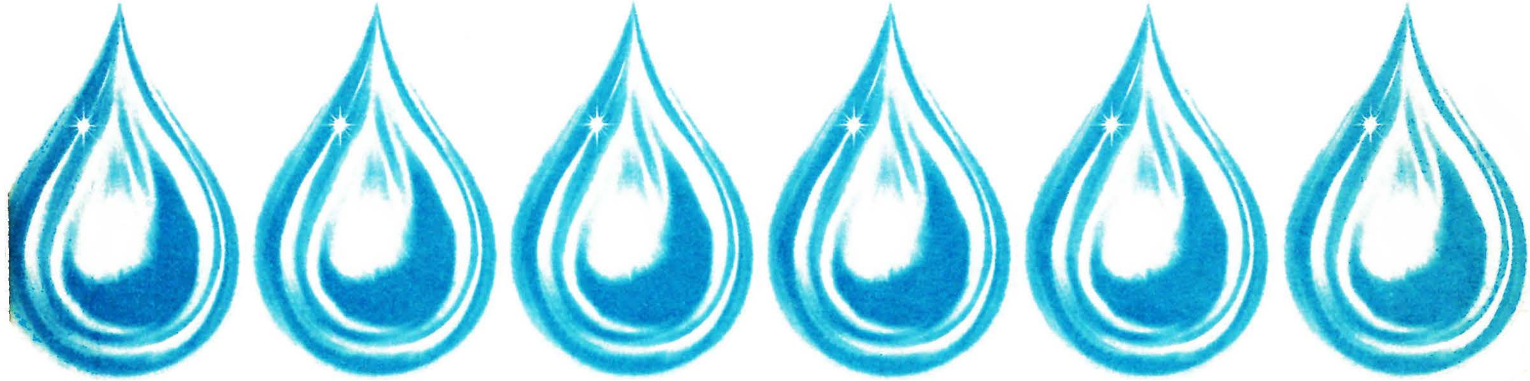
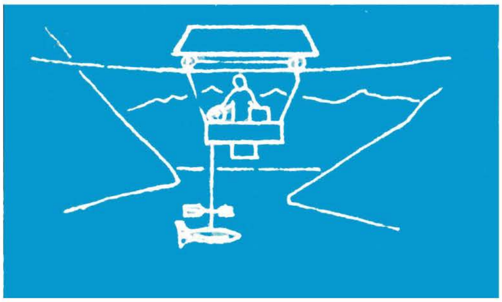
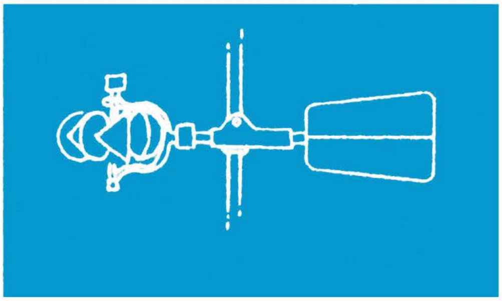


A PROPOSED STREAMFLOW-DATA PROGRAM FOR WASHINGTON STATE





UNITED STATES DEPARTMENT of the INTERIOR • Geological Survey 1971

OPEN-FILE REPORT

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A PROPOSED STREAMFLOW-DATA PROGRAM FOR WASHINGTON STATE

By M. R. Collings

ABSTRACT

An evaluation of the streamflow data available in Washington was made to provide guidelines for planning future programs. The basic steps in the evaluation procedure were (1) definition of the long-term goals of the streamflow-data program in quantitative form, (2) examination and analysis of all available data to determine which goals have already been met, and (3) consideration of alternate programs and techniques to meet the remaining objectives. It was found that by regionalization of streamflow characteristics—a method for estimating streamflow frequency characteristics at ungaged sites—mean annual flows could be predicted in western and eastern Washington with an accuracy of 12 and 36 percent, floodflows 45 and 58 percent, and flood volumes 47 and 29 percent, respectively. Even though the prediction accuracy for some flow-estimating relations could be used for some predictive purposes, the accuracy goals (determined by an empirical method) set by the Geological Survey were not met. These goals, for the equivalent of 10 years of streamflow record, were 7 and 9 percent for mean annual flows, 21.5 and 36 percent for floodflows, and 17 and 24 percent for flood volumes for western and eastern Washington, respectively. Low flows could not be regionalized in this study. However, on the bases of length of record and extension of length of record by simple-regression techniques 56 continuous-record stations were suggested for deletion from the existing network. This fact indicates that significant changes could be made in the present data program that would allow emphasis to be placed on attaining the goals that have not been met. A streamflow-data program based on the guidelines developed in this study is proposed for the future.

