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Peak-Flow Frequency Estimates for U.S. Geological Survey Streamflow-Gaging Stations in Connecticut

Water-Resources Investigations Report 03-4196

Prepared in cooperation with the
CONNECTICUT DEPARTMENT OF TRANSPORTATION and the
CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION

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

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East Hartford, Connecticut
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CONVERSION FACTORS

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

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ABSTRACT

Annual peak-flow data from 128 U.S. Geological Survey streamflow-gaging stations in Connecticut with at least 10 consecutive years of record were used to estimate peak-flow magnitudes for 1.5-, 2-, 10-, 25-, 50-, 100- and 500-year recurrence intervals (exceedance probabilities of 0.67, 0.50, 0.10, 0.04, 0.02, 0.01, and 0.002, respectively). Peak-flow frequency analyses of annual peak flows through the 2001 water year were performed using the procedures in the publication "Guidelines for Determining Flood-Flow Frequency," commonly referred to as Bulletin 17B, by the Interagency Advisory Committee on Water Data (1982). A generalized skew coefficient of 0.34, with a standard error of prediction of 0.51, was developed to improve peak-flow frequency estimates in the state; this replaces the generalized skew coefficients for Connecticut shown in Bulletin 17B.

INTRODUCTION

The magnitude and frequency of peak flows are needed to design hydraulic structures, delineate flood-hazard zones, minimize property damage, and reduce the loss of life caused by floods. In an effort to provide updated information for regulatory, planning, and design activities in Connecticut, the U.S. Geological Survey (USGS) performed a cooperative study with the Connecticut Department of Transportation and the Connecticut Department of Environmental Protection to provide peak-flow frequency estimates at streamflow-gaging stations.

This report presents the peak-flow frequency estimates for 1.5-, 2-, 10-, 25-, 50-, 100-, and 500-year recurrence intervals for selected streamflow-gaging stations in Connecticut. Information about the annual peak-flow data and computational procedures for peak-flow frequency analysis is included in the report. Graphs are presented that illustrate the magnitude of floods by drainage area.

This report updates and supersedes previously published peak-flow frequency estimates for streamflow-gaging stations in Connecticut (Weiss, 1983; see also the section "Floods" in the series of reports, Water Resources Inventory of Connecticut, Parts 1 to 10) by incorporating 20 additional years of streamflow data and updated methods of peak-flow frequency analysis. The additional data and development of a generalized skew for Connecticut provide more accurate peak-flow frequency estimates for streamflow-gaging stations than peak-flow frequency estimates from earlier reports.

The author gratefully acknowledges the following USGS personnel: Toby Feaster and Andral Caldwell, for their assistance in providing quality control and quality assurance of the annual peak-flow data and in the application of several computer programs used in a review of the peak-flow data; William H. Kirby, for his technical help in analyzing and reviewing the mixed-population data; Glenn Hodgkins, for his assistance in developing the generalized skew; and Claudia Tamayo, for her valuable help in reviewing peak-flow data and in compiling results.

ANNUAL PEAK-FLOW DATA

The USGS streamflow-gaging network provides valuable information on high flows and historical floods that is important to the understanding of hydrologic events. The basis for characterizing the frequency of floods is the annual peak-flow data. The annual peak flow is defined as the maximum instantaneous flow occurring in a water year (October 1 to September 30). Annual peak flows range from flows that barely exceed the natural stream banks and have minimal effects to flows that inundate the floodplain and cause extensive damage.

Annual peak-flow data through water year 2001 from 128 streamflow-gaging stations in Connecticut with at least 10 consecutive years of flow data were used to characterize floods. A minimum of 10 years of record is the recommended criterion for developing peak-flow frequency estimates (Interagency Advisory Committee on Water Data, 1982, p. 2). Locations of the USGS streamflow-gaging stations are shown in figure 1, and detailed descriptions of the stations, including geographic coordinates, are provided in appendix 1.

Annual peak-flow data, along with the corresponding flow dates, gage heights, and information pertaining to the basin (for example, urbanization or regulation) or to the cause of the annual peak (for example, dam failure or ice jam) are stored in the USGS National Water Information System (NWIS) database and can be accessed at http://waterdata.usgs.gov/nwis/peak. The NWIS database contains two types of peak-flow record: the systematic record (gaged period) where the annual peak is observed for each water year, and the historic record (ungaged period) where the annual peak for a flow of an unusually large magnitude is determined from flood marks. Prior to the establishment of a streamflow-gaging station, notable peak flows are considered to be “historic.” Typically, the magnitude of historic peak flows are determined by indirect measurements that involve determining the water-surface elevation from flood marks and computing the discharge using hydraulic equations. Historic peak-flow magnitudes determined by indirect methods, though less accurate than those determined by direct measurement, can improve the accuracy of the peak-flow frequency estimates. Peak-flow records for Connecticut range from a few years to more than 100 years in length. Flow data extend back to 1901 (Housatonic River at Gaylordsville), and historic flood records extend back to 1683 (Connecticut River at Hartford). Historical information on the floods used in this analysis, such as the date of occurrence and height of the water surface, can be obtained from USGS files available at the District Office in East Hartford, Connecticut, and in Thomson and others (1964).

A comprehensive review of the NWIS peak-flow database was an essential element of the study. Several computer programs (C.L. Sanders, Jr., U.S. Geological Survey, written commun., 1999) were used to perform the QA/QC review of the peak-flow data. The QA/QC review and computational steps performed by these computer programs are described by Feaster and Tasker (2002, p. 5-11). Several discrepancies between the values in the published record and the peak-flow file were discovered and revisions to the published record and (or) peak-flow database were made.

PEAK-FLOW FREQUENCY ANALYSIS AT STREAMFLOW-GAGING STATIONS

Peak-flow frequency analysis is a statistical technique used to estimate exceedance probabilities associated with floods. Through analysis of past floods, a relation between peak-flow magnitude and frequency can be established. The peak-flow frequency analysis for this study is based on guidelines published by the Interagency Advisory Committee on Water Data (1982), commonly referred to as Bulletin 17B. These guidelines promote a uniform technique to estimate peak-flow frequencies for gaged stream sites.

The frequency of a flood (annual peak flow) is described in terms of exceedance probabilities or recurrence intervals. Exceedance probability is the percent chance or likelihood that a given flow will be exceeded in any 1-year period. Recurrence interval is the average time interval (in years) during which a given flow is expected to be exceeded one time. Recurrence interval is the reciprocal of exceedance probability multiplied by 100. Exceedance probabilities define the average length of time that separates peak flows of a given magnitude, but it is possible that such flows could occur during consecutive years. Floods with the smallest exceedance probabilities are potentially catastrophic. Because the recurrence interval is most commonly used by federal and state agencies, the peak-flow frequencies for this report are presented as recurrence intervals in table 1 (at back of report).

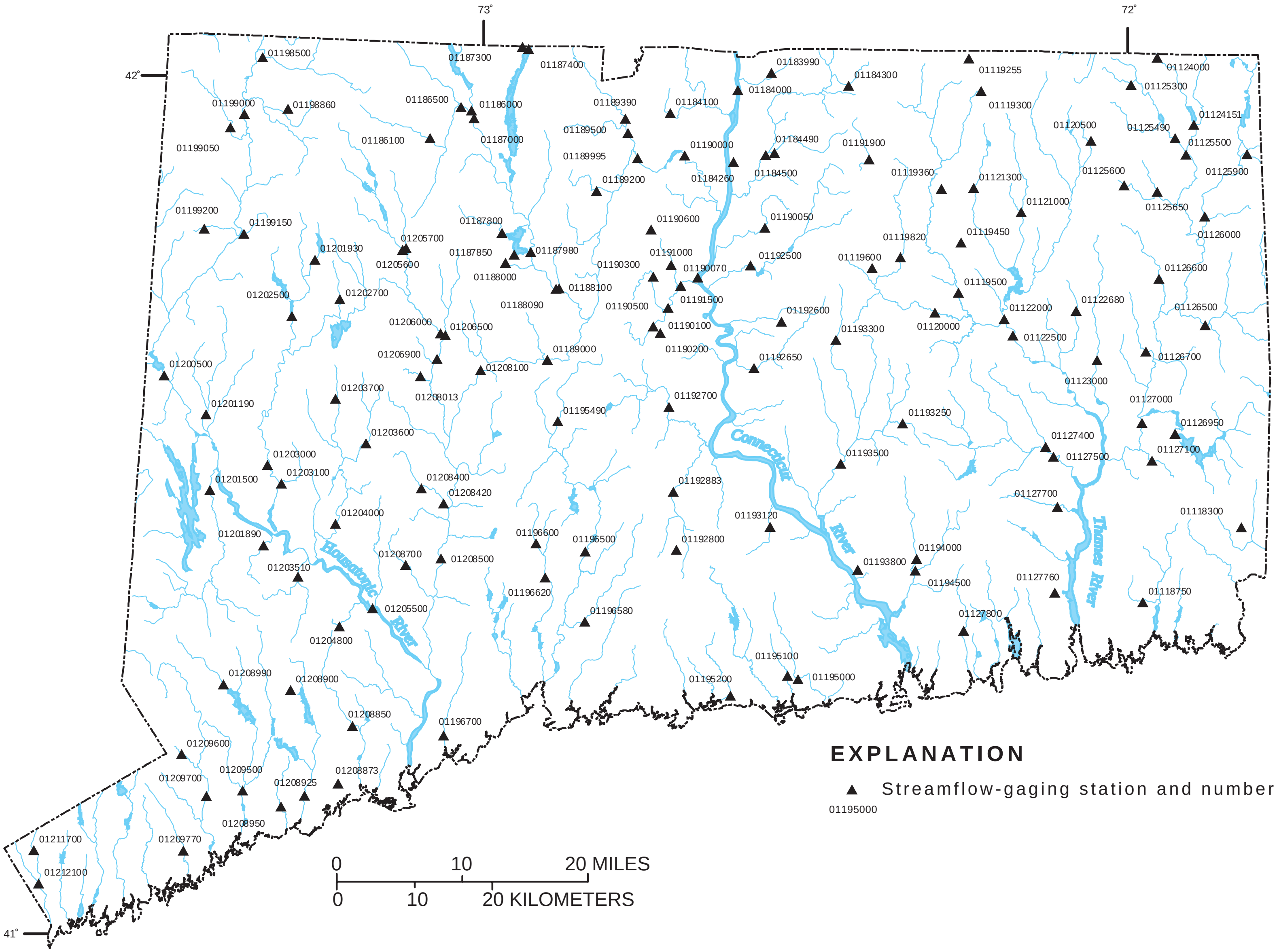

Figure 1. U.S. Geological Survey streamflow-gaging stations with at least 10 years of annual peak streamflow data, Connecticut.

Assumptions of Frequency Analysis

Several assumptions are implicit in peak-flow frequency analysis: (1) the annual peak flows are independent of each other and random, (2) the processes affecting the flows are stationary with respect to time (homogeneity), and (3) the statistical characteristics of the sample (annual peak-flow series) represent those of the population (all annual peak flows—past, present and future). The validity of these assumptions must be verified periodically to ensure useful and accurate statistical results. Substantial changes to the basin (for example, increased urbanization or construction of flood-control dams) that affect peak-flow magnitudes invalidate the assumptions of frequency analysis. Because past flood records are used to predict future peak-flow probabilities, changes in land cover and (or) extent of regulation of peak flow in a basin can invalidate the assumptions of stationarity in the hydrologic time series. The sample statistics (mean, standard deviation and skew) must be a reasonable representation of the population statistics to yield reasonable estimates of flood characteristics. Statistically, if the sample is different from the population, large errors are introduced in the peak-flow frequency estimates. Peak-flow frequency estimates should be recalculated if any of these assumptions are proven to be invalid.

To verify that the assumptions of frequency analysis are valid, statistical tests and graphical methods were performed on data from streamflow-gaging stations. Time-series plots of the annual peak flows were visually inspected and used to make preliminary inferences concerning possible changes in the magnitude of the annual peak flow over time. In addition to visual inspection of time-series plots, the Mann-Kendall trend test was performed to test for changes in the distribution of annual peak flows at stations with at least 30 years of record. The Mann-Kendall test is a nonparametric trend test (Helsel and Hirsch, 1992) and uses a rank-based procedure that tests for one-directional (monotonic) changes over time.

Trend test results indicated annual peak-flow data from 11 streamflow-gaging stations are not homogeneous at a 0.05-significance level:

USGS 01122000 Natchaug River at Willimantic,

USGS 01126000 Fivemile River at Killingly,

USGS 01184100 Stony Brook near West Suffield,

USGS 01184500 Scantic River at Broad Brook,

USGS 01187300 Hubbard River near West Hartland,

USGS 01189000 Pequabuck River at Forestville,

USGS 01192500 Hockanum River near East Hartford,

USGS 01194000 Eightmile River at North Plain,

USGS 01196500 Quinnipiac River at Wallingford,

USGS 01202500 Shepaug River at Woodville, and

USGS 01209500 Saugatuck River near Westport.

The trend test is sensitive to extreme climatic anomalies near the beginning and the end of the record. These 11 streamflow-gaging stations with detected trends were established during one of three statewide droughts (from July 1929 to December 1932, from September 1940 to April 1945, and from August 1961 to November 1971) (Weiss, 1991). Because the streamflow-gaging stations started during drought periods, it is possible the trends were caused by the extreme climatic anomalies at the beginning of the record and may not necessarily be caused by a change in the magnitude of the peak flows over time. The drought period at the beginning of the record probably influences the trend results. Also, there is a 5-percent chance that a detected trend could have arisen by chance rather than from an actual change in the magnitude of the peak flows over time. In other words, trends could be detected at 6 to 7 sites by chance rather than from an actual change in magnitude of the peak flows over time. Although peak-flow frequency estimates were made for these (11) stations, a further assessment of the watershed history would be needed to ensure that no major changes have taken place in the watershed during the period of record before using the peak-flow frequency estimates with certainty.

Generalized Skew Coefficient

The coefficient of skew calculated from the station data affects the shape of the peak-flow frequency curve. Steep basin and channel slopes, low infiltration rates, fast conveyance through systems, and (or) one or more extremely high peak flows (high outliers) can cause large positive skew values. Conversely, low mean-basin slopes, high infiltration rates, high channel losses, a substantial percentage of a basin controlled by lakes or swamps, and (or) one or more very low peak flows (low outliers) can cause large negative skew values.

