In cooperation with the Federal Emergency Management Agency, the Pennsylvania State Association of Township Supervisors, and the Susquehanna River Basin Commission

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Scientific Investigations Report 2008-5102

**U.S. Department of the Interior**
**U.S. Geological Survey**

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# Contents



# Figures

# Tables

# Conversion Factors

| Multiply | By | To obtain |
|---|---|---|
| | Length | |
| inch (in.) | 2.54 | centimeter (cm) |
| inch (in.) | 25.4 | millimeter (mm) |
| foot (ft) | 0.3048 | meter (m) |
| mile (mi) | 1.609 | kilometer (km) |
| | Area | |
| square mile ($mi^2$) | 2.590 | square kilometer ($km^2$) |
| | Flow rate | |
| cubic foot per second ($ft^3/s$) | 0.02832 | cubic meter per second ($m^3/s$) |
| inch per hour (in/h) | 0.0254 | meter per hour (m/h) |
| | Hydraulic gradient | |
| foot per mile (ft/mi) | 0.1894 | meter per kilometer (m/km) |

Vertical coordinate information is referenced to the North American Vertical Datum of 1988 (NAVD 88).

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83).

Altitude, as used in this report, refers to distance above the vertical datum.

# Regression Equations for Estimating Flood Flows at Selected Recurrence Intervals for Ungaged Streams in Pennsylvania

By Mark A. Roland and Marla H. Stuckey


## Abstract

Regression equations were developed for estimating flood flows at selected recurrence intervals for ungaged streams in Pennsylvania with drainage areas less than 2,000 square miles. These equations were developed utilizing peak-flow data from 322 streamflow-gaging stations within Pennsylvania and surrounding states. All stations used in the development of the equations had 10 or more years of record and included active and discontinued continuous-record as well as crest-stage partial-record stations. The state was divided into four regions, and regional regression equations were developed to estimate the 2-, 5-, 10-, 50-, 100-, and 500-year recurrence-interval flood flows. The equations were developed by means of a regression analysis that utilized basin characteristics and flow data associated with the stations.

Significant explanatory variables at the 95-percent confidence level for one or more regression equations included the following basin characteristics: drainage area; mean basin elevation; and the percentages of carbonate bedrock, urban area, and storage within a basin. The regression equations can be used to predict the magnitude of flood flows for specified recurrence intervals for most streams in the state; however, they are not valid for streams with drainage areas generally greater than 2,000 square miles or with substantial regulation, diversion, or mining activity within the basin. Estimates of flood-flow magnitude and frequency for streamflow-gaging stations substantially affected by upstream regulation are also presented.


## Introduction

Information on the frequency and magnitude of floods is essential for Flood Insurance Studies (FIS), flood-plain management, and the design of bridges and flood-control structures. Accurate and accessible methods that produce flood-flow statistics are important to engineers and planners working on such projects. Flood-flow statistics commonly used in flood-related projects include the magnitude of flood flows occurring, on average, once in 2, 5, 10, 50, 100, and 500 years (Q2, Q5, Q10, Q50, Q100, and Q500, respectively). These flood flows are estimates based on statistical probabilities or frequencies, and the recurrence intervals associated with each flood flow refer to the average number of years between the floods (Dinicola, 1996). For example, the Q100 has a 1 in 100 chance (or 0.01 probability or frequency) that a flood of this magnitude will occur in any given year.

Regression equations for computing the magnitude and frequency of peak flows were last developed for Pennsylvania by the U.S. Geological Survey (USGS) by use of peak-flow data collected through 1997 (Stuckey and Reed, 2000). Flooding experienced in the northern and eastern parts of Pennsylvania subsequent to 1997 prompted an analysis of flood-magnitude and flood-frequency data through the 2006 water year[1] for streamflow-gaging stations with at least 25 years of record in the Delaware and Susquehanna River Basins in Pennsylvania (Roland and Stuckey, 2007). The results of that study, other recent flooding across the state, and advances in geospatially derived basin characteristics warranted updating the flood-flow regression equations for Pennsylvania.

The USGS, in cooperation with the Federal Emergency Management Agency (FEMA), the Pennsylvania State Association of Township Supervisors (PSATS), and the Susquehanna River Basin Commission (SRBC), developed updated flood-flow regression equations for use on ungaged streams in Pennsylvania. Regression equations were developed to estimate the Q2, Q5, Q10, Q50, Q100, and Q500 flood flows for streams without substantial regulation, diversion, or mining activity in the basin. This report discusses the methodology used and presents the results of the regression analysis.

### Purpose and Scope

This report presents regression equations that describe the statistical relation between expected flood magnitudes and basin characteristics for selected recurrence intervals

[1]Water year is defined as a 12-month period beginning October 1 and ending September 30. The water year is designated by the calendar year in which it ends.

for ungaged streams in Pennsylvania. Flood-flow regression equations were developed by use of peak-flow data from 277 continuous-record[2] and 45 crest-stage partial-record[3] streamflow-gaging stations in Pennsylvania and surrounding states—New York, Ohio, Maryland, and West Virginia—with 10 or more years of record generally through the 2005 water year. Peak-flow data were used through the 2006 water year for 39 stations in the Delaware and North Branch Susquehanna River Basins that experienced severe flooding in June 2006. Flood-flow data are also presented for the Q2, Q5, Q10, Q50, Q100, and Q500 along with basin characteristics computed from the station data.

## Previous Studies

Regression equations used to predict flood frequency-magnitude relations for ungaged streams in Pennsylvania were first published by Flippo in 1977 and were updated by Flippo in 1982. The equations published in 1982 were evaluated by Ehlke and Reed (1999) on the basis of a comparison between flood flows calculated from the regression equations and peak-flow data collected through the 1996 water year. Regression equations for estimating magnitude of flood flows in Pennsylvania for selected recurrence intervals were last published in 2000 using data through the 1997 water year (Stuckey and Reed, 2000).

# Development of Regression Equations

Flood flows for selected recurrence intervals were computed using peak streamflow data from gaging stations with flow relatively unaffected by regulation, diversion, or mining. Methods used are described in Water Resource Council Bulletin 17B (Water Resources Council, Hydrology Committee, 1981). These flood flows will be referred to as “observed” in this report. The terms ‘peak flows’ and ‘flood flows’ may be used interchangeably in common parlance; however, within this report, an attempt is made to maintain consistency with regard to usage. The use of ‘peak flows’ is associated with flows that are more or less measured at a streamflow-gaging station and are associated with a period of observation (year). The term ‘flood flow’ is reserved for a more extreme event typically not measured directly and that is associated with a recurrence interval.

Basin characteristics known to affect streamflow, such as land cover, were determined for the drainage basins upstream from the gaging stations. The observed flood flows (dependent variable) were related to the basin characteristics (independent or explanatory variables) using regression techniques to obtain regression equations. These equations can be used to compute flood flows for selected recurrence intervals for streams where no gaging-station data are available. The flood flows computed from regression equations will be referred to as “predicted” in this report.

## Selection of Streamflow-Gaging Stations

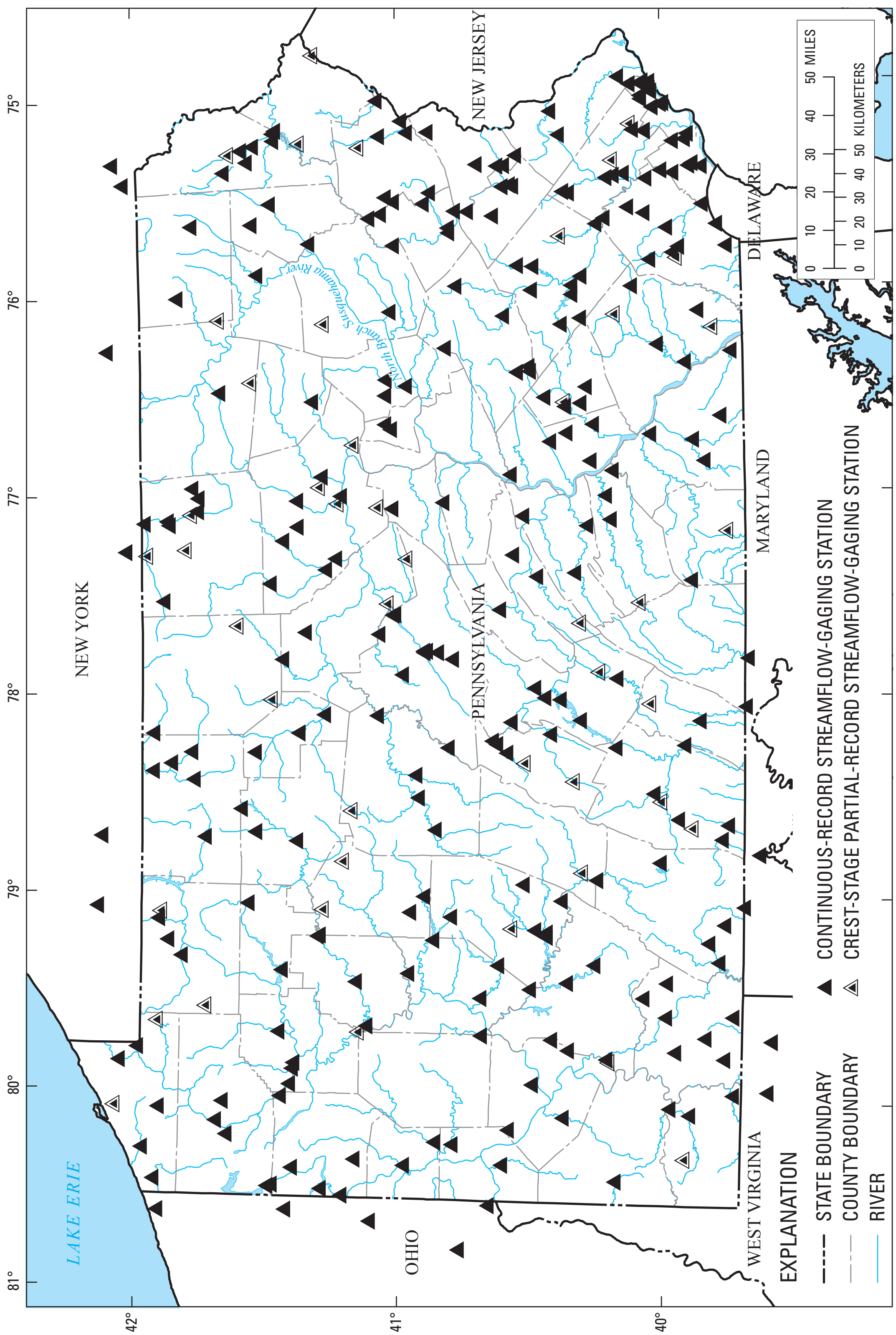
Peak-flow data generally through the 2005 water year from 306 stations on streams in Pennsylvania, along with peak-flow data from stations in surrounding states, including 6 stations in New York, 5 in Ohio, 3 in Maryland, and 2 in West Virginia, with flow relatively unaffected by regulation, diversions, and mining were used in the development of the regression equations (fig. 1). In addition, peak-flow data for water year 2006 were used for 39 stations in the Delaware and North Branch Susquehanna River Basins that experienced severe flooding due to heavy rains occurring June 23, 2006, through June 29, 2006.

Stations included in the analysis had 10 or more years of record and drainage areas less than 2,000 $mi^2$. The stations were selected on the basis of information about regulation, diversions, and mining published in the USGS Pennsylvania Water Resources Data Reports, Surface-Water-Supply Reports, and other scientific reports. In the event of regulation, diversion, or mining occurring within a basin during the period of record, only the period of record prior to the event was used in the analysis. For stations that had a gap in the operational history, the total number of years the station was in actual operation was used to determine the period of record. A list of the stations used in the development of the regression equations is provided in appendix 1.

Peak flows may be recorded outside of the streamflow-gaging station operational period (also referred to as the systematic period of record) to document major flood events. These peaks are termed “historical peaks” and may be used to supplement the period of record at a station. If historical peaks are used in the analysis, the period of record at the station is adjusted to include the total number of years from the historical peak to the operational period of record, which may include a period when the station was not in operation (Water Resources Council, Hydrology Committee, 1981). This situation affected a small number of stations used in the analysis and typically added few years to the period of record. Because of the inherent uncertainty associated with historical peaks, not all historical peaks were included in the analysis. Typically, historical peaks were included in the analysis if the peak was not the maximum peak of record for the station or if the peak was recorded less than 5 years outside the period during which the station operated. Other factors such as knowledge about a particular event or previous USGS publications were considered as part of the decision to include a historical peak. For example, station 01539000, Fishing Creek near Blooms-

[2]Continuous-record station is a site where stage or streamflow is recorded at some interval on a continuous basis. The recording interval is usually 15 minutes but may be less or more frequent.

[3]Partial-record station is a site where discrete measurements of one or more hydrologic parameters are obtained over a period of time without continuous data being recorded or computed. A common example is a crest-stage gage partial-record station at which only peak stages and flows are recorded.




Base from U.S. Geological Survey 1:2,000,000 and 1:100,000 Digital Data
State boundary from U.S. Geological Survey, 2005
Rivers from U.S. Geological Survey, 2006

Albers Equal-Area Conic projection: Standard Parallels 29°30'N and 45°30'N.
Central Meridian 77°45'W, Latitude of Origin 23°00'N

**Figure 1.** Streamflow-gaging stations used in development of flood-flow regression equations for Pennsylvania streams.

burg, Pa., began continuous operation in 1939, but a historical peak was recorded in 1936. Subsequently, the period of record used in the analysis included the period between 1936 and 1939, when the station was not in operation.

## Basin Characteristics

A set of 24 climatologic, geologic, hydrologic, and physiographic basin characteristics with possible effects on peak flow was compiled from various geographic information system (GIS) sources. The use of GIS-derived basin characteristics in the development of regression equations improved consistency, reproducibility, and ease of use. The basin characteristics evaluated in the exploratory regression analysis are presented in table 1.

## Regression Analysis

The observed flood-flow frequency statistics were computed for the 306 Pennsylvania stations and were related to the basin characteristics using exploratory Ordinary Least Squares (OLS) and Weighted Least Squares (WLS) regression techniques. The flood flows calculated for each streamflow-gaging station for specified recurrence intervals were weighted for comparison purposes to OLS on the basis of the period of record, *[(number of years of record at station * number of stations)/sum of years of record of all stations],* and incorporated into the WLS analysis (Helsel and Hirsch, 1992). Regression iterations were performed using a statistical software package, S-PLUS (MathSoft, Inc., 1997), to reduce the number of explanatory variables to those significant at the 95-percent confidence level. Flood-flow and basin-characteristic data for the 16 out-of-state stations were obtained from previously published USGS reports (Dillow, 1996; Lumia and others, 2006; Koltun, 2003; Wiley and others, 2000). Because limited data were available for these sites, they were excluded from the exploratory regression-analysis techniques. Each set of regression equations was constrained to contain the same explanatory variables in an attempt to maintain a monotonic relation between frequency and magnitude for all possible sites, whether the same explanatory variables were significant at all recurrence intervals. Diagnostics used to further evaluate the adequacy of the regression models included graphical relations, multicollinearity, standard error, and coefficient of determination ($R^2$) (Helsel and Hirsch, 1992).

The observed flood flows computed according to the guidelines in Bulletin 17B (Water Resources Council, Hydrology Committee, 1981) and the significant explanatory variables found using OLS and WLS were then related using a Generalized Least Squares (GLS) regression analysis to obtain the final regression equation. GLS is considered to be a more accurate regression technique for hydrologic regressions, particularly when using differing record lengths (Tasker and Stedinger, 1989). In addition to differing record lengths, the technique also takes into account variance of flows and cross-correlation among the stations used in the analysis (Tasker and Stedinger, 1989). This regression technique was incorporated into a USGS software package, GLSNET (Tasker and Stedinger, 1989), and was used in this analysis.

# Flood-Flow Regression Equations

Data from 322 stations within Pennsylvania and from surrounding states were used to develop the Q2, Q5, Q10, Q50, Q100, and Q500 flood-flow regression equations. Exploratory regression analysis using OLS and WLS indicated the need for the state to be regionalized. A comparative analysis was done between the updated statewide regression residual values, standard errors, and $R^2$ and those published by Stuckey and Reed (2000) for the previously developed flood-flow regions. Exploratory regressions using these previously defined flood-flow regions in association with the updated peak-flow data did not produce diagnostic statistics indicative of a significant improvement over those resulting from the statewide regression developed using OLS and WLS for the updated Q100 flood flow. Therefore, statewide regression residuals and basin flood-flow yields at the 100-year recurrence interval were used to create four flood-flow regions for the state (fig. 2). The basin flood-flow yields were computed for each station, in cubic feet per second per square mile, by dividing the Q100 flood flow by the respective drainage area. The regionalization process consisted of generating plots of the Q100 regression residual values and basin flood-flow yields for each of the 322 stations included in the study area. These plots were evaluated and regionalized on the basis of similar values. Physiographic provinces and precipitation maps were also used in the delineation of the four flood-flow regions. Hydrologic unit code (HUC8) boundaries were followed wherever possible while delineating the flood-flow regions to avoid dividing watersheds into multiple regions. The Schuylkill River Basin (HUC 02040203) was divided on the basis of differing basin and geologic characteristics.

The North Branch Susquehanna River Basin, parts of the West Branch Susquehanna River Basin, and most of the northern Delaware River Basin are within flood-flow region 1 (fig. 3). The southern part of the Delaware River Basin, including Philadelphia and surrounding areas, and the lower part of the Susquehanna River Basin are within flood-flow region 2 (fig. 4). The Schuylkill River Basin, within the Delaware River Basin, was split between regions 1 and 2; the upper part of the basin is in region 1 and the lower part, down to the mouth, is in region 2. This split was based on statewide regression diagnostics and differing hydrologic characteristics between the two parts of the basin. Flood-flow region 3 extends from south-central Pennsylvania northwest to the state borders of New York, Ohio, and West Virginia, encompassing parts of the Susquehanna, Ohio, and St. Lawrence River Basins (fig. 5). The Potomac and parts of the Ohio River Basin in the southwestern part of Pennsylvania are within flood-flow

**Table 1.** Basin characteristics selected for use in the development of regression equations for flood-flow estimates.

| Basin characteristic | Source | Reference |
|---|---|---|
| Dependent Variables | | |
| Estimates of flood flows for the 2-, 5-, 10-, 50-, 100-, and 500-year recurrence intervals (expressed in cubic feet per second) | Derived by application of PeakFQ computer program that performs statistical flood-frequency analyses of peak flows recorded at U.S. Geological Survey streamflow-gaging stations following procedures recommended in Water Resources Council Bulletin 17B | streamflow data: U.S. Geological Survey (*http://waterdata.usgs.gov/pa/nwis/*) PeakFQ computer program: Flynn and others (2006) |
| Independent Variables | | |
| Basin slope (degrees) | Digital Elevation Model (DEM) | U.S. Geological Survey (2000a) |
| Mean basin elevation (feet) | Digital Elevation Model (DEM) | U.S. Geological Survey (2000a) |
| Forested (percent of basin area) | National Land Cover Dataset (NLCD); and enhanced version (NLCDe) | Homer and others (2004); Price and others (2003) |
| Glaciated (percent of basin area) | From modified geology maps | Pennsylvania Dept. of Conservation and Natural Resources (1997); Environmental Resources Research Institute (1996) |
| Lakes and open water (percent of basin area) | National Land Cover Dataset (NLCD); and enhanced version (NLCDe); digitized from USGS quadrangle maps 1:24000 scale | Homer and others (2004); Price and others (2003) |
| Longest drainage path (mile) | National Hydrography Dataset (NHD), 1:24000 scale | U.S. Geological Survey (2000b) |
| Stream density (length, in miles, per basin area, in square miles) | National Hydrography Dataset (NHD), 1:24000 scale | U.S. Geological Survey (2000b) |
| Channel slope (feet per mile) | Digital Elevation Model (DEM) | U.S. Geological Survey (2000a) |
| Soil infiltration index (unitless, 1=well to 4=poor) | State Soil Geographic (STATSGO) database | U.S. Department of Agriculture (1994) |
| Mean annual precipitation, 1971-2000 (inches) | Parameter-elevation Regressions on Independent Slopes Model (PRISM) | Daly (1996) |
| Drainage area (square miles) | Digital Elevation Model (DEM) | U.S. Geological Survey (2000a) |
| Soil thickness, depth to bedrock (feet) | State Soil Geographic (STATSGO) database | U.S. Department of Agriculture (1994) |
| Drainage run-off curve (unitless, 1=well to 7=poor) | State Soil Geographic (STATSGO) database | U.S. Department of Agriculture (1994) |
| Soil available water content (percent) | State Soil Geographic (STATSGO) database | U.S. Department of Agriculture (1994) |
| Soil permeability (inches per hour) | State Soil Geographic (STATSGO) database | U.S. Department of Agriculture (1994) |
| Urbanized area (percent of basin area) | National Land Cover Dataset (NLCD); and enhanced version (NLCDe) | Homer and others (2004); Price and others (2003) |
| Residential area (percent of basin area) | National Land Cover Dataset enhanced version (NLCDe) | Price and others (2003) |
| Mined area (percent of basin area) | National Land Cover Dataset enhanced version (NLCDe) | Price and others (2003) |
| Commercial, industrial & transportation area (percent of basin area) | National Land Cover Dataset enhanced version (NLCDe) | Price and others (2003) |
| Wetlands (percent of basin area) | National Land Cover Dataset (NLCD); and enhanced version (NLCDe) | Homer and others (2004); Price and others (2003) |
| Ground-water head, defined as mean basin elevation minus minimum elevation (feet) | Digital Elevation Model (DEM) | U.S. Geological Survey (2000a) |

**Table 1.** Basin characteristics selected for use in the development of regression equations for flood-flow estimates.—Continued

| Basin characteristic | Source | Reference |
|---|---|---|
| Shape factor (unitless) is a measure of the shape of a basin computed as the ratio of length of the basin to its computed area | Digital Elevation Model (DEM) | U.S. Geological Survey (2000a) |
| Carbonate bedrock (percent of basin area) | From modified geology maps | Pennsylvania Dept. of Conservation and Natural Resources (1997); Environmental Resources Research Institute (1996) |
| Impervious surface area (percent of basin area) | National Land Cover Dataset (NLCD) | Homer and others (2004) |

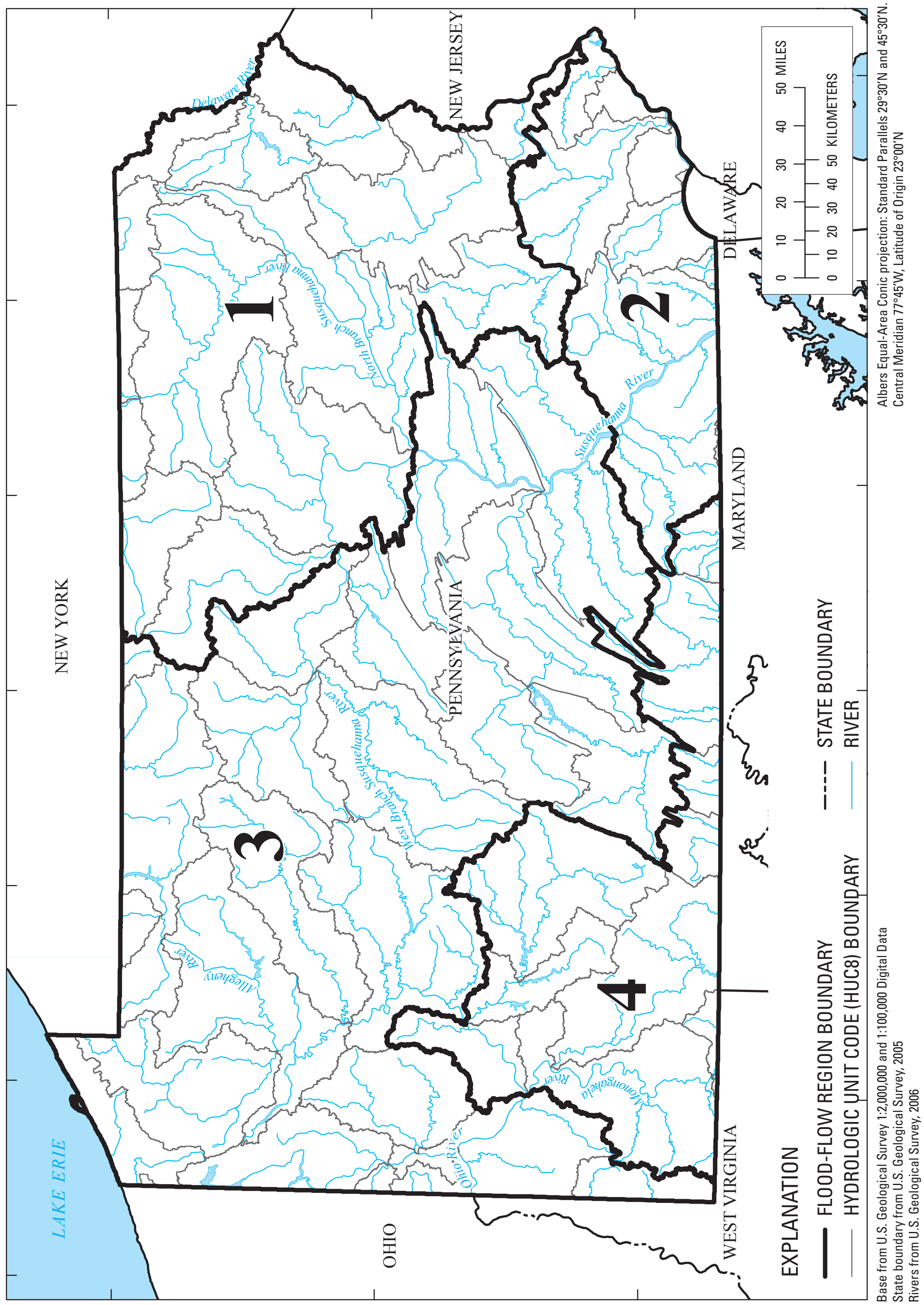
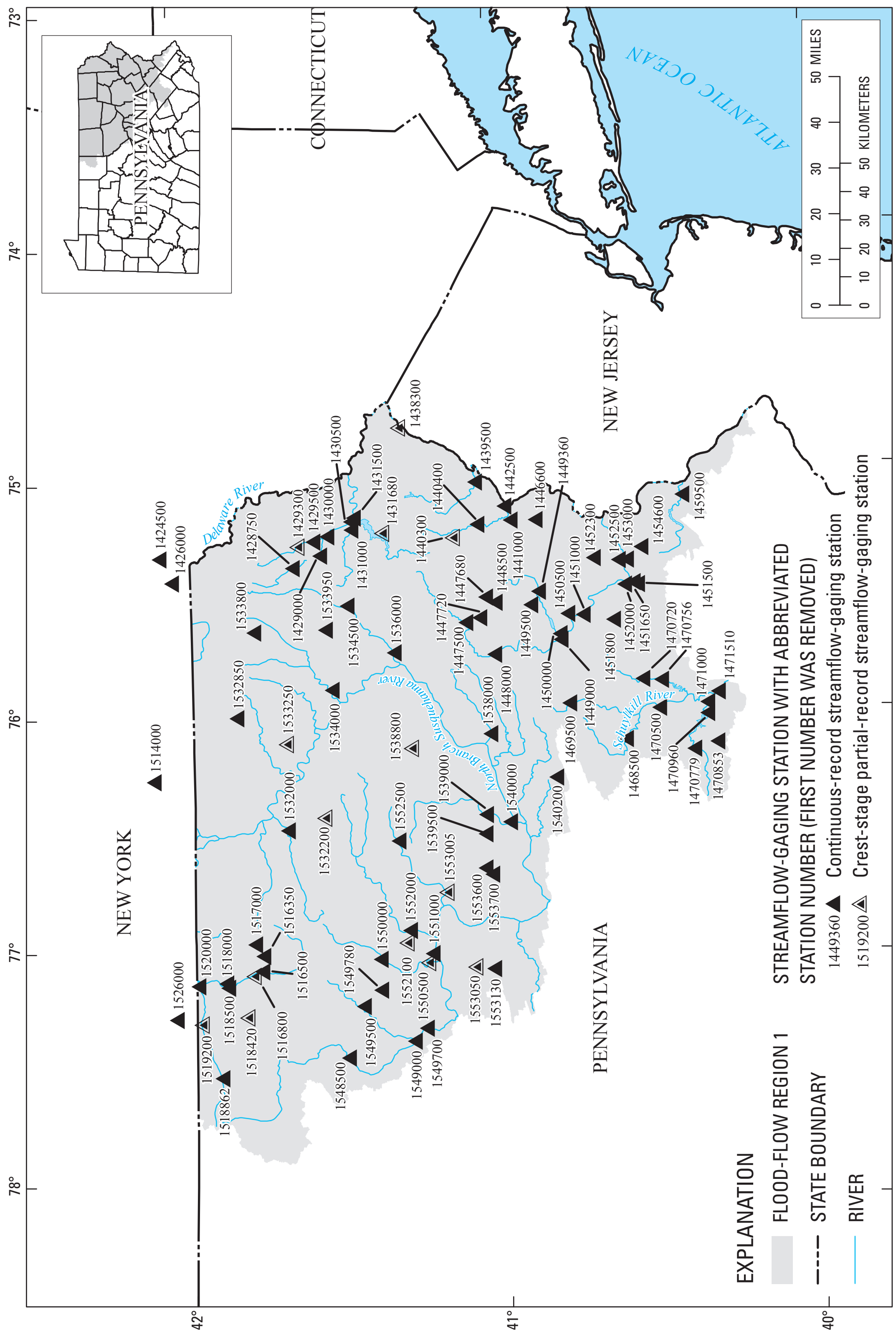


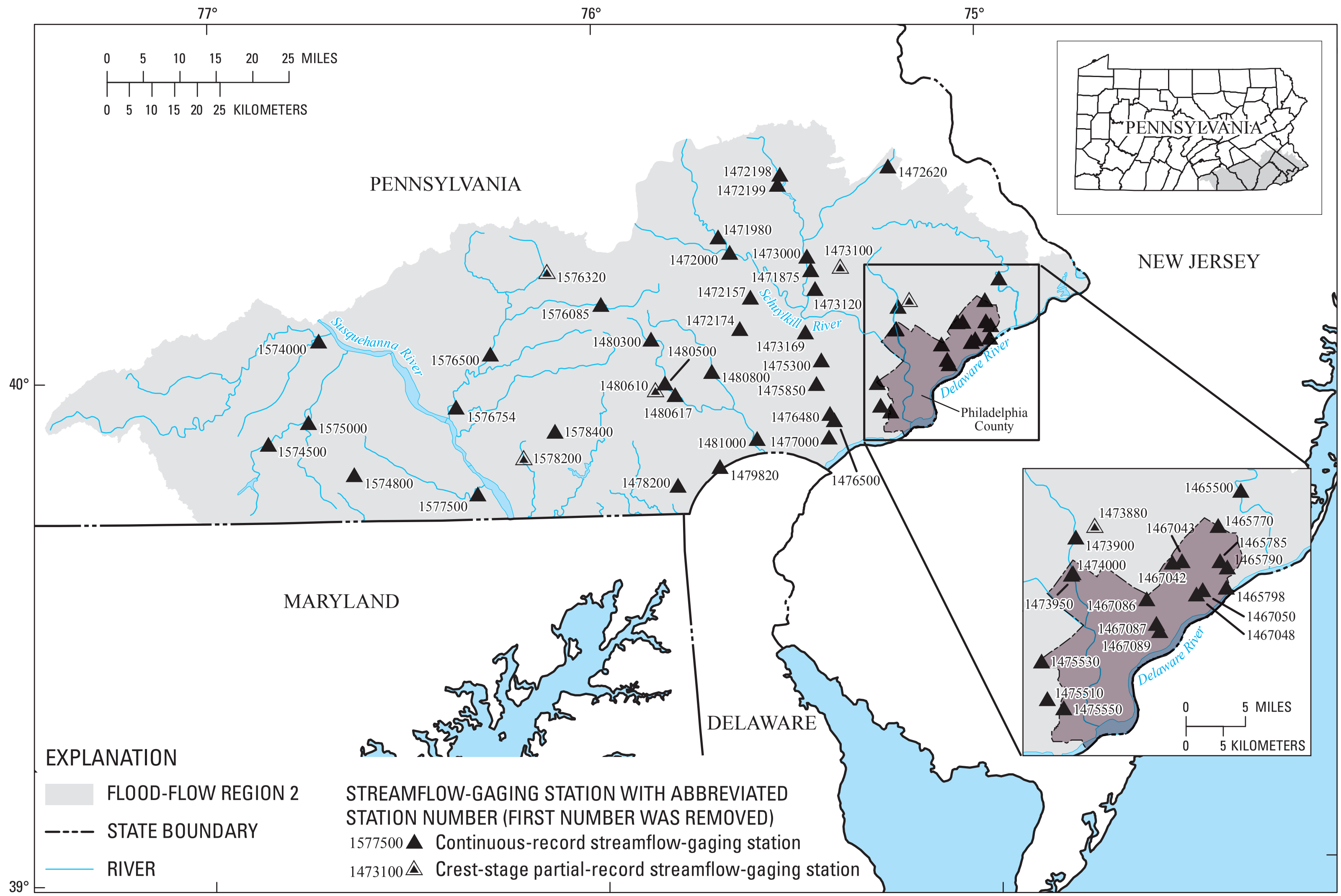

**Figure 2.** Flood-flow regions and hydrologic unit code boundaries in Pennsylvania.




Base from U.S. Geological Survey 1:2,000,000 and 1:100,000 Digital Data
State boundary from U.S. Geological Survey, 2005
Rivers from U.S. Geological Survey, 2006

Albers Equal-Area Conic projection: Standard Parallels 29°30'N and 45°30'N, Central Meridian 77°45'W, Latitude of Origin 23°00'N

**Figure 3.** Flood-flow region 1 in Pennsylvania.

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Albers Equal-Area Conic projection: Standard Parallels 29°30'N and 45°30'N.
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**Figure 4.** Flood-flow region 2 in Pennsylvania.

region 4 (fig. 6). The number of streamflow-gaging stations used to develop each flood-flow region and the area of each region are listed in table 2. The largest region is region 3, accounting for almost half the area in the state.

