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COMPARISON OF METHODS FOR COMPUTING STREAMFLOW STATISTICS FOR PENNSYLVANIA STREAMS

by Marla H. Ehlke and Lloyd A. Reed

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CONVERSION FACTORS AND ABBREVIATIONS

Multiply	By	To obtain
	Length	
inch (in)	2.54	centimeter
foot (ft)	0.3048	meter
mile (mi)	1.609	kilometer
	Area	
square foot (ft^2)	0.09290	square meter
square inch (in^2)	6.452	square centimeter
square mile (mi^2)	2.590	square kilometer
	Flow rate	
cubic foot per second (ft^3/s)	0.02832	cubic meter per second

COMPARISON OF METHODS FOR COMPUTING STREAMFLOW STATISTICS FOR PENNSYLVANIA STREAMS

by Marla H. Ehlke and Lloyd A. Reed

ABSTRACT

Methods for computing streamflow statistics intended for use on ungaged locations on Pennsylvania streams are presented and compared to frequency distributions of gaged streamflow data. The streamflow statistics used in the comparisons include the 7-day 10-year low flow, 50-year flood flow, and the 100-year flood flow; additional statistics are presented. Streamflow statistics for gaged locations on streams in Pennsylvania were computed using three methods for the comparisons: 1) Log-Pearson type III frequency distribution (Log-Pearson) of continuous-record streamflow data, 2) regional regression equations developed by the U.S. Geological Survey in 1982 (WRI 82-21), and 3) regional regression equations developed by the Pennsylvania State University in 1981 (PSU-IV). Log-Pearson distribution was considered the reference method for evaluation of the regional regression equations. Low-flow statistics were computed using the Log-Pearson distribution and WRI 82-21, whereas flood-flow statistics were computed using all three methods. The urban adjustment for PSU-IV was modified from the recommended computation to exclude Philadelphia and the surrounding areas (region 1) from the adjustment. Adjustments for storage area for PSU-IV were also slightly modified.

A comparison of the 7-day 10-year low flow computed from Log-Pearson distribution and WRI-82-21 showed that the methods produced significantly different values for about 7 percent of the state. The same methods produced 50-year and 100-year flood flows that were significantly different for about 24 percent of the state. Flood-flow statistics computed using Log-Pearson distribution and PSU-IV were not significantly different in any regions of the state. These findings are based on a statistical comparison using the t-test on signed ranks and graphical methods.

INTRODUCTION

Reliable low-flow statistics are used by planners to estimate available surface-water supplies, and by regulatory agencies to evaluate applications for permits for irrigation and water-supply withdrawals from streams as well as applications for permits for wastewater discharges. The quantity and quality of wastewater that can be discharged into a stream and the level of treatment required for the wastewater is dependent on low flow because of the dilution capacity of the stream. A commonly used low-flow statistic for regulatory purposes is the 7-day 10-year low-flow statistic ($Q_{7,10}$), which is the average minimum streamflow that can be expected for 7 consecutive days once every 10 years. The 1- and 30-day 10-year low-flow statistics ($Q_{1,10}$ and $Q_{30,10}$), which are the average minimum streamflows expected for 1 and 30 days, respectively, once every 10 years, can be used for analyzing and utilizing low-flow data.

Reliable flood-flow statistics are essential to engineers who design construction projects and to planners who must develop and implement flood-plain management techniques. The size, style, and design of flood-control structures, bridges, and culverts are dependent on the magnitude of the predicted flood flow. Reliable flood-flow statistics are needed to ensure safety and to prevent overspending. Floods can be destructive and dangerous, especially if a structure designed to withstand an estimated flood fails because of an underestimation of flood flows. Statistics commonly used for evaluating flood flow for construction projects include the flow that can be expected every 10, 25, 50, 100, and 500 years (Q_{10}, Q_{25}, Q_{50}, Q_{100}, and Q_{500}, respectively).

The U.S. Geological Survey (USGS), in cooperation with the Pennsylvania Department of Transportation (PennDOT), compared methods of computing low-flow and flood-flow statistics for gaged locations on streams in Pennsylvania. When streamflow statistics are needed on reaches of streams without a nearby streamflow-gaging station, methods other than the Log-Pearson type III frequency distribution of measured streamflow data are used to compute the statistics. Regional regression equations are one of the other methods used to compute streamflow statistics. Regional regression equations presented by Flippo (1982b) of the USGS, and Aron and Kibler (1981) of the Pennsylvania State University are widely used to compute streamflow statistics for ungaged reaches of streams. This report presents a comparison of both low-flow and flood-flow statistics for gaged streams in Pennsylvania computed from the Log-Pearson type III frequency distribution of measured streamflow data and from regional regression equations.

Purpose and Scope

This report compares methods for computing streamflow statistics at gaged locations on Pennsylvania streams. Although several different methods can be used to determine streamflow statistics, this report will focus on the following three methods: 1) Log-Pearson type III frequency distribution of continuous-record gaged streamflow data, hereafter referred to as Log-Pearson, 2) regional regression equations developed for Pennsylvania streams by Flippo (1982b), hereafter referred to as WRI 82-21, and 3) regional regression equations developed by the Pennsylvania State University (Aron and Kibler, 1981), hereafter referred to as PSU-IV. Log-Pearson analysis of gaged streamflow data is the methodology adopted by the Federal agencies participating on the Hydrology Committee of the Water Resources Council (1981) and is considered the reference point for evaluation of the regional regression equations. The low-flow method comparison uses $Q_{7,10}$ because it is the only low-flow statistic that can be estimated by WRI 82-21. The statistics Q_{50} and Q_{100} can be estimated by WRI 82-21 and PSU-IV and are used in the flood-flow comparison to compare as many overlapping statistics as possible.

This report compares the $Q_{7,10}$ computed from Log-Pearson analysis of continuous-record gaged streamflow data with $Q_{7,10}$ computed from WRI 82-21 regression equations. Because regulation of streamflow, underlying carbonate bedrock, and extensive upstream mining can affect the flow of streams during droughts, a comparison is made for gaged locations on Pennsylvania streams with flow unaffected by those factors. Streams with flow affected by underlying carbonate bedrock and extensive upstream mining are compared separately. This report also compares the Q_{50} and Q_{100} statistics computed from Log-Pearson analysis of continuous-record gaged streamflow data with those computed from WRI 82-21 regional regression equations and with those computed from PSU-IV regional regression equations. The comparison with WRI 82-21 is made for gaged locations on Pennsylvania streams with at least 10 years of continuous record, and the comparison with PSU-IV is made for gaged locations with at least 10 years of continuous record and drainage areas less than 150 mi^2 at the site of interest. WRI 82-21 and PSU-IV regional regression equations for computing flood-flow statistics account for streams underlain by carbonate bedrock through either a separate region (WRI 82-21) or a carbonate adjustment (PSU-IV).

Previous Investigations

Regional regression equations developed for computing low-flow statistics for ungaged reaches of streams in Pennsylvania were presented by Flippo (1982a). Regional regression equations were developed for estimating flood-flow statistics by Flippo (1977). Both low- and flood-flow regional regression equations were revised and the updated equations were presented by Flippo in 1982 (1982b). Regional regression equations developed by the Pennsylvania State University in 1981 (PSU-IV) were an updated version of equations previously developed by the Pennsylvania State University (Reich and others, 1971). Low-flow statistics computed by use of the Log-Pearson analysis of gaged streamflow data for Pennsylvania streams were published in a report by Page and Shaw (1977). Revised streamflow statistics, incorporating more recent data, have not been published since 1982.

METHODS FOR COMPUTING STREAMFLOW STATISTICS

Streams with 10 or more years of continuous record were used to determine selected streamflow statistics by use of Log-Pearson analysis and regional regression equations for this analysis. The streamflow data used were the most complete dataset available at the time of computation. The majority of the low-flow data runs through the 1995 climatic year (a 12-month period from April 1 to March 31), and the majority of the flood-flow data runs through the 1996 water year (a 12-month period from October 1 to September 30).

Log-Pearson Distribution of Gaged Streamflow Data

Data from streamflow-gaging stations were converted to streamflow statistics by use of the Log-Pearson techniques in the USGS computer-based National Water Data Storage and Retrieval (WATSTORE) system (Hutchison, 1975). The computation of flood-flow statistics in WATSTORE uses the methodology adopted by the Federal agencies participating on the Hydrology Committee of the Water Resources Council (1981).

Low-flow data from streamflow-gaging stations can be skewed by an excessive dry or wet period of record, or a short period of record. Low-flow data in such periods can be normalized, which consists of correlating records from the streamflow-gaging station in question with those from a long-term streamflow-gaging station with similar hydrological conditions and preferably in the same watershed. Two low-flow analyses are made for the long-term station, one for the entire period of record and one for the period of record in question. The ratio of the long-term low-flow statistic at the index station divided by the short-term low-flow statistic at the index station resulting from this analysis was multiplied by the low-flow statistic for the short-term station to determine the normalized low-flow statistic for the short-term station.

A comparison was made between the unadjusted low-flow statistics and normalized low-flow statistics used in this report for streamflow-gaging stations with a relatively short period of record, averaging 17 years. This comparison of 29 selected streamflow-gaging stations resulted in a median absolute value of percentage difference between the unadjusted and normalized equalling 6.3 percent. Low-flow data comparisons in the sections that follow are made to unadjusted low-flow statistics computed from Log-Pearson.

Regional Regression Equations

WRI 82-21 and PSU-IV regional regression equations divide Pennsylvania into regions. Each region has a separate equation and basin characteristics defining the region. Both methods were based on streamflow data compiled through the mid 1970’s.

WRI 82-21

In 1982, Flippo presented modified regional regression equations developed to compute low- and flood-flow statistics for ungaged locations on Pennsylvania streams (Flippo, 1982b). The equations were developed by statistical analyses of flow records by use of factors known to affect streamflow. In developing the regional regression equations, linear regressions were performed with statistics computed from Log-Pearson as dependent variables and drainage basin characteristics as independent variables (Flippo, 1977). Peripheral stations in the initial partitioning of the regions were retested for ‘fit’ by comparing their residuals with corresponding residuals that resulted when the station data were included in the regression analysis for the adjacent group of stations (Flippo, 1982a).

Low Flow

Previously developed regional regression equations for estimating low-flow statistics were initially based on 244 streamflow-gaging stations in Pennsylvania and the surrounding states with at least 9 years of continuous record through the 1975 water year (Flippo 1982a). These equations were modified and the updated equations were published by Flippo in 1982 (1982b). Pennsylvania is divided into 12 low-flow regions (fig. 1), and each low-flow region has different regression coefficients associated with the basin characteristics (table 1). Low-flow regional regression equations were not developed for most of Bucks County and the Sinnemahoning Creek Basin (fig. 1). Flippo recommends the regression equations not be applied to streams that are sustained in drought primarily by large springs, wastewater discharges, or other large inflows or streams with highly regulated low flows (Flippo, 1982a). The resultant regression equations are used to calculate the $Q_{7,10}$. The equations have the following format (modified from Flippo, 1982b):

$$\log Q_{7,10} = C + da\,(\log DA) + pi\,(\log PI) + gi\,GI + sl\,(\log SL), \qquad (1)$$

where C is regression constant (dimensionless);
DA is drainage area, in square miles;
PI is annual precipitation index, in inches;
GI is geologic index (dimensionless);
SL is channel slope, in feet per mile;
da is drainage area coefficient (dimensionless);
pi is precipitation index coefficient (dimensionless);
gi is geologic index coefficient (dimensionless); and
sl is channel slope coefficient (dimensionless).

Flippo (1982a) defined the four basin characteristics—drainage area, annual precipitation index, geologic index and channel slope—as described below.

Drainage area (DA), in square miles, is the area of the drainage basin upstream from the site of interest that can be delineated on maps of suitable detail and scale.

Annual precipitation index (PI), in inches, is determined from figure 2 by interpolation between respective isohyetals of average annual precipitation and potential annual evapotranspiration at the centroid of the drainage basin of interest. The difference between these two determined values is the precipitation index for the site of interest.

Geologic index (GI), dimensionless, is determined from geologic weights given in table 2. The boundary of the drainage basin for the site of interest is drawn, or overlain, on the Geologic Map of Pennsylvania (Berg and others, 1980). The areal proportion for each mapped index weight within the delineated basin is determined. The products of these areal proportions and their respective index weights are summed to obtain the geologic index. Logs of the geologic index are not obtained.

Channel slope (SL), in feet per mile, is the difference in elevation, in feet, at points 85 percent and 10 percent of the distance along the channel from the site of interest to the basin rim divided by the channel distance, in miles, between the two points.

For this report, drainage areas for gaged locations were obtained from USGS Water-Data Reports for the 1997 water year (Durlin and Schaffstall, 1998a; Durlin and Schaffstall, 1998b; Coll, Jr., and Siwicki, 1998). The annual precipitation index[1] and geologic index were determined by Geographic Information Systems (GIS) that use a digital form of the data needed to compute the indexes; channel slope was determined from topographic maps.

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[1] The precipitation index that results from the use of the GIS method is slightly different than when interpolated from figure 2. In a comparison of 73 precipitation indexes determined from the original method as described previously and from the GIS method, the maximum difference encountered was 18 percent; more than 95 percent had less than a 10-percent difference between the two methods.

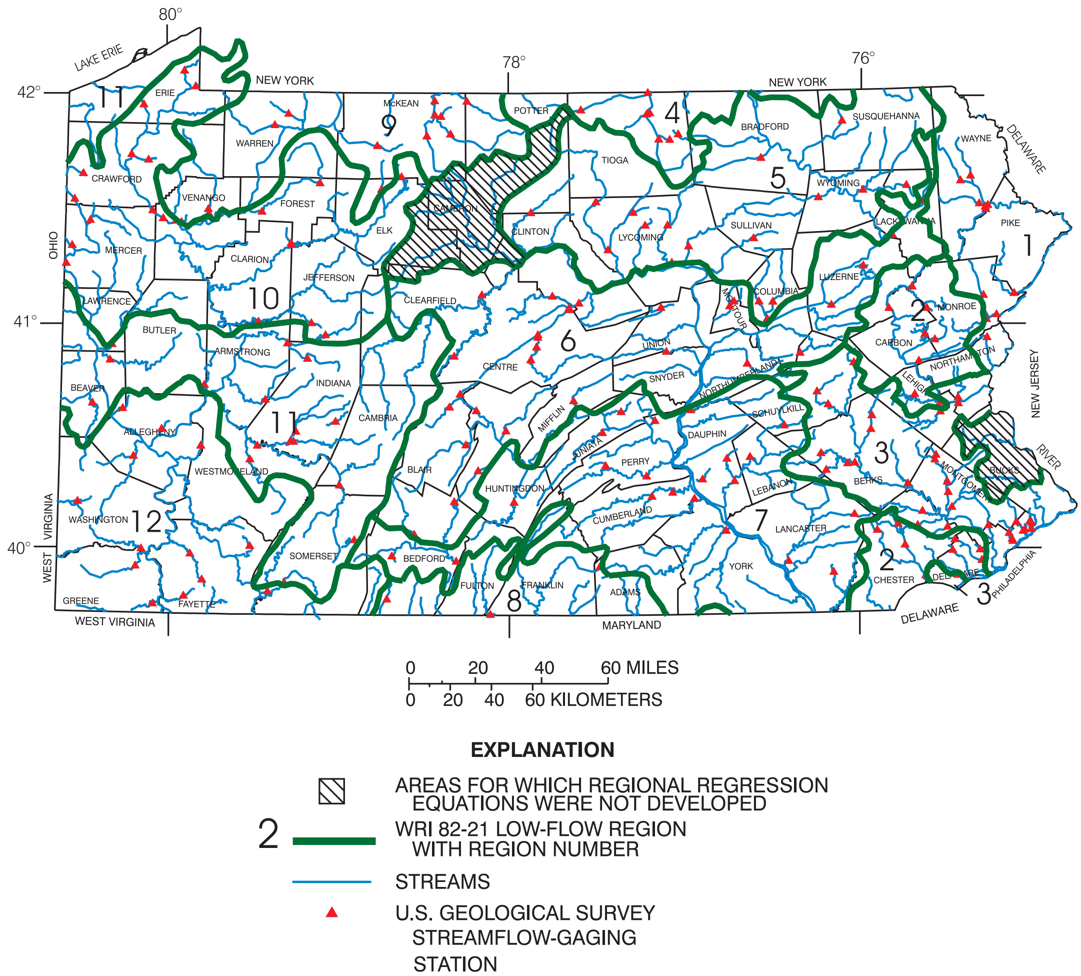
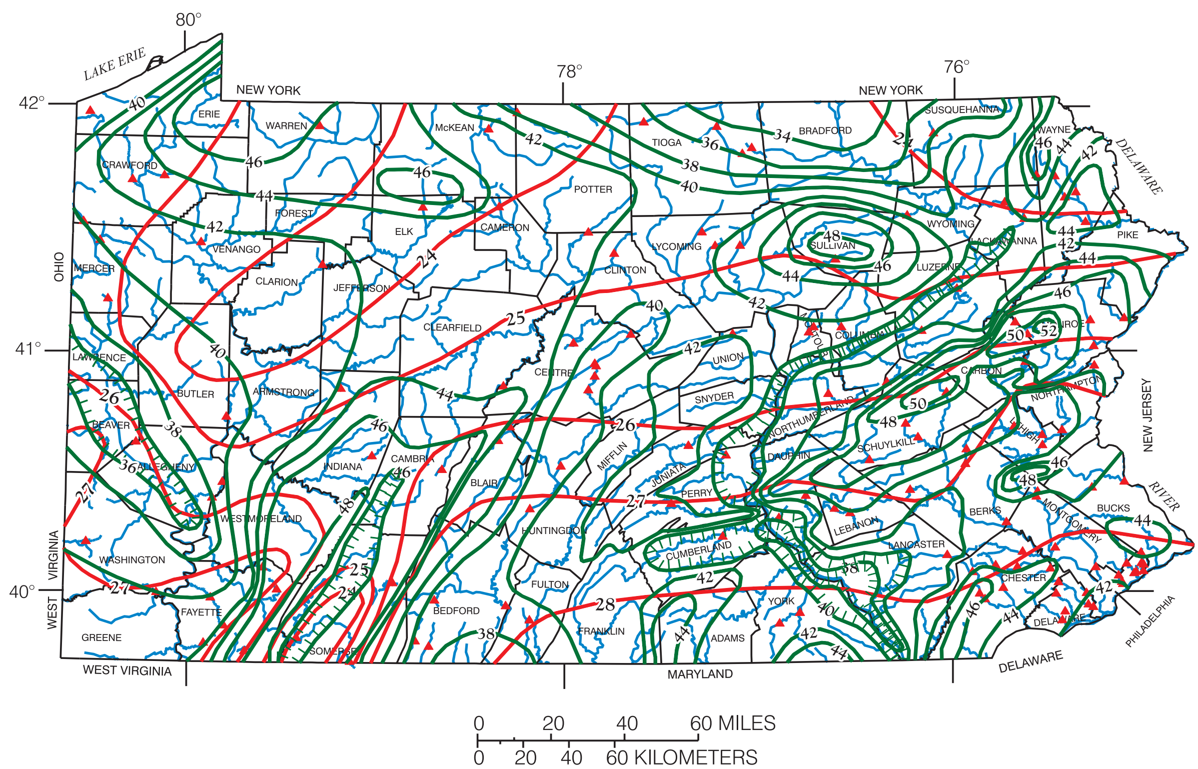


Figure 1. Pennsylvania WRI 82-21 low-flow regions (Modified from Flippo, 1982b).

Table 1. *Regression coefficients for use with WRI 82-21 low-flow regional regression equations for the computation of 7-day 10-year low flow for Pennsylvania low-flow regions*

[WRI 82-21 refers to Flippo, 1982b; modified from Flippo, 1982b; all regression coefficients are dimensionless; ---, regression coefficient not needed to compute low-flow statistic]

Low-flow region	Regression constant (C)	Drainage area coefficient (da)	Annual precipitation coefficient (pi)	Geologic index coefficient (gi)	Channel slope coefficient (sl)
1	-6.248	1.534	2.718	0.433	---
2	-2.883	1.051	1.283	.367	---
3	-4.073	1.111	2.038	.228	---
4	-6.038	1.488	2.946	---	---
5	-4.927	1.027	2.417	.435	---
6	-4.541	1.059	2.425	.351	---
7	-5.209	.934	2.958	.432	---
8	-3.990	.907	1.997	.398	---
9	-.944	.957	---	---	---
10	-2.876	1.409	---	---	0.650
11	-2.774	1.110	---	2.380	---
12	-7.051	1.162	3.279	1.357	---



EXPLANATION

25 — LINE OF EQUAL POTENTIAL EVAPOTRANSPIRATION, IN INCHES

42 — LINE OF EQUAL PRECIPITATION, IN INCHES

— STREAMS

▲ U.S. GEOLOGICAL SURVEY STREAMFLOW-MEASUREMENT STATION

Figure 2. Distributions of average annual precipitation and potential evapotranspiration in Pennsylvania (Modified from Flippo, 1982a).

Table 2. *Geologic index weights for rock-stratigraphic units in Pennsylvania for use with WRI 82-21 low-flow regional regression equations*

[Modified from Flippo, 1982a; WRI 82-21 refers to Flippo, 1982b; geologic index weight is dimensionless]

Geologic age	Geologic index weight
Quaternary[1]	3.0
Tertiary	
Bryn Formation	1.0
Pensauken and Bridgeton Formations	3.0
Cretaceous	.8
Triassic	
Brunswick and Stockton Formations	.4
New Oxford Formation, New Oxford and Stockton Conglomerates	1.0
All other units	.5
Permian	
Washington Formation	.3
Greene Formation	.5
Permian and Pennsylvanian	
Waynesburg Formation	.5
Pennsylvanian	
Monongahela and Pottsville Group	.7
Llewellyn Formation	3.0
All other units	.5
Mississippian	
Mauch Chunk Formation	.4
Burgoon Sandstone through Cuyahoga Group, undifferentiated	.7
All other units	.5
Mississippian and Devonian	
Pocono and Rockwell Formations, undivided; Spechty Kopf Formation	1.0
Berea Sandstone through Venango Formations, undivided	1.5
All other units	.5
Devonian - upper	
Lock Haven and Trimmers Rock Formations	.4
Foreknobs Formation, Brallier and Harrell Formations, undivided	.5
Catskill Formation, undivided	.9
Members: Irish Valley	.3
Poplar Gap and Packerton	1.2
Sherman Creek, Long Run and Beaverdam Run	.8
All other members	1.0
All other units	.3
Devonian - middle and lower	
Hamilton Group	.9
Mahatango, Marcellus, and Onondaga Formations	1.0
Old Port Formation	3.0
All other units	2.0
Devonian and Silurian	
Onondaga Formation through Poxono Island Formation, undivided	1.0
Keyer and Tonoloway Formations, undivided	3.0
All other units	2.0

Table 2. *Geologic index weights for rock-stratigraphic units in Pennsylvania for use with WRI 82-21 low-flow regional regression equations—Continued*

Geologic age	Geologic index weight
Silurian	
Tuscarora Formation	0.8
Wills Creek Formation and Clinton Group	1.0
Bloomsburg and Shawangunk Formations (eastern Pennsylvania)	1.5
All other units	3.0
Ordovician	
Juniata and Reedsville Formations	.3
Hamburg sequence (except limestone)	.4
Bald Eagle and Martinsburg Formations; metadiabase	.5
Hamburg limestone, Jacksonburg and Cocalico Formations	1.0
Hershey, Myerstown and Annville Formations	2.0
Coburn Formation through Nealmont Formation, undivided; Rockdale Run Formation	4.0
Benner Formation through Loysburg Formation; Axemann, Stonehenge / Larke, and Conestoga Formations	5.0
All other units	6.0
Cambrian	
Vintage Formation	.3
Antietam, Kinzers and Chickies Formations	.5
Harpers, Weverton and Loudoun Formations	.6
Elbrook Formation (in Great Valley)	2.0
Pleasant Hill Formation	4.0
Gettysburg Formation and Leithsville Formation in Lehigh Valley	5.0
All other units	6.0
Lower (?) Paleozoic	
Setters quartzite	.3
Pegmatite	.5
Mafic gneiss (hornblende, or pyroxene, bearing)	.7
Anorthosite, granitic gneiss, granite, metagabbro, Peach Bottom slate and Cardiff conglomerate	1.0
Serpentinite	2.0
Oligoclase - mica schist of Wissahickon Formation	2.2
All other units	3.0
Precambrian	
Metabasalt, greenstone schist, metadiabase	.5
Metarhyolite, graphitic gneiss, mafic gneiss (hornblende bearing), gabbroic gneiss and gabbro	.8
Anorthosite, hornblende gneiss, mafic gneiss (pyroxene bearing)	1.0
Quartz monzonite, quartz-monzonite gneiss, granodiorite, granodiorite gneiss, felsic gneiss, granitic gneiss	1.2
Franklin Marble	1.5

[1] Glacial drift not evaluated for geologic index weight.

The following example illustrates the use of a regional regression equation (1):

Example: Estimate the 7-day 10-year low flow of Northkill Creek, a tributary of Tulpehocken Creek, at its mouth.

1. From figure 1, the site is located in low-flow region 3.
2. Table 1 indicates that drainage area (DA), annual precipitation index (PI), and geologic index (GI) are needed to compute an estimate.
3. From topographic maps, the drainage area is determined as 42.1 mi^2.
4. Annual precipitation and average potential evapotranspiration obtained from figure 2 are used to compute PI as:
   PI = 46.1 in. - 26.8 in.
   PI = 19.3 in.
5. From the Geologic Map of Pennsylvania (Berg and others, 1980) and table 2, a tabulation like the following is prepared to compute GI:

Rock Unit Symbol	Rock Unit	Approximate Fraction in basin	GI weight (Table 2)	GI fraction
Ss	Shawangunk Fm.	0.125	1.5	0.188
Ohsg/Oh	Hamburg Sequence	0.875	0.4	0.350
		1.00		GI = 0.54

6. The substituted regression equation is:
   $\log Q_{7,10} = -4.073 + 1.111(\log 42.1) + 2.038(\log 19.3) + (0.228)(0.54)$
7. Solution of the equation gives:
   $\log Q_{7,10} = 0.475$
   $Q_{7,10} = 2.98\ ft^3/s$.

Flood Flow

Previously developed regression equations for estimating flood-flow statistics were initially based on peak-discharge records from 400 streamflow-gaging stations with at least 9 years of continuous record (except for 21 records with 7-9 years) through the 1972 water year (Flippo, 1977). The equations were modified to their present form in 1982 by use of peak-flow records throughout the 1975 water year (Flippo, 1982b). Pennsylvania is divided into flood-flow regions as shown in figure 3. Flood-flow region 8 includes those streams with at least 50 percent carbonate bedrock underlying the basin at the site of interest (Flippo, 1977). The regression coefficients associated with basin characteristics in the flood-flow regression equations for Q_{50} and Q_{100} are listed in table 3. The equations have the following format (modified from Flippo, 1982b):

$$\log Q_{50} \text{ or } Q_{100} = C + da(\log DA) + fr(\log FR) + pi(\log PI) + sl(\log SL) + st(\log ST) + el(\log EL), \quad (2)$$

where C is regression constant (dimensionless);
DA is drainage area, in square miles;
FR is percentage forest;
PI is annual precipitation index, in inches;
SL is channel slope, in feet per mile;
ST is percentage storage;
EL is mean basin elevation in hundreds of feet above sea level;
da is drainage area coefficient (dimensionless);
fr is percentage forest coefficient (dimensionless);
pi is precipitation index coefficient (dimensionless);
sl is channel slope coefficient (dimensionless);
st is percentage storage coefficient (dimensionless); and
el is mean basin elevation coefficient (dimensionless).

Flippo (1977) defined the basin characteristics—percentage forest, percentage basin storage, and mean basin elevation—as described below. Drainage area, annual precipitation index, and channel slope are defined on p. 4.

Percentage forest (FR) at the site of interest is the percentage of drainage area within the basin that is forested plus 1.0 percent.

Percentage storage (ST) at the site of interest is the percentage of storage area (lakes, ponds, and swamps) within the basin plus 1.0 percent.

Mean basin elevation (EL), in hundreds of feet above sea level, is the mean elevation of the basin.

For this report, drainage areas were obtained from USGS Water-Data Reports for the 1997 water year (Durlin and Schaffstall, 1998a; Durlin and Schaffstall, 1998b; Coll, Jr., and Siwicki, 1998). The annual precipitation index and percentage forest were determined by GIS methods; channel slope, percentage storage, and mean basin elevation were determined from topographic maps.

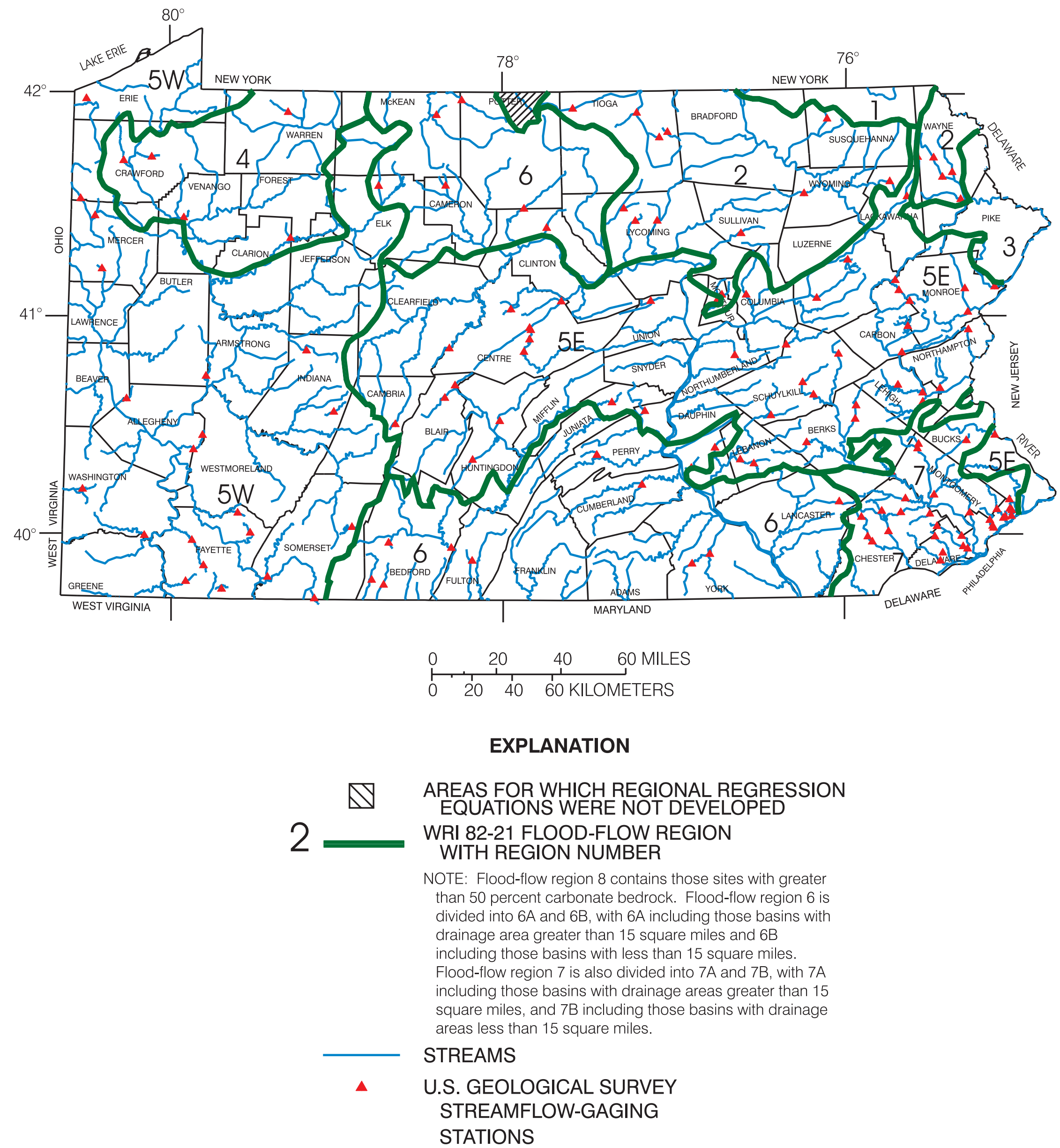


Figure 3. Pennsylvania WRI 82-21 flood-flow regions (Modified from Flippo, 1982b).

Table 3. *Regression coefficients for use with WRI 82-21 flood-flow regional regression equations for Pennsylvania flood-flow regions*

[WRI 82-21 refers to Flippo, 1982b; modified from Flippo, 1982b; all regression coefficients are dimensionless; coefficients needed to compute Q_{50} are not shaded; coefficients needed to compute Q_{100} are shaded; regions 6A and 7A include drainage areas greater than 15 square miles; regions 6B and 7B include drainage areas less than 15 square miles; region 8 includes basins underlain by at least 50 percent carbonate bedrock; ---, regression coefficient not needed to compute flood-flow statistic]

Flood-flow region	Regression constant (C)	Drainage area coefficient (da)	Percent forest coefficient (fr)	Annual precipitation coefficient (pi)	Channel slope coefficient (sl)	Percent storage coefficient (st)	Mean basin elevation coefficient (el)
1	1.217	1.003	---	---	0.443	---	---
	1.283	.994	---	---	.450	---	---
2	2.684	.744	---	---	---	---	---
	2.791	.733	---	---	---	---	---
3	2.130	.875	---	---	---	---	---
	2.196	.888	---	---	---	---	---
4	2.243	.756	---	---	---	---	---
	2.293	.754	---	---	---	---	---
5E	1.356	.745	---	0.945	---	---	---
	1.365	.727	---	1.041	---	---	---
5W	2.443	.757	---	---	---	---	---
	2.518	.751	---	---	---	---	---
6A	2.505	.790	---	---	---	---	---
	2.633	.775	---	---	---	---	---
6B	3.250	.981	-0.496	---	---	---	---
	3.382	1.001	-.519	---	---	---	---
7A	2.883	.727	-.142	---	---	---	---
	2.950	.706	-.100	---	---	---	---
7B	2.890	.871	---	---	---	-0.574	---
	2.986	.878	---	---	---	-.430	---
8	2.401	.819	.593	---	---	---	-1.127
	2.587	.820	.604	---	---	---	-1.323

The following example illustrates the use of a regional regression equation (2):

Example: Estimate the 100-year flood flow of Northkill Creek, a tributary of Tulpehocken Creek, at its mouth.