INTRODUCTION

The State of Washington is endowed with an abundant, if not evenly distributed, supply of water. This water is generally of good quality and often in its natural condition suitable for many industrial, domestic, and recreational uses. However, at present, the areal and temporal distribution of the water resources do not allow for their complete utilization.

The demand for additional water supplies to fulfill the requirements of water users has resulted in the need for an increasing knowledge of the occurrence and distribution of the State's water resources.

For proper planning of development, management, and conservation, it is necessary at the earliest possible stage to make an adequate appraisal and to estimate the characteristics and distribution of the water resources. Because the hydrologic environment is continually changing with the increasing needs of the social environment, sound management and development depend on an adequate system of continuing appraisal.

An important factor in the appraisal of water resources is the collection and evaluation of basic streamflow data. From the inception of streamflow records in Washington in 1891, on Spokane River at Spokane, the network of collection sites has increased to all parts of the State. In 1948 a program for collection of peak streamflow data was initiated by installing a network of partial-record crest-stage gages. Miscellaneous streamflow measurements have been made on as many as 2,500 streams in the State since 1890. At the present time (1970) there are 311 continuous-record stations, about 350 miscellaneous sites are measured, and the crest-stage gage network consists of 201 stations.

Even though a large number of stream sites are being and have been gaged in the State, gaging of all sites on all streams is neither possible nor desirable. The streamflow records, therefore, provide only a sample of the existing streamflows both in time and space. Also, the increasing operational costs, the restraint on manpower, and the need for more complete hydrologic information, makes it imperative that a systematic evaluation of the streamflow-data program be made. The purpose of this study is to evaluate the existing streamflow-data collection program and use this evaluation to design a program that will most efficiently produce the types of streamflow information needed.

The concepts and procedures used in this study are presented in detail by Carter and Benson (1970) and are summarized only briefly in this report. The basic steps are (1) definition of the long-term objectives of the streamflow-data program in quantitative form, (2) examination and analysis of all available data to determine which objectives have already been met, (3) consideration of alternate means of meeting the remaining objectives, and (4) preparation of a proposed program of data collection and analysis to meet the remaining objectives.

HYDROLOGY OF WASHINGTON

Precipitation and runoff are closely related in the hydrologic cycle of Washington State. The State is located in the zone of the prevailing westerly winds, and storms generally have a westerly flow. Thus, the weather during the winter months, being generated normally out of a low-pressure area in the Aleutians, will approach the coast from a west and southwest direction. In the summer months the activity, when it exists, will approach the State from the north and northwest around a high pressure area off the coast. The heaviest precipitation occurs during the winter months followed by relatively dry summer months along the Pacific Coast.

The seasonal distribution of precipitation in western Washington is reflected in the surface-water runoff. Most high stream flows occur during the winter and low flows occur during the summer. However, high flows caused by snowmelt also occur in the spring on streams draining upland areas in both eastern and western Washington. In eastern Washington, although the temporal distribution of precipitation and streamflow is generally the same as in western Washington, the effect of terrain becomes prominent. The terrain affects the amounts as well as the form (rain or snow) of precipitation, which, in turn, determines when peak streamflows will occur.

The orographic influence of landforms (fig. 1) on parcels of air approaching from the Pacific Ocean is definite. During the winter months as moist cool air approaches the coast, it is forced to rise over the Coast Range (fig. 1). In rising, the air expands and is cooled, thereby reducing its capacity to retain moisture and resulting in precipitation and high streamflows. The precipitation in the Olympic Mountains exceeds 240 inches annually. Some of the streams draining the western Olympics have as much as 200 inches of runoff annually. As the air mass passes over the crest of the mountains and descends, it is warmed and increases its capacity to retain moisture. The Puget Sound lowland is characterized by less precipitation than the coast; for example, Seattle has approximately 30 to 35 inches of precipitation annually. In order to continue eastward the airmass must repeat this cooling process as it passes over the Cascade Range where precipitation commonly exceeds 100 inches per year. Many of the streams draining the western slope of the Cascades east of Seattle have annual runoffs amounting to 80 inches. As the airmass descends the eastern slope of the Cascades, it is warmed and again increases its capacity to retain water. As a result, the Columbia Plateau of eastern Washington is generally arid and many of the streams are dry in the summer or fall. The annual precipitation on the plateau ranges from less than 10 inches to as much as 30 inches in the north parts (Environmental Science Service Administration, 1961a, p. 2). Annual streamflow in eastern Washington generally varies from 0.2 to 0.4 inch in the central and southern parts to 15-25 inches in the northern parts.

