomac River near Petersburg, WV	East	S	6,400	7,590	8,510	9,300	10,000	10,700	11,300	11,900	12,400	12,900	15,200	16,800
			R	7,260	8,760	9,900	10,900	11,700	12,500	13,200	13,900	14,500	15,100	17,600	19,500
			W	6,420	7,610	8,540	9,340	10,100	10,700	11,300	11,900	12,500	13,000	15,200	16,800
01606800	Brushy Run near Petersburg, WV	East	S	13.8	18.1	21.7	24.8	27.7	30.4	32.9	35.3	37.5	39.7	49.6	57.3
			R	42.0	50.2	56.4	61.6	66.2	70.3	74.0	77.5	80.8	83.8	96.8	106.0
			W	15.1	19.9	23.9	27.3	30.5	33.5	36.2	38.9	41.3	43.7	54.4	62.7
01607500	South Fork South Branch Potomac River at Brandywine, WV	East	S	1,510	1,860	2,140	2,380	2,610	2,820	3,010	3,200	3,380	3,550	4,320	4,880
			R	1,510	1,820	2,050	2,250	2,420	2,580	2,720	2,860	2,980	3,100	3,610	3,990
			W	1,510	1,860	2,140	2,380	2,610	2,810	3,010	3,190	3,370	3,530	4,290	4,840
01608000	South Fork South Branch Potomac River near Moorefield, WV	East	S	2,800	3,410	3,880	4,300	4,670	5,020	5,340	5,640	5,930	6,200	7,430	8,310
			R	3,450	4,160	4,700	5,150	5,550	5,920	6,250	6,560	6,850	7,120	8,310	9,180
			W	2,810	3,430	3,900	4,320	4,700	5,040	5,360	5,670	5,960	6,230	7,460	8,340
01608100	Williams Hollow near Moorefield, WV	East	S	30.2	34.0	36.6	38.6	40.4	41.9	43.2	44.4	45.4	46.4	50.5	53.4
			R	8.2	9.8	11.1	12.1	13.0	13.8	14.5	15.1	15.8	16.3	18.8	20.6
			W	27.5	30.6	32.8	34.5	36.0	37.2	38.4	39.4	40.3	41.1	44.6	47.2
01608500	South Branch Potomac River near Springfield, WV	East	S	10,400	12,700	14,500	16,100	17,500	18,800	20,000	21,100	22,100	23,100	27,600	30,800
			R	14,000	16,900	19,100	21,000	22,700	24,200	25,600	26,900	28,100	29,200	34,200	37,800
			W	10,500	12,800	14,600	16,200	17,600	18,900	20,100	21,200	22,300	23,300	27,700	31,000
01609000	Town Creek near Oldtown, MD	East	S	--	--	--	--	--	--	--	--	--	3,800	--	--
01609500	Sawpit Run near Oldtown, MD	East	S	--	--	--	--	--	--	--	--	--	262	--	--
01609800	Little Cacapon River near Levels, WV	East	S	2,030	2,390	2,660	2,880	3,070	3,240	3,400	3,540	3,670	3,800	4,330	4,720
			R	1,570	1,890	2,140	2,340	2,520	2,690	2,830	2,980	3,110	3,230	3,760	4,150
			W	1,980	2,320	2,580	2,790	2,980	3,150	3,300	3,440	3,570	3,690	4,220	4,600
01610000	Potomac River at Paw Paw, WV	East[1]	S	--	--	--	--	--	--	--	--	--	44,700	--	--
01610150	Bear Creek at Forest Park, MD	East	S	--	--	--	--	--	--	--	--	--	378	--	--
01610155	Sideling Hill Creek at Bellegrove, MD	East	S	--	--	--	--	--	--	--	--	--	4,450	--	--

Table 4. Magnitude and frequency of peak discharges for gaging stations in West Virginia and surrounding States—*Continued*

Peak discharges for the indicated recurrence interval are presented in the following order: first line (S), from the systematic and historical record on the basis of the guidelines established by the Water Resources Council; second line (R), from the regionalized regression equation; and, third line (W), from weighting (1) the systematic and historical record on the basis of the guidelines established by the

Station No.	Station name and State	Region	Esti-mate type	Peak discharge for the indicated recurrence interval, in cubic feet per second											
				1.1-year	1.2-year	1.3-year	1.4-year	1.5-year	1.6-year	1.7-year	1.8-year	1.9-year	2-year	2.5-year	3-year
01610500	Cacapon River at Yellow Spring, WV	East	S	2,500	3,350	4,040	4,640	5,180	5,680	6,140	6,580	6,990	7,390	9,130	10,600
			R	3,750	4,520	5,100	5,600	6,040	6,430	6,790	7,130	7,450	7,740	9,040	9,980
			W	2,600	3,460	4,150	4,740	5,280	5,770	6,230	6,650	7,060	7,440	9,120	10,500
01611500	Cacapon River near Great Cacapon, WV	East	S	5,060	6,640	7,880	8,940	9,880	10,700	11,500	12,200	12,900	13,600	16,300	18,600
			R	7,250	8,750	9,890	10,900	11,700	12,500	13,200	13,900	14,500	15,100	17,600	19,500
			W	5,090	6,680	7,920	8,980	9,920	10,800	11,600	12,300	13,000	13,600	16,400	18,600
01612500	Little Tonoloway Creek near Hancock, MD	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	520	- -	- -
01613000	Potomac River at Hancock, MD	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	55,500	- -	- -
01613150	Ditch Run near Hancock, MD	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	238	- -	- -
01613160	Potomac River Tributary near Hancock, MD	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	105	- -	- -
01613900	Hogue Creek near Hayfield, VA	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	838	- -	- -
01614000	Back Creek near Jones Springs, WV	East	S	2,800	3,340	3,740	4,090	4,390	4,660	4,910	5,140	5,360	5,570	6,450	7,100
			R	3,010	3,620	4,090	4,490	4,840	5,150	5,440	5,710	5,970	6,200	7,240	7,990
			W	2,810	3,350	3,760	4,100	4,410	4,680	4,930	5,170	5,390	5,600	6,490	7,150
01615000	Opequon Creek near Berryville, VA	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	2,200	- -	- -
01616000	Abrams Creek near Winchester, VA	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	483	- -	- -
01616500	Opequon Creek near Martinsburg, WV	East	S	1,860	2,380	2,780	3,120	3,430	3,710	3,970	4,210	4,440	4,650	5,600	6,340
			R	3,410	4,110	4,640	5,090	5,490	5,840	6,170	6,480	6,770	7,040	8,210	9,070
			W	1,890	2,420	2,820	3,170	3,490	3,780	4,040	4,290	4,520	4,740	5,700	6,460
01617000	Tuscarora Creek above Martinsburg, WV	East[2]	S	80	98	110	121	131	140	148	155	162	168	197	217
01618000	Potomac River at Shepherdstown, MD	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	72,200	- -	- -
01619500	Antietam Creek near Sharpsburg, MD	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	2,560	- -	- -
01620500	North River near Stokesville, VA	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	668	- -	- -
01621000	Dry River at Rawley Springs, VA	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	2,260	- -	- -

Table 4. Magnitude and frequency of peak discharges for gaging stations in West Virginia and surrounding States—*Continued*

Peak discharges for the indicated recurrence interval are presented in the following order: first line (S), from the systematic and historical record on the basis of the guidelines established by the Water Resources Council; second line (R), from the regionalized regression equation; and, third line (W), from weighting (1) the systematic and historical record on the basis of the guidelines established by the

Station No.	Station name and State	Region	Esti-mate type	Peak discharge for the indicated recurrence interval, in cubic feet per second											
				1.1-year	1.2-year	1.3-year	1.4-year	1.5-year	1.6-year	1.7-year	1.8-year	1.9-year	2-year	2.5-year	3-year
01621200	War Branch near Hinton, VA	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	550	- -	- -
01621400	Blacks Run at Harrisonburg, VA	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	469	- -	- -
01621450	Blacks Run Tributary near Harrisonburg, VA	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	40.8	- -	- -
01622000	North River near Burketown, VA	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	7,020	- -	- -
01622100	North River Tributary at Mount Crawford, VA	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	58.5	- -	- -
01622300	Buffalo Branch Tributary near Augusta Springs, VA	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	54.7	- -	- -
01622400	Buffalo Branch Tributary near Christian, VA	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	51.3	- -	- -
01632000	North Fork Shenandoah River at Cootes Store, VA	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	8,210	- -	- -
01632300	Long Meadow near Broadway, VA	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	132	- -	- -
01632900	Smith Creek near New Market, VA	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	2,160	- -	- -
01632950	Crooked Run Tributary near Conicville, VA	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	22.7	- -	- -
01632970	Crooked Run near Mount Jackson, VA	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	735	- -	- -
01633000	North Fork Shenandoah River at Mount Jackson, VA	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	10,300	- -	- -
01633500	Stony Creek at Columbia Furnace, VA	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	2,050	- -	- -
01633650	Pughs Run near Woodstock, VA	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	114	- -	- -
01634000	North Fork Shenandoah River near Strasburg, VA	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	11,200	- -	- -

Table 4. Magnitude and frequency of peak discharges for gaging stations in West Virginia and surrounding States—*Continued*

Peak discharges for the indicated recurrence interval are presented in the following order: first line (S), from the systematic and historical record on the basis of the guidelines established by the Water Resources Council; second line (R), from the regionalized regression equation; and, third line (W), from weighting (1) the systematic and historical record on the basis of the guidelines established by the

Station No.	Station name and State	Region	Estimate type	Peak discharge for the indicated recurrence interval, in cubic feet per second											
				1.1-year	1.2-year	1.3-year	1.4-year	1.5-year	1.6-year	1.7-year	1.8-year	1.9-year	2-year	2.5-year	3-year
01634500	Cedar Creek near Winchester, VA	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	3,110	- -	- -
01636500	Shenandoah River at Millville, WV	East[2]	S	13,700	17,400	20,400	22,800	25,000	27,000	28,800	30,500	32,100	33,600	40,100	45,200
02011480	Back Creek at Route 600 near Mountain Grove, VA	South	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	4,370	- -	- -
02011500	Back Creek near Mountain Grove, VA	South	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	5,940	- -	- -
02012500	Jackson River at Falling Spring, VA	South	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	10,300	- -	- -
02013000	Dunlap Creek near Covington, VA	South	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	5,060	- -	- -
02014000	Potts Creek near Covington, VA	South	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	3,800	- -	- -
03050000	Tygart Valley River near Dailey, WV	North	S	4,160	4,690	5,070	5,380	5,650	5,890	6,100	6,300	6,480	6,640	7,340	7,830
			R	3,550	4,100	4,490	4,800	5,070	5,310	5,510	5,700	5,880	6,040	6,690	7,190
			W	4,140	4,670	5,060	5,370	5,640	5,870	6,080	6,280	6,460	6,620	7,320	7,820
03050500	Tygart Valley River near Elkins, WV	North	S	4,910	5,420	5,790	6,080	6,330	6,550	6,750	6,930	7,090	7,240	7,870	8,310
			R	4,790	5,500	6,000	6,400	6,740	7,030	7,290	7,530	7,750	7,950	8,770	9,390
			W	4,910	5,430	5,790	6,090	6,350	6,570	6,770	6,950	7,110	7,270	7,910	8,350
03050650	Leading Creek Tributary near Gilman, WV	North	S	13.4	18.7	23.0	26.9	30.5	33.8	37.0	40.0	42.8	45.6	57.9	68.3
			R	28.0	36.1	42.5	48.0	52.9	57.3	61.4	65.3	68.8	72.2	87.0	98.9
			W	16.4	22.8	27.9	32.4	36.5	40.3	43.7	47.0	50.2	53.1	66.3	77.0
03051000	Tygart Valley River at Belington, WV	North	S	6,790	7,550	8,090	8,520	8,880	9,200	9,480	9,730	9,960	10,200	11,000	11,700
			R	6,590	7,510	8,150	8,670	9,100	9,480	9,810	10,100	10,400	10,600	11,700	12,400
			W	6,780	7,550	8,090	8,520	8,890	9,200	9,480	9,740	9,970	10,200	11,100	11,700
03051500	Middle Fork River at Midvale, WV	North	S	2,730	3,180	3,510	3,780	4,010	4,220	4,400	4,570	4,720	4,870	5,470	5,920
			R	2,550	2,970	3,270	3,510	3,720	3,900	4,060	4,210	4,350	4,470	4,990	5,380
			W	2,720	3,170	3,500	3,770	4,000	4,200	4,380	4,550	4,700	4,840	5,440	5,890
03052000	Middle Fork River at Audra, WV	North	S	3,520	4,040	4,420	4,720	4,990	5,220	5,430	5,620	5,790	5,950	6,630	7,120
			R	2,970	3,450	3,790	4,060	4,300	4,500	4,680	4,850	5,000	5,140	5,720	6,150
			W	3,500	4,010	4,390	4,690	4,960	5,190	5,390	5,580	5,750	5,910	6,590	7,080