1. From figure 3, the site is located in flood-flow region 5E.
2. Table 3 indicates that drainage area (DA) and annual precipitation index (PI) are needed to compute an estimate.
3. From topographic maps, the drainage area is determined as 42.1 mi^2.
4. Annual precipitation and average potential evapotranspiration obtained from figure 2 are used to compute PI as:
   PI = 46.1 in. - 26.8 in.
   PI = 19.3 in.
5. The substituted regression equation is:
   $\log Q_{100} = 1.365 + 0.727(\log 42.1) + 1.041(\log 19.3)$
6. Solution of the equation gives:
   $\log Q_{100} = 3.884$
   $Q_{100} = 7{,}660\ ft^3/s$.

PSU-IV

The Pennsylvania State University developed PSU-IV in 1981 to estimate flood peaks with return periods from 2 to 200 years through a two-step graphical procedure (Aron and Kibler, 1981). PSU-IV is based on streamflow data collected through 1977 from 129 Pennsylvania watersheds (Aron and Kibler, 1981). Pennsylvania is divided into four flood-frequency regions (fig. 4). The variables needed to calculate flood flows by use of PSU-IV include drainage area, percentage forested, basin divide elevation, skew coefficient, and standard deviation (Aron and Kibler, 1981). Aron and Kibler (1981) defined these variables as described below:

Drainage area, in square miles, is the area of the watershed above the site of interest.

Percentage forest is the percentage of the watershed covered by forest.

Basin divide elevation (elevation of the divide), in feet above mean sea level, is the elevation of the point on the watershed boundary to which the longest collector has been extended.

Skew coefficient is the generalized skew coefficient of logarithms of annual maximum streamflow for the watershed of interest.

Standard deviation is the generalized standard deviation of logarithms of annual maximum streamflow for the watershed of interest.

Adjustments to the estimated flood peak are recommended for basins with urbanization, storage area (lakes, swamps, and reservoirs), carbonate bedrock, and small drainage area (Aron and Kibler, 1981). PSU-IV recommends that urban adjustments be applied to basins with greater than 2 percent impervious area (Aron and Kibler, 1981). For storage-area adjustments, PSU-IV recommends application if a portion of the basin has the flood storage area capability to hold 0.2 ft of runoff (Aron and Kibler, 1981). PSU-IV recommends that carbonate-bedrock adjustment be applied to basins with greater than or equal to 3 percent carbonate bedrock (Aron and Kibler, 1981). Basins less than 1.5 mi^2 should have small drainage area adjustments (Aron and Kibler, 1981). All adjustments for this report were made as suggested in *Procedure PSU-IV for estimating design flood peaks on ungaged Pennsylvania watersheds* (Aron and Kibler, 1981) except the adjustments for urbanization and storage area were simplified.

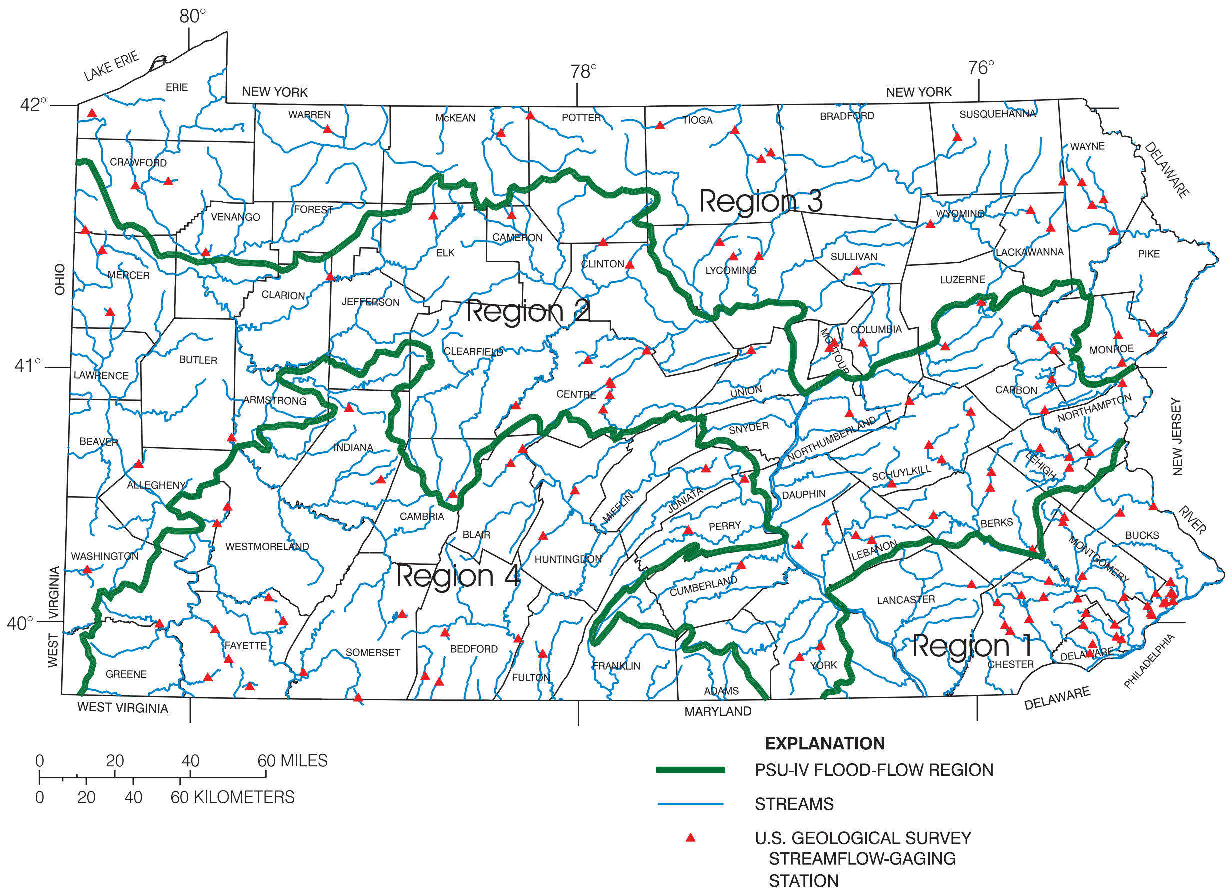


Figure 4. Pennsylvania PSU-IV flood-flow regions (Modified from Aron and Kibler, 1981).

The adjustment for urbanization was simplified by use of a relation between percentage impervious and adjustment ratio defined by

$$\text{urban flood ratio} = (\text{percentage impervious})^x \qquad (3)$$

Q_t	x
10	0.211
25	.188
50	.173
100	.168
500	.156

Q_t is the flood discharge for return interval (t).

Percentage impervious is dependent on the classification of land use and its corresponding coefficient. These coefficients were determined from road and farmstead densities throughout the state on topographic maps.

low intensity developed —0.25
high intensity residential — .45
high intensity commercial/industrial — .60
crops (agriculture) — .015
grass — .05
forest — .008
barren — .01

This simplification of the recommended urban adjustment was done because the recommended adjustment required visual inspection of streams to evaluate Manning's roughness coefficient (Aron and Kibler, 1981).

The adjustment for storage area was simplified from the recommended adjustment, which recognized five categories of storage areas, including operator-regulated flood control, water supply only, water supply with flood control, large single lakes, and multiple minor lakes or swamps (Aron and Kibler, 1981). The GIS data used in this report do not classify storage areas into the categories set by PSU-IV. Therefore, the flood statistics are adjusted for storage area of all lakes, ponds, and swamps using one equation based on the PSU-IV storage-area adjustment for water supply with flood control and multiple lakes or swamps. The simplified adjustment is defined by:

$$\text{flood reduction peak} = 0.97\left(1.1 - \left(\frac{\text{controlled area}}{\text{drainage area}}\right)\right)^{0.5} . \qquad (4)$$

The controlled area of the basin is the smaller of either the drainage area of the lake or swamp, or 10 times the surface area of the lake or swamp, the exception being reservoirs with a primary purpose of flood control that have a controlled area equal to their drainage area (Aron and Kibler, 1981).

All variables (except drainage area) and results of PSU-IV regression equations were determined from GIS and a computer code extracted and modified from HYDAN Version 2.21 (Walker and Miller, 1993) except for nine streamflow-gaging stations that were computed by hand from topographic maps. HYDAN Version 2.21 is a computerized version of PSU-IV. It was modified by the USGS to include the simplified adjustments for urbanization. Skew coefficient and standard deviation were determined by GIS, which accounted for the drainage area of the basin, and resulted in a weighted skew coefficient and standard deviation. Drainage areas were obtained from USGS Water-Data Reports for the 1997 water year (Durlin and Schaffstall, 1998a; Durlin and Schaffstall, 1998b; Coll and Siwicki, 1998). Urban and carbonate-bedrock adjustments were computed by use of the modified HYDAN Version 2.21; the storage-area and small drainage-area adjustments were computed by hand.

Further information concerning the applications of PSU-IV can be found in *Procedure PSU-IV for estimating design flood peaks on ungaged Pennsylvania watersheds* (Aron and Kibler, 1981). Flood-flow data comparisons in this report are made without the urban adjustment for region 1, and with the urban adjustment for regions 2, 3, and 4. PSU-IV recommends the urban adjustment be applied for all regions; however, the results of a preliminary computation of Q_{100} for streamflow-gaging stations in region 1 with and without the urban adjustment showed that with the urban adjustment, PSU-IV overestimated Q_{100}. Regression equations for region 1 were developed using data from streamflow-gaging stations in and around the Philadelphia area. The effects of urbanization on flood flow were most likely reflected in the gage data used to develop the equation and further adjustment is not necessary. Conversely, most of the gaged basins in regions 2, 3, and 4 are rural and the equations developed from the gage data do not account for urbanization. Flood discharge computed from PSU-IV for regions 2, 3, and 4 should, therefore, be adjusted for urbanization.

COMPARISON OF LOG-PEARSON DISTRIBUTION TO REGIONAL REGRESSION EQUATIONS FOR GAGED LOCATIONS ON PENNSYLVANIA STREAMS

Streamflow statistics ($Q_{7,10}$, Q_{50}, and Q_{100}) computed from Log-Pearson analysis of gaged streamflow data and equivalent statistics computed for each streamflow-gaging station by use of the appropriate regional regression equations were compared graphically and with a t-test on signed ranks (Helsel and Hirsch, 1997).

The t-test on signed ranks is a nonparametric test used to determine if the difference between the paired datasets is significantly different from zero (Helsel and Hirsch, 1997). This test was selected because it lessens the need for normal distribution of the differences between the data pairs through the use of rank transformation and because the test uses a standard t-distribution to determine probabilities (p-value). The need for symmetry in the differences is also lessened with rank transformation. A 95-percent confidence level (alpha (α) = 0.05) was selected for the rejection of the null hypothesis. If the probability of significant differences between the streamflow datasets as computed by the test (p-value) is less than or equal to this selected alpha level, then the datasets are declared significantly different. This confidence level was selected to provide a reasonable balance between maximizing the probability of finding real significant differences between the streamflow datasets and minimizing the probability of failing to find any significant differences that exist.

A complete list of low-flow and flood-flow statistics for streamflow-gaging stations with 10 or more years of record computed by Log-Pearson distribution of streamflow-gaging stations can be found in Appendixes 1 and 2, respectively. Low-flow statistics include the $Q_{1,10}$, $Q_{7,10}$, $Q_{30,10}$, the median streamflow, and the mean streamflow. Flood-flow statistics include Q_{10}, Q_{25}, Q_{50}, Q_{100}, and Q_{500}. These additional streamflow statistics are provided as a supplement to this report because updated, comprehensive streamflow statistics have not been published by USGS since 1982.

Low-Flow Statistics Computed From Log-Pearson Distribution and WRI 82-21 Regional Regression Equations

A total of 208 currently operating or discontinued streamflow-gaging stations have at least 10 years of continuous flow data with little or no regulation. At 151 of these 208 stations, streamflow is not affected by carbonate bedrock or extensive mining. Of the remaining 57 stations, 31 are on streams that drain basins underlain by at least 10 percent carbonate bedrock, 17 are on streams that are extensively mined, 6 are on streams located in subregions for which low-flow regional regression equations have not been developed (fig. 1), and 3 were not used in the analysis because they did not produce acceptable low-flow statistics. Some low-flow statistics were eliminated following the examination of Log-Pearson frequency distribution plots. These statistics are shown as dashed lines in Appendix 1. In situations where regulation of streamflow divided the period of record, only the record prior to regulation was used.

Streams With Flow Unaffected by Carbonate Bedrock, Mining, or Regulation

A comparison was made between $Q_{7,10}$ calculated from Log-Pearson analysis for 151 stations in Pennsylvania and WRI 82-21 (Appendix 3). Stations with at least 10 years of continuous record having less than 10 percent of the basin underlain by carbonate bedrock and with flow unaffected by extensive mining or regulation were included in this analysis. The results indicate considerable variation among individual streamflow-gaging stations, but overall, the values computed from WRI 82-21 are consistent with the values from Log-Pearson distribution. For example, the $Q_{7,10}$ for Dyberry Creek near Honesdale (station number 01429500) computed from Log-Pearson distribution was 2.80 ft^3/s compared to 2.62 ft^3/s computed by WRI 82-21. The graphical comparison between $Q_{7,10}$ computed from Log-Pearson distribution and WRI 82-21 for regions 2 and 3 are shown in figures 5 and 6 as examples of the agreement and disagreement of the data, respectively. The graphical comparison for all the regions can be found in Appendix 4. The results of the t-test on signed-ranks for each region are listed in table 4. Region 3 is the only region to show a significant difference between the two methods (table 4).

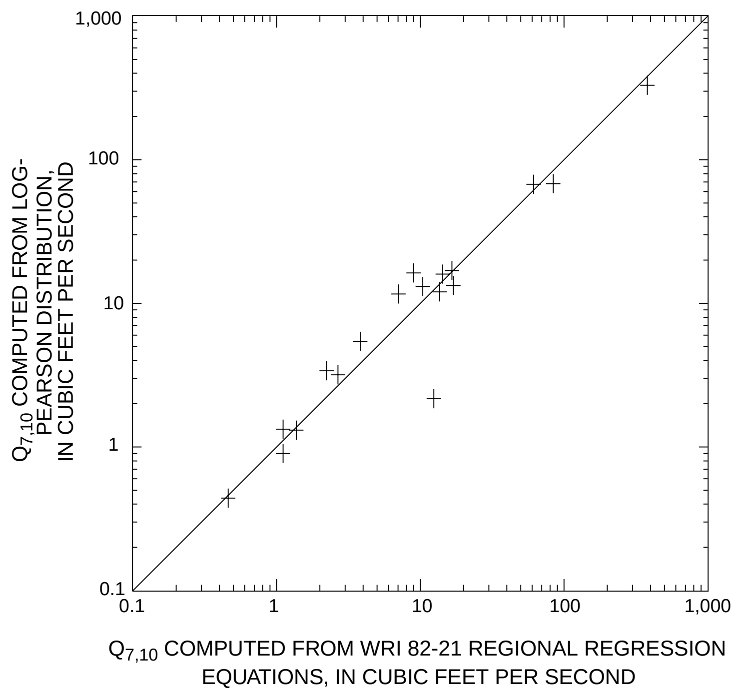


Figure 5. Comparison of 7-day, 10-year low-flow statistic ($Q_{7,10}$) computed from Log-Pearson distribution of streamflow data and WRI 82-21 regional regression equations for low-flow region 2.

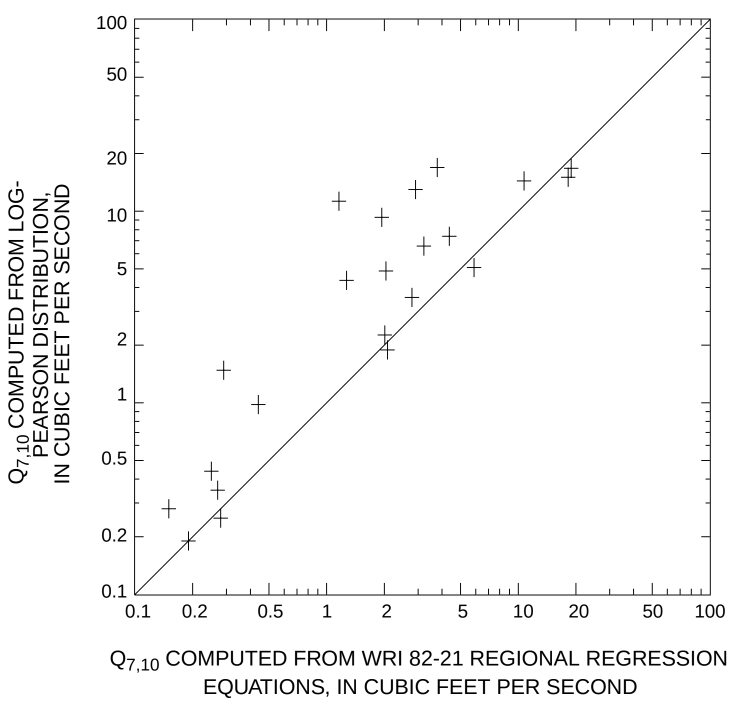


Figure 6. Comparison of 7-day, 10-year low-flow statistic ($Q_{7,10}$) computed from Log-Pearson distribution of streamflow data and WRI 82-21 regional regression equations for low-flow region 3.

Table 4. *Results of t-test on signed ranks comparing 7-day, 10-year low flow statistic ($Q_{7,10}$) computed from Log-Pearson distribution of streamflow data and WRI 82-21 regional regression equations for Pennsylvania low-flow regions*

[WRI 82-21 refers to Flippo, 1982b; >, greater than; --, insufficient data for analysis]

Low-flow region	Paired T-statistic (t_r)	Difference between methods for computing $Q_{7,10}$	Approximate p-value[1]
1	-1.08	not significant	0.33
2	-.36	not significant	.73
3	-3.02	significant	.007
4	-2.53	not significant	.05
5	-1.96	not significant	.07
6	-.65	not significant	.53
7	-.53	not significant	.61
8	--	--	--
9	.21	not significant	>.40
10	.22	not significant	>.40
11	1.28	not significant	.24
12	-1.10	not significant	.33

[1] p-value interpolated from table of student's t-distribution.

The t-test on signed ranks for region 3 resulted in t_r = -3.02 and an approximate p-value of 0.007 (table 4). The confidence level in declaring the datasets significantly different is about 99 percent. Figure 6 shows that WRI 82-21 underestimates $Q_{7,10}$ when compared to values computed from Log-Pearson distribution for region 3, which corresponds to the negative value of t_r .

About 40 percent of low-flow region 3 is composed of the heavily urbanized Philadelphia area, which could help explain the uniformly lower values of $Q_{7,10}$ computed by WRI 82-21 compared to those computed by Log-Pearson. Some explanations may include outflow from sewage treatment plants and old storm pipes that were not properly sealed, which the regression equations cannot predict. Also, the regression equations do not incorporate flow from impervious areas that originate from activities such as open fire hydrants, car washing, and runoff from small storms.

Streams with Flow Affected by Carbonate Bedrock

The $Q_{7,10}$ for 31 stations at which flow is affected by carbonate bedrock are listed in table 5 and shown on figure 7. The streams included in this analysis have at least 10 percent of their basin underlain by carbonate bedrock at the site of interest. Comparison of the $Q_{7,10}$ data by the t-test on signed-ranks resulted in t_r = -1.00, p ≈ 0.35, and the acceptance of the null hypothesis. Although the test did not produce a significant difference between the $Q_{7,10}$ computations by WRI 82-21 and Log-Pearson, low flow affected by carbonate bedrock can be difficult to predict with regression equations, depending on how much underflow the stream is subject to and where, in relation to the spring (or other stream recharge zone), the site of interest is located.

Table 5. *7-day, 10-year low-flow statistic ($Q_{7,10}$) computed from Log-Pearson distribution of streamflow data and WRI 82-21 regional regression equations for gaged locations on streams in Pennsylvania with flow affected by carbonate bedrock*

[WRI 82-21 refers to Flippo, 1982b; ft^3/s, cubic feet per second; mi^2, square miles; stream basins are underlain by at least 10 percent carbonate bedrock; climatic year, 12-month period April 1 - March 31]

U.S. Geological Survey streamflow-gaging station number	Period of record (climatic year)	Station name	Drainage area (mi^2)	Low-flow region	$Q_{7,10}$ computed from Log-Pearson distribution (ft^3/s)	$Q_{7,10}$ computed from regional regression equations (ft^3/s)	Absolute value of percentage difference
01451500	1947-95	Little Lehigh Creek near Allentown	80.8	3	28.2	29.0	2.9
01452000	1946-94	Jordan Creek at Allentown	75.8	2	2.48	27.0	990
01452500	1950-94	Monocacy Creek at Bethlehem	44.5	3	13.0	11.5	11
01470779	1976-94	Tulpehocken Creek near Bernville	66.5	3	30.0	20.0	33
01470960	1967-78	Tulpehocken Creek at Blue Marsh Damsite near Reading	175	3	38.5	24.8	35
01471000	1952-79	Tulpehocken Creek near Reading	211	3	47.5	38.1	20
01471980	1976-96	Manatawny Creek near Pottstown	85.5	3	19.6	12.6	36
01473169	1984-94	Valley Creek at Pennsylvania Turnpike near Valley Forge	20.8	3	10.8	5.29	51
01546400	1985-95	Spring Creek at Houserville	58.5	6	15.0	25.4	69
01546500	1942-94	Spring Creek near Axemann	87.2	6	28.7	53.9	88
01547100	1969-95	Spring Creek at Milesburg	142	6	104	81.2	22
01547200	1957-96	Bald Eagle Creek below Spring Creek at Milesburg	265	6	99.9	67.9	32
01547500	1956-70	Bald Eagle Creek at Blanchard	339	6	96.0	80.6	16
01548005	1911-70	Bald Eagle Creek near Beech Creek Station	562	6	115	59.2	49
01555000	1931-95	Penns Creek at Penns Creek	301	6	37.3	50.3	35
01558000	1940-95	Little Juniata River at Spruce Creek	220	6	64.2	34.6	46
01565000	[1]1941-85	Kishacoquillas Creek at Reedsville	164	6	18.5	31.0	67
01565700	1965-81	Little Lost Creek at Oakland Mills	6.52	7	.39	1.27	230
01567500	1955-96	Bixler Run near Loysville	15.0	7	2.39	1.71	28
01568000	1931-95	Sherman Creek at Shermans Dale	200	7	16.0	11.3	29
01569800	1978-96	Letort Spring Run near Carlisle	21.6	7	20.2	21.2	5.0
01570000	[1]1913-58	Conodoguinet Creek near Hogestown	470	7	62.3	49.1	21
01571500	[1]1911-93	Yellow Breeches Creek near Camp Hill	216	7	87.0	49.4	43
01573086	1965-81	Beck Creek near Cleona	7.87	7	.59	10.1	1,600
01573160	1977-94	Quittapahilla Creek near Bellegrove	74.2	7	29.4	94.3	220
01573560	1977-96	Swatara Creek near Hershey	483	7	67.7	55.2	18
01576085	1983-93	Little Conestoga Creek near Churchtown	5.82	7	.58	1.66	19
01576754	1985-95	Conestoga River at Conestoga	470	7	107	124	16
01578400	1964-81	Bowery Run near Quarryville	5.98	7	1.51	1.50	.66
01603500	1934-82	Evitts Creek near Centerville	30.2	8	1.83	1.57	14
01614090	1962-81	Conococheague Creek near Fayetteville	5.05	8	.26	.20	23

[1] Period of record not continuous.

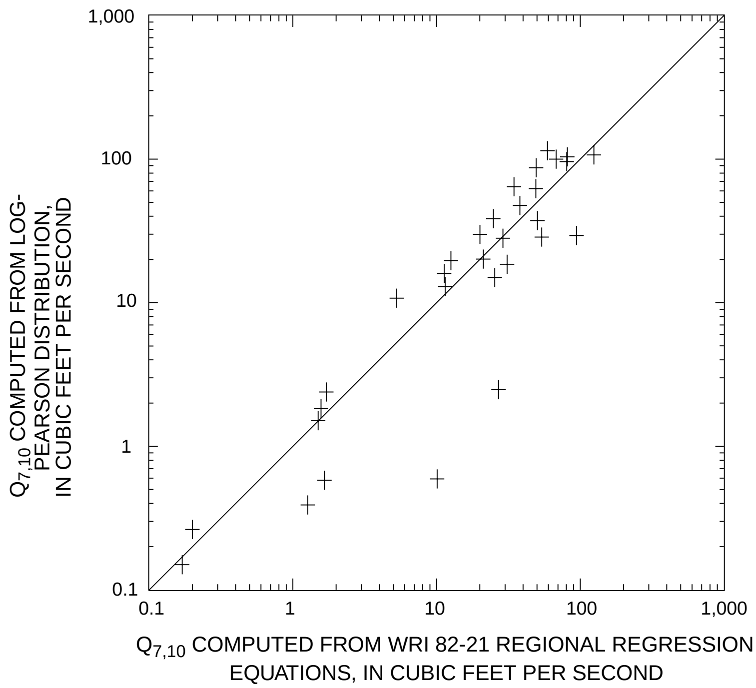


Figure 7. Comparison of 7-day, 10-year low-flow statistic ($Q_{7,10}$) computed from Log-Pearson distribution of streamflow data and WRI 82-21 regional regression equations for gaged locations on streams in Pennsylvania with flow affected by carbonate bedrock (at least 10 percent carbonate bedrock).

Spring Creek is an example of a stream subject to underflow and whose flow is affected by a large spring. Three streamflow-gaging stations are on Spring Creek, two upstream from the large spring and one downstream. Spring Creek at Houserville, station number 01546400, and Spring Creek near Axemann, station number 01546500, both upstream from the large spring at Bellefonte, are subject to underflow, which WRI 82-21 could not compensate for. WRI 82-21 overestimated the low flow at these stations by 69 and 88 percent, respectively; the low flow at the station below the spring, Spring Creek at Milesburg, station number 01547100, was underestimated by 22 percent (table 5).

Streams with Flow Affected by Extensive Mining

$Q_{7,10}$ statistics for gaged locations on streams affected by extensive upstream mining are listed in table 6 and shown on figure 8. Comparison of the $Q_{7,10}$ statistics computed from Log-Pearson distribution and WRI 82-21 by the t-test on signed-ranks indicated that the regional regression equations produced significantly different results. The t-test on signed-ranks resulted in t_r = -4.73, p ≈ 0.0003, and the rejection of the null hypothesis. Because the p-value is approaching zero, the confidence level in declaring the datasets significantly different is greater than 99 percent. Figure 8 shows that WRI 82-21 underestimates the flow in most of the streams included in this analysis, which corresponds with the negative value of t_r.

Extensive deep mining, such as in the eastern middle anthracite field, results in ground-water flow paths being altered to provide drainage and prevent the underground workings from filling with water. Tunnels have been constructed to drain water from the underground workings, resulting in water being diverted from normal drainage patterns. Regression equations are not applicable to either the streams that gain or lose streamflow as a result of extensive mining.

Table 6. *7-day, 10-year low-flow statistic ($Q_{7,10}$) computed from Log-Pearson distribution of streamflow data and WRI 82-21 regional regression equations for gaged locations on streams in Pennsylvania with flow affected by extensive mining*

[WRI 82-21 refers to Flippo, 1982b; ft^3/s, cubic feet per second; mi^2, square miles; climatic year, 12-month period April 1 - March 31]

U.S. Geological Survey streamflow-gaging station number	Period of record (climatic year)	Station name	Drainage area (mi^2)	Low-flow region	$Q_{7,10}$ computed from Log-Pearson distribution (ft^3/s)	$Q_{7,10}$ computed from WRI 82-21 regional regression equations (ft^3/s)	Absolute value of percentage difference
01467500	1945-69	Schuylkill River at Pottsville	53.4	3	17.1	10.2	40
01468500	[1]1949-95	Schuylkill River at Landingville	133	3	44.2	21.9	50
01516350	1978-96	Tioga River near Mansfield	153	4	9.79	3.12	68
01518000	1940-76	Tioga River at Tioga	282	4	8.71	6.59	24
01534500	1941-58	Lackawanna River at Archbald	108	6	22.8	18.1	21
01535500	1915-28	Lackawanna River at Moosic	264	6	84.2	35.9	57
01536000	1940-58	Lackawanna River at Old Forge	332	6	94.1	67.3	28
01537500	1941-88	Solomon Creek at Wilkes-Barre	15.7	6	.38	1.27	230
01542000	1942-93	Moshannon Creek at Oceola Mills	68.8	6	8.44	2.64	69
01554500	1941-93	Shamokin Creek near Shamokin	54.2	6	22.0	15.5	30
03034000	1940-96	Mahoning Creek at Punxsutawney	158	10	17.4	7.21	59
03034500	1941-96	Little Mahoning Creek at McCormick	87.4	11	1.74	3.93	130
03035000	1922-40	Mahoning Creek near Dayton	321	11	16.2	15.8	2.5
03042000	1953-96	Blacklick Creek at Josephine	192	11	28.1	8.92	68
03043000	1906-51	Blacklick Creek at Blacklick	390	11	20.0	20.7	3.5
03074500	1944-96	Redstone Creek at Waltersburg	73.7	12	9.75	.40	96
03085500	[1]1921-95	Chartiers Creek at Carnegie	257	12	29.2	1.93	93

[1] Period of record not continuous.

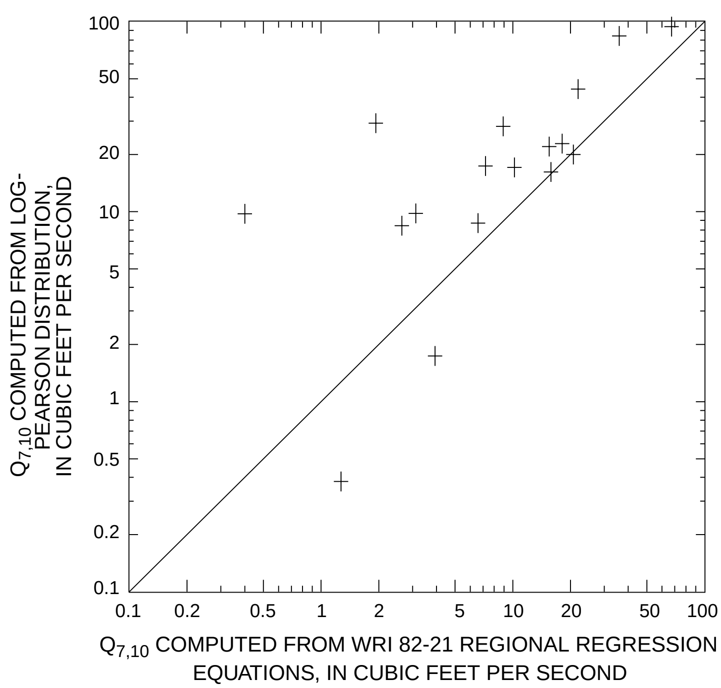


Figure 8. Comparison of 7-day, 10-year low-flow statistic ($Q_{7,10}$) computed from Log-Pearson distribution of streamflow data and WRI 82-21 regional regression equations for gaged locations on streams in Pennsylvania with flow affected by extensive mining.

Flood-Flow Statistics Computed from Log-Pearson Distribution and Regional Regression Equations

Continuous-record streamflow-gaging stations in Pennsylvania with 10 or more years of record through water year 1996 were used in this analysis. In situations where regulation of the streamflow divided the period of record, only the record prior to regulation was used. Streams affected by regulation were not used. Flood-flow statistics for the 50-year and 100-year floods were computed for this analysis. The 50-year and 100-year floods are used for the analysis to compare as many overlapping flood-flow statistics estimated by both WRI 82-21 and PSU-IV as possible.

WRI 82-21 Regional Regression Equations Compared to Log-Pearson Distribution

A comparison was made between the 50- and 100-year flood flows computed from Log-Pearson distribution for 206 streamflow-gaging stations in Pennsylvania and WRI 82-21 regional regression equations (Appendix 5). No streamflow-gaging stations fell within flood-flow region 1 (fig. 3)[2]. The graphical comparison between values of Q_{100} computed from Log-Pearson distribution and WRI 82-21 for regions 5W and 6A are shown in figures 9 and 10 as examples of the agreement and disagreement of the data, respectively. The graphical comparison for all the regions can be found in Appendix 4.

The results of the t-test on signed ranks are listed in table 7. Equations for three flood-flow regions were shown to produce significantly different datasets. Figure 10 shows that WRI 82-21 overestimates Q_{100} for region 6A, which corresponds with the positive value of t_r, equalling 3.66 (table 7). Equations for flood-flow regions 6A, 6B, and 8 were shown to produce significantly different computations of Q_{50} from those produced from Log-Pearson distribution. Equations for flood-flow regions 6A and 6B were shown to produce significantly different computations of Q_{100} from those produced from Log-Pearson distribution. The p-values for the regions in which the equations produce significantly different statistics are all less than 0.05, which means the confidence levels in declaring the datasets significantly different are greater than 95 percent. Combined, these three regions—6A, 6B, and 8—constitute approximately 24 percent of the state.

PSU-IV Regional Regression Equations Compared to Log-Pearson Distribution

A total of 137 streamflow-gaging stations were included in this comparison between the Log-Pearson distribution of streamflow data and PSU-IV regional regression equations. Only stations with 10 or more years of continuous record and with drainage areas less than or equal to 150 mi^2 were used. PSU-IV was originally developed using data from streams with drainage areas up to 233 mi^2. A comparison between the Log-Pearson distribution and PSU-IV regional regression equations from 28 sites with drainage areas between 150 and 233 mi^2 showed PSU-IV overestimated Q_{100} at 21 of the 28 sites by an average of 50 percent. Because of the overestimation at sites with large drainage areas, a limit of 150 mi^2 was selected for this comparison. PSU-IV can estimate flood peaks with return periods from 2 to 200 years, but only the 50- and 100-year flood flows were computed for this report.