The following basin characteristics were statistically significant for one or more regression equations: drainage area, mean elevation, and the percentages of carbonate bedrock, urban area, and storage within the basin. A list of the basin characteristics for the stations used in the analysis is provided in appendix 1. When applying the regression equations to estimate flood magnitudes and frequency, it is important to maintain the same source of basin-characteristic data that were used in the development of the equations. Otherwise, the flood flows predicted by the regression equations may not be valid. To form a near-linear relation between the flood flows and basin characteristics, all independent and dependent variables were log-transformed prior to regression analysis. Because percentages can have a value of zero, 1.0 was added to the decimal form of the percentages of carbonate bedrock, urban area, and storage before the log transformation. Percentage of storage was derived from the percentage of lakes, ponds, and wetlands basin characteristics. To increase the variability of the basin characteristic storage area, a multiplication factor of 10 was applied to the decimal form of the basin characteristic, in effect resulting in storage area being multiplied by 0.1 rather than 0.01 prior to log transformation, as the other basin characteristics are.

The regression model took the following form in log units:

$$Log\,\hat{Q}_T = A + bLogDA + cLogEl + dLog(1+0.01C) + eLog(1+0.01U) + fLog(1+0.1Sto) \quad (1)$$

Or, in arithmetic space:

$$\hat{Q}_T = 10^A (DA)^b (El)^c (1+0.01C)^d (1+0.01U)^e (1+0.1Sto)^f \quad (2)$$

where

| | |
|---|---|
| *Log* | = log to base 10; |
| $\hat{Q}_T$ | = the T-year predicted flood flow, in cubic feet per second; |
| *A* | = the intercept (estimated by GLS); |
| *DA* | = drainage area, in square miles; |
| *El* | = mean elevation, in feet; |
| *C* | = basin underlain by carbonate bedrock, in percent; |
| *U* | = urban area in the basin, in percent; |
| *Sto* | = storage in the basin, in percent; and |
| *b, c, d, e, and f* | = basin characteristic coefficients of regression estimated by GLS. |

Regression equations predicting flood magnitudes for the 2-, 5-, 10-, 50-, 100-, and 500-year recurrence intervals were developed for each flood-flow region. The resultant basin-characteristic coefficients along with the standard errors of prediction for the regional flood-flow regression equations are shown in table 3. The standard errors of prediction provide an estimate of reliability of the predicted flood flows (Helsel and Hirsch, 1992). The standard errors of prediction for the flood-flow regression equations ranged from 26 percent for the Q5 in Region 4 to 49 percent for the Q500, also in Region 4. The standard errors of prediction for the Q100 ranged from 36 to 38 percent.

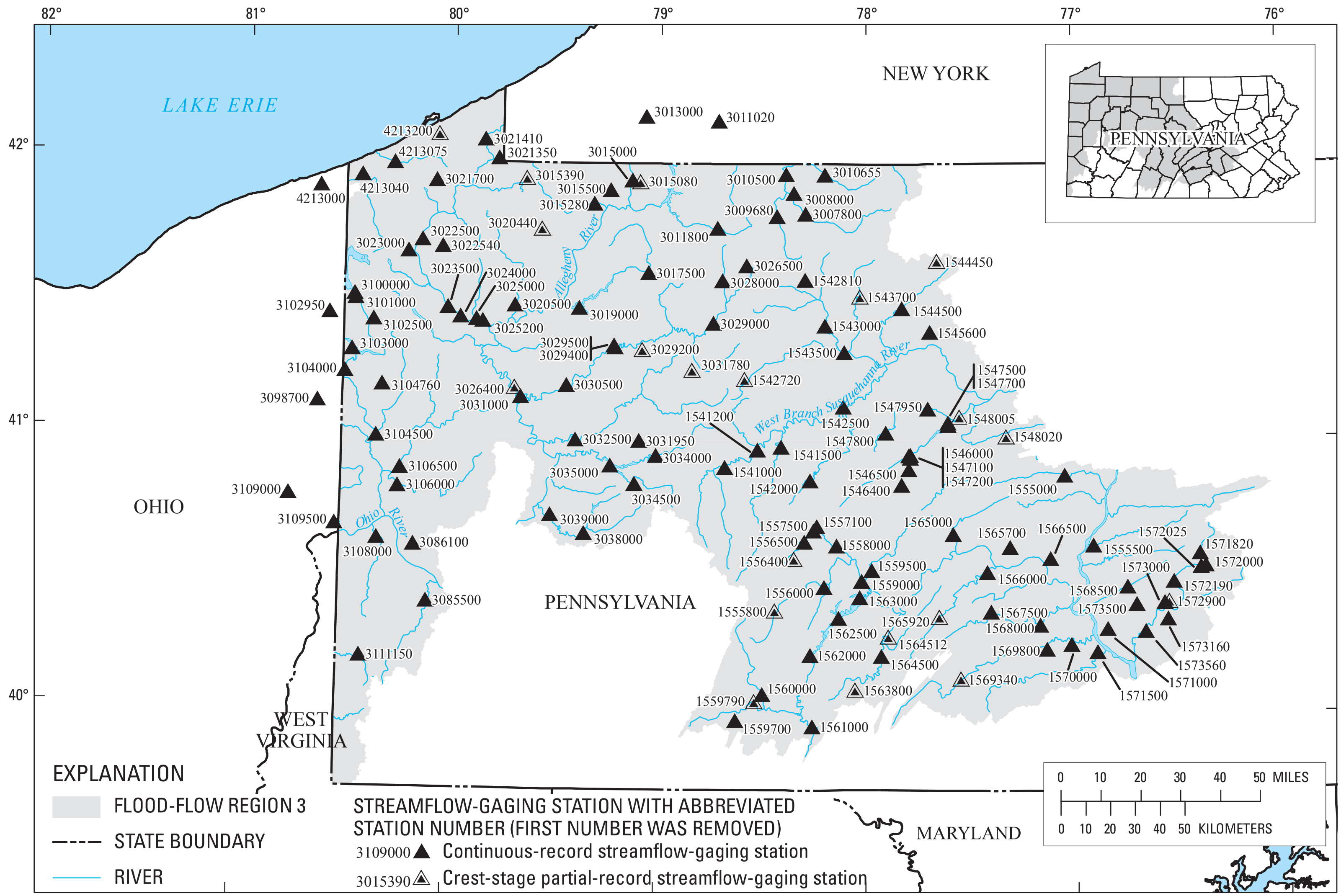
## Example using a flood-flow regression equation.

*Example 1.* Calculate the Q100 flood flow for a site near the confluence of Shohola Creek with the Delaware River in Pike County in the northeastern part of Pennsylvania at latitude 41˚25’30” and longitude 74˚57’20”. The drainage area

**Table 2.** Number of streamflow-gaging stations and area in flood-flow regions in Pennsylvania and surrounding states.

| Flood-flow region[1] | Area (square miles) | Number of in-state continuous-record stations | Number of out-of-state continuous-record stations | Number of in-state partial-record stations | Total number of stations |
|---|---|---|---|---|---|
| 1 | 12,216 | 73 | 4 | 14 | 91 |
| 2 | 4,356 | 50 | 0 | 5 | 55 |
| 3 | 22,020 | 105 | 7 | 20 | 132 |
| 4 | 6,710 | 33 | 5 | 6 | 44 |
| Total | 45,302 | 261 | 16 | 45 | 322 |

[1]Flood-flow regions are shown on figure 2.




Base from U.S. Geological Survey 1:2,000,000 and 1:100,000 Digital Data
State boundary from U.S. Geological Survey, 2005
Rivers from U.S. Geological Survey, 2006

Albers Equal-Area Conic projection: Standard Parallels 29°30′N and 45°30′N.
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**Figure 5.** Flood-flow region 3 in Pennsylvania.

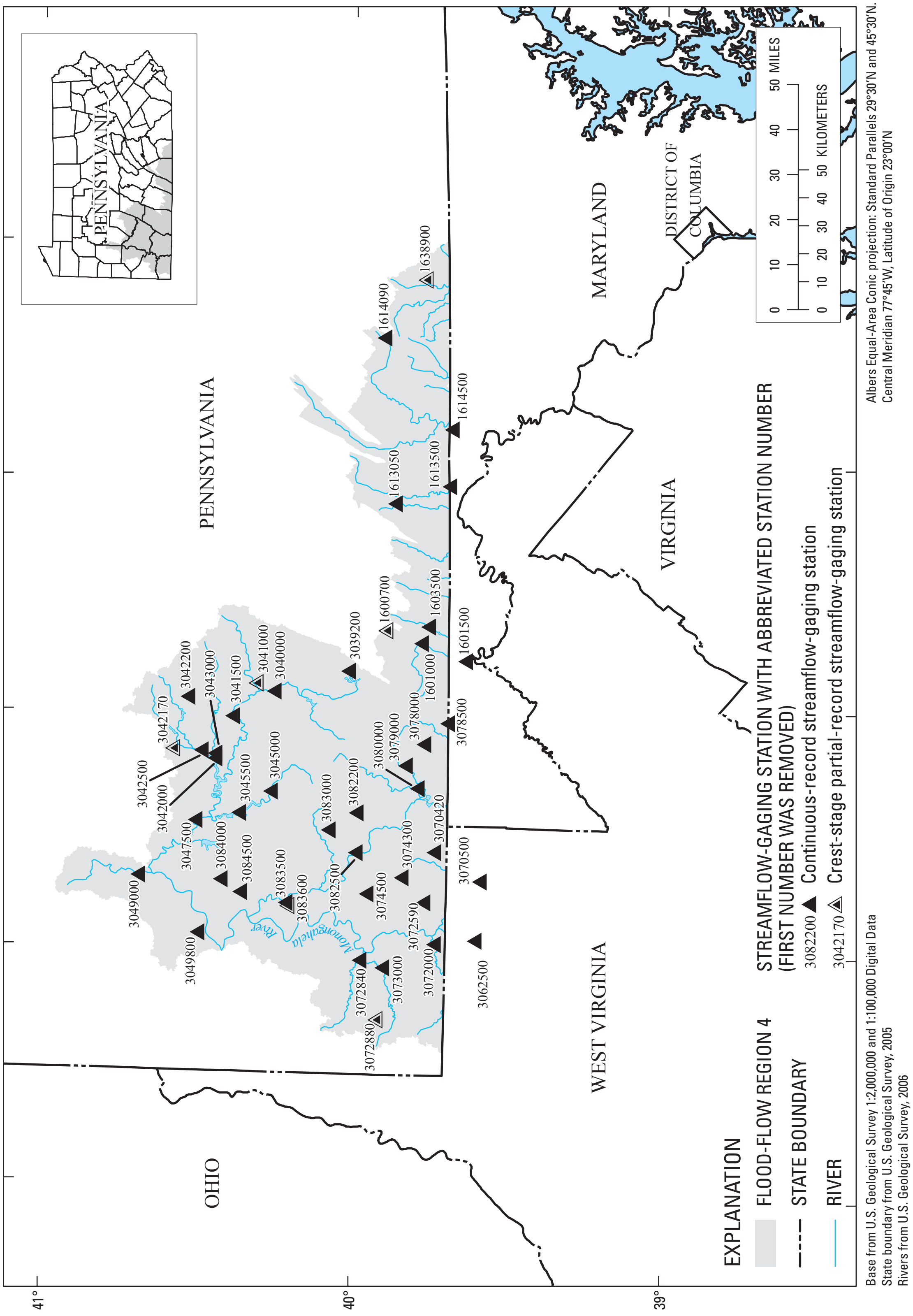


**Figure 6.** Flood-flow region 4 in Pennsylvania.

**Table 3.** Regression coefficients for use with flood-flow regression equations for Pennsylvania streams.

[ft³/s, cubic feet per second; --, basin characteristic not significant]

| T-year peak flow (ft³/s) | Intercept | Basin-characteristic coefficients | | | | | Standard error of prediction | | Coefficient of determination ($R^2$) |
|---|---|---|---|---|---|---|---|---|---|
| | | Drainage area[1] | Mean elevation[2] | Percent carbonate bedrock[3] | Percent urban area[4] | Percent storage[5] | Log units | Percent | |
| Region 1 | | | | | | | | | |
| Q2 | 1.84257 | 0.86396 | -- | -- | -- | -0.49180 | 0.14 | 33 | 0.95 |
| Q5 | 2.10658 | .84127 | -- | -- | -- | -.49148 | .13 | 31 | .95 |
| Q10 | 2.24305 | .83197 | -- | -- | -- | -.47595 | .13 | 31 | .95 |
| Q50 | 2.47845 | .81981 | -- | -- | -- | -.43501 | .15 | 36 | .92 |
| Q100 | 2.56172 | .81626 | -- | -- | -- | -.41724 | .16 | 38 | .90 |
| Q500 | 2.73185 | .81002 | -- | -- | -- | -.37550 | .19 | 46 | .85 |
| Region 2 | | | | | | | | | |
| Q2 | 2.20340 | .69782 | -- | -0.47534 | 0.91196 | -- | .17 | 41 | .88 |
| Q5 | 2.50745 | .66365 | -- | -.65666 | .56109 | -- | .15 | 36 | .89 |
| Q10 | 2.66804 | .64853 | -- | -.75941 | .39037 | -- | .14 | 33 | .88 |
| Q50 | 2.94676 | .62615 | -- | -.92098 | .11100 | -- | .14 | 33 | .84 |
| Q100 | 3.04617 | .61864 | -- | -.97299 | .00947 | -- | .15 | 36 | .81 |
| Q500 | 3.25362 | .60294 | -- | -1.07780 | -.21084 | -- | .17 | 41 | .71 |
| Region 3 | | | | | | | | | |
| Q2 | 3.27469 | .82143 | -0.4517 | -1.96079 | -- | -.74815 | .13 | 31 | .96 |
| Q5 | 3.73436 | .79492 | -.51761 | -1.78595 | -- | -.90039 | .12 | 28 | .96 |
| Q10 | 3.98972 | .78127 | -.55653 | -1.66440 | -- | -.99420 | .12 | 28 | .96 |
| Q50 | 4.42545 | .75816 | -.62224 | -1.45536 | -- | -1.15401 | .13 | 31 | .93 |
| Q100 | 4.5808 | .75043 | -.64613 | -1.38215 | -- | -1.20941 | .15 | 36 | .92 |
| Q500 | 4.90955 | .73500 | -.69814 | -1.22437 | -- | -1.32521 | .18 | 43 | .87 |
| Region 4 | | | | | | | | | |
| Q2 | 1.82330 | .84471 | -- | -- | -- | -- | .12 | 28 | .97 |
| Q5 | 2.09191 | .81363 | -- | -- | -- | -- | .11 | 26 | .97 |
| Q10 | 2.23878 | .79689 | -- | -- | -- | -- | .12 | 28 | .96 |
| Q50 | 2.50038 | .77079 | -- | -- | -- | -- | .14 | 33 | .94 |
| Q100 | 2.59407 | .76279 | -- | -- | -- | -- | .16 | 38 | .93 |
| Q500 | 2.78822 | .74809 | -- | -- | -- | -- | .20 | 49 | .88 |

[1] Drainage area, in square miles, determined from 30-meter digital elevation model (DEM).

[2] Mean elevation, in feet, is the average elevation in the basin, determined from 30-meter DEM.

[3] Percent carbonate bedrock is the percent of basin underlain by carbonate bedrock, determined by modified geology maps.

[4] Percent urban area is the percent of urban area, as defined by low-intensity residential, high-intensity residential, commercial/industrial/transportation, residential with trees, and residential without trees in the basin, determined by National Land Cover Dataset enhanced (NLCDe).

[5] Percent storage is the percent of lakes, ponds, and wetlands, determined from U.S. Geological Survey 1:24,000 quadrangles and NLCDe.

is 77.0 mi$^2$, and the percent storage is 10.2. The basin is unaffected by substantial regulation, diversion, or mining.

1. From figure 2 and the latitude and longitude, the site is in flood-flow region 1.

2. Using coefficients from table 3, the Q100 regional regression equation is:

$$\log \hat{Q}_{100} = 2.56172 + 0.81626 \log(DA) - 0.41724 \log(1 + (0.1 \times Sto))$$

3. Substituting the basin characteristics for the site into the equation produces:

$$\log \hat{Q}_{100} = 2.56172 + 0.81626 \log(77.0) - 0.41724 \log(1 + (0.1 \times 10.2))$$

$$\log \hat{Q}_{100} = 2.56172 + (1.53987) - (0.12740)$$

$$\log \hat{Q}_{100} = 3.97419$$

$$\hat{Q}_{100} = 9{,}420 \text{ ft}^3/\text{s}$$

Just as a station has a period of record that should be taken into consideration when computing flood frequencies from gaging-station peak-flow data, regression equations have an equivalent period of record that should be taken into consideration when using the equations to compute flood frequencies. The equivalent years of record provide indicators of the accuracy of the regression equations. The equivalent years of record are computed from a factor that is based on the skew coefficient of the population of annual peaks, the standard deviation of the logarithms of the annual peaks at individual stations used in the development of the regression equations, and the standard error of prediction of the regression equations. This methodology is presented by Hardison (1971). The equivalent years of record for each of the regression equations are shown in table 4. For the Q100, the equivalent period of record ranges from 11 years for Region 3 to 15 years for Region 2. To summarize, the Q100 calculated from the equation developed for Region 3 is comparable to the Q100 determined from a record from a station that has been in operation for 11 years.

A weighted method to minimize the temporal bias associated with stations has been suggested by Flippo (1977), Stuckey and Reed (2000), Water Resources Council, Hydrology Committee (1981), and others to compute flood-flow statistics for a streamflow-gaging station. Observed flood frequency-magnitude estimates may contain time-sampling variability because of the specific time span associated with the period of record for a station. The period of record for a station may or may not include years when large floods occurred. Inclusion of several large floods, or lack of any large floods, can change flood frequency-magnitude estimates for stations, especially those with short periods of record. To minimize this bias, a method has been developed that incorporates the observed, as well as the predicted, flood flows into a weighted average flood-frequency discharge estimate using the period of record of the station and the equivalent period of record for the regression equation.

The weighted average discharge estimates are computed from the equation:

$$Q_{T(W)} = \frac{\left[Q_{T(G)}\left(N\right) + \hat{Q}_{T(R)}\left(NE\right)\right]}{(N + NE)}$$

where

$Q_{T(W)}$ = the weighted flood discharge for the T-year recurrence interval, in cubic feet per second;

$Q_{T(G)}$ = the observed flood discharge computed from streamflow-gaging-station data for the T-year recurrence interval, in cubic feet

**Table 4.** Equivalent period of record for regression equations developed for estimating flood magnitudes for selected recurrence intervals in Pennsylvania.

[Methodology used described by Hardison (1971); flood-flow regions are shown in figure 2]

| Flood-recurrence interval | Equivalent period of record (years) | | | |
|---|---|---|---|---|
| | Flood-flow region 1 | Flood-flow region 2 | Flood-flow region 3 | Flood-flow region 4 |
| 2-year | 3 | 2 | 3 | 4 |
| 5-year | 6 | 4 | 5 | 7 |
| 10-year | 9 | 7 | 7 | 10 |
| 50-year | 13 | 13 | 11 | 13 |
| 100-year | 13 | 15 | 11 | 13 |
| 500-year | 14 | 16 | 11 | 12 |

per second;

N = the number of years of record at the streamflow-gaging station used to calculate $Q_{T(G)}$;

$\hat{Q}_{T(R)}$ = the predicted flood discharge computed from regression equations for the T-year recurrence interval, in cubic feet per second; and

*NE* = average equivalent years of record associated with the regression equation in table 4.

### Example showing the calculation of weighted flood flows.

*Example 2.* Calculate the weighted flood-frequency discharge estimate for streamflow-gaging station 01546400, Spring Creek at Houserville, Pa., at latitude 40°50'01" and longitude 77°49'40". The drainage area is 58.5 $mi^2$, mean elevation is 1,340 ft, percentage of carbonate bedrock is 75.1, and the basin contains 0.13 percent storage. The station operated from 1985 to 2005 as a continuous-record station, for a total of 21 years. The basin is unaffected by regulation, diversion, or mining. The reported Q100 determined from streamflow data is 2,840 $ft^3/s$.

1. The Q100 computed from the regional regression equation is 3,500 $ft^3/s$ (see Example 1 for methodology), and from table 4, the equivalent years of record for the regression equation is 11 years.

2. Substituting the discharges and number of years into equation 2 produces:

$$Q_{100(W)} = [(2{,}840 \times 21) + (3{,}500 \times 11)] / (21 + 11)$$
$$Q_{100(W)} = 3{,}070 \text{ ft}^3/\text{s}$$

The observed, predicted, and weighted flood flows for the stations used in the analysis are shown in appendix 2. Additional techniques for estimating magnitude of flood flows at selected recurrence intervals in Pennsylvania under other situations have been identified by Stuckey and Reed (2000).

# Limitations of Regression Equations

Certain conditions can limit the application of the regression equations presented in this report. The equations should not be used if the drainage area is less than 1.0 $mi^2$ or greater than 2,000 $mi^2$. Regions 1, 3, and 4 do not include a variable for percentage of urban development in the regression equations, and as a result, effects from urbanization may not be captured in regression-equation results for these regions. A summary of the range of all the variables used to develop the regression equations is presented in table 5. Predicted streamflow characteristics for basins with basin characteristics outside these ranges may not be valid. Particularly, regression equations developed for regions 1 and 3 are sensitive to percent storage, and results from these regression equations should be reviewed carefully to determine accuracy for basins with percent storage outside the range listed in table 5. When applying the regression equations to estimate flood magnitudes and frequency, it is important to maintain the same source of basin-characteristic data that were used in the development of the equations. Otherwise, the flood flows predicted by the regression equations may not be valid.

The regression equations should not be used to predict flood flows if streamflow at the site of interest is substantially affected by an upstream flood-control reservoir. The streamflow-gaging stations that were excluded from the regression analysis because of substantial upstream regulation are listed in appendix 3 with observed flood flows for specified recurrence intervals. The 500-year recurrence flow is not listed in the appendix because the storage capacity for some flood-control reservoirs may not be sufficient to store all the runoff associated with the 500-year flood event.

# Summary

Flood-flow statistics provide the foundation for Flood Insurance Studies (FIS), flood-plain management, and the design of bridges and flood-control structures. Accessible

**Table 5.** Summary of the variables used to develop the flood-flow regression equations for Pennsylvania.

[$mi^2$, square miles; ft, feet]

| Flood-flow region | Number of stations used | Range of basin-characteristic variables | | | | |
|---|---|---|---|---|---|---|
| | | Drainage area ($mi^2$) | Mean elevation (ft) | Percent urban area | Percent carbonate bedrock | Percent storage |
| 1 | 91 | 1.72 - 1,280 | 0 - 1,960 | 0 - 20 | 0 - 83 | 0 - 21.2 |
| 2 | 55 | 2.02 - 1,150 | 113 - 901 | 0 - 94 | 0 - 67 | 0 - 3.6 |
| 3 | 132 | 1.44 - 1,610 | 457 - 2,150 | 0 - 64 | 0 - 99 | 0 - 22.6 |
| 4 | 44 | .92 - 1,720 | 553 - 2,700 | 0 - 67 | 0 - 42 | 0 - 2.4 |

methods that produce estimates of the frequency and magnitude of floods are important to engineers and planners working on such projects. The USGS, in cooperation with the Federal Emergency Management Agency (FEMA), the Pennsylvania State Association of Township Supervisors (PSATS), and the Susquehanna River Basin Commission (SRBC), developed flood-flow regression equations to estimate flood flows for ungaged streams in Pennsylvania using data from 322 continuous-record and crest-stage partial-record streamflow-gaging stations with 10 or more years of record in Pennsylvania and surrounding states.

Regression equations were developed to estimate the Q2, Q5, Q10, Q50, Q100, and Q500 flood discharges for four flood-flow regions in Pennsylvania. The following basin characteristics were significant at the 95-percent confidence level for one or more regression equations: drainage area, mean elevation, and the percentages of carbonate bedrock, urban area, and storage within the basin. Standard errors of prediction ranged from 26 percent for the Q5 in Region 4 to 49 percent for the Q500, also in Region 4. The equivalent periods of record for the Q100 regression equations ranged from 11 years for Region 3 to 15 years for Region 2. To minimize temporal bias that may be associated with a station, a weighting method is presented that incorporates the observed, as well as the predicted, flood flows into a weighted-average flood-frequency discharge estimate.

Certain conditions can limit the application of the regression equations presented in this report. The equations should not be used if the contributing drainage area is less than 1.0 $mi^2$ or greater than 2,000 $mi^2$. The regression equations should not be used to predict flood-flow frequency statistics if streamflow at the site of interest is substantially affected by an upstream flood-control reservoir. Estimates of flood-flow magnitude for streamflow-gaging stations substantially affected by upstream regulation are presented. Predicted streamflow characteristics for basins with basin characteristics outside the ranges used to develop the regression equations may not be valid.

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# Appendixes

**Appendix 1.** Streamflow-gaging stations and basin characteristics used in development of flood-flow regression equations for Pennsylvania streams.

**Appendix 2.** Flood-flow magnitudes for selected recurrence intervals computed from observed streamflow-gaging data, predicted from regional regression equations, and a weighted average for streamflow-gaging stations used in analysis.

**Appendix 3.** Flood-flow magnitudes for selected recurrence intervals for streamflow-gaging stations in Pennsylvania with drainage areas less than 2,000 square miles and streamflow substantially affected by upstream regulation.

**Appendix 1.** Streamflow-gaging stations and basin characteristics used in development of flood-flow regression equations for Pennsylvania streams.