Table 4. Magnitude and frequency of peak discharges for gaging stations in West Virginia and surrounding States—*Continued*

Peak discharges for the indicated recurrence interval are presented in the following order: first line (S), from the systematic and historical record on the basis of the guidelines established by the Water Resources Council; second line (R), from the regionalized regression equation; and, third line (W), from weighting (1) the systematic and historical record on the basis of the guidelines established by the

Station No.	Station name and State	Region	Estimate type	Peak discharge for the indicated recurrence interval, in cubic feet per second											
				1.1-year	1.2-year	1.3-year	1.4-year	1.5-year	1.6-year	1.7-year	1.8-year	1.9-year	2-year	2.5-year	3-year
03052340	Mud Lick Run near Buckhannon, WV	North	S	118	126	132	136	140	144	147	149	152	154	163	169
			R	111	139	160	178	194	208	221	233	245	255	300	336
			W	116	130	141	149	157	163	169	174	179	183	201	213
03052500	Sand Run near Buckhannon, WV	North	S	395	470	526	573	615	652	685	716	745	772	889	975
			R	470	569	643	703	756	802	845	883	919	953	1,090	1,200
			W	398	475	533	581	623	661	695	727	756	784	902	989
03053500	Buckhannon River near Hall, WV	North	S	4,720	5,390	5,840	6,190	6,490	6,740	6,960	7,150	7,330	7,490	8,140	8,640
			R	4,880	5,590	6,100	6,500	6,850	7,150	7,410	7,650	7,870	8,070	8,910	9,530
			W	4,730	5,390	5,850	6,200	6,500	6,750	6,970	7,170	7,340	7,500	8,150	8,660
03054500	Tygart Valley River at Phillipi, WV	North	S	14,000	15,700	17,000	18,000	18,800	19,600	20,300	20,900	21,400	21,900	24,000	25,500
			R	12,500	14,000	15,100	15,900	16,600	17,200	17,800	18,300	18,700	19,100	20,700	21,900
			W	13,900	15,700	16,900	17,900	18,800	19,500	20,200	20,800	21,300	21,800	23,900	25,400
03055020	Bonica Run on U.S. 250 near Phillipi, WV	North	S	29.9	37.5	43.2	47.9	52.1	55.8	59.1	62.2	65.0	67.6	78.8	87.8
			R	38.5	49.4	57.9	65.1	71.5	77.3	82.7	87.7	92.4	96.8	116.0	131.0
			W	32.2	40.9	47.6	53.2	58.1	62.5	66.5	70.2	73.6	76.8	90.3	101.0
03055040	Bonica Run on Route 38 near Phillipi, WV	North	S	96	118	134	148	161	172	182	192	201	209	245	272
			R	144	180	206	229	248	266	282	297	311	324	379	423
			W	105	130	149	166	180	193	204	215	225	234	275	305
03056250	Three Fork Creek near Grafton, WV	North	S	2,590	3,020	3,340	3,600	3,820	4,020	4,200	4,360	4,520	4,660	5,250	5,680
			R	2,130	2,490	2,750	2,950	3,130	3,290	3,430	3,560	3,670	3,780	4,230	4,570
			W	2,520	2,940	3,240	3,490	3,700	3,890	4,060	4,220	4,360	4,490	5,060	5,480
03056500	Tygart Valley River at Fetterman, WV	North	S	19,800	22,300	24,100	25,500	26,700	27,800	28,700	29,600	30,300	31,000	34,000	36,100
			R	16,600	18,500	19,800	20,800	21,700	22,400	23,100	23,700	24,200	24,700	26,700	28,100
			W	19,700	22,200	23,900	25,300	26,500	27,500	28,400	29,300	30,000	30,700	33,600	35,700
03056600	Right Fork Wickwire Run near Grafton, WV	North	S	100	122	138	151	162	172	181	189	197	204	233	256
			R	112	141	162	180	196	210	223	236	247	257	303	339
			W	103	127	144	159	171	182	192	202	210	218	251	277
03057300	West Fork River at Walkersville, WV	North	S	842	999	1,110	1,210	1,290	1,360	1,420	1,480	1,540	1,590	1,800	1,960
			R	817	977	1,090	1,190	1,270	1,350	1,410	1,470	1,530	1,580	1,790	1,960
			W	838	995	1,110	1,200	1,290	1,360	1,420	1,480	1,530	1,590	1,800	1,960
03057500	Skin Creek near Brownsville, WV	North	S	854	958	1,030	1,090	1,130	1,170	1,200	1,240	1,260	1,290	1,390	1,470
			R	747	895	1,000	1,090	1,170	1,240	1,300	1,350	1,410	1,450	1,660	1,810
			W	847	954	1,030	1,090	1,130	1,180	1,210	1,240	1,270	1,300	1,410	1,490
03058000	West Fork River at Brownsville, WV	North	S	1,910	2,190	2,390	2,550	2,690	2,810	2,920	3,010	3,100	3,180	3,520	3,770
			R	2,200	2,570	2,840	3,050	3,230	3,390	3,540	3,670	3,790	3,900	4,360	4,710
			W	1,920	2,210	2,410	2,580	2,720	2,840	2,950	3,050	3,140	3,220	3,560	3,810
03058500	West Fork River at Butcherville, WV	North	S	3,440	4,030	4,440	4,780	5,050	5,300	5,510	5,710	5,890	6,050	6,720	7,230
			R	3,490	4,030	4,420	4,730	4,990	5,220	5,430	5,610	5,780	5,940	6,590	7,080
			W	3,440	4,030	4,440	4,770	5,050	5,300	5,510	5,710	5,880	6,050	6,710	7,230

Table 4. Magnitude and frequency of peak discharges for gaging stations in West Virginia and surrounding States—*Continued*

Peak discharges for the indicated recurrence interval are presented in the following order: first line (S), from the systematic and historical record on the basis of the guidelines established by the Water Resources Council; second line (R), from the regionalized regression equation; and, third line (W), from weighting (1) the systematic and historical record on the basis of the guidelines established by the

Station No.	Station name and State	Region	Estimate type	Peak discharge for the indicated recurrence interval, in cubic feet per second											
				1.1-year	1.2-year	1.3-year	1.4-year	1.5-year	1.6-year	1.7-year	1.8-year	1.9-year	2-year	2.5-year	3-year
03059000	West Fork River at Clarksburg, WV	North	S	6,200	7,110	7,740	8,220	8,620	8,970	9,270	9,540	9,780	10,000	10,900	11,600
			R	6,310	7,190	7,820	8,310	8,730	9,090	9,420	9,710	9,970	10,200	11,200	12,000
			W	6,200	7,110	7,740	8,230	8,630	8,970	9,280	9,540	9,790	10,000	10,900	11,600
03059500	Elk Creek at Quiet Dell, WV	North	S	1,190	1,480	1,700	1,880	2,040	2,180	2,310	2,430	2,540	2,640	3,070	3,420
			R	1,910	2,240	2,480	2,670	2,830	2,980	3,110	3,230	3,330	3,430	3,850	4,160
			W	1,230	1,530	1,750	1,940	2,100	2,240	2,370	2,490	2,600	2,700	3,140	3,480
03060500	Salem Fork at Salem, WV	North	S	318	414	488	551	605	655	700	742	780	817	973	1,100
			R	306	374	425	467	504	537	567	594	620	643	744	822
			W	316	407	476	534	585	631	673	711	747	781	925	1,040
03061000	West Fork River at Enterprise, WV	North	S	10,000	11,800	13,000	13,900	14,700	15,400	16,100	16,600	17,100	17,600	19,500	21,000
			R	10,800	12,200	13,100	13,900	14,500	15,000	15,500	15,900	16,300	16,700	18,200	19,300
			W	10,100	11,800	13,000	13,900	14,700	15,400	16,000	16,600	17,100	17,600	19,500	20,900
03061500	Buffalo Creek at Barrackville, WV	North	S	3,310	3,760	4,060	4,310	4,510	4,690	4,840	4,980	5,110	5,220	5,690	6,040
			R	2,450	2,860	3,150	3,380	3,580	3,760	3,920	4,060	4,190	4,310	4,810	5,190
			W	3,280	3,730	4,030	4,280	4,480	4,650	4,810	4,950	5,070	5,190	5,660	6,010
03062400	Cobun Creek at Morgantown, WV	North	S	246	294	330	360	388	413	436	457	477	496	580	639
			R	382	465	527	578	622	661	697	730	760	788	908	1,000
			W	256	307	346	379	408	435	459	482	503	523	609	671
03062500	Deckers Creek at Morgantown, WV	North	S	754	914	1,040	1,140	1,230	1,310	1,390	1,460	1,520	1,590	1,850	2,050
			R	1,520	1,790	1,990	2,150	2,280	2,400	2,510	2,610	2,700	2,780	3,130	3,400
			W	786	957	1,090	1,190	1,290	1,380	1,450	1,530	1,590	1,660	1,930	2,130
03063950	Job Run near Wymer, WV	East	S	28.0	34.1	39.0	43.3	47.2	50.7	54.1	57.3	60.3	63.1	76.1	85.3
			R	34.3	41.0	46.1	50.3	54.1	57.4	60.5	63.3	65.9	68.4	79.0	86.9
			W	28.5	34.8	39.7	44.0	47.9	51.5	54.8	58.0	61.0	63.8	76.5	85.6
03065000	Dry Fork at Hendricks, WV	East	S	7,610	8,590	9,320	9,950	10,500	11,000	11,500	11,900	12,300	12,700	14,400	15,500
			R	4,190	5,040	5,700	6,250	6,740	7,180	7,580	7,960	8,320	8,650	10,100	11,200
			W	7,500	8,460	9,180	9,800	10,400	10,800	11,300	11,700	12,100	12,500	14,200	15,300
03066000	Blackwater River at Davis, WV	East	S	1,490	1,690	1,840	1,970	2,080	2,180	2,270	2,350	2,430	2,500	2,810	3,020
			R	1,300	1,560	1,760	1,930	2,080	2,220	2,340	2,450	2,560	2,660	3,100	3,420
			W	1,480	1,690	1,840	1,970	2,080	2,180	2,270	2,350	2,430	2,500	2,820	3,030
03068610	Taylor Run at Bowden, WV	East	S	128	151	168	181	193	204	213	222	230	237	268	292
			R	123	148	166	182	195	208	219	229	239	248	288	317
			W	127	150	167	181	194	204	214	223	231	239	271	295
03069000	Shavers Fork at Parsons, WV	East	S	5,820	6,430	6,880	7,250	7,570	7,860	8,120	8,360	8,580	8,790	9,680	10,300
			R	2,770	3,340	3,770	4,130	4,460	4,750	5,010	5,260	5,490	5,710	6,660	7,360
			W	5,740	6,340	6,780	7,150	7,470	7,760	8,010	8,250	8,480	8,680	9,560	10,100