PSU-IV values were adjusted if the drainage basin contained lakes, swamps, or flood control structures, significant carbonate bedrock, urban areas, or if the basin was less than 1.5 mi^2 in drainage area. The adjustments for storage area and urbanization were modified from the recommendations made by the Pennsylvania State University. Region 1 was not adjusted for urbanization for this analysis because the effects of urbanization on flood flow are most likely reflected in the equation for region 1. However, an initial comparison of PSU-IV flood-flow values for region 1 with application of the urbanization adjustment and values calculated from Log-Pearson distribution using the t-test on signed ranks showed a significant difference in flood-flow values.

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[2] Regression equations were developed for region 1 using streamflow-gaging stations located in the state of New York (Flippo, 1982b).

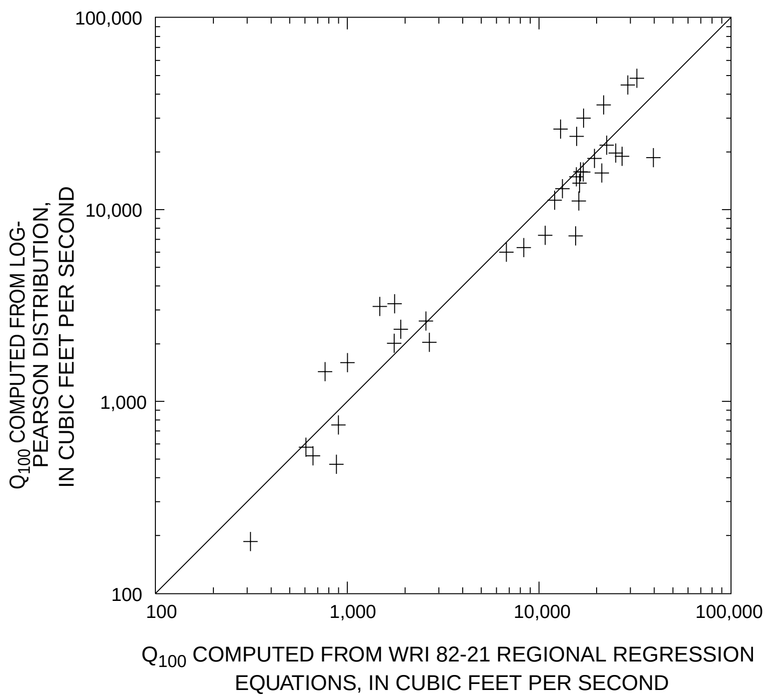

Figure 9. Comparison of 100-year flood-flow statistic (Q_{100}) computed from Log-Pearson distribution of streamflow data and WRI 82-21 regional regression equations for flood-flow region 5W.

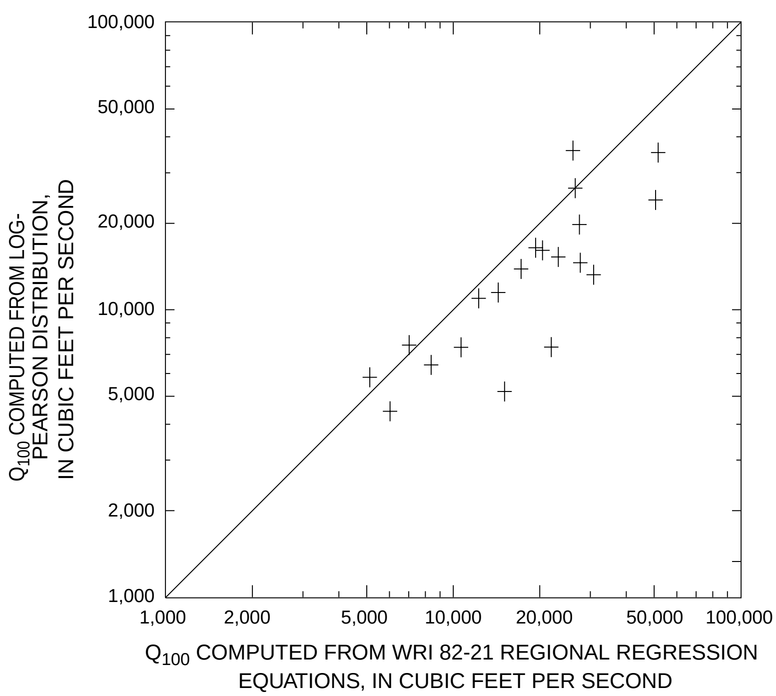

Figure 10. Comparison of 100-year flood-flow statistic (Q_{100}) computed from Log-Pearson distribution of streamflow data and WRI 82-21 regional regression equations for flood-flow region 6A.

Table 7. *Results of t-test on signed-ranks comparing 50- and 100-year flood flows (Q_{50} and Q_{100}) computed from Log-Pearson distribution of streamflow data and WRI 82-21 regional regression equations for Pennsylvania flood-flow regions*

[WRI 82-21 refers to Flippo, 1982b; >, greater than; --, insufficient data for analysis]

WRI 82-21 flood-flow region	Q_{50}			Q_{100}		
	Paired T-statistic (t_r)	Approximate p-value (p)[1]	Difference between methods for computing flood-flow statistics	Paired T-statistic (t_r)	Approximate p-value (p)[1]	Difference between methods for computing flood-flow statistics
1	--	--	--	--	--	--
2	-0.33	0.75	no significant difference	-0.21	>0.40	no significant difference
3	--	--	--	--	--	--
4	-1.73	.12	no significant difference	-1.59	.15	no significant difference
5E	1.69	.10	no significant difference	1.91	.06	no significant difference
5W	.82	.43	no significant difference	1.07	.31	no significant difference
6A	3.45	.003	significant difference	3.66	.002	significant difference
6B	-2.70	.03	significant difference	-2.70	.03	significant difference
7A	-1.98	.06	no significant difference	-1.53	.15	no significant difference
7B	.68	.52	no significant difference	.82	.45	no significant difference
8	2.41	.04	significant difference	1.97	.08	no significant difference

[1] p-value interpolated from table of student's t-distribution.

A comparison was made between the Q_{50} and Q_{100} computed from Log-Pearson distribution and PSU-IV for streamflow-gaging stations in Pennsylvania (Appendix 6). The results of the t-test on signed-ranks for the flood regions are listed in table 8. The graphical comparison between the two methods for computing Q_{100} for region 4 is shown in figure 11 as an example of the agreement of the data. The graphical comparison for all the regions can found in Appendix 4. No PSU-IV flood-flow region was shown to have a significant difference in flood flows computed from Log-Pearson distribution and PSU-IV regression equations using the t-test on signed ranks. PSU-IV, without the urban adjustment, still overestimated Q_{100} in region 1, 61 percent of the time. An example of this is Chester Creek near Chester (station number 01477000); the Q_{100} calculated from Log-Pearson distribution is 17,800 ft^3/s compared to 20,200 ft^3/s calculated from PSU-IV (Appendix 6).

Table 8. *Results of t-test on signed-ranks comparing 50- and 100-year flood flows (Q_{50} and Q_{100}) computed from Log-Pearson distribution of streamflow data and PSU-IV regional regression equations for Pennsylvania flood-flow regions*

[PSU-IV refers to Aron and Kibler, 1981]

PSU-IV flood-flow region	Q_{50}			Q_{100}		
	Paired T-statistic (t_r)	p-value (p)[1]	Difference between methods for computing flood-flow statistics	Paired T-statistic (t_r)	p-value (p)[1]	Difference between methods for computing flood-flow statistics
1	1.65	0.11	no significant difference	1.59	0.13	no significant difference
2	-.61	.55	no significant difference	-.33	.75	no significant difference
3	-1.12	.29	no significant difference	-1.16	.27	no significant difference
4	1.04	.33	no significant difference	1.30	.21	no significant difference

[1] p-value interpolated from table of student's t-distribution.

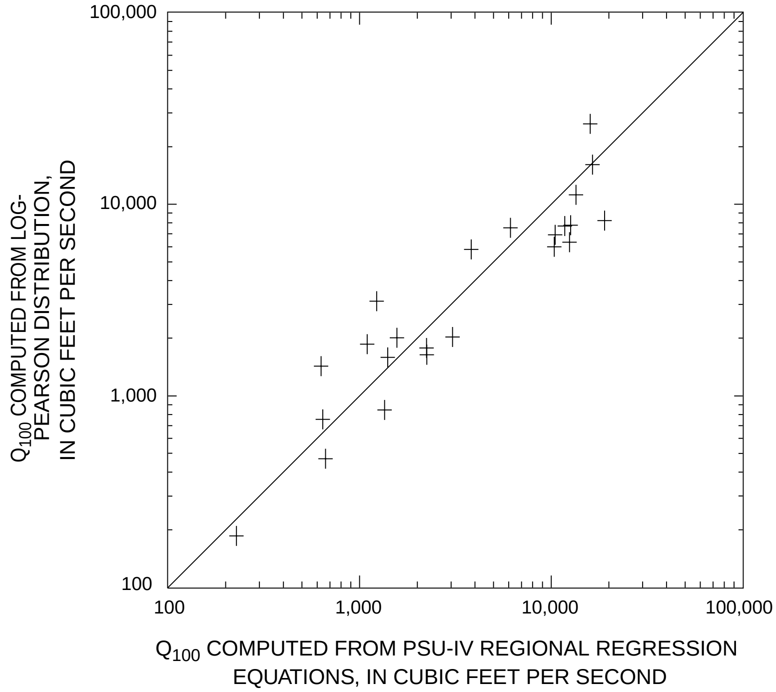

Figure 11. Comparison of 100-year flood-flow statistic (Q_{100}) computed from Log-Pearson distribution of streamflow data and PSU-IV regional regression equations for flood-flow region 4.

Limitations of WRI 82-21 Regional Regression Equations

Regression equations presented in WRI 82-21 to predict low flow should not be applied to areas for which they were not developed, such as most of Bucks County and the Sinnemahoning Creek Basin. Streams that drain areas underlain by carbonate bedrock can be influenced by underflow as well as the discharge from large springs. The effects of underflow or large springs, which can significantly affect streamflow during droughts, cannot be predicted by the regression equations. Low flow in urban area streams also is difficult to predict because of supplemental flows from impervious areas and flows from sewage treatment plants.

Flood flow computed from regression equations presented in WRI 82-21 should not be used if the site is downstream of a flood-control reservoir or a large recreational lake that may significantly affect flood flows. Discharge computations resulting from WRI 82-21 for watersheds less than 30 mi^2 located within regions 6 and 7 should be reviewed carefully because of nonagreement between the equations for regions 6A and 6B and 7A and 7B. In addition, a few streams in the state flow through more than one flood-flow region (fig. 3). One such stream is the Clarion River, which originates in region 6 (6B, less than 15 mi^2, and 6A, greater than 15 mi^2) and flows from region 6 to region 5W, to region 4, and enters the Allegheny River back in region 5W.

SUMMARY AND CONCLUSIONS

Streamflow statistics are a critical component of many hydrologic investigations. Low-flow statistics are used to determine the quantity of water that can be withdrawn from a stream and the amount and concentration of wastewater that can be assimilated by a receiving water body. Flood-flow statistics are used to design safe and effective flood-control structures, culverts, and bridges, as well as for flood-plain management. The methods discussed in this report for estimating low-flow statistics include the Log-Pearson type III frequency distribution of continuous-record streamflow-gaging data and regional regression equations developed by Flippo in 1982 (WRI 82-21). For flood flow, the methods include Log-Pearson type III frequency distribution, WRI 82-21 regional regression equations, and regional regression equations developed by Aron and Kibler in 1981 (PSU-IV) for basins less than 150 mi^2. These methods were compared graphically and statistically, by use of the t-test on signed-ranks.

Results from the comparison between the 7-day 10-year low flow, $Q_{7,10}$, determined from Log-Pearson type III frequency distribution and WRI 82-21 regional regression equations for streams unaffected by carbonate bedrock, extensive mining, or regulation indicate that the two methods do not produce significantly different low-flow data for the regions occupying about 93 percent of the area of the state. The WRI 82-21 regional regression equations produce significantly different $Q_{7,10}$ values for urbanized areas compared to those computed by Log-Pearson distribution, particularly the streams in the Philadelphia area. The regional regression equations should be used with caution for streams in areas underlain by carbonate rocks or that have past or present extensive upstream mining activity. The low flow of streams in such areas is highly variable. During periods of drought, streamflow can be influenced by springs or mining discharges, which prevents an accurate computation of flow from regional regression equations.

Results from the comparison between 50-year flood (Q_{50}) and 100-year flood (Q_{100}) determined from Log-Pearson distribution and WRI 82-21 regional regression equations for gaged locations on Pennsylvania streams are variable. The regression equations for about 24 percent of the state produce significant differences between the two methods, on the basis of the results from the t-test on signed-ranks. The equations for regions 6A, 6B, and 8 produced variable Q_{50} and Q_{100} estimates that were significantly different from the values computed from Log-Pearson distribution. Twenty-three years of valuable peak-flow data have been collected since the modification of WRI 82-21 regression equations. Numerous streamflow-gaging stations have been in operation since water year 1975. Because of this amount of new peak-flow data and the results of the comparison between Log-Pearson distribution and WRI 82-21, further investigation into the updating and modifying of WRI 82-21 regression equations is warranted.

Results from the comparison between Q_{50} and Q_{100} determined from Log-Pearson distribution and PSU-IV regional regression equations, with modified adjustments, showed no significant differences between the two methods for the regions occupying all of the state. The urban and storage area adjustments were modified from their recommended form in PSU-IV. No urban adjustment was applied to region 1, in which Philadelphia and the surrounding area are included. Although not found to produce a significant difference from Log-Pearson distribution, PSU-IV, without the urban adjustment, overestimated Q_{100} for 19 out of 31 stations in region 1.

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APPENDIXES

Appendix 1. *Low-flow statistics for gaged Pennsylvania streams*

[Low-flow statistics computed from Log-Pearson distribution of streamflow data; ---, calculated statistic not shown; mi², square miles; ft³/s, cubic feet per second; climatic year, 12-month period April 1 - March 31]

U.S. Geological Survey streamflow-gaging station number	Period of record (climatic year)	Station name	Drainage area (mi²)	Median streamflow (ft³/s)	Mean streamflow (ft³/s)	1-day, 10-year low-flow statistic (ft³/s)	7-day, 10-year low-flow statistic (ft³/s)	30-day, 10-year low-flow statistic (ft³/s)
01429000	1946-59	West Branch Lackawaxen River at Prompton	59.7	60.4	116	5.54	6.25	8.93
01429000	1962-95	West Branch Lackawaxen River at Prompton	59.7	55.4	105	3.63	4.77	7.38
01429500	1945-58	Dyberry Creek near Honesdale	64.6	55.0	114	2.31	2.80	4.45
01429500	1961-95	Dyberry Creek near Honesdale	64.6	55.1	112	2.38	3.07	4.46
01430500	1923-38	Lackawaxen River at West Hawley	206	198	352	17.9	24.0	30.3
01431000	1946-60	Middle Creek near Hawley	78.4	63.8	133	2.64	3.08	4.19
01431500	[1]1910-59	Lackawaxen River at Hawley	290	245	491	13.5	17.8	26.2
01431500	1961-95	Lackawaxen River at Hawley	290	244	478	21.8	23.8	29.9
01432000	1911-24	Wallenpaupack Creek at Wilsonville	228	246	404	7.69	21.2	34.3
01439500	1910-96	Bush Kill at Shoemakers	117	162	235	6.76	7.72	10.6
01440400	1959-96	Brodhead Creek at Analomink	65.9	84.6	144	7.00	7.54	9.13
01441000	1913-38	McMichaels Creek at Stroudsburg	65.3	80.4	119	13.3	16.0	19.3
01442500	1952-95	Brodhead Creek at Minisink Hills	259	347	559	44.7	48.7	57.2
01446600	1963-78	Martins Creek near East Bangor	10.4	7.40	17.0	---	.20	.20
01447500	1945-96	Lehigh River at Stoddardtsville	91.7	128	190	12.2	13.3	16.7
01447680	1971-96	Tunkhannock Creek near Long Pond	18	34.1	47.5	3.82	4.23	5.55
01447720	1962-95	Tobyhanna Creek near Blakeslee	118	180	289	28.2	30.8	40.9
01447800	1963-96	Lehigh River below Francis E. Walter Reservoir near White Haven	290	418	631	36.5	44.0	58.6
01448000	1918-59	Lehigh River at Tannery	322	449	673	49.7	67.4	79.6
01448500	1950-95	Dilldown Creek near Long Pond	2.39	3.20	4.88	.41	.44	.52
01449000	1984-95	Lehigh River at Lehighton	591	892	1,340	144	157	201
01449360	1968-96	Pohopoco Creek at Kresgeville	49.9	75.8	104	15.8	16.3	18.4
01449500	1945-57	Wild Creek at Hatchery	16.8	29.3	38.1	5.22	5.45	5.96
01449500	1960-78	Wild Creek at Hatchery	16.8	28.3	34	1.32	1.66	2.30
01449800	1971-96	Pohopoco Creek below Beltzville Lake near Parryville	96.4	107	172	13.3	14.9	17.7
01450000	1945-69	Pohopoco Creek near Parryville	109	119	174	18.3	19.6	22.0
01450500	1941-96	Aquashicola Creek at Palmerton	76.7	101	153	15.0	16.9	20.0
01451500	1947-95	Little Lehigh Creek near Allentown	80.8	79.2	99.8	26.9	28.2	31.4
01451800	1967-94	Jordan Creek near Schnecksville	53	49.2	92.7	1.84	2.58	4.17
01452000	1946-94	Jordan Creek at Allentown	75.8	61.5	115	---	2.48	4.00

Appendix 1. *Low-flow statistics for gaged Pennsylvania streams—Continued*

U.S. Geological Survey streamflow-gaging station number	Period of record (climatic year)	Station name	Drainage area (mi^2)	Median streamflow (ft^3/s)	Mean streamflow (ft^3/s)	1-day, 10-year low-flow statistic (ft^3/s)	7-day, 10-year low-flow statistic (ft^3/s)	30-day, 10-year low-flow statistic (ft^3/s)
01452500	1950-94	Monocacy Creek at Bethlehem	44.5	42.2	53.2	11.6	13.0	14.6
01453000	[1]1904-40	Lehigh River at Bethlehem	1,279	1,520	2,160	260	330	388
01453000	1943-94	Lehigh River at Bethlehem	1,279	1,790	2,470	332	358	438
01454700	1968-95	Lehigh River at Glendon	1,359	2,090	2,900	484	522	627
01459500	1937-72	Tohickon Creek near Pipersville	97.4	37.3	134	.42	.83	1.32
01459500	1975-95	Tohickon Creek near Pipersville	97.4	46.5	165	2.44	2.63	3.80
01460000	[1]1886-1912	Tohickon Creek at Point Pleasant	107	54.8	206	1.61	1.71	2.77
01464645	1986-96	North Branch Neshaminy Creek below Lake Galena near New Britain	16.2	9.50	25.2	2.97	3.14	3.76
01465000	[1]1886-1934	Neshaminy Creek at Rushland	134	91.7	229	2.67	3.44	4.92
01465500	1936-96	Neshaminy Creek near Langhorne	210	137	296	8.25	11.9	16.3
01465770	1966-81	Poquessing Creek at Trevose Road, Philadelphia	5.08	3.80	7.48	.28	.44	.82
01465785	1966-78	Walton Run at Philadelphia	2.17	1.20	3.41	.05	.19	.56
01465790	1967-78	Byberry Creek at Chalfont Road, Philadelphia	5.34	3.60	8.72	.74	1.02	1.54
01465798	1967-94	Poquessing Creek at Grant Avenue, Philadelphia	21.4	12.9	33.6	1.82	2.26	4.20
01467042	1966-81	Pennypack Creek at Pine Road, Philadelphia	37.9	42.6	68.4	8.63	9.29	11.4
01467048	1967-94	Pennypack Creek at Lower Rhawn Street Bridge, Philadelphia	49.8	50.8	93.4	11.4	13.0	18.0
01467050	1967-81	Wooden Bridge Run at Philadelphia	3.35	2.00	5.93	.26	.35	.68
01467086	1967-88	Tacony Creek above Adams Avenue, Philadelphia	16.6	16.5	27.3	3.60	4.36	6.56
01467087	1984-94	Frankford Creek at Castor Avenue, Philadelphia	30.4	16.2	42.2	2.73	3.55	8.12
01467089	1967-81	Frankford Creek at Torresdale Avenue, Philadelphia	33.8	23.9	58.7	4.84	6.58	10.4
01467500	1945-69	Schuylkill River at Pottsville	53.4	65.1	98.0	14.6	17.1	19.7
01468500	[1]1949-95	Schuylkill River at Landingville	133	194	286	40.2	44.2	53.0
01469500	1921-32	Little Schuylkill River at Tamaqua	42.9	53.4	91.2	4.36	5.08	6.88
01469500	1935-95	Little Schuylkill River at Tamaqua	42.9	50.9	83.8	4.90	5.48	7.30
01470500	1949-94	Schuylkill River at Berne	355	449	712	70.5	85.7	105
01470720	1967-31	Maiden Creek Tributary at Lenhartsville	7.46	5.90	12.6	---	.25	.54
01470756	1974-95	Maiden Creek at Virginville	159	151	268	14.8	16.8	23.1
01470779	1976-94	Tulpehocken Creek near Bernville	66.5	83.8	109	25.5	30.0	34.4
01470853	1984-95	Furnace Creek at Robesonia	4.18	4.90	7.11	---	.28	.70

Appendix 1. *Low-flow statistics for gaged Pennsylvania streams—Continued*

U.S. Geological Survey streamflow-gaging station number	Period of record (climatic year)	Station name	Drainage area (mi^2)	Median streamflow (ft^3/s)	Mean streamflow (ft^3/s)	1-day, 10-year low-flow statistic (ft^3/s)	7-day, 10-year low-flow statistic (ft^3/s)	30-day, 10-year low-flow statistic (ft^3/s)
01470960	1967-78	Tulpehocken Creek at Blue Marsh Damsite near Reading	175	186	290	32.7	38.5	47.5
01470960	1981-94	Tulpehocken Creek at Blue Marsh Damsite near Reading	175	174	264	28.4	31.3	50.3
01471000	1952-79	Tulpehocken Creek near Reading	211	213	309	41.8	47.5	55.1
01471000	1981-94	Tulpehocken Creek near Reading	211	213	311	34.1	43.6	59.9
01471510	1979-95	Schuylkill River at Reading	880	1,090	1,580	220	245	279
01471980	1976-96	Manatawny Creek near Pottstown	85.5	85.1	131	17.7	19.6	23.5
01472000	1935-96	Schuylkill River at Pottstown	1,147	1,300	1,920	254	281	328
01472157	1970-94	French Creek near Phoenixville	59.1	57.2	90.3	10.5	11.3	14.5
01472174	1968-83	Pickering Creek near Chester Springs	5.98	6.70	10.3	1.20	1.48	1.75
01472198	1985-95	Perkiomen Creek at East Greenville	38	37.2	61.8	6.85	7.39	10.6
01472199	1983-94	West Branch Perkiomen Creek at Hillegass	23	23.6	38.2	4.57	4.88	5.78
01472500	1886-1913	Perkiomen Creek near Frederick	152	112	252	6.70	14.4	20.5
01473000	1916-55	Perkiomen Creek at Graterford	279	168	386	9.57	15.0	24.4
01473000	1958-94	Perkiomen Creek at Graterford	279	174	403	26.0	31.4	39.1
01473120	1968-94	Skippack Creek near Collegeville	53.7	29.3	80.2	1.35	1.89	3.21
01473169	1984-94	Valley Creek at Pennsylvania Turnpike near Valley Forge	20.8	24.0	31.6	9.60	10.8	13.6
01474000	1967-94	Wissahickon Creek at mouth, Philadelphia	64	60.1	104	14.0	16.9	22.3
01474500	1935-96	Schuylkill River at Philadelphia	1,893	1,660	2,700	54.4	101	174
01475300	1974-94	Darby Creek at Waterloo Mills near Devon	5.15	6.00	8.76	1.08	1.31	1.82
01475510	1965-90	Darby Creek near Darby	37.4	44.9	64.3	10.4	11.6	15.5
01475530	1966-81	Cobbs Creek at U.S. Highway No.1 at Philadelphia	4.78	4.40	7.43	1.13	1.33	1.83
01475850	1983-95	Crum Creek near Newtown Square	15.8	15.2	22.4	1.54	3.18	5.58
01476500	1933-54	Ridley Creek at Moylan	31.9	31.4	44.2	3.94	4.88	6.43
01477000	1933-94	Chester Creek near Chester	61.1	60.9	90.4	10.8	13.1	16.6
01480300	1962-94	West Branch Brandywine Creek near Honey Brook	18.7	15.8	26.1	2.96	3.39	4.35
01480500	[1]1945-94	West Branch Brandywine Creek at Coatesville	45.8	43.7	64.9	7.34	8.27	10.5
01480617	1971-94	West Branch Brandywine Creek at Modena	55	59.3	87.5	14.2	17.5	21.1
01480675	1968-94	Marsh Creek near Glenmore	8.57	7.80	12.7	.78	.90	1.34
01480685	1975-94	Marsh Creek near Downingtown	20.3	16.2	29.9	.57	.76	1.73

Appendix 1. *Low-flow statistics for gaged Pennsylvania streams—Continued*

U.S. Geological Survey streamflow-gaging station number	Period of record (climatic year)	Station name	Drainage area (mi^2)	Median streamflow (ft^3/s)	Mean streamflow (ft^3/s)	1-day, 10-year low-flow statistic (ft^3/s)	7-day, 10-year low-flow statistic (ft^3/s)	30-day, 10-year low-flow statistic (ft^3/s)
01480700	1975-96	East Branch Brandywine Creek near Downingtown	60.6	58.0	90.7	12.4	14.5	18.5
01480800	1958-68	East Branch Brandywine Creek at Downingtown	81.6	55.9	85.8	11.5	12.0	14.6
01480870	1975-94	East Branch Brandywine Creek below Downingtown	89.9	95.5	147	26.1	28.6	34.0
01481000	[1]1913-72	Brandywine Creek at Chadds Ford	287	275	376	62.0	68.0	78.5
01481000	1975-95	Brandywine Creek at Chadds Ford	287	295	433	83.4	89.1	102
01516350	1978-96	Tioga River near Mansfield	153	97.5	218	9.09	9.79	11.6
01516500	1956-95	Corey Creek near Mainesburg	12.2	4.30	12.7	---	.05	.14
01517000	1957-76	Elk Run near Mainesburg	10.2	3.50	10.7	---	.06	.08
01518000	1940-76	Tioga River at Tioga	282	132	334	7.48	8.71	10.8
01518000	1977-95	Tioga River at Tioga	282	182	451	21.4	24.3	26.4
01518500	1955-74	Crooked Creek at Tioga	122	35.2	113	2.13	2.33	2.81
01518700	1981-96	Tioga River at Tioga Junction	446	198	508	24.4	28.5	32.2
01518862	1985-95	Cowanesque River at Westfield	90.6	42.0	98.1	.83	1.14	2.04
01520000	1953-76	Cowanesque River near Lawrenceville	298	91.8	281	1.61	2.10	3.22
01520000	1981-95	Cowanesque River near Lawrenceville	298	102	304	6.21	6.79	8.67
01531500	1915-78	Susquehanna River at Towanda	7,797	5,430	10,700	536	568	672
01531500	1981-95	Susquehanna River at Towanda	7,797	5,680	10,500	574	621	821
01531500	1915-95	Susquehanna River at Towanda	7,797	5,470	10,600	547	581	699
01532000	1915-96	Towanda Creek near Monroetown	215	117	289	2.23	2.79	4.52
01532850	1967-79	Middle Branch Wyalusing Creek Tributary near Birchardsville	5.67	4.30	10.6	.12	.16	.30
01533400	1980-96	Susquehanna River at Meshoppen	8,720	6,170	11,400	624	672	842
01533500	1942-58	North Branch Mehoopany Creek near Lovelton	35.2	20.7	46.9	.42	.60	.77
01533950	1962-78	South Branch Tunkhannock Creek near Montdale	12.6	7.20	17.5	.19	.26	.62
01534000	1915-93	Tunkhannock Creek near Tunkhannock	383	257	538	15.6	17.5	24.4
01534300	1961-95	Lackawanna River near Forest City	38.8	39.3	72.7	---	1.66	2.86
01534500	1941-58	Lackawanna River at Archbald	108	124	207	18.7	22.8	25.5
01534500	1961-96	Lackawanna River at Archbald	108	121	201	15.7	18.0	21.1
01535500	1915-28	Lackawanna River at Moosic	264	325	478	72.0	84.2	89.4
01536000	1940-58	Lackawanna River at Old Forge	332	343	558	77.3	94.1	105

Appendix 1. Low-flow statistics for gaged Pennsylvania streams—Continued

U.S. Geological Survey streamflow-gaging station number	Period of record (climatic year)	Station name	Drainage area (mi^2)	Median streamflow (ft^3/s)	Mean streamflow (ft^3/s)	1-day, 10-year low-flow statistic (ft^3/s)	7-day, 10-year low-flow statistic (ft^3/s)	30-day, 10-year low-flow statistic (ft^3/s)
01536000	1961-95	Lackawanna River at Old Forge	332	241	442	30.9	35.2	42.9
01536500	1901-78	Susquehanna River at Wilkes-Barre	9,960	7,040	13,420	775	808	922
01536500	1981-96	Susquehanna River at Wilkes-Barre	9,960	7,430	13,400	827	874	1,050
01536500	1900-96	Susquehanna River at Wilkes-Barre	9,960	7,100	13,400	785	821	945
01537000	1943-92	Toby Creek at Luzerne	32.4	20.9	41.3	1.32	1.99	3.05
01537500	1941-88	Solomon Creek at Wilkes-Barre	15.7	11.4	18.9	---	.38	.54
01538000	1921-95	Wapwallopen Creek near Wapwallopen	43.8	41.4	65.1	2.92	3.45	4.87
01539000	1940-95	Fishing Creek near Bloomsburg	274	275	481	15.6	17.1	21.6
01539500	1942-58	Little Fishing Creek at Eyers Grove	56.5	37.7	85.5	.14	.28	1.03
01540000	1915-28	Fishing Creek at Bloomsburg	355	386	682	22.5	37.0	56.4
01540500	1981-95	Susquehanna River at Danville	11,220	8,660	15,200	1,140	1,200	1,410
01540500	1906-96	Susquehanna River at Danville	11,220	8,420	15,200	960	1,010	1,200
01541000	1913-95	West Branch Susquehanna River at Bower	315	287	558	24.3	26.9	34.2
01541200	1967-95	West Branch Susquehanna River at Curwensville	367	405	690	30.6	43.6	62.5
01541303	1980-95	West Branch Susquehanna River at Hyde	474	524	873	51.2	58.8	82.7
01541308	1969-79	Bradley Run near Ashville	6.77	7.70	13.1	1.28	1.32	1.60
01541500	1915-59	Clearfield Creek at Dimeling	371	278	573	14.7	21.0	28.3
01541500	1962-96	Clearfield Creek at Dimeling	371	331	600	38.3	41.2	51.4
01542000	1942-93	Moshannon Creek at Oceola Mills	68.8	68.2	111	7.49	8.44	11.0
01542500	1942-59	West Branch Susquehanna River at Karthaus	1,462	1,390	2,520	117	126	148
01542500	1962-96	West Branch Susquehanna River at Karthaus	1,462	1,520	2,520	170	185	226
01542810	1966-95	Waldy Run near Emporium	5.24	3.60	9.05	.07	.08	.25
01543000	1913-95	Driftwood Branch Sinnemahoning Creek near Sinnemahoning	272	209	453	2.83	4.11	9.43
01543500	1940-96	Sinnemahoning Creek at Sinnemahoning	685	571	1,150	10.1	14.0	25.7
01544000	1958-95	First Fork Sinnemahoning Creek near Sinnemahoning	245	196	400	2.73	6.40	10.6
01544500	1942-95	Kettle Creek at Cross Fork	136	109	229	4.32	5.04	7.65
01545000	1964-95	Kettle Creek near Westport	233	186	379	7.23	8.98	13.5
01546000	1912-28	North Bald Eagle Creek at Milesburg	119	80.8	212	1.75	2.15	3.70
01546400	1985-95	Spring Creek at Houserville	58.5	45.9	64.4	14.6	15.0	16.6