[C, continuous-record station; P, partial-record station; ddmmss, degrees, minutes, seconds; mi², square miles; ft, feet; --, not used in regression analysis]

| U.S. Geological Survey streamflow-gaging station number | Type | Latitude (ddmmss) | Longitude (ddmmss) | Station name | Period of record[1] (water year)[2] | Number of years used in analysis[3] | Basin characteristics | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Drainage area ($mi^2$) | Mean elevation (ft) | Percent carbon-ate bedrock | Percent storage | Percent urban area |
| 01424500 | C | 420545 | 751925 | Trout Creek at Cannonsville, N.Y. | 1941-1963 | 23 | 49.5 | -- | -- | 3.04 | 0 |
| 01426000 | C | 420331 | 752542 | Oquaga Creek at Deposit, N.Y. | 1941-2005 | 35 | 67.6 | -- | -- | .56 | 0 |
| 01428750 | C | 414028 | 752235 | West Branch Lackawaxen River near Aldenville, Pa. | 1975-2006 | 32 | 40.6 | 1,750 | 0 | 1.95 | .28 |
| 01429000 | C | 413514 | 751938 | West Branch Lackawaxen River at Prompton, Pa. | 1942-2005 | 16 | 59.7 | 1,650 | 0 | 5.43 | .37 |
| 01429300 | P | 413926 | 751712 | Dyberry Creek above Reservoir near Honesdale, Pa. | 1975-2004 | 28 | 46.1 | 1,500 | 0 | 2.27 | .21 |
| 01429500 | C | 413626 | 751603 | Dyberry Creek near Honesdale, Pa. | 1942-2005 | 16 | 64.6 | 1,470 | 0 | 3.57 | .21 |
| 01430000 | C | 413343 | 751454 | Lackawaxen River near Honesdale, Pa. | 1942-2005 | 11 | 164 | 1,510 | 0 | 4.88 | 1.43 |
| 01430500 | C | 412910 | 751115 | Lackawaxen River at West Hawley, Pa. | 1922-1942 | 17 | 198 | 1,470 | 0 | 4.53 | 1.66 |
| 01431000 | C | 412905 | 751320 | Middle Creek near Hawley, Pa. | 1945-1986 | 41 | 78.4 | 1,400 | 0 | 6.95 | .67 |
| 01431500 | C | 412834 | 751021 | Lackawaxen River at Hawley, Pa. | 1909-1959 | 51 | 290 | 1,440 | 0 | 5.17 | 1.53 |
| 01431680 | P | 412315 | 751420 | Mill Brook near Paupack, Pa. | 1960-1980 | 20 | 4.84 | 1,540 | 0 | 3.57 | 2.05 |
| 01438300 | P | 411935 | 744750 | Vandermark Creek at Milford, Pa. | 1962-2006 | 45 | 5.09 | 1,060 | 0 | .75 | 5.31 |
| 01439500 | C | 410515 | 750220 | Bush Kill at Shoemakers, Pa. | 1909-2006 | 98 | 117 | 1,270 | 0 | 11.25 | 3.65 |
| 01440300 | P | 410950 | 751600 | Mill Creek at Mountainhome, Pa. | 1961-2006 | 46 | 5.9 | 1,620 | 0 | 1.29 | 12.8 |
| 01440400 | C | 410505 | 751254 | Brodhead Creek near Analomink, Pa. | 1958-2006 | 49 | 65.9 | 1,380 | 0 | 5.12 | 3.7 |
| 01441000 | C | 405845 | 751205 | McMichael Creek near Stroudsburg, Pa. | 1911-1955 | 28 | 65.3 | 952 | .23 | 3.34 | 3.17 |
| 01442500 | C | 405955 | 750835 | Brodhead Creek at Minisink Hills, Pa. | 1951-2006 | 56 | 259 | 1,130 | .06 | 3.97 | 8.29 |
| 01446600 | C | 405400 | 751208 | Martins Creek near East Bangor, Pa. | 1961-1986 | 26 | 10.4 | 947 | 0 | 7.34 | .06 |
| 01447500 | C | 410749 | 753733 | Lehigh River at Stoddartsville, Pa. | 1942-2006 | 65 | 91.7 | 1,830 | 0 | 14.04 | 7.47 |
| 01447680 | C | 410355 | 753114 | Tunkhannock Creek near Long Pond, Pa. | 1966-2006 | 40 | 20 | 1,880 | 0 | 21.24 | .74 |
| 01447720 | C | 410505 | 753621 | Tobyhanna Creek near Blakeslee, Pa. | 1955-2006 | 45 | 118 | 1,850 | 0 | 18.32 | 9.9 |
| 01448000 | C | 410225 | 754542 | Lehigh River at Tannery, Pa. | 1915-1959 | 45 | 320 | 1,790 | 0 | 13.28 | 6.76 |
| 01448500 | C | 410208 | 753237 | Dilldown Creek near Long Pond, Pa. | 1949-2006 | 58 | 2.39 | 1,890 | 0 | 5.08 | .42 |
| 01449000 | C | 404945 | 754220 | Lehigh River at Lehighton, Pa. | 1982-2006 | 25 | 589 | 1,640 | 0 | 8.68 | 6.23 |
| 01449360 | C | 405351 | 753010 | Pohopoco Creek at Kresgeville, Pa. | 1967-2006 | 40 | 49.9 | 1,060 | 0 | 1.93 | 7.3 |
| 01449500 | C | 405522 | 753332 | Wild Creek at Hatchery, Pa. | 1941-1978 | 18 | 16.8 | 1,390 | 0 | 5.66 | .55 |
| 01450000 | C | 404954 | 754053 | Pohopoco Creek near Parryville, Pa. | 1941-1970 | 29 | 109 | 1,070 | 0 | 4.03 | 4.11 |
| 01450500 | C | 404822 | 753554 | Aquashicola Creek at Palmerton, Pa. | 1940-2006 | 67 | 76.7 | 867 | 4.91 | 1.32 | 2.03 |
| 01451000 | C | 404525 | 753612 | Lehigh River at Walnutport, Pa. | 1942-2005 | 14 | 889 | 1,400 | .74 | 6.51 | 5.54 |
| 01451500 | C | 403456 | 752860 | Little Lehigh Creek near Allentown, Pa. | 1935-2006 | 61 | 80.8 | 532 | 63.7 | .73 | 13 |
| 01451650 | C | 403547 | 752828 | Little Lehigh Creek at Tenth St. Br. at Allentown, Pa. | 1987-2006 | 20 | 98 | 509 | 69.4 | .76 | 19.8 |
| 01451800 | C | 403942 | 753738 | Jordan Creek near Schnecksville, Pa. | 1967-2006 | 40 | 53 | 675 | 0 | .35 | 1.79 |
| 01452000 | C | 403723 | 752858 | Jordan Creek at Allentown, Pa. | 1945-2006 | 62 | 75.8 | 620 | 11.3 | .42 | 4.96 |
| 01452300 | C | 404310 | 752210 | East Branch Monocacy Creek near Bath, Pa. | 1963-1981 | 19 | 5.53 | 623 | 19.5 | 1.06 | 7.36 |
| 01452500 | C | 403828 | 752247 | Monocacy Creek at Bethlehem, Pa. | 1945-2006 | 62 | 44.5 | 494 | 62.8 | .94 | 12.8 |

**Appendix 1.** Streamflow-gaging stations and basin characteristics used in development of flood-flow regression equations for Pennsylvania streams.—Continued

[C, continuous-record station; P, partial-record station; ddmmss, degrees, minutes, seconds; mi², square miles; ft, feet; --, not used in regression analysis]

| U.S. Geological Survey streamflow-gaging station number | Type | Latitude (ddmmss) | Longitude (ddmmss) | Station name | Period of record[1] (water year)[2] | Number of years used in analysis[3] | Basin characteristics: Drainage area ($mi^2$) | Mean elevation (ft) | Percent carbonate bedrock | Percent storage | Percent urban area |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 01453000 | C | 403655 | 752245 | Lehigh River at Bethlehem, Pa. | 1906-2005 | 51 | 1,280 | 1,170 | 11 | 4.92 | 8.4 |
| 01454600 | C | 403405 | 751945 | Polk Valley Run at Hellertown, Pa. | 1963-1980 | 18 | 1.72 | 649 | 23.2 | 1.09 | .02 |
| 01459500 | C | 402601 | 750701 | Tohickon Creek near Pipersville, Pa. | 1936-2005 | 38 | 97.4 | 509 | 0 | 5.03 | 4.86 |
| 01465500 | C | 401026 | 745726 | Neshaminy Creek near Langhorne, Pa. | 1933-2006 | 74 | 210 | 305 | 1.83 | 1.00 | 26.8 |
| 01465770 | C | 400755 | 745940 | Poquessing Creek at Trevose Road, Phila., Pa. | 1965-1981 | 17 | 5.09 | 215 | 4.31 | .55 | 90 |
| 01465785 | C | 400522 | 745937 | Walton Run at Philadelphia, Pa. | 1965-1978 | 14 | 2.17 | 142 | 0 | .79 | 67.1 |
| 01465790 | C | 400454 | 745857 | Byberry Creek at Chalfont Road, Phila., Pa. | 1966-1978 | 13 | 5.34 | 133 | 0 | 1.97 | 68 |
| 01465798 | C | 400325 | 745908 | Poquessing Creek at Grant Ave. at Philadelphia, Pa. | 1966-2006 | 41 | 21.4 | 133 | 1.03 | 2.57 | 76.3 |
| 01467042 | C | 400523 | 750410 | PennyPack Creek at Pine Road, at Philadelphia, Pa. | 1965-1981 | 17 | 37.9 | 260 | 1.88 | .81 | 72.4 |
| 01467043 | C | 400527 | 750315 | Stream 'A' at Philadelphia, Pa. | 1965-1980 | 16 | 2.7 | 175 | 0 | .60 | 94.4 |
| 01467048 | C | 400300 | 750159 | PennyPack Cr at Lower Rhawn St Bdg, Phila., Pa. | 1966-2006 | 41 | 49.8 | 233 | 1.43 | .88 | 74.4 |
| 01467050 | C | 400319 | 750122 | Wooden Bridge Run at Philadelphia, Pa. | 1965-1981 | 17 | 3.36 | 113 | 0 | .66 | 67 |
| 01467086 | C | 400247 | 750640 | Tacony Creek at County Line, Philadelphia, Pa. | 1966-1986 | 21 | 16.6 | 254 | 0 | .54 | 86.7 |
| 01467087 | C | 400057 | 750550 | Frankford Creek at Castor Ave, Philadelphia, Pa. | 1982-2005 | 24 | 30.4 | 220 | 0 | .34 | 88.8 |
| 01467089 | C | 400025 | 750533 | Frankford Creek at Torresdale Ave., Phila., Pa. | 1966-1981 | 16 | 33.8 | 206 | 0 | .36 | 89.6 |
| 01468500 | C | 403745 | 760730 | Schuylkill River at Landingville, Pa. | 1942-2006 | 42 | 133 | 1,110 | 0 | 1.56 | 8.61 |
| 01469500 | C | 404825 | 755820 | Little Schuylkill River at Tamaqua, Pa. | 1920-2006 | 87 | 42.9 | 1,380 | 0 | 2.64 | 3.96 |
| 01470500 | C | 403121 | 755955 | Schuylkill River at Berne, Pa. | 1942-2006 | 65 | 355 | 1,020 | .12 | 1.74 | 5.74 |
| 01470720 | C | 403423 | 755234 | Maiden Creek Tributary at Lenhartsville, Pa. | 1962-1980 | 18 | 7.46 | 642 | 0 | .21 | .87 |
| 01470756 | C | 403051 | 755260 | Maiden Creek at Virginville, Pa. | 1973-1995 | 23 | 159 | 665 | 10.8 | .80 | 1.34 |
| 01470779 | C | 402448 | 761019 | Tulpehocken Creek near Bernville, Pa. | 1972-2006 | 33 | 66.5 | 523 | 83.2 | .68 | 4.51 |
| 01470853 | C | 402024 | 760837 | Furnace Creek at Robesonia, Pa. | 1983-2005 | 23 | 5.7 | 978 | 0 | .40 | .03 |
| 01470960 | C | 402214 | 760132 | Tulpehocken Cr at Blue Marsh Damsite near Reading, Pa.. | 1965-2005 | 14 | 175 | 544 | 42.1 | 1.94 | 3.08 |
| 01471000 | C | 402208 | 755846 | Tulpehocken Creek near Reading, Pa. | 1951-2005 | 28 | 211 | 529 | 41.3 | 1.70 | 3.94 |
| 01471510 | C | 402005 | 755612 | Schuylkill River at Reading, Pa. | 1757-1930 | 29 | 880 | 740 | 19 | 1.54 | 5.56 |
| 01471875 | C | 402022 | 754433 | Manatawny Creek near Spangsville, Pa. | 1994-2006 | 13 | 56.9 | 670 | 28.5 | 1.40 | 1.55 |
| 01471980 | C | 401622 | 754049 | Manatawny Creek near Pottstown, Pa. | 1972-2006 | 32 | 85.5 | 588 | 26.1 | 1.04 | 2.22 |
| 01472000 | C | 401430 | 753907 | Schuylkill River at Pottstown, Pa. | 1902-2005 | 51 | 1,150 | 684 | 18.7 | 1.42 | 6.55 |
| 01472157 | C | 400905 | 753606 | French Creek near Phoenixville, Pa. | 1969-2006 | 38 | 59.1 | 530 | .62 | 1.32 | 1.76 |
| 01472174 | C | 400522 | 753750 | Pickering Creek near Chester Springs, Pa. | 1967-1983 | 17 | 5.98 | 439 | 0 | .28 | 7.28 |
| 01472198 | C | 402338 | 753057 | Perkiomen Creek at East Greenville, Pa. | 1982-2005 | 24 | 38 | 623 | 3.35 | 1.42 | 2.98 |
| 01472199 | C | 402226 | 753122 | West Branch Perkiomen Creek at Hillegass, Pa. | 1982-2005 | 24 | 23 | 685 | 4.76 | 1.20 | 2.46 |
| 01472620 | C | 402414 | 751405 | East Branch Perkiomen Creek near Dublin, Pa. | 1984-2005 | 22 | 4.07 | 420 | 0 | 1.64 | .36 |
| 01473000 | C | 401346 | 752707 | Perkiomen Creek at Graterford, Pa. | 1915-2005 | 91 | 279 | 468 | 1.27 | 1.46 | 6.67 |
| 01473100 | P | 401226 | 752157 | Zacharias Creek near Skippack, Pa. | 1960-1980 | 21 | 7.29 | 322 | 0 | .06 | 9.65 |

**Appendix 1.** Streamflow-gaging stations and basin characteristics used in development of flood-flow regression equations for Pennsylvania streams.—Continued

[C, continuous-record station; P, partial-record station; ddmmss, degrees, minutes, seconds; mi², square miles; ft, feet; --, not used in regression analysis]

| U.S. Geological Survey streamflow-gaging station number | Type | Latitude (ddmmss) | Longitude (ddmmss) | Station name | Period of record[1] (water year)[2] | Number of years used in analysis[3] | Basin characteristics | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Drainage area ($mi^2$) | Mean elevation (ft) | Percent carbonate bedrock | Percent storage | Percent urban area |
| 01473120 | C | 400952 | 752601 | Skippack Creek near Collegeville, Pa. | 1966-1994 | 29 | 53.7 | 289 | 0 | 0.16 | 24.7 |
| 01473169 | C | 400445 | 752740 | Valley Creek at Pa. Turnpike Br near Valley Forge, Pa. | 1983-2005 | 23 | 20.8 | 356 | 66.9 | .54 | 42.9 |
| 01473880 | P | 400813 | 751121 | Pine Run Tributary at Fort Washington, Pa. | 1962-1979 | 18 | 2.02 | 287 | 0 | .19 | 62.9 |
| 01473900 | C | 400726 | 751313 | Wissahickon Creek at Fort Washington, Pa. | 1962-2006 | 25 | 40.5 | 302 | 7.66 | .40 | 53.6 |
| 01473950 | C | 400450 | 751335 | Wissahickon Cr at Bells Mill Rd, Phila., Pa. | 1966-1981 | 16 | 53.6 | 285 | 19.1 | .50 | 55.2 |
| 01474000 | C | 400445 | 751343 | Wissahickon Creek at Mouth, Philadelphia, Pa. | 1966-2005 | 40 | 64 | 284 | 16 | .53 | 57.4 |
| 01475300 | C | 400121 | 752520 | Darby Creek at Waterloo Mills near Devon, Pa. | 1972-1999 | 26 | 5.1 | 435 | 0 | .25 | 67.2 |
| 01475510 | C | 395544 | 751622 | Darby Creek near Darby, Pa. | 1964-1990 | 27 | 37.4 | 325 | 0 | .33 | 75.1 |
| 01475530 | C | 395829 | 751649 | Cobbs Cr at U.S. Hghwy No. 1 at Philadelphia, Pa. | 1965-2005 | 18 | 4.78 | 319 | 0 | .42 | 87.7 |
| 01475550 | C | 395502 | 751452 | Cobbs Creek at Darby, Pa. | 1964-1990 | 27 | 22 | 208 | 0 | .30 | 87.4 |
| 01475850 | C | 395835 | 752613 | Crum Creek near Newtown Square, Pa. | 1977-2005 | 29 | 15.8 | 420 | 0 | .34 | 30.7 |
| 01476480 | C | 395458 | 752413 | Ridley Creek at Media, Pa. | 1987-2005 | 18 | 30.2 | 374 | 0 | .36 | 23.4 |
| 01476500 | C | 395410 | 752335 | Ridley Creek at Moylan, Pa. | 1932-1955 | 24 | 31.9 | 368 | 0 | .37 | 26.6 |
| 01477000 | C | 395208 | 752431 | Chester Creek near Chester, Pa. | 1932-2006 | 75 | 61.1 | 339 | 0 | .56 | 38.1 |
| 01478200 | C | 394654 | 754803 | Middle Branch White Clay Creek near Landenberg, Pa. | 1960-1995 | 32 | 12.7 | 452 | 4.89 | .86 | 6.91 |
| 01479820 | C | 394900 | 754131 | Red Clay Creek near Kennett Square, Pa. | 1988-2005 | 18 | 28.3 | 371 | 11.1 | 1.24 | 17.6 |
| 01480300 | C | 400422 | 755140 | West Branch Brandywine Creek near Honey Brook, Pa. | 1960-2006 | 47 | 18.7 | 726 | 3.36 | 2.26 | 2.61 |
| 01480500 | C | 395908 | 754940 | West Branch Brandywine Creek at Coatesville, Pa. | 1942-2006 | 45 | 46.1 | 663 | 1.35 | 1.50 | 4.33 |
| 01480610 | P | 395820 | 755106 | Sucker Run near Coatesville, Pa. | 1964-2005 | 39 | 2.62 | 544 | 25 | .08 | 21.4 |
| 01480617 | C | 395742 | 754806 | West Branch Brandywine Creek at Modena, Pa. | 1970-2006 | 37 | 55.3 | 633 | 5.34 | 1.27 | 10.5 |
| 01480800 | C | 400020 | 754220 | East Branch Brandywine Creek at Downingtown, Pa. | 1942-1968 | 11 | 81.6 | 531 | 6.72 | 2.03 | 9.03 |
| 01481000 | C | 395211 | 753537 | Brandywine Creek at Chadds Ford, Pa. | 1912-2006 | 87 | 287 | 490 | 7.63 | 1.06 | 11.7 |
| 01514000 | C | 420745 | 761615 | Owego Creek near Owego, N.Y. | 1930-1999 | 70 | 185 | -- | -- | .28 | -- |
| 01516350 | C | 414739 | 770450 | Tioga River near Mansfield, Pa. | 1972-2005 | 34 | 153 | 1,870 | 0 | .24 | 1.45 |
| 01516500 | C | 414727 | 770054 | Corey Creek near Mainesburg, Pa. | 1955-2006 | 52 | 12.2 | 1,770 | 0 | .32 | .06 |
| 01516800 | P | 414919 | 770550 | Manns Creek near Mansfield, Pa. | 1960-1977 | 17 | 3.04 | 1,520 | 0 | .01 | 0 |
| 01517000 | C | 414854 | 765755 | Elk Run near Mainesburg, Pa. | 1955-1978 | 24 | 10.2 | 1,810 | 0 | .03 | .02 |
| 01518000 | C | 415430 | 770747 | Tioga River at Tioga, Pa. | 1889-2005 | 39 | 282 | 1,770 | 0 | .25 | 1.26 |
| 01518420 | P | 415033 | 771625 | Crooked Cr bl Catlin Hollow at Middlebury Center, Pa. | 1985-2005 | 20 | 74.4 | 1,710 | 0 | .24 | .35 |
| 01518500 | C | 415408 | 770855 | Crooked Creek at Tioga, Pa. | 1954-1974 | 21 | 122 | 1,670 | 0 | .39 | .45 |
| 01518862 | C | 415523 | 773156 | Cowanesque River at Westfield, Pa. | 1984-2005 | 21 | 90.6 | 1,960 | 0 | .26 | .78 |
| 01519200 | P | 415915 | 771809 | Cowanesque River at Elkland, Pa. | 1980-2005 | 26 | 234 | 1,850 | 0 | .13 | .51 |
| 01520000 | C | 415948 | 770825 | Cowanesque River near Lawrenceville, Pa. | 1952-2005 | 27 | 298 | 1,780 | 0 | .15 | .53 |
| 01526000 | C | 420400 | 771702 | Tuscarora Creek near South Addison, N.Y. | 1937-1972 | 46 | 114 | -- | 0 | .21 | 0 |
| 01532000 | C | 414225 | 762906 | Towanda Creek near Monroeton, Pa. | 1914-2006 | 93 | 215 | 1,600 | 0 | .49 | .57 |

**Appendix 1.** Streamflow-gaging stations and basin characteristics used in development of flood-flow regression equations for Pennsylvania streams.—Continued

[C, continuous-record station; P, partial-record station; ddmmss, degrees, minutes, seconds; mi², square miles; ft, feet; --, not used in regression analysis]

| U.S. Geological Survey streamflow-gaging station number | Type | Latitude (ddmmss) | Longitude (ddmmss) | Station name | Period of record[1] (water year)[2] | Number of years used in analysis[3] | Basin characteristics | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Drainage area (mi²) | Mean elevation (ft) | Percent carbonate bedrock | Percent storage | Percent urban area |
| 01532200 | P | 413525 | 762560 | South Branch Towanda Creek at New Albany, Pa. | 1963-1995 | 30 | 13.4 | 1,560 | 0 | 0.25 | 0.06 |
| 01532850 | C | 415145 | 760026 | MB Wyalusing Creek near Birchardville, Pa. | 1960-1979 | 20 | 5.67 | 1,480 | 0 | .24 | .06 |
| 01533250 | P | 414225 | 760710 | Tuscarora Creek near Silvara, Pa. | 1963-1995 | 33 | 11.8 | 1,250 | 0 | 1.81 | .16 |
| 01533800 | C | 414810 | 753840 | Butler Creek at Gibson, Pa. | 1963-1979 | 15 | 7.51 | 1,600 | 0 | 2.40 | .43 |
| 01533950 | C | 413429 | 753832 | SB Tunkhannock Creek near Montdale, Pa. | 1961-1978 | 18 | 12.6 | 1,510 | 0 | 3.65 | 2.1 |
| 01534000 | C | 413330 | 755342 | Tunkhannock Creek near Tunkhannock, Pa. | 1914-2006 | 93 | 383 | 1,330 | 0 | 2.87 | 3.06 |
| 01534500 | C | 413016 | 753233 | Lackawanna River at Archbald, Pa. | 1940-2005 | 20 | 108 | 1,730 | 0 | 2.82 | 7.03 |
| 01536000 | C | 412133 | 754441 | Lackawanna River at Old Forge, Pa. | 1939-2005 | 21 | 335 | 1,540 | 0 | 3.04 | 17.5 |
| 01538000 | C | 410333 | 760538 | Wapwallopen Creek near Wapwallopen, Pa. | 1920-2006 | 87 | 43.8 | 1,380 | 0 | 4.33 | 11.1 |
| 01538800 | P | 411840 | 760850 | Huntington Creek near Pikes Creek, Pa. | 1960-1980 | 21 | 4.97 | 1,580 | 0 | .11 | .06 |
| 01539000 | C | 410441 | 762553 | Fishing Creek near Bloomsburg, Pa. | 1936-2006 | 71 | 274 | 1,320 | 0 | .67 | .3 |
| 01539500 | C | 410450 | 763040 | Little Fishing Creek at Eyers Grove, Pa. | 1941-1958 | 18 | 56.5 | 1,080 | 0 | .13 | .65 |
| 01540000 | C | 410010 | 762750 | Fishing Creek at Bloomsburg, Pa. | 1914-1931 | 18 | 355 | 1,230 | .14 | .56 | .66 |
| 01540200 | C | 405110 | 761648 | Trexler Run near Ringtown, Pa. | 1959-1979 | 21 | 1.77 | 1,440 | 0 | .30 | 0 |
| 01541000 | C | 405349 | 784038 | West Branch Susquehanna River at Bower, Pa. | 1889-2005 | 92 | 315 | 1,720 | 0 | .10 | 1.83 |
| 01541200 | C | 405741 | 783110 | WB Susquehanna River near Curwensville, Pa. | 1956-1965 | 10 | 367 | 1,700 | 0 | .42 | 1.63 |
| 01541500 | C | 405818 | 782422 | Clearfield Creek at Dimeling, Pa. | 1914-2005 | 47 | 371 | 1,710 | 0 | .87 | 1.44 |
| 01542000 | C | 405058 | 781605 | Moshannon Creek at Osceola Mills, Pa. | 1936-1993 | 52 | 68.7 | 1,820 | 0 | .07 | 2.51 |
| 01542500 | C | 410703 | 780633 | WB Susquehanna River at Karthaus, Pa. | 1936-2005 | 21 | 1,460 | 1,710 | 0 | .51 | 1.93 |
| 01542720 | P | 411258 | 783460 | Wilson Run at Penfield, Pa. | 1962-1995 | 33 | 8.4 | 1,770 | 0 | 0 | .08 |
| 01542810 | C | 413444 | 781734 | Waldy Run near Emporium, Pa. | 1964-2005 | 42 | 5.24 | 1,850 | 0 | 0 | 0 |
| 01543000 | C | 412448 | 781150 | Driftwood Br Sinnemahoning Cr at Sterling Run, Pa. | 1914-2005 | 92 | 272 | 1,740 | 0 | .12 | .62 |
| 01543500 | C | 411902 | 780612 | Sinnemahoning Creek at Sinnemahoning, Pa. | 1936-2005 | 70 | 685 | 1,720 | 0 | .14 | .42 |
| 01543700 | P | 413108 | 780140 | First Fork Sinnemahoning Creek at Wharton, Pa. | 1984-2005 | 22 | 182 | 1,900 | 0 | .22 | .27 |
| 01544450 | P | 413849 | 773922 | Germania Branch at Germania, Pa. | 1964-1979 | 11 | 2.39 | 2,150 | 0 | .01 | .06 |
| 01544500 | C | 412833 | 774934 | Kettle Creek at Cross Fork, Pa. | 1936-2005 | 65 | 136 | 1,890 | 0 | .32 | .05 |
| 01545600 | C | 412322 | 774128 | Young Womans Creek near Renovo, Pa. | 1965-2005 | 41 | 46.2 | 1,820 | 0 | .01 | .11 |
| 01546000 | C | 405630 | 774740 | North Bald Eagle Creek at Milesburg, Pa. | 1911-1934 | 18 | 119 | 1,400 | 7.47 | .32 | .72 |
| 01546400 | C | 405001 | 774940 | Spring Creek at Houserville, Pa. | 1985-2005 | 21 | 58.5 | 1,340 | 75.1 | .13 | 11.1 |
| 01546500 | C | 405323 | 774740 | Spring Creek near Axemann, Pa. | 1936-2005 | 66 | 87.2 | 1,280 | 83.1 | .11 | 11.5 |
| 01547100 | C | 405554 | 774713 | Spring Creek at Milesburg, Pa. | 1967-2005 | 39 | 142 | 1,260 | 78.3 | .15 | 9.2 |
| 01547200 | C | 405635 | 774712 | Bald Eagle Creek bl Spring Creek at Milesburg, Pa. | 1956-2005 | 50 | 265 | 1,320 | 46 | .22 | 5.45 |
| 01547500 | C | 410306 | 773617 | Bald Eagle Creek at Blanchard, Pa. | 1955-2005 | 15 | 339 | 1,250 | 44.6 | 1.99 | 4.89 |
| 01547700 | C | 410334 | 773622 | Marsh Creek at Blanchard, Pa. | 1956-2005 | 50 | 44.1 | 1,300 | .35 | .05 | .53 |
| 01547800 | C | 410126 | 775415 | South Fork Beech Creek near Snow Shoe, Pa. | 1959-1981 | 23 | 12.2 | 1,960 | 0 | .01 | 2.6 |

**Appendix 1.** Streamflow-gaging stations and basin characteristics used in development of flood-flow regression equations for Pennsylvania streams.—Continued

[C, continuous-record station; P, partial-record station; ddmmss, degrees, minutes, seconds; mi², square miles; ft, feet; --, not used in regression analysis]

| U.S. Geological Survey streamflow-gaging station number | Type | Latitude (ddmmss) | Longitude (ddmmss) | Station name | Period of record[1] (water year)[2] | Number of years used in analysis[3] | Basin characteristics | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Drainage area ($mi^2$) | Mean elevation (ft) | Percent carbon-ate bedrock | Percent storage | Percent urban area |
| 01547950 | C | 410642 | 774209 | Beech Creek at Monument, Pa. | 1968-2005 | 38 | 152 | 1,670 | 0 | 0.08 | 0.72 |
| 01548005 | P | 410451 | 773259 | Bald Eagle Creek near Beech Creek Station, Pa. | 1911-2005 | 94 | 562 | 1,360 | 27.4 | 1.24 | 3.24 |
| 01548020 | P | 410030 | 771935 | Bull Run near Loganton, Pa. | 1963-1981 | 19 | 1.92 | 1,810 | .73 | 0 | 0 |
| 01548500 | C | 413118 | 772652 | Pine Creek at Cedar Run, Pa. | 1919-2005 | 87 | 604 | 1,880 | 0 | .21 | .45 |
| 01549000 | C | 411845 | 772245 | Pine Creek near Waterville, Pa. | 1909-1920 | 12 | 750 | 1,830 | 0 | .22 | .38 |
| 01549500 | C | 412825 | 771352 | Blockhouse Creek near English Center, Pa. | 1936-2005 | 65 | 37.7 | 1,770 | 0 | .15 | .81 |
| 01549700 | C | 411625 | 771928 | Pine Creek bl L Pine Creek near Waterville, Pa. | 1958-2005 | 48 | 944 | 1,790 | 0 | .29 | .38 |
| 01549780 | C | 412504 | 770946 | Larrys Creek at Cogan House, Pa. | 1960-1978 | 19 | 6.8 | 1,610 | 0 | .03 | .25 |
| 01550000 | C | 412506 | 770159 | Lycoming Creek near Trout Run, Pa. | 1914-2005 | 92 | 173 | 1,730 | 0 | .16 | .22 |
| 01550500 | P | 411601 | 770249 | Lycoming Creek near Williamsport, Pa. | 1988-2005 | 14 | 264 | 1,570 | 0 | .20 | .84 |
| 01551000 | C | 411515 | 770040 | Grafius Run at Williamsport, Pa. | 1940-1953 | 14 | 3.03 | 908 | 0 | .16 | 5.46 |
| 01552000 | C | 411930 | 765446 | Loyalsock Creek at Loyalsockville, Pa. | 1926-2005 | 80 | 435 | 1,670 | 0 | .80 | .33 |
| 01552100 | P | 412010 | 765745 | Mill Creek near Warrensville, Pa. | 1961-1978 | 18 | 11.9 | 1,380 | 0 | 5.30 | .22 |
| 01552500 | C | 412125 | 763206 | Muncy Creek near Sonestown, Pa. | 1936-2005 | 65 | 23.8 | 1,850 | 0 | .21 | .19 |
| 01553005 | P | 411227 | 764509 | Muncy Creek near Muncy, Pa. | 1989-2005 | 17 | 196 | 1,240 | 0 | .43 | .6 |
| 01553050 | P | 410705 | 770400 | White Deer Hole Creek near Elimsport, Pa. | 1961-1995 | 33 | 19.2 | 1,530 | 0 | .29 | 0 |
| 01553130 | C | 410331 | 770437 | Sand Spring Run near White Deer, Pa. | 1968-1981 | 14 | 4.93 | 1,600 | 0 | 0 | 2.95 |
| 01553600 | C | 410457 | 763917 | EB Chillisquaque Creek near Washingtonville, Pa. | 1960-1978 | 19 | 9.48 | 799 | 0 | .72 | .07 |
| 01553700 | C | 410342 | 764050 | Chillisquaque Creek at Washingtonville, Pa. | 1980-2005 | 26 | 51.5 | 735 | 6.65 | 1.14 | .23 |
| 01555000 | C | 405200 | 770255 | Penns Creek at Penns Creek, Pa. | 1930-2005 | 76 | 301 | 1,390 | 24 | 1.15 | .6 |
| 01555500 | C | 403640 | 765444 | East Mahantango Creek near Dalmatia, Pa. | 1930-2005 | 76 | 162 | 915 | 0 | .25 | 1.6 |
| 01555800 | P | 402235 | 782555 | McDonald Run near East Freedom, Pa. | 1959-1978 | 19 | 1.44 | 1,320 | 0 | 0 | 1.64 |
| 01556000 | C | 402747 | 781200 | Frankstown Br Juniata River at Williamsburg, Pa. | 1889-2005 | 89 | 291 | 1,530 | 21 | .31 | 7.55 |
| 01556400 | P | 403347 | 782035 | Sandy Run near Bellwood, Pa. | 1962-1981 | 20 | 5.93 | 1,610 | 9.15 | 0 | 19.2 |
| 01556500 | C | 403740 | 781738 | Little Juniata River at Tipton, Pa. | 1936-1981 | 36 | 93.7 | 1,730 | 5.13 | .29 | 9.83 |
| 01557100 | C | 404000 | 781500 | Schell Run at Tyrone, Pa. | 1958-1981 | 23 | 1.71 | 1,500 | 0 | 0 | 4.92 |
| 01557500 | C | 404101 | 781402 | Bald Eagle Creek at Tyrone, Pa. | 1936-2005 | 66 | 44.1 | 1,630 | 5.04 | .02 | 1.19 |
| 01558000 | C | 403645 | 780827 | Little Juniata River at Spruce Creek, Pa. | 1936-2005 | 67 | 220 | 1,570 | 20.5 | .18 | 5.51 |
| 01559000 | C | 402905 | 780109 | Juniata River at Huntingdon, Pa. | 1896-2005 | 104 | 816 | 1,420 | 32.6 | .25 | 4.43 |
| 01559500 | C | 403125 | 775815 | Standing Stone Creek near Huntingdon, Pa. | 1889-1958 | 29 | 128 | 1,210 | 5.11 | .63 | .09 |
| 01559700 | C | 395840 | 783708 | Sulphur Springs Creek near Manns Choice, Pa. | 1962-1978 | 17 | 5.28 | 1,690 | 1.73 | .01 | 2.12 |
| 01559790 | P | 400245 | 783145 | Raystown Branch Juniata River at Wolfsburg, Pa. | 1989-2005 | 13 | 131 | 1,680 | 1.17 | .75 | 1.11 |
| 01560000 | C | 400418 | 782934 | Dunning Creek at Belden, Pa. | 1936-2005 | 70 | 172 | 1,590 | 4.27 | .21 | 1.23 |
| 01561000 | C | 395720 | 781515 | Brush Creek at Gapsville, Pa. | 1930-1958 | 29 | 36.5 | 1,570 | 0 | .14 | 1.16 |
| 01562000 | C | 401257 | 781556 | Raystown Branch Juniata River at Saxton, Pa. | 1889-2005 | 93 | 756 | 1,500 | 14.2 | .27 | 1.71 |