Table 4. Magnitude and frequency of peak discharges for gaging stations in West Virginia and surrounding States—*Continued*

Peak discharges for the indicated recurrence interval are presented in the following order: first line (S), from the systematic and historical record on the basis of the guidelines established by the Water Resources Council; second line (R), from the regionalized regression equation; and, third line (W), from weighting (1) the systematic and historical record on the basis of the guidelines established by the

Station No.	Station name and State	Region	Estimate type	Peak discharge for the indicated recurrence interval, in cubic feet per second											
				1.1-year	1.2-year	1.3-year	1.4-year	1.5-year	1.6-year	1.7-year	1.8-year	1.9-year	2-year	2.5-year	3-year
03069500	Cheat River near Parsons, WV	East	S	15,300	17,100	18,500	19,600	20,600	21,500	22,300	23,000	23,800	24,400	27,300	29,100
			R	7,670	9,260	10,500	11,500	12,400	13,200	14,000	14,700	15,300	15,900	18,600	20,600
			W	15,200	16,900	18,300	19,400	20,400	21,200	22,000	22,800	23,500	24,100	27,000	28,800
03069850	Long Run near Parsons, WV	East	S	46.8	53.4	58.2	62.1	65.5	68.6	71.2	73.7	76.0	78.2	87.2	93.5
			R	31.7	37.9	42.6	46.5	49.9	53.0	55.8	58.4	60.9	63.1	72.9	80.2
			W	45.2	51.6	56.3	60.1	63.5	66.4	69.1	71.5	73.8	75.9	84.9	91.4
03069880	Buffalo Creek near Rowlesburg, WV	East	S	716	831	917	990	1,060	1,110	1,170	1,220	1,260	1,310	1,500	1,630
			R	255	306	345	377	406	432	455	477	498	517	599	660
			W	669	770	846	910	967	1,020	1,060	1,110	1,150	1,190	1,350	1,470
03070000	Cheat River at Rowlesburg, WV	East	S	20,100	22,900	24,900	26,600	28,100	29,400	30,500	31,600	32,600	33,500	37,500	40,300
			R	9,550	11,500	13,000	14,300	15,400	16,500	17,400	18,300	19,100	19,900	23,200	25,700
			W	19,900	22,600	24,600	26,200	27,700	28,900	30,100	31,200	32,100	33,100	37,000	39,700
03070500	Big Sandy Creek near Rockville, WV	East	S	4,550	5,080	5,460	5,780	6,060	6,310	6,540	6,750	6,950	7,130	7,900	8,420
			R	2,630	3,170	3,580	3,920	4,230	4,500	4,750	4,990	5,210	5,420	6,320	6,980
			W	4,510	5,030	5,420	5,730	6,010	6,260	6,490	6,700	6,890	7,070	7,850	8,370
03071000	Cheat River near Pisgah, WV	East	S	24,100	28,200	31,200	33,600	35,600	37,500	39,100	40,600	42,000	43,300	48,700	52,700
			R	13,000	15,700	17,700	19,400	21,000	22,400	23,600	24,800	26,000	27,000	31,600	35,000
			W	23,700	27,700	30,600	32,900	34,900	36,700	38,300	39,800	41,200	42,400	47,700	51,600
03071500	Cheat River near Morgantown, WV	East[2]	S	25,700	30,300	33,600	36,300	38,500	40,500	42,200	43,800	45,200	46,600	52,000	56,200
03072000	Dunkard Creek at Shannopin, PA	North	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	6,890	- -	- -
03072590	Georges Creek at Smithfield, PA	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	662	- -	- -
03075450	Little Youghiogheny River Tributary at Deer Park, MD	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	23.7	- -	- -
03075500	Youghiogheny River near Oakland, MD	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	4,200	- -	- -
03075600	Toliver Run Tributary near Hoyes Run, MD	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	28.8	- -	- -
03076505	Youghiogheny River Tributary near Friendsville, MD	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	12.1	- -	- -
03076600	Bear Creek at Friendsville, MD	East	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	1,570	- -	- -
03108000	Raccoon Creek at Moffatts Mill, PA	North	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	3,910	- -	- -

Table 4. Magnitude and frequency of peak discharges for gaging stations in West Virginia and surrounding States—*Continued*

Peak discharges for the indicated recurrence interval are presented in the following order: first line (S), from the systematic and historical record on the basis of the guidelines established by the Water Resources Council; second line (R), from the regionalized regression equation; and, third line (W), from weighting (1) the systematic and historical record on the basis of the guidelines established by the

Station No.	Station name and State	Region	Estimate type	Peak discharge for the indicated recurrence interval, in cubic feet per second											
				1.1-year	1.2-year	1.3-year	1.4-year	1.5-year	1.6-year	1.7-year	1.8-year	1.9-year	2-year	2.5-year	3-year
03109000	Lisbon Creek at Lisbon, OH	North	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	382	- -	- -
03109500	Little Beaver Creek near East Liverpool, OH	North	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	9,310	- -	- -
03110000	Yellow Creek near Hammondsville, OH	North	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	3,190	- -	- -
03111150	Brush Run near Buffalo, PA	North	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	508	- -	- -
03111500	Short Creek near Dillonvale, OH	North	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	2,940	- -	- -
03112000	Wheeling Creek at Elm Grove, WV	North	S	4,790	5,720	6,400	6,950	7,410	7,820	8,190	8,530	8,830	9,120	10,300	11,200
			R	4,930	5,650	6,170	6,570	6,920	7,220	7,490	7,730	7,950	8,160	9,000	9,630
			W	4,800	5,720	6,390	6,930	7,390	7,800	8,160	8,490	8,790	9,070	10,200	11,100
03113700	Little Grave Creek near Glendale, WV	North	S	176	235	281	320	356	388	417	445	471	495	601	689
			R	204	251	287	317	343	367	388	408	426	443	516	573
			W	182	239	282	319	352	382	409	434	458	480	576	655
03114000	Captina Creek at Armstrongs Mills, OH	North	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	6,300	- -	- -
03114240	Wood Run near Woodsfield, OH	North	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	69.6	- -	- -
03114500	Middle Island Creek at Little, WV	North	S	9,090	10,100	10,800	11,400	11,800	12,200	12,600	12,900	13,200	13,500	14,600	15,400
			R	7,250	8,240	8,930	9,490	9,950	10,400	10,700	11,000	11,300	11,600	12,700	13,500
			W	9,060	10,100	10,800	11,300	11,800	12,200	12,600	12,900	13,200	13,400	14,600	15,400
03114550	Buffalo Run near Friendly, WV	North	S	78	103	122	138	152	165	177	188	198	207	247	281
			R	53	68	79	88	97	104	111	118	124	130	154	174
			W	70	90	106	119	131	142	151	160	169	177	211	240
03114600	Little Buffalo Run near Friendly, WV	North	S	113	142	163	181	197	210	223	234	244	254	295	328
			R	67	84	98	109	120	129	137	145	153	160	189	213
			W	97	120	138	153	166	178	188	198	208	216	253	283
03114650	Buffalo Run near Little, WV	North	S	327	422	496	559	614	664	711	753	794	831	994	1,130
			R	179	221	253	280	303	324	344	361	378	393	459	510
			W	287	362	419	468	511	550	585	619	650	680	809	915
03115280	Trail Run near Antioch, OH	North	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	629	- -	- -
03115400	Little Muskingum River at Bloomfield, OH	North	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	7,110	- -	- -
03115410	Graham Run near Bloomfield, OH	North	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	19.8	- -	- -

Table 4. Magnitude and frequency of peak discharges for gaging stations in West Virginia and surrounding States—*Continued*

Peak discharges for the indicated recurrence interval are presented in the following order: first line (S), from the systematic and historical record on the basis of the guidelines established by the Water Resources Council; second line (R), from the regionalized regression equation; and, third line (W), from weighting (1) the systematic and historical record on the basis of the guidelines established by the