Three methods for developing a generalized skew coefficient are described in Bulletin 17B: (1) plot computed station skews on a map and construct skew isolines on the map, (2) develop a skew prediction equation relating basin characteristics to station skews, and (3) compute the arithmetic mean of station skew coefficients from regional gaging stations with 25 or more years of record. Guidelines in Bulletin 17B recommend using a weighted skew coefficient to reduce the uncertainty in peak-flow frequency estimates. The weighted skew coefficient is calculated by mathematically weighting the station skew coefficient and generalized skew coefficient. The generalized skew coefficient can provide some regional geographic continuity by combining the statistical parameter, coefficient of skew, from many nearby stations.

The three methods were compared using data from 36 streamflow-gaging stations in Connecticut with 25 or more years of streamflow record to derive the most accurate generalized skew coefficient. For method 1, the computed station skews were plotted at the centroid of each basin and evaluated for any geographic or topographic trends (fig. 2). No definable pattern is evident. For method 2, a statistically significant prediction equation that relates the computed skew coefficients to basin characteristics (drainage area, stream length, or channel slope) could not be derived. For method 3, the arithmetic mean and standard error of prediction of the skews were computed using data from 36 stations with 25 or more years of streamflow record.

The arithmetic mean (method 3) provided a skew coefficient estimate of 0.34. This replaces the skew coefficient from Bulletin 17B (plate 1), which was used for previous peak-flow frequency studies in Connecticut. The arithmetic mean of the 36 stations was computed after the station skew was adjusted for bias (Tasker and Stedinger, 1986). The generalized skew coefficient from Bulletin 17B was derived from fewer stations with less peak-flow record than were used for this study and was not adjusted to account for high outliers or historic floods. The new generalized skew coefficient, 0.34, has the same standard error of prediction (0.50) as the coefficient in Bulletin 17B for the same stations (table 2).

Peak-Flow Magnitude and Frequency of Floods from Log-Pearson Type III Distribution

Peak-flow frequency relations are defined by fitting the annual peak-flow series to a theoretical probability distribution. Guidelines in Bulletin 17B recommend the Pearson Type III distribution with log transformation of the annual peak flows as the theoretical distribution for determining peak-flow frequency estimates for streamflow-gaging stations. The log-Pearson Type III distribution is described by the three statistical parameters: mean—grouping of observations about a central value; standard deviation—dispersion of the observations; and coefficient of skew— degree of asymmetry of the distribution. The equation for fitting a log-Pearson Type III distribution to the annual peak-flow series, and ultimately determining the peak-flow magnitudes for given exceedance probabilities, is

$$LogQ = \bar{X} + KS, \quad (1)$$

where

Q = the flow for a given recurrence interval, in cubic feet per second;

$\bar{X}$ = the mean of the logarithms of annual peak flows at the streamflow-gaging station;

K = a factor dependent on the skew coefficient and exceedance probability; and

S = the standard deviation about the mean of the logarithms of annual peak flows.

The USGS computer program PEAKFQ (Thomas & others, written commun., 1998), which is based on Bulletin 17B guidelines, provides estimates of the magnitude of annual peak flows having recurrence intervals of 1.5, 2, 10, 25, 50, 100, and 500 years (exceedance probabilities of 0.67, 0.50, 0.10, 0.04, 0.02, 0.01, and 0.002, respectively). PEAKFQ ranks the annual peak flows from highest to lowest and then fits them to a log-Pearson type III distribution using equation 2. The frequency curves generated from PEAKFQ for this study were reviewed to determine how well the annual peak flows fit the theoretical (log-Pearson type III) distribution; and were adjusted for outliers using historic flood information when appropriate. The computer program and user manual for PEAKFQ are available at http://water.usgs.gov/software/peakfq.html (accessed on August 21, 2003).

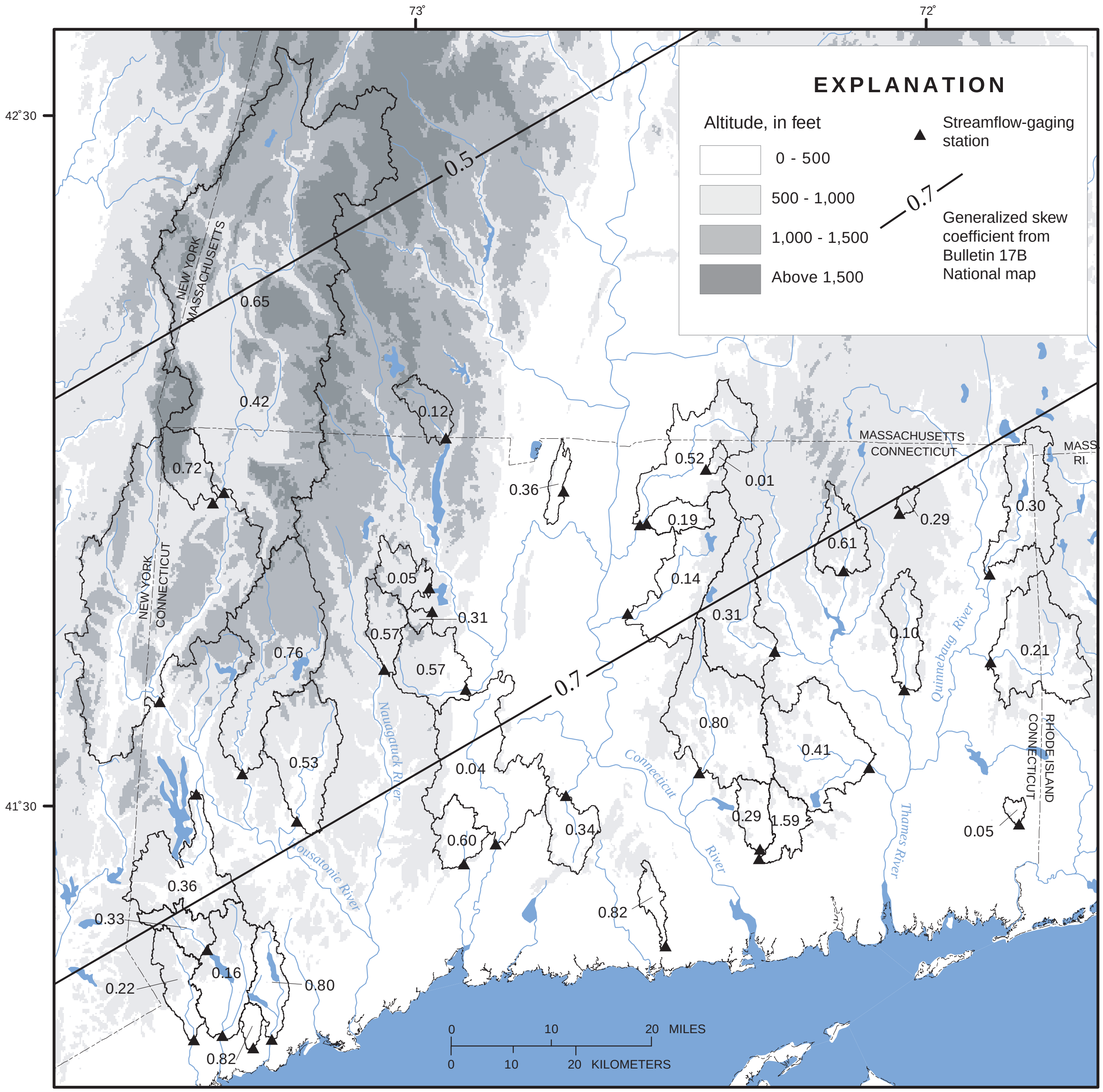

Figure 2. Station skews plotted at the centroid of each basin for geographic and topographic patterns, Connecticut.

Table 2. Arithmetic mean and standard error of prediction for 36 U.S. Geological Survey streamflow-gaging stations used to develop a generalized station skew for Connecticut

[USGS, U.S. Geological Survey]

USGS streamflow-gaging station number	USGS streamflow-gaging station name	Station skew	Systematic peak	Bias correction[1]	Unbiased skew[2]	Generalized skew (Bulletin 17B)
01118300	Pendleton Hill Bk nr Clarks Falls	-0.049	43	1.140	-0.056	0.700
01120000	Hop R nr Columbia	0.307	52	1.115	0.342	0.678
01120500	Safford Bk nr Woodstock Valley	0.289	31	1.194	0.345	0.694
01121000	Mount Hope R nr Warrenville	0.613	61	1.098	0.673	0.686
01123000	Little R nr. Hanover	0.103	50	1.120	0.115	0.696
01126000	Fivemile R at Killingly	0.302	47	1.128	0.341	0.700
01126500	Moosup R at Moosup	0.210	52	1.115	0.234	0.700
01127500	Yantic R at Yantic	0.415	71	1.085	0.450	0.693
01184100	Stony Bk nr West Suffield	0.362	42	1.143	0.414	0.631
01184300	Gillette Bk at Somers	0.009	25	1.240	0.011	0.657
01184490	Broad Bk at Broad Brook	-0.186	35	1.171	-0.218	0.650
01184500	Scantic R at Broad Brook	0.523	55	1.109	0.580	0.649
01187300	Hubbard River nr West Hartland	-0.119	45	1.133	-0.135	0.599
01187800	Nepaug R nr Nepaug	0.052	26	1.231	0.064	0.620
01188000	Burlington Bk nr Burlington	-0.314	70	1.086	-0.341	0.624
01189000	Pequabuck R at Forestville	0.568	60	1.100	0.625	0.639
01192500	Hockanum R nr East Hartford	0.138	75	1.080	0.149	0.654
01192883	Coginchaug River at Middlefield	-0.341	40	1.150	-0.392	0.663
01193500	Salmon R nr East Hampton	0.801	73	1.082	0.867	0.675
01194000	Eightmile R at North Plain	0.245	47	1.128	0.276	0.685
01194500	East Branch Eightmile R nr North Lyme	1.588	44	1.136	1.805	0.685
01195000	Menunketesuck R nr Clinton	0.817	26	1.231	1.006	0.684
01196500	Quinnipiac R at Wallingford	-0.038	71	1.085	-0.041	0.662
01196620	Mill R nr Hamden	0.601	25	1.240	0.745	0.662
01199000	Housatonic R at Falls Village	0.653	89	1.067	0.697	0.562
01199050	Salmon Ck at Lime Rock	0.724	40	1.150	0.833	0.561
01200500	Housatonic R at Gaylordsville	0.421	88	1.068	0.450	0.596
01201500	Still R nr Lanesville	0.358	53	1.113	0.399	0.622
01203000	Shepaug R nr Roxbury	0.763	54	1.111	0.848	0.623
01204000	Pomperaug R at Southbury	0.528	69	1.087	0.574	0.639
01206500	Leadmine Bk nr Thomaston	0.572	53	1.113	0.637	0.625
01208925	Mill R nr Fairfield	-0.798	29	1.207	-0.963	0.678
01208950	Sasco Bk nr Southport	0.822	42	1.143	0.939	0.679
01208990	Saugatuck R nr Redding	-0.332	40	1.150	-0.382	0.657
01209500	Saugatuck R nr Westport	0.160	35	1.171	0.187	0.675
01209700	Norwalk R at South Wilton	0.220	39	1.154	0.254	0.675

[1]Bias correction=>[1+(6/systematic peaks)].

[2]Unbiased skew=>station skew * bias correction.

For this study, annual peak-flow data from 128 streamflow-gaging stations in Connecticut were used to define the magnitude and frequency of floods. Stations used in this frequency analysis have 10 consecutive years or more of peak-flow data and are not substantially altered by regulation. Peak-flow frequency estimates for the 1.5-, 2-, 10-, 25-, 50-, 100-, and 500-year recurrence intervals for the 128 gaging stations are listed in table 1 (at back of report). The peak-flow frequency estimates are based on station skews weighted with the new generalized skew value. Frequency curves were adjusted for historical flood information and for high outliers following Bulletin 17B guidelines. The maximum known peak flow, date of the maximum known peak flow, and the period of record (historic and systematic record) for each streamflow-gaging station are included in table 1 (at back of report).

Flows Altered by Flood-Control Dams and Reservoirs

The procedures described in Bulletin 17B for peak-flow frequency analysis do not apply to basins where the flood flows are substantially modified by flood-control dams or reservoir operations. Types of analyses (for example, simulation models that include reservoir-routing procedures) other than statistical methods are more appropriately used to evaluate the effect of detention storage on flood flows. For the purpose of this peak-flow frequency analysis, annual peak flows were considered to be affected by regulation if the upstream drainage area at the streamflow-gaging station has more than 4.5 million cubic feet of usable storage per square mile (Benson, 1962). Using this criterion, the annual peak flows at 22 streamflow-gaging stations in Connecticut are affected by regulation (table 1). Nineteen of 22 streamflow-gaging stations are downstream of U.S. Army Corps of Engineers (USACOE) flood-control dams. Three other stations where the annual peak flows are substantially affected by flood-control regulation are: 01190800, Trout Brook at West Hartford; 01191000, North Branch Park River at Hartford; and 01198500, Blackberry River at Canaan. Some regulated sites have pre-flood control peak-flow data of sufficient length (10 or more years) to perform frequency analysis. Flood-frequency estimates were made at 12 of the 22 regulated stations using annual peaks from the unregulated period of record (pre-flood control or natural flow conditions).

Multiple-Site Station Records

Peak-flow frequency estimates from nearby stations are compared, and when appropriate, records from nearby stations (on the same river) can be combined into one record to provide better estimates of peak flows, particularly when the period of record is short. Four streamflow-gaging stations used in this study had been moved to another location on the same river, resulting in two records for each river. The changes in drainage area for the four streamflow-gaging stations ranged from 3 to 19 percent. Peak-flow frequency estimates were made on the individual records (old and new sites) on the Mattabessett River, Coginchaug River, Still River, and Leadmine River. Split-flow records were combined into one record, and peak-flow frequency estimates were made on each combined record. Peak-flow data were transferred from the shorter record site to the longer record site. The following equation in the Connecticut Department of Transportation drainage manual for transferring streamflow data was used to increase or decrease the annual peak flows for the change in drainage area (Connecticut Department of Transportation, Preliminary Drainage Manual (eq. 6.12), written commun., 2000) prior to the frequency analysis:

$$Q_1 = \frac{Q_2 A_1}{A_2} \times \frac{\left[A_1^{[(0.894/A_1^{0.048}) - 1]}\right]}{\left[A_2^{[(0.894/A_2^{0.048}) - 1]}\right]} \qquad (2)$$

where

Q_1 = flow at the ungaged point of interest, in cubic feet per second,

A_1 = basin area at the ungaged point of interest, in square miles,

Q_2 = flow at the streamflow-gaging station, in cubic feet per second,

A_2 = basin area at the streamflow-gaging station, in square miles.