**Appendix 1.** Streamflow-gaging stations and basin characteristics used in development of flood-flow regression equations for Pennsylvania streams.—Continued

[C, continuous-record station; P, partial-record station; ddmmss, degrees, minutes, seconds; mi², square miles; ft, feet; --, not used in regression analysis]

| U.S. Geological Survey streamflow-gaging station number | Type | Latitude (ddmmss) | Longitude (ddmmss) | Station name | Period of record[1] (water year)[2] | Number of years used in analysis[3] | Basin characteristics | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Drainage area (mi²) | Mean elevation (ft) | Percent carbon-ate bedrock | Percent storage | Percent urban area |
| 01562500 | C | 402100 | 780750 | Great Trough Creek near Marklesburg, Pa. | 1930-1957 | 28 | 84.6 | 1,490 | 0 | 0.31 | 0.5 |
| 01563000 | C | 402535 | 780147 | Raystown Branch Juniata River near Huntingdon, Pa. | 1936-1971 | 26 | 956 | 1,470 | 11.7 | 1.40 | 1.51 |
| 01563800 | P | 400520 | 780255 | Elders Branch near Hustontown, Pa. | 1960-1978 | 19 | 3.44 | 1,170 | 0 | .07 | .04 |
| 01564500 | C | 401245 | 775532 | Aughwick Creek near Three Springs, Pa. | 1939-2005 | 67 | 205 | 1,180 | 4.46 | .44 | .82 |
| 01564512 | P | 401655 | 775327 | Aughwick Creek near Shirleysburg, Pa. | 1990-2005 | 16 | 296 | 1,170 | 7.03 | .47 | .71 |
| 01565000 | C | 403917 | 773460 | Kishacoquillas Creek at Reedsville, Pa. | 1936-2005 | 51 | 164 | 1,220 | 24.8 | .19 | 1.4 |
| 01565700 | C | 403620 | 771840 | Little Lost Creek at Oakland Mills, Pa. | 1960-1981 | 22 | 6.52 | 758 | 47.8 | .50 | 1.77 |
| 01565920 | P | 402115 | 773855 | Lick Run near East Waterford, Pa. | 1962-1981 | 20 | 8.34 | 1,020 | 9.09 | .41 | .2 |
| 01566000 | C | 403055 | 772510 | Tuscarora Creek near Port Royal, Pa. | 1889-2005 | 62 | 214 | 1,010 | 0 | 1.05 | .1 |
| 01566500 | C | 403355 | 770705 | Cocolamus Creek near Millerstown, Pa. | 1930-1972 | 29 | 57.2 | 813 | 5.66 | .73 | .21 |
| 01567500 | C | 402215 | 772409 | Bixler Run near Loysville, Pa. | 1954-2005 | 52 | 15 | 907 | 0 | .91 | .23 |
| 01568000 | C | 401924 | 771009 | Sherman Creek at Shermans Dale, Pa. | 1927-2005 | 76 | 207 | 1,010 | 0 | .98 | .37 |
| 01568500 | C | 402737 | 764506 | Clark Creek near Carsonville, Pa. | 1938-1996 | 59 | 22 | 1,050 | 0 | 4.62 | .05 |
| 01569340 | P | 400740 | 773250 | Newburg Run at Newburg, Pa. | 1964-1995 | 32 | 5.42 | 804 | 0 | 0 | 1.95 |
| 01569800 | C | 401405 | 770823 | Letort Spring Run near Carlisle, Pa. | 1976-2005 | 30 | 21.6 | 498 | 99 | .51 | 24.7 |
| 01570000 | C | 401508 | 770117 | Conodoguinet Creek near Hogestown, Pa. | 1912-2005 | 73 | 470 | 754 | 38.1 | .85 | 3.98 |
| 01571000 | C | 401830 | 765100 | Paxton Creek near Penbrook, Pa. | 1940-1998 | 35 | 11.2 | 457 | 30.1 | .04 | 64.2 |
| 01571500 | C | 401329 | 765354 | Yellow Breeches Creek near Camp Hill, Pa. | 1910-2005 | 62 | 216 | 809 | 34.2 | 1.60 | 6.22 |
| 01571820 | C | 403450 | 762418 | Swatara Creek at Ravine, Pa. | 1996-2006 | 10 | 43.9 | 1,140 | 0 | .67 | 3.41 |
| 01572000 | C | 403215 | 762240 | Lower Little Swatara Creek at Pine Grove, Pa. | 1920-1984 | 18 | 34.3 | 840 | 0 | .33 | .67 |
| 01572025 | C | 403157 | 762409 | Swatara Creek near Pine Grove, Pa. | 1989-2005 | 16 | 116 | 938 | 0 | .59 | 2.67 |
| 01572190 | C | 402845 | 763152 | Swatara Creek near Inwood, Pa. | 1989-2005 | 17 | 161 | 919 | 0 | .81 | 2.46 |
| 01572900 | P | 402425 | 763315 | Reeds Creek near Ono, Pa. | 1962-1981 | 20 | 8.69 | 518 | 3.64 | .29 | 9.58 |
| 01573000 | C | 402409 | 763439 | Swatara Creek at Harper Tavern, Pa. | 1889-2005 | 87 | 337 | 754 | 1.32 | 1.05 | 2.92 |
| 01573160 | C | 402034 | 763346 | Quittapahilla Creek near Bellegrove, Pa. | 1975-1993 | 19 | 74.2 | 527 | 75.6 | .41 | 16.1 |
| 01573500 | C | 402350 | 764235 | Manada Cr at Manada Gap, Pa. | 1938-1958 | 21 | 13.5 | 803 | 0 | .28 | .83 |
| 01573560 | C | 401754 | 764005 | Swatara Creek near Hershey, Pa. | 1975-2005 | 31 | 483 | 687 | 12.9 | .92 | 4.99 |
| 01574000 | C | 400456 | 764313 | West Conewago Creek near Manchester, Pa. | 1929-2005 | 77 | 510 | 625 | 6.17 | 1.45 | 3.23 |
| 01574500 | C | 395243 | 765113 | Codorus Creek at Spring Grove, Pa. | 1930-2005 | 36 | 75.5 | 703 | 16.8 | 3.62 | 3.74 |
| 01574800 | C | 394857 | 763759 | EB Codorus Creek Tributary near Winterstown, Pa. | 1960-1975 | 16 | 5.23 | 901 | 0 | .37 | .47 |
| 01575000 | C | 395514 | 764457 | South Branch Codorus Creek near York, Pa. | 1928-1995 | 43 | 117 | 747 | 1.97 | .90 | 2.91 |
| 01576085 | C | 400841 | 755920 | Little Conestoga Creek near Churchtown, Pa. | 1982-1995 | 14 | 5.82 | 625 | 51 | .01 | 1.31 |
| 01576320 | P | 401244 | 760730 | Stony Run at Reamstown, Pa. | 1964-1995 | 31 | 3.56 | 523 | 10 | .90 | 20.4 |
| 01576500 | C | 400300 | 761639 | Conestoga River at Lancaster, Pa. | 1929-2005 | 77 | 322 | 518 | 44.3 | 1.03 | 8.02 |
| 01576754 | C | 395647 | 762205 | Conestoga River at Conestoga, Pa. | 1985-2005 | 20 | 470 | 479 | 59 | .78 | 11.6 |

**Appendix 1.** Streamflow-gaging stations and basin characteristics used in development of flood-flow regression equations for Pennsylvania streams.—Continued

[C, continuous-record station; P, partial-record station; ddmmss, degrees, minutes, seconds; mi², square miles; ft, feet; --, not used in regression analysis]

| U.S. Geological Survey streamflow-gaging station number | Type | Latitude (ddmmss) | Longitude (ddmmss) | Station name | Period of record[1] (water year)[2] | Number of years used in analysis[3] | Basin characteristics | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Drainage area ($mi^2$) | Mean elevation (ft) | Percent carbon-ate bedrock | Percent storage | Percent urban area |
| 01577500 | C | 394621 | 761858 | Muddy Creek at Castle Fin, Pa. | 1929-1972 | 15 | 133 | 650 | 0.33 | 0.46 | 0.7 |
| 01578200 | P | 395035 | 761145 | Conowingo Creek near Buck, Pa. | 1963-2005 | 41 | 5.53 | 656 | 0 | 1.28 | 1.46 |
| 01578400 | C | 395341 | 760650 | Bowery Run near Quarryville, Pa. | 1963-1981 | 19 | 5.98 | 655 | 25.4 | .98 | .02 |
| 01600700 | P | 395535 | 783940 | Little Wills Creek at Bard, Pa. | 1961-1981 | 21 | 10.3 | 1,830 | 0 | .02 | .04 |
| 01601000 | C | 394843 | 784300 | Wills Creek below Hyndman, Pa. | 1952-2005 | 38 | 146 | 2,030 | .96 | .14 | .33 |
| 01601500 | C | 394007 | 784718 | Wills Creek near Cumberland, Md. | 1930-1990 | 61 | 247 | -- | -- | .03 | -- |
| 01603500 | C | 394723 | 783848 | Evitts Creek near Centerville, Pa. | 1933-1982 | 50 | 30.2 | 1,620 | 21.8 | .22 | .2 |
| 01613050 | C | 395354 | 780757 | Tonoloway Creek near Needmore, Pa. | 1963-2005 | 41 | 10.7 | 1,240 | 0 | .14 | .91 |
| 01613500 | C | 394323 | 780338 | Licking Creek near Sylvan, Pa. | 1931-1941 | 11 | 158 | 1,040 | 16.2 | .71 | .72 |
| 01614090 | C | 395548 | 772623 | Conococheague Creek near Fayetteville, Pa. | 1961-1981 | 21 | 5.05 | 1,550 | 0 | .55 | 0 |
| 01614500 | C | 394257 | 774928 | Conococheague Creek at Fairview, Md. | 1889-1990 | 64 | 494 | -- | 42 | 1.35 | -- |
| 01638900 | P | 394745 | 771150 | White Run near Gettysburg, Pa. | 1961-1980 | 20 | 12.5 | 553 | 0 | 2.31 | 8.64 |
| 03007800 | C | 414907 | 781735 | Allegheny River at Port Allegany, Pa. | 1975-2005 | 31 | 248 | 2,060 | 0 | .09 | .94 |
| 03008000 | C | 415340 | 782057 | Newell Creek near Port Allegany, Pa. | 1960-1978 | 19 | 7.79 | 1,840 | 0 | 0 | .1 |
| 03009680 | C | 414835 | 782550 | Potato Creek at Smethport, Pa. | 1972-1997 | 24 | 160 | 1,980 | 0 | .42 | .8 |
| 03010500 | C | 415748 | 782311 | Allegheny River at Eldred, Pa. | 1916-2005 | 90 | 550 | 1,980 | 0 | 1.45 | .86 |
| 03010655 | C | 415742 | 781154 | Oswayo Creek at Shinglehouse, Pa. | 1975-2005 | 31 | 98.7 | 2,030 | 0 | .13 | .22 |
| 03011020 | C | 420923 | 784256 | Allegheny River at Salamanca, N.Y. | 1904-1999 | 96 | 1,610 | -- | -- | 1.04 | 0 |
| 03011800 | C | 414559 | 784308 | Kinzua Creek near Guffey, Pa. | 1966-2005 | 40 | 38.8 | 2,050 | 0 | .64 | 1.09 |
| 03013000 | C | 421015 | 790410 | Conewango Creek at Waterboro, N.Y. | 1938-1994 | 56 | 290 | -- | -- | 4.69 | -- |
| 03015000 | C | 415617 | 790760 | Conewango Creek at Russell, Pa. | 1936-2005 | 70 | 816 | 1,520 | 0 | 6.45 | 2.57 |
| 03015080 | P | 415555 | 790538 | Ackley Run near Russell, Pa. | 1962-1981 | 20 | 9.65 | 1,900 | 0 | 0 | .16 |
| 03015280 | C | 415410 | 791418 | Jackson Run near North Warren, Pa. | 1963-1979 | 17 | 12.8 | 1,650 | 0 | 2.33 | .9 |
| 03015390 | P | 415629 | 793841 | Hare Creek near Corry, Pa. | 1964-1985 | 19 | 13.6 | 1,630 | 0 | 3.41 | .26 |
| 03015500 | C | 415109 | 791903 | Brokenstraw Creek at Youngsville, Pa. | 1910-2005 | 96 | 321 | 1,600 | 0 | 2.96 | 1.08 |
| 03017500 | C | 413607 | 790301 | Tionesta Creek at Lynch, Pa. | 1938-1979 | 42 | 233 | 1,760 | 0 | .11 | 1.29 |
| 03019000 | C | 412825 | 792305 | Tionesta Creek at Nebraska, Pa. | 1910-1940 | 19 | 469 | 1,690 | 0 | .58 | .82 |
| 03020440 | P | 414531 | 793408 | WB Caldwell Creek near Grand Valley, Pa. | 1964-1981 | 16 | 4.37 | 1,680 | 0 | 0 | .08 |
| 03020500 | C | 412854 | 794144 | Oil Creek at Rouseville, Pa. | 1910-2005 | 96 | 300 | 1,520 | 0 | 1.32 | 1.17 |
| 03021350 | C | 420055 | 794658 | French Creek near Wattsburg, Pa. | 1975-2005 | 31 | 92 | 1,600 | 0 | 2.48 | .5 |
| 03021410 | C | 420454 | 795102 | West Branch French Creek near Lowville, Pa. | 1975-1994 | 20 | 52.3 | 1,470 | 0 | 5.25 | 1.12 |
| 03021700 | C | 415553 | 800502 | Little Conneauttee Creek near McKean, Pa. | 1961-1978 | 18 | 3.6 | 1,440 | 0 | 0 | .01 |
| 03022500 | C | 414250 | 800850 | French Creek at Saegerstown, Pa. | 1913-1939 | 18 | 629 | 1,420 | 0 | 4.54 | 1.39 |
| 03022540 | C | 414126 | 800254 | Woodcock Creek at Blooming Valley, Pa. | 1975-2005 | 31 | 31.1 | 1,450 | 0 | 2.03 | .18 |
| 03023000 | C | 414020 | 801255 | Cussewago Creek near Meadville, Pa. | 1911-1938 | 28 | 90.2 | 1,250 | 0 | 7.31 | 2.07 |

**Appendix 1.** Streamflow-gaging stations and basin characteristics used in development of flood-flow regression equations for Pennsylvania streams.—Continued

[C, continuous-record station; P, partial-record station; ddmmss, degrees, minutes, seconds; mi², square miles; ft, feet; --, not used in regression analysis]

| U.S. Geological Survey streamflow-gaging station number | Type | Latitude (ddmmss) | Longitude (ddmmss) | Station name | Period of record[1] (water year)[2] | Number of years used in analysis[3] | Basin characteristics: Drainage area (mi²) | Mean elevation (ft) | Percent carbonate bedrock | Percent storage | Percent urban area |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 03023500 | C | 412815 | 800105 | French Creek at Carlton, Pa. | 1909-1925 | 17 | 998 | 1,370 | 0 | 5.43 | 2.4 |
| 03024000 | C | 412615 | 795722 | French Creek at Utica, Pa. | 1913-2005 | 38 | 1,030 | 1,370 | 0 | 5.29 | 2.33 |
| 03025000 | C | 412543 | 795248 | Sugar Creek at Sugarcreek, Pa. | 1933-1979 | 47 | 166 | 1,440 | 0 | 1.90 | .31 |
| 03025200 | C | 412520 | 795059 | Patchel Run near Franklin, Pa. | 1961-1978 | 18 | 5.67 | 1,400 | 0 | 0 | .81 |
| 03026400 | P | 411053 | 794125 | Richey Run at Emlenton, Pa. | 1963-1981 | 19 | 5.69 | 1,390 | 0 | 0 | 3.18 |
| 03026500 | C | 413752 | 783437 | Sevenmile Run near Rasselas, Pa. | 1952-2005 | 54 | 7.84 | 2,070 | 0 | 0 | .16 |
| 03028000 | C | 413431 | 784133 | West Branch Clarion River at Wilcox, Pa. | 1955-2005 | 51 | 63 | 1,960 | 0 | .18 | 1.17 |
| 03029000 | C | 412515 | 784410 | Clarion River at Ridgway, Pa. | 1941-2004 | 12 | 303 | 1,910 | 0 | .93 | 2.71 |
| 03029200 | P | 411917 | 790439 | Clear Creek near Sigel, Pa. | 1960-1981 | 21 | 7.32 | 1,750 | 0 | 0 | .03 |
| 03029400 | C | 412016 | 791250 | Toms Run at Cooksburg, Pa. | 1960-1978 | 19 | 12.6 | 1,570 | 0 | .17 | 1 |
| 03029500 | C | 411950 | 791233 | Clarion River at Cooksburg, Pa. | 1936-2005 | 67 | 807 | 1,780 | 0 | .49 | 1.38 |
| 03030500 | C | 411133 | 792625 | Clarion River near Piney, Pa. | 1936-2005 | 58 | 966 | 1,740 | 0 | .41 | 1.46 |
| 03031000 | C | 410857 | 793937 | Clarion River at St. Petersburg, Pa. | 1942-1953 | 12 | 1,240 | 1,660 | 0 | .32 | 1.58 |
| 03031780 | P | 411453 | 785008 | Mill Creek near Brockway, Pa. | 1965-1981 | 17 | 2.02 | 1,760 | 0 | .12 | .12 |
| 03031950 | C | 405930 | 790526 | Big Run nr Sprankle Mills, Pa. | 1964-1981 | 18 | 7.38 | 1,510 | 0 | 0 | .5 |
| 03032500 | C | 405940 | 792340 | Redbank Creek at St. Charles, Pa. | 1910-2005 | 96 | 528 | 1,560 | 0 | .72 | 2.79 |
| 03034000 | C | 405621 | 790031 | Mahoning Creek at Punxsutawney, Pa. | 1936-2005 | 70 | 158 | 1,580 | 0 | .23 | 3.03 |
| 03034500 | C | 405010 | 790637 | Little Mahoning Creek at McCormick, Pa. | 1940-2005 | 66 | 87.4 | 1,560 | 0 | 0 | .35 |
| 03035000 | C | 405405 | 791335 | Mahoning Creek near Dayton, Pa. | 1917-1940 | 24 | 321 | 1,530 | 0 | 1.03 | 1.79 |
| 03038000 | C | 403917 | 792056 | Crooked Creek at Idaho, Pa. | 1936-2005 | 70 | 191 | 1,270 | 0 | .81 | 1.21 |
| 03039000 | C | 404313 | 793042 | Crooked Creek at Crooked Creek Dam, Pa. | 1910-1991 | 30 | 275 | 1,240 | 0 | 1.62 | 1.09 |
| 03039200 | C | 400249 | 784958 | Clear Run near Buckstown, Pa. | 1961-1978 | 18 | 3.68 | 2,700 | 0 | .25 | .36 |
| 03040000 | C | 401708 | 785515 | Stonycreek River at Ferndale, Pa. | 1914-2005 | 90 | 452 | 2,160 | 0 | 1.13 | 2.94 |
| 03041000 | P | 402037 | 785307 | Little Conemaugh River at East Conemaugh, Pa. | 1936-2005 | 70 | 186 | 2,070 | 0 | .92 | 5.29 |
| 03041500 | C | 402509 | 790135 | Conemaugh River at Seward, Pa. | 1936-2005 | 70 | 727 | 2,090 | 0 | .97 | 5.35 |
| 03042000 | C | 402824 | 791101 | Blacklick Creek at Josephine, Pa. | 1952-2005 | 54 | 192 | 1,810 | 0 | .19 | 2.02 |
| 03042170 | P | 403631 | 790949 | Stoney Run at Indiana, Pa. | 1964-1977 | 13 | 4.51 | 1,340 | 0 | 0 | 67.1 |
| 03042200 | C | 403345 | 785644 | Little Yellow Creek near Strongstown, Pa. | 1961-1987 | 19 | 7.36 | 1,840 | 0 | 0 | .19 |
| 03042500 | C | 403102 | 791019 | Two Lick Creek at Graceton, Pa. | 1952-2005 | 17 | 171 | 1,530 | 0 | .70 | 5.27 |
| 03043000 | C | 402825 | 791215 | Blacklick Creek at Black Lick, Pa. | 1905-1951 | 47 | 390 | 1,650 | 0 | .57 | 3.54 |
| 03045000 | C | 401733 | 792027 | Loyalhanna Creek at Kingston, Pa. | 1940-2005 | 66 | 172 | 1,720 | 0 | .25 | 2.11 |
| 03045500 | C | 402340 | 792555 | Loyalhanna Creek at New Alexandria, Pa. | 1911-1940 | 19 | 265 | 1,550 | 0 | 1.08 | 4.9 |
| 03047500 | C | 403205 | 792755 | Kiskiminetas River at Avonmore, Pa. | 1884-1937 | 48 | 1,720 | 1,750 | 0 | 1.42 | 4.33 |
| 03049000 | C | 404257 | 794159 | Buffalo Creek near Freeport, Pa. | 1941-2005 | 64 | 137 | 1,250 | 0 | .05 | 1.73 |
| 03049800 | C | 403113 | 795618 | Little Pine Creek near Etna, Pa. | 1963-2005 | 42 | 5.78 | 1,110 | 0 | 0 | 26 |

**Appendix 1.** Streamflow-gaging stations and basin characteristics used in development of flood-flow regression equations for Pennsylvania streams.—Continued

[C, continuous-record station; P, partial-record station; ddmmss, degrees, minutes, seconds; mi², square miles; ft, feet; --, not used in regression analysis]

| U.S. Geological Survey streamflow-gaging station number | Type | Latitude (ddmmss) | Longitude (ddmmss) | Station name | Period of record[1] (water year)[2] | Number of years used in analysis[3] | Basin characteristics | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Drainage area ($mi^2$) | Mean elevation (ft) | Percent carbon-ate bedrock | Percent storage | Percent urban area |
| 03062500 | C | 393745 | 795710 | Deckers Creek at Morgantown, W.V. | 1947-1997 | 51 | 63.2 | 1,770 | -- | -- | -- |
| 03070420 | C | 394551 | 793514 | Stony Fork Tributary near Gibbon Glade, Pa. | 1978-1989 | 12 | .92 | 1,870 | 0 | 0 | 0.19 |
| 03070500 | C | 393718 | 794218 | Big Sandy Creek near Rockville, W.V. | 1888-1997 | 110 | 200 | 2,070 | -- | -- | -- |
| 03072000 | C | 394533 | 795815 | Dunkard Creek at Shannopin, Pa. | 1941-2005 | 65 | 229 | 1,220 | 0 | .14 | .66 |
| 03072590 | C | 394744 | 794747 | Georges Creek at Smithfield, Pa. | 1964-1978 | 15 | 16.3 | 1,390 | 0 | .10 | 9.45 |
| 03072840 | C | 395951 | 800231 | Tenmile Creek near Clarksville, Pa. | 1969-1979 | 11 | 133 | 1,170 | 0 | .06 | 3.29 |
| 03072880 | P | 395627 | 801721 | Browns Creek near Nineveh, Pa. | 1963-1995 | 33 | 17.7 | 1,250 | 0 | .03 | .23 |
| 03073000 | C | 395523 | 800422 | South Fork Tenmile Creek at Jefferson, Pa. | 1932-1995 | 64 | 180 | 1,210 | 0 | .06 | 2.26 |
| 03074300 | C | 395204 | 794140 | Lick Run at Hopwood, Pa. | 1959-1978 | 20 | 3.8 | 1,990 | 0 | 0 | .8 |
| 03074500 | C | 395848 | 794552 | Redstone Creek at Waltersburg, Pa. | 1943-2005 | 63 | 73.7 | 1,280 | 0 | .27 | 13.6 |
| 03078000 | C | 394208 | 190812 | Casselman at Grantsville, Md. | 1948-1990 | 43 | 62.5 | -- | -- | 2.39 | -- |
| 03078500 | C | 394334 | 790255 | Big Piney Run near Salisbury, Pa. | 1933-1970 | 38 | 24.5 | 2,560 | .45 | 1.12 | .78 |
| 03079000 | C | 395135 | 791340 | Casselman River at Markleton, Pa. | 1915-2005 | 91 | 382 | 2,360 | .03 | .81 | 2.09 |
| 03080000 | C | 394913 | 791918 | Laurel Hill Creek at Ursina, Pa. | 1914-2005 | 92 | 121 | 2,210 | 0 | .65 | .71 |
| 03082200 | C | 400059 | 792533 | Poplar Run near Normalville, Pa. | 1961-1978 | 18 | 9.27 | 1,940 | 0 | 0 | .23 |
| 03082500 | C | 400103 | 793538 | Youghiogheny River at Connellsville, Pa. | 1860-1941 | 50 | 1,330 | 2,260 | 2 | 1.57 | 1.66 |
| 03083000 | C | 400618 | 793001 | Green Lick Run at Green Lick Reservoir, Pa. | 1929-1979 | 51 | 3.11 | 1,910 | 0 | 0 | .06 |
| 03083500 | C | 401424 | 794824 | Youghiogheny River at Sutersville, Pa. | 1921-1941 | 21 | 1,710 | 2,020 | 1.54 | 1.27 | 3.56 |
| 03083600 | P | 401359 | 794906 | Gillespie Run near Sutersville, Pa. | 1959-1981 | 21 | 4.05 | 1,120 | 0 | 0 | 11.6 |
| 03084000 | C | 402701 | 794250 | Abers Creek near Murrysville, Pa. | 1949-1993 | 45 | 4.39 | 1,160 | 0 | .13 | 45.1 |
| 03084500 | C | 402309 | 794555 | Turtle Creek at Trafford, Pa. | 1917-1955 | 38 | 55.9 | 1,120 | 0 | .01 | 22.4 |
| 03085500 | C | 402402 | 800548 | Chartiers Creek at Carnegie, Pa. | 1916-2005 | 82 | 257 | 1,130 | 0 | .52 | 26.4 |
| 03086100 | C | 403627 | 800949 | Big Sewickley Creek near Ambridge, Pa. | 1963-1978 | 16 | 15.6 | 1,090 | 0 | 0 | 13.8 |
| 03098700 | C | 410720 | 803808 | Crab Creek at Youngstown, Ohio | 1959-1982 | 24 | 14 | 1,060 | -- | 6.65 | 31.8 |
| 03100000 | C | 413045 | 802815 | Shenango River near Turnersville, Pa. | 1912-1922 | 11 | 152 | 1,090 | 0 | 22.61 | 5.56 |
| 03101000 | C | 412950 | 802755 | Sugar Run at Pymatuning Dam, Pa. | 1935-1955 | 21 | 8.59 | 1,120 | 0 | .32 | 1.55 |
| 03102500 | C | 412519 | 802235 | Little Shenango River at Greenville, Pa. | 1914-2005 | 89 | 104 | 1,210 | 0 | 5.83 | 2.47 |
| 03102950 | C | 412634 | 803518 | Pymatuning Creek at Kinsman, Ohio | 1966-2001 | 36 | 96.7 | 1,030 | -- | 12.96 | .32 |
| 03103000 | C | 411840 | 802840 | Pymatuning Creek near Orangeville, Pa. | 1914-1963 | 48 | 169 | 1,050 | 0 | 12.53 | .65 |
| 03104000 | C | 411355 | 803035 | Shenango River at Sharon, Pa. | 1912-1938 | 21 | 608 | 1,100 | 0 | 11.86 | 4.6 |
| 03104500 | C | 410000 | 802105 | Shenango River at New Castle, Pa. | 1913-1933 | 20 | 798 | 1,090 | 0 | 10.27 | 7.11 |
| 03104760 | C | 411110 | 801938 | Harthegig Run near Greenfield, Pa. | 1969-1980 | 12 | 2.26 | 1,260 | 0 | 4.12 | 2.08 |
| 03106000 | C | 404901 | 801433 | Connoquenessing Creek near Zelienople, Pa. | 1916-2005 | 90 | 356 | 1,190 | 0 | .35 | 10 |
| 03106500 | C | 405302 | 801402 | Slippery Rock Creek at Wurtemburg, Pa. | 1912-1968 | 56 | 398 | 1,310 | 0 | 4.02 | 2.53 |
| 03108000 | C | 403740 | 802016 | Raccoon Creek at Moffatts Mill, Pa. | 1916-2005 | 90 | 178 | 1,110 | 0 | .54 | 8.55 |

**Appendix 1.** Streamflow-gaging stations and basin characteristics used in development of flood-flow regression equations for Pennsylvania streams.—Continued

[C, continuous-record station; P, partial-record station; ddmmss, degrees, minutes, seconds; $mi^2$, square miles; ft, feet; --, not used in regression analysis]

| U.S. Geological Survey streamflow-gaging station number | Type | Latitude (ddmmss) | Longitude (ddmmss) | Station name | Period of record[1] (water year)[2] | Number of years used in analysis[3] | Basin characteristics | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Drainage area ($mi^2$) | Mean elevation (ft) | Percent carbonate bedrock | Percent storage | Percent urban area |
| 03109000 | C | 404655 | 804533 | Lisbon Creek at Lisbon, Ohio | 1947-1981 | 35 | 6.19 | 1,180 | -- | 0.40 | 1.85 |
| 03109500 | C | 404033 | 803227 | Little Beaver Creek near East Liverpool, Ohio | 1916-2001 | 86 | 496 | 1,140 | -- | .42 | 3.64 |
| 03111150 | C | 401154 | 802428 | Brush Run near Buffalo, Pa. | 1961-1985 | 21 | 10.3 | 1,190 | 0 | 0 | 1.11 |
| 04213000 | C | 415537 | 803615 | Conneaut Creek at Conneaut, Ohio | 1923-2001 | 66 | 175 | 1,010 | -- | 2.73 | 1.76 |
| 04213040 | C | 415642 | 802651 | Raccoon Creek near West Springfield, Pa. | 1961-1995 | 34 | 2.6 | 821 | 0 | 6.01 | 3.61 |
| 04213075 | C | 415931 | 801729 | Brandy Run near Girard, Pa. | 1987-2005 | 19 | 4.45 | 898 | 0 | .22 | 9.1 |
| 04213200 | P | 420554 | 800435 | Mill Creek at Erie, Pa. | 1964-2005 | 42 | 9.16 | 1,050 | 0 | 0 | 35.2 |

[1]Period of record may include historical peaks, periods of flow regulation, and breaks in systematic period of record.

[2]Water year is defined as a 12-month period beginning October 1 and ending September 30. The water year is designated by the calendar year in which it ends.

[3]Number of years used in analysis primarily consists of the systematic period of record and may include historic peak year. Breaks in systematic period of record and flow-regulated years are not included.