Appendix 1. *Low-flow statistics for gaged Pennsylvania streams—Continued*

U.S. Geological Survey streamflow-gaging station number	Period of record (climatic year)	Station name	Drainage area (mi^2)	Median streamflow (ft^3/s)	Mean streamflow (ft^3/s)	1-day, 10-year low-flow statistic (ft^3/s)	7-day, 10-year low-flow statistic (ft^3/s)	30-day, 10-year low-flow statistic (ft^3/s)
01546500	1942-94	Spring Creek near Axemann	87.2	72.3	92.9	26.3	28.7	30.5
01547100	1969-95	Spring Creek at Milesburg	142	189	233	100	104	111
01547200	1957-96	Bald Eagle Creek below Spring Creek at Milesburg	265	261	406	97.9	99.9	105
01547500	1956-70	Bald Eagle Creek at Blanchard	339	237	389	91.0	96.0	99.5
01547500	1973-95	Bald Eagle Creek at Blanchard	339	335	514	25.7	123	145
01547700	1957-96	Marsh Creek at Blanchard	44.1	26.7	59.4	---	.63	1.17
01547800	1971-81	South Fork Beech Creek near Snow Shoe	12.2	15.9	24.2	1.55	1.74	2.16
01547950	1970-96	Beech Creek at Monument	152	173	274	14.0	15.9	20.7
01548005	1911-70	Bald Eagle Creek near Beech Creek Station	562	431	770	106	115	125
01548005	1972-95	Bald Eagle Creek near Beech Creek Station	562	571	937	148	157	185
01548500	1919-95	Pine Creek at Cedar Run	604	398	843	20.8	23.8	32.8
01549000	1910-20	Pine Creek near Waterville	750	571	1170	26.0	32.8	46.3
01549500	1942-95	Blockhouse Creek near English Center	37.7	27.3	59.2	.67	.74	1.35
01549700	1962-95	Pine Creek below Little Pine Creek near Waterville	944	682	1,430	34.5	37.9	52.0
01550000	1915-95	Lycoming Creek near Trout Run	173	141	286	6.53	7.63	11.4
01551000	1941-53	Grafius Run at Williamsport	3.14	1.50	4.12	---	.01	.05
01551500	1897-1955	West Branch Susquehanna River at Williamsport	5,682	4,770	8,910	403	443	529
01551500	1958-95	West Branch Susquehanna River at Williamsport	5,682	5,440	9,160	516	584	698
01552000	[1]1927-95	Loyalsock Creek at Loyalsockville	443	403	764	20.5	22.3	29.2
01552500	1942-95	Muncy Creek near Sonestown	23.8	25.8	48.8	.92	1.15	1.77
01553130	1969-81	Sand Spring Run near White Deer	4.93	6.40	9.20	1.01	1.08	1.27
01553500	1941-55	West Branch Susquehanna River at Lewisburg	6,847	5,440	11,100	624	672	759
01553500	1962-95	West Branch Susquehanna River at Lewisburg	6,847	6,660	11,000	644	728	868
01553600	1961-78	East Branch Chillisquaque Creek near Washingtonville	9.48	3.30	12.4	---	.05	.06
01553700	1981-95	Chillisquaque Creek at Washingtonville	51.3	37.4	72.6	9.66	12.4	14.5
01554000	1981-95	Susquehanna River at Sunbury	18,300	16,600	26,800	1,930	2,150	2,560
01554500	1941-93	Shamokin Creek near Shamokin	54.2	69.8	85.3	16.2	22.0	25.9
01555000	1931-95	Penns Creek at Penns Creek	301	261	441	32.8	37.3	43.5
01555500	1931-95	East Mahantango Creek near Dalmatia	162	121	225	4.65	6.30	9.25

Appendix 1. *Low-flow statistics for gaged Pennsylvania streams*—Continued

U.S. Geological Survey streamflow-gaging station number	Period of record (climatic year)	Station name	Drainage area (mi^2)	Median streamflow (ft^3/s)	Mean streamflow (ft^3/s)	1-day, 10-year low-flow statistic (ft^3/s)	7-day, 10-year low-flow statistic (ft^3/s)	30-day, 10-year low-flow statistic (ft^3/s)
01556000	1918-95	Frankstown Branch Juniata River at Williamsburg	291	205	395	42.6	47.2	54.4
01556500	1947-62	Little Juniata River at Tipton	93.7	81.6	148	10.1	11.4	12.9
01557500	1946-96	Bald Eagle Creek at Tyrone	44.1	42.2	76.7	2.80	3.14	4.23
01558000	1940-95	Little Juniata River at Spruce Creek	220	222	377	61.9	64.2	68.2
01559000	1943-95	Juniata River at Huntingdon	816	657	1,100	100	176	197
01559500	1931-58	Standing Stone Creek near Huntingdon	128	74.9	147	9.34	10.4	12.5
01559700	1963-78	Sulphur Springs Creek near Manns Choice	5.28	2.00	5.52	---	.10	.12
01560000	1941-96	Dunning Creek at Belden	172	99.6	231	8.33	9.28	11.9
01561000	1931-58	Brush Creek at Gapsville	36.8	21.3	44.9	.39	.52	.82
01562000	1913-96	Raystown Branch Juniata River at Saxton	756	426	918	65.2	68.5	78.1
01562500	1931-57	Great Trough Creek near Marklesburg	84.6	43.2	94.8	1.06	1.57	2.30
01563000	1948-71	Raystown Branch Juniata River near Huntingdon	957	459	1,060	10.6	27.4	63.9
01563200	1973-95	Raystown Branch Juniata River below Raystown Dam near Huntingdon	960	506	1,180	---	77.5	94.4
01563500	1939-71	Juniata River at Mapleton Depot	2,030	1,210	2,320	152	241	276
01563500	1974-96	Juniata River at Mapleton Depot	2,030	1,600	2,700	406	423	453
01564500	1940-95	Aughwick Creek near Three Springs	205	100	244	3.52	4.23	6.36
01565000	[1]1941-85	Kishacoquillas Creek at Reedsville	164	118	206	17.4	18.5	20.1
01565700	1965-81	Little Lost Creek at Oakland Mills	6.52	3.90	7.59	.37	.39	.54
01566000	1913-58	Tuscarora Creek near Port Royal	214	117	258	4.39	8.64	12.8
01566500	1932-58	Cocolamus Creek near Millertown	57.2	34.6	78.4	1.66	2.39	3.17
01567000	1901-71	Juniata River at Newport	3,354	2,310	4,190	310	367	437
01567000	1974-96	Juniata River at Newport	3,354	2,730	4,456	523	543	603
01567500	1955-96	Bixler Run near Loysville	15	9.70	19.3	2.25	2.39	2.65
01568000	1931-95	Sherman Creek at Shermans Dale	200	141	288	12.8	16.0	19.8
01568500	1942-96	Clark Creek near Carsonville	22.5	6.50	20.0	1.82	2.31	2.71
01569800	1978-96	Letort Spring Run near Carlisle	21.6	38.4	42.7	19.5	20.2	21.1
01570000	[1]1913-58	Conodoguinet Creek near Hogestown	470	340	567	53.8	62.3	75.6
01570500	1892-1978	Susquehanna River at Harrisburg	24,100	20,200	34,300	2,390	2,530	2,950
01570500	1981-96	Susquehanna River at Harrisburg	24,100	20,600	33,200	3,050	3,210	3,580

Appendix 1. *Low-flow statistics for gaged Pennsylvania streams—Continued*

U.S. Geological Survey streamflow-gaging station number	Period of record (climatic year)	Station name	Drainage area (mi^2)	Median streamflow (ft^3/s)	Mean streamflow (ft^3/s)	1-day, 10-year low-flow statistic (ft^3/s)	7-day, 10-year low-flow statistic (ft^3/s)	30-day, 10-year low-flow statistic (ft^3/s)
01571000	[1]1941-95	Paxton Creek near Penbrook	11.2	6.80	14.5	.12	.15	.31
01571500	[1]1911-93	Yellow Breeches Creek near Camp Hill	216	215	289	81.7	87.0	94.2
01572000	[1]1921-84	Lower Little Swatara Creek at Pine Grove	34.3	31.1	56.9	2.13	2.31	3.05
01573000	1920-96	Swatara Creek at Harper Tavern	337	318	574	17.8	22.1	31.0
01573086	1965-81	Beck Creek near Cleona	7.87	6.60	8.53	.52	.59	.83
01573160	1977-94	Quittapahilla Creek near Bellegrove	74.2	85.8	104	26.5	29.4	33.0
01573500	1939-58	Manda Creek at Manada Gap	13.5	14.2	23.3	1.27	1.44	1.77
01573560	1977-96	Swatara Creek near Hershey	483	445	788	60.5	67.7	83.3
01574000	1930-95	West Conewago Creek near Manchester	510	250	597	7.58	10.8	17.1
01574500	1967-95	Codorus Creek at Spring Grove	75.5	56.4	82.9	7.60	19.5	24.7
01575500	1942-95	Codorus Creek near York	222	131	220	11.5	17.9	22.8
01576000	1933-96	Susquehanna River at Marietta	25,990	21,900	37,200	2,380	2,710	3,280
01576085	1983-93	Little Conestoga Creek near Churchtown	5.82	3.80	6.96	.50	.58	.81
01576500	[1]1930-95	Conestoga River at Lancaster	324	258	399	28.0	39.9	50.4
01576754	1985-95	Conestoga River at Conestoga	470	454	616	92.4	107	146
01578400	1964-81	Bowery Run near Quarryville	5.98	5.50	8.11	1.44	1.51	1.93
01603500	1934-82	Evitts Creek near Centerville	30.2	15.7	32.4	1.71	1.83	2.18
01613500	1931-41	Licking Creek near Sylvan	158	67.6	174	5.45	6.32	7.96
01614090	1962-81	Conococheague Creek near Fayetteville	5.05	4.50	7.26	.19	.26	.36
03007800	1976-96	Allegheny River at Port Allegany	248	260	468	16.6	19.5	25.0
03008000	1967-78	Newell Creek near Port Allegany	7.79	6.00	12.4	.06	.13	.22
03009680	1976-95	Potato Creek at Smethport	160	184	309	11.2	13.4	17.2
03010000	1927-39	Allegheny River at Larabee	530	422	826	----	13.4	25.3
03010500	1941-96	Allegheny River at Eldred	550	519	957	28.1	31.0	41.4
03010655	1976-96	Oswayo Creek at Shinglehouse	98.7	89.3	161	4.88	5.89	7.85
03011800	1967-95	Kinzua Creek near Guffey	46.4	50.7	79.8	4.82	5.26	6.74
03015000	1941-96	Conewango Creek at Russell	816	1,010	1,540	73.8	78.1	91.2
03015280	1963-78	Jackson Run near North Warren	12.8	12.9	23.4	.72	.88	1.27
03015500	1911-96	Brokenstraw Creek at Youngsville	321	305	595	31.5	33.8	40.1

Appendix 1. *Low-flow statistics for gaged Pennsylvania streams—Continued*

U.S. Geological Survey streamflow-gaging station number	Period of record (climatic year)	Station name	Drainage area (mi^2)	Median streamflow (ft^3/s)	Mean streamflow (ft^3/s)	1-day, 10-year low-flow statistic (ft^3/s)	7-day, 10-year low-flow statistic (ft^3/s)	30-day, 10-year low-flow statistic (ft^3/s)
03016000	1943-96	Allegheny River at West Hickory	3,660	4,330	6,720	367	394	472
03017500	1940-79	Tionesta Creek at Lynch	233	245	430	14.6	16.4	22.1
03019000	1924-40	Tionesta Creek at Nebraska	469	390	815	20.2	24.6	35.8
03020000	1941-91	Tionesta Creek at Tionesta Dam	479	531	900	---	---	40.8
03020500	1934-96	Oil Creek at Rouseville	300	294	544	28.0	30.6	37.7
03021000	1911-32	Oil Creek near Rouseville	315	242	515	26.2	33.7	40.8
03021350	1976-96	French Creek near Wattsburg	92	106	220	4.37	5.11	8.62
03021410	1976-94	West Branch French Creek near Lowville	52.3	59.7	131	2.24	2.69	4.74
03021700	1962-78	Little Conneautee Creek near McKean	3.6	2.30	7.61	---	.01	.03
03022500	1923-39	French Creek at Saegerstown	629	506	1,060	27.0	31.0	38.8
03022540	1976-96	Woodcock Creek at Blooming Valley	31.1	30.2	55.3	2.05	2.32	3.36
03023000	1912-38	Cussewago Creek near Meadville	90.2	45.5	128	.31	.42	.95
03023500	1910-25	French Creek at Carlton	998	845	1,750	68.5	72.3	97.8
03024000	1934-70	French Creek at Utica	1,028	907	1,730	58.1	62.0	78.2
03024000	1973-96	French Creek at Utica	1,028	1,380	2,020	86.6	95.7	117
03025000	1934-79	Sugar Creek at Sugarcreek	166	144	273	14.5	16.6	20.0
03025200	1966-78	Patchel Run near Franklin	5.69	5.50	8.68	.58	.63	.89
03026500	1953-96	Sevenmile Run near Rasselas	7.84	8.20	14.7	.17	.22	.36
03027500	1954-91	East Branch Clarion River at East Branch Clarion River Dam	73.2	108	138	---	15.7	19.9
03028000	1955-96	West Branch Clarion River at Wilcox	63	75.4	128	5.93	6.67	8.42
03028500	1954-94	Clarion River at Johnsonburg	204	258	384	55.4	65.3	78.7
03029000	1942-51	Clarion River at Ridgway	303	313	603	17.7	25.3	31.6
03029400	1961-78	Toms Run at Cooksburg	12.6	8.90	19.5	.44	.56	.77
03029500	1940-51	Clarion River at Cooksburg	807	802	1,470	51.8	57.4	70.8
03029500	1954-96	Clarion River at Cooksburg	807	909	1,490	143	164	187
03030500	1949-95	Clarion River near Piney	951	1,150	1,800	17.1	66.4	135
03031000	1943-53	Clarion River at St. Petersburg	1,246	1,230	2,250	38.4	55.1	72.7
03031500	1934-95	Allegheny River at Parker	7,671	8,820	13,800	649	772	971
03031950	1965-81	Big Run near Sprankle Mills	7.38	7.00	13.2	.27	.41	.73

Appendix 1. *Low-flow statistics for gaged Pennsylvania streams—Continued*

U.S. Geological Survey streamflow-gaging station number	Period of record (climatic year)	Station name	Drainage area (mi^2)	Median streamflow (ft^3/s)	Mean streamflow (ft^3/s)	1-day, 10-year low-flow statistic (ft^3/s)	7-day, 10-year low-flow statistic (ft^3/s)	30-day, 10-year low-flow statistic (ft^3/s)
03032500	1920-95	Redbank Creek at St. Charles	528	462	877	28.5	33.8	45.4
03034000	1940-96	Mahoning Creek at Punxsutawney	158	154	278	16.2	17.4	20.5
03034500	1941-96	Little Mahoning Creek at McCormick	87.4	74.3	153	1.37	1.74	3.62
03035000	1922-40	Mahoning Creek at Dayton	321	259	557	11.9	16.2	23.5
03036000	1940-91	Mahoning Creek at Mahoning Creek Dam	344	311	604	12.2	14.2	27.5
03038000	1939-67	Crooked Creek at Idaho	191	116	276	3.45	5.41	7.56
03038000	1970-95	Crooked Creek at Idaho	191	148	310	16.2	20.5	23.4
03039000	1920-91	Crooked Creek at Crooked Creek Dam	278	176	416	2.43	4.21	8.17
03039200	1966-78	Clear Run near Buckstown	3.68	3.30	6.12	---	.07	.15
03040000[1]	1915-36	Stonycreek River at Ferndale	451	353	715	15.4	18.4	24.8
03040000[2]	1940-95	Stonycreek River at Ferndale	451	326	664	14.2	15.8	22.1
03041000	1940-95	Little Conemaugh River at East Conemaugh	183	167	310	6.80	8.61	11.6
03041500	1940-96	Conemaugh River at Seward	715	732	1,290	166	178	196
03042000	1953-96	Blacklick Creek at Josephine	192	213	368	25.2	28.1	33.8
03042200	1962-88	Little Yellow Creek near Strongstown	7.36	6.60	13.4	.22	.26	.37
03042280	1973-95	Yellow Creek near Homer City	57.4	60.1	106	---	7.13	7.91
03042500	1953-67	Two Lick Creek at Graceton	171	121	258	9.33	11.5	13.1
03042500	1970-96	Two Lick Creek at Graceton	171	183	298	33.3	37.7	44.2
03043000	1906-51	Blacklick Creek at Blacklick	390	337	669	16.8	20.0	28.7
03044000	1941-51	Conemaugh River at Tunnelton	1,358	1,390	2,410	266	277	293
03044000	1952-91	Conemaugh River at Tunnelton	1,358	1,450	---	---	226	285
03045000	1941-95	Loyalhanna Creek at Kingston	172	163	299	1.96	2.90	5.94
03045500	[1]1921-40	Loyalhanna Creek at New Alexandria	265	217	428	11.6	17.0	23.2
03047000	1944-91	Loyalhanna Creek at Loyalhanna Dam	292	257	494	2.29	9.36	28.6
03047500	1909-37	Kiskiminetas River at Avonmore	1,723	1,620	2,960	107	154	190
03048500	1939-96	Kiskiminetas River at Vandergrift	1,825	1,830	3,080	185	241	306
03049000	1942-96	Buffalo Creek near Freeport	137	95.2	194	3.05	3.65	5.46
03049500	1940-96	Allegheny River at Natrona	11,410	13,100	19,700	1,190	1,360	1,640
03049800	1964-96	Little Pine Creek near Etna	5.78	2.80	6.12	---	.05	.11

Appendix 1. *Low-flow statistics for gaged Pennsylvania streams—Continued*

U.S. Geological Survey streamflow-gaging station number	Period of record (climatic year)	Station name	Drainage area (mi^2)	Median streamflow (ft^3/s)	Mean streamflow (ft^3/s)	1-day, 10-year low-flow statistic (ft^3/s)	7-day, 10-year low-flow statistic (ft^3/s)	30-day, 10-year low-flow statistic (ft^3/s)
03063000	1938-55	Monongahela River at Point Marion	2,720	2,430	4,580	235	290	389
03070420	1979-95	Stony Fork Tributary near Gibbon Glade	.93	.890	1.79	---	.02	.04
03072000	1942-96	Dunkard Creek at Shannopin	229	98.1	279	1.22	1.63	2.59
03072500	1940-95	Monongahela River at Greensboro	4,407	4,690	8,310	285	463	594
03072590	1965-78	Georges Creek at Smithfield	16.3	8.40	19.4	---	.13	.29
03072840	1969-79	Tenmile Creek near Clarksville	133	74.6	156	1.86	2.71	4.89
03073000	1933-95	South Fork Tenmile Creek at Jefferson	180	66.6	200	.30	.38	.94
03074300	1968-78	Lick Run at Hopwood	3.8	3.30	7.04	---	.06	.20
03074500	1944-96	Redstone Creek at Waltersburg	73.7	61.8	103	8.07	9.75	12.8
03075070	1935-95	Monongahela River at Elizabeth	5,340	5140	9,190	350	494	669
03077500	1941-91	Youghiogheny River at Youghiogheny River Dam	436	666	893	22.0	33.4	130
03078500	1934-70	Big Piney Run near Salisbury	24.5	15.3	36.8	.11	.13	.25
03079000	1922-96	Casselman Creek at Markleton	382	341	663	15.7	17.6	24.12
03080000	1920-95	Laurel Hill Creek at Ursina	121	149	268	4.15	5.23	8.54
03081000	1942-95	Youghiogheny River below Confluence	1,029	1,280	2,010	227	269	351
03082200	1963-78	Poplar Run near Normalville	9.27	9.10	19.1	---	.05	.18
03082500	1910-24	Youghiogheny River at Connellsville	1,326	1,390	2,630	23.0	31.1	53.9
03082500	1927-96	Youghiogheny River at Connellsville	1,326	1,650	2,620	148	209	282
03083000	1943-79	Green Lick Run at Green Lick Reservoir	3.07	2.70	5.62	.07	.08	.13
03083500	1928-95	Youghiogheny River at Sutersville	1,715	1,970	3,130	247	316	402
03084000	1950-93	Abers Creek near Murrysville	4.39	2.60	5.38	---	.09	.19
03084500	1922-52	Turtle Creek at Trafford	55.9	32.5	76.7	.43	.66	1.53
03085000	1940-95	Monongahela River at Braddock	7,337	7,720	12,500	1,030	1,200	1,420
03085500	[1]1921-95	Chartiers Creek at Carnegie	257	162	291	25.2	29.2	34.6
03086000	1935-95	Ohio River at Sewickley	19,500	22,700	33,350	2,660	2,900	3,500
03086100	1968-78	Big Sewickley Creek near Ambridge	15.6	7.60	17.3	---	.09	.13
03100000	1913-22	Shenango River near Turnersville	152	79.1	200	3.12	3.56	5.20
03101000	1935-55	Sugar Run at Pymatuning Dam	9.34	2.50	10.7	.01	.01	.01
03101500	1936-96	Shenango River at Pymatuning Dam	167	140	208	1.71	2.90	7.21

Appendix 1. *Low-flow statistics for gaged Pennsylvania streams—Continued*

U.S. Geological Survey streamflow-gaging station number	Period of record (climatic year)	Station name	Drainage area (mi^2)	Median streamflow (ft^3/s)	Mean streamflow (ft^3/s)	1-day, 10-year low-flow statistic (ft^3/s)	7-day, 10-year low-flow statistic (ft^3/s)	30-day, 10-year low-flow statistic (ft^3/s)
03102000	1921-32	Shenango River near Jamestown	181	98.4	230	2.64	3.47	4.30
03102500	1915-94	Little Shenango River at Greenville	104	66.3	144	5.03	5.77	7.32
03102850	1967-96	Shenango River near Transfer	337	293	477	44.3	52.0	66.4
03103000	1915-63	Pymatuning Creek near Orangeville	169	64.6	203	1.20	1.78	2.95
03103500	1939-91	Shenango River at Sharpsville	584	384	767	81.3	94.8	124
03104000	1912-32	Shenango River at Sharon	608	308	715	13.0	14.7	19.6
03104500	1914-32	Shenango River at New Castle	792	393	869	12.5	16.3	24.0
03104760	1970-81	Harthegig Run near Greenfield	2.26	.820	3.26	.03	.05	.07
03105500	1934-96	Beaver River at Wampum	2,235	1,440	2,560	284	308	373
03106000	1921-96	Connoquenessing Creek near Zelienople	356	212	464	9.51	11.3	15.7
03106300	1971-93	Muddy Creek near Portersville	51.2	44.2	76.0	1.16	1.74	2.46
03106500	1913-68	Slippery Rock Creek at Wurtemburg	398	249	549	25.4	30.2	38.6
03106500	1971-96	Slippery Rock Creek at Wurtemburg	398	383	624	47.9	52.0	66.0
03107500	1958-96	Beaver River at Beaver Falls	3,106	2,380	3,810	510	560	647
03108000	1959-96	Raccoon Creek at Moffatts Mill	178	96.6	189	7.38	8.25	11.0

[1] Period of record not continuous.

Appendix 2. *Flood-flow statistics for gaged Pennsylvania streams*

[Flood-flow statistics computed from Log-Pearson distribution of streamflow data; mi^2, square miles; ft^3/s, cubic feet per second; ---, statistic was not calculated; water year, 12-month period October 1 - September 30]

U.S. Geological Survey streamflow-gaging station number	Period of record (water year)	Station name	Drainage area (mi^2)	10-year flood flow (ft^3/s)	25-year flood flow (ft^3/s)	50-year flood flow (ft^3/s)	100-year flood flow (ft^3/s)	500-year flood flow (ft^3/s)
01428750	1975-96	West Branch Lackawaxen River near Aldenville	40.6	3,500	4,260	4,850	5,440	6,900
01429000	1945-60	West Branch Lackawaxen River at Prompton	59.7	4,820	6,010	6,990	8,030	10,800
01429500	1944-59	Dyberry Creek near Honesdale	64.6	8,540	12,600	16,600	21,500	37,500
01430000	1949-59	Lackawaxen River near Honesdale	164	12,900	17,100	20,700	25,000	37,200
01430500	1922-38	Lackawaxen River at West Hawley	206	11,200	14,900	18,000	21,500	31,600
01431000	1945-85	Middle Creek near Hawley	78.4	5,510	7,530	9,260	11,200	16,600
01431500	[1]1909-96	Lackawaxen River at Hawley	290	14,300	19,500	24,200	29,600	45,900
01439500	1909-96	Bush Kill at Shoemakers	117	4,310	6,200	8,010	10,300	17,700
01440200	1965-96	Delaware River below Tocks Island Damsite, near Delaware Water Gap	3,850	103,000	124,000	139,000	154,000	188,000
01440400	1957-96	Brodhead Creek at Analomink	65.9	6,480	8,930	11,000	13,300	19,800
01441000	1911-38	McMichaels Creek at Stroudsburg	65.3	2,660	3,290	3,770	4,260	5,480
01442500	1951-96	Brodhead Creek at Minisink Hills	259	20,100	29,500	38,600	49,700	86,600
01446600	1961-76	Martins Creek neat East Bangor	10.4	1,130	1,640	2,120	2,700	4,520
01447500	1944-96	Lehigh River at Stoddardtsville	91.7	6,180	9,690	13,200	17,700	33,400
01447680	1965-96	Tunkhannock Creek near Long Pond	18.0	565	682	771	861	1,080
01447720	1962-96	Tobyhanna Creek near Blakeslee	118	7,060	9,690	11,900	14,300	20,800
01448000	1917-59	Lehigh River at Tannery	322	17,500	26,800	36,000	47,700	88,200
01448500	1949-95	Dilldown Creek near Long Pond	2.93	312	434	540	660	997
01449360	1967-96	Pohopoco Creek at Kresgeville	49.9	1,860	2,280	2,600	2,930	3,720
01449500	1941-58	Wild Creek at Hatchery	16.8	1,550	2,420	3,280	4,340	7,870
01450500	1940-96	Aquashicola Creek at Palmerton	76.7	5,100	7,190	9,080	11,300	18,000
01451000	1947-60	Lehigh River at Walnutport	889	49,000	69,100	87,400	109,000	176,000
01451500	1946-95	Little Lehigh Creek near Allentown	80.8	4,760	8,000	11,200	15,500	30,200
01451800	1967-95	Jordan Creek near Schnecksville	53	4,770	6,570	8,160	9,960	15,200
01452000	1945-95	Jordan Creek at Allentown	75.8	6,560	9,530	12,300	15,600	26,100
01452500	1949-95	Monocacy Creek at Bethlehem	44.5	1,540	2,380	3,200	4,220	7,600
01453000	1910-60	Lehigh River at Bethlehem	1,279	51,200	72,200	91,300	114,000	182,000
01460000	[1]1884-1913	Tohickon Creek at Point Pleasant	107	6,810	8,800	10,500	12,500	18,400
01465000	[1]1885-1912	Neshaminy Creek at Rushland	134	7,310	9,080	10,500	12,200	16,600

Appendix 2. *Flood-flow statistics for gaged Pennsylvania streams—Continued*

U.S. Geological Survey streamflow-gaging station number	Period of record (water year)	Station name	Drainage area (mi^2)	10-year flood flow (ft^3/s)	25-year flood flow (ft^3/s)	50-year flood flow (ft^3/s)	100-year flood flow (ft^3/s)	500-year flood flow (ft^3/s)
01465500	1935-95	Neshaminy Creek near Langhorne	210	20,000	26,600	32,200	38,500	56,600
01465770	1965-81	Poquessing Creek at Trevose Road, Philadelphia	5.08	1,320	1,710	2,040	2,430	3,520
01465785	1965-78	Walton Run at Philadelphia	2.17	1,120	1,380	1,590	1,820	2,430
01465790	1966-78	Byberry Creek at Chalfont Road, Philadelphia	5.34	1,420	1,790	2,110	2,450	3,390
01465798	1966-96	Poquessing Creek at Grant Avenue, Philadelphia	21.4	5,350	7,560	9,000	10,600	14,900
01467042	1965-81	Pennypack Creek at Pine Road, Philadelphia	37.9	4,270	5,200	5,940	6,720	8,700
01467048	1966-95	Pennypack Creek at Lower Rhawn Street Bridge, Philadelphia	49.8	5,960	7,480	8,700	10,000	13,500
01467050	1965-81	Wooden Bridge Run at Philadelphia	3.35	1,660	2,150	2,570	3,030	4,320
01467086	1966-86	Tacony Creek above Adams Avenue, Philadelphia	16.6	4,080	5,000	5,700	6,410	8,160
01467087	1982-95	Frankford Creek at Castor Avenue, Philadelphia	30.4	10,200	12,400	14,000	15,700	19,800
01467089	1966-81	Frankford Creek at Torresdale Avenue, Philadelphia	33.8	9,670	11,200	12,300	13,400	16,000
01467500	[1]1948-94	Schuylkill River at Pottsville	53.4	3,460	4,890	6,140	7,580	11,700
01468500	1973-96	Schuylkill River at Landingville	133	6,720	9,200	11,400	14,000	21,800
01469500	1920-96	Little Schuylkill River at Tamaqua	42.9	3,300	4,390	5,270	6,200	8,530
01470500	1948-95	Schuylkill River at Berne	355	21,800	28,700	34,500	40,800	58,200
01470720	1962-80	Maiden Creek Tributary at Lenhartsville	7.46	1,320	1,980	2,600	3,340	5,640
01470756	1973-95	Maiden Creek at Virginville	159	9,660	13,100	16,300	19,900	30,900
01470779	1975-96	Tulpehocken Creek near Bernville	66.5	5,080	7,440	9,570	12,000	19,400
01470853	1983-95	Furnace Creek at Robesonia	4.18	498	646	766	894	1,230
01470960	1965-78	Tulpehocken Creek at Blue Marsh Damsite near Reading	175	11,000	16,300	21,100	26,800	44,000
01471000	1951-78	Tulpehocken Creek near Reading	211	9,340	12,200	14,600	17,200	24,600
01471510	[1]1902-95	Schuylkill River at Reading	880	37,000	47,100	55,300	63,900	86,300
01471980	1975-95	Manatawny Creek near Pottstown	85.5	5,620	7,200	8,510	9,920	13,700
01472000	1928-95	Schuylkill River at Pottstown	1,147	38,900	50,500	60,100	70,700	99,600
01472157	1969-95	French Creek near Phoenixville	59.1	5,720	8,600	11,400	14,800	26,200
01472198	1981-96	Perkiomen Creek at East Greenville	38	5,370	7,320	8,980	10,800	15,920
01472199	1982-95	West Branch Perkiomen Creek at Hillegass	23	2,610	3,330	3,890	4,490	6,010
01472500	1885-1911	Perkiomen Creek near Frederick	152	7,190	8,540	9,630	10,800	13,800
01472620	1984-95	East Branch Perkiomen Creek near Dublin	4.05	1,990	2,790	3,510	4,330	6,710

Appendix 2. *Flood-flow statistics for gaged Pennsylvania streams—Continued*

U.S. Geological Survey streamflow-gaging station number	Period of record (water year)	Station name	Drainage area (mi^2)	10-year flood flow (ft^3/s)	25-year flood flow (ft^3/s)	50-year flood flow (ft^3/s)	100-year flood flow (ft^3/s)	500-year flood flow (ft^3/s)
01473000	1915-56	Perkiomen Creek at Graterford	279	28,600	37,600	44,800	52,500	71,900
01473120	1966-94	Skippack Creek near Collegeville	53.7	12,900	18,800	24,600	31,700	55,800
01473169	1983-95	Valley Creek at Pennsylvania Turnpike near Valley Forge	20.8	1,520	1,790	1,990	2,200	2,740
01474000	1966-95	Wissahickon Creek at mouth, Philadelphia	64	5,250	6,050	6,630	7,190	8,470
01474500	1932-95	Schuylkill River at Philadelphia	1,893	74,000	93,800	110,000	126,000	168,000
01475300	1972-95	Darby Creek at Waterloo Mills near Devon	5.15	1,270	1,650	1,960	2,290	3,150
01475510	1964-90	Darby Creek near Darby	37.4	4,890	6,000	6,870	7,770	10,000
01475530	1965-81	Cobbs Creeks at U.S. Highway No. 1 at Philadelphia	4.78	2,160	3,390	4,610	6,180	11,700
01475550	1964-90	Cobbs Creek at Darby	22	4,270	5,260	6,030	6,840	8,850
01475850	1977-95	Crum Creek near Newtown Square	15.8	1,680	2,070	2,380	2,700	3,510
01476500	1932-55	Ridley Creek at Moylan	31.9	2,960	4,450	5,920	7,780	14,100
01477000	1932-95	Chester Creek near Chester	61.1	6,940	10,300	13,700	17,800	31,500
01480300	1960-95	West Branch Brandywine Creek near Honey Brook	18.7	3,650	6,250	9,110	13,000	28,700
01480500	[1]1944-95	West Branch Brandywine Creek at Coatesville	45.8	4,420	6,570	8,620	11,100	19,200
01480617	1970-95	West Branch Brandywine Creek at Modena	55	5,830	8,440	10,800	13,600	22,100
01480675	1967-95	Marsh Creek near Glenmore	8.57	551	792	1,010	1,270	2,060
01480800	1958-68	East Branch Brandywine Creek at Downingtown	81.6	4,720	5,330	5,800	6,270	7,440
01481000	[1]1912-94	Brandywine Creek at Chadds Ford	287	12,800	16,700	20,100	23,800	34,100
01516350	1977-96	Tioga River near Mansfield	153	20,300	31,400	42,400	56,100	102,000
01516500	1955-96	Corey Creek near Mainesburg	12.2	2,160	3,320	4,450	5,870	10,600
01517000	1955-78	Elk Run near Mainesburg	10.2	1,440	2,100	2,740	3,520	6,040
01518000	1939-77	Tioga River at Tioga	282	25,500	37,700	49,000	62,700	106,000
01518500	1954-74	Crooked Creek at Tioga	122	8,560	12,200	15,600	19,700	32,700
01518862	1984-96	Cowanesque River at Westfield	90.6	10,700	15,500	19,800	24,500	38,000
01520000	1952-78	Cowanesque River near Lawrenceville	298	24,100	33,800	42,600	52,800	83,400
01531500	[1]1893-1996	Susquehanna River at Towanda	7,797	166,000	202,000	230,000	260,000	334,000
01532000	1914-96	Towanda Creek near Monroetown	215	24,400	36,100	47,200	60,700	104,000
01532850	1960-79	Middle Branch Wyalusing Creek Tributary near Birchardsville	5.67	1,020	1,430	1,770	2,150	3,190
01533400	1977-96	Susquehanna River at Meshoppen	8,720	181,000	225,000	259,000	296,000	391,000