Station No.	Station name and State	Region	Esti-mate type	Peak discharge for the indicated recurrence interval, in cubic feet per second											
				1.1-year	1.2-year	1.3-year	1.4-year	1.5-year	1.6-year	1.7-year	1.8-year	1.9-year	2-year	2.5-year	3-year
03115510	Moss Run near Wingott, OH	North	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	221	- -	- -
03115600	Barns Run near Summerfield, OH	North	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	540	- -	- -
03151400	Little Kanawha River near Wildcat, WV	North	S	2,670	3,140	3,490	3,770	4,020	4,240	4,440	4,620	4,790	4,940	5,610	6,100
			R	2,390	2,780	3,070	3,300	3,490	3,660	3,820	3,960	4,080	4,200	4,690	5,060
			W	2,650	3,110	3,440	3,720	3,960	4,170	4,370	4,540	4,710	4,860	5,500	5,980
03151500	Little Kanawha River near Burnsville, WV	North	S	3,380	3,830	4,140	4,380	4,580	4,750	4,890	5,030	5,140	5,250	5,680	6,020
			R	3,080	3,570	3,920	4,210	4,450	4,660	4,840	5,010	5,170	5,310	5,910	6,350
			W	3,360	3,820	4,130	4,370	4,570	4,740	4,890	5,020	5,140	5,260	5,700	6,040
03152000	Little Kanawha River at Glenville, WV	North	S	6,100	6,910	7,480	7,930	8,310	8,640	8,920	9,180	9,420	9,640	10,500	11,200
			R	6,350	7,240	7,860	8,360	8,780	9,150	9,470	9,760	10,000	10,300	11,300	12,000
			W	6,100	6,920	7,490	7,940	8,320	8,650	8,940	9,200	9,440	9,660	10,500	11,200
03152200	Buck Run near Leopold, WV	North	S	217	244	261	276	287	298	306	314	322	328	355	375
			R	134	166	191	212	231	247	262	276	289	301	354	395
			W	193	220	240	256	270	282	293	303	312	320	355	381
03152500	Leading Creek near Glenville, WV	North	S	3,310	3,940	4,390	4,750	5,050	5,320	5,550	5,760	5,960	6,140	6,870	7,440
			R	2,910	3,380	3,710	3,980	4,210	4,410	4,590	4,750	4,900	5,040	5,610	6,040
			W	3,260	3,860	4,290	4,630	4,920	5,170	5,400	5,600	5,790	5,960	6,660	7,220
03153000	Steer Creek near Grantsville, WV	North	S	3,920	4,620	5,110	5,500	5,830	6,110	6,360	6,590	6,790	6,980	7,740	8,340
			R	3,190	3,700	4,060	4,350	4,590	4,810	5,000	5,180	5,340	5,480	6,090	6,550
			W	3,890	4,570	5,050	5,430	5,750	6,030	6,270	6,500	6,700	6,880	7,630	8,230
03153500	Little Kanawha River at Grantsville, WV	North	S	13,700	15,300	16,300	17,100	17,800	18,400	18,900	19,300	19,700	20,100	21,500	22,600
			R	12,500	14,000	15,100	15,900	16,600	17,200	17,800	18,200	18,700	19,100	20,700	21,900
			W	13,700	15,200	16,300	17,100	17,800	18,300	18,800	19,300	19,700	20,000	21,500	22,600
03154000	West Fork Little Kanawha River at Rocksdale, WV	North	S	4,460	5,210	5,750	6,180	6,530	6,850	7,120	7,370	7,590	7,800	8,650	9,310
			R	3,850	4,430	4,850	5,190	5,470	5,720	5,940	6,150	6,330	6,500	7,200	7,720
			W	4,440	5,190	5,720	6,140	6,500	6,800	7,080	7,320	7,550	7,750	8,590	9,250
03154250	Tanner Run at Spencer, WV	North	S	345	411	459	498	532	561	588	612	635	655	742	808
			R	130	162	186	207	225	241	256	269	282	294	345	385
			W	272	320	357	387	413	437	459	479	498	516	591	651
03154500	Reedy Creek near Reedy, WV	North	S	2,330	2,650	2,870	3,040	3,170	3,290	3,400	3,490	3,570	3,640	3,940	4,170
			R	1,820	2,130	2,360	2,550	2,700	2,840	2,970	3,080	3,180	3,280	3,680	3,980
			W	2,290	2,610	2,820	2,990	3,130	3,250	3,350	3,450	3,530	3,610	3,920	4,160
03155000	Little Kanawha River at Palestine, WV	North	S	18,700	21,200	22,900	24,300	25,400	26,300	27,100	27,900	28,600	29,200	31,700	33,500
			R	18,600	20,700	22,200	23,300	24,200	25,000	25,800	26,400	27,000	27,500	29,700	31,200
			W	18,700	21,200	22,900	24,200	25,300	26,300	27,100	27,800	28,500	29,100	31,600	33,500

Table 4. Magnitude and frequency of peak discharges for gaging stations in West Virginia and surrounding States—*Continued*

Peak discharges for the indicated recurrence interval are presented in the following order: first line (S), from the systematic and historical record on the basis of the guidelines established by the Water Resources Council; second line (R), from the regionalized regression equation; and, third line (W), from weighting (1) the systematic and historical record on the basis of the guidelines established by the

Station No.	Station name and State	Region	Estimate type	Peak discharge for the indicated recurrence interval, in cubic feet per second											
				1.1-year	1.2-year	1.3-year	1.4-year	1.5-year	1.6-year	1.7-year	1.8-year	1.9-year	2-year	2.5-year	3-year
03155200	South Fork Hughes River at Macfarlan, WV	North	S	5,630	6,260	6,690	7,020	7,300	7,530	7,730	7,910	8,070	8,220	8,800	9,240
			R	3,920	4,520	4,940	5,280	5,570	5,830	6,050	6,250	6,440	6,610	7,320	7,860
			W	5,410	6,020	6,440	6,760	7,040	7,270	7,470	7,660	7,820	7,970	8,580	9,040
03155450	Big Island Run near Elizabeth, WV	North	S	333	411	468	516	556	592	624	654	681	706	811	895
			R	155	192	221	244	265	284	301	317	331	345	404	450
			W	288	351	397	436	469	499	527	552	575	597	689	765
03155500	Hughes River at Cisco, WV	North	S	8,690	9,980	10,900	11,600	12,200	12,700	13,200	13,600	14,000	14,300	15,700	16,800
			R	7,190	8,170	8,860	9,410	9,870	10,300	10,600	11,000	11,200	11,500	12,600	13,400
			W	8,650	9,930	10,800	11,500	12,100	12,600	13,100	13,500	13,900	14,200	15,600	16,700
03159540	Shade River near Chester, OH	North	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	3,490	- -	- -
03159700	Grasslick Run near Ripley, WV	North	S	77	91	102	111	119	126	132	138	144	149	171	187
			R	44	56	65	73	80	87	93	98	103	108	129	146
			W	66	79	89	97	105	111	117	123	129	134	156	173
03171500	New River at Eggleston, VA	South	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	32,200	- -	- -
03173000	Walker Creek at Bane, VA	South	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	6,620	- -	- -
03175500	Wolf Creek near Narrows, VA	South	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	5,400	- -	- -
03176500	New River at Glen Lyn, VA	South	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	37,900	- -	- -
03177000	Rich Creek near Peterstown, WV	South	S	928	1,050	1,130	1,200	1,250	1,300	1,340	1,380	1,410	1,440	1,570	1,670
			R	1,100	1,310	1,460	1,580	1,690	1,780	1,860	1,940	2,010	2,080	2,360	2,560
			W	945	1,070	1,170	1,240	1,300	1,350	1,400	1,450	1,480	1,520	1,670	1,780
03177500	Indian Creek at Indian Mills, WV	South	S	3,030	3,260	3,410	3,520	3,620	3,690	3,760	3,820	3,880	3,930	4,120	4,260
			R	3,180	3,740	4,150	4,490	4,780	5,030	5,260	5,470	5,660	5,840	6,590	7,150
			W	3,040	3,300	3,490	3,630	3,740	3,840	3,930	4,010	4,080	4,140	4,400	4,590
03177700	Bluestone River at Bluefield, VA	South	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	704	- -	- -
03178500	Camp Creek near Camp Creek, WV	South	S	609	769	890	990	1,080	1,160	1,230	1,290	1,350	1,410	1,650	1,840
			R	762	906	1,010	1,100	1,170	1,240	1,300	1,350	1,400	1,450	1,650	1,800
			W	614	774	895	995	1,080	1,160	1,230	1,300	1,360	1,410	1,650	1,840
03179000	Bluestone River near Pipestem, WV	South	S	4,740	5,510	6,050	6,490	6,850	7,180	7,460	7,720	7,960	8,180	9,080	9,760
			R	5,750	6,740	7,470	8,050	8,560	9,000	9,400	9,770	10,100	10,400	11,700	12,700
			W	4,760	5,530	6,080	6,520	6,900	7,220	7,510	7,780	8,020	8,240	9,150	9,840

Table 4. Magnitude and frequency of peak discharges for gaging stations in West Virginia and surrounding States—*Continued*

Peak discharges for the indicated recurrence interval are presented in the following order: first line (S), from the systematic and historical record on the basis of the guidelines established by the Water Resources Council; second line (R), from the regionalized regression equation; and, third line (W), from weighting (1) the systematic and historical record on the basis of the guidelines established by the

Station No.	Station name and State	Region	Esti-mate type	Peak discharge for the indicated recurrence interval, in cubic feet per second											
				1.1-year	1.2-year	1.3-year	1.4-year	1.5-year	1.6-year	1.7-year	1.8-year	1.9-year	2-year	2.5-year	3-year
03179500	Bluestone River at Lilly, WV	South	S	5,520	6,270	6,790	7,210	7,550	7,850	8,120	8,360	8,570	8,770	9,590	10,200
			R	6,250	7,320	8,100	8,740	9,290	9,770	10,200	10,600	11,000	11,300	12,700	13,700
			W	5,540	6,310	6,840	7,270	7,630	7,940	8,210	8,460	8,680	8,890	9,730	10,400
03180000	New River at Bluestone Dam, WV	South	S	28,100	31,500	34,100	36,200	38,200	39,900	41,500	42,900	44,300	45,600	51,200	54,900
			R	41,400	47,900	52,600	56,400	59,600	62,400	65,000	67,300	69,400	71,400	79,600	85,700
			W	28,400	31,900	34,600	36,800	38,800	40,600	42,200	43,700	45,100	46,400	52,100	55,900
03180350	West Fork Greenbrier River Tributary at Durbin, WV	South	S	31.4	36.1	39.5	42.3	44.7	46.8	48.7	50.5	52.1	53.7	60.0	64.6
			R	50.6	61.4	69.4	76.0	81.8	86.9	91.4	95.7	99.6	103.0	119.0	130.0
			W	32.9	38.2	42.2	45.4	48.2	50.7	52.9	55.0	56.9	58.6	66.0	71.4
03180500	Greenbrier River at Durbin, WV	South	S	2,770	3,100	3,350	3,570	3,770	3,940	4,100	4,260	4,410	4,540	5,150	5,530
			R	2,400	2,830	3,140	3,400	3,620	3,810	3,990	4,150	4,300	4,430	5,010	5,440
			W	2,760	3,090	3,350	3,560	3,760	3,940	4,100	4,260	4,400	4,540	5,140	5,530
03180530	Brush Run near Bartow, WV	South	S	26.8	34.9	41.2	46.7	51.6	56.1	60.3	64.1	67.8	71.3	86.5	98.7
			R	57.9	70.2	79.3	86.8	93.3	99.1	104.0	109.0	114.0	118.0	135.0	149.0
			W	29.0	37.8	44.7	50.6	55.9	60.7	65.1	69.2	73.0	76.7	92.5	105.0
03180680	Cooper Run near Green Bank, WV	South	S	43.9	54.3	62.2	68.8	74.6	79.8	84.5	88.8	92.9	96.7	113.0	126.0
			R	65.0	78.7	88.8	97.2	104.0	111.0	117.0	122.0	127.0	132.0	151.0	166.0
			W	45.5	56.4	64.6	71.5	77.5	82.9	87.8	92.4	96.6	101.0	117.0	130.0
03181900	Mack Butterball Hollow near Huntersville, WV	South	S	6.5	7.4	8.0	8.5	8.9	9.3	9.6	9.9	10.2	10.4	11.4	12.1
			R	7.3	9.0	10.3	11.4	12.3	13.1	13.8	14.5	15.2	15.7	18.3	20.2
			W	6.6	7.6	8.2	8.8	9.3	9.7	10.1	10.4	10.7	11.0	12.1	13.0
03182000	Knapp Creek at Marlinton, WV	South	S	3,170	3,510	3,760	3,960	4,150	4,320	4,470	4,610	4,750	4,870	5,410	5,760
			R	2,030	2,390	2,660	2,880	3,070	3,240	3,390	3,520	3,650	3,770	4,260	4,630
			W	3,120	3,440	3,690	3,900	4,080	4,250	4,400	4,540	4,670	4,800	5,330	5,680
03182500	Greenbrier River at Buckeye, WV	South	S	10,800	12,300	13,400	14,300	15,100	15,800	16,400	17,000	17,500	18,000	20,100	21,500
			R	7,390	8,660	9,570	10,300	11,000	11,500	12,000	12,500	12,900	13,300	15,000	16,200
			W	10,800	12,200	13,300	14,200	15,000	15,700	16,300	16,900	17,400	17,900	19,900	21,400
03182700	Anthony Creek near Anthony, WV	South	S	5,980	6,640	7,130	7,530	7,880	8,180	8,460	8,720	8,960	9,180	10,100	10,800
			R	2,550	3,010	3,350	3,620	3,850	4,060	4,250	4,420	4,570	4,720	5,330	5,790
			W	5,710	6,330	6,790	7,160	7,490	7,780	8,040	8,290	8,510	8,720	9,620	10,200
03183000	Second Creek near Second Creek, WV	South	S	1,250	1,500	1,690	1,840	1,980	2,090	2,200	2,300	2,390	2,480	2,840	3,120
			R	1,600	1,900	2,110	2,290	2,440	2,570	2,690	2,800	2,910	3,000	3,390	3,690
			W	1,260	1,520	1,700	1,860	2,000	2,120	2,220	2,320	2,420	2,500	2,870	3,150
03183500	Greenbrier River at Alderson, WV	South	S	19,800	23,000	25,300	27,200	28,700	30,000	31,200	32,200	33,200	34,100	37,700	40,500
			R	15,600	18,100	20,000	21,500	22,800	23,900	24,900	25,900	26,700	27,500	30,800	33,300
			W	19,700	23,000	25,300	27,100	28,600	29,900	31,100	32,200	33,100	34,000	37,600	40,300

