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# MAGNITUDE AND FREQUENCY OF FLOODS IN WASHINGTON

By J. E. Cummans, M. R. Collings, and E. G. Nassar

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CONTENTS


| | Page |
|---|---|
| Abstract | 1 |
| Introduction | 2 |
| Purpose and scope | 2 |
| Acknowledgments | 3 |
| Previous flood studies in Washington | 3 |
| Description of the area | 4 |
| Physiographic provinces | 4 |
| Climate | 4 |
| Flood-runoff characteristics | 5 |
| Peak-discharge data used in the analysis | 6 |
| Flood-frequency analysis | 6 |
| Regression analysis | 8 |
| Results | 12 |
| Evaluation of results | 13 |
| Application of results | 14 |
| Limitations and comments | 18 |
| References cited | 19 |


ILLUSTRATIONS

(Plates are in pocket)


PLATES 1-3. Maps of Washington showing:

1. Physiographic provinces and locations of gaging stations.
2. Mean annual precipitation.
3. Flood regions discussed in report.

## TABLES


Page

TABLE 1. Discharges for selected flood frequencies, peak of record, and years of peak record, at gaging stations in Washington------------ 21

2. Indices for basin and climatic characteristics used in multiple regressions----------- 36

3. Summary of regression coefficients for equations, for regions shown on plate 3----- 45

4. Maximum and minimum values of basin and climatic characteristics at gaging stations, by flood regions---------------------------- 46

The following factors are provided for conversion of English values used in this report to metric values:

| Multiply | By | To obtain |
|---|---|---|
| Inches | 25.40 | millimetres (mm) |
| Feet (ft) | 0.3048 | metres (m) |
| Miles (mi) | 1.609 | kilometres (km) |
| Square miles ($mi^2$) | 2.590 | square kilometres ($km^2$) |
| Cubic feet per second ($ft^3/s$) | 0.02832 | cubic metres per second ($m^3/s$) |

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ABSTRACT

Relations are provided to estimate the magnitude and frequency of floods on Washington streams. Annual-peak-flow data from stream gaging stations on unregulated streams having 10 years or more of record were used to determine a log-Pearson Type III frequency curve for each station. Flood magnitudes having recurrence intervals of 2, 5, 10, 25, 50, and 100 years were then related to physical and climatic indices of the drainage basins by multiple-regression analysis using the Biomedical Computer Program BMDO2R. These regression relations are useful for estimating flood magnitudes of the specified recurrence intervals at ungaged or short-record sites.

Separate sets of regression equations were defined for western and eastern parts of the State, and the State was further subdivided into 12 regions in which the annual floods exhibit similar flood characteristics. Peak flows are related most significantly in western Washington to drainage-area size and mean annual precipitation. In eastern Washington they are related most significantly to drainage-area size, mean annual precipitation, and percentage of forest cover. Standard errors of estimate of the estimating relations range from 25 to 129 percent, and the smallest errors are generally associated with the more humid regions.

# INTRODUCTION

## Purpose and Scope

The purpose of this report is to provide information by which the magnitude and frequency of floods may be estimated for any site on naturally flowing (unregulated) streams within the State of Washington. For stream-gaging sites having 10 or more consecutive years of annual flood records, flood magnitudes having selected frequencies of occurrence are presented in tables. For ungaged or short-period record sites, equations are provided that may be solved to obtain a flood estimate by use of data measured from topographic and climatic maps.

The evaluation of the flood potential at a site includes determination of (1) the magnitude, or peak discharge of the floods, and (2) the frequency, or probability of a flood of a specific peak discharge occurring. This evaluation is needed in designing structures or planning land use along streams and on stream flood plains. Highways, bridges, and culverts must be designed weighing the economic considerations of their intended usefulness, expected life, and the endangerment to human lives with respect to the costs of too large or too small a design.

The equations presented in the report are subject to certain limitations, which are discussed in the report. Because flood-peak information is often needed at sites where gaging-station data are not available, basin and climatic indices are used to define equations from which flood magnitudes at selected frequencies, or "recurrence intervals," may be estimated. A recurrence interval is the average interval of time, in years, within which a given flood will be exceeded once as an annual maximum. A 100-year flood is one which has one chance in a hundred each year (1-percent probability) of being exceeded, and which is expected to be exceeded on an average of once in 100 years.

An assumption is made that the probability of future flood magnitudes can be evaluated from past experience. There is no method of predicting when a flood of a certain frequency or magnitude will occur. It is possible to have more than one 100-year flood within a period of that length, and it is possible that two could occur as consecutive annual peaks, though that probability is small.

Flood magnitude as defined in this report applies to the amount of water discharge only. The user of the report, if interested in stage, will need to resort to the hydraulic principles of flood routing, or to gaging-station data and flood-profile information that have been obtained by various agencies. The user also should consider that some high river stages may be caused by ice or logjams that are not accompanied by a significant amount of water.

The concepts and procedures used in the study are in accord with those currently recommended by engineers and hydrologists and are described in detail by Beard (1962, section 7), Benson (1962a,b; 1964), Riggs (1968a,b; 1973), and the [U.S.] Water Resources Council (1967).

## Acknowledgments

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## Previous Flood Studies in Washington

Some flood-frequency and historical flood data for the period prior to 1952 are presented in reports by Anderson (1948), Rantz and Riggs (1949), and Stewart and Bodhaine (1961). These data are useful for the specific areas and streams described, but do not provide methods to apply the data to ungaged sites in Washington.

Later studies that provide flood-estimating techniques are those of Bodhaine and Robinson (1952), Bodhaine and Thomas (1960), Thomas, Broom, and Cummans (1963), Bodhaine and Thomas (1964), and Hulsing and Kallio (1964). Many flood data have been obtained since these earlier studies, and methods of analysis have been improved. In general, greater confidence can be placed in the estimates derived from the techniques described in this report.

## DESCRIPTION OF THE AREA

### Physiographic Provinces

The principal topographic features of Washington are shown in the inset map on plate 1 (in pocket) and include: (1) the coastal plain which forms the western boundary of the State along the Pacific Ocean; (2) the Willapa Hills which rise to about 3,000 feet (914 m); (3) the Olympic Mountains which rise to nearly 8,000 feet (2,440 m); (4) the Puget Trough, a lowland separating the Willapa Hills and Olympic Mountains from the Cascade Range--and which includes the Cowlitz and Chehalis River valleys in its southern part--and the Puget Sound lowland in the northern part; (5) the Cascade Range which rises from wooded hills of less than 3,000 feet (914 m) on the south to glaciered peaks of over 9,000 feet (2,740 m) on the north, with Mount Rainier rising to 14,410 feet (4,392 m) as the highest point in the State; (6) the Columbia Plateau, a series of plains, low ridges, and coulees; (7) the Okanogan Highlands, a series of north-trending ridges and valleys, and (8) the Blue Mountains, which rise to 6,401 feet (1,951 m).

### Climate

Washington is separated by the Cascade Range into two climatically different regions. Western Washington has a predominantly marine-type climate, with cool, dry summers and mild, wet winters influenced by the air currents from the Pacific Ocean, whereas eastern Washington has warm, dry summers and cold winters frequently characterized by mid-continent conditions.

Mean annual precipitation varies widely in Washington (pl. 2 in pocket). A persistent pattern of winter storms moves landward from the Pacific Ocean. The heaviest precipitation on the mainland, approximately 250 inches (6,350 mm) annually, occurs as the moisture-laden air passes northeasterly over the Olympic Mountains. Farther south the storms pass over the lower Willapa Hills where maximum annual precipitation is about 120 inches (3,050 mm). A rain-shadow effect occurs on the northeastern side of the Olympic Mountains where only about 15 inches (380 mm) of precipitation occurs annually; that area has the least annual precipitation in western Washington.

The Puget Trough receives about 30-50 inches (760-1,270 mm) of precipitation annually. Winter snowfall is light at the lower elevations along the Pacific Coast and increases rapidly with elevation and distance from the ocean.

Annual precipitation increases along the Cascade Range which receives from 100 to 200 inches (2,540-5,080 mm), depending on elevation.

Daily rates of precipitation, at a 2-year frequency of occurrence can be very high in western Washington, up to about 9 inches (230 mm), although 2-4 inches (50-100 mm) is more common at the lower elevations.

Annual precipitation in eastern Washington, east of the Cascade Range, ranges from about 7 inches (180 mm) at Pasco, near the confluence of the Columbia and Snake Rivers, to as much as 60 inches (1,520 mm) in the hills and mountains along the northern, eastern, and southeastern margins of the Columbia Plateau. In the drier parts of eastern Washington, high-intensity rainfall associated with thunderstorm activity during the summer months occurs in localized areas for short periods. These storms occasionally cause extreme flood peaks to occur in small drainage areas.

## FLOOD-RUNOFF CHARACTERISTICS

Floods in western Washington usually occur from storms of high-intensity rainfall during October-March; this runoff is at times augmented by water from rapid snowmelt. The runoff increases rapidly and generally recedes rapidly, with flooding generally occurring for only a day or two on tributary streams and for 2 to 5 days on the larger rivers. Many of the large rivers of western Washington have extensive flood plains subject to periodic inundation. Some of the rivers have a secondary high-runoff period later in the spring when snowpacks in the mountains are melting. Peak flows of the lower elevation main-stem streams are usually larger during the October-March period of high precipitation than during the spring snowmelt period.

In eastern Washington the peak runoff of streams draining the eastern Cascades and the mountains and hills of the northern part of the region generally occurs from snowmelt during April-June. In the southern part of eastern Washington, the more damaging floods have occurred from rain melting snow on frozen ground. In this area intense summer thunderstorms also may cause large runoffs from small drainage areas.

The streams in the arid region of south-central eastern Washington, where precipitation is less than 9-10 inches (230-250 mm) annually, have runoff only in about 1 of 3 years.

## PEAK-DISCHARGE DATA USED IN THE ANALYSIS

The flood data used in the analysis were the annual maximum instantaneous discharges obtained for 10 or more years at 450 sites within the State and at two sites in British Columbia. Only those records were used where floodflows were not significantly altered by upstream regulation or diversion.

Table 1 lists the maximum discharges during the period of record for each gaging station used in the analysis. The stations are listed in downstream order by number assigned by the U.S. Geological Survey. The first two digits (12,13, or 14) designate the major basin subdivisions of the State (pl.1). Part 12 streams are tributary to the Pacific Ocean or the Columbia River upstream from the mouth of the Snake River, Part 13 streams are tributary to the Snake River, and Part 14 streams are tributary to the Columbia River below the mouth of the Snake River. The locations of the gages are shown in plate 1 (in pocket).

## FLOOD-FREQUENCY ANALYSIS

As recommended by the [U.S.] Water Resources Council (1967) the log-Pearson Type III distribution was used as the base method for estimating flow-frequency relation at gaged sites. Graphical frequency curves were defined also to visully check the applicability of a log-Pearson Type III relation for each gaging site. Frequency data are tabulated in table 1.

Where outliers (extremely high or low values for annual peaks) caused a poor graphical relation, the log-Pearson Type III relation was abandoned, and a graphical curve was fitted eliminating the outlier. Treatment of outliers was necessary for several sites principally in and adjacent to the arid parts of eastern Washington.

As with other techniques, it is possible with the log-Pearson method to mathematically extend the fitted curve to a far greater recurrence interval than is reasonably defined by the length of record available at a site. To restrict unwarranted extensions, frequency curves were defined only to the following recurrence intervals on the basis of available years of flood record:

| Recurrence interval (years) | 10 | 25 | 50 | 100 |
|---|---|---|---|---|
| Years of record | 10 | 15 | 20 | 25 |

Frequency data derived from the log-Pearson curve developed for each station and listed in table 1 reflect application of these guidelines.

The accuracy of using 10 or 20 years of record at a selected gaging station to estimate flows for greater recurrence intervals is depicted by the data in the example below, for the Skykomish River near Gold Bar (sta. 12134500). Computed floods from a log-Pearson curve, which was derived from annual peaks at the gaging station for the 40-year period 1929-68, are shown in the second column of the following table. The succeeding columns list computed floods from two 20-year periods and four 10-year periods of the 40-year period of record.

Peak discharge, in cubic feet per second,
of Skykomish River near Gold Bar

| Recurrence interval (years) | Period | | | | | | |
|---|---|---|---|---|---|---|---|
| | 40 years | 20 years | | 10 years | | | |
| | 1929-68 | 1929-48 | 1949-68 | 1929-38 | 1939-48 | 1949-58 | 1959-68 |
| 2 | 36,100 | 36,200 | 36,000 | 39,400 | 33,800 | 34,400 | 36,600 |
| 10 | 69,400 | 73,000 | 66,600 | 90,200 | 57,400 | 66,500 | 68,700 |
| 25 | 87,800 | 95,500 | 81,900 | 121,000 | 71,300 | 81,700 | 88,600 |
| 50 | 102,000 | 114,000 | 93,100 | 146,000 | 82,500 | 92,500 | 105,000 |
| 100 | 117,000 | 134,000 | 104,000 | 173,000 | 94,600 | 103,000 | 123,000 |

Computed magnitudes from the 20-year periods vary by only 0.3 percent from that for the 40-year period at the 2-year level; at this level the computed discharges for the 10-year periods vary by as much as 9 percent from the long-term value.

At the 100-year level, computed discharges for the 20-year periods differ by 14 percent and 11 percent from the 40-year period, and computed discharges for the 10-year periods vary as much as 48 percent from the 40-year period. However, these variations are not necessarily representative of those at other sites.

## REGRESSION ANALYSIS

Multiple-regression analyses were used to define mathematical equations between flood discharges of selected frequencies (dependent variable) and the topographic and climatic characteristics of the drainage basins (independent variables). This type of analysis includes an evaluation of the estimating effectiveness of each independent variable and an evaluation of the accuracy of each defined equation. An independent variable is used in an equation only if there is a 95-percent probability that the variable aids in providing an estimate. The accuracy of each defined equation is indicated by a "standard error of estimate" which is a range of error such that an estimate by the regression equation is within this range of the station value at about two of three sites and within twice this range of the station value at 19 of 20 sites.

The regression analysis used a mathematical model of the form

$$Q_T = \underline{a}\, A^{b_a} B^{b_b} C^{b_c} \ldots N^{b_n} ,$$

where $Q_T$ is a flood peak magnitude having a T-year recurrence interval, in cubic feet per second; A B C...N are physical and climatic indices of the drainage basins; $\underline{a}$ is a regression constant defined by the regression analysis; and $b_a$ $b_b \ldots b_n$ are regression coefficients defined by regression analysis.

Step-forward regression analyses were performed using the University of California at Los Angeles Biomedical Computer Program BMDO2R. With this program, a single flow characteristic, such as the 2-year flood, was selected as the dependent variable.

The computer program then defined the a and b values in the relation between that dependent variable and the one independent variable most effective in explaining the difference between flow magnitudes of the various drainage basins. The program also checked the effectiveness of the independent variable by defining the probability that b was not zero, and computed the standard error of estimate of the relation. Automatically, the computer program then computed the a and b values of an equation using the two independent variables most effective in explaining flow-magnitude differences, checked the effectiveness of both independent variables, and evaluated the standard error of estimate. The routine of recomputation based on one additional independent variable was continued until no grouping was possible that had a regression coefficient for each independent variable with a 95-percent probability of difference from zero. At this time, a new dependent variable, such as the 5-year-flood magnitude, was selected and the whole process was repeated.

An important part of the analysis was appraisal of residual errors, which are the differences between flood discharges from the frequency curves and the estimated discharges from regression relations. These residual errors from defined relations were plotted on a map and inspected for areal groupings.

In the actual analysis, data from all 450 gaging stations were first used to define a set of regression equations. The residual errors showed areal groupings and very large standard errors of estimate, thereby indicating that no single set of equations was applicable statewide. Numerous areal groupings of stations then were tried in separate regression studies in an effort to define the most practical set of equations.

The set of estimating equations finally selected as most practical were defined from two areal groupings, one based on data for all sites in western Washington (west of the Cascade Range crest) and the other for all sites in eastern Washington. Equations for western Washington used drainage area and mean annual precipitation as the independent variables, while equations for eastern Washington also include forest cover as an estimating variable. Maps of residual errors from these equations also showed areal groupings. Examinations of these groupings indicated that they were related to geologic differences. On the basis of the areal groupings of residual errors, the State was divided into 12 regions (pl. 3 in pocket) using differences in surficial-soils porosity to the extent possible to define the regional boundaries.

The drainage-basin and climatic characteristics computed for each gaging station and used as independent variables in this study are listed in table 2 and are described as follows:

1. Drainage area, A, in square miles, as measured by planimeter from the best available maps. Parts of the area that do not have an overland drainage are considered noncontributing and are not included in the area.

2. Mean basin elevation, E, in feet above mean sea level, determined by superimposing a rectangular grid over a contour map of the drainage area, and tabulating and averaging the elevations at the intersection of grids. The grid should provide at least 25 values.

3. Forest cover, F, expressed as the percentage of the drainage area covered by forests, as determined by the grid method from a topographic map. A minimum value of 0.01 percent is used to avoid the zero values that cannot be accommodated in the equations used in this study.

4. Main channel slope, SLP, in feet per mile. This is the average slope of the stream channel between points that are 10 and 85 percent of the distance along the main channel from between the desired site to the upstream basin border. At stream junctions the main channel is the one draining the largest area. Channel length is measured by opisometer or by draftsman's dividers set at a 0.1-mile equivalent.

5. Area of lakes and ponds, LK, expressed as the percentage of the total drainage area occupied by lakes and ponds, as determined by planimeter or a transparent grid overlay. A minimum value of 0.01 percent is used to avoid the zeros that cannot be accommodated in the equations defined in this study.

6. Length of main channel, L, in miles. This is the distance along the main channel from the desired site to the upstream basin boundary. The stream length is not extended through a noncontributing part of the drainage.

Length is measured from the best available map by use of an opisometer or by draftsman's dividers set at a 0.1-mile equivalent.

7. Source elevation, SE, in feet above mean sea level. This is the elevation at the basin border at the source of the largest stream.

8. Gage elevation, GE, in feet above mean sea level. This is the elevation of the site for which data are being computed.

9. Mean annual precipitation over the drainage basin, P, in inches, as determined by the grid method from the isohyetal map (pl. 2 in pocket) prepared by the U.S. Weather Bureau (1965).

10. Mean daily minimum January temperature, T, over the drainage area, in degrees Fahrenheit, as obtained from the [U.S.] National Oceanic and Atmospheric Administration (1965, p. 23).

## RESULTS

The regression relations selected as the most practical were as follows:

For western Washington:

$$Q_2 = a\ A^{0.86}\ P^{1.51}$$

$$Q_5 = a\ A^{0.86}\ P^{1.53}$$

$$Q_{10} = a\ A^{0.85}\ P^{1.54}$$

$$Q_{25} = a\ A^{0.85}\ P^{1.56}$$

$$Q_{50} = a\ A^{0.86}\ P^{1.58}$$

$$Q_{100} = a\ A^{0.86}\ P^{1.60}$$

For eastern Washington:

$$Q_5 = a\ A^{0.90}\ P^{1.35}\ F^{-0.21}$$

$$Q_{10} = a\ A^{0.88}\ P^{1.16}\ F^{-0.23}$$

$$Q_{25} = a\ A^{0.87}\ P^{1.03}\ F^{-0.25}$$

$$Q_{50} = a\ A^{0.86}\ P^{0.95}\ F^{-0.27}$$

$$Q_{100} = a\ A^{0.85}\ P^{0.89}\ F^{-0.29}$$

$Q_T$ is the flood magnitude for recurrence interval T, in cubic feet per second. No equation was defined for $Q_2$ in eastern Washington because the value was zero at a number of sites;

A is drainage area size, in square miles;

P is mean annual precipitation, in inches;

F is forest cover, in percent of drainage area, and

a is a regression constant that varies for each region and equation.

The equations for each region are given in table 3. The first column indicates the recurrence interval ($Q_T$) for the $Q_2$, $Q_5$, $Q_{10}$, $Q_{25}$, $Q_{50}$, and $Q_{100}$ floods. The other columns show the regression constant, the regression coefficients for each of the significant basin or climatic characteristics, and the percentage standard error of estimate.

## EVALUATION OF RESULTS

The study defined relations between selected drainage-basin and climatic characteristics and peak runoff at selected frequencies. The basin and climatic characteristics selected were those determined to be the most significant. For streams in western Washington, drainage-area size was the most significant characteristic related to flood runoff and was followed closely by annual precipitation. Better results (smaller standard errors of estimate) appeared to coincide with areas of greater annual precipitation. Larger standard errors of estimate were obtained for sites at lower elevations where porosity of the soil cover also is generally greater. There is no strong reasoning for the pattern of some of the regional areas determined from residuals in western Washington. The annual precipitation index probably is of variable accuracy in many areas where measurement of that index is sparse. The standard errors of estimate varied from 24.6 to 60.7 percent, respectively, for the low to high recurrence intervals for the equations of best fit in western Washington.

For streams in eastern Washington, drainage-area size was the most significant characteristic. Precipitation and forest cover also helped reduce the standard error of estimate significantly. Standard error of estimates for the equations of best fit in eastern Washington ranged from 41.7 to 129 percent, being lowest in the more humid area of northeastern Washington.

The errors of estimate were generally greater, on the average, in eastern Washington. This is believed attributable to less average total precipitation, more variability of precipitation in the semiarid parts, and generally shorter streamflow records and sparser coverage of the area with streamflow data than in western Washington. The precipitation index is from widely separated data in eastern Washington and its use, where not accurately measured, could be a source of the larger errors of estimates.

## APPLICATION OF RESULTS

Computation of a flood of a desired frequency at an ungaged site is made as follows:

1. From the map showing flood regions (pl. 3 in pocket), select the region in which the site is located.
2. From the appropriate region in table 3 determine the flood equation to be used for the desired recurrence interval.
3. Compute the basin and climatic characteristics required as described on pages 10-11.
4. Substitute values determined in step 3 into equation from step 2 and solve for the flood discharge.

For example, to determine the discharge for the 50-year flood at an ungaged site in region II:

The applicable equation for the 50-year flood in region II is

$$Q_{50} = 0.186\ A^{0.86}\ P^{1.58} \quad .$$

Assuming that the drainage area is 50 $mi^2$ and that the mean annual precipitation determined by the grid method from plate 2 for the drainage area is 60 inches,

$$\begin{aligned} Q_{50} &= 0.186\ A^{0.86}\ P^{1.58} \\ &= (0.186)(50)^{0.86}(60)^{1.58} \\ &= (0.186)(28.9)(645) \\ &= 3{,}470\ ft^3/s\ (98\ m^3/s) . \end{aligned}$$

If the drainage basin is located in more than one region, the desired flood value should be computed by the appropriate equation for each region. The final value is obtained by weighting the results on an areal basis.