Accuracy of Peak-Flow Frequency Estimates

The accuracy of peak-flow frequency estimates depends on the frequency distribution selected to estimate peak-flow magnitudes and how well the population parameters (mean, standard deviation, and skew) are estimated from the sample data. Because the sample is an estimate of the underlying population, large errors in the estimates can occur when the period of record is short. Generally, the longer the period of record (observed peak flows) at a station, the more reliably peak-flow frequencies can be estimated.

The accuracy of peak-flow frequency estimates was studied by Benson (1960), and the results are shown in table 3. Benson determined the years of record needed for peak-flow frequency estimates from a sample to be comparable to peak-flow frequency estimates from a population. The results indicated that the 10-, 25-, 50-, or 100-year floods can be computed from 18-, 31-, 39-, or 48-year records, respectively, with some degree of accuracy (within 25 percent of the correct value 95 percent of the time). Estimates of peak flows determined using a shorter than recommended period of record (as shown in table 3) should be interpreted conservatively.

Table 3. Length of record needed to be within 25 percent of the correct peak-flow frequency value 95 and 80 percent of the time

[ND, not determined]

Magnitude of flood	Length of record, in years	
	95 percent of the time	80 percent of the time
10 years	18	8
25 years	31	12
50 years	39	15
100 years	48	ND

Confidence limits about the annual exceedance probabilities can be used to evaluate the uncertainties inherent in the estimates. The 95-percent confidence limits for the peak-flow frequency estimates are generated as part of PEAKFQ output and are available at the USGS District Office in East Hartford, Connecticut.

Mixed-Population Analysis

Some of the largest floods in Connecticut are associated with tropical cyclonic storms. In the summer and early fall, tropical cyclones can produce extremely intense precipitation and substantial runoff because of warm temperatures and atmospheric moisture. Tropical cyclonic storms can be an important weather system in Connecticut from June to November (Weiss, 1991). From 1936 to 1997, about 40 tropical cyclones affected southern New England (Vallee and Dion, 1998). The most notable tropical cyclonic storms (hurricanes) occurred in September 1938 and August 1955, causing 124 and 87 deaths, respectively. Information on the dates and locations of the tropical cyclone events for Connecticut was obtained from the National Weather Service (data accessed on the World Wide Web on 10/18/00 at http://www.nhc.noaa.gov/pastall.shtml).

Annual peak flows associated with different climatic processes or flood-producing events (such as hurricanes and periods of intense snowmelt) often will fit different frequency distributions. If the distributions are very different, their composite frequency distribution may have a sharp curvature or “dog-leg” that cannot be fit by a log-Pearson Type III distribution. In such cases, a mixed-population analysis, which takes into account the different frequency distributions and frequencies of occurrence of the different flood-causing events, may produce an estimated frequency curve that fits the observed peak flows better than a log-Pearson Type III frequency curve.

The single-population (standard Bulletin 17B log-Pearson Type III) frequency curve results were examined for an inadequate fit that may be improved by a mixed-population analysis. In all cases, the log-Pearson Type III frequency curves from the single-population analysis produced an adequate fit of the observed peak flows to the frequency distribution. The fit of the tropical cyclone peaks was consistent with the non-tropical cyclone peaks. Although there was no reason to expect that a mixed-population analysis would improve the results, several stations were selected for mixed-population analysis to quantitatively evaluate the potential improvement. Each selected station had more than 50 years of record and had one or more peak flows that departed substantially from the theoretical (log-Pearson Type III) frequency curve and resulted from hurricanes and tropical cyclones.

Annual peak flows caused by tropical cyclones were separated from those caused by nontropical cyclones. Peak-flow frequency curves were computed separately on the two data sets. The Bulletin 17B limitation to records of at least 10 annual peaks was relaxed in the case of the tropical cyclone data sets because only 5 to 9 tropical cyclone peaks were available at each station. Results of the separate analyses were combined to form the composite mixed-population frequency curve using the following formula (W.H. Kirby, USGS, written commun., 1999):

$$P(x) = PH(x)*ph + PN(x)*pn \qquad (3)$$

where

P = the probability of the annual peak flow in any year exceeding a given value, x;

PH = the conditional probability of the annual peak flow in any year exceeding a given value, x, given that the annual peak results from a tropical cyclone;

ph = the probability that the annual peak result from a tropical cyclone;

PN = the conditional probability of the annual peak flow in any year exceeding a given value, x, given that the annual peak does not result from a tropical cyclone; and

pn = the probability that the annual peak does not result from a tropical cyclone.

The probabilities ph and pn were computed as the corresponding fractions of the number of annual peaks.

Three sites were studied for mixed-population analysis: Pomperaug River at Southbury, USGS streamflow-gaging station 01204000; Housatonic River at Falls Village, USGS streamflow-gaging station 0119000; and Quinnipiac River at Wallingford, USGS streamflow-gaging station 01196500. The results of the analysis indicate a marginal improvement of the fit of the frequency estimates to the observed data. The mixed-population curves at the Pomperaug River station and the Housatonic River station had slightly sharper curvature and slightly steeper slopes at the upper end than the log-Pearson Type III curves. The mixed-population curve at the Quinnipiac River had a flatter slope than the log-Pearson Type-III curve.

The case where the mixed-population analysis had the greatest effect is illustrated in figure 3. In this case, the peak of record is a hurricane (August 1955) that stands well above the trend of the fitted-frequency

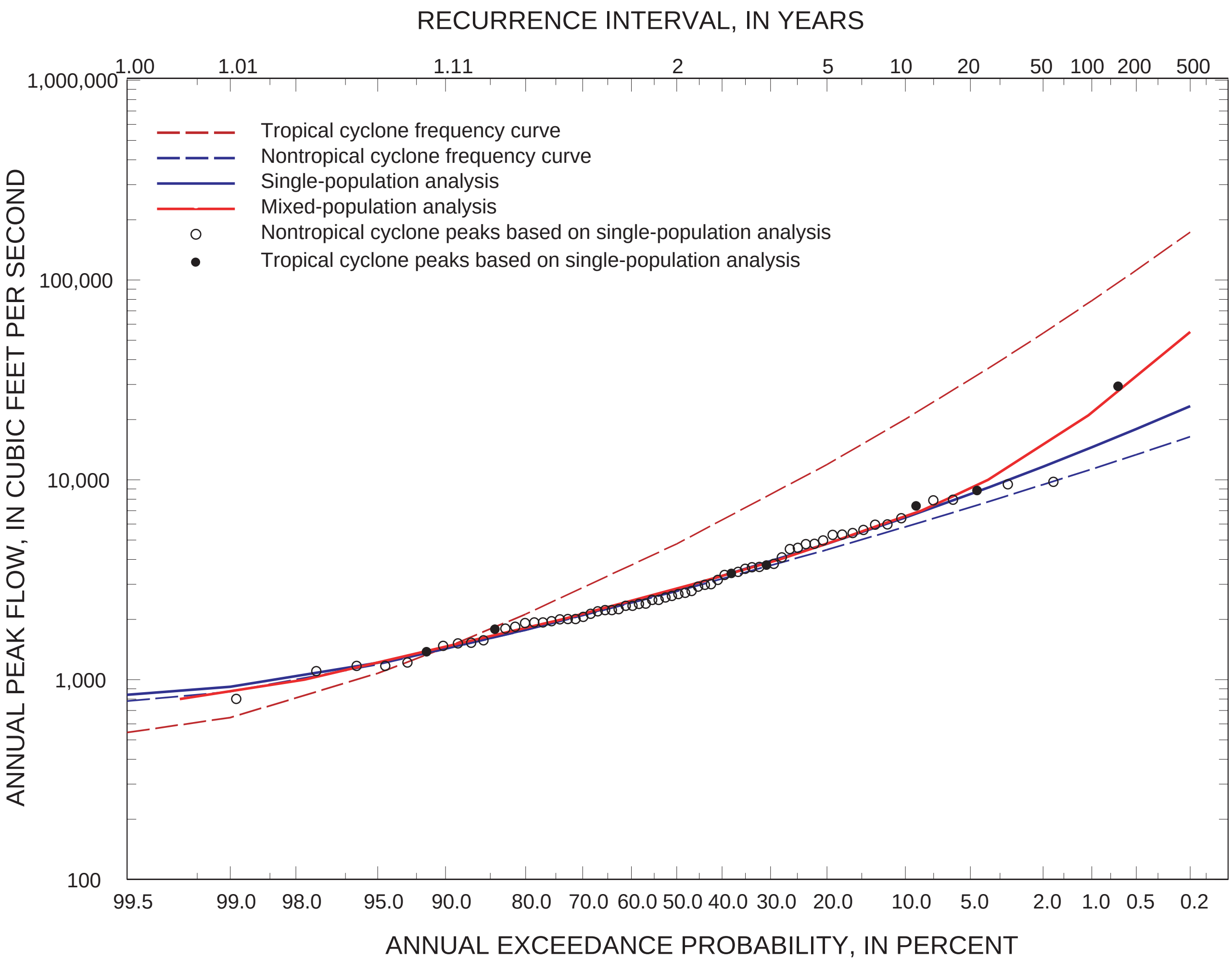

Figure 3. Frequency curves for mixed-population analysis, Pomperaug River at Southbury, Connecticut (USGS station 01204000).

curve and slightly above the trend of the conditional tropical-cyclone frequency curve. In both data sets, the peak of record could be considered a high outlier, and it could be argued that the peak of record improperly distorts the shape of the mixed-population curve. In figure 3, the single-population curve is the standard Bulletin 17B (log-Pearson Type-III) curve based on all 69 peaks in the record and including a high-outlier adjustment. The gaged record is 69 years (1931-2001), and the historic record (1852-2001) is 149 years.

The single-population analysis was used to compute the final peak-flow frequency estimates because (1) only marginal improvements to the fit of the frequency estimates to the observed data were noted with mixed-population analysis, (2) the number of tropical cyclones was too small to reliably determine the conditional probability frequency curve of tropical cyclones, and (3) the observed tropical cyclone events were consistent with the single-population frequency curve.

MAXIMUM KNOWN PEAK FLOWS

Extreme floods, referred to in table 1 as "maximum known peak flow," are plotted by drainage area in figures 4 and 5. Curves are drawn over the range of data (maximum known peak flow and 100-year peak flow estimates) based on visual inspection of the data. In figure 4, the curve defines the upper boundary of the peak flows in the state since about 1900 for a range of drainage areas. In figure 5, the curve defines the upper boundary of the 100-year peak-flow estimates based on this frequency analysis for a range of drainage areas. Peak flows caused by ice jams or dam failures are excluded from figures 4 and 5. Figure 4 serves as a

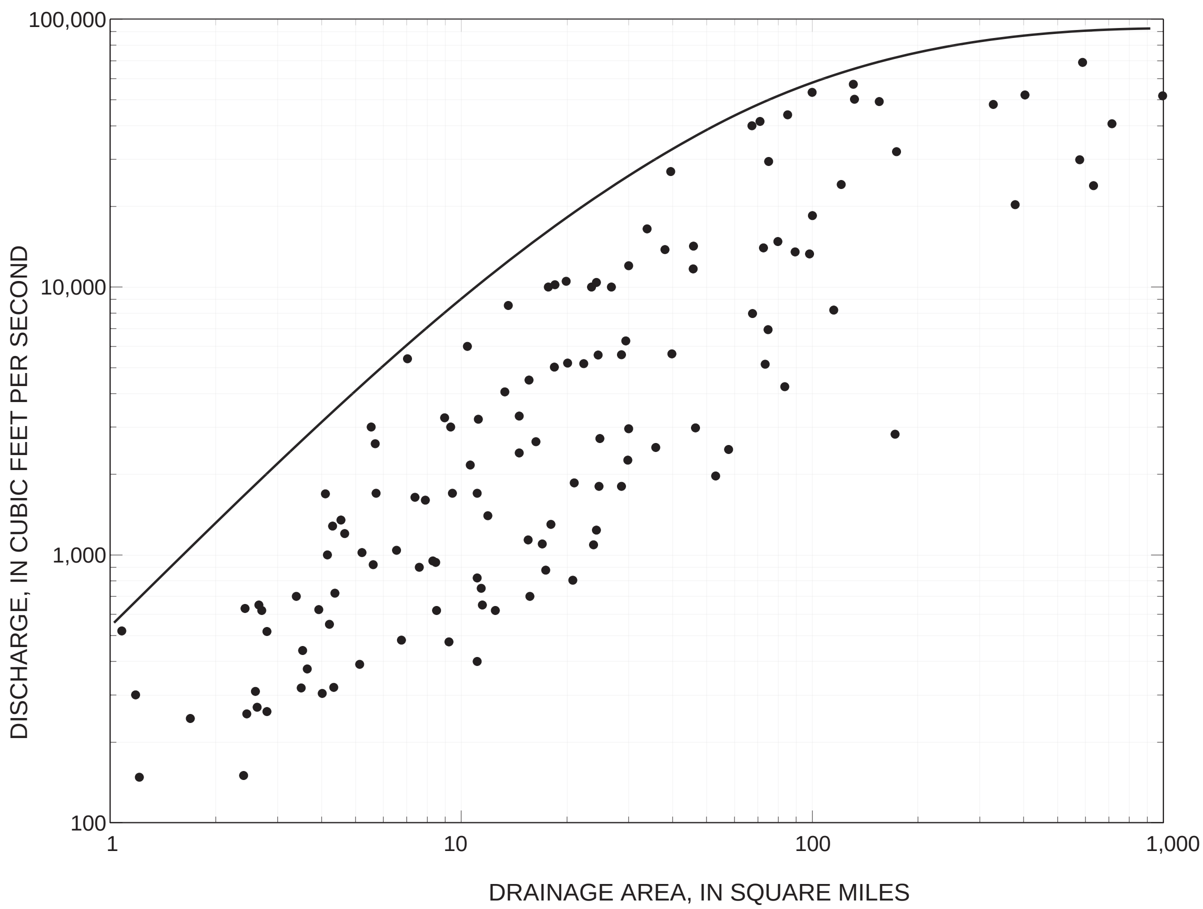

Figure 4. Relation of maximum known peak flow to drainage area for streamflow-gaging stations in Connecticut. (Curve defines upper boundary of peak flows in the State since about 1900.)