**Appendix 2.** Flood-flow magnitudes for selected recurrence intervals computed from observed streamflow-gaging station data, predicted from regional regression equations, and a weighted average for streamflow-gaging stations used in analysis.

| U.S. Geological Survey streamflow-gaging station number | Flood-flow region | Type | Flood-flow estimates, in cubic feet per second | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2-year | 5-year | 10-year | 50-year | 100-year | 500-year |
| 01424500 | 1 | Observed | 2,120 | 2,950 | 3,520 | 4,880 | 5,500 | 7,040 |
| | | Predicted | 1,780 | 2,990 | 3,960 | 6,570 | 7,890 | 11,500 |
| | | Weighted | 2,080 | 2,960 | 3,640 | 5,480 | 6,380 | 8,730 |
| 01426000 | 1 | Observed | 2,780 | 4,070 | 5,000 | 7,220 | 8,240 | 10,800 |
| | | Predicted | 2,580 | 4,310 | 5,680 | 9,300 | 11,100 | 16,000 |
| | | Weighted | 2,760 | 4,110 | 5,130 | 7,770 | 9,030 | 12,300 |
| 01428750 | 1 | Observed | 2,050 | 3,690 | 5,310 | 11,100 | 14,900 | 28,500 |
| | | Predicted | 1,560 | 2,640 | 3,500 | 5,800 | 6,960 | 10,100 |
| | | Weighted | 2,010 | 3,520 | 4,930 | 9,630 | 12,600 | 22,900 |
| 01429000 | 1 | Observed | 2,810 | 3,960 | 4,820 | 6,990 | 8,030 | 10,800 |
| | | Predicted | 1,920 | 3,220 | 4,280 | 7,120 | 8,570 | 12,600 |
| | | Weighted | 2,660 | 3,760 | 4,630 | 7,040 | 8,270 | 11,600 |
| 01429300 | 1 | Observed | 2,020 | 3,100 | 3,960 | 6,340 | 7,580 | 11,100 |
| | | Predicted | 1,720 | 2,900 | 3,840 | 6,360 | 7,630 | 11,100 |
| | | Weighted | 1,990 | 3,060 | 3,940 | 6,350 | 7,590 | 11,100 |
| 01429500 | 1 | Observed | 3,460 | 6,090 | 8,540 | 16,600 | 21,500 | 37,500 |
| | | Predicted | 2,190 | 3,670 | 4,850 | 8,030 | 9,640 | 14,100 |
| | | Weighted | 3,250 | 5,420 | 7,250 | 12,800 | 16,100 | 26,600 |
| 01430000 | 1 | Observed | 6,710 | 10,100 | 12,900 | 20,700 | 25,000 | 37,200 |
| | | Predicted | 4,690 | 7,670 | 10,100 | 16,600 | 19,800 | 28,900 |
| | | Weighted | 6,260 | 9,230 | 11,700 | 18,500 | 22,200 | 32,600 |
| 01430500 | 1 | Observed | 5,770 | 8,790 | 11,200 | 18,000 | 21,500 | 31,600 |
| | | Predicted | 5,590 | 9,110 | 11,900 | 19,500 | 23,400 | 34,000 |
| | | Weighted | 5,740 | 8,870 | 11,500 | 18,700 | 22,300 | 32,700 |
| 01431000 | 1 | Observed | 2,430 | 4,030 | 5,310 | 8,760 | 10,500 | 15,400 |
| | | Predicted | 2,330 | 3,870 | 5,130 | 8,550 | 10,300 | 15,100 |
| | | Weighted | 2,420 | 4,010 | 5,270 | 8,710 | 10,500 | 15,300 |
| 01431500 | 1 | Observed | 8,420 | 14,200 | 19,500 | 36,800 | 47,100 | 81,000 |
| | | Predicted | 7,600 | 12,300 | 16,100 | 26,200 | 31,300 | 45,500 |
| | | Weighted | 8,380 | 14,000 | 19,000 | 34,700 | 43,900 | 73,400 |
| 01431680 | 1 | Observed | 226 | 314 | 377 | 532 | 605 | 794 |
| | | Predicted | 234 | 415 | 562 | 960 | 1,160 | 1,730 |
| | | Weighted | 227 | 337 | 432 | 697 | 828 | 1,180 |
| 01438300 | 1 | Observed | 166 | 258 | 331 | 528 | 628 | 908 |
| | | Predicted | 274 | 485 | 655 | 1,110 | 1,330 | 1,960 |
| | | Weighted | 173 | 285 | 383 | 654 | 790 | 1,160 |
| 01439500 | 1 | Observed | 1,980 | 3,260 | 4,430 | 8,240 | 10,500 | 18,000 |
| | | Predicted | 2,940 | 4,850 | 6,430 | 10,800 | 13,000 | 19,200 |
| | | Weighted | 2,010 | 3,350 | 4,590 | 8,520 | 10,800 | 18,200 |

**Appendix 2.** Flood-flow magnitudes for selected recurrence intervals computed from observed streamflow-gaging station data, predicted from regional regression equations, and a weighted average for streamflow-gaging stations used in analysis.—Continued

| U.S. Geological Survey streamflow-gaging station number | Flood-flow region | Type | Flood-flow estimates, in cubic feet per second | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2-year | 5-year | 10-year | 50-year | 100-year | 500-year |
| 01440300 | 1 | Observed | 370 | 682 | 943 | 1,680 | 2,070 | 3,160 |
| | | Predicted | 304 | 536 | 723 | 1,220 | 1,480 | 2,170 |
| | | Weighted | 366 | 665 | 909 | 1,580 | 1,940 | 2,930 |
| 01440400 | 1 | Observed | 2,910 | 5,190 | 7,070 | 12,300 | 15,100 | 22,800 |
| | | Predicted | 2,120 | 3,540 | 4,690 | 7,790 | 9,360 | 13,700 |
| | | Weighted | 2,860 | 5,000 | 6,720 | 11,400 | 13,900 | 20,800 |
| 01441000 | 1 | Observed | 1,520 | 2,190 | 2,670 | 3,770 | 4,260 | 5,480 |
| | | Predicted | 2,230 | 3,730 | 4,940 | 8,160 | 9,790 | 14,300 |
| | | Weighted | 1,590 | 2,470 | 3,200 | 5,120 | 6,050 | 8,410 |
| 01442500 | 1 | Observed | 8,900 | 15,700 | 22,100 | 43,400 | 56,300 | 99,300 |
| | | Predicted | 7,180 | 11,600 | 15,200 | 24,800 | 29,600 | 42,900 |
| | | Weighted | 8,810 | 15,300 | 21,200 | 40,000 | 51,200 | 88,000 |
| 01446600 | 1 | Observed | 459 | 811 | 1,130 | 2,120 | 2,700 | 4,520 |
| | | Predicted | 401 | 699 | 945 | 1,620 | 1,960 | 2,920 |
| | | Weighted | 453 | 790 | 1,080 | 1,960 | 2,450 | 3,960 |
| 01447500 | 1 | Observed | 2,410 | 4,820 | 7,230 | 15,900 | 21,500 | 41,100 |
| | | Predicted | 2,240 | 3,720 | 4,950 | 8,350 | 10,100 | 15,100 |
| | | Weighted | 2,400 | 4,730 | 6,970 | 14,700 | 19,600 | 36,500 |
| 01447680 | 1 | Observed | 346 | 530 | 670 | 1,020 | 1,200 | 1,650 |
| | | Predicted | 528 | 906 | 1,230 | 2,130 | 2,610 | 3,970 |
| | | Weighted | 360 | 580 | 768 | 1,290 | 1,550 | 2,250 |
| 01447720 | 1 | Observed | 3,130 | 5,750 | 7,960 | 14,200 | 17,500 | 26,900 |
| | | Predicted | 2,570 | 4,240 | 5,640 | 9,560 | 11,600 | 17,400 |
| | | Weighted | 3,090 | 5,570 | 7,590 | 13,200 | 16,200 | 24,700 |
| 01448000 | 1 | Observed | 6,500 | 11,800 | 17,100 | 35,300 | 47,000 | 87,600 |
| | | Predicted | 6,700 | 10,800 | 14,200 | 23,600 | 28,400 | 42,000 |
| | | Weighted | 6,510 | 11,700 | 16,600 | 32,800 | 42,700 | 76,800 |
| 01448500 | 1 | Observed | 137 | 249 | 345 | 626 | 779 | 1,230 |
| | | Predicted | 121 | 217 | 297 | 514 | 625 | 936 |
| | | Weighted | 136 | 246 | 339 | 606 | 750 | 1,170 |
| 01449000 | 1 | Observed | 11,800 | 17,600 | 21,900 | 32,400 | 37,400 | 50,300 |
| | | Predicted | 12,700 | 20,100 | 26,200 | 42,800 | 51,200 | 74,800 |
| | | Weighted | 11,900 | 18,100 | 23,000 | 35,900 | 42,200 | 59,100 |
| 01449360 | 1 | Observed | 1,080 | 1,600 | 1,950 | 2,740 | 3,090 | 3,910 |
| | | Predicted | 1,870 | 3,140 | 4,160 | 6,870 | 8,240 | 12,000 |
| | | Weighted | 1,140 | 1,800 | 2,340 | 3,720 | 4,370 | 6,000 |
| 01449500 | 1 | Observed | 536 | 1,090 | 1,620 | 3,390 | 4,470 | 7,990 |
| | | Predicted | 639 | 1,100 | 1,480 | 2,500 | 3,020 | 4,480 |
| | | Weighted | 552 | 1,090 | 1,570 | 3,030 | 3,850 | 6,460 |

**Appendix 2.** Flood-flow magnitudes for selected recurrence intervals computed from observed streamflow-gaging station data, predicted from regional regression equations, and a weighted average for streamflow-gaging stations used in analysis.—Continued

| U.S. Geological Survey streamflow-gaging station number | Flood-flow region | Type | Flood-flow estimates, in cubic feet per second | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2-year | 5-year | 10-year | 50-year | 100-year | 500-year |
| 01450000 | 1 | Observed | 1,790 | 2,910 | 3,780 | 6,080 | 7,220 | 10,300 |
| | | Predicted | 3,400 | 5,620 | 7,410 | 12,200 | 14,600 | 21,300 |
| | | Weighted | 1,960 | 3,380 | 4,610 | 7,920 | 9,550 | 13,900 |
| 01450500 | 1 | Observed | 2,270 | 3,910 | 5,310 | 9,450 | 11,700 | 18,500 |
| | | Predicted | 2,780 | 4,630 | 6,100 | 10,000 | 12,000 | 17,300 |
| | | Weighted | 2,290 | 3,970 | 5,400 | 9,540 | 11,800 | 18,300 |
| 01451000 | 1 | Observed | 21,800 | 36,400 | 49,000 | 87,400 | 109,000 | 176,000 |
| | | Predicted | 19,200 | 30,200 | 39,200 | 63,300 | 75,500 | 109,000 |
| | | Weighted | 21,300 | 34,500 | 45,300 | 76,000 | 92,700 | 143,000 |
| 01451500 | 1 | Observed | 1,550 | 3,610 | 5,730 | 13,300 | 18,200 | 34,500 |
| | | Predicted | 2,990 | 4,970 | 6,540 | 10,700 | 12,800 | 18,400 |
| | | Weighted | 1,620 | 3,730 | 5,830 | 12,900 | 17,200 | 31,500 |
| 01451650 | 1 | Observed | 2,190 | 4,790 | 7,460 | 17,300 | 23,800 | 46,500 |
| | | Predicted | 3,520 | 5,830 | 7,660 | 12,500 | 14,900 | 21,500 |
| | | Weighted | 2,380 | 5,030 | 7,520 | 15,500 | 20,200 | 36,200 |
| 01451800 | 1 | Observed | 2,310 | 3,880 | 5,110 | 8,340 | 9,940 | 14,200 |
| | | Predicted | 2,110 | 3,550 | 4,680 | 7,680 | 9,180 | 13,300 |
| | | Weighted | 2,300 | 3,840 | 5,040 | 8,180 | 9,750 | 14,000 |
| 01452000 | 1 | Observed | 2,930 | 5,230 | 7,210 | 13,000 | 16,200 | 25,500 |
| | | Predicted | 2,870 | 4,780 | 6,290 | 10,300 | 12,300 | 17,700 |
| | | Weighted | 2,930 | 5,190 | 7,100 | 12,600 | 15,500 | 24,000 |
| 01452300 | 1 | Observed | 270 | 508 | 707 | 1,270 | 1,560 | 2,370 |
| | | Predicted | 290 | 513 | 692 | 1,170 | 1,410 | 2,080 |
| | | Weighted | 273 | 509 | 702 | 1,230 | 1,500 | 2,250 |
| 01452500 | 1 | Observed | 596 | 1,250 | 1,920 | 4,440 | 6,120 | 12,200 |
| | | Predicted | 1,770 | 2,980 | 3,940 | 6,500 | 7,780 | 11,300 |
| | | Weighted | 654 | 1,400 | 2,160 | 4,780 | 6,410 | 12,000 |
| 01453000 | 1 | Observed | 22,100 | 37,100 | 49,900 | 88,000 | 109,000 | 172,000 |
| | | Predicted | 27,600 | 43,100 | 55,600 | 89,100 | 106,000 | 152,000 |
| | | Weighted | 22,400 | 37,700 | 50,700 | 88,200 | 108,000 | 168,000 |
| 01454600 | 1 | Observed | 111 | 212 | 313 | 670 | 900 | 1,700 |
| | | Predicted | 106 | 192 | 262 | 449 | 544 | 805 |
| | | Weighted | 110 | 207 | 296 | 579 | 748 | 1,312 |
| 01459500 | 1 | Observed | 6,480 | 9,600 | 12,000 | 18,100 | 21,000 | 29,000 |
| | | Predicted | 2,980 | 4,930 | 6,510 | 10,800 | 12,900 | 18,900 |
| | | Weighted | 6,210 | 8,960 | 11,000 | 16,200 | 18,900 | 26,300 |
| 01465500 | 2 | Observed | 10,800 | 17,100 | 22,300 | 36,800 | 44,500 | 66,400 |
| | | Predicted | 8,210 | 12,600 | 16,200 | 25,400 | 29,900 | 42,000 |
| | | Weighted | 10,700 | 16,900 | 21,800 | 35,100 | 42,000 | 61,900 |

**Appendix 2.** Flood-flow magnitudes for selected recurrence intervals computed from observed streamflow-gaging station data, predicted from regional regression equations, and a weighted average for streamflow-gaging stations used in analysis.—Continued

| U.S. Geological Survey streamflow-gaging station number | Flood-flow region | Type | Flood-flow estimates, in cubic feet per second | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2-year | 5-year | 10-year | 50-year | 100-year | 500-year |
| 01465770 | 2 | Observed | 744 | 1,060 | 1,320 | 2,040 | 2,430 | 3,520 |
| | | Predicted | 875 | 1,320 | 1,660 | 2,530 | 2,940 | 3,990 |
| | | Weighted | 758 | 1,120 | 1,420 | 2,260 | 2,670 | 3,750 |
| 01465785 | 2 | Observed | 667 | 925 | 1,110 | 1,590 | 1,820 | 2,430 |
| | | Predicted | 438 | 717 | 940 | 1,520 | 1,800 | 2,570 |
| | | Weighted | 639 | 876 | 1,060 | 1,560 | 1,810 | 2,510 |
| 01465790 | 2 | Observed | 812 | 1,150 | 1,420 | 2,110 | 2,450 | 3,390 |
| | | Predicted | 825 | 1,310 | 1,690 | 2,680 | 3,150 | 4,410 |
| | | Weighted | 814 | 1,190 | 1,510 | 2,390 | 2,820 | 3,960 |
| 01465798 | 2 | Observed | 3,110 | 4,580 | 5,680 | 8,490 | 9,850 | 13,500 |
| | | Predicted | 2,260 | 3,350 | 4,200 | 6,350 | 7,370 | 9,980 |
| | | Weighted | 3,070 | 4,460 | 5,470 | 7,970 | 9,190 | 12,500 |
| 01467042 | 2 | Observed | 2,600 | 3,570 | 4,270 | 5,940 | 6,720 | 8,700 |
| | | Predicted | 3,290 | 4,810 | 6,000 | 9,000 | 10,400 | 14,000 |
| | | Weighted | 2,670 | 3,830 | 4,770 | 7,270 | 8,440 | 11,300 |
| 01467043 | 2 | Observed | 280 | 471 | 622 | 1,030 | 1,230 | 1,790 |
| | | Predicted | 586 | 903 | 1,150 | 1,770 | 2,070 | 2,840 |
| | | Weighted | 314 | 564 | 783 | 1,360 | 1,640 | 2,320 |
| 01467048 | 2 | Observed | 3,690 | 5,730 | 7,380 | 12,000 | 14,400 | 21,400 |
| | | Predicted | 4,030 | 5,830 | 7,220 | 10,700 | 12,400 | 16,600 |
| | | Weighted | 3,710 | 5,740 | 7,360 | 11,700 | 13,900 | 20,000 |
| 01467050 | 2 | Observed | 879 | 1,320 | 1,660 | 2,570 | 3,030 | 4,320 |
| | | Predicted | 594 | 959 | 1,250 | 2,000 | 2,370 | 3,340 |
| | | Weighted | 849 | 1,240 | 1,540 | 2,320 | 2,720 | 3,840 |
| 01467086 | 2 | Observed | 2,370 | 3,380 | 4,070 | 5,670 | 6,380 | 8,100 |
| | | Predicted | 2,010 | 2,950 | 3,670 | 5,510 | 6,360 | 8,550 |
| | | Weighted | 2,340 | 3,300 | 3,970 | 5,610 | 6,370 | 8,300 |
| 01467087 | 2 | Observed | 6,270 | 8,730 | 10,400 | 14,300 | 16,000 | 20,200 |
| | | Predicted | 3,090 | 4,430 | 5,460 | 8,050 | 9,250 | 12,300 |
| | | Weighted | 6,030 | 8,060 | 9,290 | 12,100 | 13,400 | 17,000 |
| 01467089 | 2 | Observed | 6,650 | 8,470 | 9,670 | 12,300 | 13,400 | 16,100 |
| | | Predicted | 3,340 | 4,770 | 5,860 | 8,610 | 9,880 | 13,100 |
| | | Weighted | 6,280 | 7,680 | 8,510 | 10,600 | 11,700 | 14,600 |
| 01468500 | 1 | Observed | 3,370 | 5,470 | 7,230 | 12,300 | 15,100 | 23,100 |
| | | Predicted | 4,430 | 7,280 | 9,550 | 15,600 | 18,600 | 26,800 |
| | | Weighted | 3,450 | 5,700 | 7,620 | 13,100 | 15,900 | 24,100 |
| 01469500 | 1 | Observed | 1,390 | 2,410 | 3,190 | 5,160 | 6,090 | 8,480 |
| | | Predicted | 1,600 | 2,690 | 3,570 | 5,920 | 7,110 | 10,400 |
| | | Weighted | 1,400 | 2,430 | 3,230 | 5,260 | 6,230 | 8,740 |

**Appendix 2.** Flood-flow magnitudes for selected recurrence intervals computed from observed streamflow-gaging station data, predicted from regional regression equations, and a weighted average for streamflow-gaging stations used in analysis.—Continued

| U.S. Geological Survey streamflow-gaging station number | Flood-flow region | Type | Flood-flow estimates, in cubic feet per second | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2-year | 5-year | 10-year | 50-year | 100-year | 500-year |
| 01470500 | 1 | Observed | 11,500 | 18,500 | 23,800 | 37,100 | 43,500 | 60,300 |
| | | Predicted | 10,300 | 16,500 | 21,500 | 34,600 | 41,100 | 59,100 |
| | | Weighted | 11,500 | 18,300 | 23,500 | 36,700 | 43,100 | 60,000 |
| 01470720 | 1 | Observed | 465 | 909 | 1,320 | 2,600 | 3,340 | 5,640 |
| | | Predicted | 391 | 686 | 922 | 1,550 | 1,860 | 2,730 |
| | | Weighted | 454 | 853 | 1,190 | 2,170 | 2,710 | 4,370 |
| 01470756 | 1 | Observed | 4,760 | 7,420 | 9,660 | 16,300 | 19,900 | 30,900 |
| | | Predicted | 5,350 | 8,750 | 11,400 | 18,600 | 22,100 | 31,800 |
| | | Weighted | 4,840 | 7,700 | 10,100 | 17,100 | 20,700 | 31,200 |
| 01470779 | 1 | Observed | 1,950 | 3,850 | 5,520 | 10,500 | 13,200 | 21,100 |
| | | Predicted | 2,530 | 4,230 | 5,570 | 9,130 | 10,900 | 15,800 |
| | | Weighted | 2,000 | 3,900 | 5,530 | 10,100 | 12,500 | 19,500 |
| 01470853 | 1 | Observed | 210 | 403 | 558 | 972 | 1,170 | 1,710 |
| | | Predicted | 307 | 542 | 731 | 1,230 | 1,480 | 2,180 |
| | | Weighted | 222 | 432 | 605 | 1,060 | 1,290 | 1,880 |
| 01470960 | 1 | Observed | 4,090 | 7,760 | 11,000 | 21,100 | 26,800 | 43,900 |
| | | Predicted | 5,530 | 9,030 | 11,800 | 19,200 | 22,900 | 33,100 |
| | | Weighted | 4,360 | 8,150 | 11,300 | 20,200 | 24,900 | 38,500 |
| 01471000 | 1 | Observed | 4,920 | 7,400 | 9,340 | 14,600 | 17,200 | 24,600 |
| | | Predicted | 6,560 | 10,700 | 13,900 | 22,600 | 26,900 | 38,800 |
| | | Weighted | 5,090 | 7,980 | 10,400 | 17,000 | 20,400 | 29,300 |
| 01471510 | 1 | Observed | 19,400 | 28,900 | 36,400 | 56,600 | 66,900 | 95,600 |
| | | Predicted | 22,700 | 35,700 | 46,000 | 73,300 | 86,900 | 124,000 |
| | | Weighted | 19,700 | 30,100 | 38,600 | 61,700 | 73,200 | 105,000 |
| 01471875 | 2 | Observed | 2,680 | 3,620 | 4,290 | 5,880 | 6,610 | 8,460 |
| | | Predicted | 2,410 | 4,020 | 5,320 | 8,830 | 10,600 | 15,600 |
| | | Weighted | 2,640 | 3,730 | 4,650 | 7,360 | 8,750 | 12,400 |
| 01471980 | 2 | Observed | 3,430 | 5,120 | 6,320 | 9,180 | 10,500 | 13,700 |
| | | Predicted | 3,250 | 5,360 | 7,050 | 11,600 | 13,900 | 20,300 |
| | | Weighted | 3,420 | 5,150 | 6,450 | 9,880 | 11,600 | 16,000 |
| 01472000 | 2 | Observed | 20,700 | 31,700 | 40,300 | 63,300 | 75,000 | 107,000 |
| | | Predicted | 21,300 | 32,000 | 40,400 | 62,700 | 73,600 | 103,000 |
| | | Weighted | 20,800 | 31,800 | 40,400 | 63,200 | 74,700 | 106,000 |
| 01472157 | 2 | Observed | 2,480 | 4,550 | 6,410 | 12,200 | 15,400 | 25,500 |
| | | Predicted | 2,790 | 4,850 | 6,570 | 11,300 | 13,800 | 20,800 |
| | | Weighted | 2,490 | 4,580 | 6,440 | 12,000 | 15,000 | 24,100 |
| 01472174 | 2 | Observed | 640 | 1,310 | 1,930 | 3,820 | 4,890 | 8,080 |
| | | Predicted | 593 | 1,100 | 1,530 | 2,730 | 3,360 | 5,190 |
| | | Weighted | 635 | 1,270 | 1,810 | 3,350 | 4,180 | 6,660 |

**Appendix 2.** Flood-flow magnitudes for selected recurrence intervals computed from observed streamflow-gaging station data, predicted from regional regression equations, and a weighted average for streamflow-gaging stations used in analysis.—Continued

| U.S. Geological Survey streamflow-gaging station number | Flood-flow region | Type | Flood-flow estimates, in cubic feet per second | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2-year | 5-year | 10-year | 50-year | 100-year | 500-year |
| 01472198 | 2 | Observed | 2,690 | 4,500 | 5,880 | 9,420 | 11,100 | 15,600 |
| | | Predicted | 2,040 | 3,580 | 4,860 | 8,400 | 10,200 | 15,400 |
| | | Weighted | 2,640 | 4,360 | 5,650 | 9,060 | 10,800 | 15,500 |
| 01472199 | 2 | Observed | 1,450 | 2,130 | 2,580 | 3,620 | 4,060 | 5,120 |
| | | Predicted | 1,420 | 2,530 | 3,470 | 6,050 | 7,400 | 11,200 |
| | | Weighted | 1,450 | 2,190 | 2,780 | 4,480 | 5,340 | 7,610 |
| 01472620 | 2 | Observed | 875 | 1,420 | 1,840 | 2,870 | 3,360 | 4,610 |
| | | Predicted | 427 | 818 | 1,160 | 2,130 | 2,650 | 4,180 |
| | | Weighted | 838 | 1,320 | 1,670 | 2,590 | 3,070 | 4,430 |
| 01473000 | 2 | Observed | 15,000 | 23,200 | 28,800 | 41,100 | 46,200 | 58,200 |
| | | Predicted | 8,570 | 13,900 | 18,200 | 29,900 | 35,800 | 52,000 |
| | | Weighted | 14,900 | 22,800 | 28,000 | 39,700 | 44,800 | 57,200 |
| 01473100 | 2 | Observed | 2,080 | 3,690 | 5,110 | 9,410 | 11,800 | 19,200 |
| | | Predicted | 695 | 1,270 | 1,750 | 3,100 | 3,800 | 5,830 |
| | | Weighted | 1,960 | 3,270 | 4,270 | 6,990 | 8,500 | 13,300 |
| 01473120 | 2 | Observed | 5,760 | 9,450 | 12,900 | 24,400 | 31,500 | 55,300 |
| | | Predicted | 3,150 | 5,120 | 6,720 | 11,000 | 13,100 | 18,900 |
| | | Weighted | 5,590 | 8,880 | 11,700 | 20,200 | 25,300 | 42,100 |
| 01473169 | 2 | Observed | 1,250 | 2,060 | 2,770 | 4,960 | 6,210 | 10,100 |
| | | Predicted | 1,440 | 2,100 | 2,600 | 3,840 | 4,430 | 5,970 |
| | | Weighted | 1,270 | 2,060 | 2,730 | 4,550 | 5,510 | 8,400 |
| 01473880 | 2 | Observed | 239 | 372 | 473 | 732 | 858 | 1,190 |
| | | Predicted | 407 | 674 | 889 | 1,450 | 1,730 | 2,470 |
| | | Weighted | 256 | 431 | 590 | 1,030 | 1,250 | 1,800 |
| 01473900 | 2 | Observed | 3,320 | 5,120 | 6,690 | 11,400 | 14,100 | 22,400 |
| | | Predicted | 3,020 | 4,540 | 5,740 | 8,790 | 10,300 | 14,100 |
| | | Weighted | 3,290 | 5,040 | 6,480 | 10,500 | 12,700 | 19,100 |
| 01473950 | 2 | Observed | 3,180 | 4,400 | 5,300 | 7,550 | 8,620 | 11,400 |
| | | Predicted | 3,530 | 5,160 | 6,400 | 9,570 | 11,100 | 14,900 |
| | | Weighted | 3,220 | 4,560 | 5,640 | 8,460 | 9,800 | 13,200 |
| 01474000 | 2 | Observed | 3,700 | 5,910 | 7,940 | 14,600 | 18,500 | 31,700 |
| | | Predicted | 4,100 | 5,950 | 7,370 | 11,000 | 12,700 | 17,000 |
| | | Weighted | 3,720 | 5,910 | 7,850 | 13,700 | 16,900 | 27,400 |
| 01475300 | 2 | Observed | 675 | 1,090 | 1,420 | 2,250 | 2,660 | 3,750 |
| | | Predicted | 796 | 1,270 | 1,640 | 2,600 | 3,060 | 4,300 |
| | | Weighted | 684 | 1,120 | 1,460 | 2,370 | 2,810 | 3,960 |
| 01475510 | 2 | Observed | 2,880 | 4,050 | 4,880 | 6,850 | 7,740 | 9,990 |
| | | Predicted | 3,330 | 4,870 | 6,070 | 9,090 | 10,500 | 14,100 |
| | | Weighted | 2,910 | 4,170 | 5,130 | 7,580 | 8,730 | 11,600 |

**Appendix 2.** Flood-flow magnitudes for selected recurrence intervals computed from observed streamflow-gaging station data, predicted from regional regression equations, and a weighted average for streamflow-gaging stations used in analysis.—Continued

| U.S. Geological Survey streamflow-gaging station number | Flood-flow region | Type | Flood-flow estimates, in cubic feet per second | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2-year | 5-year | 10-year | 50-year | 100-year | 500-year |
| 01475530 | 2 | Observed | 813 | 1,550 | 2,270 | 4,740 | 6,280 | 11,500 |
| | | Predicted | 845 | 1,290 | 1,640 | 2,530 | 2,940 | 4,030 |
| | | Weighted | 816 | 1,500 | 2,090 | 3,810 | 4,770 | 7,930 |
| 01475550 | 2 | Observed | 2,480 | 3,530 | 4,270 | 6,030 | 6,840 | 8,850 |
| | | Predicted | 2,450 | 3,560 | 4,420 | 6,570 | 7,570 | 10,100 |
| | | Weighted | 2,470 | 3,530 | 4,300 | 6,210 | 7,100 | 9,330 |
| 01475850 | 2 | Observed | 1,150 | 1,930 | 2,590 | 4,470 | 5,480 | 8,400 |
| | | Predicted | 1,400 | 2,330 | 3,100 | 5,130 | 6,150 | 8,950 |
| | | Weighted | 1,160 | 1,990 | 2,690 | 4,680 | 5,710 | 8,600 |
| 01476480 | 2 | Observed | 1,480 | 3,060 | 4,660 | 10,400 | 14,200 | 27,200 |
| | | Predicted | 2,090 | 3,480 | 4,610 | 7,660 | 9,180 | 13,400 |
| | | Weighted | 1,540 | 3,150 | 4,650 | 9,260 | 11,900 | 20,600 |
| 01476500 | 2 | Observed | 1,190 | 2,110 | 3,010 | 6,100 | 8,050 | 14,800 |
| | | Predicted | 2,220 | 3,660 | 4,820 | 7,940 | 9,490 | 13,800 |
| | | Weighted | 1,270 | 2,350 | 3,420 | 6,750 | 8,600 | 14,400 |
| 01477000 | 2 | Observed | 2,990 | 5,330 | 7,480 | 14,500 | 18,700 | 32,400 |
| | | Predicted | 3,780 | 5,910 | 7,600 | 12,000 | 14,200 | 20,000 |
| | | Weighted | 3,010 | 5,360 | 7,490 | 14,100 | 18,000 | 30,100 |
| 01478200 | 2 | Observed | 970 | 1,670 | 2,260 | 4,000 | 4,940 | 7,730 |
| | | Predicted | 977 | 1,750 | 2,390 | 4,190 | 5,120 | 7,770 |
| | | Weighted | 970 | 1,680 | 2,290 | 4,050 | 5,000 | 7,750 |
| 01479820 | 2 | Observed | 1,950 | 4,210 | 6,710 | 16,900 | 24,300 | 53,400 |
| | | Predicted | 1,810 | 3,020 | 4,000 | 6,630 | 7,950 | 11,600 |
| | | Weighted | 1,930 | 3,980 | 5,950 | 12,600 | 16,900 | 33,400 |
| 01480300 | 2 | Observed | 1,230 | 2,200 | 3,030 | 5,430 | 6,730 | 10,500 |
| | | Predicted | 1,240 | 2,230 | 3,060 | 5,380 | 6,590 | 10,100 |
| | | Weighted | 1,230 | 2,200 | 3,030 | 5,420 | 6,700 | 10,400 |
| 01480500 | 2 | Observed | 1,910 | 3,450 | 4,800 | 8,880 | 11,200 | 18,000 |
| | | Predicted | 2,390 | 4,150 | 5,620 | 9,660 | 11,700 | 17,600 |
| | | Weighted | 1,930 | 3,510 | 4,910 | 9,050 | 11,300 | 17,900 |
| 01480610 | 2 | Observed | 331 | 588 | 802 | 1,410 | 1,730 | 2,650 |
| | | Predicted | 336 | 587 | 792 | 1,350 | 1,630 | 2,420 |
| | | Weighted | 331 | 588 | 800 | 1,390 | 1,700 | 2,580 |
| 01480617 | 2 | Observed | 2,590 | 4,620 | 6,300 | 11,000 | 13,500 | 20,400 |
| | | Predicted | 2,810 | 4,720 | 6,280 | 10,500 | 12,700 | 18,700 |
| | | Weighted | 2,600 | 4,630 | 6,300 | 10,900 | 13,200 | 19,900 |
| 01480800 | 2 | Observed | 3,560 | 4,240 | 4,710 | 5,770 | 6,240 | 7,390 |
| | | Predicted | 3,620 | 6,010 | 7,960 | 13,200 | 15,900 | 23,300 |
| | | Weighted | 3,570 | 4,740 | 5,980 | 9,830 | 11,800 | 16,900 |