An example of a computation for an area falling in two regions is as follows:

Assume the 100-year flood is desired for a 100-$mi^2$ area of which 25 $mi^2$ is in region II, and 75 $mi^2$ is in region III. Average precipitation for the entire area is 50 inches. The equations for the 100-year flood for the two regions are:

$$\text{Region II, } 0.194\ A^{0.86}\ P^{1.60}$$

$$\text{Region III, } 0.102\ A^{0.86}\ P^{1.60}\ .$$

The 100-year flood discharge is first computed for each region, using the drainage basin and climatic characteristics, as follows:

<u>Region II</u>

$$Q_{100} = 0.194\ A^{0.86}\ P^{1.60}$$

$$= (0.194)(100)^{0.86}(50)^{1.60}$$

$$= (0.194)(52.5)(523)$$

$$= 5{,}330\ ft^3/s\ (151\ m^3/s)\ .$$

<u>Region III</u>

$$Q_{100} = 0.102\ A^{0.86}\ P^{1.60}$$

$$= (0.102)(100)^{0.86}(50)^{1.60}$$

$$= (0.102)(52.5)(523)$$

$$= 2{,}800\ ft^3/s\ (79.2\ m^3/s)\ .$$

The desired flood-discharge value, weighted on the basis of the area in each region, is

$$\frac{2{,}800(3) + 5{,}320(1)}{4} = 3{,}430\ ft^3/s\ (97.1\ m^3/s).$$

To aid the user, the following tables provide a listing of selected numbers raised to exponents used in the equations.

Value of number raised to exponent

| Number | Exponent -0.21 | -0.23 | -0.25 | -0.27 | -0.29 | 0.85 | 0.86 | 0.87 | 0.88 | 0.89 | 0.90 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.01 | 2.63 | 2.88 | 3.16 | 3.47 | 3.80 | -- | -- | -- | -- | -- | -- |
| 1 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 2 | .86 | .85 | .84 | .83 | .82 | 1.80 | 1.82 | 1.83 | 1.84 | 1.85 | 1.87 |
| 3 | .79 | .78 | .76 | .74 | .73 | 2.54 | 2.57 | 2.60 | 2.63 | 2.66 | 2.69 |
| 5 | .71 | .69 | .67 | .65 | .63 | 3.93 | 3.99 | 4.06 | 4.12 | 4.19 | 4.26 |
| 10 | .62 | .59 | .56 | .54 | .51 | 7.08 | 7.24 | 7.41 | 7.59 | 7.76 | 7.94 |
| 20 | .53 | .50 | .47 | .45 | .42 | 12.8 | 13.1 | 13.5 | 14.0 | 14.4 | 14.8 |
| 30 | .49 | .46 | .43 | .40 | .37 | 18.0 | 18.6 | 19.3 | 19.9 | 20.6 | 21.4 |
| 40 | .46 | .43 | .40 | .37 | .34 | 23.0 | 23.9 | 24.8 | 25.7 | 26.7 | 27.7 |
| 50 | .44 | .41 | .38 | .35 | .32 | 27.8 | 28.9 | 30.1 | 31.3 | 32.5 | 33.8 |
| 60 | .42 | .39 | .36 | .33 | .31 | 32.5 | 33.8 | 35.2 | 36.7 | 38.2 | 39.8 |
| 70 | .41 | .38 | .35 | .32 | .29 | 37.0 | 38.6 | 40.3 | 42.0 | 43.9 | 45.8 |
| 80 | .40 | .36 | .33 | .31 | .28 | 41.5 | 43.3 | 45.3 | 47.3 | 49.4 | 51.6 |
| 90 | .39 | .36 | .32 | .30 | .27 | 45.8 | 47.9 | 50.1 | 52.4 | 54.9 | 57.4 |
| 100 | .38 | .35 | .32 | .29 | .26 | 50.1 | 52.5 | 55.0 | 57.5 | 60.3 | 63.1 |

Value of number raised to exponent

| Number | Exponent 0.95 | 1.03 | 1.16 | 1.35 | 1.51 | 1.53 | 1.54 | 1.56 | 1.58 | 1.60 |
|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 6.35 | 7.42 | 9.57 | 13.8 | 18.9 | 19.6 | 20.0 | 20.8 | 21.6 | 22.5 |
| 10 | 8.91 | 10.7 | 14.5 | 22.4 | 32.4 | 33.9 | 34.7 | 36.3 | 38.0 | 39.8 |
| 20 | 17.2 | 21.9 | 32.3 | 57.1 | 92.2 | 97.9 | 101 | 107 | 114 | 121 |
| 30 | 25.3 | 33.2 | 51.7 | 98.7 | 170 | 182 | 188 | 202 | 216 | 231 |
| 40 | 33.3 | 44.7 | 72.2 | 145 | 262 | 283 | 293 | 316 | 340 | 366 |
| 50 | 41.1 | 56.2 | 93.5 | 197 | 368 | 398 | 413 | 447 | 483 | 523 |
| 60 | 48.9 | 67.8 | 116 | 251 | 484 | 525 | 547 | 594 | 645 | 700 |
| 70 | 56.6 | 79.5 | 138 | 310 | 611 | 665 | 694 | 756 | 823 | 896 |
| 80 | 64.3 | 91.2 | 161 | 371 | 748 | 816 | 853 | 931 | 1,016 | 1,109 |
| 90 | 71.9 | 103 | 185 | 435 | 893 | 977 | 1,022 | 1,118 | 1,224 | 1,339 |
| 100 | 79.4 | 115 | 209 | 501 | 1,047 | 1,148 | 1,202 | 1,318 | 1,445 | 1,585 |

The estimation of flood discharges for recurrence intervals other than those for which equations are provided requires the use of frequency curves. A frequency curve can be prepared by plotting discharges, computed by the regional equations, on a frequency graph and fitting a smooth curve through the plotted points.

A frequency curve based on annual peak discharges at a gaging station will provide a reliable estimate of flood frequencies at a gaged site if the record is sufficiently long. Hardison (1971) describes a method for determining the reliability of regression estimates in terms of equivalent years of record. If a period of record is longer than the equivalent years of the regression, then the station frequency curve probably is better for estimating floods at the gage.

The following table presents equivalent years of record of the regression equation in regions I-IX for selected recurrence intervals and helps the user decide whether to use the equations or the station frequency curve. The sparse coverage by gaging stations in regions X through XII, the relatively short periods of record, and the high variability of floodflows combine to give a pseudoaccuracy to the regression relation when expressed as equivalent years of record. In regions X through XII, it is suggested that the average of the discharges from the station frequency curve and from the regression equation be used.

| Recurrence interval (years) | Equivalent years of record | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Region | | | | | | | | |
| | I | II | III | IV | V | VI | VII | VIII | IX |
| 50 | 7 | 5 | 5 | 5 | 5 | 8 | 5 | 5 | 5 |
| 100 | 8 | 7 | 5 | 7 | 5 | 9 | 5 | 5 | 5 |

If a station record is shorter than the equivalent years of record, the desired discharge for the 50- or 100-year flood may be obtained by comparing the values from the station curve with the appropriate equation on the basis of actual and equivalent years of record. For example: An estimate of the 50-year-flood discharge is desired at gaging station 12009500 (Bear River near Naselle). The length of record at the site is 10 years and the log-Pearson curve through annual peak discharges indicates 2,740 $ft^3/s$ for the 50-year flood. A computation of the equation for the 50-year-flood discharge in region II gives an estimate of 1,790 $ft^3/s$. The equation is equivalent to 5 years of record. A weighted value of the 50-year-flood discharge is:

$$\frac{(10)(2,740) + 5(1,790)}{15} = 2,420 \text{ ft}^3/\text{s} .$$

## LIMITATIONS AND COMMENTS

The equations presented in this study can be used within certain limitations to predict the magnitude of floods for different recurrence intervals within the State of Washington. The relationships were determined from gaging-station data for natural-flow streams and should not be applied where artificial conditions affect the hydrology or hydraulics in such a way that regionwide conditions are obviously not applicable. Extrapolations beyond the limits of the basic data used in each region is not advisable. The relationships can be used with most confidence in humid areas and in areas where they are well defined by data from numerous gaging stations, and they can be used with least confidence in arid areas and in areas--in both western and eastern Washington--for which little or no streamflow data are available or for which the periods of streamflow record are relatively short. The density of gaging-station coverage can be ascertained from plate 1 (in pocket), the characteristics at these stations are given in table 2, and the ranges are listed in table 4. Flood frequencies for arid regions probably never will be defined with the accuracy achieved for humid areas.

Research is needed for future utilization of basin and climatic characteristics that may better relate flood flows and frequencies. Additional data for some areas of Washington probably would aid in defining more reliable flood-frequency estimates. There is sparse areal coverage, and streamflow records are of insufficient length, to reasonably define rare events. It is not economically feasible to establish gaging stations statewide to define flood-frequency relations of rare events in areas where benefits will not be realized.

Long-term gaging stations can be continued or established in highly developed areas or in areas proposed for development, and secondary shorter term stations can be established in adjacent areas where a lesser accuracy of estimate of floodflow is deemed to be of sufficient benefit. Some crest-stage gages in small basins may be useful as indexes for continued long-term coverage of a range in drainage-area sizes not usually gaged. The areas of statewide need for hydrologic data are more easily discernible than those subject to unanticipated development and construction or for other needs of flood-frequency data.

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TABLE 1.--Discharges for selected flood frequencies, peak of record, and years of peak record, at gaging stations in Washington

| Station number | Station name | Years* of peak record | Flood discharge, in cubic feet per second, for indicated recurrence interval, in years: 2-yr $Q_2$ | 10-yr $Q_{10}$ | 25-yr $Q_{25}$ | 50-yr $Q_{50}$ | 100-yr $Q_{100}$ | Peak discharge: Date | $ft^3/s$ |
|---|---|---|---|---|---|---|---|---|---|
| | WESTERN WASHINGTON | | | | | | | | |
| 12009500 | Bear River near Naselle | 1963-73 | 950 | 1,800 | -- | -- | -- | 1-25-71 | 2,450 |
| 010000 | Naselle River near Naselle | 1930-73 | 5,640 | 8,320 | 9,460 | 10,300 | 11,000 | 1-22-35 | 11,100 |
| 010500 | Salmon Creek near Naselle | 1954-65 | 1,640 | 4,140 | -- | -- | -- | 11-20-62 | 3,210 |
| 010600 | Lane Creek near Naselle | 1950-70 | 177 | 217 | 232 | 241 | -- | 11-20-62 | 249 |
| 011000 | North Nemah River near South Bend | 1947-61, 1965-68 | 1,400 | 1,690 | 1,880 | 2,300 | -- | 1-28-65 | 2,000 |
| 011100 | North Nemah River tributary near South Bend | 1949-66 | 49 | 75 | 85 | 93 | -- | 11-19-62 | 101 |
| 011500 | Willapa River at Leban | 1949-71 | 2,830 | 4,070 | 4,610 | 4,980 | -- | 2-22-49 | 4,930 |
| 012000 | Fork Creek near Lebam | 1954-70 | 2,230 | 3,540 | 4,310 | -- | -- | 11-20-62 | 4,400 |
| 012200 | Green Creek near Lebam | 1950-69 | 124 | 196 | 239 | 274 | -- | 11-20-60 | 233 |
| 013500 | Willapa River near Willapa | 1949-73 | 7,780 | 10,700 | 12,100 | 13,100 | -- | 2-22-49 | 11,400 |
| 014500 | South Fork Willapa River near Raymond | 1954-71 | 1,500 | 2,500 | 3,010 | 3,410 | -- | 1-26-71 | 3,280 |
| 015500 | North River near Brooklyn | 1954-65 | 1,700 | 2,510 | 2,830 | -- | -- | 12- 9-56 | 2,640 |
| 016700 | Joe Creek near Cosmopolis | 1949-70 | 153 | 246 | 293 | 328 | -- | 12- 9-56 | 329 |
| 017000 | North River near Raymond | 1928-73 | 7,610 | 14,600 | 20,500 | 26,500 | 34,000 | 12-10-33 | 35,000 |
| 019600 | Watermill Creek near Pe Ell | 1950-70 | 90 | 137 | 156 | 170 | -- | 11-19-62 | 147 |
| 020000 | Chehalis River near Doty | 1940-73 | 9,220 | 13,800 | 16,200 | 18,000 | 19,800 | 1-20-72 | 22,800 |
| 020500 | Elk Creek near Doty | 1945-72 | 1,580 | 2,490 | 2,950 | 3,290 | 3,640 | 11-20-62 | 3,400 |
| 021000 | South Fork Chehalis River at Boistfort | 1945-65 | 3,190 | 4,550 | 5,230 | 5,730 | -- | 2- 7-45 | 5,700 |
| 024000 | South Fork Newaukum River near Onalaska | 1945-71 | 2,100 | 3,180 | 3,650 | 3,980 | -- | 12-11-46 | 3,810 |
| 024500 | North Fork Newaukum River near Forest | 1958-66 | 1,410 | 2,560 | -- | -- | -- | 1-25-64 | 2,770 |
| 025000 | Newaukum River near Chehalis | 1929-73 | 5,450 | 7,420 | 8,200 | 8,710 | 9,180 | 1-21-72 | 9,770 |
| 026000 | Skookumchuck River near Centralia | 1930-33, 1940-58, 1960-68 | 3,630 | 5,420 | 6,220 | 6,780 | 7,310 | 12- 9-53 | 6,710 |
| 026300 | Skookumchuck River tributary near Bucoda | 1961-73 | 35 | 51 | -- | -- | -- | 11-21-59 | 64 |
| 027500 | Chehalis River near Grand Mound | 1929-73 | 24,700 | 37,400 | 43,800 | 48,600 | 53,300 | 1-21-72 | 49,200 |
| 030000 | Rock Creek at Cedarville | 1945-71 | 1,100 | 1,420 | 1,530 | 1,600 | 1,670 | 1-26-71 | 1,480 |
| 031000 | Chehalis River at Porter | 1947-72 | 29,000 | 42,600 | 50,000 | 55,800 | 61,800 | 1-22-72 | 55,600 |
| 032500 | Cloquallum Creek at Elma | 1945-72 | 2,990 | 4,490 | 5,170 | 5,660 | 6,130 | 12-15-59 | 5,080 |
| 034200 | East Fork Satsop River near Elma | 1958-71 | 2,890 | 4,360 | 5,040 | -- | -- | 1-19-68 | 5,030 |
| 034700 | West Fork Satsop River tributary near Matlock | 1958-73 | 46 | 83 | 98 | -- | -- | 1-19-68 | 77 |
| 035000 | Satsop River near Satsop | 1930-73 | 22,600 | 35,600 | 41,900 | 46,500 | 51,100 | 1-22-35 | 46,600 |
| 035500 | Wynoochee River at Oxbow, near Aberdeen | 1926-52 | 9,900 | 14,500 | 16,600 | 18,000 | 19,400 | 1-22-35 | 18,000 |
| 036000 | Wynoochee River above Save Creek, near Aberdeen | 1952-73 | 12,500 | 20,800 | 25,000 | 28,200 | -- | 12- 9-56 | 23,600 |
| 037400 | Wynoochee River above Black Creek, near Montesano | 1957-73 | 16,600 | 25,300 | 29,100 | -- | -- | 1-19-68 | 25,500 |
| 039000 | Humptulips River near Humptulips | 1934-73 | 18,900 | 28,600 | 33,100 | 36,200 | 39,300 | 1-22-35 | 33,000 |
| 039050 | Big Creek near Hoquiam | 1949-70 | 61 | 108 | 131 | 149 | -- | 1-22-53 | 123 |

TABLE 1.--Discharges for selected flood frequencies, peak of record, and years of peak record, at gaging stations in Washington--Continued

| Station number | Station name | Years* of peak record | Flood discharge, in cubic feet per second, for indicated recurrence interval, in years | | | | | Peak discharge | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2-yr $Q_2$ | 10-yr $Q_{10}$ | 25-yr $Q_{25}$ | 50-yr $Q_{50}$ | 100-yr $Q_{100}$ | Date | $ft^3/s$ |
| 12039100 | Big Creek tributary near Hoquiam | 1949-68 | 17 | 24 | 26 | 27 | -- | 11-22-59 | 24 |
| 039400 | Higley Creek near Amanda Park | 1955-73 | 179 | 329 | 409 | -- | -- | 12- 9-56 | 409 |
| 040000 | Clearwater River near Clearwater | 1932-67 | 19,700 | 30,700 | 36,500 | 40,800 | 45,300 | 11- 3-55 | 37,400 |
| 040500 | Queets River near Clearwater | 1931-67 | 61,300 | 95,100 | 114,000 | 128,000 | 143,000 | 1-22-35 | 130,400 |
| 041000 | Hoh River near Forks | 1927-64 | 18,700 | 30,600 | 37,000 | 41,800 | 46,900 | 11-26-49 | 38,700 |
| 041200 | Hoh River at U.S. Highway 101, near Forks | 1961-73 | 25,100 | 41,000 | -- | -- | -- | 1-15-61 | 46,000 |
| 041500 | Soleduck River near Fairholm | 1918-71 | 9,230 | 16,000 | 19,800 | 22,800 | 26,000 | 11-26-49 | 23,500 |
| 041600 | Soleduck River tributary near Fairholm | 1956-73 | 23 | 45 | 59 | -- | -- | 12- 9-56 | 52 |
| 042700 | May Creek near Forks | 1950-68 | 495 | 694 | 764 | 807 | -- | 11-19-62 | 759 |
| 042900 | Grader Creek near Forks | 1950-73 | 311 | 481 | 566 | 629 | -- | 12-26-72 | 597 |
| 043100 | Dickey River near La Push | 1963-73 | 8,430 | 13,600 | -- | -- | -- | 1-19-68 | 17,300 |
| 043300 | Hoko River near Sekiu | 1963-73 | 6,270 | 10,300 | -- | -- | -- | 12-25-72 | 14,100 |
| 043430 | East Twin River near Pysht | 1963-72 | 859 | 1,200 | -- | -- | -- | 11-19-62 | 1,220 |
| 044000 | Lyre River at Piedmont | 1918-27 | 747 | 1,170 | -- | -- | -- | 1-10-23 | 1,180 |
| 045500 | Elwa River at McDonald Bridge, near Port Angeles | 1898-1901, 1918-73 | 12,600 | 24,600 | 31,900 | 37,800 | 44,100 | 11-18-1897 | 41,600 |
| 046800 | East Valley Creek at Port Angeles | 1950-63 | 22 | 43 | 54 | -- | -- | 1-16-61 | 52 |
| 047100 | Lees Creek at Port Angeles | 1949-70 | 92 | 238 | 343 | 436 | -- | 1-15-61 | 338 |
| 047500 | Siebert Creek near Port Angeles | 1953-69 | 438 | 1,310 | 1,920 | -- | -- | 11- 3-55 | 1,620 |
| 048000 | Dungeness River near Sequim | 1938-73 | 2,700 | 5,390 | 6,760 | 7,780 | 8,780 | 11-27-49 | 6,820 |
| 049400 | Dean Creek at Blyn | 1949-70 | 27 | 60 | 80 | 96 | -- | 2-24-57 | 108 |
| 050500 | Snow Creek near Maynard | 1953-72 | 249 | 508 | 658 | 778 | -- | 1- 8-59 | 733 |
| 052400 | Penny Creek near Quilcene | 1949-68 | 216 | 442 | 539 | 603 | -- | 1- 8-59 | 557 |
| 053000 | Dosewallips River near Brinnon | 1931-68 | 4,360 | 8,170 | 10,200 | 11,800 | 13,500 | 11- -49 | 13,200 |
| 053400 | Dosewallips River tributary near Brinnon | 1951-70 | 39 | 57 | 63 | 66 | -- | 1- 8-59 | 66 |
| 054000 | Duckabush River near Brinnon | 1939-73 | 4,370 | 6,820 | 7,970 | 8,800 | 9,600 | 11-26-49 | 8,960 |
| 054500 | Hamma Hamma River near Eldon | 1952-71 | 3,420 | 5,590 | 6,630 | 7,380 | -- | 1-14-68 | 6,010 |
| 054600 | Jefferson Creek near Eldon | 1958-71 | 2,370 | 3,160 | 3,390 | -- | -- | 12-13-66 | 3,160 |
| 056300 | Annas Bay tributary near Potlatch | 1950-70 | 56 | 135 | 167 | 186 | -- | 12-28-49 | 228 |
| 056500 | North Fork Skokomish River below Staircase Rapids, near Hoodsport | 1925-73 | 6,110 | 12,800 | 17,400 | 21,500 | 26,100 | 11- 5-34 | 27,000 |
| 057500 | North Fork Skokomish River | 1914-30 | 5,590 | 12,200 | 15,900 | 18,800 | -- | 1- 6-14 | 14,000 |
| 060000 | South Fork Skokomish River near Potlatch | 1947-64 | 9,910 | 16,700 | 20,300 | 23,100 | -- | 11-26-49 | 19,300 |
| 060500 | South Fork Skokomish River near Union | 1932-73 | 11,800 | 18,800 | 22,200 | 24,500 | 26,800 | 1-22-35 | 21,600 |
| 061200 | Fir Creek tributary near Potlatch | 1955-73 | 138 | 236 | 290 | -- | -- | 12- 9-56 | 280 |
| 063000 | Union River near Bremerton | 1946-59 | 224 | 522 | 632 | -- | -- | 2-22-49 | 476 |
| 065500 | Gold Creek near Bremerton | 1946-70 | 116 | 193 | 225 | 246 | 264 | 2-22-49 | 203 |