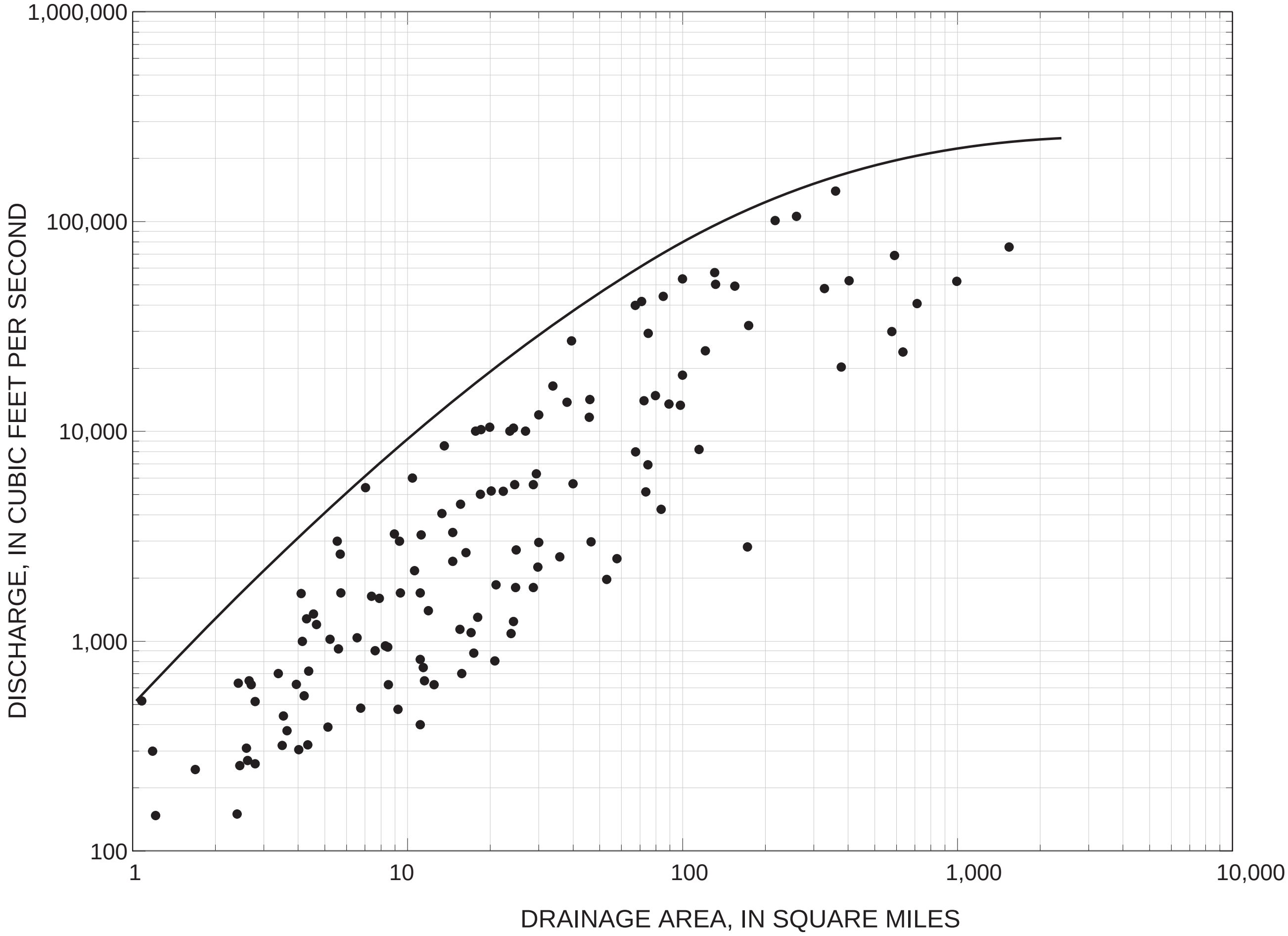

Figure 5. Relation of discharge for 100-year recurrence interval to drainage area for streamflow-gaging stations in Connecticut. (Curve defines the upper boundary of the 100-year peak-flow estimates.)

general guide for making estimates of the potential flood magnitudes in Connecticut without reference to their frequency. Some of the most notable "maximum known peak flows" occurred in March 1936, September 1938, August 1955, October 1955, and June 1982. These peak flows are associated with recurrence intervals greater than 100 years.

SUMMARY AND CONCLUSIONS

Records of annual peak flows and annual exceedance probabilities are used extensively in hydraulics, hydrology, and in engineering studies related to the design and operation of hydraulic structures (bridges, culverts, dams, erosion-control structures). In response to the ever-increasing need for flood information for zoning, planning, and designing, the U.S. Geological Survey (USGS), in cooperation with the Connecticut Department of Transportation (DOT) and the Connecticut Department of Environmental Protection (DEP), began a study in 2000 to estimate the frequency and magnitude of peak flows in Connecticut. Peak flows for recurrence intervals of 1.5, 2, 10, 25, 50, 100, and 500 years (exceedance probabilities of 0.67, 0.50, 0.10, 0.04, 0.02, 0.01, and 0.002, respectively) were determined for 128 streamflow-gaging stations in Connecticut using the USGS computer program PEAKFQ. Peak-flow frequency estimates were derived from data through water year 2001 by fitting the annual series of peak-flow data to a log-Pearson type III frequency distribution. Frequency estimates were adjusted for historical flood information and for high outliers. The frequencies of peak flows over a range of magnitudes were computed following the guidelines recommended in Bulletin 17B by the Interagency Advisory Committee on Water Data (1982). An average generalized skew coefficient of 0.34, with a standard error of prediction of 0.51, was computed for streamflow-gaging sites in Connecticut, replacing the skew values for Connecticut shown in Bulletin 17B that were used in previous peak-flow frequency studies.

A mixed-population analysis of tropical cyclonic and nontropical cyclonic storms was conducted at three stations to quantitatively evaluate the potential improvement of the fit of the observed peak flows to the frequency distribution. The single-population analysis (not separated by event type) was used to compute the final peak-flow frequency estimates because only marginal improvements to the fit of the frequency estimates to the observed data were noted with mixed-population analysis, the number of tropical cyclones was too small to reliably determine the conditional probability frequency curve of tropical cyclones, and the observed tropical cyclone events were consistent with the single-population frequency curve.

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Table 1. Peak-Flow Frequency Estimates for Streams in Connecticut for Selected Recurrence Intervals

Table 1. Peak-flow frequency estimates for streams in Connecticut for selected recurrence intervals

[Peak-flow frequency estimates are based on 10 or more years of unregulated flow record. Period of record includes historical information outside the period of systematic data collection at or near a gaging station. Period of record in italics represents the period when flows were affected by flood-control regulation. regulated, flood-control reservoir affects flow (regulated indicates that the drainage area upstream from the gaging station has more than 4.5 million cubic feet of usable storage per mile (Benson, 1962)); mi^2, square miles; ft^3/s, cubic feet per second; nr, near; rev, revised; e, estimated]

U.S. Geological Survey streamflow-gaging station		Drainage area (mi^2)	Period of record (water years)	Peak-flow frequency estimates for given recurrence interval (ft^3/s)							Maximum known peak flow	
Number	Name			1.5 years	2 years	10 years	25 years	50 years	100 years	500 years	Date	Flow (ft^3/s)
PAWCATUCK RIVER BASIN												
01118300	Pendleton Hill Brook nr Clarks Falls	4.02	1959-2001	108	132	242	303	351	402	528	06/05/1982	rev 304
SOUTHEAST COASTAL BASINS												
01118750	Haleys Brook nr Old Mystic	4.37	1962-1984	75	96	234	346	453	585	1,030	06/05/1982	720
01127800	Fourmile River nr E Lyme	4.30	1961-1984	80	96	194	267	334	415	668	06/05/1982	1,280
THAMES RIVER BASIN												
01119255	Delphi Brook nr Staffordville	2.59	1964-1976	62	88	260	394	517	664	1,110	12/21/1973	310
01119300	Roaring Brook nr Staffordville	5.61	1960-1984	198	258	559	736	877	1,030	1,400	06/05/1982	920
01119360	Conat Brook at W Willington	2.40	1964-1983	46	59	129	174	212	254	370	01/25/1979	150
01119450	Eagleville Brook at Storrs	0.36	1953-1969	74	84	123	141	153	165	192	05/12/1968	123
01119500	Willimantic River nr Coventry	121	1932-2001	1,680	2,160	5,170	7,520	9,730	12,400	20,900	08/19/1955	24,200
01119600	Ash Brook nr N Coventry	2.79	1960-1970	134	151	224	261	289	317	385	04/02/1970	260
01119820	Skungamaug River at N Coventry	24.7	1963-1975	420	556	1,400	2,050	2,640	3,330	5,470	12/21/1973	1,800
01120000	Hop River nr Columbia	74.8	1933-1984	1,610	2,040	4,450	6,070	7,470	9,050	13,600	06/06/1982	6,940
01120500	Safford Brook nr Woodstock Valley	4.15	1951-1981	275	338	659	860	1,030	1,210	1,710	08/19/1955	1,000
01121000	Mount Hope River nr Warrenville	28.6	1938, 1941-2001	816	1,030	2,280	3,180	4,000	4,950	7,840	08/19/1955	5,590
01121300	Fenton River at E Willington	11.4	1964-1976	272	349	720	933	1,100	1,280	1,720	12/21/1973	750
01122000	Natchaug River at Willimantic (regulated)	170	1931-1951, *1952-2001*	2,540	3,110	6,820	9,770	12,600	16,100	27,500	09/21/1938	32,000
01122500	Shetucket River nr Willimantic (regulated)	404	1904-1906, 1920-1921, 1929-1951, *1952-2001*	6,000	6,120	12,300	16,900	21,100	26,100	41,600	09/21/1938	e 52,200
01122680	Merrick Brook nr Scotland	5.21	1960-1984	211	274	639	894	1,120	1,380	2,130	06/05/1982	1,020
01123000	Little River nr Hanover	30.0	1936, 1938, 1952-2001	698	881	1,820	2,410	2,900	3,430	4,870	06/06/1982	rev 2,960
01124000	Quinebaug River at Quinebaug (regulated)	155	1932-1959, *1960-2001*	1,520	1,900	4,510	6,700	8,880	11,600	21,100	08/19/1955	49,300[10]
01124151	Quinebaug River at W. Thompson (regulated)	172	1967-2001, *1920-1940*	Entire period of record regulated for flood control							04/10/1987	2,820
01125300	English Neighborhood Brook at N Woodstock	4.66	1962-1984	130	187	547	805	1,030	1,290	2,020	06/05/1982	1,200
01125490	Little River at Harrisville	35.8	1936, 1938, 1962-1976	548	682	1,350	1,760	2,090	2,440	3,380	03/19/1936	2,520
01125500	Quinebaug River at Putnam (regulated)	328	1930-1959, *1960-2001*	3,030	3,800	8,300	11,600	14,500	18,000	28,500	08/19/1955	48,000[11]
01125600	Mashamoquet Brook at Abington	11.1	1963-1976	350	434	815	1,020	1,180	1,340	1,730	02/02/1973	820
01125650	Wappoquia Brook nr Pomfret	4.20	1964-1984	167	203	389	508	609	721	1,030	04/02/1970	rev 550
01125900	Cady Brook at E Putnam	8.29	1964-1984	231	309	721	979	1,190	1,420	2,020	01/26/1978	950
01126000	Fivemile River at Killingly	57.8	1936, 1938-1984	542	669	1,330	1,750	2,100	2,490	3,560	07/24/1938	2,480
01126500	Moosup River at Moosup	83.6	1933-1984	1,210	1,480	2,810	3,610	4,260	4,970	6,840	03/12/1936	rev 4,260
01126600	Blackwell Brook nr Brooklyn	17.0	1962-1976	384	515	1,260	1,760	2,180	2,660	3,970	04/02/1970	1,100

Table 1. Peak-flow frequency estimates for streams in Connecticut for selected recurrence intervals--Continued

[Peak-flow frequency estimates are based on 10 or more years of unregulated flow record. Period of record includes historical information outside the period of systematic data collection at or near a gaging station. Period of record in italics represents the period when flows were affected by flood-control regulation. regulated, flood-control reservoir affects flow (regulated indicates that the drainage area upstream from the gaging station has more than 4.5 million cubic feet of usable storage per mile (Benson, 1962)); mi^2, square miles; ft^3/s, cubic feet per second; nr, near; rev, revised; e, estimated]