Table 4. Magnitude and frequency of peak discharges for gaging stations in West Virginia and surrounding States—*Continued*

Peak discharges for the indicated recurrence interval are presented in the following order: first line (S), from the systematic and historical record on the basis of the guidelines established by the Water Resources Council; second line (R), from the regionalized regression equation; and, third line (W), from weighting (1) the systematic and historical record on the basis of the guidelines established by the

Station No.	Station name and State	Region	Esti-mate type	Peak discharge for the indicated recurrence interval, in cubic feet per second											
				1.1-year	1.2-year	1.3-year	1.4-year	1.5-year	1.6-year	1.7-year	1.8-year	1.9-year	2-year	2.5-year	3-year
03183550	Griffith Creek near	South	S	185	207	222	234	244	252	260	266	272	277	299	316
	Alderson, WV		R	137	165	186	203	218	231	243	254	264	273	312	342
			W	180	202	218	230	240	249	257	264	271	277	301	319
03183570	Buggar Lick at Pence	South	S	55	68	78	87	95	102	108	114	120	126	150	167
	Springs, WV		R	104	126	142	155	166	176	185	194	202	209	239	262
			W	59	73	84	93	101	109	116	123	129	134	159	178
03184000	Greenbrier River at	South	S	23,700	26,700	28,800	30,500	31,900	33,100	34,200	35,200	36,100	37,000	40,400	42,900
	Hilldale, WV		R	17,900	20,800	22,900	24,600	26,100	27,400	28,500	29,600	30,600	31,500	35,200	38,000
			W	23,600	26,600	28,700	30,400	31,800	33,000	34,100	35,100	36,000	36,800	40,300	42,800
03184500	New River at Hinton, WV	South	S	44,000	50,600	55,300	59,000	62,100	64,800	67,300	69,400	71,400	73,300	80,800	86,500
			R	53,000	61,200	67,100	71,900	76,000	79,600	82,800	85,700	88,400	90,800	101,000	109,000
			W	44,100	50,800	55,400	59,200	62,300	65,100	67,500	69,700	71,700	73,600	81,200	86,900
03185000	Piney Creek at Raleigh,	South	S	594	706	789	857	918	972	1,020	1,070	1,110	1,150	1,310	1,440
	WV		R	1,140	1,350	1,510	1,630	1,740	1,840	1,920	2,000	2,080	2,150	2,430	2,650
			W	608	724	810	882	945	1,000	1,050	1,100	1,140	1,180	1,360	1,490
03185020	Little Beaver Creek	South	S	10.7	14.3	17.1	19.5	21.6	23.5	25.3	27.0	28.5	30.0	36.3	41.5
	Tributary near Shady		R	31.1	37.9	42.9	47.0	50.6	53.8	56.7	59.4	61.9	64.2	73.9	81.4
	Springs, WV		W	11.9	15.9	19.0	21.7	24.1	26.2	28.2	30.0	31.7	33.3	40.1	45.7
03185500	New River at Caperton, WV	South[2]	S	50,800	59,400	65,600	70,600	74,900	78,600	81,900	84,900	87,600	90,200	101,000	109,000
03186000	New River at Fayette, WV	South	S	49,200	59,300	66,500	72,300	77,300	81,600	85,500	89,000	92,200	95,200	107,000	117,000
			R	57,000	65,800	72,100	77,300	81,600	85,500	88,900	92,000	94,900	97,500	109,000	117,000
			W	49,400	59,400	66,600	72,500	77,400	81,700	85,600	89,100	92,300	95,300	107,000	117,000
03186500	Williams River at Dyer,	South	S	4,600	5,250	5,720	6,110	6,440	6,740	7,010	7,260	7,490	7,700	8,600	9,230
	WV		R	2,320	2,740	3,050	3,300	3,510	3,700	3,870	4,030	4,170	4,300	4,860	5,280
			W	4,560	5,190	5,650	6,030	6,360	6,660	6,920	7,160	7,390	7,600	8,490	9,110
03187000	Gauley River at Camden	South	S	6,460	7,540	8,320	8,960	9,510	9,990	10,400	10,800	11,200	11,500	13,000	14,000
	on Gauley, WV		R	3,800	4,470	4,960	5,350	5,700	6,000	6,270	6,510	6,740	6,950	7,840	8,500
			W	6,410	7,470	8,240	8,870	9,410	9,890	10,300	10,700	11,100	11,400	12,800	13,900
03187300	North Fork Cranberry	South	S	403	473	526	570	608	643	675	704	732	758	869	948
	River near Hillsboro,		R	293	352	394	430	460	487	511	533	554	573	653	714
	WV		W	395	463	514	557	595	628	659	688	714	739	846	923
03187500	Cranberry River near	South	S	2,750	3,150	3,440	3,680	3,890	4,070	4,230	4,380	4,520	4,650	5,200	5,590
	Richwood, WV		R	1,600	1,890	2,110	2,280	2,430	2,560	2,680	2,790	2,890	2,990	3,380	3,680
			W	2,720	3,110	3,390	3,630	3,830	4,010	4,170	4,320	4,450	4,580	5,120	5,500

Table 4. Magnitude and frequency of peak discharges for gaging stations in West Virginia and surrounding States—*Continued*

Peak discharges for the indicated recurrence interval are presented in the following order: first line (S), from the systematic and historical record on the basis of the guidelines established by the Water Resources Council; second line (R), from the regionalized regression equation; and, third line (W), from weighting (1) the systematic and historical record on the basis of the guidelines established by the

Station No.	Station name and State	Region	Esti-mate type	Peak discharge for the indicated recurrence interval, in cubic feet per second											
				1.1-year	1.2-year	1.3-year	1.4-year	1.5-year	1.6-year	1.7-year	1.8-year	1.9-year	2-year	2.5-year	3-year
03189000	Cherry River at Fenwick, WV	South	S	5,000	5,640	6,130	6,530	6,890	7,220	7,510	7,790	8,040	8,280	9,330	10,000
			R	2,640	3,110	3,460	3,740	3,980	4,190	4,390	4,560	4,720	4,870	5,500	5,970
			W	4,920	5,550	6,020	6,420	6,770	7,090	7,370	7,640	7,900	8,130	9,150	9,840
03189100	Gauley River near Craigsville, WV	South	S	13,900	16,400	18,200	19,700	20,900	22,000	23,000	23,900	24,700	25,400	28,500	30,900
			R	7,270	8,520	9,420	10,200	10,800	11,300	11,800	12,300	12,700	13,100	14,700	15,900
			W	13,700	16,100	17,900	19,300	20,500	21,500	22,400	23,300	24,100	24,800	27,800	30,100
03189500	Gauley River near Summersville, WV	South	S	16,700	18,600	20,000	21,100	22,100	22,900	23,700	24,400	25,100	25,700	28,300	30,100
			R	8,900	10,400	11,500	12,400	13,100	13,800	14,400	15,000	15,500	15,900	17,900	19,400
			W	16,500	18,300	19,600	20,700	21,700	22,500	23,300	24,000	24,600	25,200	27,800	29,600
03189650	Collison Creek near Nallen, WV	South	S	84	102	116	127	137	145	153	160	166	172	197	216
			R	107	130	146	159	171	181	191	199	207	215	246	270
			W	86	105	119	131	140	149	157	164	171	177	203	223
03190000	Meadow River at Nallen, WV	South	S	3,820	4,310	4,660	4,930	5,170	5,370	5,540	5,700	5,850	5,980	6,530	6,930
			R	4,450	5,230	5,790	6,250	6,650	7,000	7,310	7,600	7,860	8,100	9,130	9,900
			W	3,830	4,330	4,680	4,960	5,200	5,400	5,590	5,750	5,900	6,030	6,590	7,010
03190400	Meadow River near Mount Lookout, WV	South	S	5,410	6,220	6,810	7,270	7,660	8,010	8,310	8,590	8,840	9,080	10,000	10,800
			R	5,390	6,330	7,010	7,560	8,040	8,460	8,830	9,180	9,490	9,790	11,000	11,900
			W	5,410	6,230	6,810	7,280	7,680	8,030	8,340	8,620	8,870	9,110	10,100	10,800
03190500	Meadow Creek near Summersville, WV	South	S	198	227	247	263	277	288	298	307	315	323	353	377
			R	149	179	201	220	236	250	263	274	285	295	338	370
			W	193	221	241	257	271	283	293	302	311	319	351	376
03191400	Laurel Creek near Summersville, WV	South	S	81	106	127	144	160	175	188	200	212	224	273	313
			R	152	182	205	224	240	255	268	279	290	301	344	377
			W	84	111	132	150	166	181	194	207	219	230	279	319
03191500	Peters Creek near Lockwood, WV	South	S	1,230	1,470	1,660	1,810	1,950	2,070	2,180	2,280	2,380	2,470	2,850	3,130
			R	915	1,090	1,210	1,320	1,410	1,480	1,560	1,620	1,680	1,740	1,970	2,140
			W	1,210	1,460	1,640	1,790	1,920	2,040	2,140	2,240	2,340	2,420	2,790	3,070
03192000	Gauley River above Belva, WV	South	S	26,400	29,700	32,000	33,900	35,600	37,000	38,300	39,500	40,600	41,700	45,900	48,900
			R	15,100	17,600	19,400	20,900	22,200	23,300	24,300	25,200	26,000	26,800	30,000	32,400
			W	26,200	29,400	31,800	33,600	35,300	36,700	38,000	39,200	40,300	41,300	45,500	48,500
03192500	Gauley River at Belva, WV	South	S	21,500	24,900	27,200	29,100	30,700	32,100	33,400	34,500	35,500	36,500	40,300	43,300
			R	15,900	18,500	20,400	22,000	23,300	24,500	25,500	26,400	27,300	28,100	31,500	34,000
			W	21,300	24,500	26,900	28,700	30,300	31,700	32,900	34,000	35,000	35,900	39,800	42,700
03193000	Kanawha River at Kanawha Falls, WV	South	S	70,900	82,500	90,700	97,300	103,000	108,000	112,000	116,000	120,000	123,000	136,000	147,000
			R	67,000	77,300	84,600	90,600	95,600	100,000	104,000	108,000	111,000	114,000	127,000	137,000
			W	70,800	82,400	90,700	97,300	103,000	108,000	112,000	116,000	119,000	123,000	136,000	146,000