TABLE 1.--Discharges for selected flood frequencies, peak of record, and years of peak record, at gaging stations in Washington--Continued

| Station number | Station name | Years* of peak record | Flood discharge, in cubic feet per second, for indicated recurrence interval, in years | | | | | Peak discharge | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2-yr $Q_2$ | 10-yr $Q_{10}$ | 25-yr $Q_{25}$ | 50-yr $Q_{50}$ | 100-yr $Q_{100}$ | Date | $ft^3/s$ |
| 12066000 | Tahuya River near Bremerton | 1946-56 | 339 | 499 | -- | -- | -- | 11- 3-55 | 504 |
| 067500 | Tahuya River near Belfair | 1946-56 | 707 | 1,040 | -- | -- | -- | 11- 3-55 | 1,210 |
| 068500 | Dewatto River near Dewatto | 1948-73 | 1,040 | 1,770 | 2,140 | 2,420 | 2,700 | 1-15-61 | 2,160 |
| 070000 | Dogfish Creek near Poulsbo | 1948-71 | 128 | 221 | 279 | 327 | 380 | 2-22-49 | 333 |
| 072000 | Chico Creek near Bremerton | 1948-50, 1962-73 | 473 | 1,030 | 1,440 | -- | -- | 2-22-49 | 1,640 |
| 073500 | Huge Creek near Wauna | 1948-69 | 124 | 291 | 407 | 509 | -- | 2- 9-51 | 391 |
| 076500 | Goldsborough Creek near Shelton | 1952-71 | 861 | 1,330 | 1,530 | 1,670 | -- | 1-19-68 | 1,430 |
| 078400 | Kennedy Creek near Kamilche | 1961-71 | 719 | 1,160 | -- | -- | -- | 11-20-62 | 1,110 |
| 078600 | Schneider Creek tributary near Shelton | 1950-69 | 56 | 91 | 109 | 121 | -- | 12- 9-56 | 106 |
| 079000 | Deschutes River near Rainier | 1950-73 | 3,580 | 5,320 | 6,300 | 7,080 | 7,910 | 1-20-72 | 7,420 |
| 080000 | Deschutes River near Olympia | 1946-64 | 3,840 | 5,610 | 6,400 | 6,960 | -- | 1-26-64 | 6,650 |
| 081000 | Woodland Creek near Olympia | 1950-69 | 91 | 152 | 184 | 209 | -- | 2- 9-51 | 204 |
| 081300 | Eaton Creek near Yelm | 1960-73 | 28 | 40 | -- | -- | -- | 3- 6-72 | 45 |
| 082500 | Nisqually River near National | 1943-73 | 5,220 | 8,750 | 10,700 | 12,100 | 13,700 | 1-29-65 | 11,000 |
| 083000 | Mineral Creek near Mineral | 1943-73 | 4,830 | 7,200 | 8,130 | 8,730 | 9,270 | 1-20-72 | 9,740 |
| 084000 | Nisqually River near Alder | 1932-44 | 9,780 | 17,700 | 22,500 | -- | -- | 12-22-33 | 25,000 |
| 084500 | Little Nisqually River near Alder | 1921-43 | 1,900 | 2,610 | 2,870 | 3,050 | 3,200 | 12-20-33 | 2,920 |
| 087000 | Mashel River near La Grande | 1941-57 | 2,710 | 4,970 | 6,420 | 7,660 | -- | 12-11-46 | 7,980 |
| 088000 | Ohop Creek near Eatonville | 1928-71 | 632 | 1,190 | 1,520 | 1,790 | 2,090 | 12- 9-53 | 1,740 |
| 090200 | Muck Creek at Roy | 1957-72 | 386 | 603 | 663 | -- | -- | 3- 7-72 | 692 |
| 090400 | North Fork Clover Creek near Parkland | 1960-73 | 150 | 178 | -- | -- | -- | 2-28-72 | 190 |
| 090500 | Clover Creek near Tillicum | 1950-70 | 180 | 359 | 458 | -- | -- | 2-12-51 | 568 |
| 092000 | Puyallup River near Electron | 1945-49, 1958-73 | 3,890 | 7,720 | 10,200 | 12,300 | 14,600 | 11-22-59 | 10,800 |
| 093000 | Kapowsin Creek near Kapowsin | 1928-32, 1942-70 | 340 | 586 | 703 | 786 | 866 | 1-29-65 | 681 |
| 093500 | Puyallup River near Orting | 1932-73 | 6,320 | 11,300 | 13,900 | 15,800 | 17,800 | 11-20-62 | 15,300 |
| 094000 | Carbon River near Fairfax | 1930-65 | 4,060 | 7,500 | 9,330 | 10,700 | 12,200 | 12- 9-33 | 11,000 |
| 095000 | South Prairie Creek at South Prairie | 1950-71 | 2,890 | 5,210 | 6,360 | 7,200 | -- | 12-11-55 | 6,850 |
| 096500 | Puyallup River at Alderton | 1916-27, 1944-57 | 13,200 | 20,100 | 23,500 | 25,900 | 28,300 | 12-12-55 | 23,300 |
| 096800 | Dry Creek near Greenwater | 1957-73 | 20 | 45 | 64 | -- | -- | 1-29-65 | 67 |
| 097000 | White River at Greenwater | 1930-73 | 4,460 | 9,390 | 12,800 | 15,700 | 19,100 | 12-21-33 | 18,100 |
| 097500 | Greenwater River at Greenwater | 1930-73 | 1,230 | 2,870 | 4,230 | 5,550 | 7,200 | 11-22-59 | 5,360 |
| 097700 | Cyclone Creek near Enumclaw | 1950-72 | 138 | 304 | 442 | 576 | -- | 1-29-65 | [a]2,000 |
| 100000 | White River at Buckley | 1900-02, 1911-23, 1935-38 | 11,800 | 18,700 | 21,300 | -- | -- | 12-18-17 | 23,100 |
| 102200 | Swan Creek near Tacoma | 1951-71 | 109 | 175 | 214 | 246 | -- | 12- 9-56 | 229 |
| 102800 | South Fork Hylebos Creek near Puyallup | 1949-66 | 5 | 6 | 7 | -- | -- | 12-11-55 | 7 |

TABLE 1.--Discharges for selected flood frequencies, peak of record, and years of peak record, at gaging stations in Washington--Continued

| Station number | Station name | Years* of peak record | Flood discharge, in cubic feet per second, for indicated recurrence interval, in years | | | | | Peak discharge | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2-yr $Q_2$ | 10-yr $Q_{10}$ | 25-yr $Q_{25}$ | 50-yr $Q_{50}$ | 100-yr $Q_{100}$ | Date | $ft^3/s$ |
| 12103200 | Joes Creek at Tacoma | 1958-73 | 10 | 14 | 16 | -- | -- | 1-19-67 | 17 |
| 103500 | Snow Creek near Lester | 1946-65 | 888 | 1,900 | 2,530 | 3,050 | -- | 11-23-59 | 3,400 |
| 104000 | Friday Creek near Lester | 1946-73 | 260 | 587 | 848 | 1,100 | 1,410 | 11-22-59 | 1,370 |
| 104500 | Green River near Lester | 1946-73 | 4,370 | 9,890 | 13,900 | 17,600 | 21,900 | 11-22-59 | 22,000 |
| 104700 | Green Canyon Creek near Lester | 1961-70 | 152 | 268 | -- | -- | -- | 1-28-65 | 284 |
| 105000 | Smay Creek near Lester | 1948-70 | 436 | 1,010 | 1,460 | 1,880 | -- | 11-23-59 | 2,380 |
| 105710 | North Fork Green River near Lemolo | 1957-73 | 959 | 1,810 | 2,300 | -- | -- | 1-28-65 | 2,370 |
| 106500 | Green River near Palmer | 1932-63 | 11,600 | 20,800 | 25,700 | 29,400 | 33,200 | 11-23-59 | 27,800 |
| 107200 | Deep Creek at Cumberland | 1950-70 | 68 | 108 | 119 | 124 | -- | 1-29-65 | 128 |
| 108500 | Newaukum Creek near Black Diamond | 1945-73 | 706 | 1,300 | 1,710 | 2,070 | 2,480 | 2-17-49 | 1,820 |
| 112500 | Big Soos Creek near Auburn | 1945-56 | 643 | 1,130 | -- | -- | -- | 2-10-51 | 1,570 |
| 112600 | Big Soos Creek above hatchery, near Auburn | 1961-73 | 698 | 1,060 | -- | -- | -- | 2-28-72 | 1,090 |
| 113000 | Green River near Auburn | 1937-73 | 11,800 | 20,600 | 25,000 | 28,200 | 31,400 | 11-23-59 | 28,100 |
| 113200 | Mill Creek near Auburn | 1949-70 | 47 | 72 | 81 | 86 | -- | 2- 9-51 | 112 |
| 113300 | Mill Creek tributary near Auburn | 1959-73 | 5 | 10 | 11 | -- | -- | 1-25-64 | 15 |
| 113500 | North Fork Cedar River near Lester | 1945-63 | 837 | 1,890 | 2,660 | 3,370 | -- | 11-22-59 | 3,160 |
| 114000 | South Fork Cedar River near Lester | 1945-73 | 425 | 1,040 | 1,590 | 2,140 | 2,860 | 12- 9-56 | 2,340 |
| 114500 | Cedar River below Bear Creek, near Cedar Falls | 1946-63 | 1,570 | 3,480 | 5,140 | 6,800 | -- | 11-22-59 | 7,620 |
| 115000 | Cedar River near Cedar Falls | 1946-73 | 2,720 | 5,770 | 7,720 | 9,380 | 11,200 | 11-22-59 | 9,490 |
| 115300 | Green Point Creek near Cedar Falls | 1957-73 | 62 | 124 | 159 | -- | -- | 1- 5-69 | 125 |
| 115500 | Rex River near Cedar Falls | 1946-73 | 1,530 | 2,870 | 3,620 | 4,190 | 4,790 | 11-22-59 | 4,200 |
| 116100 | Canyon Creek near Cedar Falls | 1946-73 | 54 | 94 | 112 | 124 | 136 | 12-19-46 | 102 |
| 117000 | Taylor Creek near Selleck | 1946-73 | 879 | 1,960 | 2,700 | -- | -- | 1-29-65 | 2,730 |
| 119600 | May Creek at mouth near Renton | 1946-71 | 220 | 343 | 406 | -- | -- | 11-30-64 | 295 |
| 119800 | North Branch Mercer Creek near Bellevue | 1949-71 | 33 | 74 | 120 | 173 | -- | 2-10-51 | 241 |
| 120000 | Mercer Creek near Bellevue | 1956-73 | 204 | 248 | 266 | -- | -- | 3- 6-72 | 402 |
| 121000 | Issaquah Creek near Issaquah | 1946-64 | 638 | 1,310 | 1,820 | 2,290 | -- | 2- 9-51 | 2,610 |
| 123000 | Cottage Lake Creek near Redmond | 1956-65 | 79 | 134 | -- | -- | -- | 1- 6-56 | 132 |
| 123300 | Evans Creek tributary near Redmond | 1949-69 | 24 | 42 | 48 | 51 | -- | 2- 9-51 | 60 |
| 124000 | Evans Creek above mouth, near Redmond | 1956-73 | 118 | 156 | 169 | -- | -- | 3- 6-72 | 211 |
| 125000 | Sammamish River near Redmond | 1940-57 | 742 | 1,240 | 1,480 | 1,660 | -- | 2-11-51 | 1,520 |
| 126000 | North Creek near Bothell | 1946-72 | 302 | 446 | 523 | 582 | 643 | 3- 5-50 | 680 |
| 126500 | Sammamish River at Bothell | 1940-63 | 1,150 | 1,680 | 1,900 | 2,050 | 2,190 | 1- 6-56 | 1,910 |
| 130500 | South Fork Skykomish River near Skykomish | 1930-31, 1947-70 | 6,340 | 12,600 | 16,600 | 19,900 | 23,600 | 11-22-59 | 20,000 |
| 131000 | Beckler River near Skykomish | 1930-33, 1947-70 | 5,520 | 10,600 | 13,600 | 16,300 | 19,100 | 12-15-59 | 17,100 |

TABLE 1.--Discharges for selected flood frequencies, peak of record, and years of peak record, at gaging stations in Washington--Continued

| Station number | Station name | Years* of peak record | Flood discharge, in cubic feet per second, for indicated recurrence interval, in years | | | | | Peak discharge | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2-yr $Q_2$ | 10-yr $Q_{10}$ | 25-yr $Q_{25}$ | 50-yr $Q_{50}$ | 100-yr $Q_{100}$ | Date | $ft^3/s$ |
| 12132700 | South Fork Skykomish River tributary at Baring | 1951-70 | 109 | 181 | 212 | 234 | -- | 12- 9-56 | 217 |
| 133000 | South Fork Skykomish River near Index | 1897, 1903-05, 1911-73 | 22,300 | 43,700 | 56,300 | 66,600 | 77,400 | 1897 | 70,000 |
| 133500 | Troublesome Creek near Index | 1930-41 | 920 | 2,020 | -- | -- | -- | 12- 21-33 | 2,300 |
| 134000 | North Fork Skykomish River at Index | 1911-21, 1930-48 | 13,700 | 24,700 | 30,500 | 34,900 | -- | 12-21-33 | 28,400 |
| 134500 | Skykomish River near Gold Bar | 1929-73 | 35,500 | 67,900 | 86,000 | 100,000 | 115,000 | 12-21-33 | 88,700 |
| 135000 | Wallace River at Gold Bar | 1929-33, 1947-73 | 2,090 | 3,100 | 3,600 | 3,970 | 4,340 | 1- 5-59 | 3,400 |
| 135500 | Olney Creek near Gold Bar | 1947-68 | 912 | 2,100 | 3,170 | 4,260 | -- | 10-25-46 | 4,020 |
| 137500 | Sultan River near Startup | 1935-68 | 16,000 | 28,600 | 34,600 | 38,800 | 42,900 | 2- 9-51 | 34,600 |
| 141000 | Woods Creek near Monroe | 1947-71 | 1,230 | 2,000 | 2,400 | 2,710 | 3,030 | 1-30-71 | 2,350 |
| 141300 | Middle Fork Snoqualmie River near Tanner | 1960-72 | 12,900 | 21,000 | -- | -- | -- | 11-23-59 | 49,000 |
| 141500 | Middle Fork Snoqualmie River near North Bend | 1909-32 | 12,500 | 23,800 | 30,300 | 35,400 | -- | 11-23-09 | 26,700 |
| 142000 | North Fork Snoqualmie River near Snoqualmie Falls | 1930-73 | 7,140 | 12,600 | 15,500 | 17,600 | 19,800 | 2-26-32 | 15,800 |
| 143000 | North Fork Snoqualmie River near North Bend | 1908-26, 1929-38, 1961-71 | 8,050 | 13,900 | 16,600 | 18,600 | 20,500 | 11-23-09 | 15,800 |
| 143300 | South Fork Snoqualmie River tributary near North Bend | 1951-70 | 24 | 39 | 44 | 47 | -- | 11-22-59 | 44 |
| 143310 | South Fork Snoqualmie River tributary No. 9 near North Bend | 1962-72 | 17 | 30 | -- | -- | -- | 1- 1-64 | 31 |
| 143400 | South Fork Snoqualmie River above Alice Creek, near Garcia | 1961-73 | 2,560 | 5,090 | -- | -- | -- | 11-19-62 | 7,090 |
| 144000 | South Fork Snoqualmie River near North Bend | 1908-26, 1930-38, 1945-50, 1960-73 | 4,390 | 7,540 | 9,100 | 10,200 | -- | 11-22-59 | 13,000 |
| 144500 | Snoqualmie River near Snoqualmie | 1959-73 | 26,200 | 48,800 | 61,000 | -- | -- | 11-23-59 | 61,000 |
| 145500 | Raging River near Fall City | 1946-73 | 1,790 | 2,670 | 3,120 | 3,450 | 3,780 | 2- 9-51 | 3,420 |
| 146000 | Patterson Creek near Fall City | 1948-50, 1956-71 | 223 | 348 | 428 | 498 | -- | 2-17-49 | 480 |
| 147000 | Griffin Creek near Carnation | 1946-70 | 391 | 730 | 937 | 1,110 | 1,300 | 1-29-65 | 1,000 |
| 147500 | North Fork Tolt River near Carnation | 1953-63, 1968-73 | 5,000 | 8,100 | -- | -- | -- | 12-15-59 | 9,560 |
| 148000 | South Fork Tolt River near Carnation | 1953-63, 1970-73 | 3,450 | 5,780 | -- | -- | -- | 12-15-59 | 6,500 |
| 148100 | South Fork Tolt River tributary near Carnation | 1955-73 | 121 | 211 | 257 | -- | -- | 12-15-59 | 242 |
| 148500 | Tolt River near Carnation | 1929, 1931, 1938-73 | 7,250 | 13,100 | 16,000 | 18,200 | 20,300 | 12-15-59 | 17,400 |
| 149000 | Snoqualmie River near Carnation | 1929-73 | 28,200 | 48,700 | 59,400 | 67,400 | 75,600 | 2-27-32 | 59,500 |
| 152500 | Pilchuck River near Granite Falls | 1944-72 | 5,170 | 7,720 | 8,870 | 9,670 | 10,400 | 10-25-45 | 11,800 |
| 153000 | Little Pilchuck Creek near Lake Stevens | 1947-51, 1953-70 | 270 | 455 | 556 | 636 | 718 | 11-21-59 | 625 |
| 156400 | Munson Creek near Marysville | 1949-69 | 25 | 40 | 47 | 52 | -- | 3-21-50 | 50 |
| 157000 | Quilceda Creek near Marysville | 1947-69 | 162 | 235 | 272 | 299 | 326 | 1-29-65 | 306 |

TABLE 1.--Discharges for selected flood frequencies, peak of record, and years of peak record, at gaging stations in Washington--Continued

| Station number | Station name | Years* of peak record | Flood discharge, in cubic feet per second, for indicated recurrence interval, in years | | | | | Peak discharge | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2-yr $Q_2$ | 10-yr $Q_{10}$ | 25-yr $Q_{25}$ | 50-yr $Q_{50}$ | 100-yr $Q_{100}$ | Date | $ft^3/s$ |
| 12161000 | South Fork Stillaguamish River near Granite Falls | 1929-73 | 15,700 | 24,300 | 28,300 | 31,200 | 34,000 | 2-26-32 | 32,400 |
| 162500 | South Fork Stillaguamish River near Arlington | 1938-57 | 19,600 | 26,300 | 28,600 | 30,100 | -- | 2- 9-51 | 27,700 |
| 164000 | Jim Creek near Arlington | 1938-69 | 2,790 | 4,120 | 4,700 | 5,110 | 5,500 | 12-28-49 | 4,730 |
| 165000 | Squire Creek near Darrington | 1951-69 | 2,960 | 4,720 | 5,580 | 6,220 | -- | 2-10-51 | 6,440 |
| 166500 | Deer Creek at Oso | 1918-30 | 7,290 | 9,390 | 10,400 | -- | -- | 12-12-21 | 10,400 |
| 167000 | North Fork Stillaquamish River near Arlington | 1929-73 | 20,800 | 28,700 | 31,500 | 33,200 | 34,700 | 2- 9-51 | 30,600 |
| 168500 | Pilchuck Creek near Bryant | 1930-31, 1951, 1953-73 | 4,020 | 5,810 | 6,680 | 7,320 | -- | 1-30-71 | 6,900 |
| 169500 | Fish Creek near Arlington | 1951-72 | 94 | 178 | 223 | 257 | -- | 12-25-67 | 245 |
| 172000 | Big Beaver Creek near Newhalem | 1941-69 | 2,390 | 4,150 | 5,110 | -- | -- | 10-22-63 | 4,420 |
| 172500 | Skagit River near Newhalem | 1922, 1930-39 | 14,000 | 25,200 | -- | -- | -- | 12- -21 | 33,000 |
| 173500 | Ruby Creek below Panther Creek, near Newhalem | 1949-69 | 4,670 | 7,140 | 8,450 | -- | -- | 11-27-49 | 8,640 |
| 174000 | Ruby Creek near Newhalem | 1929-49 | 4,270 | 6,700 | 7,800 | 8,570 | -- | 5-27-48 | 9,920 |
| 174500 | Skagit River below Ruby Creek, near Newhalem | 1920-30 | 18,900 | 35,000 | -- | -- | -- | 12-12-21 | 45,700 |
| 175500 | Thunder Creek near Newhalem | 1931-73 | 3,840 | 7,340 | 9,660 | 11,700 | 14,000 | 10-25-55 | 10,800 |
| 176000 | Thunder Creek near Marblemount | 1920-30 | 4,840 | 11,100 | -- | -- | -- | 12-12-21 | 15,400 |
| 177500 | Stetattle Creek near Newhalem | 1934-73 | 1,830 | 3,890 | 5,410 | 6,810 | 8,460 | 11-26-49 | 8,580 |
| 178100 | Newhalem Creek near Newhalem | 1961-73 | 1,430 | 3,370 | -- | -- | -- | 11-20-62 | 5,600 |
| 181100 | South Fork Cascade River at South Cascade Glacier | 1961-73 | 128 | 160 | -- | -- | -- | 10-24-59 | 194 |
| 182500 | Cascade River at Marblemount | 1815, 1929-72 | 6,570 | 12,200 | 15,500 | 18,100 | 21,000 | 1815 | [a]46,000 |
| 186000 | Sauk River near Darrington | 1918-22, 1929-73 | 8,490 | 17,900 | 24,700 | 30,900 | 38,100 | 11-27-49 | 30,200 |
| 187500 | Sauk River at Darrington | 1915-32 | 18,900 | 42,100 | 58,200 | 72,300 | -- | 2-26-32 | 46,500 |
| 189000 | Suiattle River near Mansford | 1939-50 | 10,000 | 21,200 | -- | -- | -- | 11-27-49 | 30,700 |
| 189400 | Sauk River tributary near Darrington | 1951-70 | 101 | 166 | 196 | 218 | -- | 12- 9-56 | 184 |
| 189500 | Sauk River near Sauk | 1929-73 | 26,900 | 50,400 | 64,000 | 74,800 | 86,200 | 11-27-49 | 82,400 |
| 196000 | Alder Creek near Hamilton | 1944-71 | 297 | 567 | 727 | 857 | 997 | 12- 9-56 | 714 |
| 196500 | Day Creek near Lyman | 1944-61 | 4,390 | 5,490 | 5,940 | 6,250 | 6,540 | 2-20-61 | 6,000 |
| 197200 | Parker Creek near Lyman | 1951-70 | 135 | 186 | 208 | 223 | -- | 12- 9-56 | 233 |
| 199800 | East Fork Nookachamps Creek near Big Lake | 1962-71 | 464 | 601 | -- | -- | -- | 10-21-63 | 610 |
| 200700 | Carpenter Creek tributary near Mt. Vernon | 1949-70 | 34 | 66 | 83 | 97 | -- | 12-25-67 | 86 |
| 200800 | Lake Creek near Bellingham | 1949-68 | 118 | 222 | 281 | 327 | -- | 2-17-49 | 250 |