U.S. Geological Survey streamflow-gaging station		Drainage area (mi^2)	Period of record (water years)	Peak-flow frequency estimates for given recurrence interval (ft^3/s)							Maximum known peak flow	
Number	Name			1.5 years	2 years	10 years	25 years	50 years	100 years	500 years	Date	Flow (ft^3/s)
01126700	Kitt Brook nr Canterbury	11.1	1964-1976	176	206	344	421	481	544	703	02/02/1973	400
01126950	Pachaug River at Pachaug	53.0	1936, 1938, 1961-1973	502	596	1,010	1,230	1,400	1,570	2,000	09/21/1938	1,970
01127000	Quinebaug River at Jewett City (regulated)	713	1919-1964, *1965-2001*	6,270	7,640	15,600	21,300	26,400	32,300	50,100	08/20/1955	40,700
01127100	Broad Brook nr Preston City	12.5	1961-1976	292	341	556	672	762	855	1,080	09/21/1961	620
01127400	Susquetonscut Brook at Yantic	15.7	1962-1976	378	434	655	761	838	914	1,090	04/02/1970	700
01127500	Yantic River at Yantic	89.3	1931-2001	2,100	2,640	5,740	7,860	9,730	11,800	18,000	09/21/1938	e 13,500
01127700	Trading Cove Brook nr Thamesville	8.46	1961-1974	286	361	758	1,010	1,220	1,450	2,070	02/02/1973	940
01127760	Hunts Brook at Old Norwich Rd. at Quaker Hill	11.5	1964-1976	195	244	512	686	835	1,000	1,460	06/19/1972	650
CONNECTICUT RIVER BASIN												
01183990	Jawbuck Brook nr Hazardville	2.16	1967-1976	42	50	89	111	129	147	196	01/28/1976	88
01184000	Connecticut River at Thompsonville	9,660	1929-2001	Peak-flow frequency estimates available upon request							03/20/1936	282,000
01184100	Stony Brook nr W Suffield	10.4	1955, 1960-2001	303	405	1,060	1,560	2,030	2,580	4,300	08/19/1955	e 6,000
01184260	Namerick Brook nr Warehouse Point	2.70	1964-1984	176	229	505	677	819	972	1,380	12/21/1973	620
01184300	Gillette Brook at Somers	3.60	1960-1984	98	126	273	367	446	533	770	09/27/1975	375
01184490	Broad Brook at Broad Brook	15.5	1938, 1962-1976, 1982-2001	329	417	848	1,100	1,300	1,520	2,070	09/27/1975	1,140
01184500	Scantic River at Broad Brook	98.2	1929-1984	859	1,070	2,260	3,080	3,800	4,640	7,080	08/19/1955	13,300
01186000	W Branch Farmington River at Riverton (regulated)	131	1955-1968, *1969-2001*	1,560	2,030	5,660	9,050	12,600	17,300	35,000	08/19/1955	57,200
01186100	Mad River at Winsted (regulated)	18.5	1955, 1957-1961, *1962-1969*	Less than 10 years of unregulated flow							08/19/1955	10,200
01186500	Still River at Robertsville (regulated)	85.0	1936, 1938, 1949-1961, *1962-2001*	2,200	2,880	7,110	10,300	13,200	16,700	27,400	08/19/1955	44,000
01187000	W Branch Farmington River at Riverton	217	1930-1956	5,010	6,590	18,100	28,100	38,200	51,100	96,300	08/19/1955	101,000
01187300	Hubbard River nr W Hartland	19.9	1938-1954[1], 1955, 1957-2001	971	1,270	2,820	3,750	4,510	5,320	7,410	08/19/1955	e 10,500
01187400	Valley Brook nr W Hartland	7.03	1940-1954[1], 1955-1972	245	350	1,060	1,610	2,130	2,740	4,640	08/19/1955	5,400
01187800	Nepaug River nr Nepaug	23.5	1922-1954[1], 1955, 1958-1984	637	843	1,990	2,750	3,390	4,110	6,080	08/19/1955	e 10,000
01187850	Clear Brook nr Collinsville	0.59	1922-1954[1], 1955-1973	10	14	35	50	64	81	130	08/19/1955	56
01187980	Farmington River at Collinsville (regulated)	360	1928, 1936, 1938, 1955, 1963-1968, *1969-1977*	Less than 10 years of unregulated flow							08/19/1955	140,000
01188000	Burlington Brook at Burlington	4.10	1932-2001	217	294	702	953	1,160	1,370	1,930	08/19/1955	1,690
01188090	Farmington River at Unionville (regulated)	378	1978-2001, *1920-1940*	Entire period of record regulated for flood control							03/23/1980	20,300
01188100	Roaring Brook at Unionville	7.60	1962-1984	142	194	518	755	967	1,210	1,930	06/05/1982	900
01189000	Pequabuck River at Forestville	45.8	1938, 1942-2001	1,290	1,650	3,840	5,470	6,960	8,740	14,200	08/19/1955	11,700
01189200	Stratton Brook nr Simsbury	5.13	1964-1984	100	134	316	432	528	633	912	06/05/1982	390
01189390	E Branch Salmon Book at Granby	39.5	1955-1956, 1964-1976	555	764	2,450	4,080	5,810	8,130	16,900	08/19/1955	e 27,000

Table 1. Peak-flow frequency estimates for streams in Connecticut for selected recurrence intervals--Continued

[Peak-flow frequency estimates are based on 10 or more years of unregulated flow record. Period of record includes historical information outside the period of systematic data collection at or near a gaging station. Period of record in italics represents the period when flows were affected by flood-control regulation. regulated, flood-control reservoir affects flow (regulated indicates that the drainage area upstream from the gaging station has more than 4.5 million cubic feet of usable storage per mile (Benson, 1962)); mi^2, square miles; ft^3/s, cubic feet per second; nr, near; rev, revised; e, estimated]

U.S. Geological Survey streamflow-gaging station		Drainage area (mi^2)	Period of record (water years)	Peak-flow frequency estimates for given recurrence interval (ft^3/s)							Maximum known peak flow	
Number	Name			1.5 years	2 years	10 years	25 years	50 years	100 years	500 years	Date	Flow (ft^3/s)
01189500	Salmon Brook nr Granby[2]	67.4	1947-1963	1,440	1,930	5,780	9,500	13,400	18,800	38,900	08/19/1955	e 40,000
01189995	Farmington River at Tariffville (regulated)	577	1913-1939, *1971-2001*	Peak-flow frequency estimates not determined at this site							09/22/1938	29,900
01190000	Farmington River at Rainbow (regulated)	590	1928, 1936-1968, *1969-1986*	5,540	7,120	18,100	27,300	36,500	48,000	87,500	08/19/1955	69,200
01190050	Podunk River at Wapping	4.34	1962-1976	77	93	184	247	303	368	557	09/26/1975	320
01190070	Connecticut River at Hartford	10,493	1905-2001	Peak-flow frequency estimates available upon request								
01190100	Piper Brook at Newington Junction[3]	14.6	1955, 1958-1984	571	745	1,630	2,160	2,590	3,050	4,220	10/03/1979	2,400
01190200	Mill Brook at Newington[3]	2.65	1955, 1958-1984	159	217	489	636	745	854	1,110	10/03/1979	650
01190300	Trout Brook at W Hartford (regulated)	14.6	1955, 1958-1963, *1964-1972, 1975, 1980*	Less than 10 years of unregulated flow							08/19/1955 10/03/1979	3,300
01190500	S Branch Park River at Hartford[3]	39.9	1936-1972, 1974-1981	1,130	1,500	3,660	5,160	6,480	7,980	12,300	10/03/1979	5,630
01190600	Wash Brook at Bloomfield	5.54	1955, 1959-1971	156	198	476	702	921	1,190	2,100	08/19/1955	3,000
01191000	N Branch Park River at Hartford (regulated)	26.8	1936-1962, *1963-1996*	943	1,150	2,460	3,430	4,330	5,400	8,760	08/19/1955	10,000
01191500	Park River at Hartford[3]	72.5	1936-1962	1,770	2,150	4,590	6,460	8,220	10,400	17,200	08/19/1955	14,000
01191900	Charter Brook nr Crystal Lake	8.51	1965-1984	203	275	647	869	1,050	1,230	1,700	09/12/1971	rev 620
01192500	Hockanum River nr E Hartford	73.4	1920-1921, 1929-2001	826	1,050	2,200	2,940	3,550	4,220	6,040	09/21/1938	5,160
01192600	S Branch Salmon Brook at Buckingham	0.94	1961-1976	18	24	66	99	130	167	285	09/19/1972	115
01192650	Roaring Brook at Hopewell	24.3	1962-1976	439	507	852	1,060	1,240	1,430	1,960	04/02/1970	1,240
01192700	Mattabesset River at E Berlin	46.5	1962-1979, 1995-1998[4]	1,310	1,590	2,780	3,400	3,880	4,360	5,530	02/03/1970	2,980
01192800	Parmalee Brook nr Durham	2.79	1960-84	174	215	397	494	569	645	830	01/25/1979 06/05/1982	517
01192883	Coginchaug River at Middlefield	29.8	1962-1980; 1981-2001[5]	581	747	1,550	2,010	2,370	2,750	3,690	04/16/1996	2,260
01193120	Ponset Brook nr Higganum	5.72	1962-1977, 1982	188	246	598	855	1,090	1,360	2,160	06/05/1982	1,700
01193250	Judd Brook nr Colchester	3.93	1962-1979	116	157	403	578	732	908	1,420	01/25/1979	625
01193300	Blackledge River nr Gilead	6.75	1960-1984	161	198	366	459	532	608	798	06/05/1982	480
01193500	Salmon River nr E Hampton	100	1929-2001	2,140	2,730	6,460	9,390	12,200	15,500	26,300	06/06/1982	18,500
01193800	Hemlock Valley Brook at Hadlyme	2.62	1961-1976	97	123	245	314	368	424	563	03/06/1963	270
01194000	Eightmile River at N Plain	20.1	1938-1984	679	861	1,850	2,500	3,060	3,680	5,400	06/06/1982	5,200
01194500	E Branch Eightmile River nr N Lyme	22.3	1938-1982	536	645	1,350	1,900	2,430	3,070	5,180	06/06/1982	5,170
SOUTH CENTRAL COASTAL BASINS												
01195000	Menunketesuck River nr Clinton	11.2	1938, 1942-1967, 1982	448	410	873	1,210	1,520	1,890	3,020	06/06/1982 09/21/1938	3,210 4,600[6]
01195100	Indian River nr Clinton	5.68	1982-2001	140	176	405	578	738	930	1,530	06/05/1982	2,600
01195200	Neck River nr Madison	6.55	1962-1982	144	183	401	548	675	818	1,230	06/05/1982	1,040
01195490	Quinnipiac River at Southington[3]	17.4	1988-2001	384	461	785	949	1,070	1,200	1,490	06/06/1992	876

Table 1. Peak-flow frequency estimates for streams in Connecticut for selected recurrence intervals--Continued

[Peak-flow frequency estimates are based on 10 or more years of unregulated flow record. Period of record includes historical information outside the period of systematic data collection at or near a gaging station. Period of record in italics represents the period when flows were affected by flood-control regulation. regulated, flood-control reservoir affects flow (regulated indicates that the drainage area upstream from the gaging station has more than 4.5 million cubic feet of usable storage per mile (Benson, 1962)); mi^2, square miles; ft^3/s, cubic feet per second; nr, near; rev, revised; e, estimated]

U.S. Geological Survey streamflow-gaging station		Drainage area (mi^2)	Period of record (water years)	Peak-flow frequency estimates for given recurrence interval (ft^3/s)							Maximum known peak flow	
Number	Name			1.5 years	2 years	10 years	25 years	50 years	100 years	500 years	Date	Flow (ft^3/s)
01196500	Quinnipiac River at Wallingford	110	1931-2001	1,690	2,100	4,100	5,260	6,180	7,140	9,610	06/06/1982	8,200
01196580	Muddy River nr N Haven	18.0	1963-1976	626	712	1,080	1,280	1,440	1,590	1,990	02/03/1970	1,300
01196600	Willow Brook nr Cheshire	9.34	1960-1983	210	278	780	1,230	1,690	2,290	4,410	06/06/1982	3,000
01196620	Mill River nr Hamden	24.5	1969-1970, 1979-2001	718	946	2,420	3,580	4,670	5,980	10,200	06/06/1982	5,580
01196700	Wepawaug River at Milford	18.4	1962-1984	520	667	1,580	2,280	2,930	3,700	6,100	06/06/1982	5,020
HOUSATONIC RIVER BASIN												
01198500	Blackberry River at Canaan (regulated)	45.9	1949-1961, *1962-1981*	1,400	1,830	4,190	5,740	7,070	8,550	12,600	08/19/1955	14,200
01198860	Deming Brook nr Huntsville	1.08	1971-1984	62	91	309	495	676	900	1,630	03/21/1980	520
01199000	Housatonic River at Falls Village	634	1913-2001	5,250	6,260	11,600	15,100	18,100	21,400	30,800	01/01/1949	23,900
01199050	Salmon Creek at Lime Rock	29.4	1949, 1955, 1962-2001	450	588	1,510	2,250	2,970	3,850	6,750	08/19/1955	6,300
01199150	Furnace Brook at Cornwall Bridge	13.3	1945, 1949, 1955, 1962-1976	229	312	921	1,460	1,990	2,680	5,050	08/19/1955	4,060
01199200	Guinea Brook at W Woods Rd at Ellsworth	3.50	1960-1981	76	96	199	262	314	369	517	12/21/1973	319
01200500	Housatonic River at Gaylordsville	996	1901-1914, 1924, 1928-2001	8,660	10,600	21,200	28,100	33,900	40,500	58,900	08/19/1955	51,800
01201190	W Aspetuck River at Sand Rd nr New Milford	23.8	1963-1972	276	360	842	1,180	1,480	1,820	2,800	08/05/1969	1,090
01201500	Still River nr Lanesville	67.5	1932-1966, 1967-1984[7]	938	1,220	2,940	4,190	5,320	6,630	10,600	10/16/1955	7,980
01201890	Pond Brook nr Hawleyville	11.9	1963-1976	316	425	1,100	1,600	2,050	2,580	4,170	09/26/1975	1,400
01201930	Marshepaug River nr Milton	9.24	1968-1981[8]	182	224	392	472	530	588	713	12/22/1973	474
01202500	Shepaug River at Woodville	38.0	1936-1988	956	1,280	3,120	4,320	5,340	6,460	9,530	08/19/1955	13,800
01202700	Butternut Brook nr Litchfield	2.42	1960-1984	176	229	506	677	817	968	1,360	02/02/1973	630
01203000	Shepaug River nr Roxbury	132	1931-1984	2,320	2,960	7,210	10,600	14,000	18,100	31,500	08/19/1955	50,300
01203100	Jacks Brook nr Roxbury Falls	7.90	1961-1984	410	542	1,230	1,650	2,000	2,370	3,330	09/26/1975	e 1,600
01203510	Pootatuck River at Sandy Hook	24.8	1966-84	1,040	1,290	2,390	2,970	3,410	3,860	4,940	01/25/1979	2,720
01203600	Nonnewaug River at Minortown	17.7	1955, 1963-1979, 2001	1,070	1,460	3,740	5,320	6,680	8,220	12,600	08/19/1955	e 10,000
01203700	Wood Creek nr Bethlehem	3.39	1962-1984	154	197	458	649	824	1,030	1,650	02/02/1973	e 700
01204000	Pomperaug River at Southbury	75.1	1933-2001	2,210	2,810	6,490	9,190	11,600	14,600	23,400	08/19/1955	29,400
01204800	Copper Mill Brook nr Monroe	2.45	1959-1976	122	148	257	312	352	391	483	02/02/1973	255
01205500	Housatonic River at Stevenson	1,544	1924-1925, 1928-2001	15,400	20,000	45,200	61,700	75,700	91,200	134,000	10/16/1955	75,800
01205600	W Branch Naugatuck River at Torrington (regulated)	33.8	1955, 1957-1961, *1962-1996*	Less than 10 years of unregulated flow							08/19/1955	16,500
01205700	E Branch Naugatuck River at Torrington (regulated)	13.6	1955, 1957-1963, *1964-1996*	Less than 10 years of unregulated flow							08/19/1955	8,550
01206000	Naugatuck River nr Thomaston	71.0	1931-1959	2,630	3,260	7,120	10,000	12,600	15,800	25,600	08/19/1955	41,600
01206500	Leadmine Brook nr Thomaston	24.3	1931-59, 1960-1984[9]	938	1,240	3,320	5,010	6,640	8,640	15,200	08/19/1955	10,400

Table 1. Peak-flow frequency estimates for streams in Connecticut for selected recurrence intervals--Continued