Table 4. Magnitude and frequency of peak discharges for gaging stations in West Virginia and surrounding States—*Continued*

Peak discharges for the indicated recurrence interval are presented in the following order: first line (S), from the systematic and historical record on the basis of the guidelines established by the Water Resources Council; second line (R), from the regionalized regression equation; and, third line (W), from weighting (1) the systematic and historical record on the basis of the guidelines established by the

Station No.	Station name and State	Region	Esti-mate type	Peak discharge for the indicated recurrence interval, in cubic feet per second											
				1.1-year	1.2-year	1.3-year	1.4-year	1.5-year	1.6-year	1.7-year	1.8-year	1.9-year	2-year	2.5-year	3-year
03193725	Little Fork at Mossy, WV	South	S	10.1	11.8	13.0	13.9	14.8	15.6	16.2	16.9	17.4	18.0	20.3	21.9
			R	22.4	27.4	31.1	34.1	36.8	39.1	41.2	43.2	45.0	46.7	53.9	59.4
			W	11.0	12.9	14.4	15.6	16.6	17.5	18.4	19.1	19.9	20.5	23.3	25.3
03194700	Elk River below Webster Springs, WV	South	S	7,080	7,920	8,540	9,040	9,490	9,880	10,200	10,600	10,900	11,100	12,300	13,200
			R	4,180	4,920	5,450	5,890	6,260	6,590	6,890	7,160	7,410	7,640	8,600	9,330
			W	7,020	7,860	8,460	8,970	9,410	9,800	10,100	10,500	10,800	11,000	12,200	13,000
03195000	Elk River at Centralia, WV	South[2]	S	8,230	8,940	9,430	9,800	10,100	10,400	10,600	10,800	11,000	11,200	11,900	12,300
03195100	Right Fork Holly River at Guardian, WV	South	S	1,450	1,650	1,790	1,910	2,010	2,100	2,180	2,260	2,330	2,390	2,670	2,860
			R	1,120	1,330	1,490	1,610	1,720	1,820	1,900	1,980	2,050	2,120	2,400	2,620
			W	1,410	1,610	1,750	1,870	1,970	2,060	2,140	2,220	2,290	2,350	2,630	2,820
03195250	Left Fork Holly River near Replete, WV	South	S	1,410	1,640	1,810	1,940	2,060	2,170	2,260	2,350	2,440	2,510	2,840	3,070
			R	1,030	1,220	1,360	1,480	1,580	1,670	1,740	1,820	1,880	1,940	2,210	2,400
			W	1,390	1,610	1,770	1,910	2,020	2,130	2,220	2,310	2,390	2,460	2,780	3,010
03195500	Elk River at Sutton, WV	South	S	12,400	14,000	15,100	16,000	16,700	17,300	17,900	18,400	18,800	19,200	20,900	22,200
			R	7,410	8,680	9,600	10,300	11,000	11,600	12,100	12,500	12,900	13,300	15,000	16,200
			W	12,300	13,900	15,000	15,800	16,600	17,200	17,700	18,200	18,700	19,100	20,700	22,000
03195600	Granny Creek at Sutton, WV	South	S	578	646	695	733	766	794	819	842	863	882	962	1,020
			R	224	269	302	330	353	374	393	410	426	441	503	550
			W	541	603	647	683	713	740	764	785	805	823	900	955
03197000	Elk River at Queen Shoals, WV	South	S	17,900	19,900	21,300	22,500	23,400	24,300	25,100	25,800	26,400	27,000	29,500	31,200
			R	13,500	15,800	17,400	18,700	19,800	20,800	21,700	22,500	23,300	24,000	26,900	29,000
			W	17,900	19,800	21,200	22,400	23,400	24,200	25,000	25,700	26,300	26,900	29,400	31,200
03197150	Ashleycamp Run near Left Hand, WV	South	S	140	155	165	172	179	184	189	194	198	201	216	226
			R	82	99	112	122	131	139	146	153	159	165	189	208
			W	133	147	158	165	172	178	183	188	192	196	212	224
03197900	Elk Twomile Creek Tributary near Charleston, WV	South	S	32.6	39.6	44.8	49.2	53.0	56.4	59.6	62.4	65.1	67.6	78.4	86.5
			R	26.8	32.7	37.1	40.7	43.8	46.6	49.2	51.5	53.6	55.6	64.1	70.6
			W	32.0	38.8	43.8	48.0	51.7	55.1	58.1	60.8	63.4	65.8	76.2	84.0
03198450	Drawdy Creek near Peytona, WV	South	S	162	196	223	245	266	284	301	317	332	346	409	455
			R	245	294	330	359	385	407	428	446	464	480	547	599
			W	167	202	230	253	274	294	311	327	343	357	421	467
03198500	Big Coal River at Ashford, WV	South	S	5,350	6,420	7,200	7,850	8,400	8,900	9,350	9,760	10,100	10,500	12,000	13,100
			R	5,700	6,690	7,410	7,990	8,490	8,930	9,330	9,690	10,000	10,300	11,600	12,600
			W	5,360	6,420	7,200	7,850	8,410	8,900	9,350	9,750	10,100	10,500	12,000	13,100
03198780	Hunters Branch near Madison, WV	South	S	55	68	78	86	93	99	105	110	115	120	139	154
			R	82	99	112	122	131	139	146	153	159	165	189	208
			W	57	71	81	90	97	104	110	115	120	125	145	161

Table 4. Magnitude and frequency of peak discharges for gaging stations in West Virginia and surrounding States—*Continued*

Peak discharges for the indicated recurrence interval are presented in the following order: first line (S), from the systematic and historical record on the basis of the guidelines established by the Water Resources Council; second line (R), from the regionalized regression equation; and, third line (W), from weighting (1) the systematic and historical record on the basis of the guidelines established by the

Station No.	Station name and State	Region	Esti-mate type	Peak discharge for the indicated recurrence interval, in cubic feet per second											
				1.1-year	1.2-year	1.3-year	1.4-year	1.5-year	1.6-year	1.7-year	1.8-year	1.9-year	2-year	2.5-year	3-year
03198800	Low Gap Creek near Madison, WV	South	S	19.0	27.7	35.1	41.8	48.0	53.7	59.2	64.4	69.3	74.0	95.4	114.0
			R	57.9	70.2	79.3	86.8	93.3	99.1	104.0	109.0	114.0	118.0	135.0	149.0
			W	20.8	30.3	38.1	45.2	51.6	57.5	63.1	68.4	73.4	78.2	99.5	118.0
03199000	Little Coal River at Danville, WV	South	S	4,000	5,030	5,810	6,460	7,030	7,540	8,000	8,430	8,830	9,200	10,800	12,100
			R	4,220	4,960	5,500	5,940	6,320	6,650	6,950	7,220	7,470	7,700	8,680	9,410
			W	4,000	5,030	5,800	6,450	7,010	7,510	7,970	8,400	8,790	9,160	10,700	12,000
03199400	Little Coal River at Julian, WV	South	S	4,980	5,930	6,650	7,250	7,780	8,250	8,680	9,070	9,450	9,790	11,300	12,400
			R	4,830	5,670	6,280	6,780	7,210	7,590	7,920	8,230	8,520	8,780	9,890	10,700
			W	4,970	5,910	6,610	7,190	7,710	8,160	8,580	8,960	9,320	9,650	11,100	12,100
03200500	Coal River at Tornado, WV	South	S	11,800	13,800	15,300	16,400	17,300	18,100	18,800	19,500	20,000	20,600	22,700	24,400
			R	10,800	12,600	13,900	14,900	15,900	16,700	17,400	18,000	18,600	19,200	21,500	23,300
			W	11,800	13,800	15,200	16,300	17,300	18,100	18,800	19,400	20,000	20,500	22,700	24,400
03200600	Little Scary Creek near Nitro, WV	South	S	42.3	50.7	56.9	62.1	66.5	70.4	74.0	77.3	80.3	83.1	95.0	104.0
			R	43.1	52.3	59.2	64.9	69.8	74.1	78.1	81.7	85.1	88.2	101.0	112.0
			W	42.4	50.9	57.2	62.4	66.9	70.9	74.5	77.9	80.9	83.8	95.9	105.0
03201000	Pocatalico River at Sissonville, WV	South	S	3,770	4,430	4,900	5,280	5,600	5,870	6,120	6,340	6,540	6,730	7,480	8,070
			R	3,820	4,500	4,990	5,390	5,730	6,040	6,310	6,560	6,790	7,000	7,890	8,550
			W	3,770	4,430	4,910	5,280	5,600	5,880	6,120	6,350	6,550	6,730	7,490	8,080
03201410	Poplar Fork at Teays, WV	South	S	629	721	785	837	880	917	950	980	1,010	1,030	1,130	1,210
			R	262	314	353	384	412	436	458	477	496	513	585	640
			W	596	680	739	787	827	862	893	921	946	970	1,070	1,140
03201420	Long Branch near Teays, WV	South	S	156	181	197	211	221	231	239	246	253	259	283	302
			R	85	103	116	127	136	145	152	159	165	171	197	216
			W	148	171	187	199	209	218	226	233	240	246	270	289
03201440	Sixteenmile Creek near Pliny, WV	South	S	158	186	207	224	240	254	266	277	288	298	341	372
			R	48	59	66	73	78	83	88	92	95	99	114	125
			W	142	166	183	198	210	222	232	242	251	259	296	322
03201480	Threemile Creek Tributary near Point Pleasant, WV	South	S	47	63	76	87	97	105	113	121	127	134	161	185
			R	35	43	49	53	57	61	64	67	70	72	83	92
			W	45	61	72	82	91	99	106	112	118	124	148	168
03202000	Raccoon Creek at Adamsville, OH	South	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	6,030	- -	- -
03202400	Guyandotte River near Baileysville, WV	South	S	3,080	4,000	4,720	5,330	5,870	6,370	6,820	7,230	7,620	7,990	9,580	10,900
			R	4,680	5,500	6,090	6,580	6,990	7,360	7,690	7,990	8,270	8,520	9,600	10,400
			W	3,120	4,050	4,770	5,380	5,920	6,410	6,850	7,270	7,650	8,020	9,580	10,800
03202480	Brier Creek at Fanrock, WV	South	S	205	252	287	316	341	364	385	404	422	439	511	566
			R	233	280	314	342	367	388	408	425	442	457	522	571
			W	208	254	289	319	344	367	388	407	425	441	512	567

Table 4. Magnitude and frequency of peak discharges for gaging stations in West Virginia and surrounding States—*Continued*

Peak discharges for the indicated recurrence interval are presented in the following order: first line (S), from the systematic and historical record on the basis of the guidelines established by the Water Resources Council; second line (R), from the regionalized regression equation; and, third line (W), from weighting (1) the systematic and historical record on the basis of the guidelines established by the