The lack of cloud cover in eastern Washington increases the temperature range between day and night and between summer and winter, as compared to the cloudy conditions generally found west of the Cascades, where the temperature range is typically small. This temperature range generally causes greater water losses through evaporation in the eastern part of the State than in the western part.

Because of this difference in climatic conditions and consequently in streamflow the State is divided into eastern and western Washington, for the analyses in this report, with the Cascade Crest as the dividing line. The streamflows are analyzed and evaluated for each part of the State as an entity. The division of the State also was indicated by the plot, on a State map, of the residuals from a multiple-regression analysis between streamflow characteristics and basin and climatic characteristics. These are explained in a later section of the report.

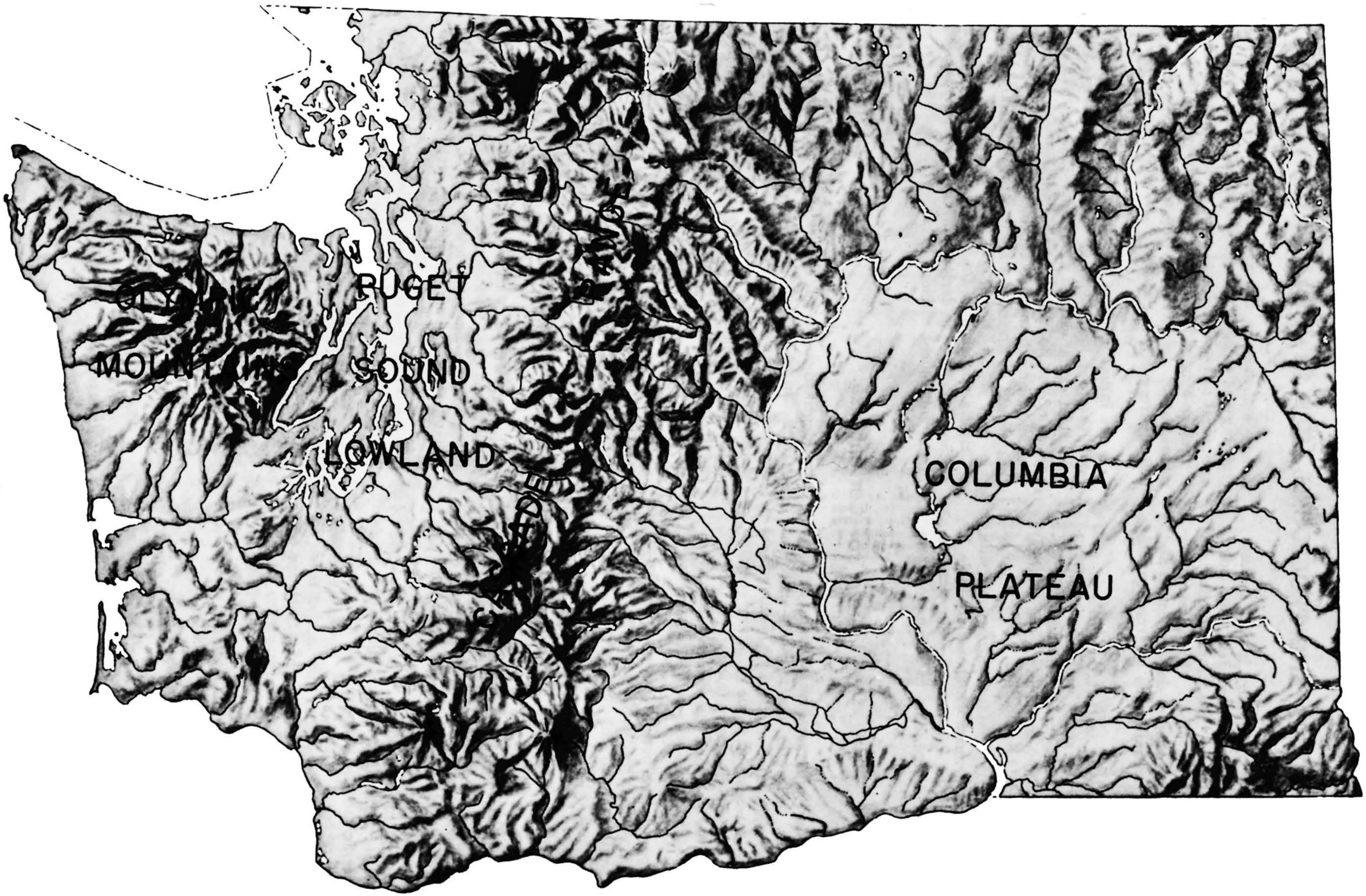


FIGURE 1.—Principal physiographic areas of Washington.

CONCEPTS AND PROCEDURES USED IN THIS STUDY

The principal concept of this study is that because streamflow information may be needed at any point on any stream in Washington, the program must be designed to accommodate this need. This information can be provided by a combination of data collection and hydrologic studies that generalize the information obtained at gaging sites.

Another important concept is that the goals of the program, including accuracy goals, should be identified in quantitative form. This permits evaluation of existing data to determine which goals have been attained and how the program should be modified.

The procedures used in this study are presented with reference to the general framework shown by table 1. The streamflow-data types are data for current use, data for planning and design, data to define long-term trends, and data on the stream environment. For the planning and design type of data, streams are classified as natural or regulated, and each of these classification is further subdivided into principal or minor, with the separation of the two occurring at a drainage area of 500 square miles.

In the initial phase of the study, program goals were established for each type of data. All available data were then examined and analyzed. This led to a comparison of the information now available with the goal that had been set and to a consideration of the elements that should be included in the future program.

Criteria for each of the four types of data, and the methods employed in deriving information, are discussed in the subsequent section.

Data for Current Use