[Peak-flow frequency estimates are based on 10 or more years of unregulated flow record. Period of record includes historical information outside the period of systematic data collection at or near a gaging station. Period of record in italics represents the period when flows were affected by flood-control regulation. regulated, flood-control reservoir affects flow (regulated indicates that the drainage area upstream from the gaging station has more than 4.5 million cubic feet of usable storage per mile (Benson, 1962)); mi^2, square miles; ft^3/s, cubic feet per second; nr, near; rev, revised; e, estimated]

U.S. Geological Survey streamflow-gaging station		Drainage area (mi^2)	Period of record (water years)	Peak-flow frequency estimates for given recurrence interval (ft^3/s)							Maximum known peak flow	
Number	Name			1.5 years	2 years	10 years	25 years	50 years	100 years	500 years	Date	Flow (ft^3/s)
01206900	Naugatuck River at Thomaston (regulated)	99.8	1955, *1960-2001*	Less than 10 years of unregulated flow							08/19/1955	53,400
01208013	Branch Brook nr Thomaston (regulated)	20.8	1971-2001, *1920-1940*	Entire period of record regulated for flood control							06/08/1982	805
01208100	Hancock Brook nr Terryville	1.18	1960-1981	95	118	219	274	315	357	459	09/26/1975	300
01208400	Hop Brook nr Middlebury	9.43	1955, 1962-1975	333	436	1,050	1,480	1,870	2,310	3,610	08/19/1955	1,700
01208420	Hop Brook nr Naugatuck (regulated)	16.3	1955, *1970-2001*	Less than 10 years of unregulated flow							08/19/1955	2,650
01208500	Naugatuck River at Beacon Falls (regulated)	260	1920-1959, *1960-2001*	6,700	8,620	20,700	29,900	38,400	48,500	80,200	08/19/1955	106,000
01208700	Little River at Oxford	4.54	1960-1984	186	243	600	870	1,120	1,420	2,340	06/05/1982	1,350
SOUTHWEST COASTAL BASINS												
01208850	Pequonnock River at Trumbull	15.6	1955, 1962-1984	555	732	1,720	2,380	2,950	3,580	5,340	10/16/1955	e 4,500
01208873	Rooster River at Fairfield[3]	10.6	1978-2001	959	1,140	1,800	2,070	2,250	2,410	2,740	04/09/1980	2,170
01208900	Patterson Brook nr Easton	1.21	1960-1984	61	72	116	139	156	173	214	06/05/1982	148
01208925	Mill River nr Fairfield	28.6	1973-2001	507	679	1,530	2,020	2,390	2,780	3,740	04/10/1980	1,800
01208950	Sasco Brook nr Southport	7.38	1960-2001	205	270	728	1,120	1,500	1,970	3,580	06/19/1972	1,640
01208990	Saugatuck River nr Redding	21.0	1962-2001	456	586	1,220	1,580	1,860	2,160	2,900	03/25/1969	1,860
01209500	Saugatuck River nr Westport	79.8	1933-1967	1,140	1,540	3,950	5,680	7,220	8,990	14,200	10/16/1955	14,800
01209600	Comstock Brook at N Wilton	3.50	1960-1975	116	137	251	325	388	459	659	09/26/1975	440
01209700	Norwalk River at S Wilton	30.0	1956, 1963-2001	778	1,010	2,320	3,220	4,000	4,880	7,390	10/16/1955	e 12,000
01209770	Fivemile River nr Norwalk	8.96	1956, 1962-1984	431	536	1,130	1,540	1,890	2,300	3,470	10/16/1955	e 3,250
01211700	E Branch Byram River at Round Hill	1.69	1960-1975	78	100	225	306	376	452	663	06/19/1972	245
01212100	E Branch Byram River at Riversville	11.1	1963-1984	409	567	1,450	2,020	2,490	3,000	4,340	06/19/1972	1,700

[1]Peak flow for these water years is a maximum daily average.

[2]Gaging station formerly published under the name West Branch Salmon Brook at Granby, Connecticut.

[3]Discharge is affected by urbanization or channelization.

[4]1995–98 streamflow data collected at station 01192704, Mattabesset River at Rt. 372 at East Berlin adjusted to site (data transferred using transfer equation 6.12, Drainage Manual, Connecticut Dept. of Transportation, January 2000).

[5]1962–80 streamflow data collected at station 01192890, Coginchaug River at Rockfall adjusted to site (data transferred using transfer equation 6.12, Drainage Manual, Connecticut Dept. of Transportation, January 2000).

[6]Peak flow affected by dam break.

[7]1967–84 streamflow data collected at station 01201510, Still River at Lanesville adjusted to site (data transferred using transfer equation 6.12, Drainage Manual, Connecticut Dept. of Transportation, January 2000).

[8]Peak-flow frequency estimates based on water years 1972–81.

[9]1960–84 streamflow data collected at station 01206400, Leadmine Brook near Harwinton adjusted to site (data transferred using transfer equation 6.12, Drainage Manual, Connecticut Dept. of Transportation, January 2000).

[10]Peak flow augmented by release of storage from dam failure.

[11]Peak flow affected by dam failures.

Appendix 1. Description of U.S. Geological Survey Stream-Flow-Gaging Station Locations, Connecticut

Appendix 1. Description of U.S. Geological Survey streamflow-gaging station locations, Connecticut

[lat, latitude; long, longitude; mi, miles; ft, feet; right and left bank are referenced facing downstream]

Station number	Station name	Station location
01118300	Pendleton Hill Brook near Clarks Falls, CT	Lat 41°28'30", long 71°50'03", New London County, Hydrologic Unit 01090005, on left bank just upstream from twin culverts on Grindstone Hill Road, 0.1 mi west of State Route 49 in the township of North Stonington, 1.6 mi northwest of Clarks Falls, and 3.4 mi northeast of village of North Stonington.
01118750	Haleys Brook near Old Mystic, CT	Lat 41°23'21", long 71°59'09", New London County, Hydrologic Unit 01100003, at bridge on Colonel Ledyard Highway, 1.25 mi west of Old Mystic.
01119255	Delphi Brook near Staffordville, CT	Lat 42°01'23", long 72°14'53", Tolland County, Hydrologic Unit 01100002, at bridge on State Highway 19, 2.1 mi northeast of Staffordville.
01119300	Roaring Brook near Staffordville, CT	Lat 41°59'05", long 72°13'45", Tolland County, Hydrologic Unit 01100002, at abandoned bridge beside Bradway Road, 1.7 mi east of Staffordville.
01119360	Conat Brook at West Willington, CT	Lat 41°52'18", long 72°17'30", Tolland County, Hydrologic Unit 01100002, at bridge on Sharps Hill Road, 0.5 mi southeast of West Willington.
01119450	Eagleville Brook at Storrs, CT	Lat 41°48'32", long 72°15'42", Tolland County, Hydrologic Unit 01100002, at South side of Eagleville Road, at Storrs.
01119500	Willimantic River near Coventry, CT	Lat 41°45'02", long 72°15'56", Tolland County, Hydrologic Unit 01100002, on left bank 700 ft upstream from bridge on State Rt. 31, 1 mi downstream from Mill Brook, 2.4 mi southeast of South Coventry, 2.8 mi upstream from Hop River and 6.3 mi upstream from mouth.
01119600	Ash Brook near North Coventry, CT	Lat 41°46'47", long 72°23'58", Tolland County, Hydrologic Unit 01100002, at bridge on Brewster Street, 2 mi southwest of North Coventry, and 2 mi northwest of Bolton.
01119820	Skungamaug River at North Coventry, CT	Lat 41°47'32", long 72°21'20", Tolland County, Hydrologic Unit 01100002, at bridge on State Highway 31, 1.0 mi southeast of North Coventry.
01120000	Hop River near Columbia, CT	Lat 41°43'39", long 72°18'09", Tolland County, Hydrologic Unit 01100002, 1,500 ft downstream from Hop River Village near Columbia.
01120500	Safford Brook near Woodstock Valley, CT	Lat 41°55'35", long 72°03'35", Windham County, Hydrologic Unit 01100002, on right bank at downstream side of bridge on Hopkins Road, 0.3 mi downstream from Bradford Brook, 0.3 mi upstream from mouth, and 2 mi southwest of West Woodstock.
01121000	Mount Hope River near Warrenville, CT	Lat 41°50'37", long 72°10'08", Windham County, Hydrologic Unit 01100002, on left bank 250 ft downstream from Knowlton Brook, 700 ft upstream from bridge on State Route 89, 1.8 mi south of Warrenville, and 3.2 mi southwest of Ashford.
01121300	Fenton River at East Willington, CT	Lat 41°52'20", long 72°14'31", Tolland County, Hydrologic Unit 01100002, at bridge on U.S. Highway 44, at East Willington.
01122000	Natchaug River at Willimantic, CT	Lat 41°43'11", long 72°11'46", Windham County, Hydrologic Unit 01100002, on left bank at upstream side of bridge on State Route 66, 1 mi northeast of Willimantic, 1.6 mi upstream from mouth, and 3.7 mi downstream from Mansfield Hollow Dam.
01122500	Shetucket River near Willimantic, CT	Lat 41°42'01", long 72°10'57", Windham County, Hydrologic Unit 01100002, on right bank at downstream side of Bingham Bridge on Plains Road, 500 ft upstream from Penn. Central Co. railroad bridge, 500 ft downstream from Potash Brook, 1.3 mi downstream from confluence of Willimantic and Natchaug Rivers, 1.5 mi southeast of Willimantic, and 17 mi upstream from mouth.
01122680	Merrick Brook near Scotland, CT	Lat 41°43'43", long 72°05'07", Windham County, Hydrologic Unit 01100002, by Brook Road, 2.1 mi north of Scotland.
01123000	Little River near Hanover, CT	Lat 41°40'16", long 72°03'11", Windham County, Hydrologic Unit 01100002, on left bank 800 ft upstream from bridge on Hanover Road, 0.7 mi downstream from Peck Brook, 2.3 mi northeast of Hanover, and 6.5 mi upstream from mouth.
01124000	Quinebaug River at Quinebaug, CT	Lat 42°01'20", long 71°57'22", Windham County, Hydrologic Unit 01100001, on right bank at Quinebaug, 500 ft upstream from bridge on State Route 197, 0.2 mi downstream from Massachusetts-Connecticut State line, 7.8 mi upstream from French River, and at mile 46.

Appendix 1. Description of U.S. Geological Survey streamflow-gaging station locations, Connecticut--Continued

[lat, latitude; long, longitude; mi, miles; ft, feet; right and left bank are referenced facing downstream]

Station number	Station name	Station location
01124151	Quinebaug River at West Thompson, CT	Lat 41°56’36”, long 71°54’03”, Windham County, Hydrologic Unit 01100001, on left bank near downstream end of tailrace, upstream from concrete V-notch weir at flood control dam at West Thompson.
01125300	English Neighborhood Brook at N. Woodstock, CT	Lat 41°59’27”, long 71°59’50”, Windham County, Hydrologic Unit 01100001, at bridge on State Highway 93, at North Woodstock.
01125490	Little River at Harrisville, CT	Lat 41°55’40”, long 71°55’49”, Windham County, Hydrologic Unit 01100001, at bridge on Tripp Road, 0.5 mi east of Harrisville.
01125500	Quinebaug River at Putnam, CT	Lat 41°54’33”, long 71°54’48”, Windham County, Hydrologic Unit 01100001, on right bank at Putnam, 0.15 mi downstream from Little River, 0.3 mi upstream from New York, New Haven and Hartford Railroad bridge, 2.8 mi downstream from French River, 3.0 mi downstream from West Thompson Dam, and 36 mi upstream from mouth.
01125600	Mashamoquet Brook at Abington, CT	Lat 41°52’27”, long 72°00’34”, Windham County, Hydrologic Unit 01100001, at bridge on Taft Pond Road, 1 mi north of Abington.
01125650	Wappoquia Brook near Pomfret, CT	Lat 41°51’57”, long 71°57’29”, Windham County, Hydrologic Unit 01100001, at bridge on Day Road, 2 mi south of Pomfret.
01125900	Cady Brook at East Putnam, CT	Lat 41°54’32”, long 71°49’09”, Windham County, Hydrologic Unit 01100001, at bridge on E. Putnam Rd., 1/3 mi south of E. Putnam.
01126000	Fivemile River at Killingly, CT	Lat 41°50’14”, long 71°53’08”, Windham County, Hydrologic Unit 01100001, at Penn. Central Railroad Co. bridge, 0.6 mi south of Killingly.
01126500	Moosup River at Moosup, CT	Lat 41°42’38”, long 71°53’10”, Windham County, Hydrologic Unit 01100001, at Kaman Aircraft Corp. at Moosup.
01126600	Blackwell Brook near Brooklyn, CT	Lat 41°45’55”, long 71°57’24”, Windham County, Hydrologic Unit 01100001, on left bank 75 ft upstream from bridge on State Highway 169, 1.5 mi south of Brooklyn.
01126700	Kitt Brook near Canterbury, CT	Lat 41°40’50”, long 71°58’42”, Windham County, Hydrologic Unit 01100001, at bridge on Mudhole (Elmdale) Road, 1.25 mi south of Canterbury.
01126950	Pachaug River at Pachaug, CT	Lat 41°35’05”, long 71°56’03”, New London County, Hydrologic Unit 01100001, at right bank 300 ft from bridge on State Highway 138 at Pachaug, and 0.3 mi downstream from Pachaug Pond.
01127000	Quinebaug River at Jewett City, CT	Lat 41°35’52”, long 71°59’05”, New London County, Hydrologic Unit 01100001, on left bank behind high school on Slater Avenue at Jewett City, 570 ft downstream from outlet of canal from Wedgewood Mills at mouth of Pachaug River, 1,000 ft downstream from railroad bridge and at mile 6.1.
01127100	Broad Brook near Preston City, CT	Lat 41°33’14”, long 71°58’13”, New London County, Hydrologic Unit 01100001, at bridge on State Highway 164, 1.8 mi north of Preston City.
01127400	Susquetonscut Brook at Yantic, CT	Lat 41°34’16”, long 72°08’00”, New London County, Hydrologic Unit 01100003, at bridge on State Highway 87, 1 mi northeast of Yantic.
01127500	Yantic River at Yantic, CT	Lat 41°33’32”, long 72°07’18”, New London County, Hydrologic Unit 01100003, on left bank at Yantic, 700 ft downstream from stone-arch highway bridge, 1 mi downstream from Susquetonscut Brook, and 4.8 mi upstream from mouth.
01127700	Trading Cove Brook near Thamesville, CT	Lat 41°30’03”, long 72°06’59”, New London County, Hydrologic Unit 01100003, at culvert on Conn. Turnpike, 1.5 mi west of Thamesville and 3 mi southwest of Norwich.
01127760	Hunts Brook at Old Norwich Road at Quaker Hill, CT	Lat 41°24’04”, long 72°07’16”, New London County, Hydrologic Unit 01100003, at bridge on Old Norwich Road, at Quaker Hill.
01127800	Fourmile River near East Lyme, CT	Lat 41°21’26”, long 72°15’39”, New London County, Hydrologic Unit 01100003, at bridge on Stones Ranch Road, 2.5 mi west of East Lyme.
01183990	Jawbuck Brook near Hazardville, CT	Lat 42°00’25”, long 72°33’14”, Hartford County, Hydrologic Unit 01080205, at bridge on North Maple Street, 1.5 mi north of Hazardville.