**Appendix 2.** Flood-flow magnitudes for selected recurrence intervals computed from observed streamflow-gaging station data, predicted from regional regression equations, and a weighted average for streamflow-gaging stations used in analysis.—Continued

| U.S. Geological Survey streamflow-gaging station number | Flood-flow region | Type | Flood-flow estimates, in cubic feet per second | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2-year | 5-year | 10-year | 50-year | 100-year | 500-year |
| 01481000 | 2 | Observed | 7,010 | 11,100 | 14,400 | 23,100 | 27,600 | 40,000 |
| | | Predicted | 8,860 | 14,000 | 18,100 | 29,000 | 34,400 | 49,100 |
| | | Weighted | 7,050 | 11,200 | 14,600 | 23,900 | 28,600 | 41,500 |
| 01514000 | 1 | Observed | 5,950 | 8,980 | 11,300 | 17,500 | 20,500 | 28,500 |
| | | Predicted | 6,240 | 10,200 | 13,300 | 21,500 | 25,500 | 36,600 |
| | | Weighted | 5,960 | 9,080 | 11,500 | 18,100 | 21,300 | 29,800 |
| 01516350 | 1 | Observed | 7,130 | 13,100 | 18,700 | 36,600 | 47,300 | 81,500 |
| | | Predicted | 5,310 | 8,700 | 11,400 | 18,400 | 21,900 | 31,400 |
| | | Weighted | 6,9890 | 12,500 | 17,200 | 31,700 | 40,100 | 86,900 |
| 01516500 | 1 | Observed | 810 | 1,480 | 2,090 | 4,050 | 5,200 | 8,850 |
| | | Predicted | 595 | 1,030 | 1,380 | 2,310 | 2,770 | 4,040 |
| | | Weighted | 797 | 1,430 | 1,990 | 3,710 | 4,700 | 7,840 |
| 01516800 | 1 | Observed | 318 | 463 | 563 | 793 | 895 | 1,140 |
| | | Predicted | 172 | 308 | 419 | 714 | 863 | 1,270 |
| | | Weighted | 295 | 422 | 515 | 759 | 881 | 1,200 |
| 01517000 | 1 | Observed | 597 | 1,030 | 1,440 | 2,740 | 3,520 | 6,040 |
| | | Predicted | 517 | 900 | 1,210 | 2,020 | 2,420 | 3,530 |
| | | Weighted | 588 | 1,010 | 1,380 | 2,490 | 3,130 | 5,120 |
| 01518000 | 1 | Observed | 10,200 | 18,400 | 25,800 | 49,100 | 62,700 | 105,000 |
| | | Predicted | 9,000 | 14,500 | 18,900 | 30,400 | 36,100 | 51,600 |
| | | Weighted | 10,100 | 17,900 | 24,500 | 44,600 | 55,900 | 91,300 |
| 01518420 | 1 | Observed | 4,530 | 7,530 | 10,000 | 17,200 | 21,000 | 32,200 |
| | | Predicted | 2,850 | 4,740 | 6,240 | 10,200 | 12,200 | 17,500 |
| | | Weighted | 4,300 | 6,880 | 8,900 | 14,500 | 17,500 | 26,200 |
| 01518500 | 1 | Observed | 3,760 | 6,300 | 8,560 | 15,600 | 19,700 | 32,700 |
| | | Predicted | 4,330 | 7,140 | 9,350 | 15,200 | 18,100 | 26,000 |
| | | Weighted | 3,840 | 6,490 | 8,790 | 15,500 | 19,100 | 30,000 |
| 01518862 | 1 | Observed | 4,230 | 7,250 | 9,500 | 15,000 | 17,500 | 23,800 |
| | | Predicted | 3,370 | 5,590 | 7,350 | 12,000 | 14,300 | 20,600 |
| | | Weighted | 4,110 | 6,880 | 8,880 | 13,900 | 16,200 | 22,500 |
| 01519200 | 1 | Observed | 9,970 | 15,600 | 19,700 | 30,100 | 35,000 | 47,700 |
| | | Predicted | 7,710 | 12,500 | 16,300 | 26,200 | 31,200 | 44,600 |
| | | Weighted | 9,720 | 15,000 | 18,900 | 28,800 | 33,700 | 46,600 |
| 01520000 | 1 | Observed | 10,600 | 17,900 | 24,100 | 42,600 | 52,800 | 83,400 |
| | | Predicted | 9,480 | 15,300 | 19,900 | 31,900 | 37,900 | 54,100 |
| | | Weighted | 10,500 | 17,400 | 23,100 | 39,200 | 47,800 | 73,400 |
| 01526000 | 1 | Observed | 6,340 | 10,200 | 12,900 | 19,200 | 22,000 | 28,500 |
| | | Predicted | 4,120 | 6,800 | 8,910 | 14,500 | 17,300 | 24,800 |
| | | Weighted | 6,190 | 9,800 | 12,300 | 18,200 | 20,900 | 27,600 |

**Appendix 2.** Flood-flow magnitudes for selected recurrence intervals computed from observed streamflow-gaging station data, predicted from regional regression equations, and a weighted average for streamflow-gaging stations used in analysis.—Continued

| U.S. Geological Survey streamflow-gaging station number | Flood-flow region | Type | Flood-flow estimates, in cubic feet per second | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2-year | 5-year | 10-year | 50-year | 100-year | 500-year |
| 01532000 | 1 | Observed | 9,890 | 17,500 | 24,300 | 45,000 | 56,800 | 92,900 |
| | | Predicted | 7,040 | 11,400 | 14,900 | 24,100 | 28,600 | 41,100 |
| | | Weighted | 9,790 | 17,200 | 23,500 | 42,500 | 53,200 | 86,200 |
| 01532200 | 1 | Observed | 642 | 1,030 | 1,360 | 2,390 | 2,960 | 4,740 |
| | | Predicted | 648 | 1,120 | 1,500 | 2,500 | 3,000 | 4,380 |
| | | Weighted | 643 | 1,040 | 1,390 | 2,420 | 2,970 | 4,620 |
| 01532850 | 1 | Observed | 410 | 748 | 1,020 | 1,770 | 2,150 | 3,190 |
| | | Predicted | 308 | 544 | 733 | 1,240 | 1,490 | 2,180 |
| | | Weighted | 396 | 700 | 936 | 1,570 | 1,890 | 2,770 |
| 01533250 | 1 | Observed | 470 | 799 | 1,060 | 1,720 | 2,050 | 2,910 |
| | | Predicted | 539 | 936 | 1,260 | 2,110 | 2,540 | 3,730 |
| | | Weighted | 476 | 820 | 1,100 | 1,830 | 2,190 | 3,150 |
| 01533800 | 1 | Observed | 421 | 779 | 1,120 | 2,270 | 2,980 | 5,350 |
| | | Predicted | 357 | 627 | 845 | 1,430 | 1,730 | 2,550 |
| | | Weighted | 410 | 735 | 1,020 | 1,890 | 2,390 | 4,000 |
| 01533950 | 1 | Observed | 770 | 1,210 | 1,530 | 2,320 | 2,700 | 3,660 |
| | | Predicted | 533 | 924 | 1,240 | 2,100 | 2,530 | 3,740 |
| | | Weighted | 734 | 1,130 | 1,440 | 2,230 | 2,630 | 3,690 |
| 01534000 | 1 | Observed | 13,200 | 20,100 | 24,800 | 35,500 | 40,100 | 50,900 |
| | | Predicted | 10,500 | 16,800 | 21,900 | 35,400 | 42,100 | 60,700 |
| | | Weighted | 13,100 | 19,900 | 24,600 | 35,500 | 40,300 | 52,200 |
| 01534500 | 1 | Observed | 3,240 | 4,690 | 5,840 | 9,000 | 10,600 | 15,300 |
| | | Predicted | 3,520 | 5,810 | 7,650 | 12,500 | 15,000 | 21,800 |
| | | Weighted | 3,280 | 4,950 | 6,380 | 10,400 | 12,400 | 18,000 |
| 01536000 | 1 | Observed | 8,260 | 12,500 | 16,100 | 26,700 | 32,500 | 49,700 |
| | | Predicted | 9,290 | 15,000 | 19,500 | 31,500 | 37,600 | 54,300 |
| | | Weighted | 8,400 | 13,100 | 17,100 | 28,500 | 34,500 | 51,500 |
| 01538000 | 1 | Observed | 1,210 | 2,000 | 2,620 | 4,300 | 5,160 | 7,500 |
| | | Predicted | 1,530 | 2,570 | 3,420 | 5,700 | 6,860 | 10,100 |
| | | Weighted | 1,220 | 2,030 | 2,690 | 4,480 | 5,380 | 7,860 |
| 01538800 | 1 | Observed | 425 | 762 | 1,030 | 1,760 | 2,130 | 3,110 |
| | | Predicted | 277 | 490 | 661 | 1,120 | 1,340 | 1,970 |
| | | Weighted | 405 | 701 | 925 | 1,520 | 1,820 | 2,660 |
| 01539000 | 1 | Observed | 8,630 | 14,300 | 18,900 | 31,400 | 37,800 | 55,700 |
| | | Predicted | 8,610 | 13,900 | 18,100 | 29,200 | 34,700 | 49,600 |
| | | Weighted | 8,630 | 14,300 | 18,800 | 31,100 | 37,300 | 54,700 |
| 01539500 | 1 | Observed | 2,070 | 2,720 | 3,150 | 4,100 | 4,510 | 5,470 |
| | | Predicted | 2,260 | 3,780 | 4,990 | 8,170 | 9,760 | 14,100 |
| | | Weighted | 2,100 | 2,990 | 3,740 | 5,770 | 6,740 | 9,230 |

**Appendix 2.** Flood-flow magnitudes for selected recurrence intervals computed from observed streamflow-gaging station data, predicted from regional regression equations, and a weighted average for streamflow-gaging stations used in analysis.—Continued

| U.S. Geological Survey streamflow-gaging station number | Flood-flow region | Type | Flood-flow estimates, in cubic feet per second | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2-year | 5-year | 10-year | 50-year | 100-year | 500-year |
| 01540000 | 1 | Observed | 11,400 | 17,900 | 22,400 | 33,000 | 37,800 | 49,300 |
| | | Predicted | 10,800 | 17,400 | 22,600 | 36,200 | 43,000 | 61,500 |
| | | Weighted | 11,400 | 17,800 | 22,500 | 34,300 | 40,000 | 54,600 |
| 01540200 | 1 | Observed | 52 | 118 | 189 | 457 | 638 | 1,290 |
| | | Predicted | 112 | 204 | 277 | 474 | 574 | 847 |
| | | Weighted | 60 | 137 | 215 | 464 | 613 | 1,110 |
| 01541000 | 3 | Observed | 7,800 | 11,400 | 14,200 | 21,500 | 25,200 | 35,300 |
| | | Predicted | 7,280 | 11,000 | 13,700 | 20,000 | 22,900 | 30,300 |
| | | Weighted | 7,780 | 11,400 | 14,100 | 21,300 | 24,900 | 34,800 |
| 01541200 | 3 | Observed | 9,460 | 12,600 | 14,600 | 18,800 | 20,500 | 24,300 |
| | | Predicted | 8,100 | 12,100 | 15,000 | 21,800 | 24,900 | 32,700 |
| | | Weighted | 9,160 | 12,500 | 14,800 | 20,300 | 22,800 | 28,700 |
| 01541500 | 3 | Observed | 7,820 | 11,100 | 13,500 | 19,200 | 21,800 | 28,600 |
| | | Predicted | 7,900 | 11,800 | 14,500 | 20,900 | 23,800 | 31,100 |
| | | Weighted | 7,820 | 11,200 | 13,600 | 19,500 | 22,200 | 29,000 |
| 01542000 | 3 | Observed | 1,270 | 1,930 | 2,430 | 3,670 | 4,270 | 5,850 |
| | | Predicted | 2,040 | 3,200 | 4,050 | 6,120 | 7,070 | 9,550 |
| | | Weighted | 1,310 | 2,050 | 2,630 | 4,090 | 4,760 | 6,490 |
| 01542500 | 3 | Observed | 27,700 | 38,500 | 45,600 | 61,100 | 67,600 | 83,000 |
| | | Predicted | 25,000 | 36,100 | 43,800 | 61,400 | 69,300 | 89,100 |
| | | Weighted | 27,400 | 38,000 | 45,100 | 61,200 | 68,200 | 85,000 |
| 01542720 | 3 | Observed | 239 | 329 | 391 | 538 | 605 | 772 |
| | | Predicted | 369 | 613 | 802 | 1,270 | 1,500 | 2,090 |
| | | Weighted | 249 | 368 | 466 | 717 | 829 | 1,100 |
| 01542810 | 3 | Observed | 192 | 301 | 390 | 643 | 777 | 1,170 |
| | | Predicted | 245 | 412 | 542 | 867 | 1,020 | 1,440 |
| | | Weighted | 195 | 313 | 413 | 688 | 828 | 1,220 |
| 01543000 | 3 | Observed | 8,150 | 13,600 | 18,200 | 31,400 | 38,500 | 59,300 |
| | | Predicted | 6,410 | 9,720 | 12,100 | 17,700 | 20,300 | 26,900 |
| | | Weighted | 8,100 | 13,400 | 17,700 | 30,000 | 36,500 | 55,800 |
| 01543500 | 3 | Observed | 17,000 | 27,100 | 35,400 | 58,900 | 71,200 | 107,000 |
| | | Predicted | 13,800 | 20,400 | 25,100 | 36,000 | 40,900 | 53,400 |
| | | Weighted | 16,900 | 26,700 | 34,500 | 55,800 | 67,100 | 99,600 |
| 01543700 | 3 | Observed | 4,560 | 6,960 | 8,830 | 13,900 | 16,400 | 23,400 |
| | | Predicted | 4,390 | 6,680 | 8,340 | 12,200 | 14,000 | 18,600 |
| | | Weighted | 4,540 | 6,900 | 8,710 | 13,300 | 15,600 | 21,800 |
| 01544450 | 3 | Observed | 100 | 140 | 167 | 234 | 264 | 340 |
| | | Predicted | 109 | 181 | 235 | 372 | 436 | 606 |
| | | Weighted | 102 | 153 | 194 | 301 | 350 | 473 |

**Appendix 2.** Flood-flow magnitudes for selected recurrence intervals computed from observed streamflow-gaging station data, predicted from regional regression equations, and a weighted average for streamflow-gaging stations used in analysis.—Continued

| U.S. Geological Survey streamflow-gaging station number | Flood-flow region | Type | Flood-flow estimates, in cubic feet per second | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2-year | 5-year | 10-year | 50-year | 100-year | 500-year |
| 01544500 | 3 | Observed | 3,520 | 5,790 | 7,700 | 13,300 | 16,300 | 25,300 |
| | | Predicted | 3,440 | 5,270 | 6,590 | 9,730 | 11,200 | 14,800 |
| | | Weighted | 3,510 | 5,750 | 7,590 | 12,800 | 15,600 | 23,800 |
| 01545600 | 3 | Observed | 889 | 1,660 | 2,370 | 4,760 | 6,200 | 10,900 |
| | | Predicted | 1,480 | 2,340 | 2,990 | 4,560 | 5,290 | 7,190 |
| | | Weighted | 927 | 1,730 | 2,470 | 4,720 | 6,000 | 10,100 |
| 01546000 | 3 | Observed | 6,930 | 10,400 | 13,000 | 20,200 | 23,800 | 33,700 |
| | | Predicted | 3,070 | 4,880 | 6,240 | 9,570 | 11,100 | 15,200 |
| | | Weighted | 6,410 | 9,140 | 11,100 | 16,200 | 19,000 | 26,700 |
| 01546400 | 3 | Observed | 568 | 939 | 1,260 | 2,270 | 2,840 | 4,630 |
| | | Predicted | 681 | 1,210 | 1,660 | 2,880 | 3,500 | 5,250 |
| | | Weighted | 581 | 992 | 1,370 | 2,470 | 3,070 | 4,840 |
| 01546500 | 3 | Observed | 708 | 1,330 | 1,950 | 4,200 | 5,680 | 11,000 |
| | | Predicted | 885 | 1,570 | 2,160 | 3,770 | 4,590 | 6,910 |
| | | Weighted | 715 | 1,340 | 1,970 | 4,140 | 5,520 | 10,400 |
| 01547100 | 3 | Observed | 1,230 | 2,270 | 3,250 | 6,610 | 8,680 | 15,700 |
| | | Predicted | 1,400 | 2,440 | 3,330 | 5,710 | 6,900 | 10,300 |
| | | Weighted | 1,240 | 2,290 | 3,270 | 6,420 | 8,290 | 14,500 |
| 01547200 | 3 | Observed | 5,040 | 8,370 | 11,200 | 19,400 | 23,900 | 37,200 |
| | | Predicted | 3,370 | 5,550 | 7,310 | 11,800 | 14,000 | 19,900 |
| | | Weighted | 4,950 | 8,100 | 10,700 | 18,100 | 22,100 | 34,100 |
| 01547500 | 3 | Observed | 4,290 | 6,190 | 7,530 | 10,700 | 12,100 | 15,700 |
| | | Predicted | 3,810 | 6,090 | 7,890 | 12,400 | 14,500 | 20,200 |
| | | Weighted | 4,220 | 6,170 | 7,650 | 11,400 | 13,100 | 17,600 |
| 01547700 | 3 | Observed | 1,210 | 2,210 | 3,160 | 6,370 | 8,350 | 15,000 |
| | | Predicted | 1,640 | 2,660 | 3,440 | 5,360 | 6,270 | 8,680 |
| | | Weighted | 1,230 | 2,250 | 3,190 | 6,190 | 7,970 | 13,900 |
| 01547800 | 3 | Observed | 315 | 518 | 687 | 1,180 | 1,440 | 2,220 |
| | | Predicted | 478 | 783 | 1,010 | 1,590 | 1,860 | 2,570 |
| | | Weighted | 333 | 567 | 766 | 1,310 | 1,580 | 2,330 |
| 01547950 | 3 | Observed | 2,400 | 3,920 | 5,150 | 8,590 | 10,400 | 15,500 |
| | | Predicted | 4,070 | 6,280 | 7,910 | 11,800 | 13,600 | 18,200 |
| | | Weighted | 2,520 | 4,200 | 5,600 | 9,290 | 11,100 | 16,100 |
| 01548005 | 3 | Observed | 8,030 | 12,500 | 15,800 | 23,800 | 27,500 | 37,100 |
| | | Predicted | 7,470 | 11,600 | 14,700 | 22,300 | 25,800 | 35,200 |
| | | Weighted | 8,010 | 12,400 | 15,700 | 23,600 | 27,300 | 36,900 |
| 01548020 | 3 | Observed | 61 | 112 | 159 | 313 | 403 | 697 |
| | | Predicted | 107 | 185 | 247 | 407 | 484 | 692 |
| | | Weighted | 67 | 128 | 184 | 347 | 433 | 695 |

**Appendix 2.** Flood-flow magnitudes for selected recurrence intervals computed from observed streamflow-gaging station data, predicted from regional regression equations, and a weighted average for streamflow-gaging stations used in analysis.—Continued

| U.S. Geological Survey streamflow-gaging station number | Flood-flow region | Type | Flood-flow estimates, in cubic feet per second | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2-year | 5-year | 10-year | 50-year | 100-year | 500-year |
| 01548500 | 1 | Observed | 12,000 | 19,400 | 25,700 | 44,000 | 54,000 | 83,700 |
| | | Predicted | 17,400 | 27,700 | 35,700 | 56,800 | 67,300 | 95,800 |
| | | Weighted | 12,200 | 20,000 | 26,600 | 45,600 | 55,800 | 85,300 |
| 01549000 | 1 | Observed | 21,100 | 29,200 | 34,300 | 44,900 | 49,100 | 58,700 |
| | | Predicted | 21,000 | 33,200 | 42,700 | 67,800 | 80,300 | 114,000 |
| | | Weighted | 21,100 | 30,500 | 37,800 | 56,600 | 65,500 | 88,400 |
| 01549500 | 1 | Observed | 1,820 | 2,980 | 3,900 | 6,420 | 7,720 | 11,300 |
| | | Predicted | 1,590 | 2,690 | 3,560 | 5,860 | 7,010 | 10,100 |
| | | Weighted | 1,810 | 2,950 | 3,860 | 6,330 | 7,600 | 11,100 |
| 01549700 | 1 | Observed | 19,300 | 31,400 | 41,500 | 70,200 | 85,600 | 130,000 |
| | | Predicted | 25,500 | 40,100 | 51,600 | 81,600 | 96,600 | 137,000 |
| | | Weighted | 19,700 | 32,400 | 43,000 | 72,600 | 88,000 | 132,000 |
| 01549780 | 1 | Observed | 248 | 421 | 572 | 1,030 | 1,300 | 2,110 |
| | | Predicted | 364 | 640 | 861 | 1,450 | 1,740 | 2,550 |
| | | Weighted | 265 | 474 | 662 | 1,200 | 1,480 | 2,290 |
| 01550000 | 1 | Observed | 6,650 | 10,800 | 14,100 | 23,400 | 28,200 | 41,800 |
| | | Predicted | 5,930 | 9,680 | 12,600 | 20,400 | 24,300 | 34,800 |
| | | Weighted | 6,620 | 10,700 | 14,000 | 23,000 | 27,700 | 40,900 |
| 01550500 | 1 | Observed | 9,790 | 17,900 | 25,500 | 50,600 | 65,700 | 115,000 |
| | | Predicted | 8,510 | 13,800 | 17,900 | 28,800 | 34,200 | 49,000 |
| | | Weighted | 9,550 | 16,700 | 22,700 | 40,300 | 50,300 | 82,100 |
| 01551000 | 1 | Observed | 273 | 515 | 711 | 1,240 | 1,500 | 2,190 |
| | | Predicted | 180 | 322 | 437 | 741 | 895 | 1,320 |
| | | Weighted | 256 | 457 | 607 | 1,000 | 1,200 | 1,750 |
| 01552000 | 1 | Observed | 14,900 | 22,600 | 28,600 | 44,900 | 53,200 | 76,500 |
| | | Predicted | 12,800 | 20,400 | 26,400 | 42,400 | 50,300 | 71,900 |
| | | Weighted | 14,800 | 22,400 | 28,400 | 44,500 | 52,800 | 75,900 |
| 01552100 | 1 | Observed | 398 | 707 | 992 | 1,920 | 2,480 | 4,280 |
| | | Predicted | 479 | 832 | 1,120 | 1,900 | 2,300 | 3,410 |
| | | Weighted | 410 | 739 | 1,030 | 1,910 | 2,400 | 3,910 |
| 01552500 | 1 | Observed | 1,610 | 2,340 | 2,860 | 4,150 | 4,760 | 6,320 |
| | | Predicted | 1,070 | 1,820 | 2,420 | 4,010 | 4,800 | 6,970 |
| | | Weighted | 1,590 | 2,290 | 2,810 | 4,130 | 4,770 | 6,440 |
| 01553005 | 1 | Observed | 7,730 | 13,500 | 18,800 | 35,900 | 46,000 | 78,600 |
| | | Predicted | 6,530 | 10,600 | 13,900 | 22,400 | 26,700 | 38,200 |
| | | Weighted | 7,540 | 12,800 | 17,200 | 30,200 | 37,500 | 60,400 |
| 01553050 | 1 | Observed | 597 | 1,160 | 1,640 | 3,070 | 3,840 | 6,070 |
| | | Predicted | 881 | 1,510 | 2,020 | 3,350 | 4,010 | 5,840 |
| | | Weighted | 622 | 1,210 | 1,720 | 3,150 | 3,890 | 6,000 |

**Appendix 2.** Flood-flow magnitudes for selected recurrence intervals computed from observed streamflow-gaging station data, predicted from regional regression equations, and a weighted average for streamflow-gaging stations used in analysis.—Continued

| U.S. Geological Survey streamflow-gaging station number | Flood-flow region | Type | Flood-flow estimates, in cubic feet per second | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2-year | 5-year | 10-year | 50-year | 100-year | 500-year |
| 01553130 | 1 | Observed | 149 | 361 | 587 | 1,440 | 2,000 | 3,990 |
| | | Predicted | 276 | 489 | 660 | 1,110 | 1,340 | 1,960 |
| | | Weighted | 173 | 400 | 615 | 1,290 | 1,680 | 2,980 |
| 01553600 | 1 | Observed | 789 | 1,520 | 2,220 | 4,550 | 5,970 | 10,700 |
| | | Predicted | 470 | 819 | 1,100 | 1,850 | 2,220 | 3,250 |
| | | Weighted | 743 | 1,350 | 1,870 | 3,480 | 4,420 | 7,520 |
| 01553700 | 1 | Observed | 2,320 | 3,110 | 3,630 | 4,820 | 5,340 | 6,590 |
| | | Predicted | 1,990 | 3,340 | 4,410 | 7,270 | 8,700 | 12,600 |
| | | Weighted | 2,290 | 3,150 | 3,830 | 5,620 | 6,480 | 8,690 |
| 01555000 | 3 | Observed | 5,390 | 9,080 | 12,200 | 21,600 | 26,800 | 42,200 |
| | | Predicted | 4,700 | 7,380 | 9,410 | 14,400 | 16,700 | 22,900 |
| | | Weighted | 5,360 | 8,970 | 12,000 | 20,700 | 25,500 | 39,800 |
| 01555500 | 3 | Observed | 4,420 | 7,880 | 11,300 | 23,100 | 30,700 | 57,100 |
| | | Predicted | 5,550 | 8,880 | 11,400 | 17,600 | 20,500 | 28,300 |
| | | Weighted | 4,460 | 7,940 | 11,300 | 22,400 | 29,400 | 53,500 |
| 01555800 | 3 | Observed | 101 | 164 | 217 | 368 | 450 | 688 |
| | | Predicted | 99 | 176 | 239 | 402 | 483 | 705 |
| | | Weighted | 101 | 167 | 223 | 380 | 462 | 694 |
| 01556000 | 3 | Observed | 6,350 | 9,820 | 12,500 | 19,200 | 22,400 | 31,100 |
| | | Predicted | 4,880 | 7,690 | 9,820 | 15,000 | 17,500 | 24,000 |
| | | Weighted | 6,310 | 9,710 | 12,300 | 18,700 | 21,900 | 30,300 |
| 01556400 | 3 | Observed | 204 | 371 | 525 | 1,020 | 1,310 | 2,230 |
| | | Predicted | 243 | 417 | 556 | 912 | 1,090 | 1,550 |
| | | Weighted | 209 | 381 | 533 | 981 | 1,230 | 1,990 |
| 01556500 | 3 | Observed | 2,570 | 3,990 | 5,030 | 7,580 | 8,780 | 11,800 |
| | | Predicted | 2,400 | 3,770 | 4,790 | 7,250 | 8,390 | 11,400 |
| | | Weighted | 2,560 | 3,960 | 4,990 | 7,510 | 8,690 | 11,700 |
| 01557100 | 3 | Observed | 95 | 170 | 228 | 378 | 450 | 638 |
| | | Predicted | 108 | 189 | 254 | 423 | 506 | 732 |
| | | Weighted | 96 | 173 | 234 | 392 | 468 | 668 |
| 01557500 | 3 | Observed | 1,410 | 2,250 | 2,890 | 4,510 | 5,280 | 7,320 |
| | | Predicted | 1,350 | 2,180 | 2,820 | 4,370 | 5,110 | 7,040 |
| | | Weighted | 1,410 | 2,250 | 2,880 | 4,490 | 5,260 | 7,280 |
| 01558000 | 3 | Observed | 5,130 | 8,440 | 11,300 | 20,200 | 25,200 | 40,800 |
| | | Predicted | 3,890 | 6,170 | 7,910 | 12,200 | 14,200 | 19,500 |
| | | Weighted | 5,080 | 8,270 | 11,000 | 19,100 | 23,600 | 37,800 |
| 01559000 | 3 | Observed | 13,500 | 21,700 | 28,600 | 48,800 | 59,700 | 92,200 |
| | | Predicted | 9,870 | 15,500 | 19,800 | 30,300 | 35,200 | 48,400 |
| | | Weighted | 13,400 | 21,400 | 28,100 | 47,100 | 57,400 | 88,000 |

**Appendix 2.** Flood-flow magnitudes for selected recurrence intervals computed from observed streamflow-gaging station data, predicted from regional regression equations, and a weighted average for streamflow-gaging stations used in analysis.—Continued

| U.S. Geological Survey streamflow-gaging station number | Flood-flow region | Type | Flood-flow estimates, in cubic feet per second | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2-year | 5-year | 10-year | 50-year | 100-year | 500-year |
| 01559500 | 3 | Observed | 2,520 | 3,700 | 4,610 | 7,010 | 8,210 | 11,500 |
| | | Predicted | 3,550 | 5,630 | 7,200 | 11,000 | 12,800 | 17,500 |
| | | Weighted | 2,610 | 3,990 | 5,130 | 8,080 | 9,480 | 13,100 |
| 01559700 | 3 | Observed | 293 | 547 | 773 | 1,470 | 1,860 | 3,040 |
| | | Predicted | 248 | 421 | 555 | 897 | 1,060 | 1,500 |
| | | Weighted | 287 | 517 | 707 | 1,250 | 1,540 | 2,440 |
| 01559790 | 3 | Observed | 2,840 | 5,070 | 6,870 | 11,700 | 14,200 | 20,900 |
| | | Predicted | 3,340 | 5,140 | 6,450 | 9,570 | 11,000 | 14,700 |
| | | Weighted | 2,930 | 5,090 | 6,720 | 10,800 | 12,700 | 18,000 |
| 01560000 | 3 | Observed | 4,310 | 6,910 | 9,060 | 15,200 | 18,500 | 28,200 |
| | | Predicted | 4,190 | 6,510 | 8,220 | 12,300 | 14,200 | 19,200 |
| | | Weighted | 4,310 | 6,880 | 8,980 | 14,800 | 17,900 | 26,900 |
| 01561000 | 3 | Observed | 900 | 1,760 | 2,610 | 5,620 | 7,540 | 14,200 |
| | | Predicted | 1,290 | 2,070 | 2,670 | 4,120 | 4,800 | 6,590 |
| | | Weighted | 935 | 1,810 | 2,620 | 5,220 | 6,780 | 12,100 |
| 01562000 | 3 | Observed | 14,000 | 22,000 | 28,100 | 43,300 | 50,600 | 69,800 |
| | | Predicted | 12,100 | 18,400 | 23,000 | 34,200 | 39,300 | 52,600 |
| | | Weighted | 14,000 | 21,900 | 27,700 | 42,400 | 49,400 | 68,000 |
| 01562500 | 3 | Observed | 1,650 | 2,710 | 3,610 | 6,290 | 7,770 | 12,200 |
| | | Predicted | 2,600 | 4,100 | 5,210 | 7,890 | 9,140 | 12,400 |
| | | Weighted | 1,740 | 2,920 | 3,940 | 6,730 | 8,160 | 12,300 |
| 01563000 | 3 | Observed | 14,400 | 19,900 | 23,400 | 30,200 | 32,800 | 38,600 |
| | | Predicted | 14,300 | 21,300 | 26,300 | 38,000 | 43,300 | 57,000 |
| | | Weighted | 14,400 | 20,200 | 24,000 | 32,400 | 36,000 | 44,000 |
| 01563800 | 3 | Observed | 166 | 266 | 344 | 552 | 656 | 942 |
| | | Predicted | 142 | 229 | 293 | 448 | 520 | 707 |
| | | Weighted | 163 | 258 | 330 | 515 | 606 | 856 |
| 01564500 | 3 | Observed | 6,030 | 10,500 | 14,400 | 26,000 | 32,400 | 51,700 |
| | | Predicted | 5,430 | 8,540 | 10,900 | 16,500 | 19,200 | 26,100 |
| | | Weighted | 6,010 | 10,400 | 14,100 | 24,700 | 30,600 | 48,100 |
| 01564512 | 3 | Observed | 7,690 | 15,600 | 23,500 | 51,700 | 69,800 | 133,000 |
| | | Predicted | 7,020 | 11,000 | 13,900 | 21,100 | 24,400 | 33,200 |
| | | Weighted | 7,590 | 14,500 | 20,500 | 39,500 | 51,300 | 92,300 |
| 01565000 | 3 | Observed | 2,580 | 4,630 | 6,500 | 12,500 | 16,000 | 27,100 |
| | | Predicted | 3,200 | 5,230 | 6,830 | 10,800 | 12,800 | 18,000 |
| | | Weighted | 2,610 | 4,690 | 6,540 | 12,200 | 15,400 | 25,500 |
| 01565700 | 3 | Observed | 236 | 437 | 634 | 1,330 | 1,780 | 3,350 |
| | | Predicted | 197 | 370 | 524 | 953 | 1,180 | 1,830 |
| | | Weighted | 232 | 424 | 606 | 1,210 | 1,580 | 2,850 |