Appendix 2. *Flood-flow statistics for gaged Pennsylvania streams—Continued*

U.S. Geological Survey streamflow-gaging station number	Period of record (water year)	Station name	Drainage area (mi^2)	10-year flood flow (ft^3/s)	25-year flood flow (ft^3/s)	50-year flood flow (ft^3/s)	100-year flood flow (ft^3/s)	500-year flood flow (ft^3/s)
01533500	1941-58	North Branch Mehoopany Creek near Lovelton	35.2	6,640	10,700	14,800	20,000	37,500
01533950	1961-78	South Branch Tunkhannock Creek near Montdale	12.6	1,530	1,970	2,320	2,700	3,660
01534000	1914-96	Tunkhannock Creek near Tunkhannock	383	24,100	29,500	33,500	37,400	46,300
01534300	1958-96	Lackawanna River near Forest City	38.8	1,090	1,250	1,370	1,480	1,740
01534500	1940-59	Lackawanna River at Archbald	108	5,840	7,540	9,000	10,600	15,300
01535500	1914-28	Lackawanna River at Moosic	264	9,800	12,800	15,300	17,900	24,800
01536000	1960-96	Lackawanna River at Old Forge	332	12,800	17,100	20,700	24,600	35,200
01536500	1891-1996	Susquehanna River at Wilkes-Barre	9,960	191,000	229,000	259,000	289,000	364,000
01537500	1940-90	Solomon Creek at Wilkes-Barre	15.7	1,360	1,950	2,470	3,070	4,750
01538000	1920-96	Wapwallopen Creek near Wapwallopen	43.8	2,510	3,350	4,050	4,810	6,870
01539000	1939-96	Fishing Creek near Bloomsburg	274	17,300	23,600	28,900	34,900	51,900
01539500	1941-58	Little Fishing Creek at Eyers Grove	56.5	3,150	3,700	4,100	4,510	5,470
01540000	1914-31	Fishing Creek at Bloomsburg	355	22,400	28,400	33,000	37,800	49,300
01540200	1959-79	Trexler Run near Ringtown	1.77	189	320	457	638	1,290
01540500	1900-96	Susquehanna River at Danville	11,220	202,000	242,000	272,000	304,000	381,000
01541000	1913-96	West Branch Susquehanna River at Bower	315	14,000	17,900	21,200	24,900	35,100
01541200	1956-67	West Branch Susquehanna River at Curwensville	367	14,500	17,700	20,200	22,700	28,600
01541308	1968-79	Bradley Run near Ashville	6.77	585	764	912	1,070	1,510
01541500	1914-60	Clearfield Creek at Dimeling	371	13,500	16,700	19,200	21,800	28,600
01542000	1941-93	Moshannon Creek at Oceola Mills	68.8	2,430	3,110	3,670	4,270	5,850
01542500	1940-60	West Branch Susquehanna River at Karthaus	1,462	45,600	54,500	61,100	67,600	83,000
01542810	1964-96	Waldy Run near Emporium	5.24	417	569	702	845	1,300
01543000	1914-96	Driftwood Branch Sinnemahoning Creek near Sinnemahoning	272	18,700	25,900	32,300	39,700	61,100
01543500	1939-96	Sinnemahoning Creek at Sinnemahoning	685	34,800	46,400	56,300	67,400	98,500
01544500	1941-96	Kettle Creek at Cross Fork	136	7,790	10,800	13,400	16,400	25,400
01545500	[1]1896-1996	West Branch Susquehanna River at Renovo	2,975	99,500	129,000	153,000	180,000	254,000
01545600	1965-96	Young Womans Creek near Renovo	46.2	2,430	3,700	4,920	6,430	11,400
01546000	1911-28	North Bald Eagle Creek at Milesburg	119	13,000	16,900	20,200	23,800	33,700
01546400	1985-96	Spring Creek at Houserville	58.5	1,170	1,680	2,170	2,750	4,610

Appendix 2. *Flood-flow statistics for gaged Pennsylvania streams—Continued*

U.S. Geological Survey streamflow-gaging station number	Period of record (water year)	Station name	Drainage area (mi^2)	10-year flood flow (ft^3/s)	25-year flood flow (ft^3/s)	50-year flood flow (ft^3/s)	100-year flood flow (ft^3/s)	500-year flood flow (ft^3/s)
01546500	1941-96	Spring Creek near Axemann	87.2	1,940	3,050	4,170	5,630	10,800
01547100	1967-96	Spring Creek at Milesburg	142	3,270	4,900	6,450	8,350	14,500
01547200	1957-96	Bald Eagle Creek below Spring Creek at Milesburg	265	11,100	15,200	18,800	22,800	34,600
01547500	1955-69	Bald Eagle Creek at Blanchard	339	7,560	9,350	10,800	12,200	15,800
01547700	1956-96	Marsh Creek at Blanchard	44.1	3,100	4,640	6,120	7,940	13,900
01547800	1959-81	South Fork Beech Creek near Snow Shoe	12.2	687	947	1,180	1,440	2,220
01547950	1968-96	Beech Creek at Monument	152	5,430	7,300	8,910	10,700	15,700
01548000	1911-65	Bald Eagle Creek at Beech Creek Station	562	17,100	20,600	23,400	26,100	32,500
01548500	1919-96	Pine Creek at Cedar Run	604	25,800	35,600	44,300	54,300	84,200
01549000	1909-20	Pine Creek near Waterville	750	34,400	40,700	45,200	49,600	59,300
01549500	1941-96	Blockhouse Creek near English Center	37.7	3,890	5,320	6,560	7,960	12,000
01549700	1958-96	Pine Creek below Little Pine Creek near Waterville	944	42,800	58,700	72,700	88,600	135,000
01549780	1960-78	Larrys Creek at Cogan House	6.8	572	814	1,040	1,300	2,110
01550000	1914-96	Lycoming Creek near Trout Run	173	14,100	19,200	23,700	28,800	43,300
01551000	1940-53	Grafius Run at Williamsport	3.14	711	997	1,240	1,500	2,190
01551500	1895-1961	West Branch Susquehanna River at Williamsport	5,682	162,000	195,000	221,000	247,000	309,000
01552000	[1]1926-96	Loyalsock Creek at Loyalsock	443	44,400	61,900	77,200	94,500	144,000
01552500	1941-96	Muncy Creek near Sonestown	23.8	4,190	6,000	7,660	9,600	15,500
01553130	1968-81	Sand Spring Run near White Deer	4.93	587	1,010	1,440	2,000	3,990
01553500	1940-61	West Branch Susquehanna River at Lewisburg	6,847	181,000	221,000	253,000	286,000	373,000
01553600	1960-78	East Branch Chillisquaque Creek near Washingtonville	9.48	2,220	3,400	4,550	5,970	10,700
01553700	1980-96	Chillisquaque Creek at Washingtonville	51.3	3,480	4,100	4,560	5,030	6,150
01554000	1919-95	Susquehanna River at Sunbury	18,300	343,000	429,000	500,000	577,000	786,000
01554500	1940-93	Shamokin Creek near Shamokin	54.2	1,850	2,550	3,190	3,940	6,260
01555000	1930-95	Penns Creek at Penns Creek	301	11,600	16,100	20,000	24,500	37,600
01555500	1930-95	East Mahantango Creek near Dalmatia	162	10,700	16,200	21,800	28,900	53,900
01556000	1917-95	Frankstown Branch Juniata River at Williamsport	291	11,900	15,200	17,800	20,500	27,600
01556500	1946-81	Little Juniata River at Tipton	93.7	5,030	6,450	7,580	8,780	11,800
01557500	1940-95	Bald Eagle Creek at Tyrone	44.1	2,890	3,800	4,540	5,350	7,500

Appendix 2. *Flood-flow statistics for gaged Pennsylvania streams—Continued*

U.S. Geological Survey streamflow-gaging station number	Period of record (water year)	Station name	Drainage area (mi^2)	10-year flood flow (ft^3/s)	25-year flood flow (ft^3/s)	50-year flood flow (ft^3/s)	100-year flood flow (ft^3/s)	500-year flood flow (ft^3/s)
01558000	1939-95	Little Juniata River at Spruce Creek	220	10,600	14,600	18,300	22,600	35,600
01559000	[1]1896-1991	Juniata River at Huntingdon	816	27,700	37,900	47,000	57,500	89,000
01559500	1930-58	Standing Stone Creek near Huntingdon	128	4,610	5,920	7,010	8,210	11,500
01559700	1962-78	Sulphur Springs Creek near Manns Choice	5.28	773	1,130	1,470	1,860	3,040
01560000	1940-95	Dunning Creek at Belden	172	8,050	10,600	12,800	15,300	22,100
01561000	1930-58	Brush Creek at Gapsville	36.8	2,610	4,110	5,620	7,540	14,200
01562000	1912-95	Raystown Branch Juniata River at Saxton	756	27,000	34,500	40,400	46,600	62,500
01562500	1930-57	Great Trough Creek near Marklesburg	84.6	3,610	5,020	6,290	7,770	12,200
01563000	1946-71	Raystown Branch Juniata River near Huntingdon	957	23,400	27,500	30,300	33,000	38,800
01563500	1938-72	Juniata River at Mapleton Depot	2,030	53,600	72,100	88,100	106,000	158,000
01564500	1939-95	Aughwick Creek near Three Springs	205	13,200	17,900	22,000	26,500	39,200
01565000	[1]1940-95	Kishacoquillas Creek at Reedsville	164	5,390	7,270	8,870	10,700	15,700
01565700	1960-81	Little Lost Creek at Oakland Mills	6.52	634	982	1,330	1,780	3,350
01566000	1912-58	Tuscarora Creek near Port Royal	214	11,300	14,400	17,000	19,800	27,200
01566500	1930-58	Cocolamus Creek near Millertown	57.2	4,610	5,810	6,740	7,700	10,000
01567000	1899-72	Juniata River at Newport	3,354	85,600	111,000	132,000	155,000	219,000
01567500	1954-95	Bixler Run near Loysville	15	2,680	4,620	6,740	9,660	21,200
01568000	[1]1927-95	Sherman Creek at Shermans Dale	200	15,700	22,400	28,500	35,800	58,100
01569800	1976-95	Letort Spring Run near Carlisle	21.6	685	1,100	1,540	2,120	4,260
01570000	[1]1929-96	Conodoguinet Creek near Hogestown	470	13,000	16,900	20,300	24,100	35,000
01570500	1891-1996	Susquehanna River at Harrisburg	24,100	441,000	551,000	641,000	740,000	1,010,000
01571000	[1]1940-94	Paxton Creek near Penbrook	11.2	2,900	3,880	4,690	5,560	7,910
01571500	[1]1910-95	Yellow Breeches Creek near Camp Hill	216	5,930	8,650	11,300	14,600	25,600
01572000	1920-32	Lower Little Swatara Creek at Pine Grove	34.3	2,700	3,750	4,700	5,820	9,210
01573000	1919-95	Swatara Creek at Harper Tavern	337	17,700	23,500	28,600	34,500	51,800
01573086	1964-81	Beck Creek near Cleona	7.87	1,320	3,150	5,710	9,990	---
01573160	1975-93	Quittapahilla Creek near Bellegrove	74.2	2,200	3,280	4,320	5,630	10,000
01573500	1938-58	Manda Creek at Manada Gap	13.5	1,790	2,810	3,820	5,080	9,280
01573560	1975-95	Swatara Creek near Hershey	483	18,700	24,400	29,500	35,300	52,000

Appendix 2. *Flood-flow statistics for gaged Pennsylvania streams—Continued*

U.S. Geological Survey streamflow-gaging station number	Period of record (water year)	Station name	Drainage area (mi^2)	10-year flood flow (ft^3/s)	25-year flood flow (ft^3/s)	50-year flood flow (ft^3/s)	100-year flood flow (ft^3/s)	500-year flood flow (ft^3/s)
01574000	1929-95	West Conewago Creek near Manchester	510	29,400	40,100	50,100	62,000	100,000
01574500	1930-66	Codorus Creek at Spring Grove	75.5	4,620	6,670	8,610	11,000	18,500
01575000	1928-71	South Branch Codorus Creek near York	117	5,410	8,060	10,600	13,900	24,700
01576000	1932-72	Susquehanna River at Marietta	25,990	487,000	641,000	777,000	934,000	1,400,000
01576085	1982-95	Little Conestoga Creek near Churchtown	5.82	1,550	2,060	2,480	2,930	4,120
01576500	[1]1929-96	Conestoga River at Lancaster	324	15,900	22,200	27,700	34,100	52,900
01576754	1985-95	Conestoga River at Conestoga	470	18,300	22,900	26,600	30,600	40,900
01578400	1963-81	Bowery Run near Quarryville	5.98	2,000	3,440	5,040	7,270	16,200
01601000	1952-86	Wills Creek below Hyndman	146	8,660	11,300	13,600	16,100	23,000
01603500	1933-82	Evitts Creek near Centerville	30.2	2,120	2,940	3,640	4,430	6,670
01613050	1963-96	Tonoloway Creek near Needmore	10.7	837	1,130	1,380	1,640	2,350
01614090	1961-81	Conococheague Creek near Fayetteville	5.05	296	466	634	845	1,560
03007800	1975-96	Allegheny River at Port Allegany	248	8,820	10,600	11,900	13,200	16,500
03008000	1960-78	Newell Creek near Port Allegany	7.79	1,490	2,470	3,470	4,780	9,450
03009680	1975-95	Potato Creek at Smethport	160	5,550	6,320	6,880	7,410	8,620
03010500	1916-96	Allegheny River at Eldred	550	16,600	24,000	31,100	39,800	68,300
03010655	1975-96	Oswayo Creek at Shinglehouse	98.7	3,540	4,220	4,720	5,200	6,280
03011800	1966-96	Kinzua Creek near Guffey	46.4	3,110	4,300	5,340	6,500	9,800
03015000	1940-61	Conewango Creek at Russell	816	13,100	15,300	16,900	18,400	21,800
03015280	1963-79	Jackson Run near North Warren	12.8	685	760	812	861	966
03015500	1910-96	Brokenstraw Creek at Youngsville	321	11,900	14,100	15,600	17,100	20,600
03016000	1942-65	Allegheny River at West Hickory	3,660	82,800	97,200	107,000	117,000	139,000
03017500	1938-79	Tionesta Creek at Lynch	233	10,600	13,200	15,200	17,300	22,500
03019000	[1]1910-40	Tionesta Creek at Nebraska	469	13,900	16,100	17,800	19,400	23,000
03020500	1910-96	Oil Creek at Rouseville	300	12,800	15,400	17,500	19,600	24,700
03021350	1975-96	French Creek near Wattsburg	92	6,020	6,920	7,530	8,110	9360
03021410	1975-94	West Branch French Creek near Lowville	52.3	5,230	6,580	7,690	8,870	12,000
03021700	1961-78	Little Conneautee Creek near McKean	3.6	537	681	797	921	1,240
03022500	1922-39	French Creek at Saegerstown	629	15,900	18,500	20,400	22,300	26,500

Appendix 2. *Flood-flow statistics for gaged Pennsylvania streams—Continued*

U.S. Geological Survey streamflow-gaging station number	Period of record (water year)	Station name	Drainage area (mi^2)	10-year flood flow (ft^3/s)	25-year flood flow (ft^3/s)	50-year flood flow (ft^3/s)	100-year flood flow (ft^3/s)	500-year flood flow (ft^3/s)
03022540	1975-95	Woodcock Creek at Blooming Valley	31.1	2,280	2,860	3,320	3,780	4,900
03023000	1911-38	Cussewago Creek near Meadville	90.2	2,540	3,130	3,610	4,130	5,500
03023500	1909-25	French Creek at Carlton	998	26,100	31,600	35,800	40,200	51,000
03024000	1933-71	French Creek at Utica	1,028	19,600	22,100	23,800	25,500	29,200
03025000	1933-79	Sugar Creek at Sugarcreek	166	8,580	10,100	11,200	12,200	14,500
03025200	1961-78	Patchel Run near Franklin	5.69	619	924	1,210	1,560	2,680
03025500	1915-40	Allegheny River at Franklin	5,982	112,000	134,000	150,000	166,000	207,000
03026500	1952-96	Sevenmile Run near Rasselas	7.84	1,140	1,710	2,240	2,890	4,950
03028000	1954-96	West Branch Clarion River at Wilcox	63	4,180	5,390	6,370	7,410	10,100
03029000	1941-53	Clarion River at Ridgway	303	20,100	26,900	32,700	39,100	57,000
03029400	1960-78	Toms Run at Cooksburg	12.6	618	760	866	972	1,220
03029500	1939-52	Clarion River at Cooksburg	807	28,900	35,100	39,800	44,700	56,800
03031950	1964-81	Big Run near Sprankle Mills	7.38	906	1,120	1,270	1,420	1,780
03032500	1918-96	Redbank Creek at St. Charles	528	21,700	27,900	33,000	38,600	53,900
03034000	1939-95	Mahoning Creek at Punxsutawney	158	8,020	10,600	12,900	15,500	23,300
03034500	1940-95	Little Mahoning Creek at McCormick	87.4	4,930	5,760	6,350	6,930	8,230
03035000	1917-40	Mahoning Creek at Dayton	321	12,200	15,000	17,200	19,700	26,200
03038000	1936-96	Crooked Creek at Idaho	191	8,990	11,400	13,500	15,700	21,700
03039000	1910-39	Crooked Creek at Crooked Creek Dam	278	15,200	17,900	19,800	21,700	25,700
03039200	1961-78	Clear Run near Buckstown	3.68	261	338	401	470	651
03040000	1914-36	Stonycreek River at Ferndale	451	21,600	30,400	38,600	48,400	79,100
03041000	1940-61	Little Conemaugh River at East Conemaugh	183	10,000	12,300	14,000	15,700	20,100
03042000	1952-96	Blacklick Creek at Josephine	192	13,800	19,200	24,200	30,000	48,000
03042200	1961-78	Little Yellow Creek near Strongstown	7.36	1,150	1,760	2,360	3,120	5,710
03042500	1952-68	Two Lick Creek at Graceton	171	8,980	11,200	12,900	14,800	19,700
03043000	1905-51	Blacklick Creek at Blacklick	390	22,300	30,000	36,800	44,700	67,900
03044000	1939-91	Conemaugh River at Tunnelton	1,358	36,300	46,300	54,700	63,800	88,400
03045000	1940-84	Loyalhanna Creek at Kingston	172	11,800	16,000	19,700	24,100	37,200
03045500	[1]1920-40	Loyalhanna Creek at New Alexandria	265	16,000	22,400	28,300	35,100	55,900

Appendix 2. Flood-flow statistics for gaged Pennsylvania streams—Continued

U.S. Geological Survey streamflow-gaging station number	Period of record (water year)	Station name	Drainage area (mi^2)	10-year flood flow (ft^3/s)	25-year flood flow (ft^3/s)	50-year flood flow (ft^3/s)	100-year flood flow (ft^3/s)	500-year flood flow (ft^3/s)
03047500	[1]1884-1904	Kiskiminetas River at Avonmore	1,723	74,400	95,200	112,000	130,000	177,000
03049000	1941-96	Buffalo Creek near Freeport	137	7,360	9,390	11,100	12,800	17,600
03049800	1963-96	Little Pine Creek near Etna	5.78	1,160	2,160	3,310	4,930	11,700
03070420	1978-89	Stony Fork Tributary near Gibbon Glade	.93	111	139	162	186	247
03072000	1941-96	Dunkard Creek at Shannopin	229	12,200	14,700	16,600	18,500	22,900
03072590	1964-78	Georges Creek at Smithfield	16.3	1,210	1,520	1,770	2,030	2,700
03072840	1969-79	Tenmile Creek near Clarksville	133	10,700	15,800	20,600	26,300	44,300
03073000	1932-95	South Fork Tenmile Creek at Jefferson	180	9,840	11,500	12,700	13,700	16,100
03074300	1959-78	Lick Run at Hopwood	3.8	350	490	613	754	1,170
03074500	1943-96	Redstone Creek at Waltersburg	73.7	3,900	4,830	5,570	6,340	8,300
03078500	[1]1933-86	Big Piney Run near Salisbury	24.5	2500	3,610	4,630	5,820	9,460
03079000	1915-96	Casselman Creek at Markleton	382	20,600	27,200	32,900	39,400	58,000
03080000	1914-96	Laurel Hill Creek at Ursina	121	7,120	8,730	9,960	11,200	14,200
03082200	1961-78	Poplar Run near Normalville	9.27	1,150	1,470	1,730	2,010	2,790
03082500	[1]1891-1924	Youghiogheny River at Connellsville	1,326	53,800	65,500	74,700	84,300	109,000
03083000	1929-79	Green Lick Run at Green Lick Reservoir	3.07	592	866	1,120	1,430	2,390
03084000	1949-93	Abers Creek near Murrysville	4.39	896	1,160	1,370	1,590	2,120
03084500	1917-52	Turtle Creek at Trafford	55.9	3,900	4,750	5,380	6,000	7,450
03085500	[1]1916-96	Chartiers Creek at Carnegie	257	9,830	12,100	13,800	15,500	19,500
03086100	1963-78	Big Sewickley Creek near Ambridge	15.6	1,320	1,790	2,180	2,630	3,870
03100000	1912-22	Shenango River near Turnersville	152	6,170	8,100	9,710	11,500	16,400
03101000	1935-55	Sugar Run at Pymatuning Dam	9.34	1,430	2,050	2,610	3,230	5,020
03102000	1920-32	Shenango River near Jamestown	181	2,800	3,060	3,230	3,400	3,750
03102500	1914-96	Little Shenango River at Greenville	104	4,510	5,610	6,470	7,340	9,490
03103000	1914-63	Pymatuning Creek near Orangeville	169	5,010	5,970	6,650	7,290	8,680
03104000	1910-32	Shenango River at Sharon	608	15,700	19,800	22,900	26,200	34,200
03104500	1913-33	Shenango River at New Castle	792	16,500	21,300	25,300	29,700	41,600
03104760	1969-80	Harthegig Run near Greenfield	2.26	342	434	504	577	756
03106000	1916-96	Connoquenessing Creek near Zelienople	356	12,600	15,100	17,000	19,000	23,800

Appendix 2. *Flood-flow statistics for gaged Pennsylvania streams—Continued*

U.S. Geological Survey streamflow-gaging station number	Period of record (water year)	Station name	Drainage area (mi^2)	10-year flood flow (ft^3/s)	25-year flood flow (ft^3/s)	50-year flood flow (ft^3/s)	100-year flood flow (ft^3/s)	500-year flood flow (ft^3/s)
03106500	1912-87	Slippery Rock Creek at Wurtemburg	398	12,100	14,700	16,700	18,700	23,500
03108000	[1]1916-96	Raccoon Creek at Moffatts Mill	178	6,820	8,490	9,770	11,100	14,300
03111150	1961-85	Brush Run near Buffalo	10.3	1,240	1,670	2,010	2,380	3,310
04213040	1966-95	Raccoon Creek near West Springfield	2.53	284	374	445	520	708
04213075	1986-96	Brandy Run near Girard	4.45	1,340	1,900	2,380	2,900	4,350

[1] Period of record not continuous.

Appendix 3. *7-day, 10-year low-flow statistic ($Q_{7,10}$) computed from Log-Pearson distribution of streamflow data and WRI 82-21 regional regression equations for gaged locations on streams in Pennsylvania unaffected by carbonate bedrock, extensive mining, or regulation*

[WRI 82-21 refers to Flippo, 1982b; ft^3/s, cubic feet per second; mi^2, square miles; climatic year, 12-month period April 1 - March 31]

U.S. Geological Survey streamflow-gaging station number	Period of record (climatic year)	Station name	Drainage area (mi^2)	$Q_{7,10}$ computed from Log-Pearson distribution (ft^3/s)	$Q_{7,10}$ computed from WRI 82-21 regional regression equations[1] (ft^3/s)	Absolute value of percentage difference
Low-Flow Region 1						
01429000	1946-59	West Branch Lackawaxen River at Prompton	59.7	6.25	2.81	55
01429500	1945-58	Dyberry Creek near Honesdale	64.6	2.80	2.62	6.4
01430500	1923-38	Lackawaxen River at West Hawley	206	24.0	17.9	25
01431000	1946-60	Middle Creek near Hawley	78.4	3.08	4.54	47
01431500	[1]1910-59	Lackawaxen River at Hawley	290	17.8	31.4	76
01432000	1911-24	Wallenpaupack Creek at Wilsonville	228	21.2	15.7	26
01439500	1910-96	Bush Kill at Shoemakers	117	7.72	8.54	11
01440400	1959-96	Brodhead Creek near Analomink	65.9	7.54	3.87	49
01442500	1952-95	Brodhead Creek at Minisink Hills	259	48.7	36.8	24
01446600	1963-78	Martins Creek near East Bangor	10.4	.20	.18	10
Low-Flow Region 2						
01441000	1913-38	McMichaels Creek at Stroudsburg	65.3	16.0	14.3	11
01447500	1945-96	Lehigh River at Stoddardtsville	91.7	13.3	17.0	28
01448000	1918-59	Lehigh River at Tannery	322	67.4	61.4	8.9
01448500	1950-95	Dilldown Creek near Long Pond	2.39	.44	.46	4.5
01449360	1968-96	Pohopoco Creek at Kresgeville	49.9	16.3	8.97	45
01449500	1945-57	Wild Creek at Hatchery	16.8	5.45	3.82	30
01450500	1941-96	Aquashicola Creek at Palmerton	76.7	16.9	16.6	1.8
01451800	1967-94	Jordan Creek near Schnecksville	53.0	2.58	12.4	470
01453000	[1]1904-40	Lehigh River at Bethlehem	1,279	330	380	15
01475300	1974-94	Darby Creek at Waterloo Mills near Devon	5.15	1.31	1.37	4.6
01475510	1965-90	Darby Creek near Darby	37.4	11.6	7.04	39
01475530	1966-81	Cobbs Creek at U.S. Highway No. 1 at Philadelphia	4.78	1.33	1.11	17
01475850	1983-95	Crum Creek near Newtown Square	15.8	3.18	2.67	16
01477000	1933-94	Chester Creek near Chester	61.1	13.1	10.4	21
01480300	1962-94	West Branch Brandywine Creek near Honey Brook	18.7	3.39	2.23	34
01480675	1968-94	Marsh Creek near Glenmoore	8.57	.90	1.11	23
01480800	1958-68	East Branch Brandywine Creek at Downingtown	81.6	12.0	13.6	13
01481000	[1]1913-72	Brandywine Creek at Chadds Ford	287	68.0	84.0	24
Low-Flow Region 3						
01465770	1966-81	Poquessing Creek at Trevose Road, Philadelphia	5.08	.44	.25	43
01465785	1966-78	Walton Run at Philadelphia	2.17	.19	.19	0
01465790	1967-78	Byberry Creek at Chalfont Road, Philadelphia	5.34	1.02	.44	55
01465798	1967-94	Poquessing Creek at Grant Avenue, Philadelphia	21.4	2.26	2.01	11
01467042	1966-81	Pennypack Creek at Pine Road, Philadelphia	37.9	9.29	1.94	79
01467048	1967-94	Pennypack Creek at Lower Rhawn Street Bridge, Philadelphia	49.8	13.0	2.91	78
01467050	1967-81	Wooden Bridge Run at Philadelphia	3.35	.35	.27	23
01467086	1967-88	Tacony Creek above Adams Avenue, Philadelphia	16.6	4.36	1.27	71
01467087	1984-94	Frankford Creek at Castor Avenue, Philadelphia	30.4	3.55	2.79	21
01467089	1967-81	Frankford Creek at Torresdale Avenue, Philadelphia	33.8	6.58	3.22	51
01469500	1921-32	Little Schuylkill River at Tamaqua	42.9	5.08	5.88	16

Appendix 3. *7-day, 10-year low-flow statistic ($Q_{7,10}$) computed from Log-Pearson distribution of streamflow data and WRI 82-21 regional regression equations for gaged locations on streams in Pennsylvania unaffected by carbonate bedrock, extensive mining, or regulation—Continued*

U.S. Geological Survey streamflow-gaging station number	Period of record (climatic year)	Station name	Drainage area (mi^2)	$Q_{7,10}$ computed from Log-Pearson distribution (ft^3/s)	$Q_{7,10}$ computed from WRI 82-21 regional regression equations[1] (ft^3/s)	Absolute value of percentage difference
01470720	1967-81	Maiden Creek Tributary at Lenhartsville	7.46	0.25	0.28	12
01470756	1974-95	Maiden Creek at Virginville	159	16.8	18.9	13
01470853	1984-95	Furnace Creek at Robesonia	4.18	.28	.15	46
01472157	1970-94	French Creek near Phoenixville	59.1	11.3	1.16	90
01472174	1968-83	Pickering Creek near Chester Springs	5.98	1.48	.29	80
01472198	1985-95	Perkiomen Creek at East Greenville	38	7.39	4.37	41
01472199	1983-94	West Branch Perkiomen Creek at Hillegass	23	4.88	2.04	58
01472500	1886-1913	Perkiomen Creek near Frederick	152	14.4	10.7	25
01473000	1916-55	Perkiomen Creek at Graterford	279	15.0	18.2	21
01473120	1968-94	Skippack Creek near Collegeville	53.7	1.89	2.08	10
01474000	1967-94	Wissahickon Creek at mouth, Philadelphia	64	16.9	3.78	78
Low-Flow Region 4						
01516500	1956-95	Corey Creek near Mainesburg	12.2	.05	.05	0
01517000	1957-76	Elk Run near Mainesburg	10.2	.06	.03	52
01518500	1955-74	Crooked Creek at Tioga	122	2.33	1.63	30
01518862	1985-95	Cowanesque River at Westfield	90.6	1.14	.85	25
01520000	1953-76	Cowanesque River near Lawrenceville	298	2.10	1.80	15
Low-Flow Region 5						
01532000	1915-96	Towanda Creek near Monroetown	215	2.79	2.94	5.4
01532850	1967-79	Middle Branch Wyalusing Creek Tributary near Birchardsville	5.67	.16	.10	38
01533500	1942-58	North Branch Mehoopany Creek near Lovelton	35.2	.60	.75	25
01533950	1962-78	South Branch Tunkhannock Creek near Montdale	12.6	.26	.42	62
01534000	1915-93	Tunkhannock Creek near Tunkhannock	383	17.5	13.1	25
01539000	1940-95	Fishing Creek near Bloomsburg	274	17.1	8.35	50
01539500	1942-58	Little Fishing Creek at Eyers Grove	56.5	.28	1.20	330
01540000	1915-28	Fishing Creek at Bloomsburg	355	37.0	9.48	74
01544500	1942-95	Kettle Creek at Cross Fork	136	5.04	3.94	11
01548500	1919-95	Pine Creek at Cedar Run	604	23.8	14.0	41
01549000	1910-20	Pine Creek near Waterville	750	32.8	22.0	33
01549500	1942-95	Blockhouse Creek near English Center	37.7	.74	.85	15
01550000	1915-95	Lycoming Creek near Trout Run	173	7.63	4.68	39
01551000	1941-53	Grafius Run at Williamsport	3.14	.01	.05	400
01552000	[1]1927-95	Loyalsock Creek at Loyalsockville	443	22.3	19.0	15
01552500	1942-95	Muncy Creek near Sonestown	23.8	1.15	1.19	3.5
Low-Flow Region 6						
01538000	1921-95	Wapwallopen Creek near Wapwallopen	43.8	3.45	2.58	25
01542500	1942-59	West Branch Susquehanna River at Karthaus	1,462	126	136	7.9
01547700	1957-96	Marsh Creek at Blanchard	44.1	.63	1.51	140
01547950	1970-96	Beech Creek at Monument	152	15.9	6.46	59
01553130	1969-81	Sand Spring Run near White Deer	4.93	1.08	.20	81
01553600	1961-78	East Branch Chillisquaque Creek near Washingtonville	9.48	.05	.40	700
01553700	1981-95	Chillisquaque Creek at Washingtonville	51.3	12.4	3.41	73

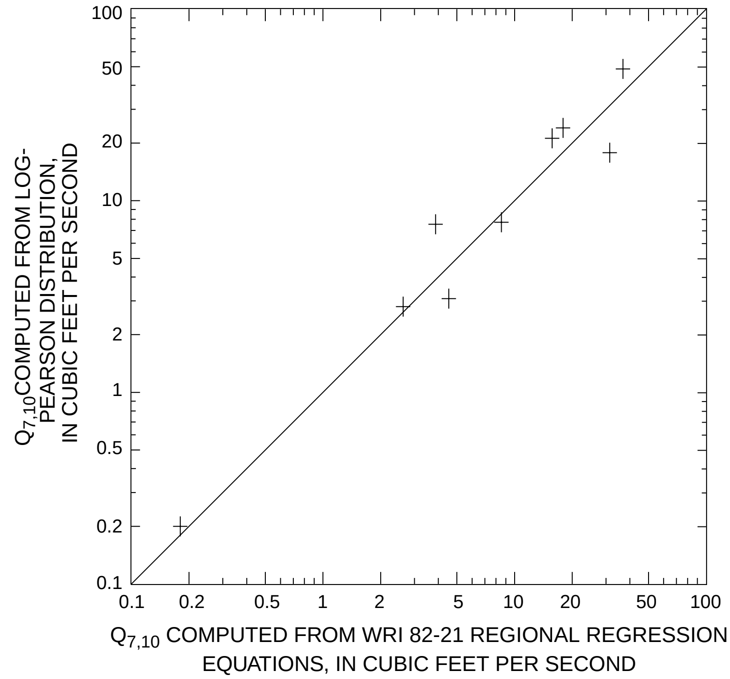
Appendix 3. *7-day, 10-year low-flow statistic ($Q_{7,10}$) computed from Log-Pearson distribution of streamflow data and WRI 82-21 regional regression equations for gaged locations on streams in Pennsylvania unaffected by carbonate bedrock, extensive mining, or regulation—Continued*