Appendix 1. Description of U.S. Geological Survey streamflow-gaging station locations, Connecticut--Continued

[lat, latitude; long, longitude; mi, miles; ft, feet; right and left bank are referenced facing downstream]

Station number	Station name	Station location
01184000	Connecticut River at Thompsonville, CT	Lat 41°59'12", long 72°36'20", Hartford County, Hydrologic Unit 01080205, on right bank just upstream from Enfield Dam, 1.0 mi downstream from Thompsonville, 3.0 mi downstream from Massachusetts-Connecticut State line, and at mile 63.6.
01184100	Stony Brook near West Suffield, CT	Lat 41°57'39", long 72°42'38", Hartford County, Hydrologic Unit 01080205, at bridge on South Grand Street, 2.1 mi south of West Suffield.
01184260	Namerick Brook near Warehouse Point, CT	Lat 41°54'13", long 72°36'45", Hartford County, Hydrologic Unit 01080205, at bridge on U.S. Highway 5, 1.7 mi south of Warehouse Point.
01184300	Gillette Brook at Somers, CT	Lat 41°59'31", long 72°26'04", Tolland County, Hydrologic Unit 01080205, at twin culverts on Battle Street, 0.7 mi northeast of Somers.
01184490	Broad Brook at Broad Brook, CT	Lat 41°54'50", long 72°32'58", Hartford County, Hydrologic Unit 01080205, on left bank just upstream from bridge on State Route 191 (Mill Street) at Broad Brook, 0.5 mi upstream from mouth.
01184500	Scantic River at Broad Brook, CT	Lat 41°54'42", long 72°33'46", Hartford County, Hydrologic Unit 01080205, upstream from bridge on State Highway 191, at Broad Brook.
01186000	West Branch Farmington River at Riverton, CT	Lat 41°57'47", long 73°01'05", Litchfield County, Hydrologic Unit 01080207, on right bank at downstream side of bridge on State Route 20 at Riverton, 0.3 mi upstream from Still River, 2.0 mi downstream from Goodwin Dam of West Branch Reservoir, and at mile 55.
01186100	Mad River at Winsted, CT	Lat 41°55'51", long 73°04'53", Litchfield County, Hydrologic Unit 01080207, on left bank by U.S. Highway 44 at Winsted, 0.2 mi upstream from Indian Meadow Brook, 0.2 mi downstream from Winsted City line, 0.5 mi downstream from Mad River Dam, and 1.8 mi upstream from mouth.
01186500	Still River at Robertsville, CT	Lat 41°58'01", long 73°02'02", Litchfield County, Hydrologic Unit 01080207, on left bank 1,500 ft downstream from Sandy Brook, 1 mi southeast of Robertsville, 1 mi northwest of Riverton, and 1 mi upstream from mouth.
01187000	West Branch Farmington River at Riverton, CT	Lat 41°57'14", long 73°00'50", Litchfield County, Hydrologic Unit 01080207, on right bank 0.4 mi downstream from Still River, 0.6 mi south of Riverton.
01187300	Hubbard River near West Hartland, CT	Lat 42°02'15", long 72°56'22", Hartford County, Hydrologic Unit 01080207, on left bank at Massachusetts-Connecticut Stateline, 800 ft upstream from bridge on State Route 20, 0.5 mi upstream from confluence with Valley Brook, and 2.6 mi northeast of West Hartland.
01187400	Valley Brook near West Hartland, CT	Lat 42°02'04", long 72°55'48", Hartford County, Hydrologic Unit 01080207, on right bank just upstream from bridge on State Highway 20, 0.25 mi south of Connecticut-Connecticut State Line, 0.3 mi upstream from confluence with Hubbard River, and 2.25 mi northeast of West Hartland.
01187800	Nepaug River near Nepaug, CT	Lat 41°49'15", long 72°58'13", Litchfield County, Hydrologic Unit 01080207, beside U.S. Highway 202, 0.2 mi upstream from Nepaug Reservoir.
01187850	Clear Brook near Collinsville, CT	Lat 41°47'44", long 72°57'05", Hartford County, Hydrologic Unit 01080207, on right bank 200 ft upstream from Nepaug Reservoir beside Clear Brook Road, 1.75 mi southwest of Collinsville.
01187980	Farmington River at Collinsville, CT	Lat 41°47'56", long 72°55'34", Hartford County, Hydrologic Unit 01080207, on left bank at abandoned hydroelectric plant 0.8 mi south of Collinsville, and at mile 39.8.
01188000	Burlington Brook near Burlington, CT	Lat 41°47'10", long 72°57'54", Hartford County, Hydrologic Unit 01080207, on left bank 1.2 mi north of Burlington, 3 mi upstream from mouth, 2,000 ft east of the intersection of Covey Road and Hotchkiss Road, and 3 mi southwest of Collinsville.
01188090	Farmington River at Unionville, CT	Lat 41°45'22", long 72°53'13", Hartford County, Hydrologic Unit 01080207, at right bank upstream from steel truss highway bridge on State Route 177 at Unionville, 4.1 mi downstream from Burlington Brook and 3.0 mi upstream from Pequabuck River.
01188100	Roaring Brook at Unionville, CT	Lat 41°45'24", long 72°52'56", Hartford County, Hydrologic Unit 01080207, at bridge on State Highway 4, at Unionville.
01189000	Pequabuck River at Forestville, CT	Lat 41°40'24", long 72°53'59", Hartford County, Hydrologic Unit 01080207, on left bank 500 ft upstream from bridge on Central Street, 0.2 mi downstream from Copper Mine Brook, and 6.5 mi upstream from mouth.

Appendix 1. Description of U.S. Geological Survey streamflow-gaging station locations, Connecticut--Continued

[lat, latitude; long, longitude; mi, miles; ft, feet; right and left bank are referenced facing downstream]

Station number	Station name	Station location
01189200	Stratton Brook near Simsbury, CT	Lat 41°52’12”, long 72°49’27”, Hartford County, Hydrologic Unit 01080207, at bridge on Farms Village Road, 400 ft upstream from mouth, and 1.0 mi west of Simsbury.
01189390	East Branch Salmon Brook at Granby, CT	Lat 41°57’15”, long 72°46’46”, Hartford County, Hydrologic Unit 01080207, on right bank at downstream side of bridge on State Highway 20, 0.5 mi upstream from West Branch Salmon Brook, and 1.8 mi downstream from Manitook Lake.
01189500	Salmon Brook near Granby, CT	Lat 41°56’15”, long 72°46’34”, Hartford County, Hydrologic Unit 01080207, on left bank 50 ft upstream from New York, New Haven and Hartford Railroad bridge, 0.5 mi downstream from confluence of East Branch and West Branch.
01189995	Farmington River at Tariffville, CT	Lat 41°54’29”, long 72°45’40”, Hartford County, Hydrologic Unit 01080207, on right bank at Tariffville, behind house at 20 Tunxis Road, 0.3 mi downstream from bridge on State Route 189 and 5.5 mi upstream from gage at Rainbow.
01190000	Farmington River at Rainbow, CT	Lat 41°54’40”, long 72°41’17”, Hartford County, Hydrologic Unit 01080207, on left bank at Rainbow, 300 ft from Stevens Paper Mill, 0.4 mi downstream from Farmington River Power Co. dam, 1.3 mi upstream from Poquonock, 6.4 mi downstream from Salmon Brook, and at mile 8.2.
01190050	Podunk River at Wapping, CT	Lat 41°49’37”, long 72°33’51”, Hartford County, Hydrologic Unit 01080205, at bridge on Ellington Road, 0.5 mi west of Wapping.
01190070	Connecticut River at Hartford, CT	Lat 41°46’08”, long 72°40’01”, Hartford County, Hydrologic Unit 01080205, at Bulkley Memorial Bridge on U.S. Highway 84, at Hartford, 1.5 mi downstream from Podunk River and 1.2 mi upstream from Hockanum River.
01190100	Piper Brook at Newington Junction, CT	Lat 41°42’45”, long 72°44’13”, Hartford County, Hydrologic Unit 01080205, at bridge on Willard Avenue at Newington Junction.
01190200	Mill Brook at Newington, CT	Lat 41°42’17”, long 72°43’33”, Hartford County, Hydrologic Unit 01080205, at bridge on Dowd Street. 0.5 mi north of Newington.
01190300	Trout Brook at West Hartford CT	Lat 41°46’12”, long 72°44’13”, Hartford County, Hydrologic Unit 01080205, on left bank 250 ft upstream from Fern Street Bridge in West Hartford.
01190500	South Branch Park River at Hartford, CT	Lat 41°44’03”, long 72°42’49”, Hartford County, Hydrologic Unit 01080205, on left bank 100 ft downstream from bridge on Newfield Avenue in Hartford, 0.7 mi downstream from confluence of Trout Brook and Piper Brook, and 3.3 Mi upstream from confluence with North Branch.
01190600	Wash Brook at Bloomfield, CT	Lat 41°49’33”, long 72°44’21”, Hartford County, Hydrologic Unit 01080205, on right bank just upstream from bridge on Gabb Road, 0.4 mi south of Bloomfield.
01191000	North Branch Park River at Hartford, CT	Lat 41°47’02”, long 72°42’32”, Hartford County, Hydrologic Unit 01080205, on right bank 60 ft downstream from stone-arch bridge on Albany Avenue in Hartford, and 3 mi upstream from confluence with South Branch.
01191500	Park River at Hartford, CT	Lat 41°45’36”, long 72°41’40”, Hartford County, Hydrologic Unit 01080205, at bridge at Broad Street at Hartford, 1 mi upstream from Connecticut River and 1 mi downstream from confluence of North Branch Park River and South Branch Park R.
01191900	Charter Brook near Crystal Lake, CT	Lat 41°54’23”, long 72°24’12”, Tolland County, Hydrologic Unit 01080205, at bridge on Browns Bridge Road, 2 mi southwest of Crystal Lake.
01192500	Hockanum River near East Hartford, CT	Lat 41°46’60”, long 72°35’13”, Hartford County, Hydrologic Unit 01080205, on left bank at end of Preston Street, 0.2 mi upstream from bridge on Walnut Street, 1.5 mi downstream from Hop Brook, and 2.8 mi east of East Hartford.
01192600	South Branch Salmon Brook at Buckingham, CT	Lat 41°43’04”, long 72°32’23”, Hartford County, Hydrologic Unit 01080205, on left bank upstream from culvert on Keeney Street at Buckingham.
01192650	Roaring Brook at Hopewell, CT	Lat 41°39’49”, long 72°34’54”, Hartford County, Hydrologic Unit 01080205, at bridge on Matson Hill Road at Hopewell.
01192700	Mattabasset River at East Berlin, CT	Lat 41°37’08”, long 72°42’46”, Hartford County, Hydrologic Unit 01080205, at bridge on Berlin Street, at East Berlin.

Appendix 1. Description of U.S. Geological Survey streamflow-gaging station locations, Connecticut--Continued

[lat, latitude; long, longitude; mi, miles; ft, feet; right and left bank are referenced facing downstream]

Station number	Station name	Station location
01192800	Parmalee Brook near Durham, CT	Lat 41°27’09”, long 72°42’06”, Middlesex County, Hydrologic Unit 01080205, at bridge on Saw Mill Road, 2 mi southwest of Durham.
01192883	Coginchaug River at Middlefield, CT	Lat 41°31’12”, long 72°42’22”, Middlesex County, Hydrologic Unit 01080205, on right bank just upstream from Cider Mill Road, 0.5 mi northeast of Middlefield, and 0.75 mi upstream from Wadsworth Falls.
01193120	Ponset Brook near Higganum, CT	Lat 41°28’45”, long 72°33’26”, Middlesex County, Hydrologic Unit 01080205, at bridge on Skinner Road, 1.25 mi upstream from mouth, at Higganum.
01193250	Judd Brook near Colchester, CT	Lat 41°35’56”, long 72°21’11”, Tolland County, Hydrologic Unit 01080205, at bridge on Colchester Road, 2 mi northwest of Colchester.
01193300	Blackledge River near Gilead, CT	Lat 41°41’47”, long 72°27’20”, Hartford County, Hydrologic Unit 01080205, at box culverts on State Highway 94, 3 mi west of Gilead, and 4 mi east of Buckingham.
01193500	Salmon River near East Hampton, CT	Lat 41°33’08”, long 72°26’56”, Middlesex County, Hydrologic Unit 01080205, on left bank at Route 16 Bridge, 450 ft downstream from New London-Middlesex County line, 300 ft downstream from Comstock Bridge, 0.7 mi downstream from Dickinson Creek, and 3.5 mi southeast of East Hampton.
01193800	Hemlock Valley Brook at Hadlyme, CT	Lat 41°25’43”, long 72°25’23”, Middlesex County, Hydrologic Unit 01080205, on right bank just upstream from culvert on Bone Mill Road at Hadlyme, 0.5 mi upstream from mouth.
01194000	Eightmile River at North Plain, CT	Lat 41°26’29”, long 72°19’58”, Middlesex County, Hydrologic Unit 01080205, at bridge on State Highway 82, at North Plain.
01194500	East Branch Eightmile River near North Lyme, CT	Lat 41°25’39”, long 72°20’06”, New London County, Hydrologic Unit 01080205, on left bank at State Rt. 156 bridge, 0.7 mi south of intersection of State Rt. 82, 0.4 mi upstream from confluence of Eightmile River, and 5.5 mi above mouth.
01195000	Menunketesuck River near Clinton, CT	Lat 41°18’07”, long 72°30’55”, Middlesex County, Hydrologic Unit 01100004, on right bank at Fairy Dell, 100 ft downstream from Cobb's Bridge, 1.7 mi north of Clinton, 2.4 mi downstream from Kelseytown Reservoir, and 4.9 mi upstream from mouth.
01195100	Indian River near Clinton, CT	Lat 41°18’21”, long 72°31’52”, Middlesex County, Hydrologic Unit 01100004, on right downstream side of bridge at Hurd Bridge Road, 2.0 mi north of Clinton.
01195200	Neck River near Madison, CT	Lat 41°16’58”, long 72°37’08”, New Haven County, Hydrologic Unit 01100004, on left bank just upstream from culvert on Fort Path Road, 1.2 mi west of Madison, and 3.5 mi upstream from mouth.
01195490	Quinnipiac River at Southington, CT	Lat 41°36’13”, long 72°52’59”, Hartford County, Hydrologic Unit 01100004, on west bank, 400 ft downstream from bridge on Mill Street, and 500 ft upstream from bridge on Center Street in Southington.
01196500	Quinnipiac River at Wallingford, CT	Lat 41°26’60”, long 72°50’28”, New Haven County, Hydrologic Unit 01100004, on right bank on Wilbur Cross Highway, 0.8 mi downstream from bridge on Quinnipiac Street in Wallingford, and 2 mi upstream from Wharton Brook.
01196580	Muddy River near North Haven, CT	Lat 41°22’07”, long 72°50’30”, New Haven County, Hydrologic Unit 01100004, at bridge on Velvet Street, 2 mi southeast of North Haven.
01196600	Willow Brook near Cheshire, CT	Lat 41°27’35”, long 72°55’02”, New Haven County, Hydrologic Unit 01100004, at bridge on Mount Sanford Road, at corner of Harrison Avenue, 2.5 mi south of Cheshire.
01196620	Mill River near Hamden, CT	Lat 41°25’14”, long 72°54’10”, New Haven County, Hydrologic Unit 01100004, 150 ft downstream from bridge on Mount Carmel Avenue, 0.4 mi downstream from Eaton's Brook, and 2.5 mi north of Hamden.
01196700	Wepawaug River at Milford	Lat 41°14’10”, long 73°03’28”, New Haven County, Hydrologic Unit 01100004, by bridge on Walnut Street, at Milford.
01198500	Blackberry River at Canaan, CT	Lat 42°01’26”, long 73°20’31”, Litchfield County, Hydrologic Unit 01100005, at bridge on U.S. Highway 44, at Canaan.
01198860	Deming Brook near Huntsville, CT	Lat 41°57’51”, long 73°18’05”, Litchfield County, Hydrologic Unit 01100005, 20 ft downstream from Under Mountain Road, 1.5 mi northeast of Huntsville.