TABLE 1.--Discharges for selected flood frequencies, peak of record, and years of peak record, at gaging stations in Washington--Continued

| Station number | Station name | Years* of peak record | Flood discharge, in cubic feet per second, for indicated recurrence interval, in years | | | | | Peak discharge | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2-yr $Q_2$ | 10-yr $Q_{10}$ | 25-yr $Q_{25}$ | 50-yr $Q_{50}$ | 100-yr $Q_{100}$ | Date | $ft^3/s$ |
| 12201500 | Samish River near Burlington | 1944-71 | 2,370 | 4,450 | 5,530 | 6,350 | 7,160 | 12-28-49 | 5,830 |
| 204400 | Nooksack River tributary near Glacier | 1956-73 | 58 | 129 | 182 | -- | -- | 11- 3-55 | 181 |
| 205000 | North Fork Nooksack River below Cascade Creek, near Glacier | 1938-73 | 5,430 | 8,450 | 9,930 | 11,000 | 12,100 | 11-26-49 | 10,300 |
| 209000 | South Fork Nooksack River near Wickersham | 1934-73 | 9,430 | 15,000 | 17,700 | 19,500 | 21,300 | 11- 3-55 | 19,300 |
| 209500 | Skookum Creek near Wickersham | 1949-69 | 1,130 | 1,860 | 2,410 | 2,920 | -- | 11-27-49 | 3,050 |
| 210500 | Nooksack River at Deming | 1932, 1936-73 | 25,400 | 38,300 | 44,200 | 48,300 | 52,200 | 2-27-32 | 49,300 |
| 211500 | Nooksack River near Lynden | 1945-67 | 29,100 | 43,400 | 49,400 | 53,400 | 57,200 | 2-10-51 | 46,200 |
| 212000 | Fishtrap Creek at Lynden | 1949-70 | 354 | 496 | 557 | 599 | -- | 2-11-51 | 550 |
| 212700 | Tenmile Creek tributary near Bellingham | 1949-67 | 25 | 46 | 57 | 65 | -- | 2-10-51 | 56 |
| 212800 | Tenmile Creek tributary No. 2 near Bellingham | 1956-73 | 21 | 40 | 51 | -- | -- | 1-26-71 | 52 |
| | EASTERN WASHINGTON | | | | | | | | |
| 12395800 | Deer Creek near Dalkena | 1954-73 | 45 | 72 | 84 | 92 | -- | 3-29-60 | 78 |
| 395900 | Davis Creek near Dalkena | 1954-73 | 91 | 142 | 170 | 192 | -- | 3-30-60 | 175 |
| 396000 | Calispell Creek near Dalkena | 1951-73 | 543 | 941 | 1,150 | 1,310 | -- | 2-25-58 | 1,070 |
| 396100 | Winchester Creek near Cusick | 1954-73 | 82 | 147 | 181 | 207 | -- | 4-22-56 | 184 |
| 396450 | Little Muddy Creek at Ione | 1954-73 | 99 | 213 | 281 | 336 | -- | 4-23-69 | 300 |
| 396900 | Sullivan Creek above Outlet Creek, near Metalline Falls | 1959-72 | 931 | 1,290 | 1,470 | -- | -- | 5-26-61 | 1,480 |
| 398900 | Salmo River near Salmo, British Columbia | 1961-73 | 7,460 | 11,800 | -- | -- | -- | 6- 2-68 | 16,300 |
| 399900 | Big Sheep Creek near Rossland, British Columbia | 1950-73 | 1,490 | 2,200 | 2,590 | 2,900 | -- | 5-12-54 | 2,700 |
| 400500 | Sheep Creek near Northport | 1930-42, 1948 | 1,750 | 2,570 | 2,950 | -- | -- | 1948 | 3,070 |
| 401500 | Kettle River near Ferry | 1929-73 | 11,900 | 16,500 | 18,400 | 19,700 | 21,000 | 5-29-48 | 21,200 |
| 403700 | Third Creek near Curlew | 1954-73 | 9 | 17 | 19 | -- | -- | 4- 9-60 | 16 |
| 405400 | Nancy Creek near Kettle Falls | 1952-72 | 56 | 131 | 180 | 221 | -- | 4-23-69 | 154 |
| 407500 | Sheep Creek at Springdale | 1953-72 | 44 | 79 | 94 | 105 | -- | 4- 8-69 | 82 |
| 407520 | Deer Creek near Valley | 1960-72 | 121 | 262 | -- | -- | -- | 3-29-60 | 425 |
| 407600 | Thomason Creek near Chewelah | 1954-73 | 6 | 10 | 14 | -- | -- | 6-15-62 | 14 |
| 407700 | Chewelah Creek at Chewelah | 1957-73 | 159 | 306 | 385 | -- | -- | 3-30-60 | 355 |
| 408200 | Bighorn Creek (Patchen Creek) near Tiger | 1954-73 | 9 | 20 | 26 | 31 | -- | 4-22-56 | 41 |
| 408300 | Little Pend Oreille River near Colville | 1958-73 | 334 | 806 | 1,120 | -- | -- | 5-10-61 | 1,060 |
| 408400 | Narcisse Creek near Colville | 1954-73 | 27 | 60 | 82 | 102 | -- | 5-10-61 | 80 |
| 408420 | Haller Creek near Arden | 1960-70 | 43 | 124 | -- | -- | -- | 3-29-60 | 148 |

TABLE 1.--Discharges for selected flood frequencies, peak of record, and years of peak record, at gaging stations in Washington--Continued

| Station number | Station name | Years* of peak record | Flood discharge, in cubic feet per second, for indicated recurrence interval, in years: 2-yr $Q_2$ | 10-yr $Q_{10}$ | 25-yr $Q_{25}$ | 50-yr $Q_{50}$ | 100-yr $Q_{100}$ | Peak discharge: Date | $ft^3/s$ |
|---|---|---|---|---|---|---|---|---|---|
| 12408500 | Mill Creek near Colville | 1940-72 | 320 | 589 | 707 | 786 | 859 | 4-24-69 | 694 |
| 409000 | Colville River at Kettle Falls | 1923-73 | 1,180 | 2,300 | 2,780 | 3,100 | 3,390 | 4-23-56 | 3,230 |
| 409500 | Hall Creek at Inchelium | 1913-29, 1948, 1972-73 | 446 | 1,110 | -- | -- | -- | 1948 | 1,770 |
| 410600 | South Fork Harvey Creek near Cedonia | 1954-73 | 22 | 35 | 41 | 45 | -- | 4-22-56 | 41 |
| 410650 | North Fork Harvey Creek near Cedonia | 1954-73 | 6 | 10 | 13 | 15 | -- | 4-22-56 | 15 |
| 423550 | Hangman Creek tributary near Latah | 1961-73 | 52 | 270 | -- | -- | -- | 2- 3-63 | 155 |
| 423700 | South Fork Rock Creek tributary near Fairfield | 1962-73 | 29 | 36 | -- | -- | -- | 2- 4-63 | 41 |
| 423900 | Stevens Creek tributary near Moran | 1954-73 | 19 | 67 | 98 | 124 | -- | 2- 4-63 | 125 |
| 424000 | Hangman Creek at Spokane | 1948-73 | 6,670 | 13,100 | 17,300 | 20,700 | 24,600 | 2- 3-63 | 20,600 |
| 429600 | Deer Creek near Chattaroy | 1962-73 | 123 | 246 | -- | -- | -- | 2-17-70 | 391 |
| 429800 | Mud Creek near Deer Park | 1954-73 | 12 | 22 | 26 | 29 | -- | 2-24-57 | 27 |
| 430370 | Bigelow Gulch near Spokane | 1950, 1962-73 | 25 | 131 | -- | -- | -- | 6-11-50 | [b]1,510 |
| 431000 | Little Spokane River at Dartford | 1929-32, 1947-73 | 1,510 | 2,370 | 2,590 | 2,710 | 2,790 | 2-17-70 | 3,170 |
| 431100 | Little Creek at Dartford | 1963-73 | 26 | 217 | -- | -- | -- | 2- 3-63 | 325 |
| 433300 | Spring Creek tributary near Reardon | 1954-73 | 45 | 92 | 111 | 122 | -- | 2- 3-63 | 135 |
| 433580 | Hawk Creek at Davenport | 1957, 1959, 1963-73 | 338 | 1,660 | -- | -- | -- | 2-26-57 | [c]2,200 |
| 433800 | Granite Creek near Republic | 1954-73 | 12 | 25 | 34 | 42 | -- | 4-22-56 | 36 |
| 437500 | Nespelem River at Nespelem | 1911-29 | 175 | 485 | 664 | 800 | -- | 4- 5-19 | 483 |
| 437930 | East Fork Foster Creek at Leahy | 1959, 1963-73 | 67 | 260 | -- | -- | -- | 1-12-59 | 355 |
| 437950 | East Fork Foster Creek tributary near Bridgeport | 1957-73 | 28 | 228 | 500 | -- | -- | May or June 1957 | [d]982 |
| 437960 | West Fork Foster Creek near Bridgeport | 1957-73 | 59 | 327 | 694 | -- | -- | 2-26-57 | [d]756 |
| 439200 | Dry Creek tributary near Molson | 1958-73 | 7 | 42 | 80 | -- | -- | 3-30-63 | [e]47 |
| 441800 | Olie Creek near Loomis | 1961-73 | .01 | 6 | -- | -- | -- | 1963 | 8 |
| 442000 | Toats Coulee Creek near Loomis | 1920-26, 1948, 1957-70 | 521 | 1,690 | 2,730 | -- | -- | 5-28-48 | 6,010 |
| 442500 | Similkameen River near Nighthawk | 1911-73 | 16,600 | 27,000 | 31,400 | 34,300 | 37,000 | 6- 1-72 | 45,800 |
| 443700 | Spectacle Lake tributary near Loomis | 1961-73 | .5 | 31 | -- | -- | -- | 2-27-73 | 109 |
| 444400 | Siwash Creek tributary near Tonasket | 1957-73 | 6 | 27 | 47 | -- | -- | 1- 9-59 | 52 |
| 445800 | Omak Creek tributary near Disautel | 1955-73 | 6 | 12 | 15 | -- | -- | 1962 | 13 |
| 447100 | Okanogan River tributary at Malott | 1959-73 | .25 | 22 | 51 | -- | -- | 1- 9-59 | 50 |
| 447400 | Doe Creek near Winthrop | 1957-73 | 22 | 46 | 57 | -- | -- | 6-10-72 | 89 |

TABLE 1.--Discharges for selected flood frequencies, peak of record, and years of peak record, at gaging stations in Washington--Continued

| Station number | Station name | Years* of peak record | Flood discharge, in cubic feet per second, for indicated recurrence interval, in years | | | | | Peak discharge | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2-yr $Q_2$ | 10-yr $Q_{10}$ | 25-yr $Q_{25}$ | 50-yr $Q_{50}$ | 100-yr $Q_{100}$ | Date | $ft^3/s$ |
| 12449500 | Methow River at Twisp | 1920-29, 1934-62 | 11,400 | 20,400 | 24,700 | 27,700 | 30,700 | 5-29-48 | 40,800 |
| 449600 | Beaver Creek below South Fork, near Twisp | 1961-73 | 183 | 520 | -- | -- | -- | 5-29-72 | 535 |
| 449900 | Methow River tributary near Methow | 1954-69 | .01 | 12 | 26 | -- | -- | 10-26-55 | 18 |
| 449950 | Methow River near Pateros | 1948, 1959-73 | 12,800 | 26,700 | 37,300 | -- | -- | 5-29-48 | [f]46,700 |
| 450500 | Methow River at Pateros | 1904-20 | 11,600 | 14,500 | 15,000 | -- | -- | 5-11-10 | 15,400 |
| 451000 | Stehekin River at Stehekin | 1911-15, 1927-73 | 9,280 | 13,900 | 15,800 | 17,100 | 18,300 | 5-29-48 | 18,900 |
| 451500 | Railroad Creek at Lucerne | 1911-13, 1927-57 | 1,280 | 2,330 | 2,990 | 3,550 | 4,160 | 5-28-48 | 3,900 |
| 452800 | Entiat River near Ardenvoir | 1958-73 | 2,940 | 3,970 | 4,300 | -- | -- | 6-10-72 | 6,430 |
| 453000 | Entiat River at Entiat | 1911-25, 1952-58 | 3,450 | 5,880 | 7,060 | -- | -- | 5-29-48 | 10,800 |
| 453600 | Columbia River tributary near Entiat | 1954-72 | .6 | 1.0 | 1.0 | 1.0 | -- | 1956 | 1.4 |
| 454000 | White River near Plain | 1955-73 | 4,900 | 5,700 | 5,930 | -- | -- | 5-26-58 | 5,780 |
| 455000 | Wenatchee River below Wenatchee Lake | 1932-58 | 6,990 | 10,000 | 11,200 | 11,900 | 12,600 | 5-29-48 | 13,700 |
| 456500 | Chiwawa River near Plain | 1911-14, 1937-49, 1955-57 | 3,000 | 4,820 | 5,640 | -- | -- | 5-29-48 | 5,880 |
| 457000 | Wenatchee River at Plain | 1911-73 | 11,700 | 16,800 | 18,900 | 20,200 | 21,500 | 5-29-48 | 22,700 |
| 457300 | Skinney Creek at Winton | 1954-73 | 28 | 51 | 63 | 73 | -- | 4-22-56 | 75 |
| 458000 | Icicle Creek above Snow Creek, near Leavenworth | 1937-71 | 4,380 | 7,080 | 8,470 | 9,520 | 10,600 | 5-28-48 | 11,600 |
| 458900 | Posey Canyon near Leavenworth | 1954-73 | 3 | 7 | 9 | 10 | -- | 3-18-72 | 11 |
| 459000 | Wenatchee River at Peshastin | 1929-73 | 16,300 | 22,600 | 25,000 | 26,500 | 27,800 | 5-28-48 | 32,300 |
| 459400 | Tronsen Creek near Peshastin | 1960-73 | 22 | 36 | -- | -- | -- | 11-22-59 | 107 |
| 461000 | Wenatchee River at Dryden | 1905-06, 1910-17, 1948 | 18,100 | 29,100 | -- | -- | -- | 1948 | 34,600 |
| 461100 | East Branch Mission Creek near Cashmere | 1955-73 | 19 | 43 | 58 | -- | -- | 3-13-72 | 75 |
| 461200 | East Branch Mission Creek tributary near Cashmere | 1955-73 | 6 | 13 | 17 | -- | -- | 5- 8-72 | 30 |
| 461400 | Mission Creek above Sand Creek near Cashmere | 1959-71 | 127 | 227 | 288 | -- | -- | 1-31-71 | 299 |
| 461500 | Sand Creek near Cashmere | 1954-73 | 57 | 144 | 218 | 291 | -- | 8-15-56 | 325 |
| 462000 | Mission Creek at Cashmere | 1948, 1954-73 | 167 | 336 | 468 | 594 | -- | 3-13-72 | 560 |
| 462700 | Moses Creek at Waterville | 1954-73 | 9 | 149 | 268 | 369 | -- | 3-20-60 | 117 |
| 462800 | Moses Creek at Douglas | 1955-73 | 44 | 269 | 436 | 573 | -- | 3-18-57 | 257 |
| 463000 | Douglas Creek at Waterville | 1948-60 | 588 | 4,060 | 6,240 | -- | -- | 6-10-48 | 6,420 |
| 463600 | Rattlesnake Creek tributary near Soap Lake | 1959-73 | 6 | 50 | 119 | -- | -- | 2- 9-62 | 129 |
| 463700 | McCarteney Creek tributary near Farmer | 1960-73 | 3 | 22 | 35 | -- | -- | 3- -60 | 41 |

TABLE 1.--Discharges for selected flood frequencies, peak of record, and years of peak record, at gaging stations in Washington--Continued

| Station number | Station name | Years* of peak record | Flood discharge, in cubic feet per second, for indicated recurrence interval, in years | | | | | Peak discharge | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2-yr $Q_2$ | 10-yr $Q_{10}$ | 25-yr $Q_{25}$ | 50-yr $Q_{50}$ | 100-yr $Q_{100}$ | Date | ft³/s |
| 12463800 | Pine Canyon tributary near Farmer | 1960-73 | 0.2 | 14 | 27 | -- | -- | 1-19-73 | 30 |
| 464600 | Schnebly Coulee tributary near Vantage | 1955-73 | 8 | 38 | 55 | 68 | -- | 3-23-56, 3-18-57 | [g]42 |
| 464650 | South Fork Crab Creek tributary near Waukon | 1954-73 | 18 | 53 | 83 | 112 | -- | 2-26-57 | 111 |
| 465000 | Crab Creek at Irby | 1943-73 | 1,130 | 4,980 | 8,120 | 11,000 | 14,200 | 2-27-57 | 8,370 |
| 465100 | Connawai Creek tributary near Govan | 1958-73 | 5 | 47 | 110 | -- | -- | 8-25-58 | [h]165 |
| 465300 | Broadax Draw tributary near Wilbur | 1955-73 | 27 | 107 | 163 | -- | -- | 7-26-55 | [i]205 |
| 465500 | Wilson Creek at Wilson Creek | 1951-73 | 756 | 4,600 | 7,940 | 11,300 | -- | 2-26-57 | 12,900 |
| 467000 | Crab Creek near Moses Lake | 1943-73 | 474 | 3,950 | 6,730 | 9,030 | 11,400 | 2-28-57 | 10,400 |
| 467400 | Haynes Canyon near Coulee City | 1959-73 | 13 | 79 | -- | -- | -- | 1-12-59 | 154 |
| 468500 | Park Creek below Park Lake, near Coulee City | 1946-68 | 25 | 37 | 41 | 44 | 47 | 2- 9-51 | 47 |
| [illegible]0300 | Iron Springs Creek near Winchester | 1959-73 | 18 | 76 | 118 | -- | -- | 1-24-59 | 127 |
| [illegible]1100 | Paha Coulee tributary near Ritzville | 1962-73 | 118 | 301 | -- | -- | -- | 1-16-71 | 264 |
| 471200 | Lind Coulee tributary near Lind | 1956-73 | 2 | 16 | 25 | -- | -- | 2-21-56 | 60 |
| 471300 | Weber Coulee tributary near Ruff | 1959-72 | 1 | 63 | 216 | -- | -- | 1-16-71 | 239 |
| 473700 | Kansas No. 2 near Cunningham | 1955-70 | .01 | 58 | 255 | -- | -- | 2-21-56 | 175 |
| 480500 | Teanaway River near Cle Elum | 1910, 1911, 1914, 1947-52 | 2,900 | 4,310 | -- | -- | -- | 3-20-10 | 4,330 |
| 480700 | Hovey Creek near Cle Elum | 1955-73 | 31 | 48 | 53 | -- | -- | 5-20-56 | 68 |
| 483300 | South Fork Manastash Creek tributary near Ellensburg | 1955-73 | 33 | 60 | 69 | -- | -- | 5-10-57 | 100 |
| 483800 | Naneum Creek near Ellensburg | 1957-71, 1973 | 397 | 728 | 918 | -- | -- | 6- 9-64 | 968 |
| 484200 | Johnson Canyon tributary near Kittitas | 1956-73 | 1 | 25 | 57 | -- | -- | 3-23-56 | [j]43 |
| 484600 | McPherson Canyon at Wymer | 1952-73 | 35 | 182 | 245 | 282 | -- | 8-10-52 | [k]304 |
| 485700 | Selah Creek tributary near Yakima | 1955-73 | .2 | 40 | 93 | 149 | -- | 1-16-71 | [l]101 |
| 485900 | Pine Canyon near Naches | 1961-73 | 11 | 61 | -- | -- | -- | 2- 3-63 | 137 |
| 488300 | American River tributary near Nile | 1955-73 | 17 | 27 | 31 | -- | -- | 5-31-56 | 36 |
| 488500 | American River near Nile | 1909, 1940-73 | 1,420 | 2,210 | 2,550 | 2,790 | 3,010 | 6- 2-68 | 2,840 |
| 491700 | Hause Creek near Rimrock | 1955-73 | 22 | 41 | 50 | -- | -- | 2-28-72 | 59 |
| 492500 | Tieton River near Naches | 1908-24, 1933 | 2,450 | 4,530 | 5,690 | -- | -- | 12-22-33 | 8,910 |
| 500400 | Firewater Canyon near Moxee City | 1963-73 | 11 | 166 | -- | -- | -- | 1-16-71 | 550 |
| 500500 | North Fork Ahtanum Creek near Tampico | 1908, 1910-21, 1932-73 | 384 | 625 | 737 | 817 | 894 | 5-20-56 | 823 |
| 501000 | South Fork Ahtanum Creek at Conrad Ranch, near Tampico | 1915-24, 1931-73 | 95 | 213 | 291 | 358 | 432 | 12-23-33 | 424 |

TABLE 1.--Discharges for selected flood frequencies, peak of record, and years of peak record, at gaging stations in Washington--Continued

| Station number | Station name | Years* of peak record | Flood discharge, in cubic feet per second, for indicated recurrence interval, in years | | | | | Peak discharge | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2-yr $Q_2$ | 10-yr $Q_{10}$ | 25-yr $Q_{25}$ | 50-yr $Q_{50}$ | 100-yr $Q_{100}$ | Date | $ft^3/s$ |
| 12502000 | Ahtanum Creek at The Narrows, near Tampico | 1909-13, 1961-68 | 603 | 1,240 | -- | -- | -- | 3- 1-10 | 1,900 |
| 502500 | Ahtanum Creek at Union Gap | 1910, 1961-73 | 425 | 856 | -- | -- | -- | 3- 3-10 | 1,530 |
| 506000 | Toppenish Creek near Fort Simco | 1910-24 | 734 | 1,510 | 1,970 | -- | -- | 5- 4-16 | 1,680 |
| 506500 | Simcoe Creek near Fort Simcoe | 1909-23 | 243 | 845 | 1,320 | -- | -- | 3- 1-10 | 1,750 |
| 507300 | Toppenish Creek tributary near Toppenish | 1955-73 | 1 | 31 | 34 | 34 | -- | 12-21-55 | 33 |
| 507600 | Shinando Creek tributary near Goldendale | 1955-73 | 3 | 12 | 20 | 27 | -- | 12-22-64 | 21 |
| 507660 | Satus Creek tributary near Toppenish | 1953, 1956, 1961-73 | 182 | 821 | -- | -- | -- | 12-21-55 | 955 |
| 508500 | Satus Creek below Dry Creek, near Toppenish | 1914-24 | 1,500 | 3,450 | -- | -- | -- | 12-22-15 | 3,870 |
| 508800 | Yakima River tributary near Sunnyside | 1954-73 | .01 | 95 | 184 | 267 | -- | 8-20-54 | 264 |
| 510600 | Webber Canyon near Kiona | 1955-73 | .01 | 110 | 381 | 745 | -- | 1-12-69 | [m]209 |
| 510700 | Yakima River tributary near Kiona | 1955-73 | .01 | 2 | 2 | 2 | -- | 1-30-65 2-12-69 | 2 |
| 512500 | Providence Coulee at Cunningham | 1953-73 | .01 | 790 | 1,640 | 2,520 | -- | 2-21-56 | 2,160 |
| 512600 | Hatton Coulee tributary No. 2 near Cunningham | 1961-73 | 9 | 87 | -- | -- | -- | 1-23-70 | [n]86 |
| 512700 | Hatton Coulee tributary near Hatton | 1956-73 | 5 | 64 | 151 | -- | -- | 2-21-56 | 186 |
| 513000 | Esquatzel Coulee at Connell | 1953-73 | .01 | 2,490 | 5,510 | 8,160 | -- | 2-21-56 | 5,560 |
| 513300 | Dunnigan Coulee near Connell | 1956, 1963-73 | .8 | 261 | -- | -- | -- | 2-21-56 | [o]465 |
| 513500 | Esquatzel Coulee at Eltopia | 1953-73 | .01 | 800 | 2,920 | 5,040 | -- | 2-22-56 | 3,740 |
| 13334500 | Asotin Creek near Asotin | 1904, 1929-59 | 328 | 688 | 921 | 1,120 | 1,340 | 4-15-04 | 1,180 |
| 334700 | Asotin Creek below Kearney Gulch, near Asotin | 1960-73 | 356 | 1,410 | -- | -- | -- | 12-23-64 | 2,720 |
| 335200 | Critchfield Draw near Clarkston | 1959-73 | 16 | 324 | 994 | -- | -- | 6- 5-64 | 705 |
| 343520 | Clayton Gulch near Alpowa | 1961-73 | 92 | 264 | -- | -- | -- | 2- 3-63 | [p]298 |
| 343620 | South Fork Deadman Creek tributary near Pataha | 1961-73 | 21 | 176 | -- | -- | -- | 9-13-66 | 192 |
| 343660 | Smith Gulch tributary near Pataha | 1955-73 | 50 | 307 | 542 | 776 | -- | 9-13-66 | [q]656 |
| 344500 | Tucannon River near Starbuck | 1915-17, 1929-31, 1959-73 | 1,870 | 6,070 | 9,250 | -- | -- | 12-22-64 | 7,980 |
| 346100 | Palouse River at Colfax | 1956-73 | 4,470 | 7,520 | 8,920 | -- | -- | 12-22-64 | 8,510 |
| 348000 | South Fork Palouse River at Pullman | 1935-42, 1948, 1960-73 | 858 | 1,720 | 2,260 | -- | -- | 2-26-48 | 5,000 |
| 348400 | Missouri Flat Creek tributary near Pullman | 1955-73 | 30 | 115 | 206 | -- | -- | 2- 3-63 | 234 |
| 348500 | Missouri Flat Creek at Pullman | 1934-40, 1948, 1960-73 | 374 | 864 | -- | -- | -- | 2-26-48 | 1,500 |
| 349210 | Palouse River below South Fork, at Colfax | 1963-73 | 6,440 | 13,900 | -- | -- | -- | 1-21-72 | 14,700 |
| 349300 | Palouse River tributary at Colfax | 1955-73 | 25 | 90 | 148 | -- | -- | 9-23-63 | 183 |
| 349350 | Hardman Draw tributary at Plaza | 1955-73 | 27 | 216 | 677 | -- | -- | 5-14-57 | [r]1,780 |
| 349400 | Pine Creek at Pine City | 1962-73 | 1,430 | 5,430 | -- | -- | -- | 2- 3-63 | 10,600 |