U.S. Geological Survey streamflow-gaging station number	Period of record (climatic year)	Station name	Drainage area (mi^2)	$Q_{7,10}$ computed from Log-Pearson distribution (ft^3/s)	$Q_{7,10}$ computed from WRI 82-21 regional regression equations[1] (ft^3/s)	Absolute value of percentage difference
01556000	1918-95	Frankstown Branch Juniata River at Williamsburg	291	47.2	38.1	19
01556500	1947-62	Little Juniata River at Tipton	93.7	11.4	9.11	20
01557500	1946-96	Bald Eagle Creek at Tyrone	44.1	3.14	3.35	6.7
01559500	1931-58	Standing Stone Creek near Huntingdon	128	10.4	6.71	36
01560000	1941-96	Dunning Creek at Belden	172	9.28	13.8	49
01562000	1913-96	Raystown Branch Juniata River at Saxton	756	68.5	69.6	1.6
Low-Flow Region 7						
01555500	1931-95	East Mahantango Creek near Dalmatia	162	6.30	5.56	12
01559700	1963-78	Sulphur Springs Creek near Manns Choice	5.28	.10	.08	20
01561000	1931-58	Brush Creek at Gapsville	36.8	.52	.41	21
01562500	1931-57	Great Trough Creek near Marklesburg	84.6	1.57	1.20	24
01564500	1940-95	Aughwick Creek near Three Springs	205	4.23	4.31	1.9
01566000	1913-58	Tuscarora Creek near Port Royal	214	8.64	8.01	7.3
01566500	1932-58	Cocolamus Creek near Millertown	57.2	2.39	1.80	25
01571000	[1]1941-95	Paxton Creek near Penbrook	11.2	.15	.17	13
01572000	[1]1921-84	Lower Little Swatara Creek at Pine Grove	34.3	2.31	2.44	5.6
01573000	1920-96	Swatara Creek at Harper Tavern	337	22.1	22.8	3.2
01573500	1939-58	Manada Creek at Manada Gap	13.5	1.44	.79	45
01574000	1930-95	West Conewago Creek near Manchester	510	10.8	12.1	12
Low-Flow Region 8						
01613500	1932-41	Licking Creek near Sylvan	158	6.32	5.50	13
Low-Flow Region 9						
03007800	1976-96	Allegheny River at Port Allegany	248	19.5	22.2	14
03008000	1967-78	Newell Creek near Port Allegany	7.79	.13	.81	520
03009680	1976-95	Potato Creek at Smethport	160	13.4	14.6	9.1
03010000	1927-39	Allegheny River at Larabee	530	13.4	46.0	240
03010500	1941-96	Allegheny River at Eldred	550	31.0	47.7	54
03010655	1976-96	Oswayo Creek at Shinglehouse	98.7	5.89	9.22	57
03011800	1967-95	Kinzua Creek near Guffey	46.4	5.26	4.48	15
03015280	1963-78	Jackson Run near North Warren	12.8	.88	1.30	48
03015500	1911-96	Brokenstraw Creek at Youngsville	321	33.8	28.5	16
03020500	1934-96	Oil Creek at Rouseville	300	30.6	26.7	13
03021000	1911-32	Oil Creek near Rouseville	315	33.7	28.0	17
03025000	1934-79	Sugar Creek at Sugarcreek	166	16.6	15.2	8.9
03025200	1966-78	Patchel Run near Franklin	5.69	.63	.60	4.8
03028000	1955-96	West Branch Clarion River at Wilcox	63	6.67	6.00	10
Low-Flow Region 10						
03017500	1940-79	Tionesta Creek at Lynch	233	16.4	12.6	23
03019000	1924-40	Tionesta Creek at Nebraska	469	24.6	27.7	13
03021350	1976-96	French Creek near Wattsburg	92	5.11	5.13	.39
03021410	1976-94	West Branch French Creek near Lowville	52.3	2.69	1.29	52
03021700	1962-78	Little Conneautee Creek near McKean	3.6	.01	.05	400
03022500	1923-39	French Creek at Saegerstown-	629	31.0	38.9	25
03022540	1976-96	Woodcock Creek at Blooming Valley	31.1	2.32	1.04	55

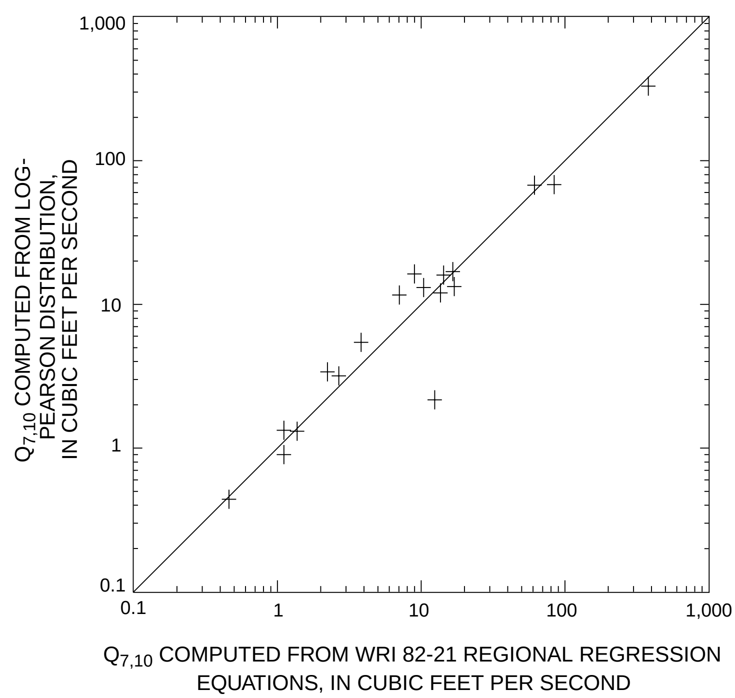
Appendix 3. *7-day, 10-year low-flow statistic ($Q_{7,10}$) computed from Log-Pearson distribution of streamflow data and WRI 82-21 regional regression equations for gaged locations on streams in Pennsylvania unaffected by carbonate bedrock, extensive mining, or regulation—Continued*

U.S. Geological Survey streamflow-gaging station number	Period of record (climatic year)	Station name	Drainage area (mi^2)	$Q_{7,10}$ computed from Log-Pearson distribution (ft^3/s)	$Q_{7,10}$ computed from WRI 82-21 regional regression equations[1] (ft^3/s)	Absolute value of percentage difference
03023500	1910-25	French Creek at Carlton	998	72.3	67.7	6.4
03024000	1934-70	French Creek at Utica	1,028	62.0	68.6	11
03026500	1953-96	Sevenmile Run near Rasselas	7.84	.22	.42	91
03029400	1961-78	Toms Run at Cooksburg	12.6	.56	.70	25
03029500	1940-51	Clarion River at Cooksburg	807	57.4	59.0	2.8
03031950	1965-81	Big Run near Sprankle Mills	7.38	.41	.26	37
03032500	1920-95	Redbank Creek at St. Charles	528	33.8	27.7	18
03100000	1913-22	Shenango River near Turnersville	152	3.56	2.69	24
03102000	1921-32	Shenango River near Jamestown	181	3.47	4.89	41
03102500	1915-94	Little Shenango River at Greenville	104	5.77	4.11	29
03103000	1915-63	Pymatuning Creek near Orangeville	169	1.78	3.24	82
03104000	1912-32	Shenango River at Sharon	608	14.7	21.5	47
03106500	1913-68	Slippery Rock Creek at Wurtemburg	398	30.2	23.7	22
Low-Flow Region 11						
03038000	1939-67	Crooked Creek at Idaho	191	5.41	8.87	64
03039200	1966-78	Clear Run near Buckstown	3.68	.07	.20	190
03040000	1915-36	Stonycreek River at Ferndale	451	18.4	25.7	40
03042200	1962-88	Little Yellow Creek near Strongstown	7.36	.26	.24	7.7
03042500	1953-67	Two Lick Creek at Graceton	171	11.5	7.85	32
03044000	1941-51	Conemaugh River at Tunnelton	1,358	277	82.7	70
03045500	[1]1921-40	Loyalhanna Creek at New Alexandria	265	17.0	19.8	16
03049000	1942-96	Buffalo Creek near Freeport	137	3.65	6.48	78
03079000	1922-96	Casselman Creek at Markleton	382	17.6	23.8	35
03080000	1920-95	Laurel Hill Creek at Ursina	121	5.23	5.96	14
03106000	1921-96	Connoquenessing Creek near Zelienople	356	11.3	17.7	57
Low-Flow Region 12						
03049800	1964-96	Little Pine Creek near Etna	5.78	.05	.01	80
03072000	1942-96	Dunkard Creek at Shannopin	229	1.63	1.40	16
03072590	1965-78	Georges Creek at Smithfield	16.3	.13	.11	15
03072840	1969-79	Tenmile Creek near Clarksville	133	2.71	.40	85
03073000	1933-95	South Fork Tenmile Creek at Jefferson	180	.38	.83	110
03074300	1968-78	Lick Run at Hopwood	3.8	.06	.03	50
03082200	1963-78	Poplar Run near Normalville	9.27	.05	.12	140
03084000	1950-93	Abers Creek near Murrysville	4.39	.09	.02	77
03086100	1968-78	Big Sewickley Creek near Ambridge	15.6	.09	.02	78

[1] Period of record not continuous.

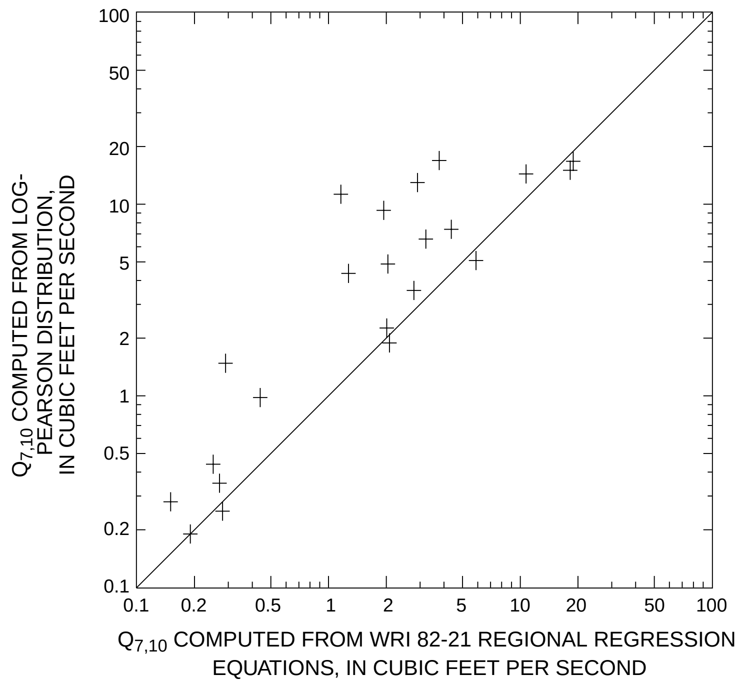


Comparison of 7-day, 10-year low-flow statistic ($Q_{7,10}$) computed using Log-Pearson distribution and WRI 82-21 regional regression equations for low-flow region 1.

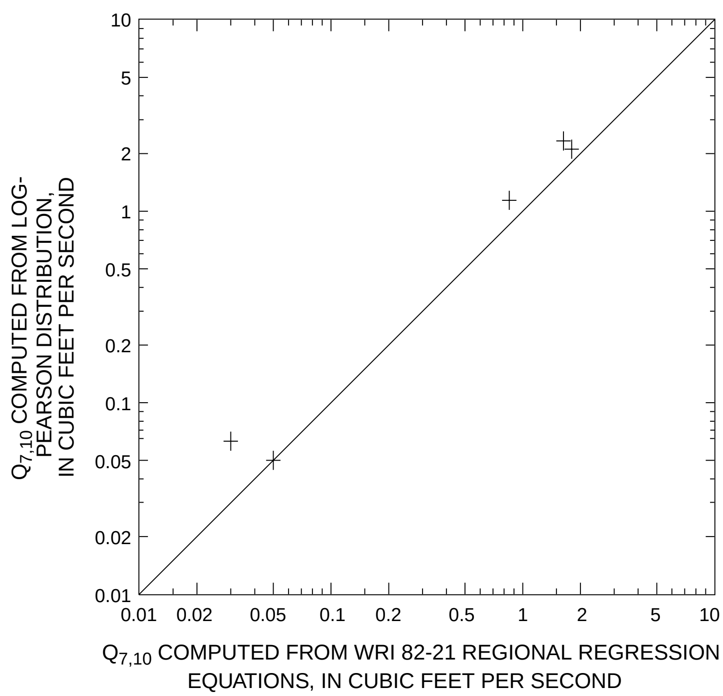


Comparison of 7-day, 10-year low-flow statistic ($Q_{7,10}$) computed from Log-Pearson distribution of streamgage data and WRI 82-21 regional regression equations for low-flow region 2.

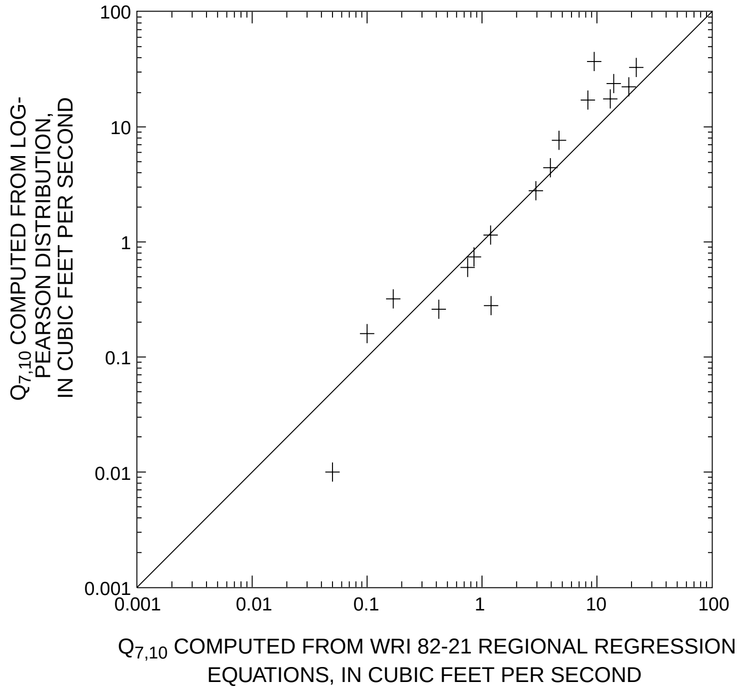
Appendix 4. *Comparison of streamflow statistics computed using Log-Pearson distribution and regression equations—Continued*



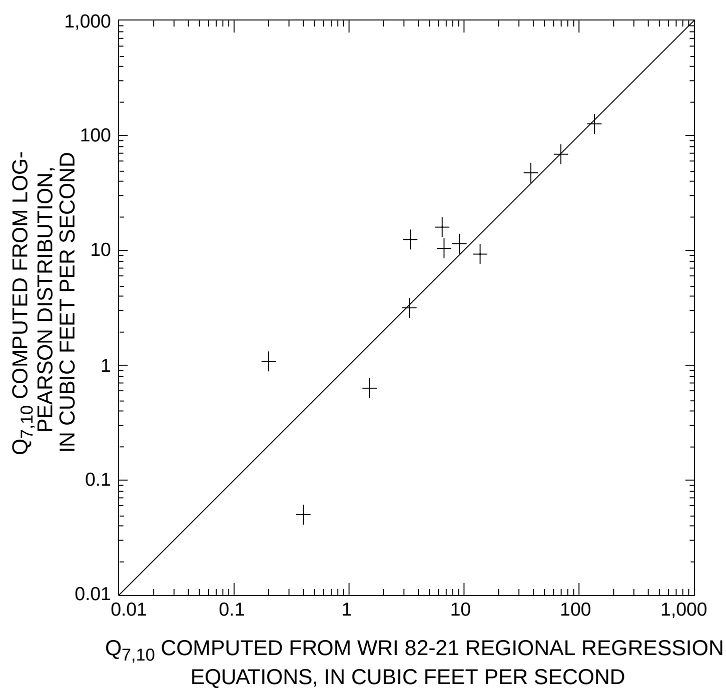
Comparison of 7-day, 10-year low-flow statistic ($Q_{7,10}$) computed from Log-Pearson distribution of streamgage data and WRI 82-21 regional regression equations for low-flow region 3.



Comparison of 7-day, 10-year low-flow statistic ($Q_{7,10}$) computed using Log-Pearson distribution and WRI 82-21 regional regression equations for low-flow region 4.

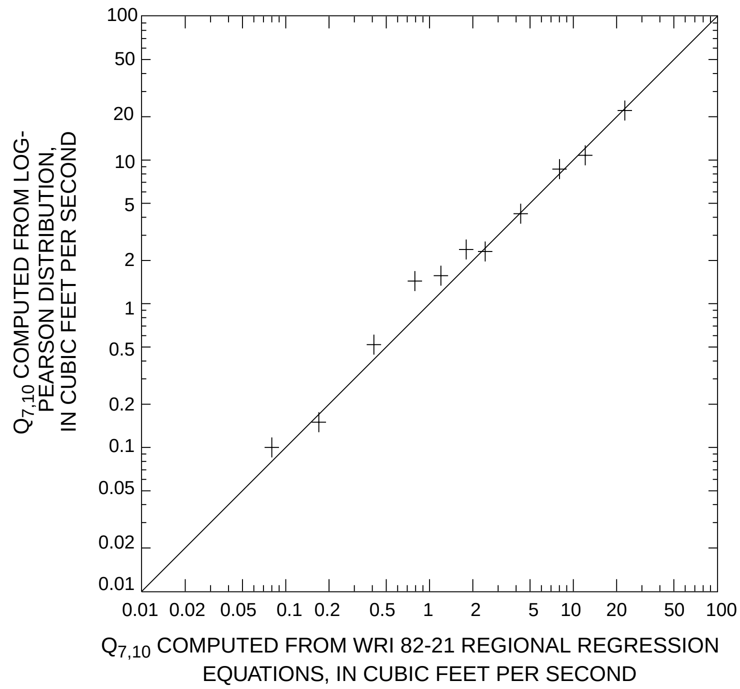


Comparison of 7-day, 10-year low-flow statistic ($Q_{7,10}$) computed using Log-Pearson distribution and WRI 82-21 regional regression equations for low-flow region 5.

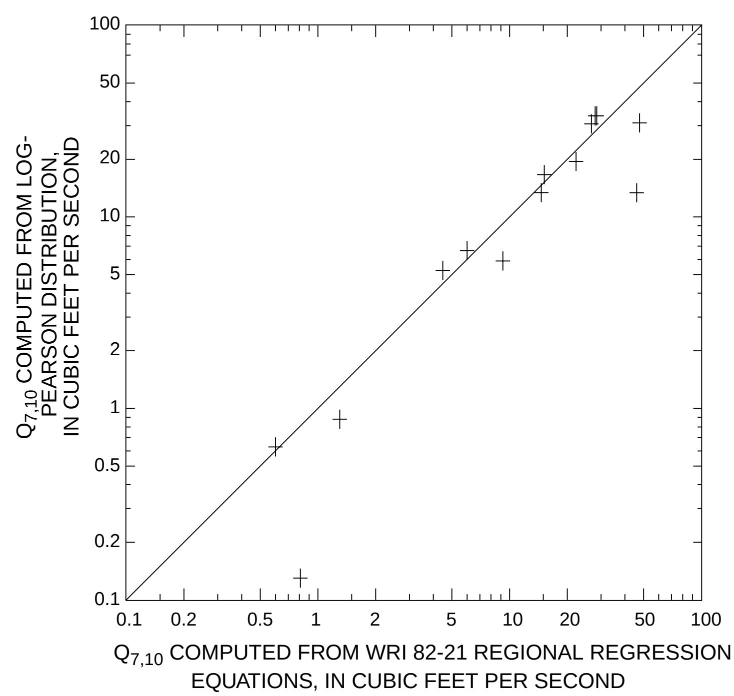


Comparison of 7-day, 10-year low-flow statistic ($Q_{7,10}$) computed using Log-Pearson distribution and WRI 82-21 regional regression equations for low-flow region 6.

__Appendix 4.__ Comparison of streamflow statistics computed using Log-Pearson distribution and regression equations—Continued

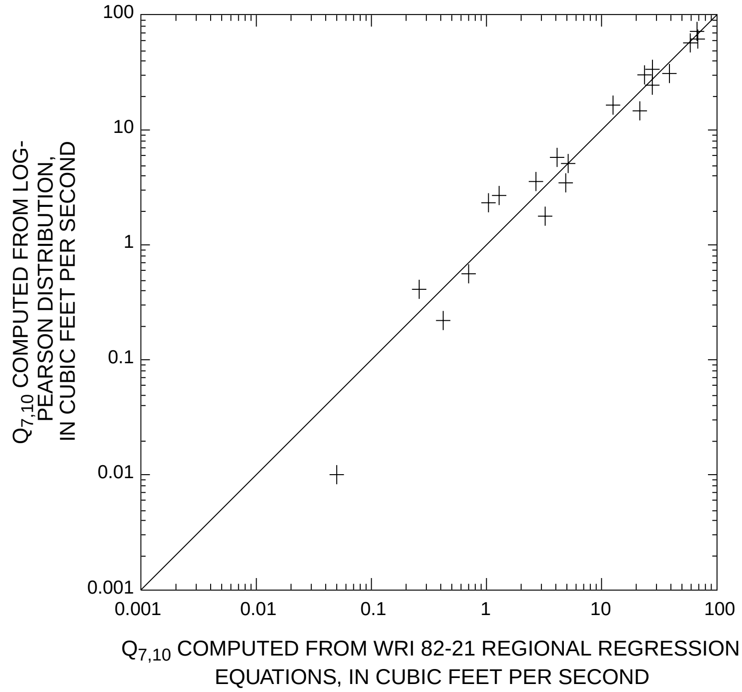


Comparison of 7-day, 10-year low-flow statistic ($Q_{7,10}$) computed using Log-Pearson distribution and WRI 82-21 regional regression equations for low-flow region 7.

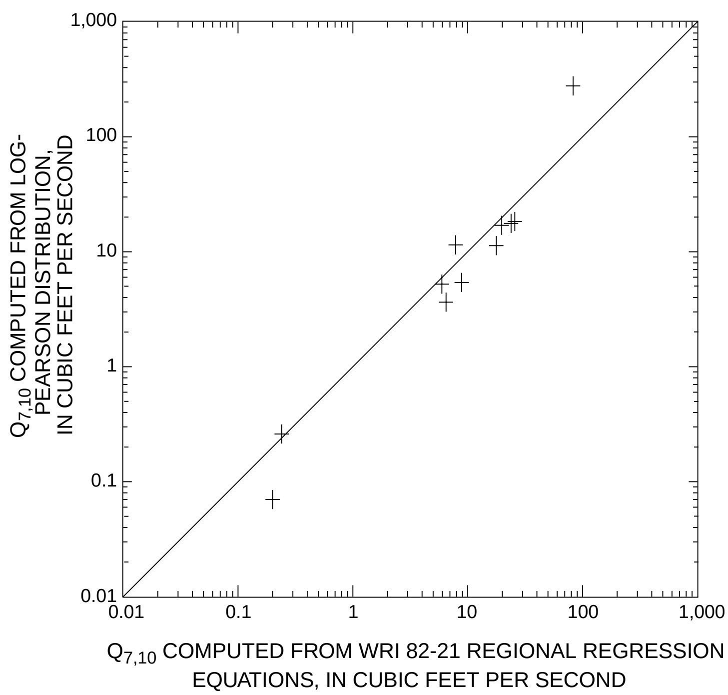


Comparison of 7-day, 10-year low-flow statistic ($Q_{7,10}$) computed using Log-Pearson distribution and WRI 82-21 regional regression equations for low-flow region 9.

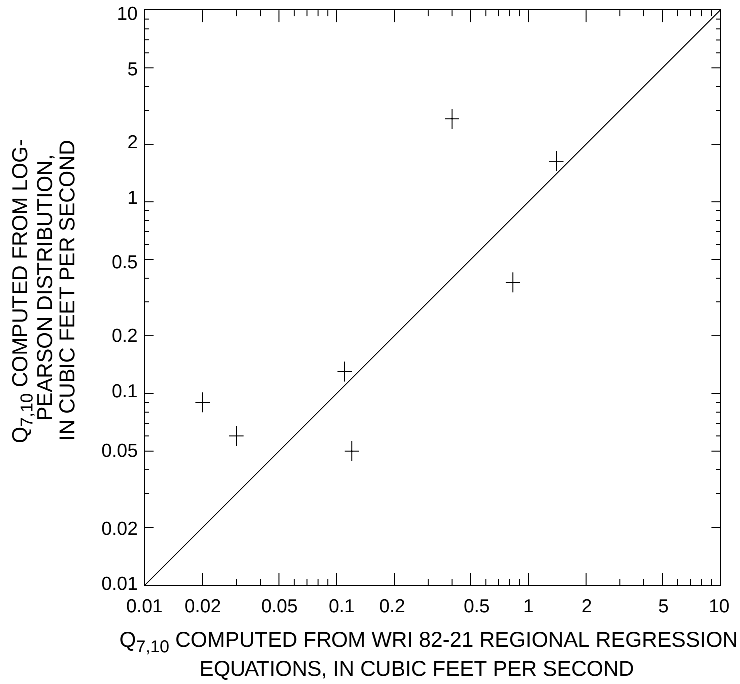
Appendix 4. *Comparison of streamflow statistics computed using Log-Pearson distribution and regression equations—Continued*



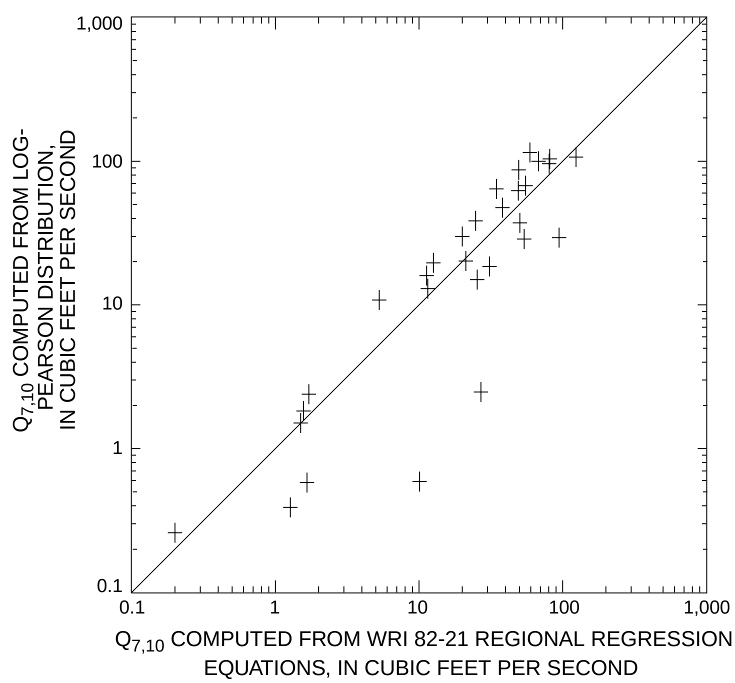
Comparison of 7-day, 10-year low-flow statistic ($Q_{7,10}$) computed using Log-Pearson distribution and WRI 82-21 regional regression equations for low-flow region 10.



Comparison of 7-day, 10-year low-flow statistic ($Q_{7,10}$) computed using Log-Pearson distribution and WRI 82-21 regional regression equations for low-flow region 11.

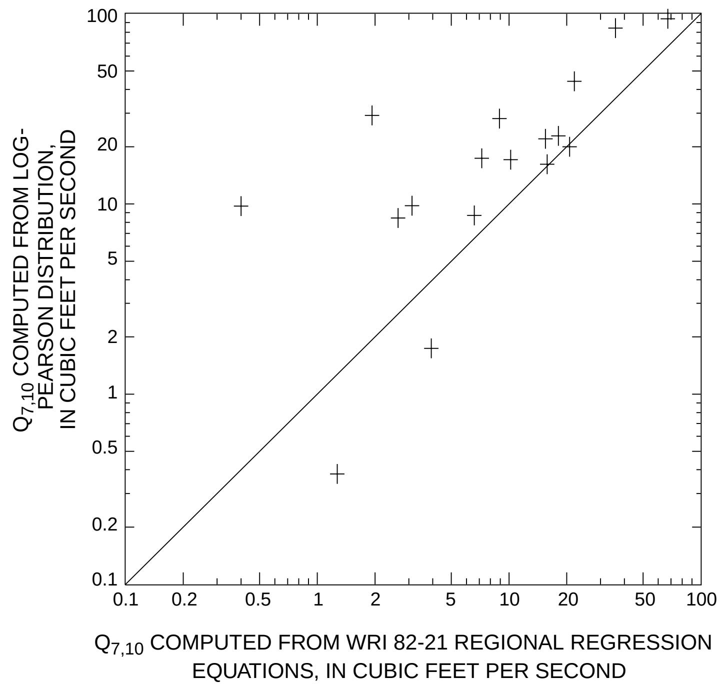


Comparison of 7-day, 10-year low-flow statistic ($Q_{7,10}$) computed using Log-Pearson distribution and WRI 82-21 regional regression equations for low-flow region 12.

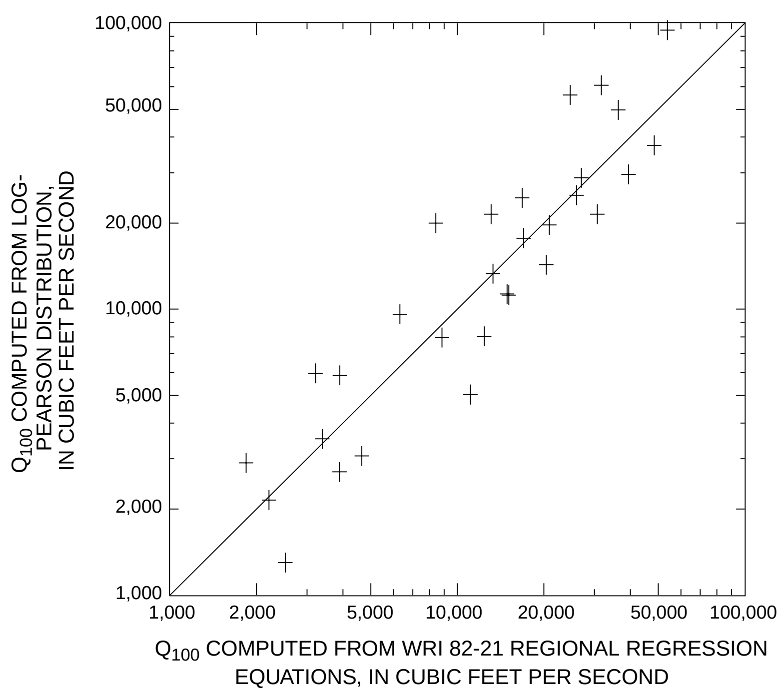


Comparison of 7-day 10-year low-flow statistic ($Q_{7,10}$) computed from Log-Pearson distribution of streamgage data and WRI 82-21 regional regression equations for gaged locations on streams in Pennsylvania with flow affected by carbonate bedrock (at least 10 percent carbonate bedrock.

__Appendix 4.__ Comparison of streamflow statistics computed using Log-Pearson distribution and regression equations—Continued

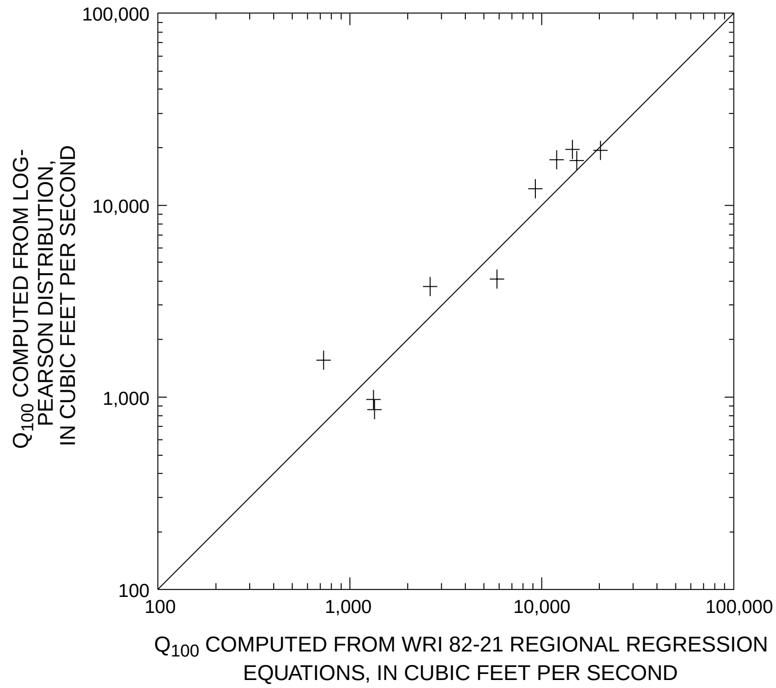


Comparison of 7-day 10-year low-flow statistic ($Q_{7,10}$) computed from Log-Pearson distribution of streamgage data and WRI 82-21 regional regression equations for gaged locations on streams in Pennsylvania with flow affected by extensive mining.

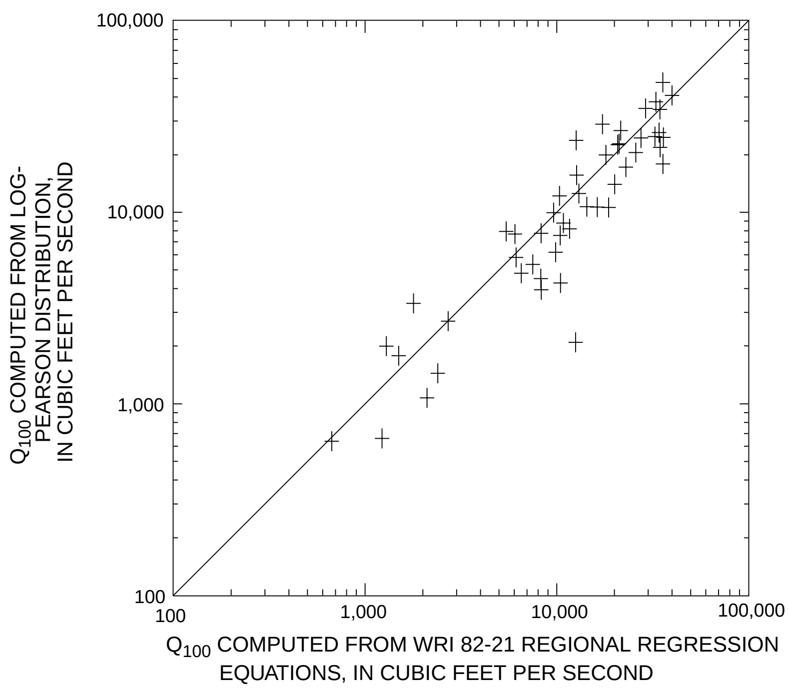


Comparison of 100-year flood flow statistic (Q_{100}) computed using Log-Pearson distribution and WRI 82-21 regional regression equations for flood-flow region 2.