Appendix 1. Description of U.S. Geological Survey streamflow-gaging station locations, Connecticut--Continued

[lat, latitude; long, longitude; mi, miles; ft, feet; right and left bank are referenced facing downstream]

Station number	Station name	Station location
01199000	Housatonic River at Falls Village, CT	Lat 41°57'26", long 73°22'09", Litchfield County, Hydrologic Unit 01100005, on left bank at hydroelectric plant of Connecticut Light and Power Company at Falls Village, 1.4 mi downstream from Hollenbeck River, and at mile 75.9.
01199050	Salmon Creek at Lime Rock, CT	Lat 41°56'32", long 73°23'28", Litchfield County, Hydrologic Unit 01100005, on left bank 300 ft upstream from bridge on Uptown Salisbury Road, 0.6 mi north of Lime Rock, and 3.0 mi upstream from mouth.
01199150	Furnace Brook at Cornwall Bridge, CT	Lat 41°49'07", long 73°22'08", Litchfield County, Hydrologic Unit 01100005, at bridge on State Highway 4, 0.2 mi from mouth.
01199200	Guinea Brook at West Woods Road at Ellsworth, CT	Lat 41°49'28", long 73°25'48", Litchfield County, Hydrologic Unit 01100005, on left bank just upstream from culvert on West Woods Road, 0.4 mi southwest of Ellsworth, 3 mi west of Cornwall Bridge, and 4.5 mi southeast of Sharon.
01200500	Housatonic River at Gaylordsville, CT	Lat 41°39'12", long 73°29'24", Litchfield County, Hydrologic Unit 01100005, on left bank 0.4 mi downstream from hydroelectric plant of Connecticut Light and Power Co., 0.5 mi upstream from bridge on U.S. Route 7 at Gaylordsville, 1.5 mi downstream from Tenmile River, and at mile 50.6.
01201190	West Aspetuck River at Sand Road near New Milford, CT	Lat 41°36'29", long 73°25'29", Litchfield County, Hydrologic Unit 01100005, at downstream side of bridge on Sand Road, off Long Mountain Road, 1000 ft west of State Highway 129, 1 mi northwest of Wellsville, and 2 mi north of New Milford.
01201500	Still River near Lanesville, CT	Lat 41°31'12", long 73°25'06", Litchfield County, Hydrologic Unit 01100005, on left bank on upstream side of Highway bridge, 0.25 mi east of U.S. Highway 7, 1.1 mi south of Lanesville, 3 mi upstream from mouth, and 4 mi south of New Milford.
01201890	Pond Brook near Hawleyville, CT	Lat 41°27'22", long 73°20'06", Fairfield County, Hydrologic Unit 01100005, at bridge on Pond Brook Road, 2 mi northeast of Hawleyville.
01201930	Marshepaug River near Milton, CT	Lat 41°47'21", long 73°15'32", Litchfield County, Hydrologic Unit 01100005, on left bank downstream from bridge on Maple Street, 0.7mi downstream from Woodridge Lake, and 1.5 mi northeast of Milton.
01202500	Shepaug River at Woodville, CT	Lat 41°43'24", long 73°17'38", Litchfield County, Hydrologic Unit 01100005, at left end of dam at outlet of Shepaug Reservoir, 1 mi North of Woodville, and 3.5 mi upstream from Bantam River.
01202700	Butternut Brook near Litchfield, CT	Lat 41°44'35", long 73°13'12", Litchfield County, Hydrologic Unit 01100005, at bridge on Ripley Road, 1.5 mi west of Litchfield.
01203000	Shepaug River near Roxbury, CT	Lat 41°32'59", long 73°19'47", Litchfield County, Hydrologic Unit 01100005, at Wellers Bridge, 1.2 mi southwest of Roxbury.
01203100	Jacks Brook near Roxbury Falls, CT	Lat 41°31'42", long 73°18'31", Litchfield County, Hydrologic Unit 01100005, at bridge on River Road, 1.2 mi north of Roxbury Falls.
01203510	Pootatuck River at Sandy Hook, CT	Lat 41°25'12", long 73°16'56", Fairfield County, Hydrologic Unit 01100005, at bridge on Church Hill Road, at Sandy Hook.
01203600	Nonewaug River at Minortown, CT	Lat 41°34'33", long 73°10'43", Litchfield County, Hydrologic Unit 01100005, on right bank 1,000 ft downstream from bridge by State Routes. 6 and 202 at Minortown, and 2.5 mi northeast of Woodbury.
01203700	Wood Creek near Bethlehem, CT	Lat 41°37'38", long 73°13'32", Litchfield County, Hydrologic Unit 01100005, a bridge on State Highway 132, 1.25 mi southwest of Bethlehem.
01204000	Pomperaug River at Southbury, CT	Lat 41°28'54", long 73°13'29", New Haven County, Hydrologic Unit 01100005, on right bank 200 ft upstream from bridge on Poverty Road, 800 ft downstream from Bullet Hill Brook, 0.6 mi west of Southbury, and 5.8 mi upstream from mouth.
01204800	Copper Mill Brook near Monroe, CT	Lat 41°21'46", long 73°13'06", Fairfield County, Hydrologic Unit 01100005, on right bank just upstream from Twin culverts on Hammertown Road, 700 ft upstream from mouth, 1.2 mi west of State Highway 111, 2.2 mi northwest of Monroe, and 2.2 mi east of Botsford.

Appendix 1. Description of U.S. Geological Survey streamflow-gaging station locations, Connecticut--Continued

[lat, latitude; long, longitude; mi, miles; ft, feet; right and left bank are referenced facing downstream]

Station number	Station name	Station location
01205500	Housatonic River at Stevenson, CT	Lat 41°23’02”, long 73°10’02”, New Haven County, Hydrologic Unit 01100005, on left bank, 0.2 mi downstream from dam of Connecticut Light and Power Company at Stevenson, Fairfield County, 0.2 mi upstream from Eightmile Brook, and at mile 19.2.
01205600	West Branch Naugatuck River at Torrington, CT	Lat 41°48’04”, long 73°07’26”, Litchfield County, Hydrologic Unit 01100005, on right bank just downstream from bridge on Prospect Street in Torrington, 0.5 mi upstream from confluence with East Branch, and 3.0 mi upstream from Stillwater Pond.
01205700	East Branch Naugatuck River at Torrington, CT	Lat 41°48’11”, long 73°07’05”, Litchfield County, Hydrologic Unit 01100005, on upstream side of Wall Street bridge in Torrington, 0.3 mi downstream from Troy Brook, and 0.6 mi upstream from confluence with West Branch.
01206000	Naugatuck River near Thomaston, CT	Lat 41°42’14”, long 73°03’54”, Litchfield County, Hydrologic Unit 01100005, on right bank near downstream side of Twomile Bridge, 250 ft downstream from New York, New Haven, and Hartford Railroad bridge, 0.4 mi upstream from Leadmine Brook.
01206500	Leadmine Brook near Thomaston, CT	Lat 41°42’07”, long 73°03’27”, Litchfield County, Hydrologic Unit 01100005, on left bank 10 ft downstream from Highway bridge, 0.4 mi upstream from mouth.
01206900	Naugatuck River at Thomaston, CT	Lat 41°40’26”, long 73°04’12”, Litchfield County, Hydrologic Unit 01100005, on left bank at downstream side of bridge on U.S. Routes 6 and 202 at Thomaston, 1.5 mi downstream from Thomaston Reservoir, 2.5 mi upstream from Branch Brook, and at mile 29.5.
01208013	Branch Brook near Thomaston, CT	Lat 41°39’14”, long 73°05’42”, Litchfield County, Hydrologic Unit 01100005, on right bank 140 ft upstream from State Highway 6, and 1.7 mi southwest of Thomaston.
01208100	Hancock Brook near Terryville, CT	Lat 41°39’41”, long 73°00’11”, Litchfield County, Hydrologic Unit 01100005, at bridge on Waterbury Road, at corner of South Main Street, 1.1 mi south of Terryville.
01208400	Hop Brook near Middlebury, CT	Lat 41°31’26”, long 73°05’36”, New Haven County, Hydrologic Unit 01100005, at bridge on Shaddock Road, 1.5 mi east of Middlebury
01208420	Hop Brook near Naugatuck, CT	Lat 41°30’22”, long 73°03’32”, New Haven County, Hydrologic Unit 01100005, on left bank 30 ft downstream from Porter Avenue bridge at the borough of Naugatuck golf course, 400 ft east of State Highway 63, 0.8 mi downstream from Hop Brook Lake, 1.4 mi north of Naugatuck, and 0.6 mi upstream from mouth.
01208500	Naugatuck River at Beacon Falls, CT	Lat 41°26’31”, long 73°03’47”, New Haven County, Hydrologic Unit 01100005, on left bank at downstream side of bridge on Bridge Street at Beacon Falls, 0.4 mi upstream from Bronson Brook, and at mile 10.1.
01208700	Little River at Oxford, CT	Lat 41°26’03”, long 73°07’02”, New Haven County, Hydrologic Unit 01100005, at bridge on Governor Hill Road, at Oxford.
01208850	Pequonnock River at Trumbull, CT	Lat 41°14’48”, long 73°11’51”, Fairfield County, Hydrologic Unit 01100006, at bridge on Daniels Farm Road at Trumbull.
01208873	Rooster River at Fairfield, CT	Lat 41°10’48”, long 73°13’09”, Fairfield County, Hydrologic Unit 01100006, on left bank, on floodwall, at corner of Renwick Drive and Renwick Place, Bridgeport.
01208900	Patterson Brook near Easton, CT	Lat 41°17’17”, long 73°17’32”, Fairfield County, Hydrologic Unit 01100006, at culvert on State Highway 59, 2.5 mi north of Easton.
01208925	Mill River near Fairfield, CT	Lat 41°09’55”, long 73°16’13”, Fairfield County, Hydrologic Unit 01100006, on right bank just downstream from bridge on Duck Farm Road, 1.5 mi north of Fairfield, 14.0 mi downstream from headwater of Mill River.
01208950	Sasco Brook near Southport, CT	Lat 41°09’10”, long 73°18’21”, Fairfield County, Hydrologic Unit 01100006, on left downstream abutment of bridge on Hulls Farm Road, 1.5 mi northwest of Southport.
01208990	Saugatuck River near Redding, CT	Lat 41°17’40”, long 73°23’42”, Fairfield County, Hydrologic Unit 01100006, on right downstream side of bridge on State Route 53, 100 ft south of intersection of State Routes 53 and 107, 0.8 mi upstream from Saugatuck Reservoir, and 1.0 mi southwest of Redding.
01209500	Saugatuck River near Westport, CT	Lat 41°10’15”, long 73°21’53”, Fairfield County, Hydrologic Unit 01100006, on left bank on Old Ford Road (Clinton Avenue), 400 ft downstream from West Branch, 600 ft downstream from Aspetuck River, 2 mi north of Westport, and 5.5 mi upstream from mouth.

Appendix 1. Description of U.S. Geological Survey streamflow-gaging station locations, Connecticut--Continued

[lat, latitude; long, longitude; mi, miles; ft, feet; right and left bank are referenced facing downstream]

Station number	Station name	Station location
01209600	Comstock Brook at North Wilton, CT	Lat 41°12’46”, long 73°27’30”, Fairfield County, Hydrologic Unit 01100006, at bridge on Nod Hill Road, at North Wilton.
01209700	Norwalk River at South Wilton, CT	Lat 41°09’50”, long 73°25’11”, Fairfield County, Hydrologic Unit 01100006, on right bank at upstream side of bridge on Kent Road at South Wilton, 2.5 mi north of Norwalk.
01209770	Fivemile River near Norwalk, CT	Lat 41°06’02”, long 73°27’16”, Fairfield County, Hydrologic Unit 01100006, at bridge on West Cedar Street, 1.75 mi west of Norwalk.
01211700	East Branch Byram River at Round Hill, CT	Lat 41°05’57”, long 73°40’59”, Fairfield County, Hydrologic Unit 01100006, at bridge on John Street, 0.8 mi west of Round Hill.
01212100	East Branch Byram River at Riversville, CT	Lat 41°03’39”, long 73°40’29”, Fairfield County, Hydrologic Unit 01100006, at bridge on Riversville Road just downstream from Merritt Parkway, 0.2 mi upstream from mouth.