Current information on streamflow is needed at many sites for decisions on water management—such as assessment of current water availability, management of water quality, forecast of floods or water contamination, and surveillance necessary to comply with legal requirements. Sites at which the needed data are collected are termed "current-purpose" data stations.

Data for current use are obtained by operating gaging stations to obtain the data specifically required for water-management systems. Current-purpose data stations are identified separately in this study because (1) justification can be related to specific needs; (2) the data may have little or no transfer value in a hydrologic sense; and (3) the locations of the stations, the accuracy requirements, and the period of operation are specified by the user of the data, who usually provides the financing.

This part of the program is not subject to design, but changes in response to the needs for data in water management.

Data for Planning and Design

Streamflow records form the principal basis for the planning and design of water-related facilities. Past hydrologic experience, however, is never precisely duplicated in the future; the exact sequence of wet and dry years probably will not occur again. For this reason, designers and planners commonly utilize statistical characteristics of streamflow rather than the records of flow at specific times. It is assumed that the probability of occurrence of a flow of a given magnitude can be predicted from a frequency distribution based on past records. Typical statistical characteristics are the mean flow, the flood of 50-year recurrence interval, and the standard deviation of annual mean flows.

A long record of streamflow at a specific site is desirable for defining statistical characteristics of streamflow at that site. Although it is not feasible to collect a long continuous streamflow record at every site where it may be needed, a number of such stations are required to provide information that can be transferred to ungaged sites or to sites where little streamflow information is available.

To evaluate the adequacy of streamflow records the streams in Washington were identified as having either natural- or regulated-flow conditions. For the purpose of this study, streams also were defined under each of the above categories as being minor streams (drainage area less than 500 sq mi), or principal streams (drainage area greater than 500 sq mi).

Natural-Flow Streams

The transfer of information on natural-flow streams is done by relating flow characteristics to basin characteristics, such as drainage area, topography, and climate; by relating a short record to a longer one; or by interpolating between gaged points on a stream channel.