Appendix 4. *Comparison of streamflow statistics computed using Log-Pearson distribution and regression equations—Continued*

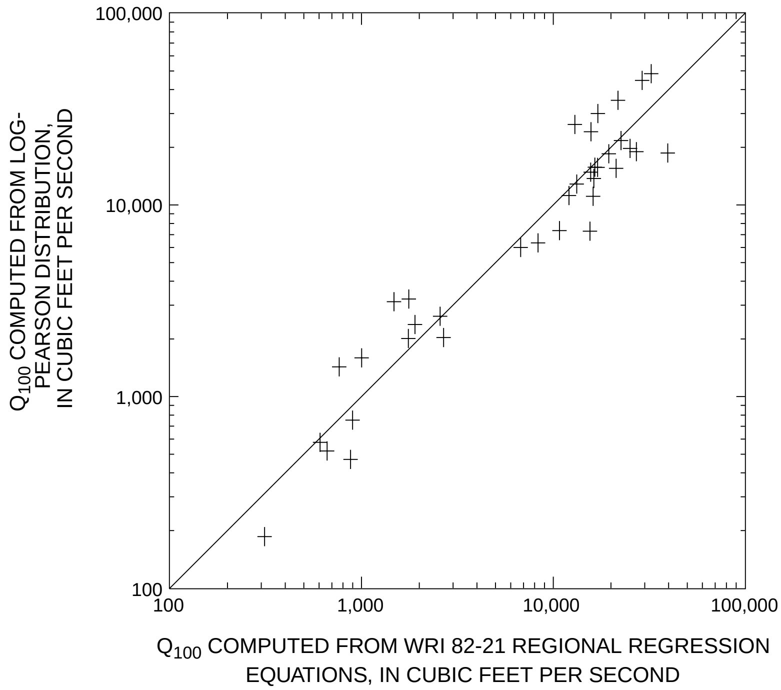


Comparison of 100-year flood flow statistic (Q_{100}) computed using Log-Pearson distribution and WRI 82-21 regional regression equations for flood-flow region 4.

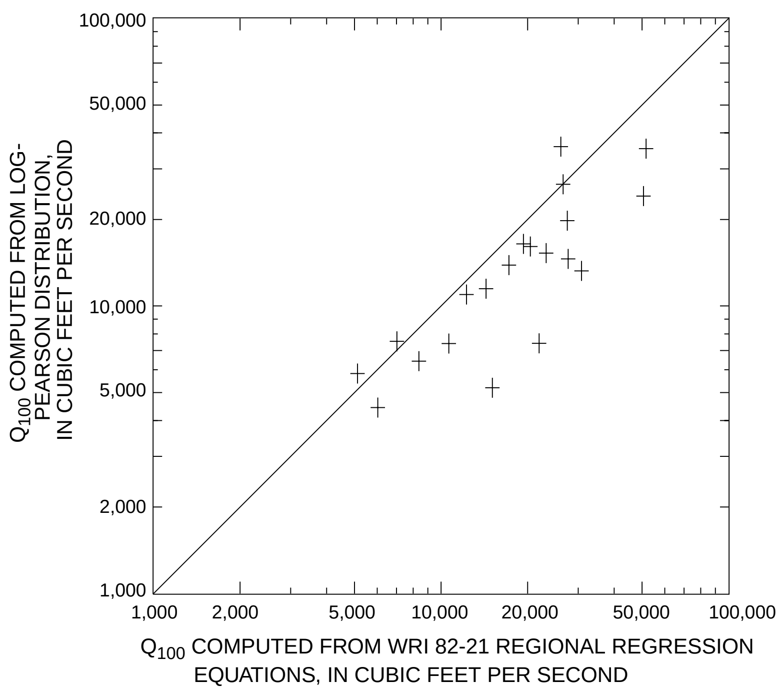


Comparison of 100-year flood flow statistic (Q_{100}) computed from Log-Pearson distribution of streamgage data and WRI 82-21 regional regression equations for flood-flow region 5E.

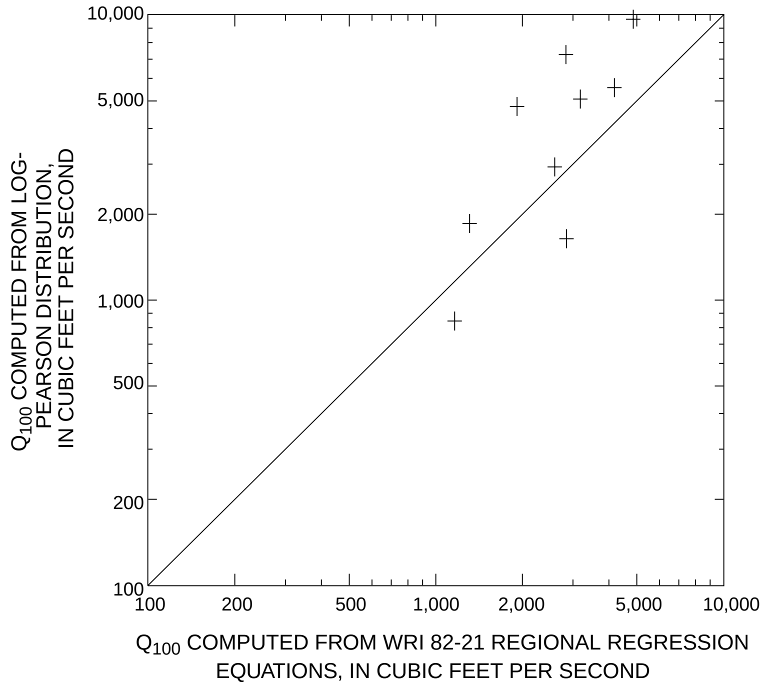
__Appendix 4.__ Comparison of streamflow statistics computed using Log-Pearson distribution and regression equations—Continued



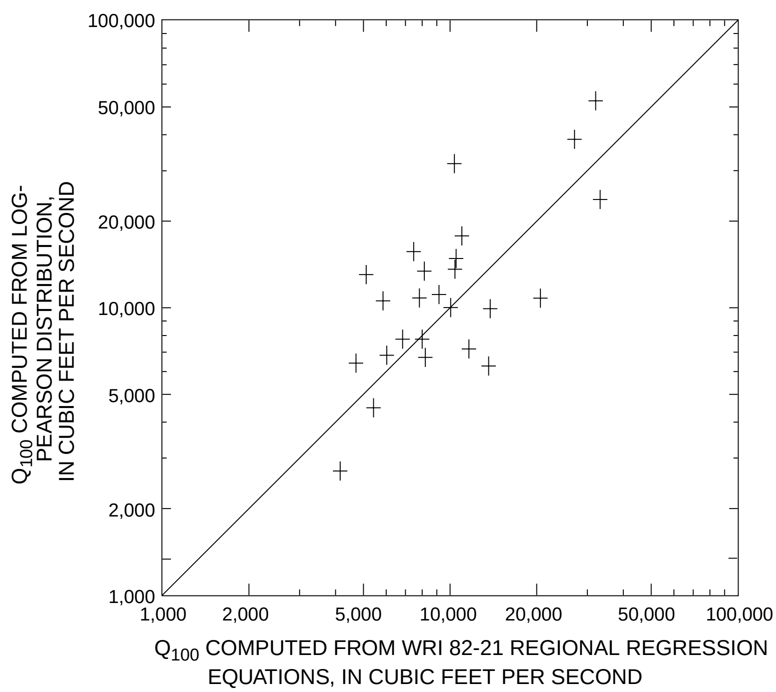
Comparison of 100-year flood flow statistic (Q_{100}) computed using Log-Pearson distribution and WRI 82-21 regional regression equations for flood-flow region 5W.



Comparison of 100-year flood flow statistic (Q_{100}) computed using Log-Pearson distribution and WRI 82-21 regional regression equations for flood-flow region 6A.

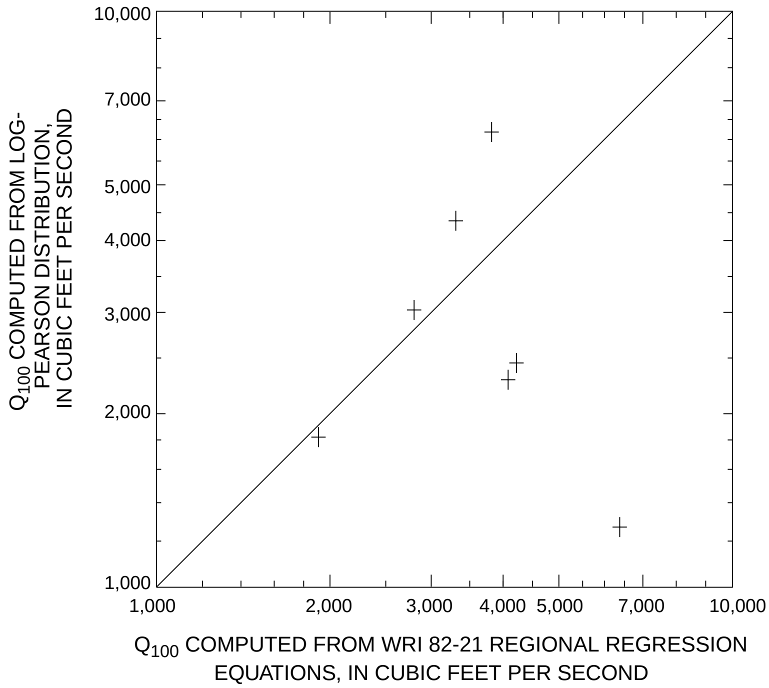


Comparison of 100-year flood flow statistic (Q_{100}) computed from Log-Pearson distribution of streamgage data and WRI 82-21 regional regression equations for flood-flow region 6B.

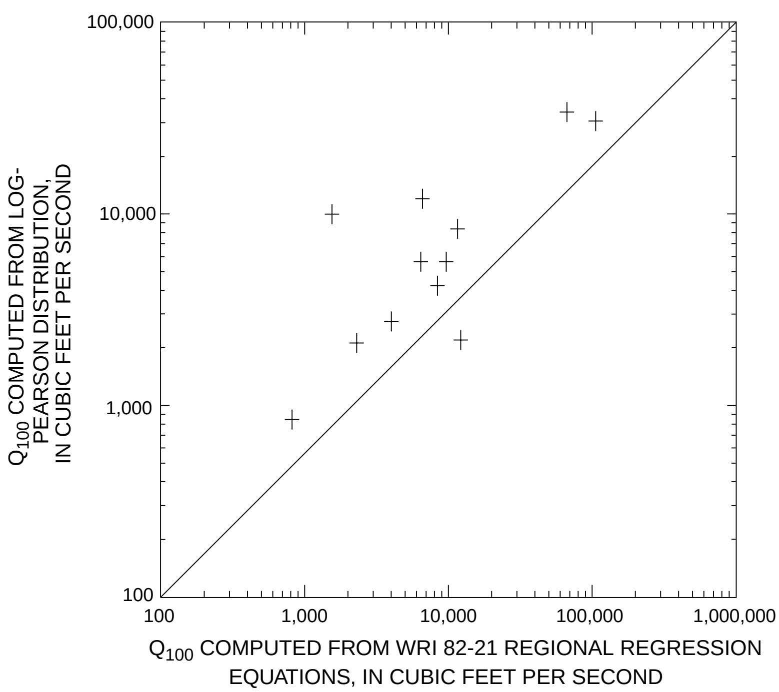


Comparison of 100-year flood flow statistic (Q_{100}) computed using Log-Pearson distribution and WRI 82-21 regional regression equations for flood-flow region 7A.

__Appendix 4.__ Comparison of streamflow statistics computed using Log-Pearson distribution and regression equations—Continued

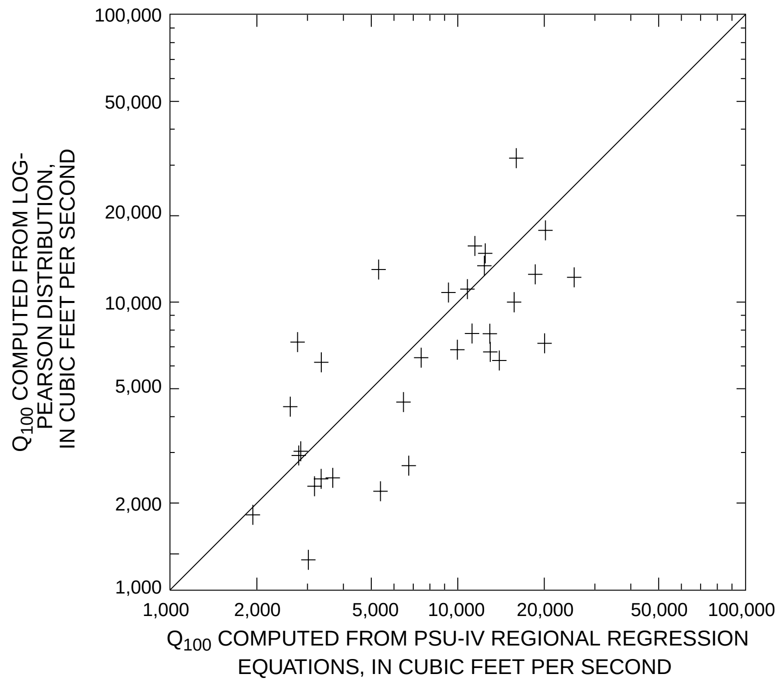


Comparison of 100-year flood flow statistic (Q_{100}) computed using Log-Pearson distribution and WRI 82-21 regional regression equations for flood-flow region 7B.

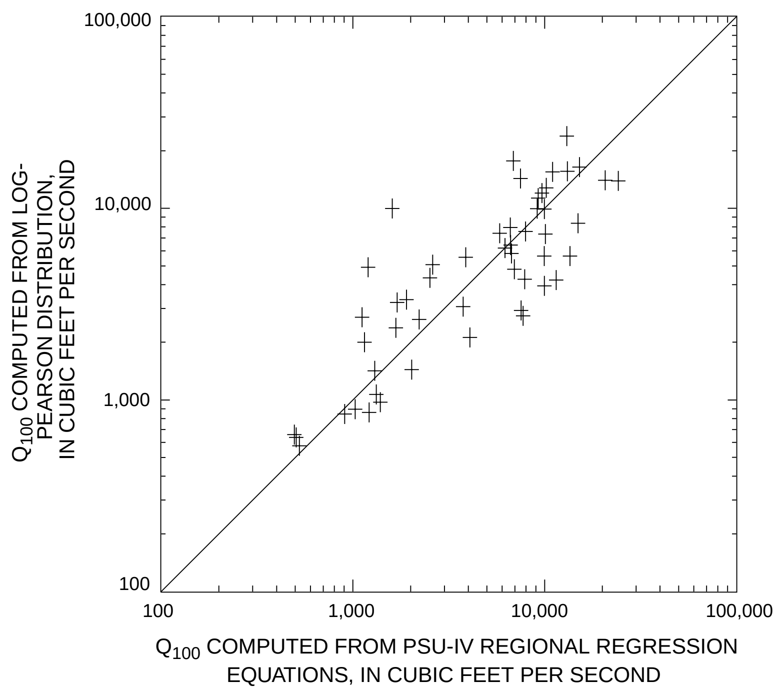


Comparison of 100-year flood flow statistic (Q_{100}) computed using Log-Pearson distribution and WRI 82-21 regional regression equations for flood-flow region 8.

__Appendix 4.__ Comparison of streamflow statistics computed using Log-Pearson distribution and regression equations—Continued

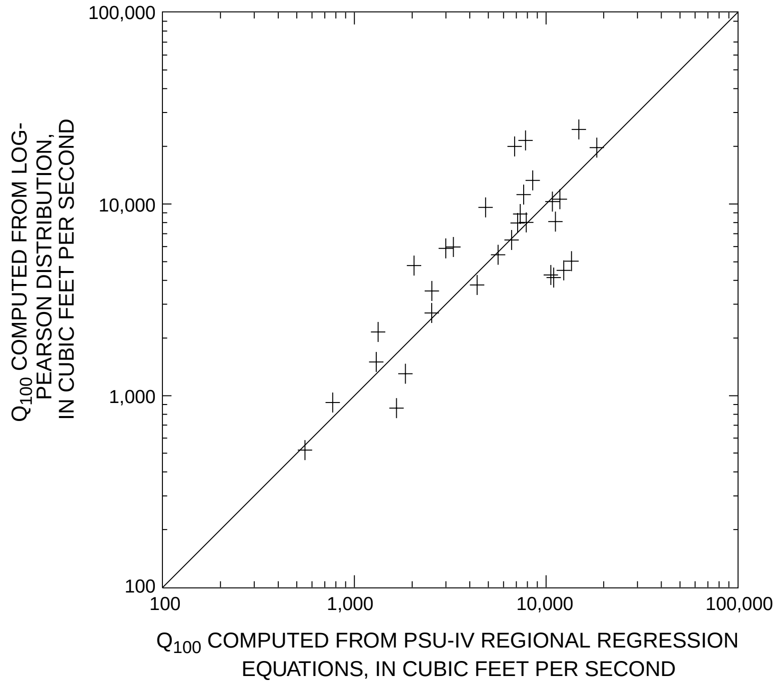


Comparison of 100-year flood flow statistic (Q_{100}) computed using Log-Pearson distribution and PSU-IV regional regression equations for flood-flow region 1.

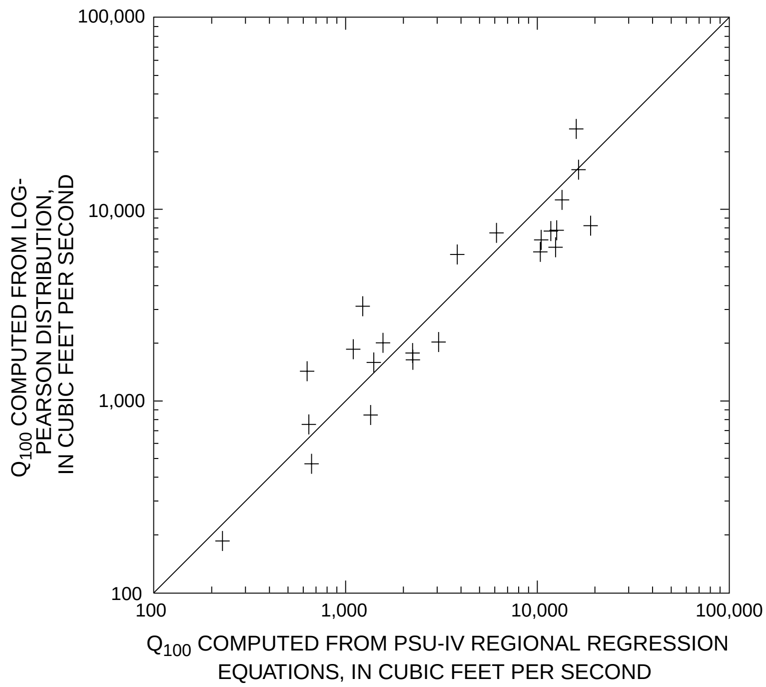


Comparison of 100-year flood flow statistic (Q_{100}) computed using Log-Pearson distribution and PSU-IV regional regression equations for flood-flow region 2.

__Appendix 4.__ Comparison of streamflow statistics computed using Log-Pearson distribution and regression equations—Continued



Comparison of 100-year flood flow statistic (Q_{100}) computed using Log-Pearson distribution and PSU-IV regional regression equations for flood-flow region 3.



Comparison of 100-year flood flow statistic (Q_{100}) computed using Log-Pearson distribution and PSU-IV regional regression equations for flood-flow region 4.

Appendix 5. *Flood-flow statistics computed from Log-Pearson distribution of streamflow data and WRI 82-21 regional regression equations for gaged locations on streams in Pennsylvania*

[WRI 82-21 refers to Flippo, 1982b; ft³/s, cubic feet per second; mi², is square miles; water year, 12-month period October 1 - September 30]

U.S. Geological Survey streamflow-gaging station	Period of record (water year)	Station name	Drainage area (mi²)	50-year flood flow computed from Log-Pearson distribution (ft³/s)	50-year flood flow computed from WRI 82-21 regression equations (ft³/s)	Absolute value of percentage difference	100-year flood flow computed from Log-Pearson distribution (ft³/s)	100-year flood flow computed from WRI 82-21 regression equations [1] (ft³/s)	Absolute value of percentage difference
Flood-flow region 2									
01428750	1975-96	West Branch Lackawaxen River near Aldenville	40.6	4,850	7,520	55	5,440	9,330	72
01429000	1945-60	West Branch Lackawaxen River at Prompton	59.7	6,990	10,100	44	8,030	12,400	54
01429500	1944-59	Dyberry Creek near Honesdale	64.6	16,600	10,700	36	21,500	13,100	39
01430000	1949-59	Lackawaxen River near Honesdale	164	20,700	19,500	5.8	25,000	26,000	4.0
01430500	1922-38	Lackawaxen River at West Hawley	206	18,000	23,100	28	21,500	30,700	43
01431000	1945-85	Middle Creek near Hawley	78.4	9,260	12,400	34	11,200	15,100	35
01431500	[1]1909-96	Lackawaxen River at Hawley	290	24,200	32,800	36	29,600	39,400	33
01440400	1957-96	Brodhead Creek at Analomink	65.9	11,000	10,900	.90	13,300	13,300	0
01442500	1951-96	Brodhead Creek at Minisink Hills	259	38,600	30,200	22	49,700	36,300	27
01447500	1944-96	Lehigh River at Stoddardtsville	91.7	13,200	13,900	5.3	17,700	17,000	4.0
01447720	1962-96	Tobyhanna Creek near Blakeslee	118	11,900	16,800	41	14,300	20,400	43
01450500	1940-96	Aquashicola Creek at Palmerton	76.7	9,080	12,200	34	11,300	14,900	32
01516350	1977-96	Tioga River near Mansfield	153	42,400	20,400	52	56,100	24,700	56
01516500	1955-96	Corey Creek near Mainesburg	12.2	4,450	3,110	30	5,870	3,900	34
01517000	1955-78	Elk Run near Mainesburg	10.2	2,740	2,720	.73	3,520	3,390	3.7
01518500	1954-74	Crooked Creek at Tioga	122	15,600	17,200	10	19,700	20,900	6.1
01518862	1984-96	Cowanesque River at Westfield	90.6	19,800	13,800	30	24,500	16,800	31
01532000	1914-96	Towanda Creek near Monroetown	215	47,200	26,300	44	60,700	31,700	48
01532850	1960-79	Middle Branch Wyalusing Creek Tributary near Birchardsville	5.67	1,770	1,760	.56	2,150	2,210	2.8
01533500	1941-58	North Branch Mehoopany Creek near Lovelton	35.2	14,800	6,830	54	20,000	8,410	58
01533950	1961-78	South Branch Tunkhannock Creek near Montdale	12.6	2,320	3,180	37	2,700	3,890	44
01534000	1914-96	Tunkhannock Creek near Tunkhannock	383	33,500	40,400	21	37,400	48,400	29
01537500	1940-90	Solomon Creek at Wilkes-Barre	15.7	2,470	3,750	52	3,070	4,650	51
01549500	1941-96	Blockhouse Creek near English Center	37.7	6,560	7,190	9.6	7,960	8,840	11
01549780	1960-78	Larrys Creek at Cogan House	6.8	1,040	2,010	93	1,300	2,520	94
01550000	1914-96	Lycoming Creek near Trout Run	173	23,700	22,300	5.9	28,800	27,000	6.3

Appendix 5. *Flood-flow statistics computed from Log-Pearson distribution of streamflow data and WRI 82-21 regional regression equations for gaged locations on streams in Pennsylvania—Continued*

U.S. Geological Survey streamflow-gaging station	Period of record (water year)	Station name	Drainage area (mi^2)	50-year flood flow computed from Log-Pearson distribution (ft^3/s)	50-year flood flow computed from WRI 82-21 regression equations (ft^3/s)	Absolute value of percentage difference	100-year flood flow computed from Log-Pearson distribution (ft^3/s)	100-year flood flow computed from WRI 82-21 regression equations [1] (ft^3/s)	Absolute value of percentage difference
01552000	[1]1926-96	Loyalsock Creek at Loyalsock	443	77,200	45,000	42	94,500	53,800	43
01552500	1941-96	Muncy Creek near Sonestown	23.8	7,660	5,110	33	9,600	6,310	34
01553600	1960-78	East Branch Chillisquaque Creek near Washingtonville	9.48	4,550	2,580	43	5,970	3,210	46
01553700	1980-96	Chillisquaque Creek at Washingtonville	51.3	4,560	9,040	98	5,030	11,100	120
04213075	1986-96	Brandy Run near Girard	4.45	2,380	1,470	38	2,900	1,840	36
Flood-flow region 3									
01439500	1909-96	Bush Kill at Shoemakers	117	8,010	8,700	8.6	10,300	10,800	4.9
Flood-flow region 4									
03015280	1963-79	Jackson Run near North Warren	12.8	812	1,200	48	861	1,340	56
03015500	1910-96	Brokenstraw Creek at Youngsville	321	15,600	13,700	12	17,100	15,200	11
03017500	1938-79	Tionesta Creek at Lynch	233	15,200	10,800	29	17,300	12,000	31
03019000	[1]1910-40	Tionesta Creek at Nebraska	469	17,800	18,300	2.8	19,400	20,300	4.6
03020500	1910-96	Oil Creek at Rouseville	300	17,500	13,100	25	19,600	14,500	26
03022540	1975-95	Woodcock Creek at Blooming Valley	31.1	3,320	2,350	29	3,780	2,620	31
03023000	1911-38	Cussewago Creek near Meadville	90.2	3,610	5,260	46	4,130	5,850	42
03025000	1933-79	Sugar Creek at Sugarcreek	166	11,200	8,344	26	12,200	9,270	24
03025200	1961-78	Patchel Run near Franklin	5.69	1,210	651	46	1,560	728	53
03029400	1960-78	Toms Run at Cooksburg	12.6	866	1,190	37	972	1,330	37
Flood-flow region 5E									
01441000	1911-38	McMichaels Creek at Stroudsburg	65.3	3,770	9,680	160	4,260	12,400	190
01446600	1961-76	Martins Creek neat East Bangor	10.4	2,120	2,080	1.9	2,700	2,710	.37
01448000	1917-59	Lehigh River at Tannery	322	36,000	29,100	19	47,700	35,800	25
01448500	1949-95	Dilldown Creek near Long Pond	2.93	540	1,030	91	660	1,220	85
01449500	1941-58	Wild Creek at Hatchery	16.8	3,280	3,520	7.3	4,340	4,610	6.2
01451800	1967-95	Jordan Creek near Schnecksville	53	8,160	7,590	7.0	9,960	9,640	3.2
01452000	1945-95	Jordan Creek at Allentown	75.8	12,300	10,000	19	15,600	12,700	19
01460000	[1]1884-1913	Tohickon Creek at Point Pleasant	107	10,500	10,600	.95	12,500	13,100	4.8
01467500	[1]1948-94	Schuylkill River at Pottsville	53.4	6,140	8,160	33	7,580	10,400	37

Appendix 5. *Flood-flow statistics computed from Log-Pearson distribution of streamflow data and WRI 82-21 regional regression equations for gaged locations on streams in Pennsylvania—Continued*

U.S. Geological Survey streamflow-gaging station	Period of record (water year)	Station name	Drainage area (mi^2)	50-year flood flow computed from Log-Pearson distribution (ft^3/s)	50-year flood flow computed from WRI 82-21 regression equations (ft^3/s)	Absolute value of percentage difference	100-year flood flow computed from Log-Pearson distribution (ft^3/s)	100-year flood flow computed from WRI 82-21 regression equations [1] (ft^3/s)	Absolute value of percentage difference
01468500	1973-96	Schuylkill River at Landingville	133	11,400	16,000	40	14,000	20,100	44
01469500	1920-96	Little Schuylkill River at Tamaqua	42.9	5,270	7,610	44	6,200	9,870	59
01470500	1948-95	Schuylkill River at Berne	355	34,500	32,400	6.1	40,800	40,000	2.0
01470720	1962-80	Maiden Creek Tributary at Lenhartsville	7.46	2,600	1,400	46	3,340	1,790	46
01470756	1973-95	Maiden Creek at Virginville	159	16,300	14,700	10	19,900	18,100	9.0
01470853	1983-95	Furnace Creek at Robesonia	4.18	766	776	1.3	894	992	47
01470960	1965-78	Tulpehocken Creek at Blue Marsh Damsite near Reading	175	21,100	17,500	17	26,800	21,600	19
01471000	1951-78	Tulpehocken Creek near Reading	211	14,600	18,800	29	17,200	23,000	34
01534500	1940-59	Lackawanna River at Archbald	108	9,000	14,700	63	10,600	18,700	76
01535500	1914-28	Lackawanna River at Moosic	264	15,300	28,700	88	17,900	35,900	100
01536000	1960-96	Lackawanna River at Old Forge	332	20,700	29,400	42	24,600	36,000	46
01538000	1920-96	Wapwallopen Creek near Wapwallopen	43.8	4,050	5,240	29	4,810	6,530	36
01539000	1939-96	Fishing Creek near Bloomsburg	274	28,900	23,800	18	34,900	29,100	17
01539500	1941-58	Little Fishing Creek at Eyers Grove	56.5	4,100	6,770	65	4,510	8,270	83
01540000	1914-31	Fishing Creek at Bloomsburg	355	33,000	27,200	18	37,800	33,000	13
01540200	1959-79	Trexler Run near Ringtown	1.77	457	505	11	638	670	5.0
01541000	1913-96	West Branch Susquehanna River at Bower	315	21,200	26,600	25	24,900	32,500	31
01541308	1968-79	Bradley Run near Ashville	6.77	912	1,600	75	1,070	2,100	96
01541500	1914-60	Clearfield Creek at Dimeling	371	19,200	28,600	49	21,800	34,600	59
01542000	1941-93	Moshannon Creek at Oceola Mills	68.8	3,670	8,360	130	4,270	10,500	150
01546000	1911-28	North Bald Eagle Creek at Milesburg	119	20,200	10,400	49	23,800	12,600	47
01547200	1957-96	Bald Eagle Creek below Spring Creek at Milesburg	265	18,800	17,800	5.3	22,800	21,200	7.0
01547500	1955-69	Bald Eagle Creek at Blanchard	339	10,800	9,500	12	12,200	10,300	16
01547700	1956-96	Marsh Creek at Blanchard	44.1	6,120	4,450	27	7,940	5,450	31
01547800	1959-81	South Fork Beech Creek near Snow Shoe	12.2	1,180	1,890	60	1,440	2,390	66
01547950	1968-96	Beech Creek at Monument	152	8,910	12,500	40	10,700	14,400	35
01548005	1911-65	Bald Eagle Creek near Beech Creek Station	562	23,400	29,300	25	26,100	34,200	31
01553130	1968-81	Sand Spring Run near White Deer	4.93	1,440	999	31	2,000	1,290	36

Appendix 5. *Flood-flow statistics computed from Log-Pearson distribution of streamflow data and WRI 82-21 regional regression equations for gaged locations on streams in Pennsylvania—Continued*

U.S. Geological Survey streamflow-gaging station	Period of record (water year)	Station name	Drainage area (mi^2)	50-year flood flow computed from Log-Pearson distribution (ft^3/s)	50-year flood flow computed from WRI 82-21 regression equations (ft^3/s)	Absolute value of percentage difference	100-year flood flow computed from Log-Pearson distribution (ft^3/s)	100-year flood flow computed from WRI 82-21 regression equations [1] (ft^3/s)	Absolute value of percentage difference
01554500	1940-93	Shamokin Creek near Shamokin	54.2	3,190	6,640	110	3,940	8,310	110
01555000	1930-95	Penns Creek at Penns Creek	301	20,000	22,800	14	24,500	27,500	12
01555500	1930-95	East Mahantango Creek near Dalmatia	162	21,800	14,200	35	28,900	17,300	40
01556000	1917-95	Frankstown Branch Juniata River at Williamsport	291	17,800	19,900	12	20,500	25,800	26
01556500	1946-81	Little Juniata River at Tipton	93.7	7,580	8,860	17	8,780	10,800	23
01557500	1940-95	Bald Eagle Creek at Tyrone	44.1	4,540	5,930	31	5,350	7,490	40
01558000	1939-95	Little Juniata River at Spruce Creek	220	18,300	17,200	6.0	22,600	20,800	8.0
01559500	1930-58	Standing Stone Creek near Huntingdon	128	7,010	9,720	39	8,210	11,700	43
01562500	1930-57	Great Trough Creek near Marklesburg	84.6	6,290	6,890	10	7,770	8,300	6.8
01565000	[1]1940-95	Kishacoquillas at Reedsville	164	8,870	13,400	51	10,700	16,300	52
01565700	1960-81	Little Lost Creek at Oakland Mills	6.52	1,330	1,170	12	1,780	1,500	16
01566500	1930-58	Cocolamus Creek near Millertown	57.2	6,740	5,600	17	7,700	6,050	21
01572000	1920-32	Lower Little Swatara Creek at Pine Grove	34.3	4,700	4,850	3.2	5,820	6,140	5.5
01573000	1919-95	Swatara Creek at Harper Tavern	337	28,600	28,300	1.0	34,500	34,600	.30
Flood-flow region 5W									
03034500	1940-95	Little Mahoning Creek at McCormick	87.4	6,350	8,180	29	6,930	9,460	37
03035000	1917-40	Mahoning Creek at Dayton	321	17,200	21,900	27	19,700	25,100	27
03038000	1936-96	Crooked Creek at Idaho	191	13,500	14,800	10	15,700	17,000	8.3
03039000	1910-39	Crooked Creek at Crooked Creek Dam	278	19,800	19,600	1.0	21,700	22,600	4.1
03039200	1961-78	Clear Run near Buckstown	3.68	401	744	86	470	877	87
03040000	1914-36	Stonycreek River at Ferndale	451	38,600	28,300	27	48,400	32,500	33
03041000	1940-61	Little Conemaugh River at East Conemaugh	183	14,000	14,300	2.1	15,700	16,500	5.1
03042000	1952-96	Blacklick Creek at Josephine	192	24,200	14,800	39	30,000	17,100	43
03042200	1961-78	Little Yellow Creek near Strongstown	7.36	2,360	1,260	47	3,120	1,480	53
03042500	1952-68	Two Lick Creek at Graceton	171	12,900	13,600	5.4	14,800	15,700	6.1
03043000	1905-51	Blacklick Creek at Blacklick	390	36,800	25,400	31	44,700	29,100	35
03045000	1940-84	Loyalhanna Creek at Kingston	172	19,700	13,700	30	24,100	15,700	35
03045500	[1]1920-40	Loyalhanna Creek at New Alexandria	265	28,300	18,900	33	35,100	21,800	38