Station No.	Station name and State	Region	Esti-mate type	Peak discharge for the indicated recurrence interval, in cubic feet per second											
				1.1-year	1.2-year	1.3-year	1.4-year	1.5-year	1.6-year	1.7-year	1.8-year	1.9-year	2-year	2.5-year	3-year
03202750	Clear Fork at Clear Fork, WV	South	S	2,600	2,980	3,260	3,480	3,660	3,830	3,980	4,110	4,230	4,350	4,820	5,160
			R	2,290	2,710	3,010	3,260	3,470	3,660	3,820	3,980	4,120	4,250	4,800	5,220
			W	2,590	2,970	3,240	3,460	3,650	3,820	3,970	4,100	4,230	4,340	4,820	5,170
03203000	Guyandotte River at Man, WV	South	S	9,970	12,200	13,700	15,000	16,100	17,100	17,900	18,700	19,400	20,000	22,700	24,900
			R	9,710	11,300	12,500	13,500	14,300	15,100	15,700	16,300	16,900	17,400	19,500	21,100
			W	9,960	12,100	13,700	15,000	16,100	17,000	17,900	18,600	19,300	20,000	22,600	24,800
03203600	Guyandotte River at Logan, WV	South	S	10,900	13,700	15,800	17,500	19,000	20,300	21,500	22,600	23,500	24,500	28,300	31,400
			R	10,500	12,200	13,500	14,500	15,400	16,200	16,900	17,600	18,100	18,700	21,000	22,700
			W	10,900	13,700	15,700	17,400	18,900	20,100	21,300	22,300	23,300	24,200	28,000	31,000
03204000	Guyandotte River at Branchland, WV	South	S	11,700	14,300	16,100	17,600	18,800	19,800	20,800	21,600	22,300	23,000	25,800	28,200
			R	14,300	16,600	18,300	19,700	20,900	22,000	22,900	23,800	24,500	25,300	28,300	30,600
			W	11,800	14,300	16,200	17,600	18,800	19,900	20,800	21,600	22,400	23,100	25,900	28,200
03204500	Mud River near Milton, WV	South	S	3,290	3,890	4,330	4,690	5,010	5,290	5,550	5,780	6,010	6,210	7,090	7,730
			R	4,060	4,770	5,290	5,710	6,070	6,390	6,680	6,940	7,190	7,410	8,350	9,050
			W	3,310	3,910	4,350	4,710	5,040	5,320	5,580	5,820	6,040	6,240	7,130	7,770
03205995	Sandusky Creek near Burlington, OH	South	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	103	- -	- -
03206600	East Fork Twelvepole Creek near Dunlow, WV	South	S	1,100	1,250	1,350	1,440	1,510	1,580	1,640	1,690	1,740	1,780	1,970	2,110
			R	884	1,050	1,170	1,270	1,360	1,430	1,500	1,570	1,620	1,680	1,900	2,070
			W	1,090	1,240	1,340	1,430	1,510	1,570	1,630	1,680	1,730	1,780	1,970	2,100
03206800	East Fork Twelvepole Creek near East Lynn, WV	South	S	1,990	2,290	2,500	2,680	2,830	2,960	3,080	3,180	3,280	3,380	3,760	4,040
			R	2,480	2,930	3,250	3,520	3,750	3,950	4,130	4,300	4,450	4,590	5,180	5,630
			W	2,010	2,330	2,550	2,730	2,890	3,030	3,150	3,260	3,370	3,460	3,870	4,160
03207000	Twelvepole Creek at Wayne, WV	South[2]	S	3,210	3,890	4,390	4,800	5,160	5,470	5,750	6,010	6,240	6,460	7,380	8,100
03207020	Twelvepole Creek below Wayne, WV	South	S	3,240	3,920	4,420	4,830	5,170	5,480	5,760	6,010	6,250	6,460	7,370	8,070
			R	4,610	5,410	6,000	6,480	6,890	7,250	7,570	7,870	8,140	8,390	9,450	10,200
			W	3,260	3,950	4,450	4,860	5,210	5,520	5,800	6,060	6,290	6,510	7,420	8,130
03207962	Dicks Fork at Phyllis, KY	South	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	52.4	- -	- -
03208000	Levisa Fork below Fishtrap Dam, KY	South	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	12,100	- -	- -
03209575	Bill D. Branch near Kite, KY	South	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	287	- -	- -
03210000	Johns Creek near Meta, KY	South	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	2,710	- -	- -
03211500	Johns Creek near Van Lear, KY	South	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	3,920	- -	- -

Table 4. Magnitude and frequency of peak discharges for gaging stations in West Virginia and surrounding States—*Continued*

Peak discharges for the indicated recurrence interval are presented in the following order: first line (S), from the systematic and historical record on the basis of the guidelines established by the Water Resources Council; second line (R), from the regionalized regression equation; and, third line (W), from weighting (1) the systematic and historical record on the basis of the guidelines established by the

Station No.	Station name and State	Region	Estimate type	Peak discharge for the indicated recurrence interval, in cubic feet per second											
				1.1-year	1.2-year	1.3-year	1.4-year	1.5-year	1.6-year	1.7-year	1.8-year	1.9-year	2-year	2.5-year	3-year
03212000	Paint Creek at Staffordsville, KY	South	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	5,280	- -	- -
03212750	Tug Fork at Welch, WV	South	S	1,420	1,710	1,920	2,100	2,250	2,390	2,510	2,620	2,730	2,820	3,230	3,540
			R	2,970	3,500	3,890	4,210	4,480	4,710	4,930	5,130	5,310	5,470	6,180	6,700
			W	1,500	1,820	2,060	2,250	2,420	2,570	2,700	2,830	2,940	3,050	3,490	3,830
03212980	Dry Fork at Beartown, WV	South	S	2,970	3,440	3,780	4,040	4,260	4,450	4,620	4,770	4,910	5,040	5,550	5,940
			R	3,450	4,060	4,500	4,860	5,170	5,450	5,690	5,920	6,130	6,320	7,130	7,730
			W	3,000	3,500	3,840	4,120	4,350	4,550	4,730	4,890	5,030	5,170	5,710	6,130
03213000	Tug Fork at Litwar, WV	South	S	5,350	6,740	7,790	8,650	9,400	10,100	10,700	11,200	11,700	12,200	14,200	15,800
			R	6,990	8,190	9,060	9,770	10,400	10,900	11,400	11,800	12,200	12,600	14,200	15,300
			W	5,370	6,770	7,810	8,680	9,420	10,100	10,700	11,200	11,700	12,200	14,200	15,800
03213500	Panther Creek near Panther, WV	South	S	572	766	918	1,050	1,160	1,270	1,360	1,450	1,530	1,610	1,950	2,230
			R	742	884	987	1,070	1,140	1,210	1,270	1,320	1,370	1,420	1,610	1,750
			W	576	769	920	1,050	1,160	1,260	1,360	1,450	1,530	1,600	1,930	2,210
03213700	Tug Fork at Williamson, WV	South	S	8,170	9,980	11,300	12,500	13,500	14,400	15,200	16,000	16,700	17,400	20,300	22,500
			R	11,500	13,400	14,800	16,000	16,900	17,800	18,500	19,200	19,900	20,500	23,000	24,800
			W	8,250	10,100	11,500	12,600	13,600	14,500	15,400	16,100	16,900	17,500	20,400	22,600
03214000	Tug Fork near Kermit, WV	South[2]	S	10,100	12,800	14,900	16,600	18,100	19,400	20,700	21,800	22,900	23,900	28,100	31,500
03214500	Tug Fork at Kermit, WV	South	S	11,400	14,000	15,900	17,500	18,900	20,200	21,300	22,400	23,400	24,300	28,200	31,200
			R	14,800	17,200	19,000	20,400	21,700	22,800	23,700	24,600	25,400	26,200	29,300	31,700
			W	11,400	14,000	15,900	17,600	19,000	20,200	21,400	22,400	23,400	24,300	28,200	31,200
03214900	Tug Fork at Glenhayes, WV	South	S	9,080	11,000	12,500	13,600	14,700	15,600	16,400	17,200	17,900	18,600	21,400	23,600
			R	16,900	19,600	21,600	23,300	24,700	25,900	27,000	28,000	28,900	29,800	33,300	36,000
			W	9,500	11,600	13,100	14,300	15,400	16,400	17,300	18,100	18,800	19,500	22,400	24,700
03215500	Blaine Creek at Yatesville, KY	South	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	6,000	- -	- -
03216500	Little Sandy River at Grayson, KY	South	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	9,910	- -	- -
03216540	East Fork Little Sandy River near Fallsburg, KY	South	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	815	- -	- -
03216563	Mile Branch near Rush, KY	South	S	- -	- -	- -	- -	- -	- -	- -	- -	- -	199	- -	- -

[1]The station is located in West Virginia but is operated by the U.S. Geological Survey in Maryland, and is considered as one of the site"operated by a surrounding state" for this study.
[2]The station is located in the indicated region, but was not used in the regional frequency analysis.

Appendix 1. Fortran program for Calculating Frequency Factors

```
C   10/29/2001 MAIN  written by John Atkins, Charleston, WV
C    remainder is from LIB3.2 rev of 6-29-98
C The input is a skew
C The output is a list of frequency factors

C Calls:
C     GAUSAB GAUSCF GAUSDY GAUSEX HARTIV HARTK HARTK1
C     HARTP HARTP1 HARTRG OUTKGB STUTP STUTX STVRSN
C     WILFRS WILFRT WILFRV

      DIMENSION PROB1(31), PROB2(31), PD(31)
      REAL NEXPR
      DATA PROB2  /    0.00010,
     #   0.00050,  0.00100,  0.00200,  0.00500,  0.01000,  0.02000,
     #   0.02500,  0.04000,  0.05000,  0.10000,  0.20000,  0.30000,
     #   0.40000,  0.429624, 0.50000,  0.570376, 0.60000,  0.70000,
     #   0.80000,  0.90000,  0.95000,  0.96000,  0.97500,  0.98000,
     #   0.99000,  0.99500,  0.99800,  0.99900,  0.99950,  0.99990 /

      open (7,file='freqfactg')
      WRITE(6,*) ' ENTER SKEW:'
      READ(5,*) SKEW
      CALL HARTIV(SKEW,PD)
c      WRITE(6,*) ' K-value REF: 17-B Appendix 3:  ',  HARTK(NEXPR,PD)
      do 20 i=1,31
        WRITE(7,18) (1 - PROB2(i)),PD(i)
   18   format(1h ,f20.7,f15.5)
   20 continue
      EXPR = 1/1.1
      NEXPR = 1. - EXPR
      WRITE(7,18) EXPR,HARTK(NEXPR,PD)

      EXPR = 1/1.2
      NEXPR = 1. - EXPR
      WRITE(7,18) EXPR,HARTK(NEXPR,PD)

      EXPR = 1/1.3
      NEXPR = 1. - EXPR
      WRITE(7,18) EXPR,HARTK(NEXPR,PD)

      EXPR = 1/1.4
      NEXPR = 1. - EXPR
      WRITE(7,18) EXPR,HARTK(NEXPR,PD)

      EXPR = 1/1.5
      NEXPR = 1. - EXPR
      WRITE(7,18) EXPR,HARTK(NEXPR,PD)

      EXPR = 1/1.6
      NEXPR = 1. - EXPR
      WRITE(7,18) EXPR,HARTK(NEXPR,PD)

      EXPR = 1/1.7
      NEXPR = 1. - EXPR
      WRITE(7,18) EXPR,HARTK(NEXPR,PD)

      EXPR = 1/1.8
      NEXPR = 1. - EXPR
      WRITE(7,18) EXPR,HARTK(NEXPR,PD)

      EXPR = 1/1.9
      NEXPR = 1. - EXPR
      WRITE(7,18) EXPR,HARTK(NEXPR,PD)

      EXPR = 1/3.0
      NEXPR = 1. - EXPR
      WRITE(7,18) EXPR,HARTK(NEXPR,PD)

      END
```