TABLE 1.—Framework for design of data-collection program

Type of data	Current use	Planning and design				Long-term trends	Stream environment
		Natural flow		Regulated flow			
		Minor streams	Principal streams	Minor streams	Principal streams		
Goals	To provide current data on streamflow needed for day-by-day decisions on water management as required.	To provide information on statistical characteristics of flow at any site on any stream to the specified accuracy.				To provide a long-term data base of homogeneous records on natural-flow streams.	To describe the hydrologic environment of stream channels and drainage basins.
Drainage-area limits	Full range	Less than 500 sq mi	Greater than 500 sq mi.	Less than 500 sq mi	Greater than 500 sq mi	Full range	Full range
Accuracy goal	As required	Equivalent to 10 years of record.	Equivalent to 25 years of record.	Equivalent to 10 years of record.	Equivalent to 25 years of record.	Highest obtainable	As required
Approach	Operate gaging stations as required to provide specific information needed. Less than a complete record may be adequate for some purposes.	Gaging at selected sites on streams and transference of this data to ungaged sites by regression or interpolation.	Operate gaging stations to obtain 25 years of record (or the equivalent by correlation) at a network of points on principal streams; interpolate between points.	Develop generalized relations that account for the effect of storage, diversion or regulation on natural flow characteristics.	Utilize analytical model of stream system with observed data as input to compute homogenous records for both natural flow conditions and present conditions of development.	Operate a number of carefully selected gaging stations indefinitely.	Observe and publish information on stream environment.
Evaluate available data	Identify stations where data are used currently and code the specific use of data.	Develop relationship for each flow characteristic and compare standard error with accuracy goal. Evaluate sample.	Lay out network of points on principal streams and compare data available at these points with goal.	Appraise type of regulation, data available, and areas where relationships are needed.	Identify stream systems that should be studied using model approach and determine data requirements.	Are the present stations designated for this purpose adequate?	Evaluate information available in relation to goals.
Design future program		Identify goals that have not been attained. Consider alternate means of attaining goals. Identify elements of future program.					

Regulated-Flow Streams

The natural flow regimen of many streams is altered by the construction of storage reservoirs and the diversion of water for consumptive use. These alterations increase the scope of both the data collection and the analysis that is required to provide information on the flow characteristics.

To be useful in statistical predictions, streamflow data must be homogeneous in time. Frequently, however, it is not possible to obtain a long record under one condition of development before additional changes occur.

Definition of the flow characteristics at any point on any stream is also much more difficult under conditions of regulation. The procedures used for natural streams —regression, interpolation, etc.—cannot be applied.

For regulated streams, a systems approach seems to be the most efficient way of providing meaningful information on the statistical characteristics of flow. This approach requires some sort of analytical model of the stream system. Such models are simple in concept and generally consist of water-budget equations and flow-storage equations. However, in many instances the use of the digital computer is required for complex computations, or to handle large volumes of data. A computer program tailored to the individual system can be prepared.

Development of such a model requires information on stage-capacity curves of reservoirs, stage-discharge curves at the outlets, operating-rule curves for the release of water, losses due to evaporation and seepage, the geometry of the stream channel, and records of diversions and return flow. Information on streamflow at some point or points also is needed as input to the model and to verify the output. Frequently, aquifer characteristics and ground-water pumpage should be considered.

The model and the associated data can be used to derive homogeneous data for both the natural and the regulated conditions. All historical streamflow records for both natural and regulated flows could be used as input to the model. Furthermore, data could also be derived for ungaged sites in the stream system.

Accuracy of Streamflow Characteristics

In using past hydrologic experience to appraise the probability of future occurrences, some error must be tolerated. Natural streamflow, like other events related to climate, is generally random in occurrence and varies greatly in time and space. Statistical techniques used in the analysis of random events, therefore, are considered applicable. Measures of the variability with time of annual mean flow and other streamflow characteristics are determined from the historical streamflow data, and the probable errors involved in defining streamflow characteristics can be appraised. The principal measure of the accuracy with which a particular streamflow characteristic can be determined is the statistical measure of error, "standard error of estimate," and is expressed in this report as a percentage of the average value of the characteristic. The standard error is the estimated limit above and below the average within which about two-thirds of future values of the characteristics are expected to fall. Conversely, there is only one chance in three that future values will differ from the average by more than one standard error.

In general, the longer the record, the more reliable are the estimates of probable future occurrences. However, even with a long record, say 50-100 years or more, it is not possible to determine with great precision the probability of certain flow characteristics, such as floods of a given magnitude, for example. The standard error of various streamflow parameters decreases with the years of available record, but at a decreasing rate; typical examples are shown in figure 2. The incremental economic value of the additional years of record beyond a reasonable limit in the planning and design of projects is under continuing study, but no usable guidelines are available now.