Appendix 5. *Flood-flow statistics computed from Log-Pearson distribution of streamflow data and WRI 82-21 regional regression equations for gaged locations on streams in Pennsylvania*—*Continued*

U.S. Geological Survey streamflow-gaging station	Period of record (water year)	Station name	Drainage area (mi²)	50-year flood flow computed from Log-Pearson distribution (ft³/s)	50-year flood flow computed from WRI 82-21 regression equations (ft³/s)	Absolute value of percentage difference	100-year flood flow computed from Log-Pearson distribution (ft³/s)	100-year flood flow computed from WRI 82-21 regression equations [1] (ft³/s)	Absolute value of percentage difference
03049000	1941-96	Buffalo Creek near Freeport	137	11,100	11,500	3.6	12,800	13,300	3.9
03070420	1978-89	Stony Fork Tributary near Gibbon Glade	.93	162	263	62	186	312	68
03072000	1941-96	Dunkard Creek at Shannopin	229	16,600	17,000	2.4	18,500	19,500	5.4
03072590	1964-78	Georges Creek at Smithfield	16.3	1,770	2,290	23	2,030	2,680	32
03072840	1969-79	Tenmile Creek near Clarksville	133	20,600	11,200	46	26,300	13,000	51
03073000	1932-95	South Fork Tenmile Creek at Jefferson	180	12,700	14,100	11	13,700	16,300	19
03074300	1959-78	Lick Run at Hopwood	3.8	613	762	24	754	898	19
03074500	1943-96	Redstone Creek at Waltersburg	73.7	5,570	7,190	29	6,340	8330	31
03080000	1914-96	Laurel Hill Creek at Ursina	121	9,960	10,500	5.4	11,200	12,100	8.0
03082200	1961-78	Poplar Run near Normalville	9.27	1,730	1,500	13	2,010	1,760	12
03083000	1929-79	Green Lick Run at Green Lick Reservoir	3.07	1,120	648	42	1,430	765	47
03084000	1949-93	Abers Creek near Murrysville	4.39	1,370	849	38	1,590	1,000	37
03084500	1917-52	Turtle Creek at Trafford	55.9	5,380	5,830	8.4	6,000	6,770	13
03085500	[1]1916-96	Chartiers Creek at Carnegie	257	13,800	18,500	34	15,500	21,300	37
03086100	1963-78	Big Sewickley Creek near Ambridge	15.6	2,180	2,220	1.8	2,630	2,570	2.3
03101000	1935-55	Sugar Run at Pymatuning Dam	9.34	2,610	1,500	42	3,230	1,760	46
03102500	1914-96	Little Shenango River at Greenville	104	6,470	9,330	44	7,340	10,800	47
03103000	1914-63	Pymatuning Creek near Orangeville	169	6,650	13,500	100	7,290	15,500	110
03104760	1969-80	Harthegig Run near Greenfield	2.26	504	514	1.8	577	608	5.4
03106000	1916-96	Connoquenessing Creek near Zelienople	356	17,000	23,700	39	19,000	27,200	43
03106500	1912-87	Slippery Rock Creek at Wurtemburg	398	16,700	25,800	54	18,700	39,500	110
03108000	[1]1916-96	Raccoon Creek at Moffatts Mill	178	9,770	14,000	43	11,100	16,100	45
03111150	[1]1961-85	Brush Run near Buffalo	10.3	2,010	1,620	19	2,380	1,900	20
04213040	1966-95	Raccoon Creek near West Springfield	2.53	445	560	26	520	662	27
Flood-flow region 6A									
01543000	1914-96	Driftwood Branch Sinnemahoning Creek near Sinnemahoning	272	32,300	26,800	17	39,700	33,100	17
01544500	1941-96	Kettle Creek at Cross Fork	136	13,400	15,500	16	16,400	19,300	17
01545600	1965-96	Young Womans Creek near Renovo	46.2	4,920	6,610	34	6,430	8,380	30

Appendix 5. *Flood-flow statistics computed from Log-Pearson distribution of streamflow data and WRI 82-21 regional regression equations for gaged locations on streams in Pennsylvania—Continued*

U.S. Geological Survey streamflow-gaging station	Period of record (water year)	Station name	Drainage area (mi^2)	50-year flood flow computed from Log-Pearson distribution (ft^3/s)	50-year flood flow computed from WRI 82-21 regression equations (ft^3/s)	Absolute value of percentage difference	100-year flood flow computed from Log-Pearson distribution (ft^3/s)	100-year flood flow computed from WRI 82-21 regression equations [1] (ft^3/s)	Absolute value of percentage difference
01560000	1940-95	Dunning Creek at Belden	172	12,800	18,700	46	15,300	23,200	52
01561000	1930-58	Brush Creek at Gapsville	36.8	5,620	5,520	1.8	7,540	7,020	6.9
01564500	1939-95	Aughwick Creek near Three Springs	205	22,000	21,400	2.7	26,500	26,600	.38
01566000	1912-58	Tuscarora Creek near Port Royal	214	17,000	22,200	31	19,800	27,500	39
01568000	[1]1927-95	Sherman Creek at Shermans Dale	200	28,500	21,000	26	35,800	26,100	27
01570000	[1]1929-96	Conodoguinet Creek near Hogestown	470	20,300	41,300	100	24,100	50,600	110
01571500	[1]1910-95	Yellow Breeches Creek near Camp Hill	216	11,300	22,300	97	14,600	27,700	90
01573560	1975-95	Swatara Creek near Hershey	483	29,500	42,200	43	35,300	51,600	46
01574500	1930-66	Codorus Creek at Spring Grove	75.5	8,610	9,740	13	11,000	12,300	12
01575000	1928-71	South Branch Codorus Creek near York	117	10,600	13,800	30	13,900	17,200	24
01601000	1952-86	Wills Creek below Hyndman	146	13,600	16,400	21	16,100	20,400	27
01603500	1933-82	Evitts Creek near Centerville	30.2	3,640	4,720	30	4,430	6,030	36
03007800	1975-96	Allegheny River at Port Allegany	248	11,900	24,900	110	13,200	30,800	130
03009680	1975-95	Potato Creek at Smethport	160	6,880	17,600	160	7,410	21,900	200
03010655	1975-96	Oswayo Creek at Shinglehouse	98.7	4,720	12,000	150	5,200	15,100	190
03028000	1954-96	West Branch Clarion River at Wilcox	63	6,370	8,440	32	7,410	10,600	43
03078500	[1]1933-86	Big Piney Run near Salisbury	24.5	4,630	4,000	14	5,820	5,120	12
03100000	1912-22	Shenango River near Turnersville	152	9,710	12,400	28	11,500	14,300	24
Flood-flow region 6B									
01542810	1964-96	Waldy Run near Emporium	5.24	702	923	31	845	1,160	37
01559700	1962-78	Sulphur Springs Creek near Manns Choice	5.28	1,470	1,040	29	1,860	1,310	30
01567500	1954-95	Bixler Run near Loysville	15	6,740	3,710	45	9,660	4,860	50
01571000	[1]1940-94	Paxton Creek near Penbrook	11.2	4,690	3,190	32	5,560	4,180	25
01573500	1938-58	Manada Creek at Manada Gap	13.5	3,820	2,470	35	5,080	3,180	37
01576085	1982-95	Little Conestoga Creek near Churchtown	5.82	2,480	1,990	20	2,930	2,590	12
01578400	1963-81	Bowery Run near Quarryville	5.98	5,040	2,170	57	7,270	2,840	61
01613050	1963-96	Tonoloway Creek near Needmore	10.7	1,380	2,210	60	1,640	2,850	74
03008000	1960-78	Newell Creek near Port Allegany	7.79	3,470	1,500	57	4,780	1,920	60

Appendix 5. *Flood-flow statistics computed from Log-Pearson distribution of streamflow data and WRI 82-21 regional regression equations for gaged locations on streams in Pennsylvania—Continued*

U.S. Geological Survey streamflow-gaging station	Period of record (water year)	Station name	Drainage area (mi^2)	50-year flood flow computed from Log-Pearson distribution (ft^3/s)	50-year flood flow computed from WRI 82-21 regression equations (ft^3/s)	Absolute value of percentage difference	100-year flood flow computed from Log-Pearson distribution (ft^3/s)	100-year flood flow computed from WRI 82-21 regression equations [1] (ft^3/s)	Absolute value of percentage difference
Flood-flow region 7A									
01465500	1935-95	Neshaminy Creek near Langhorne	210	32,200	22,300	31	38,500	27,100	30
01465798	1966-96	Poquessing Creek at Grant Avenue, Philadelphia	21.4	9,000	4,750	47	10,600	5,850	45
01467042	1965-81	Pennypack Creek at Pine Road, Philadelphia	37.9	5,940	6,560	10	6,720	8,210	22
01467048	1966-95	Pennypack Creek at Lower Rhawn Street Bridge, Philadelphia	49.8	8,700	8,110	6.8	10,000	10,000	0
01467086	1966-86	Tacony Creek above Adams Avenue, Philadelphia	16.6	5,700	3,750	34	6,410	4,710	27
01467087	1982-95	Frankford Creek at Castor Avenue, Philadelphia	30.4	14,000	6,100	56	15,700	7,470	52
01467089	1966-81	Frankford Creek at Torresdale Avenue, Philadelphia	33.8	12,300	6,690	46	13,400	8,140	39
01471980	1975-95	Manatawny Creek near Pottstown	85.5	8,510	11,000	29	9,920	13,800	39
01472157	1969-95	French Creek near Phoenixville	59.1	11,400	8,230	28	14,800	10,500	29
01472198	1981-96	Perkiomen Creek at East Greenville	38	8,980	6,130	32	10,800	7,823	28
01472199	1982-95	Northwest Branch Perkiomen Creek at Hillegass	23	3,890	4,180	7.5	4,490	5,420	21
01472500	1885-1911	Perkiomen Creek near Frederick	152	9,630	16,500	71	10,800	20,600	91
01473000	1915-56	Perkiomen Creek at Graterford	279	44,800	26,200	42	52,500	32,100	39
01473120	1966-94	Skippack Creek near Collegeville	53.7	24,600	8,290	66	31,700	10,300	68
01474000	1966-95	Wissahickon Creek at mouth, Philadelphia	64	6,630	9,320	41	7,190	11,600	61
01475510	1964-90	Darby Creek near Darby	37.4	6,870	6,350	7.6	7,770	8,000	3.0
01475550	1964-90	Cobbs Creek at Darby	22	6,030	4,920	18	6,840	6,000	12
01475850	1977-95	Crum Creek near Newtown Square	15.8	2,380	3,170	33	2,700	4,150	54
01476500	1932-55	Ridley Creek at Moylan	31.9	5,920	5,320	10	7,780	6,840	12
01477000	1932-95	Chester Creek near Chester	61.1	13,700	8,710	36	17,800	11,000	38
01480300	1960-95	West Branch Brandywine Creek near Honey Brook	18.7	9,110	4,070	55	13,000	5,110	61
01480500	[1]1944-95	West Branch Brandywine Creek at Coatesville	45.8	8,620	7,270	16	11,100	9,150	18
01480617	1970-95	West Branch Brandywine Creek at Modena	55	10,800	8,290	23	13,600	10,400	24
01480800	1958-68	East Branch Brandywine Creek at Downingtown	81.6	5,800	10,900	88	6,270	13,600	120
01481000	[1]1912-94	Brandywine Creek at Chadds Ford	287	20,100	27,400	36	23,800	33,200	39

Appendix 5. *Flood-flow statistics computed from Log-Pearson distribution of streamflow data and WRI 82-21 regional regression equations for gaged locations on streams in Pennsylvania—Continued*

U.S. Geological Survey streamflow-gaging station	Period of record (water year)	Station name	Drainage area (mi^2)	50-year flood flow computed from Log-Pearson distribution (ft^3/s)	50-year flood flow computed from WRI 82-21 regression equations (ft^3/s)	Absolute value of percentage difference	100-year flood flow computed from Log-Pearson distribution (ft^3/s)	100-year flood flow computed from WRI 82-21 regression equations [1] (ft^3/s)	Absolute value of percentage difference
Flood-flow region 7B									
01465770	1965-81	Poquessing Creek at Trevose Road, Philadelphia	5.08	2,040	3,200	57	2,430	4,030	66
01465785	1965-78	Walton Run at Philadelphia	2.17	1,590	1,520	4.4	1,820	1,910	4.9
01465790	1966-78	Byberry Creek at Chalfont Road, Philadelphia	5.34	2,110	3,340	58	2,450	4,220	72
01467050	1965-81	Wooden Bridge Run at Philadelphia	3.35	2,570	2,220	14	3,030	2,800	7.6
01472620	1984-95	East Branch Perkiomen Creek near Dublin	4.05	3,510	2,620	25	4,330	3,310	24
01475300	1972-95	Darby Creek at Waterloo Mills near Devon	5.15	1,960	3,240	65	2,290	4,080	78
01475530	1965-81	Cobbs Creek at US Highway No. 1 at Philadelphia	4.78	4,610	3,030	34	6,180	3,820	38
01480675	1967-95	Marsh Creek near Glenmore	8.57	1,010	5,040	80	1,270	6,380	80
Flood-flow region 8									
01451500	1946-95	Little Lehigh Creek near Allentown	80.8	11,200	15,000	34	15,500	18,200	17
01452500	1949-95	Monocacy Creek at Bethlehem	44.5	3,200	6,920	120	4,220	8,400	99
01470779	1975-96	Tulpehocken Creek near Bernville	66.5	9,570	5,730	40	12,000	6,600	45
01473169	1983-95	Valley Creek at Pennsylvania Turnpike near Valley Forge	20.8	1,990	9,320	370	2,200	12,200	450
01546400	1985-96	Spring Creek at Houserville	58.5	2,170	4,020	85	2,750	4,010	46
01546500	1941-96	Spring Creek near Axemann	87.2	4,170	6,270	50	5,630	6,420	14
01547100	1967-96	Spring Creek at Milesburg	142	6,450	11,100	72	8,350	11,600	39
01569800	1976-95	Letort Spring Run near Carlisle	21.6	1,540	1,970	28	2,120	2,300	9.0
01573086	1964-81	Beck Creek near Cleona	7.87	5,710	1,320	77	9,990	1,550	84
01573160	1975-93	Quittapahilla Creek near Bellegrove	74.2	4,320	8,190	90	5,630	9,650	71
01576500	[1]1929-96	Conestoga River at Lancaster	324	27,700	53,200	92	34,100	66,800	96
01576754	1985-95	Conestoga River at Conestoga	470	26,600	81,100	200	30,600	106,000	250
01614090	1961-81	Conococheague Creek near Fayetteville	5.05	634	765	21	845	816	3.4

[1] Period of record not continuous.

Appendix 6. *Flood-flow statistics computed from Log-Pearson distribution of streamflow data and PSU-IV regional regression equations for gaged locations on streams in Pennsylvania*

[PSU-IV refers to Aron and Kibler, 1981; mi^2, square miles; ft^3/s, cubic feet per second; water year, 12-month period October 1 - September 30]

U.S. Geological Survey streamflow-gaging station number	Period of record (water years)	Station name	Drainage area (mi^2)	50-year flood flow computed from Log-Pearson distribution (ft^3/s)	50-year flood flow computed from PSU-IV regression equations (ft^3/s)	Absolute value of percentage difference	100-year flood flow computed from Log-Pearson distribution (ft^3/s)	100-year flood flow computed from PSU-IV regression equations (ft^3/s)	Absolute value of percentage difference
Region 1									
01460000	[1]1884-1913	Tohickon Creek at Point Pleasant	107	10,500	15,200	45	12,500	18,600	49
01465000	[1]1885-1912	Neshaminy Creek at Rushland	134	10,500	21,000	100	12,200	25,400	110
01465770	1965-81	Poquessing Creek at Trevose Road, Philadelphia	5.08	2,040	2,780	36	2,430	3,340	37
01465785	1965-78	Walton Run at Philadelphia	2.17	1,590	1,610	1.3	1,820	1,940	6.6
01465790	1966-78	Byberry Creek at Chalfont Road, Philadelphia	5.34	2,110	3,050	45	2,450	3,670	50
01467042	1965-81	Pennypack Creek at Pine Road, Philadelphia	37.9	5,940	10,800	82	6,720	13,000	93
01467048	1966-95	Pennypack Creek at Lower Rhawn Street Bridge, Philadelphia	49.8	8,700	13,000	49	10,000	15,700	57
01467050	1965-81	Wooden Bridge Run at Philadelphia	3.35	2,570	2,360	8.2	3,030	2,840	6.3
01467086	1966-86	Tacony Creek above Adams Avenue, Philadelphia	16.6	5,700	6,160	8.1	6,410	7,460	16
01467087	1982-95	Frankford Creek at Castor Avenue, Philadelphia	30.4	14,000	9,470	32	15,700	11,500	27
01467089	1966-81	Frankford Creek at Torresdale Avenue, Philadelphia	33.8	12,300	10,200	17	13,400	12,400	7.5
01472157	1969-95	French Creek near Phoenixville	59.1	11,400	10,100	11	14,800	12,500	16
01472198	1981-96	Perkiomen Creek at East Greenville	38	8,980	7,520	16	10,800	9,280	14
01472199	1982-95	West Branch Perkiomen Creek at Hillegass	23	3,890	5,520	82	4,490	6,470	44
01472620	1984-95	East Branch Perkiomen Creek near Dublin	4.05	3,510	2,150	39	4,330	2,610	40
01473120	1966-94	Skippack Creek near Collegeville	53.7	24,600	13,200	46	31,700	16,000	50
01473169	1983-95	Valley Creek at Pennsylvania Turnpike near Valley Forge	20.8	1,990	4,190	110	2,200	5,380	140
01474000	1966-95	Wissahickon Creek at mouth, Philadelphia	64	6,630	17,000	160	7,190	20,050	180
01475300	1972-95	Darby Creek at Waterloo Mills near Devon	5.15	1,960	2,590	32	2,290	3,180	38
01475510	1964-90	Darby Creek near Darby	37.4	6,870	10,500	53	7,770	12,900	66
01475530	1965-81	Cobbs Creek at US Highway No. 1 at Philadelphia	4.78	4,610	2,740	41	6,180	3,350	46
01475550	1964-90	Cobbs Creek at Darby	22	6,030	8,120	35	6,840	9,960	46
01475850	1977-95	Crum Creek near Newtown Square	15.8	2,380	5,490	130	2,700	6,750	150
01476500	1932-55	Ridley Creek at Moylan	31.9	5,920	9,090	54	7,780	11,200	44
01477000	1932-95	Chester Creek near Chester	61.1	13,700	16,300	19	17,800	20,200	13
01480300	1960-95	West Branch Brandywine Creek near Honey Brook	18.7	9,110	4,050	55	13,000	5,300	59
01480500	[1]1944-95	West Branch Brandywine Creek at Coatesville	45.8	8,620	8,650	1.5	11,100	10,800	2.7

Appendix 6. *Flood-flow statistics computed from Log-Pearson distribution of streamflow data and PSU-IV regional regression equations for gaged locations on streams in Pennsylvania*—*Continued*

U.S. Geological Survey streamflow-gaging station number	Period of record (water years)	Station name	Drainage area (mi^2)	50-year flood flow computed from Log-Pearson distribution (ft^3/s)	50-year flood flow computed from PSU-IV regression equations (ft^3/s)	Absolute value of percentage difference	100-year flood flow computed from Log-Pearson distribution (ft^3/s)	100-year flood flow computed from PSU-IV regression equations (ft^3/s)	Absolute value of percentage difference
01480675	1967-95	Marsh Creek near Glenmore	8.57	1,010	2,440	140	1,270	3,020	140
01480800	1958-68	East Branch Brandywine Creek at Downingtown	81.6	5,800	11,100	91	6,270	13,900	120
01576085	1982-95	Little Conestoga Creek near Churchtown	5.82	2,480	2,180	12	2,930	2,800	4.4
01578400	1963-81	Bowery Run near Quarryville	5.98	5,040	2,130	58	7,270	2,770	62
Region 2									
01446600	1961-76	Martins Creek neat East Bangor	10.4	2,120	931	56	2,700	1,120	59
01447500	1944-96	Lehigh River at Stoddardtsville	91.7	13,200	5,600	58	17,700	6,870	61
01447680	1965-96	Tunkhannock Creek near Long Pond	18.0	771	996	29	861	1,210	41
01447720	1962-96	Tobyhanna Creek near Blakeslee	118	11,900	6,130	48	14,300	7,480	48
01448500	1949-95	Dilldown Creek near Long Pond	2.93	540	405	25	660	495	25
01449360	1967-96	Pohopoco Creek at Kresgeville	49.9	2,600	6,200	140	2,930	7,540	160
01449500	1941-58	Wild Creek at Hatchery	16.8	3,280	2,050	38	4,340	2,520	42
01450500	1940-96	Aquashicola Creek at Palmerton	76.7	9,080	7,580	17	11,300	9,250	18
01451500	1946-95	Little Lehigh Creek near Allentown	80.8	11,200	8,530	24	15,500	11,000	29
01451800	1967-95	Jordan Creek near Schnecksville	53	8,160	7,320	10	9,960	9,150	8.1
01452000	1945-95	Jordan Creek at Allentown	75.8	12,300	10,400	15	15,600	13,100	16
01452500	1949-95	Monocacy Creek at Bethlehem	44.5	3,200	6,600	110	4,220	11,500	170
01467500	[1]1948-94	Schuylkill River at Pottsville	53.4	6,140	6,250	1.8	7,580	7,950	4.9
01468500	1973-96	Schuylkill River at Landingville	133	11,400	16,300	43	14,000	20,700	48
01469500	1920-96	Little Schuylkill River at Tamaqua	42.9	5,270	4,940	6.3	6,200	6,220	.3
01470720	1962-80	Maiden Creek Tributary at Lenhartsville	7.46	2,600	1,520	42	3,340	1,900	43
01470779	1975-96	Tulpehocken Creek near Bernville	66.5	9,570	7,170	25	12,000	9,680	19
01470853	1983-95	Furnace Creek at Robesonia	4.18	766	810	5.7	894	1,030	15
01471980	1975-95	Manatawny Creek near Pottstown	85.5	8,510	7,930	6.8	9,920	9,960	.5
01537500	1940-90	Solomon Creek at Wilkes-Barre	15.7	2,470	3,060	24	3,070	3,760	22
01538000	1920-96	Wapwallopen Creek near Wapwallopen	43.8	4,050	5,620	39	4,810	6,960	45
01540200	1959-79	Trexler Run near Ringtown	1.77	457	396	13	638	506	21
01541308	1968-79	Bradley Run near Ashville	6.77	912	1,090	20	1,070	1,320	24

Appendix 6. *Flood-flow statistics computed from Log-Pearson distribution of streamflow data and PSU-IV regional regression equations for gaged locations on streams in Pennsylvania—Continued*

U.S. Geological Survey streamflow-gaging station number	Period of record (water years)	Station name	Drainage area (mi^2)	50-year flood flow computed from Log-Pearson distribution (ft^3/s)	50-year flood flow computed from PSU-IV regression equations (ft^3/s)	Absolute value of percentage difference	100-year flood flow computed from Log-Pearson distribution (ft^3/s)	100-year flood flow computed from PSU-IV regression equations (ft^3/s)	Absolute value of percentage difference
01542000	1941-93	Moshannon Creek at Oceola Mills	68.8	3,670	6,420	75	4,270	7,870	84
01542810	1964-96	Waldy Run near Emporium	5.24	702	734	4.6	845	906	7.2
01544500	1941-96	Kettle Creek at Cross Fork	136	13,400	11,900	11	16,400	15,200	7.3
01545600	1965-96	Young Womans Creek near Renovo	46.2	4,920	5,120	4.1	6,430	6,650	3.4
01546000	1911-28	North Bald Eagle Creek at Milesburg	119	20,200	10,400	49	23,800	13,100	45
01546400	1985-96	Spring Creek at Houserville	58.5	2,170	5,740	160	2,750	7,720	180
01546500	1941-96	Spring Creek near Axemann	87.2	4,170	7,440	78	5,630	9,960	77
01547100	1967-96	Spring Creek at Milesburg	142	6,450	11,100	72	8,350	14,900	79
01547700	1956-96	Marsh Creek at Blanchard	44.1	6,120	5,170	16	7,940	6,620	17
01547800	1959-81	South Fork Beech Creek near Snow Shoe	12.2	1,180	1,600	36	1,440	2,020	40
01553130	1968-81	Sand Spring Run near White Deer	4.93	1,440	800	44	2,000	1,150	43
01554500	1940-93	Shamokin Creek near Shamokin	54.2	3,190	7,840	150	3,940	9,960	150
01569800	1976-95	Letort Spring Run near Carlisle	21.6	1,540	3,040	97	2,120	4,080	92
01571000	[1]1940-94	Paxton Creek near Penbrook	11.2	4,690	3,070	35	5,560	3,880	30
01572000	1920-32	Lower Little Swatara Creek at Pine Grove	34.3	4,700	5,220	11	5,820	6,720	15
01573086	1964-81	Beck Creek near Cleona	7.87	5,710	1,170	80	9,990	1,600	84
01573160	1975-93	Quittapahilla Creek near Bellegrove	74.2	4,320	10,000	130	5,630	13,600	140
01573500	1938-58	Manda Creek at Manada Gap	13.5	3,820	2,050	46	5,080	2,610	49
01575000	1928-71	South Branch Codorus Creek near York	117	10,600	18,000	70	13,900	24,200	74
03028000	1954-96	West Branch Clarion River at Wilcox	63	6,370	4,880	23	7,410	5,830	21
03029400	1960-78	Toms Run at Cooksburg	12.6	866	1,180	37	972	1,390	43
03031950	1964-81	Big Run near Sprankle Mills	7.38	1,270	1,000	21	1,420	1,300	8.5
03049000	1941-96	Buffalo Creek near Freeport	137	11,100	8,760	21	12,800	10,200	20
03049800	1963-96	Little Pine Creek near Etna	5.78	3,310	990	70	4,930	1,200	76
03086100	1963-78	Big Sewickley Creek near Ambridge	15.6	2,180	1,810	17	2,630	2,210	16
03101000	1935-55	Sugar Run at Pymatuning Dam	9.34	2,610	1,250	52	3,230	1,700	47
03102500	1914-96	Little Shenango River at Greenville	104	6,470	8,520	32	7,340	10,100	38
03104760	1969-80	Harthegig Run near Greenfield	2.26	504	439	13	577	526	8.8
03111150	[1]1961-85	Brush Run near Buffalo	10.3	2,010	1,440	28	2,380	1,680	30

Appendix 6. *Flood-flow statistics computed from Log-Pearson distribution of streamflow data and PSU-IV regional regression equations for gaged locations on streams in Pennsylvania—Continued*

U.S. Geological Survey streamflow-gaging station number	Period of record (water years)	Station name	Drainage area (mi²)	50-year flood flow computed from Log-Pearson distribution (ft³/s)	50-year flood flow computed from PSU-IV regression equations (ft³/s)	Absolute value of percentage difference	100-year flood flow computed from Log-Pearson distribution (ft³/s)	100-year flood flow computed from PSU-IV regression equations (ft³/s)	Absolute value of percentage difference
Region 3									
01428750	1975-96	West Branch Lackawaxen River near Aldenville	40.6	4,850	4,720	2.7	5,440	5,620	3.3
01429000	1945-60	West Branch Lackawaxen River at Prompton	59.7	6,990	6,610	5.4	8,030	7,880	1.9
01429500	1944-59	Dyberry Creek near Honesdale	64.6	16,600	6,570	60	21,500	7,810	64
01431000	1945-85	Middle Creek near Hawley	78.4	9,260	6,280	32	11,200	7,650	32
01439500	1909-96	Bush Kill at Shoemakers	117	8,010	9,030	13	10,300	10,800	4.9
01440400	1957-96	Brodhead Creek at Analomink	65.9	11,000	7,050	36	13,300	8,520	36
01441000	1911-38	McMichaels Creek at Stroudsburg	65.3	3,770	8,770	130	4,260	10,600	150
01516500	1955-96	Corey Creek near Mainesburg	12.2	4,450	2,460	45	5,870	3,000	49
01517000	1955-78	Elk Run near Mainesburg	10.2	2,740	2,090	24	3,520	2,540	28
01518500	1954-74	Crooked Creek at Tioga	122	15,600	15,200	2.6	19,700	18,400	6.6
01518862	1984-96	Cowanesque River at Westfield	90.6	19,800	12,200	38	24,500	14,800	40
01532850	1960-79	Middle Branch Wyalusing Creek Tributary near Birchardsville	5.67	1,770	1,110	37	2,150	1,330	38
01533500	1941-58	North Branch Mehoopany Creek near Lovelton	35.2	14,800	5,520	63	20,000	6,850	66
01533950	1961-78	South Branch Tunkhannock Creek near Montdale	12.6	2,320	2,110	9.1	2,700	2,530	6.3
01534500	1940-59	Lackawanna River at Archbald	108	9,000	9,880	9.8	10,600	11,800	11
01539500	1941-58	Little Fishing Creek at Eyers Grove	56.5	4,100	9,760	140	4,510	12,400	170
01549500	1941-96	Blockhouse Creek near English Center	37.7	6,560	5,720	13	7,960	7,110	11
01549780	1960-78	Larrys Creek at Cogan House	6.8	1,040	1,770	41	1,300	1,850	42
01551000	1940-53	Grafius Run at Williamsport	3.14	1,240	1,000	19	1,500	1,300	13
01552500	1941-96	Muncy Creek near Sonestown	23.8	7,660	3,860	50	9,600	4,840	50
01553600	1960-78	East Branch Chillisquaque Creek near Washingtonville	9.48	4,550	2,580	43	5,970	3,280	45
01553700	1980-96	Chillisquaque Creek at Washingtonville	51.3	4,560	10,700	130	5,030	13,600	170
03008000	1960-78	Newell Creek near Port Allegany	7.79	3,470	1,640	53	4,780	2,050	57
03011800	1966-96	Kinzua Creek near Guffey	46.4	5,340	5,470	2.4	6,500	6,610	1.7
03015280	1963-79	Jackson Run near North Warren	12.8	812	1,470	81	861	1,660	93
03021350	1975-96	French Creek near Wattsburg	92	7,530	9,550	27	8,110	11,200	38
03021410	1975-94	West Branch French Creek near Lowville	52.3	7,690	6,210	19	8,870	7,340	17

Appendix 6. *Flood-flow statistics computed from Log-Pearson distribution of streamflow data and PSU-IV regional regression equations for gaged locations on streams in Pennsylvania*—*Continued*

U.S. Geological Survey streamflow-gaging station number	Period of record (water years)	Station name	Drainage area (mi^2)	50-year flood flow computed from Log-Pearson distribution (ft^3/s)	50-year flood flow computed from PSU-IV regression equations (ft^3/s)	Absolute value of percentage difference	100-year flood flow computed from Log-Pearson distribution (ft^3/s)	100-year flood flow computed from PSU-IV regression equations (ft^3/s)	Absolute value of percentage difference
03021700	1961-78	Little Conneautee Creek near McKean	3.6	797	658	17	921	770	16
03022540	1975-95	Woodcock Creek at Blooming Valley	31.1	3,320	3,750	13	3,780	4,370	16
03023000	1911-38	Cussewago Creek near Meadville	90.2	3,610	9,380	160	4,130	11,000	170
04213040	1966-95	Raccoon Creek near West Springfield	2.53	445	474	6.5	520	552	6.2
Region 4									
01559500	1930-58	Standing Stone Creek near Huntingdon	128	7,010	15,000	110	8,210	19,000	130
01559700	1962-78	Sulphur Springs Creek near Manns Choice	5.28	1,470	887	40	1,860	1,090	41
01561000	1930-58	Brush Creek at Gapsville	36.8	5,620	4,970	12	7,540	6,130	19
01562500	1930-57	Great Trough Creek near Marklesburg	84.6	6,290	10,200	62	7,770	12,600	62
01565700	1960-81	Little Lost Creek at Oakland Mills	6.52	1,330	1,680	26	1,780	2,230	25
01566500	1930-58	Cocolamus Creek near Millertown	57.2	6,740	9,210	37	7,700	11,800	53
01601000	1952-86	Wills Creek below Hyndman	146	13,600	13,600	0	16,100	16,400	1.9
01613050	1963-96	Tonoloway Creek near Needmore	10.7	1,380	1,820	32	1,640	2,240	37
01614090	1961-81	Conococheague Creek near Fayetteville	5.05	634	1,000	58	845	1,350	60
03034500	1940-95	Little Mahoning Creek at McCormick	87.4	6,350	8,810	39	6,930	10,500	51
03039200	1961-78	Clear Run near Buckstown	3.68	401	550	37	470	664	40
03042200	1961-78	Little Yellow Creek near Strongstown	7.36	2,360	1,030	56	3,120	1,230	61
03070420	1978-89	Stony Fork Tributary near Gibbon Glade	.93	162	190	17	186	228	24
03072590	1964-78	Georges Creek at Smithfield	16.3	1,770	2,560	45	2,030	3,050	50
03072840	1969-79	Tenmile Creek near Clarksville	133	20,600	13,700	33	26,300	16,000	39
03074300	1959-78	Lick Run at Hopwood	3.8	613	535	13	754	642	15
03074500	1943-96	Redstone Creek at Waltersburg	73.7	5,570	10,400	87	6,340	12,500	97
03078500	[2]1933-86	Big Piney Run near Salisbury	24.5	4,630	3,160	32	5,820	3,820	34
03080000	1914-96	Laurel Hill Creek at Ursina	121	9,960	11,200	12	11,200	13,500	20
03082200	1961-78	Poplar Run near Normalville	9.27	1,730	1,300	25	2,010	1,570	22
03083000	1929-79	Green Lick Run at Green Lick Reservoir	3.07	1,120	520	54	1,430	629	56
03084000	1949-93	Abers Creek near Murrysville	4.39	1,370	1,180	14	1,590	1,400	12
03084500	1917-52	Turtle Creek at Trafford	55.9	5,380	8,680	61	6,000	10,400	73

[1] Period of record not continuous.