TABLE 1.--Discharges for selected flood frequencies, peak of record, and years of peak record, at gaging stations in Washington--Continued

| Station number | Station name | Years* of peak record | Flood discharge, in cubic feet per second, for indicated recurrence interval, in years | | | | | Peak discharge | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2-yr $Q_2$ | 10-yr $Q_{10}$ | 25-yr $Q_{25}$ | 50-yr $Q_{50}$ | 100-yr $Q_{100}$ | Date | $ft^3/s$ |
| 13350500 | Union Flat Creek near Colfax | 1954-71 | 798 | 2,040 | 3,000 | 3,890 | -- | 1-29-65 | 2,930 |
| 351000 | Palouse River at Hooper | 1898, 1899, 1901-07, 1909-16, 1951-73 | 8,270 | 20,300 | 26,900 | 31,900 | 36,900 | 2- 4-63 | 33,500 |
| 352200 | Cow Creek tributary near Ritzville | 1951, 1955-73 | 22 | 113 | 194 | 273 | -- | 3-18-51 | 200 |
| 352550 | Stewart Canyon tributary near Riparia | 1958-73 | 16 | 122 | 271 | -- | -- | 2- 4-63 | 277 |
| 353050 | Smith Canyon tributary near Connell | 1955-73 | .1 | 26 | 47 | -- | -- | 2-21-56 | [a]46 |
| 14013000 | Mill Creek near Walla Walla | 1914-17, 1940-73 | 829 | 1,850 | 2,620 | 3,330 | 4,180 | 12-23-64 | 3,240 |
| 013500 | Blue Creek near Walla Walla | 1940-71 | 318 | 613 | 752 | 850 | 942 | 1- 6-69 | 1,320 |
| 015900 | Spring Creek tributary near Walla Walla | 1955-73 | 17 | 100 | 207 | -- | -- | 12- 5-71 | 228 |
| 016000 | Dry Creek near Walla Walla | 1949-67 | 604 | 1,670 | 2,360 | -- | -- | 2-22-49 | 3,340 |
| 016500 | East Fork Touchet River near Dayton | 1956-68 | 818 | 2,080 | 3,160 | -- | -- | 12-23-64 | 5,450 |
| 016600 | Hatley Creek near Dayton | 1955-73 | 67 | 243 | 364 | 465 | -- | 1-19-71 | 253 |
| 016650 | Davis Hollow near Dayton | 1956-73 | 10 | 144 | 382 | -- | -- | 5- 9-56 | 305 |
| 017000 | Touchet River at Bolles | 1925-29, 1952-73 | 2,610 | 5,630 | 7,560 | 9,180 | 11,000 | 12-23-64 | 9,350 |
| 017040 | Thorn Hollow near Dayton | 1962-73 | 32 | 213 | -- | -- | -- | 12-22-64 | 218 |
| 017070 | East Fork McKay Creek near Huntsville | 1963-73 | 51 | 515 | -- | -- | -- | 2- 4-63 | 733 |
| 017200 | Badger Hollow near Clyde | 1955-73 | 46 | 392 | 799 | 1,260 | -- | 12-23-64 | [t]1,560 |
| 017500 | Touchet River near Touchet | 1941-59, 1965 | 3,480 | 7,870 | 10,700 | 13,100 | -- | 2-10-49 | 13,300 |
| 018500 | Walla Walla River near Touchet | 1952-73 | 6,300 | 17,400 | 27,000 | 36,400 | -- | 12-22-64 | 33,400 |
| 019100 | Walla Walla River tributary near Wallula | 1955-73 | .6 | 12 | 67 | 255 | -- | 12-22-64 | 320 |
| 034250 | Glade Creek tributary near Bickleton | 1961-73 | 8 | 30 | -- | -- | -- | 2- 3- 63 | 43 |
| 034270 | East Branch Glade Creek near Prosser | 1962-73 | .01 | 477 | -- | -- | -- | 1-29-65 | 478 |
| 034320 | Dead Canyon tributary near Alderdale | 1955-73 | .01 | 7 | 16 | 22 | -- | 12-22-64 | 17 |
| 034325 | Alder Creek near Bickleton | 1963-73 | 196 | 746 | -- | -- | -- | 12-22-64 | 973 |
| 107000 | Klickitat River above West Fork, near Glenwood | 1945-73 | 1,750 | 2,670 | 3,220 | 3,670 | 4,150 | 5-27-48 | 3,280 |
| 110000 | Klickitat River near Glenwood | 1910-71 | 3,070 | 4,960 | 5,990 | 6,780 | 7,600 | 12-22-33 | 9,870 |
| 111800 | West Prong Little Klickitat River near Goldendale | 1961-73 | 91 | 298 | -- | -- | -- | 12-22-64 | 569 |
| 112000 | Little Klickitat River near Goldendale | 1911-12, 1947-51, 1958-70 | 936 | 2,590 | 3,900 | -- | -- | 12-22-64 | 5,200 |
| 112200 | Little Klickitat River tributary near Goldendale | 1960-73 | 23 | 126 | -- | -- | -- | 12-22-64 | 229 |
| 112500 | Little Klickitat River near Wahkiacus | 1945-73 | 3,120 | 8,100 | 10,900 | 12,900 | 15,000 | 12-23-64 | 17,300 |
| 113000 | Klickitat River near Pitt | 1910-11, 1929-73 | 7,880 | 17,600 | 23,700 | 28,900 | 34,400 | 12-23-64 | 31,100 |

TABLE 1.--Discharges for selected flood frequencies, peak of record, and years of peak record, at gaging stations in Washington--Continued

| Station number | Station name | Years* of peak record | Flood discharge, in cubic feet per second, for indicated recurrence interval, in years | | | | | Peak discharge | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2-yr $Q_2$ | 10-yr $Q_{10}$ | 25-yr $Q_{25}$ | 50-yr $Q_{50}$ | 100-yr $Q_{100}$ | Date | ft³/s |
| 14121300 | White Salmon River below Cascade Creek, near Trout Lake | 1958-73 | 573 | 761 | 838 | -- | -- | 12-23-64 | 1,070 |
| 121400 | White Salmon River above Trout Lake Creek, near Trout Lake | 1960-69 | 758 | 1,040 | -- | -- | -- | 12-23-64 | 1,080 |
| 121500 | Trout Lake Creek near Trout Lake | 1910-11, 1960-69 | 1,580 | 2,620 | -- | -- | -- | 12-23-64 | 2,000 |
| 122000 | White Salmon River near Trout Lake | 1929-31, 1958-67 | 1,950 | 3,400 | -- | -- | -- | 11-20-62 | 3,860 |
| 123000 | White Salmon River at Husum | 1909-19, 1929-41, 1957-62 | 2,750 | 5,560 | 7,610 | -- | -- | 12-22-33 | 10,800 |
| 123500 | White Salmon River near Underwood | 1916-30, 1936-73 | 4,640 | 7,410 | 8,590 | 9,400 | 10,100 | 12-29-17 | 9,700 |
| 124500 | Little White Salmon River at Willard | 1945-61 | 2,810 | 3,740 | 4,100 | -- | -- | 12-15-46 | 4,140 |
| 125000 | Little White Salmon River near Willard | 1950-63 | 2,480 | 3,620 | 4,270 | -- | -- | 11-24-60 | 4,330 |
| 125200 | Rock Creek near Willard | 1949-68 | 188 | 348 | 450 | 537 | -- | 12-22-64 | 491 |
| 125500 | Little White Salmon River near Cook | 1957-73 | 2,950 | 6,160 | 8,700 | -- | -- | 1-21-72 | 9,250 |
| 126300 | Columbia River tributary at Home Valley | 1950-70 | 44 | 75 | 91 | 104 | -- | 12-23-64 | 103 |
| 127000 | Wind River above Trout Creek, near Carson | 1945-69 | 5,260 | 7,760 | 8,880 | 9,680 | -- | 2- 8-45 | 8,880 |
| 128500 | Wind River near Carson | 1935-73 | 13,200 | 21,100 | 24,700 | 27,200 | 29,700 | 1-20-72 | 31,400 |
| 143200 | Canyon Creek near Washougal | 1949-70 | 125 | 222 | 283 | 336 | -- | 2-17-49 | 281 |
| 143500 | Washougal River near Washougal | 1945-73 | 13,300 | 17,900 | 20,000 | 21,400 | 22,800 | 1-20-72 | 22,600 |
| 144000 | Little Washougal River near Washougal | 1951-68 | 1,250 | 2,020 | 2,410 | -- | -- | 12-22-64 | 2,430 |
| 144550 | Shanghai Creek near Hockinson | 1950-70 | 76 | 127 | 151 | 168 | -- | 1-25-64 | 127 |
| 144600 | Groeneveld Creek near Camas | 1958-73 | 41 | 70 | 88 | -- | -- | 12-22-64 | 103 |
| 211900 | Burntbridge Creek at Vancouver | 1949-71 | 81 | 131 | 148 | 158 | 167 | 12-11-55 | 176 |
| 212000 | Salmon Creek near Battleground | 1944-73 | 872 | 1,340 | 1,520 | 1,650 | 1,760 | 1-22-54 | 1,500 |
| 213200 | Lewis River near Trout Lake | 1959-72 | 5,640 | 9,650 | 13,300 | -- | -- | 1-20-72 | 15,600 |
| 213500 | Big Creek below Skookum Meadow, near Trout Lake | 1929-31, 1956-70 | 501 | 844 | 1,020 | -- | -- | 12-23-64 | 1,070 |
| 214000 | Rush Creek above Meadow Creek, near Trout Lake | 1956-65 | 479 | 940 | -- | -- | -- | 11-20-62 | 1,180 |
| 214500 | Meadow Creek below Lone Butte Meadow, near Trout Lake | 1929-31, 1956-65 | 272 | 450 | -- | -- | -- | 11-20-62 | 528 |
| 215000 | Rush Creek above falls, near Cougar | 1928-31, 1956-62, 1964-73 | 698 | 1,030 | -- | -- | -- | 12-21-72 | 2,750 |
| 215500 | Curly Creek near Cougar | 1956-70 | 359 | 911 | 1,440 | -- | -- | 11-20-62 | 1,880 |
| 216000 | Lewis River above Muddy River, near Cougar | 1928-34, 1955-70 | 9,030 | 16,800 | 21,600 | -- | -- | 12-21-33 | 27,000 |
| 216500 | Muddy River below Clear Creek, near Cougar | 1928-32, 1934, 1955-73 | 5,570 | 9,970 | 12,800 | 15,200 | -- | 12-21-33 | 17,500 |
| 216800 | Pine Creek near Cougar | 1958-70 | 971 | 1,590 | 1,930 | -- | -- | 11-20-62 | 1,840 |
| 218000 | Lewis River near Cougar | 1925-58 | 18,900 | 34,300 | 42,900 | 49,700 | 56,800 | 12-21-33 | 54,400 |

TABLE 1.--Discharges for selected flood frequencies, peak of record, and years of peak record, at gaging stations in Washington--Continued

| Station number | Station name | Years of peak record* | Flood discharge, in cubic feet per second, for indicated recurrence interval, in years | | | | | Peak discharge | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2-yr $Q_2$ | 10-yr $Q_{10}$ | 25-yr $Q_{25}$ | 50-yr $Q_{50}$ | 100-yr $Q_{100}$ | Date | $ft^3/s$ |
| 14218300 | Dog Creek at Cougar | 1956-73 | 297 | 453 | 534 | -- | -- | 1-20-72 | 724 |
| 219000 | Canyon Creek near Amboy | 1923-34 | 5,860 | 10,500 | -- | -- | -- | 12-21-33 | 11,700 |
| 219500 | Lewis River near Amboy | 1912-31 | 34,200 | 61,300 | 73,900 | 82,800 | -- | 12-18-17 | 79,300 |
| 219800 | Speelyai Creek near Cougar | 1960-73 | 1,550 | 2,620 | 3,300 | -- | -- | 11-20-62 | 3,600 |
| 221500 | Cedar Creek near Ariel | 1952-55, 1962-69 | 1,510 | 2,200 | -- | -- | -- | 11-20-62 | 2,230 |
| 222500 | East Fork Lewis River near Heisson | 1930-73 | 9,100 | 13,700 | 16,000 | 17,800 | 19,500 | 1-20-72 | 19,200 |
| 222700 | East Fork Lewis River tributary near Woodland | 1950-67 | 35 | 88 | 133 | 177 | -- | 12-11-55 | 192 |
| 223000 | Kalama River near Kalama | 1912, 1913, 1917-32 | 7,310 | 14,500 | 21,000 | -- | -- | 11-25-27 | 13,200 |
| 223500 | Kalama River below Italian Creek, near Kalama | 1947-73 | 9,790 | 13,800 | 16,100 | 17,800 | 19,600 | 1-20-72 | 17,900 |
| 223800 | Columbia River tributary at Carrolls | 1950-70 | 51 | 82 | 99 | 113 | -- | 12-11-55 | 112 |
| 224500 | Clear Fork Cowlitz River near Packwood | 1908-17, 1931-41 | 1,600 | 3,640 | -- | -- | -- | 12-22-33 | 8,030 |
| 225500 | Lake Creek near Packwood | 1912-17, 1919-24, 1931-42, 1950-54, 1960-73 | 421 | 795 | -- | -- | -- | 12-22-33 | 1,400 |
| 226500 | Cowlitz River at Packwood | 1912-19, 1930-73 | 12,600 | 23,200 | 29,800 | 35,300 | 41,300 | 12-21-33 | 36,000 |
| 226800 | Skate Creek tributary near Packwood | 1959-73 | 53 | 104 | 139 | -- | -- | 11-22-59 | 130 |
| 226900 | Skate Creek tributary No. 2 near Packwood | 1959-73 | 97 | 156 | 184 | -- | -- | 11-22-59 | 167 |
| 230000 | Johnson Creek near Packwood | 1908-13, 1919-21, 1923,1924, 1947,1948 | 1,340 | 2,610 | -- | -- | -- | 12-11-46 | 2,990 |
| 231100 | Mill Creek at Randle | 1950-70 | 88 | 114 | 118 | 120 | -- | 11-20-59 | 133 |
| 232000 | Niggerhead Creek near Randle | 1954-63 | 2,400 | 3,560 | -- | -- | -- | 1-12-53 | 4,150 |
| 232500 | Cispus River near Randle | 1911, 1930-41, 1943-73 | 7,370 | 11,700 | 13,200 | 14,100 | 14,900 | 12-22-33 | 20,000 |
| 233500 | Cowlitz River near Kosmos | 1949-68 | 25,700 | 38,600 | 46,200 | 52,300 | -- | 11-24-59 | 47,500 |
| 235000 | Cowlitz River at Mossyrock | 1913-17, 1927-32, 1934-35, 1948-60 | 26,600 | 46,900 | 61,700 | 75,200 | 91,100 | 12-23-33 | 83,500 |
| 235300 | Tilton River near Mineral | 1950-70 | 86 | 123 | 138 | 148 | -- | 12-11-55 | 142 |
| 235500 | West Fork Tilton River near Morton | 1951-71 | 2,040 | 3,600 | 4,650 | 5,570 | -- | 12-11-55 | 6,620 |
| 236200 | Tilton River above Bear Canyon Creek, near Cinebar | 1957-73 | 10,700 | 17,500 | 20,700 | -- | -- | 1-20-72 | 17,600 |
| 236500 | Tilton River near Cinebar | 1942-59 | 10,800 | 18,300 | 22,600 | 26,100 | -- | 12-11-55 | 23,200 |
| 237000 | Klickitat Creek at Mossyrock | 1949-72 | 104 | 159 | 181 | 195 | 208 | 1-25-64 | 170 |
| 237500 | Winston Creek near Silver Creek | 1950-70 | 1,170 | 2,170 | 2,820 | 3,390 | -- | 12- 9-53 | 3,510 |
| 238000 | Cowlitz River below Mayfield Dam | 1935-73 | 32,400 | 49,200 | 57,700 | 64,100 | 70,600 | 12-13-46 | [u]67,000 |
| 239000 | Salmon Creek near Toledo | 1962-71 | 3,480 | 6,480 | -- | -- | -- | 1-25-64 | 7,480 |
| 239100 | North Fork Lacamas Creek near Ethel | 1950-69 | 24 | 34 | 38 | 41 | -- | 12-11-55<br>1-25-64<br>12-22-64 | 34 |

TABLE 1.--Discharges for selected flood frequencies, peak of record, and years of peak record, at gaging stations in Washington--Continued

| Station number | Station name | Years * of peak record | Flood discharge, in cubic feet per second, for indicated recurrence interval, in years | | | | | Peak discharge | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2-yr $Q_2$ | 10-yr $Q_{10}$ | 25-yr $Q_{25}$ | 50-yr $Q_{50}$ | 100-yr $Q_{100}$ | Date | ft$^3$/s |
| 4239700 | Olequa Creek near Winlock | 1950-69 | 22 | 37 | 45 | 52 | -- | 1-25-64 | 47 |
| 241500 | South Fork Toutle River near Toutle | 1940-57 | 6,150 | 9,660 | 11,900 | 13,700 | -- | 12- 9-53 | 14,300 |
| 242500 | Toutle River near Silver Lake | 1910,1912,1921, 1923, 1930-73 | 16,100 | 25,000 | 30,000 | 34,100 | 38,400 | 1-20-72 | 38,000 |
| 242600 | Toutle River tributary near Castle Rock | 1950-70 | 39 | 78 | 101 | 120 | -- | 2- 3-63 1-25-64 | 99 |
| 243000 | Cowlitz River at Castle Rock | 1928-73 | 51,300 | 79,500 | 93,500 | 104,000 | 114,000 | 12-23-33 | 139,000 |
| 243500 | Delameter Creek near Castle Rock | 1950-69 | 1,260 | 2,120 | 2,580 | 2,930 | -- | 1-19-62 | 2,420 |
| 245000 | Coweman River near Kelso | 1951-73 | 4,660 | 7,320 | 8,900 | 10,200 | -- | 11-20-62 | 9,720 |
| 247500 | Elochoman River near Cathlamet | 1941-71 | 4,860 | 7,040 | 7,980 | 8,620 | 9,230 | 11-20-62 | [u]8,530 |
| 248100 | Risk Creek near Skamokawa | 1949-70 | 79 | 146 | 177 | 200 | -- | 11-22-59 | 151 |
| 249000 | Grays River above South Fork, near Grays River | 1956-73 | 5,430 | 7,870 | 8,880 | 9,550 | 10,200 | 1-20-72 | 9,280 |
| 250500 | West Fork Grays River near Grays River | 1950-69 | 2,400 | 3,840 | 4,660 | 5,310 | -- | 11-19-62 | 4,770 |

*Water years, which include period of October 1 through following September 30.

[a]Approximately.

[b]Probably the largest flood since at least 1916, reported by resident.

[c]First or second largest flood since 1910, reported by resident.

[d]Probably the largest flood since at least 1914, reported by resident.

[e]High floods occurred in 1948, 1950, 1957. Information from residents indicates the 1950 flood may have een in excess of a thousand cubic feet per second.

[f]Maximum flow since 1920, reported by resident.

[g]Possibly highest peak since 1943, as reported by resident.

[h]Highest peak since 1932, and possibly since 1914, reported by resident.

[i]Highest peak since at least 1946, reported by resident.

[j]Possibly highest peak since 1945, reported by resident.

[k]Possibly highest peak since at least 1934, reported by resident.

[l]Highest peak since at least 1952, reported by resident.

[m]Largest flood since 1949, as reported by resident.

[n]A flood in 1956 is estimated as 380 ft$^3$/s.

[o]Second largest flood since at least 1928, as reported by resident.

[p]Flood of August 24, 1954 was 1,600 ft$^3$/s at site 1 mile downstream.

[q]Largest flood since 1951, as reported by resident.

[r]Reported largest flood in 65 years by resident.

[s]Reported largest flood since 1917 by resident.

[t]Reported largest flood since 1932 by resident.

[u]Flood in December 1933 was larger.