At sites on natural-flow streams where streamflow records are not available, the desired streamflow characteristics may be defined by means of the relation between the streamflow parameter and the characteristics of the drainage basin, referred to as regionalization. This definition is accomplished by multiple-regression analysis, which is a statistical method of handling sample data that can relate a streamflow characteristic to the topographic and climatic characteristics that affect streamflow. This analysis produces a regression equation that can be used to compute the flow characteristics at any point on natural streams in Washington. The standard error of a regression equation provides a measure of the accuracy of an estimate made from it at an ungaged site. That error may be compared with the error associated with the same characteristic defined from a given number of years of record in order to determine whether the accuracy objective has been met.

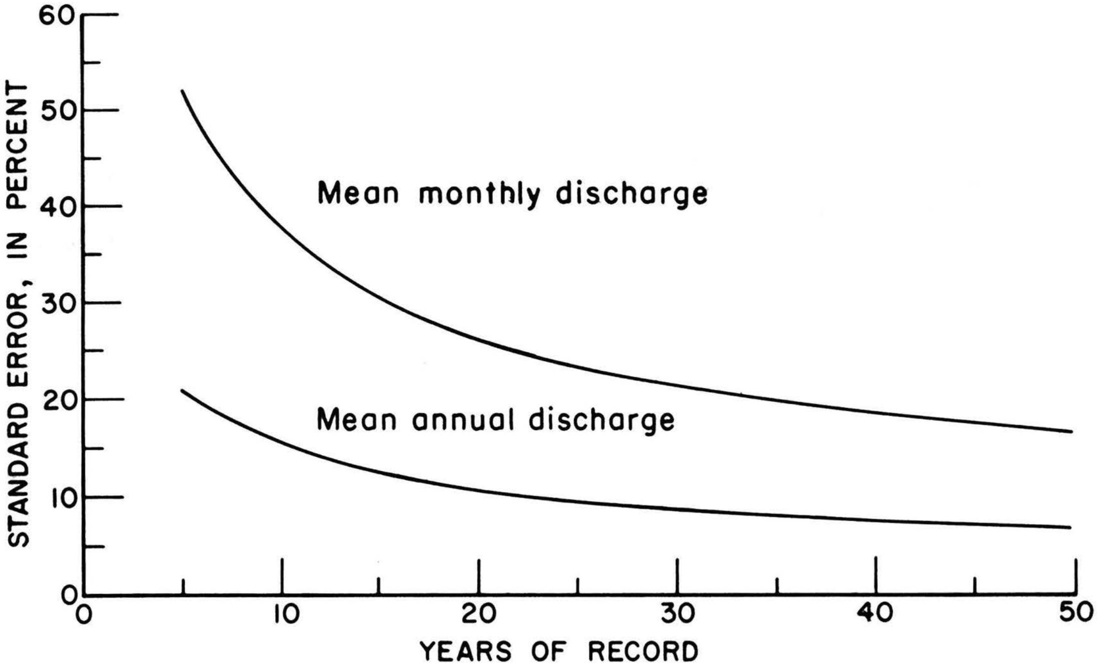


FIGURE 2.—Relation of standard error to length of period.

Data to Define Long-Term Trends

Characteristics of streamflow defined from gaging-station records are used to estimate future-flow characteristics, on the assumption that the observed record is a representative sample of the long-term flows of the stream. To affirm this assumption, or to better define the ways in which the characteristics of flows change with time, selected gaging stations on natural streams should be operated indefinitely. The accuracy of gaging at these sites should be the highest that the state of the art permits.

Data on Stream Environment

Environmental data describe the physical environment in which the water exists, especially those features that relate to the use of water for recreation, waste disposal, conjunctive surface water-ground water supply, and the preservation of the esthetic character of future features. The types of data required for this purpose are suggested by the following:

1. The geologic and hydraulic properties of the stream-aquifer systems.
2. Time of travel of solutes in stream channels.
3. Definition of flood profiles along stream channels.
4. Identification of flood plains of streams for floods of different frequencies.
5. Definition of stream and stream-channel properties, such as velocities, depths, bank vegetation, bed material, water temperature, water quality, and accessibility.
6. Data needed to define the effects of manmade changes in the environment on the quantity and quality of streamflow.
7. Character of the drainage basin, including area, vegetal cover, land and channel slopes, geology, and topography.
8. Climatic factors influencing the water supply.