Appendix 2. Accuracy of Estimating Equations

The uncertainty or error in a prediction at an ungaged site may be estimated by partitioning the mean square error into the part due to having an imperfect model, γ^2, and the part due to sampling error, MSE_s (Tasker and Stedinger, 1989). The values for the standard error of the model, γ, are calculated in log (base 10) units. The standard error of the model can be transformed from log (base 10) units to percent with the equation

$$SE_{model}(\text{in percent}) = 100\left[e^{(5.3019\gamma^2)} - 1\right]^{0.5} .$$

The values for SE_{model} (in percent) for each regional equation are shown in table 1. The sampling mean square error, MSE_s, is the mean square error for a site due to estimating the true model parameters from observed flows at gaging stations in a region. The MSE_s value at a specific site can be estimated as described below. Denote the column vector of n logarithms of observed peak-discharge characteristics at n sites in a region by **Y**. For example,

$$\mathbf{Y} = \begin{bmatrix} \log Q_{50,\,1} \\ \log Q_{50,\,2} \\ \cdots \\ \cdots \\ \log Q_{50,\,n} \end{bmatrix},$$

where, $Q_{50,i}$ represents the observed 50-year peak at the *i*th gaging station in the region. Further, let **X** represent a (n by p) matrix of p-1 basin characteristics augmented by a column of ones at n gaging stations in a region, and let **B** represent a column vector of p regression coefficients. For example, in the North Region where drainage area, A, was the significant explanatory variable,

$$\mathbf{X} = \begin{bmatrix} 1 & \log(A_1) \\ 1 & \log(A_2) \\ \cdots & \cdots \\ \cdots & \cdots \\ 1 & \log(A_n) \end{bmatrix} \text{ and } \mathbf{B} = \begin{bmatrix} a \\ b \end{bmatrix} .$$

The linear model can be written in matrix notation as

$$\mathbf{Y} = \mathbf{XB}.$$

The mean square sampling error, MSE_s, for an ungaged site with basin characteristics given by the row vector x_0 =[1 log(A_0)], for example, is calculated as

$$MSE_s = \mathbf{x}_0\{\mathbf{X}^T\Lambda^{-1}\mathbf{X}\}^{-1}\mathbf{x}_0^T,$$

where Λ is the (n by n) covariance matrix associated with **Y**. The diagonal elements of Λ are model error variance, γ^2, plus the time sampling error for each site i, (i=1,2,3,...n), which is estimated as a function of a regional estimate of the standard deviation of annual peaks at site i, the recurrence interval of the dependent variable, and the number of years of record at site i. The off-diagonal elements of Λ are the sample covariance of the estimated T-year peaks at sites i and j. These off-diagonal elements are estimated as a function of a regional estimate of the standard deviation of annual peaks at sites i and j, the recurrence interval of the dependent variable, and the number of concurrent years of record at sites i and j (Tasker and Stedinger, 1989). The p by p matrix $\{\mathbf{X}^T\Lambda^{-1}\mathbf{X}\}^{-1}$, along with values of γ^2 for each equation in table 1, is shown in table 2A. The mean square error of a prediction, in square log (base 10) units, at a specific ungaged site can be estimated as

$$MSE_p = \gamma^2 + MSE_s .$$

To estimate the average prediction error for a region, MSE_p is computed for each gage site as if it were an ungaged site. An appropriate basin characteristic for $\mathbf{x_0}$ is chosen, an average for all the gaged sites is computed and its square root calculated. This result, APE_{logs}, is in log (base 10) units. The average prediction error, APE, in percent, can be calculated as

$$APE_{percent} = 100\left[e^{(5.3019\overline{MSE_p})} - 1\right]^{0.5} ,$$

where $\overline{MSE}_p$ is $(ASE_{logs})^2$. The values for $APE_{percent}$ for each equation in each region are shown in table 1.

Consider the process of estimating error for a particular application of one of the regional equations in table 4. Taking the example of the 2-year recurrence-interval matrix for the North Region in table 2A,

$$MSEs = \begin{bmatrix} 1 & \log A_0 \end{bmatrix} \begin{bmatrix} 0.0020084 & -0.00075628 \\ -0.00075628 & 0.00036696 \end{bmatrix} \begin{bmatrix} 1 \\ \log A_0 \end{bmatrix} ,$$

the resulting estimate of mean square error of prediction is the scalar function of log A_0 given as

$$MSE_p = 0.013303 + 0.0020084 + 2(-0.00075628 \log A_0) + 0.00036696 (\log A_0)^2.$$

A value of the independent variable, A_0 = 0.13 square mile, gives

$$MSE_p = 0.0169395,$$

resulting in

$$APE_{percent} = 30.7.$$

This value differs from the average prediction error of 28.0 percent (table 1) by 2.7 percent. All prediction values fall within the shaded area shown in figure 3.

Table 2A. Matrix $[\chi^T \Lambda^{-1} \chi]^{-1}$ and values of γ^2 for each flood estimating equation by region and recurrence interval for rural, unregulated streams in West Virginia

[These matrices and γ^2 can be used to compute the standard error of a prediction, MSE_p, as explained in the text of this appendix. Numbers are given in scientific notation; for example, 0.20007E-02 = 0.0020007. γ^2 is the model error variance]

North Region

1.1-year recurrence interval, γ^2=0.17076E-01

0.22449E-02	-0.85898E-03
-0.85898E-03	0.42857E-03

1.2-year recurrence interval, γ^2=0.14983E-01

0.21106E-02	-0.80042E-03
-0.80042E-03	0.39359E-03

1.3-year recurrence interval, γ^2=0.14048E-01

0.20492E-02	-0.77365E-03
-0.77365E-03	0.37770E-03

1.4-year recurrence interval, γ^2=0.13531E-01

0.20148E-02	-0.75867E-03
-0.75867E-03	0.36884E-03

1.5-year recurrence interval, γ^2=0.13217E-01

0.19936E-02	-0.74947E-03
-0.74947E-03	0.36341E-03

1.6-year recurrence interval, γ^2=0.13022E-01

0.19805E-02	-0.74376E-03
-0.74376E-03	0.36005E-03

1.7-year recurrence interval, γ^2=0.12903E-01

0.19724E-02	-0.74026E-03
-0.74026E-03	0.35799E-03

1.8-year recurrence interval, γ^2=0.12829E-01

0.19674E-02	-0.73806E-03
-0.73806E-03	0.35669E-03

1.9-year recurrence interval, γ^2=0.12789E-01

0.19646E-02	-0.73686E-03
-0.73686E-03	0.35599E-03

2-year recurrence interval, γ^2=0.13303E-01

0.20084E-02	-0.75628E-03
-0.75628E-03	0.36696E-03

2.5-year recurrence interval, γ^2=0.12887E-01

0.19713E-02	-0.73977E-03
-0.73977E-03	0.35770E-03

3-year recurrence interval, γ^2=0.13207E-01

0.19930E-02	-0.74919E-03
-0.74919E-03	0.36325E-03

Table 2A. Matrix $[\chi^T \Lambda^{-1} \chi]^{-1}$ and values of γ^2 for each flood estimating equation by region and recurrence interval for rural, unregulated streams in West Virginia—*Continued*

East Region

1.1-year recurrence interval, γ^2=0.43831E-01

0.30460E-02	-0.11252E-02
-0.11252E-02	0.65451E-03

1.2-year recurrence interval, γ^2=0.37710E-01

0.27721E-02	-0.10061E-02
-0.10061E-02	0.57903E-03

1.3-year recurrence interval, γ^2=0.34363E-01

0.26204E-02	-0.94026E-03
-0.94026E-03	0.53743E-03

1.4-year recurrence interval, γ^2=0.32125E-01

0.25179E-02	-0.89582E-03
-0.89582E-03	0.50946E-03

1.5-year recurrence interval, γ^2=0.30479E-01

0.24420E-02	-0.86292E-03
-0.86292E-03	0.48879E-03

1.6-year recurrence interval, γ^2=0.29203E-01

0.23827E-02	-0.83727E-03
-0.83727E-03	0.47271E-03

1.7-year recurrence interval, γ^2=0.28179E-01

0.23348E-02	-0.81657E-03
-0.81657E-03	0.45976E-03

1.8-year recurrence interval, γ^2=0.27330E-01

0.22950E-02	-0.79934E-03
-0.79934E-03	0.44900E-03

1.9-year recurrence interval, γ^2=0.26615E-01

0.22612E-02	-0.78477E-03
-0.78477E-03	0.43990E-03

2-year recurrence interval, γ^2=0.25063E-01

0.21930E-02	-0.75555E-03
-0.75555E-03	0.42133E-03

2.5-year recurrence interval, γ^2=0.23905E-01

0.21320E-02	-0.72899E-03
-0.72899E-03	0.40521E-03

3-year recurrence interval, γ^2=0.22712E-01

0.20742E-02	-0.70413E-03
-0.70413E-03	0.38980E-03

Table 2A. Matrix $[\chi^T \Lambda^{-1} \chi]^{-1}$ and values of γ^2 for each flood estimating equation by region and recurrence interval for rural, unregulated streams in West Virginia—*Continued*

South Region

1.1-year recurrence interval, γ^2=0.38257E-01

0.25075E-02	-0.85364E-03
-0.85364E-03	0.39760E-03

1.2-year recurrence interval, γ^2=0.33422E-01

0.23192E-02	-0.78101E-03
-0.78101E-03	0.35933E-03

1.3-year recurrence interval, γ^2=0.30972E-01

0.22225E-02	-0.74375E-03
-0.74375E-03	0.33977E-03

1.4-year recurrence interval, γ^2=0.29435E-01

0.21612E-02	-0.72019E-03
-0.72019E-03	0.32744E-03

1.5-year recurrence interval, γ^2=0.28368E-01

0.21184E-02	-0.70373E-03
-0.70373E-03	0.31884E-03

1.6-year recurrence interval, γ^2=0.27583E-01

0.20867E-02	-0.69155E-03
-0.69155E-03	0.31249E-03

1.7-year recurrence interval, γ^2=0.26983E-01

0.20624E-02	-0.68222E-03
-0.68222E-03	0.30763E-03

1.8-year recurrence interval, γ^2=0.26509E-01

0.20431E-02	-0.67482E-03
-0.67482E-03	0.30378E-03

1.9-year recurrence interval, γ^2=0.26128E-01

0.20276E-02	-0.66885E-03
-0.66885E-03	0.30068E-03

2-year recurrence interval, γ^2=0.22800E-01

0.20219E-02	-0.66676E-03
-0.66676E-03	0.29941E-03

2.5-year recurrence interval, γ^2=0.24886E-01

0.19767E-02	-0.64932E-03
-0.64932E-03	0.29053E-03

3-year recurrence interval, γ^2=0.24533E-01

0.19621E-02	-0.64375E-03
-0.64375E-03	0.28764E-03