**Appendix 2.** Flood-flow magnitudes for selected recurrence intervals computed from observed streamflow-gaging station data, predicted from regional regression equations, and a weighted average for streamflow-gaging stations used in analysis.—Continued

| U.S. Geological Survey streamflow-gaging station number | Flood-flow region | Type | Flood-flow estimates, in cubic feet per second | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2-year | 5-year | 10-year | 50-year | 100-year | 500-year |
| 01565920 | 3 | Observed | 302 | 628 | 957 | 2,150 | 2,920 | 5,620 |
| | | Predicted | 384 | 669 | 899 | 1,500 | 1,790 | 2,600 |
| | | Weighted | 312 | 636 | 941 | 1,920 | 2,520 | 4,550 |
| 01566000 | 3 | Observed | 6,120 | 9,650 | 12,300 | 19,000 | 22,200 | 30,600 |
| | | Predicted | 6,320 | 9,860 | 12,500 | 18,800 | 21,700 | 29,400 |
| | | Weighted | 6,130 | 9,660 | 12,300 | 19,000 | 22,200 | 30,500 |
| 01566500 | 3 | Observed | 2,400 | 3,690 | 4,610 | 6,740 | 7,700 | 10,000 |
| | | Predicted | 2,160 | 3,590 | 4,710 | 7,530 | 8,900 | 12,600 |
| | | Weighted | 2,380 | 3,680 | 4,630 | 6,950 | 8,030 | 10,700 |
| 01567500 | 3 | Observed | 747 | 1,500 | 2,270 | 5,160 | 7,090 | 14,100 |
| | | Predicted | 753 | 1,270 | 1,680 | 2,710 | 3,210 | 4,560 |
| | | Weighted | 747 | 1,480 | 2,200 | 4,750 | 6,410 | 12,500 |
| 01568000 | 3 | Observed | 6,700 | 11,000 | 14,600 | 24,500 | 29,800 | 44,600 |
| | | Predicted | 6,170 | 9,650 | 12,200 | 18,500 | 21,400 | 29,000 |
| | | Weighted | 6,680 | 11,000 | 14,400 | 23,800 | 28,700 | 42,700 |
| 01568500 | 3 | Observed | 314 | 669 | 1,030 | 2,380 | 3,260 | 6,400 |
| | | Predicted | 776 | 1,230 | 1,560 | 2,360 | 2,740 | 3,710 |
| | | Weighted | 335 | 714 | 1,090 | 2,380 | 3,180 | 5,980 |
| 01569340 | 3 | Observed | 306 | 592 | 892 | 2,060 | 2,860 | 5,950 |
| | | Predicted | 368 | 652 | 884 | 1,490 | 1,800 | 2,630 |
| | | Weighted | 311 | 600 | 890 | 1,920 | 2,590 | 5,100 |
| 01569800 | 3 | Observed | 232 | 408 | 579 | 1,190 | 1,570 | 2,940 |
| | | Predicted | 355 | 702 | 1,030 | 1,990 | 2,510 | 4,100 |
| | | Weighted | 243 | 451 | 667 | 1,400 | 1,830 | 3,250 |
| 01570000 | 3 | Observed | 6,890 | 10,200 | 12,700 | 19,600 | 23,100 | 32,900 |
| | | Predicted | 7,390 | 12,200 | 16,100 | 26,100 | 30,900 | 44,300 |
| | | Weighted | 6,900 | 10,300 | 13,000 | 20,400 | 24,200 | 34,400 |
| 01571000 | 3 | Observed | 1,340 | 2,190 | 2,830 | 4,470 | 5,260 | 7,330 |
| | | Predicted | 513 | 968 | 1,370 | 2,500 | 3,090 | 4,800 |
| | | Weighted | 1,280 | 2,030 | 2,580 | 4,010 | 4,740 | 6,730 |
| 01571500 | 3 | Observed | 2,600 | 4,260 | 5,770 | 10,600 | 13,500 | 22,700 |
| | | Predicted | 3,800 | 6,290 | 8,290 | 13,400 | 15,800 | 22,600 |
| | | Weighted | 2,650 | 4,420 | 6,040 | 11,000 | 13,800 | 22,700 |
| 01571820 | 3 | Observed | 1,670 | 3,000 | 4,190 | 7,980 | 10,200 | 17,100 |
| | | Predicted | 1,670 | 2,710 | 3,500 | 5,450 | 6,370 | 8,820 |
| | | Weighted | 1,670 | 2,900 | 3,900 | 6,680 | 8,170 | 12,800 |
| 01572000 | 3 | Observed | 1,240 | 2,030 | 2,700 | 4,700 | 5,820 | 9,210 |
| | | Predicted | 1,600 | 2,680 | 3,530 | 5,670 | 6,700 | 9,500 |
| | | Weighted | 1,290 | 2,170 | 2,940 | 5,060 | 6,160 | 9,320 |

**Appendix 2.** Flood-flow magnitudes for selected recurrence intervals computed from observed streamflow-gaging station data, predicted from regional regression equations, and a weighted average for streamflow-gaging stations used in analysis.—Continued

| U.S. Geological Survey streamflow-gaging station number | Flood-flow region | Type | Flood-flow estimates, in cubic feet per second | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2-year | 5-year | 10-year | 50-year | 100-year | 500-year |
| 01572025 | 3 | Observed | 3,410 | 5,390 | 7,050 | 11,900 | 14,500 | 22,200 |
| | | Predicted | 4,070 | 6,520 | 8,390 | 13,000 | 15,100 | 20,800 |
| | | Weighted | 3,510 | 5,670 | 7,470 | 12,300 | 14,700 | 21,600 |
| 01572190 | 3 | Observed | 4,930 | 7,750 | 10,000 | 16,300 | 19,600 | 29,000 |
| | | Predicted | 5,290 | 8,400 | 10,700 | 16,400 | 19,100 | 26,200 |
| | | Weighted | 4,980 | 7,900 | 10,200 | 16,400 | 19,400 | 27,900 |
| 01572900 | 3 | Observed | 1,240 | 2,020 | 2,650 | 4,370 | 5,250 | 7,700 |
| | | Predicted | 603 | 1,090 | 1,490 | 2,580 | 3,120 | 4,670 |
| | | Weighted | 1,160 | 1,830 | 2,340 | 3,750 | 4,490 | 6,630 |
| 01573000 | 3 | Observed | 9,290 | 14,100 | 17,900 | 28,700 | 34,400 | 50,800 |
| | | Predicted | 10,200 | 16,000 | 20,400 | 31,100 | 36,200 | 49,500 |
| | | Weighted | 9,320 | 14,200 | 18,100 | 29,000 | 34,600 | 50,600 |
| 01573160 | 3 | Observed | 908 | 1,580 | 2,200 | 4,320 | 5,630 | 10,000 |
| | | Predicted | 1,230 | 2,290 | 3,250 | 5,940 | 7,360 | 11,500 |
| | | Weighted | 949 | 1,730 | 2,490 | 4,900 | 6,260 | 10,600 |
| 01573500 | 3 | Observed | 587 | 1,190 | 1,790 | 3,820 | 5,080 | 9,280 |
| | | Predicted | 762 | 1,310 | 1,760 | 2,890 | 3,450 | 4,970 |
| | | Weighted | 608 | 1,220 | 1,780 | 3,510 | 4,510 | 7,800 |
| 01573560 | 3 | Observed | 10,200 | 15,500 | 19,800 | 31,500 | 37,600 | 54,800 |
| | | Predicted | 11,600 | 18,700 | 24,100 | 37,500 | 43,900 | 61,100 |
| | | Weighted | 10,300 | 16,000 | 20,600 | 33,000 | 39,300 | 56,500 |
| 01574000 | 2 | Observed | 15,000 | 22,100 | 28,300 | 47,500 | 58,500 | 93,100 |
| | | Predicted | 12,400 | 19,700 | 25,700 | 41,700 | 49,700 | 71,600 |
| | | Weighted | 14,900 | 22,000 | 28,100 | 46,700 | 57,100 | 89,300 |
| 01574500 | 2 | Observed | 1,980 | 3,370 | 4,620 | 8,610 | 11,000 | 18,500 |
| | | Predicted | 3,140 | 5,230 | 6,930 | 11,500 | 13,900 | 20,400 |
| | | Weighted | 2,040 | 3,570 | 5,000 | 9,390 | 11,800 | 19,100 |
| 01574800 | 2 | Observed | 215 | 579 | 1,070 | 3,740 | 6,130 | 18,300 |
| | | Predicted | 509 | 967 | 1,360 | 2,490 | 3,100 | 4,860 |
| | | Weighted | 247 | 662 | 1,160 | 3,180 | 4,670 | 11,500 |
| 01575000 | 2 | Observed | 2,200 | 3,850 | 5,410 | 10,600 | 13,900 | 24,700 |
| | | Predicted | 4,500 | 7,600 | 10,200 | 17,200 | 20,700 | 30,800 |
| | | Weighted | 2,300 | 4,200 | 6,080 | 12,200 | 15,600 | 26,400 |
| 01576085 | 2 | Observed | 721 | 1,190 | 1,550 | 2,480 | 2,930 | 4,120 |
| | | Predicted | 454 | 796 | 1,070 | 1,830 | 2,220 | 3,320 |
| | | Weighted | 688 | 1,100 | 1,390 | 2,160 | 2,560 | 3,680 |
| 01576320 | 2 | Observed | 538 | 823 | 1,030 | 1,560 | 1,810 | 2,450 |
| | | Predicted | 438 | 779 | 1,060 | 1,830 | 2,230 | 3,350 |
| | | Weighted | 532 | 818 | 1,040 | 1,640 | 1,940 | 2,760 |

**Appendix 2.** Flood-flow magnitudes for selected recurrence intervals computed from observed streamflow-gaging station data, predicted from regional regression equations, and a weighted average for streamflow-gaging stations used in analysis.—Continued

| U.S. Geological Survey streamflow-gaging station number | Flood-flow region | Type | Flood-flow estimates, in cubic feet per second | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2-year | 5-year | 10-year | 50-year | 100-year | 500-year |
| 01576500 | 2 | Observed | 7,410 | 12,200 | 16,000 | 26,700 | 32,300 | 48,200 |
| | | Predicted | 8,100 | 12,200 | 15,400 | 23,700 | 27,700 | 38,600 |
| | | Weighted | 7,430 | 12,200 | 16,000 | 26,300 | 31,600 | 46,500 |
| 01576754 | 2 | Observed | 10,900 | 15,300 | 18,400 | 25,900 | 29,300 | 37,900 |
| | | Predicted | 10,400 | 15,000 | 18,500 | 27,500 | 31,900 | 43,400 |
| | | Weighted | 10,800 | 15,200 | 18,400 | 26,500 | 30,400 | 40,400 |
| 01577500 | 2 | Observed | 5,280 | 8,830 | 12,100 | 22,600 | 28,800 | 49,200 |
| | | Predicted | 4,870 | 8,270 | 11,100 | 18,900 | 22,800 | 34,000 |
| | | Weighted | 5,230 | 8,710 | 11,800 | 20,800 | 25,800 | 41,300 |
| 01578200 | 2 | Observed | 440 | 861 | 1,270 | 2,680 | 3,570 | 6,560 |
| | | Predicted | 534 | 1,010 | 1,420 | 2,590 | 3,200 | 5,010 |
| | | Weighted | 444 | 875 | 1,290 | 2,660 | 3,470 | 6,120 |
| 01578400 | 2 | Observed | 611 | 1,270 | 2,000 | 5,040 | 7,270 | 16,200 |
| | | Predicted | 500 | 909 | 1,250 | 2,200 | 2,700 | 4,130 |
| | | Weighted | 601 | 1,200 | 1,800 | 3,880 | 5,260 | 10,600 |
| 01600700 | 4 | Observed | 438 | 817 | 1,170 | 2,350 | 3,060 | 5,390 |
| | | Predicted | 479 | 825 | 1,110 | 1,920 | 2,330 | 3,530 |
| | | Weighted | 444 | 819 | 1,150 | 2,190 | 2,790 | 4,730 |
| 01601000 | 4 | Observed | 4,770 | 7,200 | 9,060 | 13,900 | 16,200 | 22,600 |
| | | Predicted | 4,480 | 7,110 | 9,180 | 14,700 | 17,600 | 25,500 |
| | | Weighted | 4,750 | 7,190 | 9,080 | 14,100 | 16,600 | 23,300 |
| 01601500 | 4 | Observed | 5,930 | 9,660 | 13,000 | 23,300 | 29,400 | 48,500 |
| | | Predicted | 6,990 | 10,900 | 14,000 | 22,100 | 26,300 | 37,900 |
| | | Weighted | 5,990 | 9,790 | 13,100 | 23,100 | 28,900 | 46,800 |
| 01603500 | 4 | Observed | 920 | 1,580 | 2,120 | 3,640 | 4,430 | 6,670 |
| | | Predicted | 1,180 | 1,970 | 2,620 | 4,380 | 5,280 | 7,860 |
| | | Weighted | 938 | 1,630 | 2,210 | 3,790 | 4,600 | 6,890 |
| 01613050 | 4 | Observed | 373 | 730 | 1,080 | 2,260 | 3,000 | 5,480 |
| | | Predicted | 493 | 849 | 1,150 | 1,970 | 2,390 | 3,620 |
| | | Weighted | 383 | 748 | 1,090 | 2,190 | 2,860 | 5,070 |
| 01613500 | 4 | Observed | 4,560 | 8,460 | 12,200 | 25,200 | 33,400 | 61,400 |
| | | Predicted | 4,790 | 7,590 | 9,790 | 15,700 | 18,700 | 27,100 |
| | | Weighted | 4,620 | 8,120 | 11,100 | 20,100 | 25,500 | 43,800 |
| 01614090 | 4 | Observed | 100 | 199 | 297 | 634 | 845 | 1,560 |
| | | Predicted | 261 | 461 | 630 | 1,100 | 1,350 | 2,060 |
| | | Weighted | 124 | 265 | 403 | 810 | 1,030 | 1,740 |
| 01614500 | 4 | Observed | 7,440 | 11,000 | 13,900 | 22,100 | 26,400 | 38,800 |
| | | Predicted | 12,600 | 19,200 | 24,300 | 37,700 | 44,500 | 63,600 |
| | | Weighted | 7,720 | 11,800 | 15,300 | 24,700 | 29,400 | 42,600 |

**Appendix 2.** Flood-flow magnitudes for selected recurrence intervals computed from observed streamflow-gaging station data, predicted from regional regression equations, and a weighted average for streamflow-gaging stations used in analysis.—Continued

| U.S. Geological Survey streamflow-gaging station number | Flood-flow region | Type | Flood-flow estimates, in cubic feet per second | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2-year | 5-year | 10-year | 50-year | 100-year | 500-year |
| 01638900 | 4 | Observed | 1,290 | 2,360 | 3,350 | 6,570 | 8,490 | 14,700 |
| | | Predicted | 563 | 964 | 1,300 | 2,220 | 2,700 | 4,070 |
| | | Weighted | 1,170 | 1,990 | 2,670 | 4,890 | 6,250 | 10,800 |
| 03007800 | 3 | Observed | 5,290 | 7,020 | 8,190 | 10,800 | 12,000 | 14,800 |
| | | Predicted | 5,520 | 8,300 | 10,300 | 14,900 | 17,100 | 22,400 |
| | | Weighted | 5,300 | 7,210 | 8,590 | 11,900 | 13,300 | 16,800 |
| 03008000 | 3 | Observed | 451 | 972 | 1,510 | 3,500 | 4,800 | 9,450 |
| | | Predicted | 341 | 566 | 740 | 1,170 | 1,380 | 1,930 |
| | | Weighted | 437 | 885 | 1,300 | 2,670 | 3,540 | 6,700 |
| 03009680 | 3 | Observed | 4,040 | 5,720 | 7,000 | 10,300 | 11,900 | 16,400 |
| | | Predicted | 3,820 | 5,800 | 7,220 | 10,600 | 12,100 | 16,000 |
| | | Weighted | 4,020 | 5,740 | 7,050 | 10,400 | 12,000 | 16,200 |
| 03010500 | 3 | Observed | 7,240 | 11,900 | 16,100 | 29,500 | 37,400 | 63,200 |
| | | Predicted | 9,840 | 14,200 | 17,300 | 24,200 | 27,300 | 35,000 |
| | | Weighted | 7,320 | 12,000 | 16,100 | 28,900 | 36,300 | 60,100 |
| 03010655 | 3 | Observed | 2,090 | 2,930 | 3,480 | 4,630 | 5,110 | 6,190 |
| | | Predicted | 2,600 | 4,000 | 5,020 | 7,450 | 8,570 | 11,400 |
| | | Weighted | 2,130 | 3,090 | 3,770 | 5,350 | 6,020 | 7,560 |
| 03011020 | 3 | Observed | 23,200 | 31,200 | 36,800 | 50,100 | 56,300 | 71,700 |
| | | Predicted | 24,800 | 35,200 | 42,300 | 58,200 | 65,300 | 82,900 |
| | | Weighted | 23,200 | 31,400 | 37,200 | 50,900 | 57,200 | 72,800 |
| 03011800 | 3 | Observed | 1,190 | 2,050 | 2,770 | 4,850 | 5,950 | 9,160 |
| | | Predicted | 1,160 | 1,810 | 2,300 | 3,450 | 3,990 | 5,360 |
| | | Weighted | 1,190 | 2,030 | 2,700 | 4,550 | 5,530 | 8,340 |
| 03013000 | 3 | Observed | 3,690 | 5,100 | 6,090 | 8,430 | 9,480 | 12,100 |
| | | Predicted | 5,410 | 7,790 | 9,420 | 13,100 | 14,700 | 18,800 |
| | | Weighted | 3,770 | 5,330 | 6,480 | 9,170 | 10,300 | 13,200 |
| 03015000 | 3 | Observed | 7,710 | 10,200 | 11,800 | 15,300 | 16,800 | 20,400 |
| | | Predicted | 11,700 | 16,100 | 19,000 | 25,400 | 28,100 | 34,900 |
| | | Weighted | 7,860 | 10,600 | 12,500 | 16,600 | 18,400 | 22,400 |
| 03015080 | 3 | Observed | 660 | 811 | 904 | 1,100 | 1,170 | 1,350 |
| | | Predicted | 401 | 661 | 860 | 1,360 | 1,590 | 2,210 |
| | | Weighted | 628 | 780 | 892 | 1,190 | 1,320 | 1,650 |
| 03015280 | 3 | Observed | 496 | 612 | 680 | 811 | 861 | 969 |
| | | Predicted | 460 | 736 | 940 | 1,440 | 1,670 | 2,270 |
| | | Weighted | 491 | 641 | 759 | 1,050 | 1,180 | 1,480 |
| 03015390 | 3 | Observed | 828 | 1,150 | 1,380 | 1,950 | 2,230 | 2,950 |
| | | Predicted | 456 | 720 | 912 | 1,380 | 1,590 | 2,140 |
| | | Weighted | 780 | 1,050 | 1,250 | 1,750 | 1,990 | 2,650 |

**Appendix 2.** Flood-flow magnitudes for selected recurrence intervals computed from observed streamflow-gaging station data, predicted from regional regression equations, and a weighted average for streamflow-gaging stations used in analysis.—Continued

| U.S. Geological Survey streamflow-gaging station number | Flood-flow region | Type | Flood-flow estimates, in cubic feet per second | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2-year | 5-year | 10-year | 50-year | 100-year | 500-year |
| 03015500 | 3 | Observed | 7,510 | 10,100 | 11,800 | 15,300 | 16,800 | 20,000 |
| | | Predicted | 6,340 | 9,280 | 11,300 | 15,900 | 18,000 | 23,200 |
| | | Weighted | 7,480 | 10,100 | 11,800 | 15,400 | 16,900 | 20,400 |
| 03017500 | 3 | Observed | 5,820 | 8,610 | 10,600 | 15,200 | 17,300 | 22,500 |
| | | Predicted | 5,620 | 8,550 | 10,700 | 15,700 | 18,000 | 23,800 |
| | | Weighted | 5,810 | 8,610 | 10,600 | 15,300 | 17,400 | 22,800 |
| 03019000 | 3 | Observed | 9,110 | 12,000 | 13,900 | 17,800 | 19,400 | 23,000 |
| | | Predicted | 9,830 | 14,600 | 18,000 | 25,900 | 29,500 | 38,600 |
| | | Weighted | 9,200 | 12,600 | 15,000 | 20,700 | 23,100 | 28,700 |
| 03020440 | 3 | Observed | 310 | 411 | 478 | 628 | 693 | 847 |
| | | Predicted | 221 | 375 | 495 | 801 | 949 | 1,340 |
| | | Weighted | 297 | 402 | 483 | 697 | 798 | 1,050 |
| 03020500 | 3 | Observed | 7,740 | 10,900 | 13,100 | 18,500 | 21,000 | 27,500 |
| | | Predicted | 6,800 | 10,200 | 12,600 | 18,300 | 20,900 | 27,400 |
| | | Weighted | 7,710 | 10,800 | 13,100 | 18,500 | 21,000 | 27,500 |
| 03021350 | 3 | Observed | 3,810 | 4,910 | 5,580 | 6,900 | 7,420 | 8,560 |
| | | Predicted | 2,340 | 3,560 | 4,420 | 6,460 | 7,390 | 9,760 |
| | | Weighted | 3,690 | 4,720 | 5,360 | 6,790 | 7,420 | 8,870 |
| 03021410 | 3 | Observed | 3,120 | 4,800 | 6,120 | 9,700 | 11,500 | 16,600 |
| | | Predicted | 1,310 | 1,980 | 2,440 | 3,510 | 4,000 | 5,230 |
| | | Weighted | 2,890 | 4,210 | 5,130 | 7,560 | 8,840 | 12,600 |
| 03021700 | 3 | Observed | 291 | 432 | 537 | 797 | 921 | 1,250 |
| | | Predicted | 202 | 348 | 464 | 763 | 908 | 1,300 |
| | | Weighted | 279 | 413 | 516 | 784 | 916 | 1,270 |
| 03022500 | 3 | Observed | 10,500 | 13,800 | 15,900 | 20,400 | 22,300 | 26,500 |
| | | Predicted | 10,700 | 15,100 | 18,200 | 25,000 | 28,000 | 35,400 |
| | | Weighted | 10,500 | 14,100 | 16,600 | 22,100 | 24,400 | 29,900 |
| 03022540 | 3 | Observed | 1,180 | 1,770 | 2,180 | 3,140 | 3,580 | 4,630 |
| | | Predicted | 1,030 | 1,630 | 2,070 | 3,140 | 3,640 | 4,930 |
| | | Weighted | 1,170 | 1,750 | 2,160 | 3,140 | 3,590 | 4,710 |
| 03023000 | 3 | Observed | 1,580 | 2,180 | 2,630 | 3,760 | 4,310 | 5,780 |
| | | Predicted | 2,010 | 2,960 | 3,610 | 5,080 | 5,740 | 7,400 |
| | | Weighted | 1,620 | 2,300 | 2,830 | 4,130 | 4,720 | 6,240 |
| 03023500 | 3 | Observed | 16,000 | 22,000 | 26,100 | 35,800 | 40,200 | 51,000 |
| | | Predicted | 15,100 | 21,100 | 25,100 | 33,900 | 37,700 | 47,200 |
| | | Weighted | 15,900 | 21,800 | 25,800 | 35,100 | 39,200 | 49,500 |
| 03024000 | 3 | Observed | 14,200 | 17,600 | 19,700 | 23,800 | 25,400 | 29,000 |
| | | Predicted | 15,600 | 21,800 | 25,900 | 35,000 | 39,000 | 48,800 |
| | | Weighted | 14,300 | 18,200 | 20,700 | 26,200 | 28,500 | 33,400 |

**Appendix 2.** Flood-flow magnitudes for selected recurrence intervals computed from observed streamflow-gaging station data, predicted from regional regression equations, and a weighted average for streamflow-gaging stations used in analysis.—Continued

| U.S. Geological Survey streamflow-gaging station number | Flood-flow region | Type | Flood-flow estimates, in cubic feet per second | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2-year | 5-year | 10-year | 50-year | 100-year | 500-year |
| 03025000 | 3 | Observed | 5,290 | 7,320 | 8,580 | 11,200 | 12,200 | 14,500 |
| | | Predicted | 4,130 | 6,270 | 7,800 | 11,400 | 13,000 | 17,300 |
| | | Weighted | 5,230 | 7,210 | 8,480 | 11,200 | 12,400 | 15,000 |
| 03025200 | 3 | Observed | 235 | 435 | 619 | 1,210 | 1,560 | 2,680 |
| | | Predicted | 297 | 506 | 671 | 1,090 | 1,300 | 1,850 |
| | | Weighted | 243 | 451 | 634 | 1,170 | 1,460 | 2,360 |
| 03026400 | 3 | Observed | 463 | 576 | 641 | 763 | 808 | 903 |
| | | Predicted | 299 | 510 | 677 | 1,100 | 1,310 | 1,860 |
| | | Weighted | 442 | 562 | 651 | 884 | 992 | 1,250 |
| 03026500 | 3 | Observed | 399 | 736 | 1,050 | 2,030 | 2,610 | 4,440 |
| | | Predicted | 325 | 536 | 697 | 1,100 | 1,290 | 1,790 |
| | | Weighted | 395 | 718 | 1,000 | 1,880 | 2,380 | 3,990 |
| 03028000 | 3 | Observed | 2,170 | 3,280 | 4,070 | 5,980 | 6,860 | 9,050 |
| | | Predicted | 1,820 | 2,840 | 3,600 | 5,400 | 6,240 | 8,390 |
| | | Weighted | 2,160 | 3,240 | 4,010 | 5,880 | 6,740 | 8,930 |
| 03029000 | 3 | Observed | 9,790 | 16,000 | 20,900 | 34,400 | 41,300 | 60,500 |
| | | Predicted | 6,350 | 9,430 | 11,600 | 16,600 | 18,900 | 24,700 |
| | | Weighted | 9,130 | 14,000 | 17,400 | 26,100 | 30,500 | 43,400 |
| 03029200 | 3 | Observed | 273 | 499 | 709 | 1,400 | 1,810 | 3,170 |
| | | Predicted | 331 | 554 | 726 | 1,160 | 1,360 | 1,910 |
| | | Weighted | 280 | 510 | 713 | 1,320 | 1,660 | 2,740 |
| 03029400 | 3 | Observed | 341 | 506 | 618 | 866 | 972 | 1,220 |
| | | Predicted | 537 | 889 | 1,160 | 1,830 | 2,150 | 3,010 |
| | | Weighted | 366 | 588 | 769 | 1,210 | 1,410 | 1,870 |
| 03029500 | 3 | Observed | 17,200 | 24,900 | 30,400 | 44,100 | 50,600 | 67,200 |
| | | Predicted | 15,100 | 22,100 | 27,000 | 38,300 | 43,400 | 56,200 |
| | | Weighted | 17,200 | 24,700 | 30,100 | 43,300 | 49,500 | 65,600 |
| 03030500 | 3 | Observed | 21,800 | 31,600 | 38,700 | 56,600 | 65,000 | 87,100 |
| | | Predicted | 17,800 | 26,000 | 31,700 | 44,900 | 50,900 | 65,900 |
| | | Weighted | 21,600 | 31,100 | 37,900 | 54,800 | 62,800 | 83,700 |
| 03031000 | 3 | Observed | 26,500 | 35,800 | 41,700 | 54,000 | 59,000 | 70,400 |
| | | Predicted | 22,500 | 32,800 | 40,000 | 56,600 | 64,000 | 82,800 |
| | | Weighted | 25,800 | 34,900 | 41,000 | 55,200 | 61,400 | 76,300 |
| 03031780 | 3 | Observed | 108 | 180 | 231 | 350 | 401 | 525 |
| | | Predicted | 114 | 196 | 261 | 428 | 509 | 727 |
| | | Weighted | 109 | 184 | 240 | 380 | 444 | 604 |
| 03031950 | 3 | Observed | 492 | 739 | 906 | 1,270 | 1,420 | 1,780 |
| | | Predicted | 356 | 601 | 791 | 1,270 | 1,510 | 2,130 |
| | | Weighted | 474 | 708 | 873 | 1,270 | 1,460 | 1,910 |

**Appendix 2.** Flood-flow magnitudes for selected recurrence intervals computed from observed streamflow-gaging station data, predicted from regional regression equations, and a weighted average for streamflow-gaging stations used in analysis.—Continued

| U.S. Geological Survey streamflow-gaging station number | Flood-flow region | Type | Flood-flow estimates, in cubic feet per second | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2-year | 5-year | 10-year | 50-year | 100-year | 500-year |
| 03032500 | 3 | Observed | 11,900 | 17,900 | 22,800 | 36,200 | 43,100 | 62,900 |
| | | Predicted | 11,100 | 16,500 | 20,400 | 29,400 | 33,500 | 43,800 |
| | | Weighted | 11,800 | 17,900 | 22,600 | 35,500 | 42,100 | 60,900 |
| 03034000 | 3 | Observed | 4,440 | 7,100 | 9,360 | 16,000 | 19,700 | 30,800 |
| | | Predicted | 4,260 | 6,580 | 8,280 | 12,300 | 14,200 | 19,100 |
| | | Weighted | 4,430 | 7,070 | 9,260 | 15,500 | 19,000 | 29,200 |
| 03034500 | 3 | Observed | 3,100 | 4,480 | 5,500 | 8,080 | 9,330 | 12,600 |
| | | Predicted | 2,670 | 4,210 | 5,360 | 8,120 | 9,420 | 12,800 |
| | | Weighted | 3,090 | 4,460 | 5,480 | 8,090 | 9,340 | 12,700 |
| 03035000 | 3 | Observed | 7,420 | 10,100 | 12,200 | 17,200 | 19,700 | 26,200 |
| | | Predicted | 7,300 | 11,000 | 13,600 | 19,700 | 22,500 | 29,700 |
| | | Weighted | 7,410 | 10,300 | 12,500 | 18,000 | 20,600 | 27,300 |
| 03038000 | 3 | Observed | 4,960 | 7,520 | 9,650 | 15,800 | 19,200 | 29,100 |
| | | Predicted | 5,260 | 8,130 | 10,200 | 15,300 | 17,600 | 23,600 |
| | | Weighted | 4,970 | 7,560 | 9,700 | 15,700 | 18,900 | 28,300 |
| 03039000 | 3 | Observed | 9,300 | 12,900 | 15,200 | 19,800 | 21,700 | 25,700 |
| | | Predicted | 6,790 | 10,300 | 12,800 | 18,800 | 21,500 | 28,600 |
| | | Weighted | 9,090 | 12,500 | 14,700 | 19,600 | 21,600 | 26,500 |
| 03039200 | 4 | Observed | 134 | 206 | 261 | 401 | 470 | 651 |
| | | Predicted | 200 | 356 | 489 | 864 | 1,060 | 1,630 |
| | | Weighted | 145 | 248 | 342 | 592 | 714 | 1,030 |
| 03040000 | 4 | Observed | 10,400 | 16,800 | 22,100 | 36,800 | 44,500 | 66,500 |
| | | Predicted | 11,700 | 17,900 | 22,600 | 35,300 | 41,700 | 59,500 |
| | | Weighted | 10,400 | 16,900 | 22,100 | 36,600 | 44,100 | 65,700 |
| 03041000 | 4 | Observed | 5,340 | 9,050 | 12,300 | 22,400 | 28,200 | 46,000 |
| | | Predicted | 5,500 | 8,670 | 11,200 | 17,800 | 21,100 | 30,600 |
| | | Weighted | 5,350 | 9,010 | 12,200 | 21,700 | 27,100 | 43,800 |
| 03041500 | 4 | Observed | 16,500 | 26,900 | 35,900 | 62,800 | 77,800 | 124,000 |
| | | Predicted | 17,400 | 26,300 | 33,000 | 50,800 | 59,800 | 84,900 |
| | | Weighted | 16,600 | 26,900 | 35,500 | 60,900 | 75,100 | 118,000 |
| 03042000 | 4 | Observed | 6,460 | 10,400 | 13,700 | 23,600 | 29,000 | 45,400 |
| | | Predicted | 5,650 | 8,890 | 11,400 | 18,200 | 21,700 | 31,400 |
| | | Weighted | 6,410 | 10,200 | 13,400 | 22,600 | 27,600 | 42,900 |
| 03042170 | 4 | Observed | 317 | 408 | 465 | 585 | 634 | 745 |
| | | Predicted | 238 | 420 | 576 | 1,010 | 1,240 | 1,890 |
| | | Weighted | 299 | 412 | 513 | 795 | 932 | 1,290 |
| 03042200 | 4 | Observed | 434 | 799 | 1,150 | 2,360 | 3,120 | 5,710 |
| | | Predicted | 359 | 626 | 850 | 1,470 | 1,800 | 2,730 |
| | | Weighted | 422 | 752 | 1,050 | 2,010 | 2,600 | 4,580 |