TABLE 2.--Indices for basin and climatic characteristics used in multiple regressions

| Station number | Drainage area ($mi^2$) | Mean basin elevation (ft) | Forest cover (percent of basin) | Annual precipitation (inches) | Minimum mean daily January temperature (°F) | Main channel slope (ft/mi) | Percent area of lakes | Channel length (mi) | Stream source elevation (ft) | Gage elevation (ft) |
|---|---|---|---|---|---|---|---|---|---|---|
| | A | E | F | P | T | SLP | LK | L | SE | GE |
| 12009500 | 11.7 | 546 | 96 | 87 | 30 | 58 | 0.01 | 8.5 | 800 | 15 |
| 010000 | 54.8 | 910 | 77 | 109 | 30 | 42 | .01 | 20.5 | 2,650 | 24 |
| 010500 | 16.4 | 480 | 93 | 99 | 31 | 43 | .01 | 15.5 | 2,150 | 80 |
| 010600 | 2.15 | 750 | 90 | 110 | 31 | 435 | .01 | 3.7 | 1,780 | 24 |
| 011000 | 18 | 689 | 97 | 110 | 31 | 52 | .01 | 8.0 | 700 | 60 |
| 011100 | .46 | 250 | 95 | 120 | 33 | 107 | .01 | 1.11 | 255 | 30 |
| 011500 | 41.4 | 754 | 79 | 84 | 30 | 95 | .01 | 11.6 | 2,400 | 154 |
| 012000 | 20.4 | 1,110 | 92 | 100 | 30 | 113 | .01 | 9.3 | 2,250 | 155 |
| 012200 | 1.79 | 340 | 85 | 79 | 30 | 117 | .01 | 2.5 | 830 | 30 |
| 013500 | 130 | 641 | 84 | 87 | 30 | 16 | .01 | 27.3 | 2,400 | 569 |
| 014500 | 27.8 | 585 | 88 | 100 | 30 | 45 | .01 | 12.4 | 1,760 | 155 |
| 015500 | 29.8 | 660 | 99 | 72 | 30 | 38 | .01 | 10.1 | 1,680 | 190 |
| 016700 | 2.05 | 460 | 95 | 102 | 31 | 213 | .01 | 2.0 | 940 | 120 |
| 017000 | 219 | 250 | 93 | 84 | 30 | 5 | .01 | 57.5 | 1,680 | 7 |
| 019600 | 1.98 | 680 | 95 | 76 | 32 | 85 | .01 | 2.65 | 960 | 426 |
| 020000 | 113 | 1,000 | 90 | 91 | 32 | 44 | .01 | 26 | 2,400 | 302 |
| 020500 | 46.7 | 810 | 95 | 80 | 30 | 17 | .01 | 13.4 | 970 | 350 |
| 021000 | 48.0 | 830 | 82 | 80 | 32 | 29 | .01 | 23.7 | 1,840 | 255 |
| 024000 | 42.4 | 1,280 | 91 | 69 | 29 | 118 | .03 | 14.9 | 3,760 | 540 |
| 024500 | 31.5 | 1,220 | 91 | 62 | 30 | 83 | .01 | 13.4 | 2,560 | 380 |
| 025000 | 155 | 900 | 90 | 57 | 30 | 35 | .02 | 33.6 | 3,760 | 190 |
| 026000 | 61.7 | 1,700 | 89 | 68 | 29 | 90 | .01 | 18.1 | 3,440 | 301 |
| 026300 | .58 | 420 | 95 | 46 | 33 | 217 | .01 | 1.2 | 540 | 245 |
| 027500 | 895 | 800 | 80 | 63 | 32 | 13 | .04 | 67.9 | 2,400 | 123 |
| 030000 | 24.8 | 525 | 98 | 62 | 31 | 68 | .01 | 10 | 790 | 70 |
| 031000 | 1,294 | 700 | 78 | 60 | 32 | 8 | .12 | 94.5 | 2,400 | 24 |
| 032500 | 64.9 | 410 | 89 | 72 | 32 | 21 | .63 | 19.8 | 480 | 20 |
| 034200 | 65.9 | 650 | 99 | 98 | 30 | 13 | .77 | 14.4 | 2,890 | 205 |
| 034700 | .33 | 1,600 | 90 | 135 | 28 | 1,720 | .01 | 1.15 | 2,640 | 960 |
| 035000 | 299 | 500 | 93 | 128 | 29 | 14 | .25 | 28 | 2,890 | 0 |
| 035500 | 70.7 | 2,000 | 89 | 201 | 27 | 64 | .05 | 22.7 | 4,050 | 492 |
| 036000 | 74.1 | 1,950 | 86 | 199 | 27 | 58 | .05 | 25.3 | 4,050 | 401 |
| 037400 | 155 | 1,710 | 90 | 150 | 28 | 17 | .03 | 60.8 | 4,050 | 40 |
| 039000 | 130 | 1,000 | 97 | 155 | 28 | 23 | .02 | 36 | 3,360 | 120 |
| 039050 | .56 | 310 | 95 | 110 | 31 | 147 | .01 | .90 | 380 | 100 |
| 039100 | .15 | 290 | 90 | 110 | 31 | 127 | .01 | .95 | 400 | 100 |
| 039400 | .77 | 1,080 | 95 | 135 | 28 | 1,140 | .01 | 1.9 | 2,800 | 200 |
| 040000 | 142 | 1,500 | 98 | 136 | 28 | 30 | .01 | 34.9 | 3,840 | 70 |
| 040500 | 445 | 1,700 | 89 | 152 | 28 | 31 | .01 | 48.7 | 5,820 | 40 |
| 041000 | 208 | 3,000 | 79 | 167 | 26 | 91 | .11 | 34.4 | 7,700 | 320 |
| 041200 | 253 | 2,440 | 85 | 160 | 27 | 66 | .17 | 44.8 | 7,700 | 164 |
| 041500 | 83.8 | 2,900 | 88 | 99 | 27 | 147 | .49 | 16.9 | 5,400 | 1,060 |
| 041600 | .42 | 1,840 | 95 | 98 | 29 | 1,250 | .01 | 1.1 | 2,560 | 1,100 |
| 042700 | 2.03 | 650 | 95 | 120 | 32 | 272 | .01 | 2.45 | 1,090 | 240 |
| 042900 | 1.67 | 530 | 95 | 110 | 32 | 149 | .01 | 2.60 | 880 | 170 |
| 043100 | 86.3 | 440 | 100 | 95 | 32 | 12 | 1.20 | 17.6 | 800 | 50 |
| 043300 | 51.2 | 805 | 100 | 124 | 32 | 30 | .01 | 18.4 | 2,300 | 50 |
| 043430 | 14 | 1,280 | 100 | 90 | 32 | 297 | .01 | 6.5 | 3,700 | 10 |
| 044000 | 48.6 | 2,190 | 98 | 91 | 29 | 242 | 16.7 | 11.7 | 2,000 | 580 |
| 045500 | 269 | 3,700 | 82 | 112 | 25 | 64 | .24 | 36.6 | 5,200 | 200 |

TABLE 2.--Indices for basin and climatic characteristics used in multiple regressions--Continued

| Station number | Drainage area ($mi^2$) A | Mean basin elevation (ft) E | Forest cover (percent of basin) F | Annual precipitation (inches) P | Minimum mean daily January temperature (°F) T | Main channel slope (ft/mi) SLP | Percent area of lakes LK | Channel length (mi) L | Stream source elevation (ft) SE | Gage elevation (ft) GE |
|---|---|---|---|---|---|---|---|---|---|---|
| 12046800 | 0.69 | 1,110 | 85 | 27 | 31 | 590 | 0.01 | 2.45 | 260 | 28 |
| 047100 | 4.77 | 780 | 65 | 23 | 29 | 274 | .01 | 5 | 750 | 120 |
| 047500 | 15.5 | 1,550 | 97 | 41 | 28 | 298 | .01 | 9 | 5,450 | 225 |
| 048000 | 156 | 4,500 | 83 | 66 | 26 | 196 | .07 | 22.4 | 7,000 | 569 |
| 049400 | 2.96 | 1,490 | 95 | 32 | 29 | 583 | .01 | 4.0 | 2,450 | 30 |
| 050500 | 11.2 | 1,800 | 91 | 43 | 29 | 435 | .01 | 6.5 | 3,050 | 220 |
| 052400 | 6.78 | 1,450 | 95 | 60 | 28 | 127 | 1.00 | 4.75 | 740 | 129 |
| 053000 | 93.5 | 4,700 | 80 | 97 | 25 | 204 | .12 | 21.6 | 6,000 | 321 |
| 053400 | .62 | 1,770 | 95 | 60 | 29 | 1,840 | .01 | 1.63 | 3,400 | 140 |
| 054000 | 66.5 | 4,700 | 95 | 113 | 26 | 150 | .3 | 19.7 | 5,000 | 241 |
| 054500 | 51.3 | 3,830 | 89 | 110 | 27 | 325 | .5 | 11.8 | 5,200 | 510 |
| 054600 | 21.6 | 2,660 | 88 | 103 | 28 | 384 | .29 | 10 | 5,100 | 500 |
| 056300 | .82 | 500 | 95 | 78 | 34 | 341 | .01 | 2.05 | 610 | 20 |
| 056500 | 57.2 | 3,700 | 92 | 161 | 26 | 190 | .18 | 13.9 | 6,400 | 762 |
| 057500 | 93.7 | 3,100 | 93 | 145 | 27 | 94 | 6.4 | 23.5 | 6,400 | 486 |
| 060000 | 63.4 | 2,505 | 98 | 161 | 27 | 80 | .17 | 18 | 4,300 | 456 |
| 060500 | 76.3 | 2,100 | 98 | 153 | 28 | 64 | .27 | 24.5 | 4,100 | 110 |
| 061200 | .76 | 870 | 95 | 110 | 30 | 408 | .01 | 1.8 | 1,600 | 550 |
| 063000 | 3.16 | 924 | 100 | 57 | 34 | 118 | .01 | 3.4 | 2,060 | 395 |
| 065500 | 1.51 | 1,120 | 99 | 61 | 34 | 295 | .01 | 1.85 | 880 | 751 |
| 066000 | 5.99 | 930 | 96 | 61 | 34 | 153 | 1.68 | 4.45 | 880 | 540 |
| 067500 | 15.0 | 684 | 97 | 62 | 34 | 39 | 3.54 | 10.1 | 880 | 353 |
| 068500 | 18.4 | 376 | 98 | 61 | 34 | 36 | .71 | 7.6 | 440 | 55 |
| 070000 | 5.01 | 289 | 80 | 37 | 34 | 43 | .01 | 3.7 | 170 | 20 |
| 072000 | 15.3 | 400 | 98 | 50 | 34 | 100 | 4.59 | 6.1 | 900 | 50 |
| 073500 | 6.47 | 316 | 77 | 54 | 34 | 58 | .16 | 7.6 | 460 | 316 |
| 076500 | 39.3 | 420 | 96 | 84 | 30 | 26 | 1.08 | 8.4 | 480 | 205 |
| 078400 | 17.4 | 600 | 98 | 59 | 31 | 54 | 4.85 | 8.6 | 720 | 110 |
| 078600 | 1.12 | 470 | 95 | 57 | 31 | 289 | .01 | 1.9 | 1,080 | 60 |
| 079000 | 89.8 | 1,340 | 88 | 61 | 29 | 50 | .63 | 27.8 | 3,280 | 350 |
| 080000 | 160 | 950 | 78 | 57 | 31 | 24 | .67 | 50.3 | 3,280 | 95 |
| 081000 | 24.6 | 189 | 61 | 50 | 31 | 16 | 6.84 | 9.0 | 325 | 25 |
| 081300 | 2.28 | 280 | 80 | 42 | 31 | 37 | .01 | 2.5 | 285 | 205 |
| 082500 | 133 | 4,020 | 82 | 94 | 25 | 192 | .38 | 25.9 | 14,100 | 1,450 |
| 083000 | 75.2 | 2,740 | 92 | 98 | 27 | 155 | .67 | 13 | 4,240 | 1,340 |
| 084000 | 249 | 3,300 | 85 | 92 | 26 | 120 | .34 | 32.6 | 14,100 | 1,014 |
| 084500 | 28.0 | 2,600 | 99 | 81 | 28 | 145 | .37 | 8.6 | 3,800 | 978 |
| 087000 | 80.7 | 2,300 | 93 | 71 | 27 | 117 | .01 | 18.4 | 4,930 | 620 |
| 088000 | 34.5 | 1,600 | 97 | 54 | 28 | 177 | 1.78 | 11.4 | 580 | 518 |
| 090200 | 86.8 | 350 | 45 | 37 | 34 | 17 | 1.00 | 24.6 | 425 | 310 |
| 090400 | 5.26 | 410 | 15 | 35 | 33 | 14 | .01 | 4.4 | 460 | 315 |
| 090500 | 73.8 | 420 | 15 | 36 | 33 | 13 | .02 | 20.7 | 320 | 280 |
| 092000 | 92.8 | 4,100 | 70 | 105 | 24 | 630 | .55 | 15.5 | 14,100 | 1,640 |
| 093000 | 25.9 | 1,500 | 94 | 53 | 27 | 126 | 2.71 | 12.9 | 1,800 | 583 |
| 093500 | 172 | 3,000 | 90 | 85 | 26 | 214 | .82 | 31.1 | 14,100 | 352 |
| 094000 | 78.9 | 4,000 | 68 | 92 | 24 | 289 | .26 | 22.3 | 9,200 | 1,213 |
| 095000 | 79.5 | 2,300 | 97 | 65 | 28 | 174 | .64 | 16.5 | 5,440 | 430 |
| 096500 | 438 | 2,200 | 84 | 75 | 28 | 105 | .78 | 45.3 | 14,100 | 40 |
| 096800 | 1.01 | 4,410 | 95 | 60 | 21 | 1,480 | .01 | 2.4 | 6,080 | 2,650 |
| 097000 | 216 | 4,700 | 77 | 80 | 22 | 139 | .47 | 32.7 | 14,400 | 1,725 |

TABLE 2.--Indices for basin and climatic characteristics used in multiple regressions--Continued

| Station number | Drainage area ($mi^2$) A | Mean basin elevation (ft) E | Forest cover (percent of basin) F | Annual precipitation (inches) P | Minimum mean daily January temperature (°F) T | Main channel slope (ft/mi) SLP | Percent area of lakes LK | Channel length (mi) L | Stream source elevation (ft) SE | Gage elevation (ft) GE |
|---|---|---|---|---|---|---|---|---|---|---|
| 12097500 | 73.5 | 4,200 | 93 | 94 | 22 | 143 | 0.28 | 20.3 | 6,130 | 1,725 |
| 097700 | 2.35 | 2,810 | 25 | 70 | 27 | 860 | .01 | 2.3 | 4,000 | 1,440 |
| 100000 | 427 | 3,750 | 82 | 78 | 24 | 70 | .35 | 56.4 | 14,400 | 30 |
| 102200 | 2.15 | 430 | 10 | 37 | 32 | 10 | .01 | 3.2 | 780 | 380 |
| 102800 | .27 | 350 | 70 | 42 | 29 | 215 | .03 | .9 | 350 | 240 |
| 103200 | .78 | 350 | 95 | 39 | 32 | 117 | .01 | 1.6 | 430 | 235 |
| 103500 | 11.5 | 3,370 | 61 | 97 | 20 | 557 | .01 | 4.6 | 3,840 | 1,950 |
| 104000 | 4.67 | 3,190 | 99 | 84 | 20 | 630 | .44 | 3.6 | 4,440 | 1,760 |
| 104500 | 96.2 | 3,190 | 91 | 88 | 20 | 120 | .02 | 16.2 | 5,520 | 1,480 |
| 104700 | 3.23 | 3,200 | 100 | 70 | 24 | 760 | .01 | 3.1 | 4,100 | 1,480 |
| 105000 | 8.56 | 3,220 | 82 | 99 | 23 | 377 | .01 | 4.6 | 4,040 | 1,900 |
| 105710 | 16.5 | 2,890 | 61 | 101 | 24 | 198 | .78 | 10.1 | 4,160 | 1,250 |
| 106500 | 230 | 3,100 | 90 | 85 | 25 | 41 | .01 | 34.2 | 5,520 | 913 |
| 107200 | 2.17 | 1,330 | 95 | 70 | 30 | 352 | .01 | 3.6 | 2,890 | 855 |
| 108500 | 27.4 | 883 | 47 | 48 | 30 | 54 | .01 | 14.1 | 2,860 | 310 |
| 112500 | 59.2 | 496 | 81 | 48 | 30 | 19 | 4.01 | 12.5 | 420 | 170 |
| 112600 | 66.7 | 450 | 80 | 47 | 34 | 25 | 1.70 | 14.1 | 420 | 70 |
| 113000 | 399 | 2,400 | 70 | 70 | 28 | 33 | .60 | 64.3 | 5,520 | 60 |
| 113200 | 3.14 | 420 | 70 | 41 | 31 | 110 | 2.55 | 2.85 | 465 | 82 |
| 113300 | .30 | 420 | 50 | 40 | 31 | 25 | .01 | .83 | 500 | 240 |
| 113500 | 9.3 | 3,830 | 78 | 118 | 21 | 317 | 5.39 | 3.7 | 3,600 | 2,360 |
| 114000 | 6.0 | 3,500 | 78 | 118 | 21 | 317 | .01 | 4.0 | 4,500 | 2,300 |
| 114500 | 25.4 | 3,460 | 71 | 124 | 22 | 189 | 1.98 | 7.1 | 3,600 | 1,880 |
| 115000 | 40.7 | 3,230 | 77 | 120 | 23 | 116 | 1.48 | 12.2 | 3,600 | 1,560 |
| 115300 | .89 | 3,030 | 70 | 103 | 28 | 1,540 | .01 | 1.8 | 4,640 | 1,590 |
| 115500 | 13.4 | 3,360 | 87 | 119 | 25 | 386 | .01 | 6.4 | 4,500 | 1,600 |
| 116100 | .19 | 1,420 | 99 | 90 | 33 | 155 | .09 | 1.55 | 1,560 | 1,040 |
| 117000 | 17.2 | 2,300 | 100 | 82 | 29 | 289 | .01 | 8.2 | 3,600 | 940 |
| 119600 | 6.8 | 770 | 91 | 45 | 29 | 221 | .01 | 6.4 | 1,300 | 50 |
| 119800 | 3.05 | 360 | 75 | 45 | 32 | 95 | .01 | 2.6 | 450 | 180 |
| 120000 | 12 | 305 | 80 | 45 | 32 | 65 | .01 | 3.9 | 380 | 17 |
| 121000 | 27 | 940 | 91 | 66 | 30 | 144 | .37 | 10.6 | 2,700 | 210 |
| 123000 | 10.7 | 375 | 87 | 43 | 32 | 42 | 1.78 | 7.5 | 600 | 210 |
| 123300 | 2.46 | 450 | 90 | 45 | 31 | 127 | .01 | 3.25 | 510 | 111 |
| 124000 | 13.0 | 365 | 92 | 45 | 32 | 74 | .09 | 8.6 | 640 | 50 |
| 125000 | 150 | 600 | 87 | 53 | 31 | 23 | 5.70 | 30.1 | 2,700 | 23 |
| 126000 | 24.6 | 390 | 82 | 38 | 33 | 49 | 2.08 | 9.9 | 550 | 70 |
| 126500 | 212 | 500 | 80 | 49 | 31 | 16 | 4.26 | 34.3 | 2,700 | 17 |
| 130500 | 135 | 3,870 | 95 | 119 | 21 | 211 | 1.39 | 16.6 | 4,950 | 1,030 |
| 131000 | 96.5 | 3,600 | 95 | 126 | 21 | 173 | .53 | 18.6 | 6,000 | 1,040 |
| 132700 | .95 | 2,260 | 95 | 97 | 24 | 2,010 | .01 | 1.9 | 4,800 | 662 |
| 133000 | 355 | 3,800 | 85 | 122 | 21 | 98 | .91 | 33.8 | 4,950 | 575 |
| 133500 | 10.6 | 3,500 | 62 | 170 | 21 | 673 | 3.88 | 6.9 | 7,140 | 1,350 |
| 134000 | 146 | 3,800 | 85 | 151 | 21 | 132 | .42 | 27 | 5,880 | 525 |
| 134500 | 535 | 3,700 | 85 | 128 | 22 | 87 | .74 | 42.4 | 4,950 | 209 |
| 135000 | 19 | 2,660 | 75 | 88 | 26 | 300 | .85 | 9.35 | 4,500 | 174 |
| 135500 | 8.31 | 1,800 | 90 | 75 | 28 | 610 | .01 | 5.9 | 4,400 | 970 |
| 137500 | 74.5 | 3,120 | 83 | 120 | 25 | 80 | .41 | 19.2 | 4,250 | 750 |
| 141000 | 56.4 | 625 | 91 | 48 | 31 | 40 | 2.12 | 15.1 | 440 | 100 |
| 141300 | 154 | 3,710 | 75 | 137 | 23 | 117 | 1.30 | 29.6 | 6,020 | 780 |

TABLE 2.--Indices for basin and climatic characteristics used in multiple regressions--Continued

| Station number | Drainage area ($mi^2$) A | Mean basin elevation (ft) E | Forest cover (percent of basin) F | Annual precipitation (inches) P | Minimum mean daily January temperature (°F) T | Main channel slope (ft/mi) SLP | Percent area of lakes LK | Channel length (mi) L | Stream source elevation (ft) SE | Gage elevation (ft) GE |
|---|---|---|---|---|---|---|---|---|---|---|
| 12141500 | 169 | 3,500 | 74 | 132 | 23 | 91 | 1.31 | 37.2 | 6.020 | 460 |
| 142000 | 64 | 3,200 | 77 | 131 | 26 | 85 | .79 | 17.3 | 5,700 | 1,130 |
| 143000 | 95.7 | 3,100 | 75 | 119 | 26 | 68 | 1.67 | 24.2 | 5,700 | 470 |
| 143300 | .15 | 2,850 | 70 | 121 | 21 | 2,800 | .01 | 1.15 | 4,800 | 1,900 |
| 143310 | .34 | 3,900 | 20 | 121 | 26 | 2,530 | .01 | 1.45 | 5,320 | 1,900 |
| 143400 | 41.6 | 3,390 | 80 | 120 | 22 | 760 | .31 | 2.25 | 5,450 | 1,480 |
| 144000 | 81.7 | 2,900 | 81 | 110 | 25 | 102 | .38 | 27.2 | 5,450 | 432 |
| 144500 | 375 | 3,300 | 76 | 118 | 25 | 72 | 1.24 | 44.8 | 6,020 | 120 |
| 145500 | 30.6 | 1,330 | 99 | 77 | 29 | 179 | .01 | 12.5 | 3,000 | 250 |
| 146000 | 15.5 | 410 | 90 | 47 | 31 | 52 | .01 | 8.4 | 560 | 70 |
| 147000 | 17.1 | 781 | 97 | 53 | 30 | 50 | .24 | 11.2 | 1,580 | 120 |
| 147500 | 39.9 | 2,590 | 73 | 97 | 28 | 103 | .04 | 15.2 | 5,640 | 600 |
| 148000 | 19.7 | 2,940 | 59 | 112 | 27 | 162 | 7.12 | 10.2 | 2,980 | 1,300 |
| 148100 | 2.19 | 2,290 | 99 | 80 | 29 | 610 | .01 | 4.1 | 3,760 | 1,200 |
| 148500 | 81.4 | 2,300 | 73 | 94 | 28 | 115 | 1.80 | 18.2 | 5,640 | 348 |
| 149000 | 603 | 2,400 | 79 | 99 | 26 | 40 | .70 | 60.8 | 6,020 | 50 |
| 152500 | 54.5 | 1,500 | 96 | 68 | 29 | 46 | .19 | 20.5 | 4,400 | 340 |
| 153000 | 17.0 | 376 | 94 | 42 | 30 | 40 | .09 | 8.7 | 560 | 200 |
| 156400 | .97 | 300 | 10 | 38 | 34 | 193 | .01 | 1.8 | 310 | 212 |
| 157000 | 15.4 | 220 | 75 | 37 | 31 | 78 | .07 | 6.0 | 395 | 28 |
| 161000 | 119 | 2,600 | 94 | 106 | 25 | 46 | .09 | 36.2 | 6,610 | 310 |
| 162500 | 199 | 2,300 | 94 | 94 | 26 | 43 | .06 | 47.2 | 6,610 | 80 |
| 164000 | 46.2 | 1,400 | 92 | 91 | 29 | 132 | .88 | 18.7 | 4,240 | 103 |
| 165000 | 20.0 | 2,530 | 70 | 100 | 24 | 308 | .01 | 10.2 | 6,600 | 490 |
| 166500 | 65.9 | 2,540 | 98 | 89 | 30 | 101 | .01 | 22.6 | 4,000 | 220 |
| 167000 | 262 | 2,300 | 92 | 83 | 28 | 33 | .01 | 42 | 3,210 | 89 |
| 168500 | 52.0 | 1,290 | 91 | 64 | 30 | 75 | 2.49 | 16.3 | 1,310 | 120 |
| 169500 | 7.52 | 270 | 60 | 37 | 36 | 74 | 3.46 | 6.0 | 580 | 55 |
| 172000 | 63.2 | 4,400 | 76 | 74 | 18 | 115 | .01 | 18.5 | 3,900 | 1,600 |
| 172500 | 780 | 4,800 | 78 | 75 | 16 | 38 | .21 | 56.0 | 3,900 | 1,250 |
| 173500 | 206 | 5,700 | 79 | 77 | 18 | 194 | .05 | 19.6 | 6,690 | 1,640 |
| 174000 | 210 | 5,700 | 79 | 77 | 18 | 190 | .06 | 20.5 | 6,690 | 1,554 |
| 174500 | 999 | 4,990 | 78 | 75 | 17 | 34 | .17 | 59 | 3,900 | 1,190 |
| 175500 | 105 | 5,800 | 61 | 129 | 22 | 257 | .11 | 15.2 | 6,330 | 1,220 |
| 176000 | 114 | 5,600 | 63 | 128 | 22 | 218 | .10 | 18.2 | 6,330 | 1,085 |
| 177500 | 22.0 | 5,000 | 84 | 88 | 24 | 560 | .46 | 7.8 | 6,640 | 907 |
| 178100 | 27.9 | 4,140 | 77 | 125 | 26 | 578 | .31 | 7.7 | 7,280 | 1,080 |
| 181100 | 2.36 | 6,240 | 1 | 154 | 16 | 876 | .05 | 2.6 | 7,280 | 5,290 |
| 182500 | 168 | 4,400 | 78 | 131 | 23 | 156 | .17 | 28.6 | 8,260 | 380 |
| 186000 | 152 | 3,700 | 81 | 139 | 21 | 125 | .14 | 24.5 | 7,360 | 930 |
| 187500 | 293 | 3,800 | 80 | 128 | 21 | 89 | .08 | 34.4 | 7,360 | 525 |
| 189000 | 335 | 4,500 | 74 | 132 | 20 | 96 | .16 | 42 | 9,050 | 530 |
| 189400 | 1.30 | 1,620 | 80 | 79 | 28 | 842 | .01 | 2.6 | 3,160 | 485 |
| 189500 | 714 | 3,900 | 79 | 125 | 21 | 69 | .11 | 54.9 | 7,360 | 266 |
| 196000 | 10.7 | 1,280 | 99 | 58 | 29 | 203 | .01 | 7.1 | 1,350 | 125 |
| 196500 | 34.2 | 2,310 | 88 | 77 | 31 | 143 | .65 | 12.6 | 4,320 | 90 |
| 197200 | 1.82 | 1,970 | 90 | 60 | 31 | 1,080 | .01 | 3.6 | 3,870 | 135 |
| 199800 | 3.56 | 2,700 | 62 | 60 | 33 | 435 | .01 | 3.8 | 4,000 | 1,700 |
| 200700 | 2.58 | 490 | 70 | 35 | 37 | 166 | .01 | 2.9 | 700 | 300 |
| 200800 | 2.35 | 1,220 | 95 | 48 | 31 | 398 | .01 | 2.35 | 1,980 | 480 |