GOALS OF THE WASHINGTON STATE STREAMFLOW-DATA PROGRAM

The objective of the Washington streamflow-data program is to provide information on flow at any point on any stream where needed. Within this general objective, specific goals are set for each of the four types of data that represent the particular information that is needed.

Data for Current Use

The program goal for this type of data is to provide the particular information needed at specific sites for current use. Accuracy goals at a given site are specified by the data user. Unusually high goals can be met by intensive observation, or by more sophisticated instrumentation.

Data for Planning and Design

The goal for this type of data is to define accuracy that is equivalent to 10 years of streamflow record for minor streams and to 25 years of record for principal streams. This accuracy goal applies not only to all streams with natural flow, but also to those streams that are affected by regulation and diversion. The standard errors, in percent, corresponding to these record lengths can be calculated from a theoretical relation of standard error to index of variability and number of years of record. Those standard-error goals for eastern and western Washington are shown in table 2.

TABLE 2.—Accuracy goals for streamflow characteristics for Washington streams

Streamflow characteristic	Standard error (percent)			
	Western Washington		Eastern Washington	
	10 years	25 years	10 years	25 years
Mean annual	7	4	9	6
Standard deviation of annual discharge	22	14	22	14
Mean monthly discharge (average of 12 months)	14.5	9	16	10
Standard deviation of monthly discharges (average)	22	14	22	14
25-year flood	21.5	14	36	23
50-year flood	24.5	15.5	28	17.5
7-day 2-year low flow	9	5.5	14.5	9
7-day 20-year low flow	14	8.5	22	14
7-day 50-year high flow	17	10.5	24	15

Data to Define Long-Term Trends

The goal for this type of data is to operate indefinitely a small network of gaging stations on streams that are expected to be relatively free from manmade changes. One or two stations should be located in each major drainage area in the State, and stations should be located on streams that differ in physical characteristics.

Data on Stream Environment

Environmental data describe the flow and the stream channel in terms that will be valuable in planning the use of the stream for any purpose such as recreation, waste disposal, conjunctive surface water-ground water supply, and in guarding against floods or accidental water contamination. The long-range goals for this type of data in Washington are given below:

1. Hydrometric surveys of stream-aquifer systems.
2. Surveys of time of travel of solutes in stream channels.
3. Definition of flood profiles along stream channels.
4. Identification of flood plains of streams for floods of different frequencies.
5. Reconnaissance surveys of streamflow and stream channel parameters that are related to the use of the stream for recreation, such as velocities, depths, bank vegetation, bed material, water temperature, water quality and accessibility.
6. Research studies of the effect of manmade changes in the environment on streamflow.

EVALUATION OF EXISTING STREAMFLOW DATA IN WASHINGTON

In this evaluation all available Geological Survey streamflow data in Washington are considered and analyzed in relation to program objectives. A separate evaluation is made for each of the four types of data listed in Table 1.

Data for Current Use

Of the 311 existing recording gaging stations in Washington, 185 provide data for current use. The need for this type of data is being met and program modifications, as dictated by future needs and requirements, can be made to conform to the individual situation.

The specific uses of the 185 gaging stations in the State needed to satisfy the current data requirements are:

Use of data	Number of stations
1. Accounting	27
2. Operation (water management, powerplants, etc.)	119
3. Forecasting (floods for example)	31
4. Waste disposal effects (as for sewage treatment)	1
5. Water quality (chemical, sediment, biological)	7
6. Compact or legal	34
7. Research or special studies	25

Some current-use stations satisfy more than one use. The current-purpose gaging stations and their uses are included in table A-3.

Data for Planning and Design

The statistical characteristics of streamflow can be defined by sample gaging, analytical methods or regionalization, and systems studies, or by any combination of the three. The following discussion of the evaluation of the planning and design type of data follows the framework shown in table 1.

Evaluation of the Natural-Flow Streams

The purpose of the evaluation is to determine how accurately the statistical characteristics that are listed as goals can be defined by regionalization of the data now available.

The most efficient and effective way of generalizing the statistics of streamflow for a region is through multiple-regression techniques where each streamflow statistic is regressed against the basin characteristics of each site.

After defining the regression relation, the streamflow characteristics, for any ungaged site, may be determined by substituting the appropriate basin characteristics in the formulas. The accuracy of a streamflow characteristic estimated from a regression equation is indicated by the standard error of regression. The evaluation consists of comparing the standard errors of regression with the goals shown in table 2.