**Appendix 2.** Flood-flow magnitudes for selected recurrence intervals computed from observed streamflow-gaging station data, predicted from regional regression equations, and a weighted average for streamflow-gaging stations used in analysis.—Continued

| U.S. Geological Survey streamflow-gaging station number | Flood-flow region | Type | Flood-flow estimates, in cubic feet per second | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2-year | 5-year | 10-year | 50-year | 100-year | 500-year |
| 03042500 | 4 | Observed | 5,210 | 7,390 | 8,980 | 12,900 | 14,800 | 19,700 |
| | | Predicted | 5,120 | 8,090 | 10,400 | 16,700 | 19,800 | 28,800 |
| | | Weighted | 5,200 | 7,600 | 9,510 | 14,500 | 17,000 | 23,400 |
| 03043000 | 4 | Observed | 11,200 | 17,300 | 22,300 | 36,800 | 44,700 | 67,900 |
| | | Predicted | 10,300 | 15,800 | 20,100 | 31,400 | 37,200 | 53,200 |
| | | Weighted | 11,200 | 17,100 | 21,900 | 35,700 | 43,100 | 65,000 |
| 03045000 | 4 | Observed | 6,030 | 9,300 | 12,000 | 19,500 | 23,400 | 34,800 |
| | | Predicted | 5,140 | 8,110 | 10,500 | 16,700 | 19,900 | 28,800 |
| | | Weighted | 5,980 | 9,190 | 11,800 | 19,000 | 22,800 | 33,900 |
| 03045500 | 4 | Observed | 7,070 | 11,800 | 16,000 | 28,300 | 35,100 | 55,900 |
| | | Predicted | 7,420 | 11,600 | 14,800 | 23,300 | 27,700 | 39,900 |
| | | Weighted | 7,130 | 11,800 | 15,600 | 26,300 | 32,200 | 49,800 |
| 03047500 | 4 | Observed | 39,700 | 59,900 | 76,200 | 122,000 | 146,000 | 215,000 |
| | | Predicted | 36,100 | 53,000 | 65,700 | 98,800 | 116,000 | 162,000 |
| | | Weighted | 39,500 | 59,000 | 74,400 | 117,000 | 139,000 | 204,000 |
| 03049000 | 4 | Observed | 3,890 | 5,950 | 7,610 | 12,200 | 14,600 | 21,500 |
| | | Predicted | 4,250 | 6,760 | 8,740 | 14,000 | 16,700 | 24,400 |
| | | Weighted | 3,910 | 6,030 | 7,760 | 12,500 | 15,000 | 22,000 |
| 03049800 | 4 | Observed | 270 | 666 | 1,140 | 3,270 | 4,930 | 11,900 |
| | | Predicted | 293 | 514 | 701 | 1,220 | 1,500 | 2,280 |
| | | Weighted | 272 | 644 | 1,060 | 2,800 | 4,140 | 9,840 |
| 03062500 | 4 | Observed | 1,590 | 2,720 | 3,680 | 6,490 | 8,020 | 12,600 |
| | | Predicted | 2,210 | 3,600 | 4,720 | 7,730 | 9,280 | 13,700 |
| | | Weighted | 1,630 | 2,830 | 3,850 | 6,740 | 8,270 | 12,800 |
| 03070420 | 4 | Observed | 61 | 90 | 111 | 162 | 186 | 247 |
| | | Predicted | 62 | 115 | 162 | 297 | 369 | 577 |
| | | Weighted | 61 | 99 | 134 | 231 | 280 | 410 |
| 03070500 | 4 | Observed | 7,130 | 10,300 | 12,900 | 20,000 | 23,700 | 34,300 |
| | | Predicted | 5,850 | 9,190 | 11,800 | 18,800 | 22,400 | 32,300 |
| | | Weighted | 7,090 | 10,200 | 12,800 | 19,900 | 23,600 | 34,100 |
| 03072000 | 4 | Observed | 7,200 | 10,500 | 12,700 | 17,700 | 19,800 | 24,800 |
| | | Predicted | 6,560 | 10,300 | 13,200 | 20,900 | 24,800 | 35,800 |
| | | Weighted | 7,160 | 10,500 | 12,800 | 18,200 | 20,600 | 26,400 |
| 03072590 | 4 | Observed | 662 | 978 | 1,210 | 1,770 | 2,030 | 2,700 |
| | | Predicted | 703 | 1,200 | 1,600 | 2,720 | 3,300 | 4,960 |
| | | Weighted | 670 | 1,050 | 1,360 | 2,200 | 2,610 | 3,690 |
| 03072840 | 4 | Observed | 4,410 | 8,250 | 11,800 | 23,200 | 29,900 | 51,300 |
| | | Predicted | 4,140 | 6,600 | 8,540 | 13,700 | 16,400 | 23,800 |
| | | Weighted | 4,340 | 7,600 | 10,300 | 18,100 | 22,700 | 37,100 |

**Appendix 2.** Flood-flow magnitudes for selected recurrence intervals computed from observed streamflow-gaging station data, predicted from regional regression equations, and a weighted average for streamflow-gaging stations used in analysis.—Continued

| U.S. Geological Survey streamflow-gaging station number | Flood-flow region | Type | Flood-flow estimates, in cubic feet per second | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2-year | 5-year | 10-year | 50-year | 100-year | 500-year |
| 03072880 | 4 | Observed | 842 | 1,550 | 2,150 | 3,790 | 4,630 | 6,960 |
| | | Predicted | 752 | 1,280 | 1,710 | 2,890 | 3,510 | 5,260 |
| | | Weighted | 833 | 1,510 | 2,050 | 3,540 | 4,320 | 6,520 |
| 03073000 | 4 | Observed | 6,150 | 8,620 | 10,200 | 13,300 | 14,500 | 17,300 |
| | | Predicted | 5,350 | 8,440 | 10,900 | 17,300 | 20,600 | 29,900 |
| | | Weighted | 6,100 | 8,600 | 10,200 | 14,000 | 15,500 | 19,200 |
| 03074300 | 4 | Observed | 151 | 259 | 350 | 613 | 754 | 1,170 |
| | | Predicted | 206 | 366 | 502 | 886 | 1,090 | 1,670 |
| | | Weighted | 160 | 287 | 400 | 718 | 883 | 1,350 |
| 03074500 | 4 | Observed | 2,260 | 3,240 | 3,920 | 5,510 | 6,220 | 7,990 |
| | | Predicted | 2,520 | 4,080 | 5,330 | 8,710 | 10,400 | 15,300 |
| | | Weighted | 2,280 | 3,320 | 4,110 | 6,040 | 6,930 | 9,140 |
| 03078000 | 4 | Observed | 2,010 | 2,920 | 3,650 | 5,680 | 6,740 | 9,800 |
| | | Predicted | 2,190 | 3,570 | 4,680 | 7,670 | 9,200 | 13,500 |
| | | Weighted | 2,020 | 3,010 | 3,840 | 6,130 | 7,300 | 10,600 |
| 03078500 | 4 | Observed | 1,030 | 1,880 | 2,650 | 5,070 | 6,480 | 10,900 |
| | | Predicted | 991 | 1,660 | 2,210 | 3,720 | 4,500 | 6,710 |
| | | Weighted | 1,030 | 1,840 | 2,560 | 4,740 | 5,990 | 9,930 |
| 03079000 | 4 | Observed | 10,800 | 16,100 | 20,200 | 31,600 | 37,400 | 53,800 |
| | | Predicted | 10,100 | 15,600 | 19,800 | 30,900 | 36,600 | 52,500 |
| | | Weighted | 10,800 | 16,000 | 20,200 | 31,500 | 37,300 | 53,600 |
| 03080000 | 4 | Observed | 4,050 | 5,850 | 7,090 | 9,920 | 11,200 | 14,200 |
| | | Predicted | 3,830 | 6,110 | 7,920 | 12,800 | 15,200 | 22,200 |
| | | Weighted | 4,040 | 5,870 | 7,170 | 10,300 | 11,700 | 15,100 |
| 03082200 | 4 | Observed | 650 | 935 | 1,150 | 1,730 | 2,010 | 2,790 |
| | | Predicted | 437 | 755 | 1,020 | 1,760 | 2,150 | 3,250 |
| | | Weighted | 614 | 884 | 1,110 | 1,740 | 2,070 | 2,970 |
| 03082500 | 4 | Observed | 32,600 | 46,000 | 55,900 | 80,800 | 92,800 | 125,000 |
| | | Predicted | 28,900 | 42,800 | 53,300 | 80,800 | 94,600 | 133,000 |
| | | Weighted | 32,400 | 45,600 | 55,500 | 80,800 | 93,200 | 126,000 |
| 03083000 | 4 | Observed | 235 | 423 | 592 | 1,120 | 1,430 | 2,390 |
| | | Predicted | 174 | 311 | 428 | 759 | 933 | 1,430 |
| | | Weighted | 231 | 409 | 566 | 1,050 | 1,330 | 2,220 |
| 03083500 | 4 | Observed | 36,700 | 56,300 | 71,200 | 110,000 | 128,000 | 178,000 |
| | | Predicted | 35,900 | 52,700 | 65,400 | 98,300 | 115,000 | 161,000 |
| | | Weighted | 36,600 | 55,400 | 69,400 | 105,000 | 123,000 | 172,000 |
| 03083600 | 4 | Observed | 184 | 342 | 492 | 997 | 1,310 | 2,340 |
| | | Predicted | 217 | 385 | 528 | 930 | 1,140 | 1,750 |
| | | Weighted | 189 | 353 | 504 | 972 | 1,250 | 2,130 |

**Appendix 2.** Flood-flow magnitudes for selected recurrence intervals computed from observed streamflow-gaging station data, predicted from regional regression equations, and a weighted average for streamflow-gaging stations used in analysis.—Continued

| U.S. Geological Survey streamflow-gaging station number | Flood-flow region | Type | Flood-flow estimates, in cubic feet per second | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2-year | 5-year | 10-year | 50-year | 100-year | 500-year |
| 03084000 | 4 | Observed | 422 | 696 | 896 | 1,370 | 1,590 | 2,120 |
| | | Predicted | 232 | 411 | 563 | 990 | 1,210 | 1,860 |
| | | Weighted | 408 | 657 | 836 | 1,290 | 1,510 | 2,070 |
| 03084500 | 4 | Observed | 2,210 | 3,390 | 4,250 | 6,300 | 7,240 | 9,580 |
| | | Predicted | 1,990 | 3,260 | 4,280 | 7,040 | 8,450 | 12,500 |
| | | Weighted | 2,190 | 3,370 | 4,250 | 6,480 | 7,540 | 10,300 |
| 03085500 | 3 | Observed | 5,460 | 8,120 | 9,940 | 14,000 | 15,800 | 19,900 |
| | | Predicted | 7,220 | 11,200 | 14,200 | 21,200 | 24,500 | 33,100 |
| | | Weighted | 5,520 | 8,310 | 10,300 | 14,800 | 16,800 | 21,500 |
| 03086100 | 3 | Observed | 622 | 1,010 | 1,320 | 2,180 | 2,630 | 3,870 |
| | | Predicted | 762 | 1,290 | 1,700 | 2,750 | 3,250 | 4,620 |
| | | Weighted | 643 | 1,080 | 1,440 | 2,410 | 2,880 | 4,170 |
| 03098700 | 3 | Observed | 671 | 857 | 982 | 1,270 | 1,390 | 1,700 |
| | | Predicted | 484 | 760 | 959 | 1,440 | 1,660 | 2,220 |
| | | Weighted | 651 | 840 | 977 | 1,320 | 1,470 | 1,860 |
| 03100000 | 3 | Observed | 3,130 | 4,840 | 6,170 | 9,710 | 11,500 | 16,400 |
| | | Predicted | 2,050 | 2,720 | 3,120 | 3,970 | 4,320 | 5,170 |
| | | Weighted | 2,910 | 4,160 | 4,950 | 6,890 | 7,900 | 10,800 |
| 03101000 | 3 | Observed | 540 | 1,020 | 1,430 | 2,610 | 3,240 | 5,030 |
| | | Predicted | 450 | 768 | 1,020 | 1,660 | 1,970 | 2,800 |
| | | Weighted | 529 | 969 | 1,320 | 2,290 | 2,800 | 4,270 |
| 03102500 | 3 | Observed | 2,480 | 3,630 | 4,420 | 6,240 | 7,050 | 9,020 |
| | | Predicted | 2,460 | 3,660 | 4,490 | 6,410 | 7,280 | 9,470 |
| | | Weighted | 2,480 | 3,630 | 4,430 | 6,260 | 7,080 | 9,070 |
| 03102950 | 3 | Observed | 1,420 | 1,960 | 2,310 | 3,010 | 3,290 | 3,900 |
| | | Predicted | 1,880 | 2,680 | 3,200 | 4,350 | 4,860 | 6,110 |
| | | Weighted | 1,450 | 2,050 | 2,460 | 3,310 | 3,660 | 4,420 |
| 03103000 | 3 | Observed | 2,910 | 4,200 | 5,010 | 6,650 | 7,290 | 8,680 |
| | | Predicted | 2,990 | 4,210 | 4,990 | 6,720 | 7,480 | 9,340 |
| | | Weighted | 2,920 | 4,200 | 5,010 | 6,660 | 7,320 | 8,800 |
| 03104000 | 3 | Observed | 7,940 | 12,100 | 15,200 | 22,600 | 26,100 | 35,000 |
| | | Predicted | 8,570 | 11,700 | 13,600 | 17,800 | 19,600 | 24,100 |
| | | Weighted | 8,010 | 12,000 | 14,800 | 21,000 | 23,900 | 31,200 |
| 03104500 | 3 | Observed | 8,750 | 13,100 | 16,500 | 25,300 | 29,700 | 41,600 |
| | | Predicted | 11,400 | 15,600 | 18,300 | 24,100 | 26,600 | 32,800 |
| | | Weighted | 9,080 | 13,600 | 17,000 | 24,900 | 28,600 | 38,400 |
| 03104760 | 3 | Observed | 186 | 327 | 443 | 767 | 934 | 1,400 |
| | | Predicted | 113 | 189 | 246 | 390 | 459 | 640 |
| | | Weighted | 172 | 285 | 368 | 590 | 706 | 1,040 |

**Appendix 2.** Flood-flow magnitudes for selected recurrence intervals computed from observed streamflow-gaging station data, predicted from regional regression equations, and a weighted average for streamflow-gaging stations used in analysis.—Continued

| U.S. Geological Survey streamflow-gaging station number | Flood-flow region | Type | Flood-flow estimates, in cubic feet per second | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2-year | 5-year | 10-year | 50-year | 100-year | 500-year |
| 03106000 | 3 | Observed | 7,920 | 11,000 | 13,300 | 19,100 | 21,900 | 29,300 |
| | | Predicted | 9,340 | 14,400 | 18,100 | 26,800 | 30,900 | 41,500 |
| | | Weighted | 7,960 | 11,200 | 13,700 | 19,900 | 22,900 | 30,600 |
| 03106500 | 3 | Observed | 7,480 | 10,900 | 13,200 | 18,500 | 20,800 | 26,300 |
| | | Predicted | 7,820 | 11,400 | 13,800 | 19,400 | 21,900 | 28,200 |
| | | Weighted | 7,500 | 10,900 | 13,300 | 18,700 | 21,000 | 26,600 |
| 03108000 | 3 | Observed | 3,610 | 5,600 | 7,150 | 11,300 | 13,400 | 19,200 |
| | | Predicted | 5,370 | 8,430 | 10,700 | 16,200 | 18,800 | 25,500 |
| | | Weighted | 3,660 | 5,750 | 7,420 | 11,800 | 14,000 | 19,900 |
| 03109000 | 3 | Observed | 382 | 614 | 797 | 1,290 | 1,540 | 2,230 |
| | | Predicted | 335 | 573 | 761 | 1,240 | 1,480 | 2,110 |
| | | Weighted | 378 | 609 | 791 | 1,280 | 1,520 | 2,200 |
| 03109500 | 3 | Observed | 8,980 | 13,300 | 16,400 | 24,000 | 27,600 | 36,800 |
| | | Predicted | 12,400 | 19,000 | 23,800 | 35,200 | 40,500 | 54,100 |
| | | Weighted | 9,090 | 13,600 | 17,000 | 25,200 | 29,100 | 38,800 |
| 03111150 | 3 | Observed | 533 | 933 | 1,240 | 2,010 | 2,380 | 3,310 |
| | | Predicted | 521 | 885 | 1,170 | 1,900 | 2,250 | 3,210 |
| | | Weighted | 532 | 923 | 1,220 | 1,970 | 2,330 | 3,270 |
| 04213000 | 3 | Observed | 6,130 | 8,950 | 10,800 | 14,900 | 16,600 | 20,500 |
| | | Predicted | 4,810 | 7,380 | 9,250 | 13,700 | 15,700 | 21,000 |
| | | Weighted | 6,080 | 8,840 | 10,600 | 14,700 | 16,500 | 20,600 |
| 04213040 | 3 | Observed | 131 | 220 | 286 | 448 | 524 | 714 |
| | | Predicted | 140 | 235 | 308 | 491 | 578 | 811 |
| | | Weighted | 132 | 222 | 290 | 458 | 537 | 738 |
| 04213075 | 3 | Observed | 321 | 495 | 619 | 912 | 1,050 | 1,370 |
| | | Predicted | 293 | 516 | 697 | 1,170 | 1,410 | 2,050 |
| | | Weighted | 317 | 499 | 641 | 1,000 | 1,180 | 1,620 |
| 04213200 | 3 | Observed | 732 | 1,170 | 1,510 | 2,470 | 2,960 | 4,350 |
| | | Predicted | 502 | 862 | 1,150 | 1,890 | 2,250 | 3,220 |
| | | Weighted | 717 | 1,130 | 1,460 | 2,350 | 2,810 | 4,120 |

**Appendix 3.** Flood-flow magnitudes for selected recurrence intervals for streamflow-gaging stations in Pennsylvania with drainage areas less than 2,000 square miles and streamflow substantially affected by upstream regulation.

[Data from these streamflow-gaging stations were not included in the regression analysis; $mi^2$, square miles; water year, 12-month period October 1- September 30; all flood flows in cubic feet per second]

| U.S. Geological Survey streamflow-gaging station | Station name | Drainage area ($mi^2$) | Period of record (water year)[1] | Flood flows, computed from streamflow-gaging-station data | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2-year | 5-year | 10-year | 50-year | 100-year |
| 01429000 | West Branch Lackawaxen River at Prompton, Pa. | 59.7 | 1961-2006 | 1,350 | 2,070 | 2,580 | 3,830 | 4,400 |
| 01429500 | Dyberry Creek near Honesdale, Pa. | 64.6 | 1960-2006 | 1,530 | 1,940 | 2,210 | 2,820 | 3,090 |
| 01430000 | Lackawaxen River near Honesdale, Pa. | 164 | 1960-2006 | 3,890 | 5,720 | 7,120 | 10,700 | 12,500 |
| 01431500 | Lackawaxen River at Hawley, Pa. | 290 | 1960-2006 | 6,630 | 10,300 | 13,300 | 21,900 | 26,500 |
| 01447800 | Lehigh River bl Francis E Walter Res nr White Haven, Pa. | 290 | 1961-2006 | 5,680 | 7,900 | 9,470 | 13,200 | 14,900 |
| 01449500 | Wild Creek at Hatchery, Pa. | 16.8 | 1959-78 | 191 | 308 | 400 | 643 | 764 |
| 01449800 | Pohopoco Cr bl Beltzville Dam nr Parryville, Pa. | 96.4 | 1971-2006 | 1,300 | 1,570 | 1,720 | 2,010 | 2,110 |
| 01451000 | Lehigh River at Walnutport, Pa. | 889 | 1961-2006 | 17,900 | 27,300 | 34,200 | 51,100 | 58,900 |
| 01453000 | Lehigh River at Bethlehem, Pa. | 1,280 | 1961-2006 | 23,900 | 36,500 | 45,700 | 67,800 | 78,100 |
| 01454700 | Lehigh River at Glendon, Pa. | 1,360 | 1967-2006 | 25,800 | 38,900 | 48,100 | 69,900 | 79,800 |
| 01459500 | Tohickon Creek near Pipersville, Pa. | 97.4 | 1974-2006 | 6,200 | 10,200 | 13,400 | 21,900 | 26,100 |
| 01464645 | NB Neshaminy Cr bl Lake Galena nr New Britain, Pa. | 16.2 | 1986-2006 | 627 | 1,410 | 2,160 | 4,620 | 6,070 |
| 01464720 | NB Neshaminy Creek at Chalfont, Pa. | 31.5 | 1991-2006 | 1,800 | 3,960 | 6,110 | 13,500 | 18,100 |
| 01470960 | Tulpehocken Cr at Blue Marsh Damsite near Reading, Pa. | 175 | 1979-2006 | 2,430 | 3,410 | 4,080 | 5,600 | 6,270 |
| 01471000 | Tulpehocken Creek near Reading, Pa. | 211 | 1979-2006 | 2,650 | 3,740 | 4,510 | 6,290 | 7,100 |
| 01471510 | Schuylkill River at Reading, Pa. | 880 | 1980-2006 | 16,600 | 26,800 | 34,600 | 54,900 | 64,800 |
| 01472000 | Schuylkill River at Pottstown, Pa. | 1,150 | 1979-2006 | 21,100 | 30,300 | 36,900 | 53,100 | 60,600 |
| 01480400 | Birch Run near Wagontown, Pa. | 4.55 | 1997-2006 | 162 | 309 | 441 | 845 | 1,070 |
| 01480685 | Marsh Creek near Downingtown, Pa. | 20.3 | 1974-2006 | 331 | 488 | 594 | 826 | 924 |
| 01480700 | East Branch Brandywine Creek near Downingtown, Pa. | 60.6 | 1974-2006 | 2,250 | 3,640 | 4,660 | 7,170 | 8,330 |
| 01480870 | East Branch Brandywine Creek below Downingtown, Pa. | 89.9 | 1974-2006 | 3,320 | 5,100 | 6,410 | 9,640 | 11,200 |
| 01518000 | Tioga River at Tioga, Pa. | 282 | 1980-2006 | 5,700 | 6,390 | 6,780 | 7,510 | 7,780 |
| 01518700 | Tioga River at Tioga Junction, Pa. | 446 | 1980-2006 | 6,710 | 8,050 | 8,950 | 11,000 | 11,800 |
| 01520000 | Cowanesque River near Lawrenceville, Pa. | 298 | 1980-2006 | 4,460 | 5,410 | 5,980 | 7,150 | 7,620 |
| 01534300 | Lackawanna River near Forest City, Pa. | 38.8 | 1960-2006 | 759 | 961 | 1,080 | 1,300 | 1,390 |
| 01534500 | Lackawanna River at Archbald, Pa. | 108 | 1960-2006 | 2,390 | 3,880 | 5,110 | 8,620 | 10,500 |
| 01536000 | Lackawanna River at Old Forge, Pa. | 332 | 1960-2006 | 6,150 | 10,500 | 14,000 | 23,800 | 28,900 |

**Appendix 3.** Flood-flow magnitudes for selected recurrence intervals for streamflow-gaging stations in Pennsylvania with drainage areas less than 2,000 square miles and streamflow substantially affected by upstream regulation.—Continued

[Data from these streamflow-gaging stations were not included in the regression analysis; $mi^2$, square miles; water year, 12-month period October 1- September 30; all flood flows in cubic feet per second]

| U.S. Geological Survey streamflow-gaging station | Station name | Drainage area ($mi^2$) | Period of record (water year)[1] | Flood flows, computed from streamflow-gaging-station data | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2-year | 5-year | 10-year | 50-year | 100-year |
| 01541200 | WB Susquehanna River near Curwensville, Pa. | 367 | 1966-2006 | 4,780 | 5,650 | 6,210 | 7,430 | 7,950 |
| 01541303 | West Branch Susquehanna River at Hyde, Pa. | 474 | 1979-2006 | 5,680 | 6,710 | 7,390 | 8,890 | 9,540 |
| 01541500 | Clearfield Creek at Dimeling, Pa. | 371 | 1961-2006 | 6,240 | 9,030 | 11,100 | 16,600 | 19,300 |
| 01542500 | WB Susquehanna River at Karthaus, Pa. | 1,460 | 1961-2006 | 20,000 | 30,300 | 38,800 | 63,100 | 76,000 |
| 01544000 | First Fork Sinnemahoning Cr near Sinnemahoning, Pa. | 245 | 1956-2006 | 4,900 | 6,150 | 6,930 | 8,540 | 9,190 |
| 01545000 | Kettle Creek near Westport, Pa. | 233 | 1962-2006 | 4,660 | 5,640 | 6,240 | 7,440 | 7,910 |
| 01547500 | Bald Eagle Creek at Blanchard, Pa. | 339 | 1971-2006 | 2,860 | 3,590 | 4,020 | 4,900 | 5,240 |
| 01563200 | Rays Br Juniata River bl Rays Dam nr Huntingdon, Pa. | 960 | 1973-2006 | 11,900 | 14,900 | 16,600 | 19,600 | 20,800 |
| 01575500 | Codorus Creek near York, Pa. | 222 | 1947-2006 | 3,950 | 6,430 | 8,690 | 16,000 | 20,300 |
| 01574500 | Codorus Creek at Spring Grove, Pa. | 75.5 | 1967-2006 | 1,600 | 3,060 | 4,580 | 10,300 | 14,300 |
| 01575000 | South Branch Codorus Creek near York, Pa. | 117 | 1972-95 | 4,240 | 8,070 | 11,900 | 25,300 | 34,000 |
| 03020000 | Tionesta Creek at Tionesta Creek Dam, Pa. | 479 | 1941-91 | 6,600 | 8,350 | 9,440 | 11,700 | 12,600 |
| 03021520 | French Creek near Union City, Pa. | 221 | 1972-91 | 2,370 | 3,100 | 3,550 | 4,450 | 4,810 |
| 03023100 | French Creek at Meadville, Pa. | 788 | 1989-2006 | 10,100 | 12,600 | 14,100 | 17,200 | 18,400 |
| 03024000 | French Creek at Utica, Pa. | 1,030 | 1971-2006 | 12,100 | 14,700 | 16,200 | 19,000 | 20,000 |
| 03022554 | Woodcock Creek at Woodcock Creek Dam, Pa. | 45.6 | 1975-91 | 608 | 775 | 877 | 1,090 | 1,170 |
| 03027500 | EB Clarion River at EB Clarion River Dam, Pa. | 73.2 | 1953-91 | 581 | 904 | 1,170 | 1,910 | 2,310 |
| 03028500 | Clarion River at Johnsonburg, Pa. | 204 | 1953-2006 | 3,880 | 5,690 | 7,050 | 10,500 | 12,200 |
| 03036000 | Mahoning Creek at Mahoning Creek Dam, Pa. | 344 | 1941-91 | 4,910 | 6,560 | 7,730 | 10,500 | 11,800 |
| 03039000 | Crooked Creek at Crooked Creek Dam, Pa. | 278 | 1941-91 | 3,780 | 4,840 | 5,470 | 6,730 | 7,220 |
| 03042280 | Yellow Creek near Homer City, Pa. | 57.4 | 1971-2006 | 1,360 | 2,640 | 3,890 | 8,260 | 11,000 |
| 03042500 | Two Lick Creek at Graceton, Pa. | 171 | 1969-2006 | 4,030 | 7,790 | 11,400 | 24,100 | 32,100 |
| 03044000 | Conemaugh River at Tunnelton, Pa. | 1,360 | 1952-91 | 17,700 | 23,100 | 26,400 | 33,500 | 36,400 |
| 03047000 | Loyalhanna Creek at Loyalhanna Dam, Pa. | 292 | 1942-91 | 3,800 | 4,810 | 5,440 | 6,730 | 7,250 |
| 03048500 | Kiskiminetas River at Vandergrift, Pa. | 1,830 | 1942-2006 | 21,700 | 30,500 | 36,800 | 52,000 | 59,100 |
| 03077500 | Youghiogheny River at Youghiogheny River Dam, Pa. | 436 | 1944-91 | 4,990 | 6,750 | 7,860 | 10,200 | 11,100 |
| 03081000 | Youghiogheny River below Confluence, Pa. | 1,030 | 1942-2006 | 16,100 | 23,000 | 28,200 | 41,400 | 47,800 |

**Appendix 3.** Flood-flow magnitudes for selected recurrence intervals for streamflow-gaging stations in Pennsylvania with drainage areas less than 2,000 square miles and streamflow substantially affected by upstream regulation.—Continued

[Data from these streamflow-gaging stations were not included in the regression analysis; $mi^2$, square miles; water year, 12-month period October 1- September 30; all flood flows in cubic feet per second]

| U.S. Geological Survey streamflow-gaging station | Station name | Drainage area ($mi^2$) | Period of record (water year)[1] | Flood flows, computed from streamflow-gaging-station data | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2-year | 5-year | 10-year | 50-year | 100-year |
| 03082500 | Youghiogheny River at Connellsville, Pa. | 1,330 | 1942-2006 | 23,800 | 35,700 | 44,800 | 68,200 | 79,700 |
| 03083500 | Youghiogheny River at Sutersville, Pa. | 1,720 | 1942-2006 | 29,200 | 44,000 | 55,300 | 84,500 | 98,800 |
| 03101500 | Shenango River at Pymatuning Dam, Pa. | 167 | 1935-2006 | 900 | 1,150 | 1,310 | 1,620 | 1,740 |
| 03102850 | Shenango River near Transfer, Pa. | 337 | 1966-2006 | 4,480 | 5,190 | 5,560 | 6,170 | 6,380 |
| 03103500 | Shenango River at Sharpsville, Pa. | 584 | 1939-91 | 4,840 | 7,660 | 9,920 | 16,100 | 19,300 |
| 03106300 | Muddy Creek near Portersville, Pa. | 51.2 | 1970-2006 | 349 | 481 | 574 | 793 | 892 |
| 03106500 | Slippery Rock Creek at Wurtemburg, Pa. | 398 | 1969-2006 | 6,240 | 8,020 | 9,060 | 11,100 | 11,900 |

[2]Water year is defined as a 12-month period beginning October 1 and ending September 30. The water year is designated by the calendar year in which it ends.

Roland and Stuckey— **Regression Equations for Estimating Flood Flows for Ungaged Streams in Pennsylvania**—Scientific Investigations Report 2008-5102