TABLE 2.--Indices for basin and climatic characteristics used in multiple regressions--Continued

| Station number | Drainage area (mi$^2$) A | Mean basin elevation (ft) E | Forest cover (percent of basin) F | Annual precipitation (inches) P | Minimum mean daily January temperature (°F) T | Main channel slope (ft/mi) SLP | Percent area of lakes LK | Channel length (mi) L | Stream source elevation (ft) SE | Gage elevation (ft) GE |
|---|---|---|---|---|---|---|---|---|---|---|
| 12201500 | 87.8 | 904 | 87 | 49 | 30 | 14 | 1.82 | 22.2 | 1,650 | 45 |
| 204400 | 1.15 | 4,070 | 95 | 80 | 22 | 1,700 | .01 | 2.2 | 5,700 | 1,750 |
| 205000 | 105 | 4,300 | 71 | 109 | 19 | 106 | .20 | 17.6 | 6,400 | 1,245 |
| 209000 | 103 | 3,000 | 84 | 92 | 25 | 58 | .30 | 25.8 | 5,300 | 385 |
| 209500 | 23.1 | 3,020 | 90 | 93 | 24 | 334 | .10 | 9.5 | 5,600 | 400 |
| 210500 | 584 | 3,000 | 86 | 92 | 22 | 62 | .24 | 43.1 | 6,400 | 204 |
| 211500 | 648 | 2,760 | 82 | 88 | 23 | 41 | .24 | 63.1 | 6,400 | 24 |
| 212000 | 22.3 | 154 | 20 | 42 | 28 | 23 | 1.26 | 8.2 | 260 | 110 |
| 212700 | .74 | 290 | 25 | 40 | 29 | 78 | .01 | 1.45 | 320 | 200 |
| 212800 | .24 | 230 | 20 | 40 | 29 | 115 | .01 | 1.1 | 320 | 202 |
| 395800 | 4.75 | 2,430 | 85 | 36 | 17 | 60 | .01 | 5.2 | 3,120 | 2,240 |
| 395900 | 16.8 | 2,490 | 86 | 36 | 16 | 67 | 1.49 | 8.7 | 3,120 | 2,180 |
| 396000 | 68.3 | 3,650 | 99 | 38 | 16 | 109 | .42 | 16.2 | 5,170 | 2,070 |
| 396100 | 16.8 | 3,630 | 99 | 37 | 17 | 167 | .01 | 11.2 | 5,550 | 2,010 |
| 396450 | 11.3 | 3,510 | 99 | 29 | 17 | 225 | .01 | 7.7 | 3,600 | 2,100 |
| 396900 | 70.2 | 4,760 | 100 | 45 | 18 | 140 | 1.70 | 17.4 | 6,100 | 2,557 |
| 398900 | 450 | 4,000 | 92 | 30 | 14 | 62 | .02 | 36.6 | 7,890 | 2,000 |
| 399900 | 140 | 3,700 | 90 | 25 | 15 | 130 | .01 | 23 | 5,000 | 2,250 |
| 400500 | 225 | 4,120 | 96 | 25 | 15 | 93 | .05 | 34.8 | 5,000 | 1,295 |
| 401500 | 2,220 | 4,560 | 96 | 27 | 13 | 20 | .21 | 125.4 | 6,000 | 1,837 |
| 403700 | 1.18 | 4,560 | 80 | 24 | 14 | 645 | .01 | 1.8 | 5,650 | 4,025 |
| 405400 | 11.9 | 3,180 | 99 | 20 | 15 | 703 | .01 | 5.2 | 4,050 | 1,350 |
| 407500 | 48.2 | 2,390 | 85 | 18 | 16 | 53 | 7.27 | 18.5 | 2,880 | 1,989 |
| 407520 | 36 | 3,160 | 97 | 20 | 14 | 71 | .01 | 13.6 | 4,400 | 2,006 |
| 407600 | 4.08 | 3,210 | 90 | 20 | 16 | 520 | .01 | 3.55 | 3,980 | 2,230 |
| 407700 | 94.1 | 3,160 | 94 | 22 | 16 | 109 | .02 | 18.7 | 5,100 | 1,674 |
| 408200 | 1.65 | 3,690 | 99 | 34 | 17 | 295 | .01 | 2.25 | 3,950 | 3,150 |
| 408300 | 132 | 3,480 | 98 | 29 | 16 | 54 | .62 | 23.2 | 3,300 | 1,983 |
| 408400 | 11.1 | 3,420 | 99 | 25 | 16 | 250 | .01 | 5.5 | 4,060 | 2,450 |
| 408420 | 37.0 | 2,570 | 95 | 20 | 16 | 237 | .01 | 9.8 | 4,480 | 1,600 |
| 408500 | 83.0 | 3,510 | 96 | 26 | 16 | 121 | .01 | 15.8 | 5,100 | 1,950 |
| 409000 | 1,007 | 3,000 | 89 | 21 | 16 | 16 | .64 | 71.3 | 4,400 | 1,500 |
| 409500 | 161 | 3,650 | 87 | 20 | 16 | 99 | .01 | 27.8 | 5,720 | 1,250 |
| 410600 | 18.1 | 3,770 | 90 | 21 | 15 | 237 | .01 | 7.2 | 5,650 | 2,120 |
| 410650 | 6.96 | 3,330 | 90 | 22 | 15 | 317 | .01 | 4.3 | 3,540 | 2,520 |
| 423550 | 2.18 | 2,710 | 2 | 20 | 17 | 109 | .01 | 3.55 | 3,450 | 2,440 |
| 423700 | .59 | 2,730 | 5 | 22 | 16 | 178 | .01 | 1.95 | 3,160 | 2,590 |
| 423900 | 2.02 | 2,680 | 10 | 22 | 19 | 453 | .01 | 2.7 | 3,640 | 2,220 |
| 424000 | 689 | 2,710 | 78 | 20 | 20 | 12.5 | .05 | 76.6 | 4,000 | 1,720 |
| 429600 | 31.9 | 2,680 | 80 | 28 | 19 | 118 | .01 | 13.9 | 5,040 | 1,840 |
| 429800 | 1.83 | 2,600 | 80 | 18 | 16 | 355 | .01 | 2.4 | 3,590 | 2,200 |
| 430370 | 2.07 | 2,340 | 30 | 18 | 17 | 160 | .01 | 2.2 | 2,500 | 2,075 |
| 431000 | 665 | 2,400 | 60 | 25 | 17 | 13 | .55 | 47.9 | 4,720 | 1,590 |
| 431100 | 11.9 | 2,200 | 25 | 20 | 18 | 143 | .01 | 6.3 | 2,920 | 1,580 |
| 433300 | 1.14 | 2,580 | .01 | 15 | 18 | 230 | .01 | 1.8 | 2,530 | 2,390 |
| 433580 | 23.2 | 2,570 | .01 | 15 | 17 | 7.5 | .01 | 8 | 2,600 | 1,427 |
| 433800 | 4.25 | 4,030 | 95 | 19 | 13 | 173 | .01 | 6 | 5,200 | 3,015 |
| 437500 | 122 | 3,100 | 91 | 21 | 15 | 84 | .21 | 17.1 | 3,920 | 1,820 |
| 437930 | 35.4 | 2,260 | .01 | 12 | 15 | 57 | .01 | 10.1 | 3,200 | 1,955 |
| 437950 | 4.75 | 2,100 | .01 | 12 | 17 | 350 | .01 | 3.05 | 2,200 | 1,210 |

TABLE 2.--Indices for basin and climatic characteristics used in multiple regressions--Continued

| Station number | Drainage area ($mi^2$) A | Mean basin elevation (ft) E | Forest cover (percent of basin) F | Annual precipitation (inches) P | Minimum mean daily January temperature (°F) T | Main channel slope (ft/mi) SLP | Percent area of lakes LK | Channel length (mi) L | Stream source elevation (ft) SE | Gage elevation (ft) GE |
|---|---|---|---|---|---|---|---|---|---|---|
| 12437960 | 28 | 2,700 | 0.10 | 12 | 14 | 75 | 0.01 | 10.7 | 3,080 | 2,075 |
| 439200 | 1.68 | 4,180 | .01 | 21 | 12 | 440 | .01 | 2.6 | 4,770 | 3,520 |
| 441800 | 1.42 | 4,260 | 21 | 21 | 10 | 853 | .01 | 2.35 | 5,360 | 2,640 |
| 442000 | 130 | 5,520 | 79 | 29 | 10 | 273 | .01 | 16.6 | 5,660 | 1,880 |
| 442500 | 3,550 | 5,110 | 85 | 30 | 8 | 21 | .23 | 140 | 6,500 | 1,138 |
| 443700 | 4.59 | 2,870 | 6 | 14 | 10 | 459 | .01 | 5 | 3,840 | 1,400 |
| 444400 | .66 | 2,020 | .01 | 14 | 12 | 730 | .01 | 1.75 | 2,630 | 1,500 |
| 445800 | 4.12 | 3,740 | 99 | 18 | 15 | 379 | .01 | 4.15 | 4,480 | 2,640 |
| 447100 | 2.66 | 1,740 | .01 | 12 | 16 | 476 | .60 | 2.75 | 1,920 | 820 |
| 447400 | 3.8 | 4,760 | 99 | 19 | 8 | 814 | .01 | 5.15 | 7,150 | 2,300 |
| 449500 | 1,301 | 5,180 | 76 | 35 | 9 | 72 | .14 | 58.8 | 6,600 | 1,580 |
| 449600 | 62.0 | 5,090 | 2.4 | 24 | 12 | 331 | .4 | 9.6 | 5,800 | 2,800 |
| 449900 | .77 | 3,180 | 62 | 20 | 14 | 1,580 | .01 | 1.9 | 3,940 | 1,040 |
| 449950 | 1,772 | 4,780 | 78 | 32 | 10 | 42 | .11 | 92.1 | 6,600 | 900 |
| 450500 | 1,792 | 4,780 | 78 | 32 | 10 | 39 | .11 | 97.8 | 6,600 | 739 |
| 451000 | 344 | 5,130 | 83 | 99 | 16 | 137 | .32 | 28.7 | 7,120 | 1,100 |
| 451500 | 64.8 | 4,930 | 68 | 52 | 16 | 239 | .43 | 19.7 | 5,590 | 1,250 |
| 452800 | 203 | 5,230 | 91 | 59 | 16 | 91 | .11 | 40.4 | 8,800 | 1,563 |
| 453000 | 419 | 4,390 | 92 | 45 | 17 | 68 | .06 | 58.2 | 8,800 | 690 |
| 453600 | .77 | 2,280 | .01 | 20 | 16 | 1,100 | .01 | 2.35 | 3,640 | 810 |
| 454000 | 150 | 4,590 | 51 | 108 | 17 | 89 | .08 | 23.1 | 7,030 | 1,880 |
| 455000 | 273 | 4,720 | 64 | 100 | 17 | 46 | 2.3 | 34 | 5,800 | 1,860 |
| 456500 | 172 | 4,440 | 87 | 78 | 16 | 56 | .41 | 32.1 | 8,400 | 2,100 |
| 457000 | 591 | 4,540 | 76 | 69 | 16 | 26 | 1.07 | 41.9 | 5,800 | 1,805 |
| 457300 | 2.55 | 2,760 | 95 | 41 | 15 | 495 | .01 | 2.8 | 3,520 | 2,046 |
| 458000 | 193 | 5,260 | 85 | 88 | 17 | 81 | .49 | 28.2 | 5,500 | 1,450 |
| 458900 | 1.36 | 2,140 | 90 | 23 | 16 | 663 | .01 | 2.25 | 2,980 | 1,275 |
| 459000 | 1,000 | 4,590 | 80 | 67 | 16 | 25 | .94 | 66.6 | 5,800 | 1,028 |
| 459400 | 3.96 | 4,830 | 90 | 27 | 16 | 1,400 | 3.7 | 2.4 | 5,940 | 3,840 |
| 461000 | 1,155 | 4,500 | 76 | 62 | 17 | 24 | 1.01 | 71.9 | 5,800 | 905 |
| 461100 | 15.4 | 3,530 | 90 | 25 | 17 | 456 | .01 | 7.4 | 5,730 | 1,870 |
| 461200 | 2.49 | 2,980 | 99 | 22 | 17 | 574 | .01 | 3.6 | 4,510 | 1,880 |
| 461400 | 39.8 | 3,400 | 88 | 25 | 17 | 309 | .01 | 11.1 | 6,800 | 1,750 |
| 461500 | 18.6 | 3,060 | 95 | 24 | 16 | 432 | .01 | 6.1 | 4,720 | 1,730 |
| 462000 | 81.2 | 3,100 | 80 | 21 | 17 | 185 | .01 | 17.4 | 5,840 | 850 |
| 462700 | 3.48 | 2,770 | .02 | 10 | 18 | 82 | .01 | 3.6 | 3,200 | 2,300 |
| 462800 | 15.4 | 2,810 | .05 | 10 | 18 | 69 | .01 | 7.3 | 3,200 | 2,400 |
| 463000 | 99.9 | 2,800 | .01 | 11 | 18 | 30 | .01 | 19.8 | 2,900 | 2,260 |
| 463600 | 2.22 | 2,280 | .01 | 10 | 18 | 235 | .01 | 2.1 | 2,600 | 2,050 |
| 463700 | .4 | 2,500 | .01 | 10 | 18 | 105 | .01 | 1.4 | 2,520 | 2,325 |
| 463800 | 1.1 | 2,500 | .01 | 10 | 18 | 65 | .01 | 1.35 | 2,600 | 2,524 |
| 464600 | .82 | 2,460 | .01 | 12 | 17 | 192 | .01 | 2.3 | 2,640 | 2,170 |
| 464650 | .68 | 2,480 | .01 | 17 | 18 | 54 | .01 | 1.6 | 2,580 | 2,430 |
| 465000 | 1,042 | 2,200 | 2.9 | 13 | 18 | 13 | .40 | 76.8 | 2,780 | 1,386 |
| 465100 | .25 | 2,100 | .01 | 10 | 17 | 130 | .01 | 1.03 | 2,140 | 2,050 |
| 465300 | 1.12 | 2,450 | .01 | 13 | 18 | 209 | .01 | 2.3 | 2,840 | 2,340 |
| 465500 | 427 | 1,500 | .01 | 10 | 18 | 22 | .01 | 54.3 | 1,800 | 1,280 |
| 467000 | 2,009 | 2,150 | .01 | 11 | 19 | 10 | 13 | 125.3 | 2,780 | 1,070 |
| 467400 | 2.7 | 2,400 | .01 | 10 | 18 | 180 | .01 | 2.2 | 2,500 | 2,073 |
| 468500 | 36 | 1,950 | 4 | 10 | 18 | 143 | 3.65 | 9.9 | 2,200 | 1,092 |

TABLE 2.--Indices for basin and climatic characteristics used in multiple regressions--Continued

| Station number | Drainage area ($mi^2$) A | Mean basin elevation (ft) E | Forest cover (percent of basin) F | Annual precipitation (inches) P | Minimum mean daily January temperature (°F) T | Main channel slope (ft/mi) SLP | Percent area of lakes LK | Channel length (mi) L | Stream source elevation (ft) SE | Gage elevation (ft) GE |
|---|---|---|---|---|---|---|---|---|---|---|
| 12470300 | 1.57 | 2,620 | 0.01 | 10 | 19 | 100 | 0.01 | 1.95 | 2,670 | 2,470 |
| 471100 | 8.52 | 1,960 | .01 | 12 | 18 | 24 | .01 | 6.6 | 2,300 | 1,600 |
| 471200 | .21 | 1,680 | .01 | 10 | 19 | 167 | .01 | 1.2 | 1,780 | 1,550 |
| 471300 | .95 | 1,520 | .01 | 10 | 16 | 152 | .01 | 1.5 | 1,590 | 1,415 |
| 473700 | 6.06 | 1,400 | .01 | 10 | 17 | 45 | .01 | 6.2 | 1,380 | 1,275 |
| 480500 | 200 | 3,700 | 94 | 40 | 17 | 35 | .01 | 26.5 | 5,840 | 1,932 |
| 480700 | 2.65 | 3,990 | 95 | 30 | 17 | 548 | .01 | 3.5 | 5,100 | 2,880 |
| 483300 | 2.12 | 3,280 | .02 | 18 | 18 | 503 | .01 | 3.4 | 3,920 | 2,420 |
| 483800 | 69.5 | 4,830 | 90 | 25 | 17 | 180 | .01 | 18.7 | 5,840 | 2,500 |
| 484200 | .65 | 2,640 | .01 | 13 | 18 | 330 | .01 | 1.7 | 2,890 | 2,350 |
| 484600 | 5.48 | 2,250 | .01 | 10 | 15 | 338 | .01 | 3.95 | 3,160 | 1,405 |
| 485700 | .68 | 2,370 | .01 | 10 | 15 | 336 | .01 | 2.5 | 2,980 | 1,940 |
| 485900 | 2.26 | 3,290 | .01 | 13 | 16 | 494 | .01 | 4.15 | 4,360 | 2,160 |
| 488300 | 1.10 | 4,800 | 99 | 48 | 19 | 1,300 | .01 | 2.0 | 6,320 | 3,240 |
| 488500 | 78.9 | 4,860 | 91 | 55 | 19 | 64 | .19 | 22.6 | 5,300 | 2,700 |
| 491700 | 3.91 | 4,300 | 99 | 25 | 18 | 1,070 | .01 | 3.1 | 6,120 | 2,560 |
| 492500 | 239 | 4,740 | 90 | 57 | 19 | 42 | 2.08 | 30.4 | 7,770 | 2,280 |
| 500400 | 7.3 | 2,460 | .01 | 10 | 19 | 232 | .01 | 8.0 | 4,180 | 1,609 |
| 500500 | 68.9 | 4,700 | 95 | 53 | 18 | 193 | .01 | 17.3 | 6,980 | 2,450 |
| 501000 | 24.8 | 4,280 | 98 | 54 | 18 | 286 | .01 | 11.2 | 6,800 | 2,400 |
| 502000 | 119 | 3,870 | 94 | 49 | 19 | 140 | .10 | 24.9 | 6,970 | 1,830 |
| 502500 | 173 | 3,200 | 65 | 38 | 18 | 86 | .01 | 45.1 | 6,880 | 940 |
| 506000 | 122 | 3,550 | 80 | 29 | 16 | 132 | .01 | 25.7 | 4,530 | 1,400 |
| 506500 | 81.5 | 2,990 | 60 | 39 | 16 | 178 | .01 | 18.9 | 5,850 | 1,150 |
| 507300 | 1.24 | 1,360 | .01 | 10 | 20 | 182 | .01 | 2.2 | 1,450 | 960 |
| 507600 | .38 | 3,520 | 95 | 24 | 21 | 925 | .01 | 1.6 | 4,200 | 2,650 |
| 507660 | 8.54 | 3,020 | 10 | 18 | 21 | 311 | .01 | 6.3 | 3,500 | 1,640 |
| 508500 | 434 | 2,910 | 40 | 18 | 20 | 98 | .01 | 32.0 | 5,220 | 880 |
| 508800 | 1.91 | 2,060 | .01 | 10 | 21 | 275 | .01 | 3.0 | 2,700 | 1,600 |
| 510600 | 2.88 | 1,540 | .01 | 10 | 22 | 53 | .01 | 3.5 | 1,620 | 1,350 |
| 510700 | 3.35 | 850 | .01 | 10 | 23 | 57 | .01 | 2.9 | 685 | 510 |
| 512500 | 27.8 | 1,400 | .01 | 10 | 22 | 45 | .01 | 14.1 | 1,780 | 1,160 |
| 512600 | 2.44 | 1,520 | .01 | 10 | 22 | 110 | .01 | 2.9 | 1,710 | 1,340 |
| 512700 | 3.71 | 1,300 | .01 | 10 | 21 | 61 | .01 | 5.0 | 1,820 | 1,025 |
| 513000 | 234 | 1,300 | .01 | 10 | 22 | 36 | .01 | 27.8 | 1,840 | 840 |
| 513300 | 27.1 | 1,300 | .01 | 10 | 23 | 19 | .01 | 17.8 | 1,550 | 1,300 |
| 513500 | 383 | 1,200 | .01 | 10 | 22 | 22 | .01 | 48.3 | 1,840 | 580 |
| 13334500 | 156 | 3,760 | 49 | 22 | 22 | 150 | .01 | 23.7 | 6,100 | 1,436 |
| 334700 | 170 | 3,550 | 45 | 24 | 21 | 140 | .01 | 27.1 | 6,100 | 1,090 |
| 335200 | 1.80 | 1,520 | .01 | 14 | 24 | 296 | .01 | 3.2 | 1,860 | 1,050 |
| 343520 | 5.60 | 2,490 | .01 | 15 | 23 | 281 | .01 | 4.6 | 2,760 | 1,575 |
| 343620 | .54 | 2,640 | .01 | 17 | 25 | 100 | .01 | 1.75 | 2,660 | 2,450 |
| 343660 | 1.85 | 2,540 | .01 | 16 | 25 | 80 | .01 | 1.85 | 2,640 | 2,425 |
| 344500 | 431 | 3,000 | 35 | 23 | 25 | 72 | .01 | 50.6 | 6,200 | 730 |
| 346100 | 497 | 3,050 | 60 | 31 | 21 | 9.8 | .05 | 73.7 | 3,500 | 1,957 |
| 348000 | 132 | 2,770 | 8.3 | 22 | 26 | 19 | .01 | 23.6 | 4,980 | 2,326 |
| 348400 | .88 | 2,570 | .01 | 21 | 24 | 80 | .01 | 1.5 | 2,610 | 2,470 |
| 348500 | 27.1 | 2,670 | .4 | 21 | 24 | 28 | .01 | 15 | 3,120 | 2,328 |
| 349210 | 796 | 2,990 | 34 | 25 | 23 | 19 | .01 | 58.9 | 3,500 | 1,932 |
| 349300 | 2.10 | 2,270 | .01 | 20 | 22 | 145 | .01 | 2.1 | 2,380 | 1,990 |
| 349350 | 1.64 | 2,500 | .01 | 18 | 21 | 79 | .01 | 1.85 | 2,580 | 2,325 |
| 349400 | 302 | 2,200 | 5.3 | 18 | 22 | 13 | .02 | 49.6 | 2,420 | 2,012 |

TABLE 2.--Indices for basin and climatic characteristics used in multiple regressions--Continued

| Station number | Drainage area ($mi^2$) A | Mean basin elevation (ft) E | Forest cover (percent of basin) F | Annual precipitation (inches) P | Minimum mean daily January temperature (°F) T | Main channel slope (ft/mi) SLP | Percent area of lakes LK | Channel length (mi) L | Stream source elevation (ft) SE | Gage elevation (ft) GE |
|---|---|---|---|---|---|---|---|---|---|---|
| 13350500 | 189 | 2,680 | 0.1 | 18 | 26 | 19 | 0.01 | 48.1 | 3,100 | 1,868 |
| 351000 | 2,500 | 2,410 | 15 | 18 | 22 | 12 | .29 | 147.7 | 3,500 | 1,040 |
| 352200 | 1.51 | 1,900 | .01 | 13 | 20 | 48 | .01 | 2.1 | 2,050 | 1,920 |
| 352550 | 1.27 | 1,640 | .01 | 12 | 25 | 166 | .01 | 2.65 | 1,800 | 1,260 |
| 353050 | 1.80 | 1,180 | .01 | 10 | 23 | 69 | .01 | 2.65 | 1,220 | 1,050 |
| 14013000 | 59.6 | 3,860 | 87 | 40 | 20 | 160 | .01 | 13.3 | 5,900 | 2,000 |
| 013500 | 17.0 | 3,190 | 55 | 38 | 22 | 253 | .01 | 8.9 | 4,420 | 1,700 |
| 015900 | 1.94 | 1,850 | .01 | 20 | 25 | 214 | .01 | 2.8 | 2,100 | 1,465 |
| 016000 | 48.4 | 2,360 | 81 | 28 | 24 | 157 | .01 | 16.6 | 4,630 | 1,200 |
| 016500 | 102 | 3,750 | 85 | 30 | 25 | 151 | .01 | 17.7 | 5,600 | 1,870 |
| 016600 | 4.12 | 2,850 | 5 | 23 | 24 | 376 | .01 | 4.3 | 3,420 | 934 |
| 016650 | 3.01 | 2,440 | .01 | 21 | 24 | 275 | .01 | 5.0 | 3,100 | 1,700 |
| 017000 | 361 | 2,950 | 40 | 25 | 25 | 82 | .01 | 35.4 | 5,600 | 1,150 |
| 017040 | 2.68 | 2,080 | .01 | 19 | 24 | 167 | .01 | 3.2 | 2,120 | 1,650 |
| 017070 | 4.92 | 1,950 | .01 | 18 | 24 | 77 | .01 | 4.0 | 1,950 | 1,630 |
| 017200 | 4.16 | 1,730 | .01 | 16 | 24 | 91 | .01 | 3.8 | 1,880 | 1,410 |
| 017500 | 721 | 2,200 | 30 | 20 | 23 | 38 | .01 | 68.6 | 5,700 | 530 |
| 018500 | 1,657 | 1,600 | 25 | 22 | 19 | 60 | .15 | 59.4 | 5,700 | 405 |
| 019100 | .8 | 1,120 | .01 | 10 | 21 | 650 | .01 | 2.2 | 1,610 | 420 |
| 034250 | .5 | 2,750 | .01 | 13 | 19 | 280 | .01 | 1.1 | 2,920 | 2,640 |
| 034270 | 50.3 | 1,370 | .01 | 10 | 20 | 37 | .01 | 13.6 | 1,800 | 885 |
| 034320 | .61 | 790 | .01 | 10 | 23 | 100 | .01 | 2.2 | 912 | 690 |
| 034325 | 8.35 | 3,260 | .01 | 10 | 20 | 100 | .02 | 6.1 | 3,980 | 2,820 |
| 107000 | 151 | 4,690 | 88 | 58 | 19 | 52 | .08 | 31.0 | 8,200 | 2,720 |
| 110000 | 360 | 4,520 | 87 | 56 | 20 | 53 | .29 | 45.2 | 8,200 | 1,703 |
| 111800 | 10.4 | 4,290 | 95 | 25 | 20 | 380 | .01 | 7.2 | 5,760 | 2,390 |
| 112000 | 83.5 | 3,160 | 92 | 25 | 21 | 116 | .01 | 17 | 4,600 | 1,690 |
| 112200 | .71 | 1,890 | 5 | 20 | 22 | 156 | .01 | 2.4 | 2,360 | 1,675 |
| 112500 | 280 | 2,600 | 70 | 25 | 21 | 68 | .05 | 34.7 | 4,600 | 570 |
| 113000 | 1,297 | 3,140 | 77 | 36 | 21 | 46 | .10 | 88.7 | 8,200 | 289 |
| 121300 | 32.4 | 5,190 | 77 | 106 | 22 | 428 | .01 | 10.3 | 7,900 | 3,080 |
| 121400 | 64.9 | 4,740 | 83 | 97 | 22 | 262 | .01 | 16.8 | 7,900 | 2,050 |
| 121500 | 69.3 | 3,450 | 92 | 82 | 23 | 123 | .59 | 14.6 | 3,950 | 2,000 |
| 122000 | 185 | 3,940 | 84 | 82 | 21 | 195 | .20 | 21.7 | 7,900 | 1,780 |
| 123000 | 294 | 3,380 | 88 | 71 | 23 | 101 | .03 | 39.5 | 7,900 | 360 |
| 123500 | 386 | 3,220 | 86 | 66 | 23 | 93 | .27 | 45.2 | 7,900 | 113 |
| 124500 | 114 | 2,960 | 93 | 70 | 24 | 135 | .01 | 21.3 | 4,240 | 1,230 |
| 125000 | 117 | 2,910 | 93 | 70 | 24 | 135 | .01 | 16 | 4,240 | 980 |
| 125200 | 4.10 | 1,910 | 95 | 55 | 25 | 412 | .01 | 4.4 | 3,670 | 1,970 |
| 125500 | 134 | 2,770 | 92 | 70 | 24 | 140 | .02 | 25.9 | 4,240 | 150 |
| 126300 | .54 | 710 | 80 | 70 | 25 | 590 | .01 | 1.4 | 900 | 75 |
| 127000 | 108 | 2,740 | 98 | 103 | 25 | 103 | .04 | 20 | 3,050 | 890 |
| 128500 | 225 | 2,460 | 52 | 99 | 25 | 62 | .04 | 29.6 | 3,050 | 113 |
| 143200 | 2.74 | 1,310 | 80 | 75 | 29 | 292 | .01 | 4.2 | 2,150 | 680 |
| 143500 | 108 | 1,610 | 94 | 100 | 28 | 57 | .01 | 23.9 | 3,440 | 175 |
| 144000 | 23.3 | 810 | 85 | 70 | 29 | 120 | .01 | 10.7 | 3,200 | 117 |
| 144550 | 2.14 | 750 | 95 | 62 | 30 | 337 | .01 | 2.3 | 1,150 | 370 |
| 144600 | .51 | 560 | 50 | 44 | 31 | 240 | .01 | 1.3 | 800 | 380 |
| 211900 | 21.6 | 240 | 10 | 42 | 31 | 17 | .01 | 10.5 | 275 | 174 |
| 212000 | 18.3 | 3,010 | 93 | 73 | 29 | 285 | .01 | 5.2 | 2,220 | 355 |

TABLE 2.--Indices for basin and climatic characteristics used in multiple regressions--Continued

| Station number | Drainage area ($mi^2$) A | Mean basin elevation (ft) E | Forest cover (percent of basin) F | Annual precipitation (inches) P | Minimum mean daily January temperature (°F) T | Main channel slope (ft/mi) SLP | Percent area of lakes LK | Channel length (mi) L | Stream source elevation (ft) SE | Gage elevation (ft) GE |
|---|---|---|---|---|---|---|---|---|---|---|
| 14213200 | 127 | 3,950 | 93 | 100 | 26 | 227 | 0.09 | 25.4 | 12,300 | 1,500 |
| 213500 | 13.2 | 3,950 | 93 | 106 | 23 | 144 | .16 | 6.9 | 4,700 | 3,213 |
| 214000 | 5.87 | 4,490 | 92 | 86 | 25 | 303 | 3.42 | 5.2 | 4,750 | 3,400 |
| 214500 | 11.7 | 3,980 | 96 | 88 | 25 | 356 | .18 | 5.5 | 4,800 | 3,227 |
| 215000 | 26.0 | 4,000 | 96 | 90 | 25 | 294 | 1.55 | 8.8 | 4,750 | 2,260 |
| 215500 | 11.6 | 2,960 | 100 | 105 | 25 | 200 | .87 | 4.2 | 5,000 | 2,490 |
| 216000 | 227 | 3,540 | 95 | 104 | 24 | 141 | .45 | 36.7 | 12,300 | 1,080 |
| 216500 | 131 | 3,180 | 95 | 119 | 26 | 80 | .16 | 19.1 | 4,040 | 1,200 |
| 216800 | 22.4 | 2,920 | 78 | 132 | 27 | 367 | .01 | 11.4 | 10,700 | 1,330 |
| 218000 | 481 | 3,120 | 93 | 113 | 25 | 68 | 1.92 | 51.9 | 12,300 | 576 |
| 218300 | 2.31 | 1,660 | 99 | 115 | 28 | 832 | .01 | 2.6 | 2,880 | 550 |
| 219000 | 64.9 | 2,410 | 98 | 102 | 27 | 128 | .03 | 16.2 | 4,000 | 520 |
| 219500 | 665 | 2,830 | 95 | 112 | 27 | 50 | 2.57 | 67.8 | 12,300 | 180 |
| 219800 | 12.6 | 2,100 | 100 | 105 | 28 | 455 | .01 | 5.5 | 3,000 | 500 |
| 221500 | 40.8 | 980 | 91 | 76 | 29 | 94 | .13 | 17.9 | 1,940 | 287 |
| 222500 | 125 | 1,940 | 99 | 93 | 28 | 78 | .02 | 23.3 | 3,840 | 367 |
| 222700 | .53 | 250 | 35 | 45 | 31 | 80 | .01 | 1.5 | 275 | 205 |
| 223000 | 179 | 2,100 | 99 | 96 | 29 | 83 | .29 | 39.1 | 9,680 | 150 |
| 223500 | 198 | 1,880 | 98 | 82 | 29 | 73 | .02 | 45.2 | 9,680 | 20 |
| 223800 | 1.06 | 580 | 95 | 46 | 32 | 525 | .01 | 2.05 | 1,400 | 30 |
| 224500 | 56.5 | 4,330 | 91 | 102 | 20 | 188 | .03 | 16.6 | 6,760 | 1,290 |
| 225500 | 19.2 | 4,700 | 74 | 107 | 21 | 354 | 4.18 | 8.2 | 6,990 | 2,840 |
| 226500 | 287 | 4,230 | 88 | 95 | 21 | 111 | .46 | 24 | 9,200 | 1,050 |
| 226800 | 1.22 | 4,360 | 95 | 95 | 24 | 1,250 | .01 | 2.15 | 5,330 | 2,530 |
| 226900 | 1.82 | 3,760 | 95 | 100 | 24 | 1,080 | .01 | 2.25 | 4,620 | 2,010 |
| 230000 | 50 | 4,010 | 94 | 99 | 22 | 275 | .03 | 12.1 | 4,200 | 1,100 |
| 231100 | 229 | 2,460 | 80 | 65 | 26 | 1,080 | .01 | 3 | 4,660 | 895 |
| 232000 | 66.3 | 3,740 | 75 | 75 | 25 | 123 | .01 | 15.5 | 4,800 | 1,290 |
| 232500 | 321 | 4,130 | 76 | 84 | 23 | 84 | .16 | 38.2 | 7,300 | 1,220 |
| 233500 | 1,042 | 3,760 | 86 | 86 | 24 | 30 | .21 | 62.6 | 9,360 | 759 |
| 235000 | 1,162 | 3,430 | 86 | 72 | 25 | 16.5 | .19 | 89.4 | 9,360 | 357 |
| 235300 | .79 | 2,580 | 99 | 85 | 28 | 890 | .01 | 1.8 | 3,290 | 1,750 |
| 235500 | 16.4 | 2,450 | 76 | 87 | 28 | 276 | .13 | 5.7 | 4,320 | 1,150 |
| 236200 | 141 | 2,330 | 90 | 84 | 28 | 43 | .02 | 22.7 | 3,300 | 600 |
| 236500 | 156 | 1,990 | 90 | 83 | 28 | 39 | .02 | 27 | 3,300 | 398 |
| 237000 | 3.29 | 985 | 52 | 56 | 29 | 178 | .01 | 2.7 | 1,000 | 668 |
| 237500 | 37.8 | 1,640 | 76 | 60 | 29 | 136 | .01 | 10.8 | 2,320 | 470 |
| 238000 | 1,400 | 3,150 | 86 | 72 | 26 | 14 | .16 | 99.9 | 9,360 | 227 |
| 239000 | 77.6 | 630 | 91 | 56 | 28 | 35 | .01 | 26.4 | 2,500 | 110 |
| 239100 | .36 | 650 | 95 | 48 | 30 | 105 | .01 | 1.15 | 660 | 550 |
| 239700 | .38 | 470 | 80 | 46 | 31 | 390 | .01 | 1.1 | 720 | 235 |
| 241500 | 120 | 2,150 | 93 | 97 | 29 | 86 | .18 | 32.3 | 9,430 | 1 |
| 242500 | 474 | 2,310 | 94 | 84 | 29 | 78 | 1.53 | 43.9 | 5,200 | 407 |
| 242600 | .64 | 540 | 80 | 57 | 31 | 298 | .01 | 1.25 | 680 | 240 |
| 243000 | 2,238 | 2,540 | 88 | 71 | 27 | 11 | .27 | 133.2 | 9,360 | 20 |
| 243500 | 19.6 | 906 | 97 | 72 | 32 | 284 | .01 | 8.6 | 1,500 | 75 |
| 245000 | 119 | 1,390 | 99 | 69 | 31 | 49 | .09 | 28.8 | 3,920 | 100 |
| 247500 | 65.8 | 1,190 | 88 | 94 | 32 | 48 | .03 | 19.4 | 1,920 | 30 |
| 248100 | 1.13 | 280 | 90 | 107 | 32 | 266 | .01 | 1.6 | 920 | 10 |
| 249000 | 39.9 | 1,350 | 90 | 116 | 31 | 142 | .01 | 10.6 | 2,760 | 350 |
| 250500 | 15.2 | 1,180 | 99 | 103 | 30 | 150 | .01 | 7 | 2,630 | 71 |

TABLE 3.--Summary of regression coefficients for equations, for regions shown on plate 3

| Recurrence interval, T | Regression coefficient | | | | Standard error of estimate (percent) |
|---|---|---|---|---|---|
| | Regression constant, a | Drainage area, A | Annual precipi- tation, P | Forest cover, F | |
| **Region I** | | | | | |
| 2 | 0.191 | 0.86 | 1.51 | -- | 24.9 |
| 5 | .257 | .86 | 1.53 | -- | 24.6 |
| 10 | .288 | .85 | 1.54 | -- | 26.9 |
| 25 | .317 | .85 | 1.56 | -- | 31.5 |
| 50 | .332 | .86 | 1.58 | -- | 35.7 |
| 100 | .343 | .86 | 1.60 | -- | 40.3 |
| **Region II** | | | | | |
| 2 | 0.104 | 0.86 | 1.51 | -- | 39.8 |
| 5 | .140 | .86 | 1.53 | -- | 37.3 |
| 10 | .158 | .85 | 1.54 | -- | 37.1 |
| 25 | .176 | .85 | 1.56 | -- | 38.5 |
| 50 | .186 | .86 | 1.58 | -- | 40.7 |
| 100 | .194 | .86 | 1.60 | -- | 43.5 |
| **Region III** | | | | | |
| 2 | 0.054 | 0.86 | 1.51 | -- | 41.6 |
| 5 | .073 | .86 | 1.53 | -- | 42.8 |
| 10 | .082 | .85 | 1.54 | -- | 45.4 |
| 25 | .092 | .85 | 1.56 | -- | 50.3 |
| 50 | .098 | .86 | 1.58 | -- | 55.1 |
| 100 | .102 | .86 | 1.60 | -- | 60.7 |
| **Region IV** | | | | | |
| 2 | 0.059 | 0.86 | 1.51 | -- | 39.3 |
| 5 | .081 | .86 | 1.53 | -- | 38.5 |
| 10 | .092 | .85 | 1.54 | -- | 36.9 |
| 25 | .105 | .85 | 1.56 | -- | 39.9 |
| 50 | .112 | .86 | 1.58 | -- | 42.4 |
| 100 | .119 | .86 | 1.60 | -- | 46.0 |
| **Region V** | | | | | |
| 5 | 0.982 | 0.90 | 1.35 | -0.21 | 65.1 |
| 10 | 2.87 | .88 | 1.16 | -.23 | 73.9 |
| 25 | 7.51 | .87 | 1.03 | -.25 | 91.1 |
| 50 | 13.6 | .86 | .95 | -.27 | 105 |
| 100 | 23.4 | .85 | .89 | -.29 | 121 |
| **Region VI** | | | | | |
| 5 | 0.260 | 0.90 | 1.35 | -0.21 | 50.2 |
| 10 | .741 | .88 | 1.16 | -.23 | 45.2 |
| 25 | 1.77 | .87 | 1.03 | -.25 | 48.3 |
| 50 | 2.97 | .86 | .95 | -.27 | 55.7 |
| 100 | 4.70 | .85 | .89 | -.29 | 66.2 |
| **Region VII** | | | | | |
| 5 | 0.263 | 0.90 | 1.35 | -0.21 | 75.8 |
| 10 | .850 | .88 | 1.16 | -.23 | 50.0 |
| 25 | 2.07 | .87 | 1.03 | -.25 | 54.7 |
| 50 | 3.46 | .86 | .95 | -.27 | 57.1 |
| 100 | 5.45 | .85 | .89 | -.29 | 59.4 |
| **Region VIII** | | | | | |
| 5 | 0.508 | 0.90 | 1.35 | -0.21 | 41.7 |
| 10 | 1.32 | .88 | 1.16 | -.23 | 44.1 |
| 25 | 2.95 | .87 | 1.03 | -.25 | 47.4 |
| 50 | 4.78 | .86 | .95 | -.27 | 51.3 |
| 100 | 7.36 | .85 | .89 | -.29 | 55.9 |
| **Region IX** | | | | | |
| 5 | 0.186 | 0.90 | 1.35 | -0.21 | 62.9 |
| 10 | .525 | .88 | 1.16 | -.23 | 64.4 |
| 25 | 1.29 | .87 | 1.03 | -.25 | 72.2 |
| 50 | 2.22 | .86 | .95 | -.27 | 81.0 |
| 100 | 3.60 | .85 | .89 | -.29 | 91.7 |
| **Region X** | | | | | |
| 5 | 0.449 | 0.90 | 1.35 | -0.21 | 90.1 |
| 10 | 1.16 | .88 | 1.16 | -.23 | 93.1 |
| 25 | 2.54 | .87 | 1.03 | -.25 | 104 |
| 50 | 4.03 | .86 | .95 | -.27 | 115 |
| 100 | 6.05 | .85 | .89 | -.29 | 129 |
| **Region XI** | | | | | |
| 5 | 0.450 | 0.90 | 1.35 | -0.21 | 66.6 |
| 10 | 1.36 | .88 | 1.16 | -.23 | 62.2 |
| 25 | 3.59 | .87 | 1.03 | -.25 | 63.3 |
| 50 | 6.61 | .86 | .95 | -.27 | 72.1 |
| 100 | 11.5 | .85 | .89 | -.29 | 88.0 |
| **Region XII** | | | | | |
| 5 | 0.157 | 0.90 | 1.35 | -0.21 | 93.6 |
| 10 | .629 | .88 | 1.16 | -.23 | 54.0 |
| 25 | 1.76 | .87 | 1.03 | -.25 | 56.6 |
| 50 | 3.05 | .86 | .95 | -.27 | 67.0 |
| 100 | 4.83 | .85 | .89 | -.29 | 81.8 |

TABLE 4.--Maximum and minimum values of basin and climatic characteristics at gaging stations, by flood regions

| | Drainage area, A | Annual precipitation, P | Forest cover, F |
|---|---|---|---|
| Region I | | | |
| Maximum | 262 | 124 | -- |
| Minimum | .24 | 23 | |
| Region II | | | |
| Maximum | 2,238 | 199 | -- |
| Minimum | .15 | 35 | |
| Region III | | | |
| Maximum | 999 | 201 | -- |
| Minimum | .15 | 32 | |
| Region IV | | | |
| Maximum | 1,042 | 132 | -- |
| Minimum | 1.22 | 65 | |
| Region V | | | |
| Maximum | 1,297 | 36 | 95 |
| Minimum | .38 | 10 | .01 |
| Region VI | | | |
| Maximum | 434 | 106 | 99 |
| Minimum | .65 | 10 | .01 |
| Region VII | | | |
| Maximum | 1,792 | 108 | 99 |
| Minimum | .77 | 19 | .01 |
| Region VIII | | | |
| Maximum | 2,220 | 45 | 100 |
| Minimum | 1.18 | 19 | 80 |
| Region IX | | | |
| Maximum | 3,550 | 38 | 99 |
| Minimum | .66 | 12 | .01 |
| Region X | | | |
| Maximum | 1,042 | 22 | 78 |
| Minimum | .21 | 10 | .01 |
| Region XI | | | |
| Maximum | 2,500 | 40 | 87 |
| Minimum | .54 | 10 | .01 |
| Region XII | | | |
| Maximum | 234 | 10 | .01 |
| Minimum | 1.80 | 10 | .01 |