The 192 streamflow records in western Washington and the 60 in eastern Washington used in the regression analysis are those having 10 or more years of mostly unregulated flows, or flows that were adjusted to natural conditions. Both minor and principal streams are included. Because of some regulation, not all flow characteristics were defined for each record. At some stations, regulation materially affected low flows but in significantly affected peaks.

In addition to the records at regular gaging stations, records of flood peaks at 66 partial-record crest-stage gaging stations in western Washington and at 51 partial-record crest-stage gaging stations in eastern Washington were used in the analysis.

Drainage-basin characteristics.—The drainage-basin characteristics defined for this study (table A-1) are described below:

a. Drainage area, A, in square miles, as shown in the latest Geological Survey streamflow reports.

b. Main-channel slope, S_1, in feet per mile, is the average slope of the main channel between points that are 10 and 85 percent of the distance upstream from the gaging site to the basin border. This index was described and used by Benson (1962, p. B23-B25).

c. Percent surface storage, L, was computed as the ratio, times 100, of total drainage area occupied by lakes and ponds. To avoid difficulties associated with the use of zeros, all of the values were increased by 0.01 percent.

d. Mean basin elevation, E, in feet above mean sea level, divided by 1,000, is considered as a topographic variable because of the relation between elevation and radiation, temperature, wind, and vegetation, which in turn are related to the characteristics of streamflow.

e. Forest cover, F, expressed as the percentage of the drainage area covered by forests as shown on the topographic map, determined by a grid method.

f. Mean annual precipitation, P, in inches, determined from an isohyetal map (prepared by the U.S. Weather Bureau Forecast Center, Portland, Oreg., using adjusted climatological data (1930-57) and values derived by correlation with physiographic factors. Published by the Soil Conservation Service, U.S. Department of Agriculture, in cooperation with the U.S. Weather Bureau, U.S. Department of Commerce, March 1965).

g. Maximum 24-hour rainfall having a recurrence interval of 2 years, $P_{24,2}$, expressed in inches. These values were obtained from the Environmental Science Service Administration (1961b, p. 95).

h. Minimum January temperature, T_1, in degrees Fahrenheit. Values were obtained from the Environmental Science Service Administration (1965). Temperature may affect streamflow by changing storage through accumulation or melting of snow.

Streamflow characteristics.—The following streamflow characteristics defined at gaging stations include the full range of flow and represent those required for planning and design:

a. Mean-flow characteristics are described by the mean of the annual means, Q_a, and by the means of record for each calendar month, q_n, where the subscript refers to the numerical order of the month beginning with January as 1.

b. Flow-variability characteristics are represented by the standard deviations of the annual and monthly means. The symbols used are, respectively, SD_a and SD_n, where the subscript n refers to the numerical order of months with January as 1.

c. Low-flow characteristics are the annual minimum 7-day mean flows at 2-year, 10-year recurrence intervals ($M_{7,2}$, $M_{7,10}$, and $M_{7,20}$). These were determined graphically from low-flow frequency curves.

d. Flood-peak characteristics are represented by discharges from the annual flood-frequency curve at recurrence intervals of 2, 5, 10, 25, and 50 years. In this report, these peak-flow rates are denoted as P_2, P_5, etc. The frequency curves were prepared as described by the Water Resources Council (1967).

e. Flood-volume characteristics represent the annual highest average flow for 7-day periods, at recurrence intervals of 2, 10, 25, and 50 years. These characteristics are noted symbolically in this report as $V_{7,2}$, $V_{7,10}$, $V_{7,25}$, and $V_{7,50}$. They were determined from frequency curves prepared as described by the Water Resources Council (1967).

Regression analysis.—The next step was to relate each of the streamflow characteristics to basin and climatic characteristics in equations developed by using multiple regression techniques. The equation has the form $Y = a A^{b_1} S_l^{b_2} L^{b_3}$ ----, where Y is a statistical streamflow characteristic; A, S_l, L----, are topographic or climatic characteristics; a is the regression constant; and b_1, b_2, and b_3 are coefficients obtained by regression. This method was described by Benson (1962). The usefulness of each of the drainage-basin characteristics was judged on the basis of its statistical significance. Those that were significant were used in the equation, others were left out.

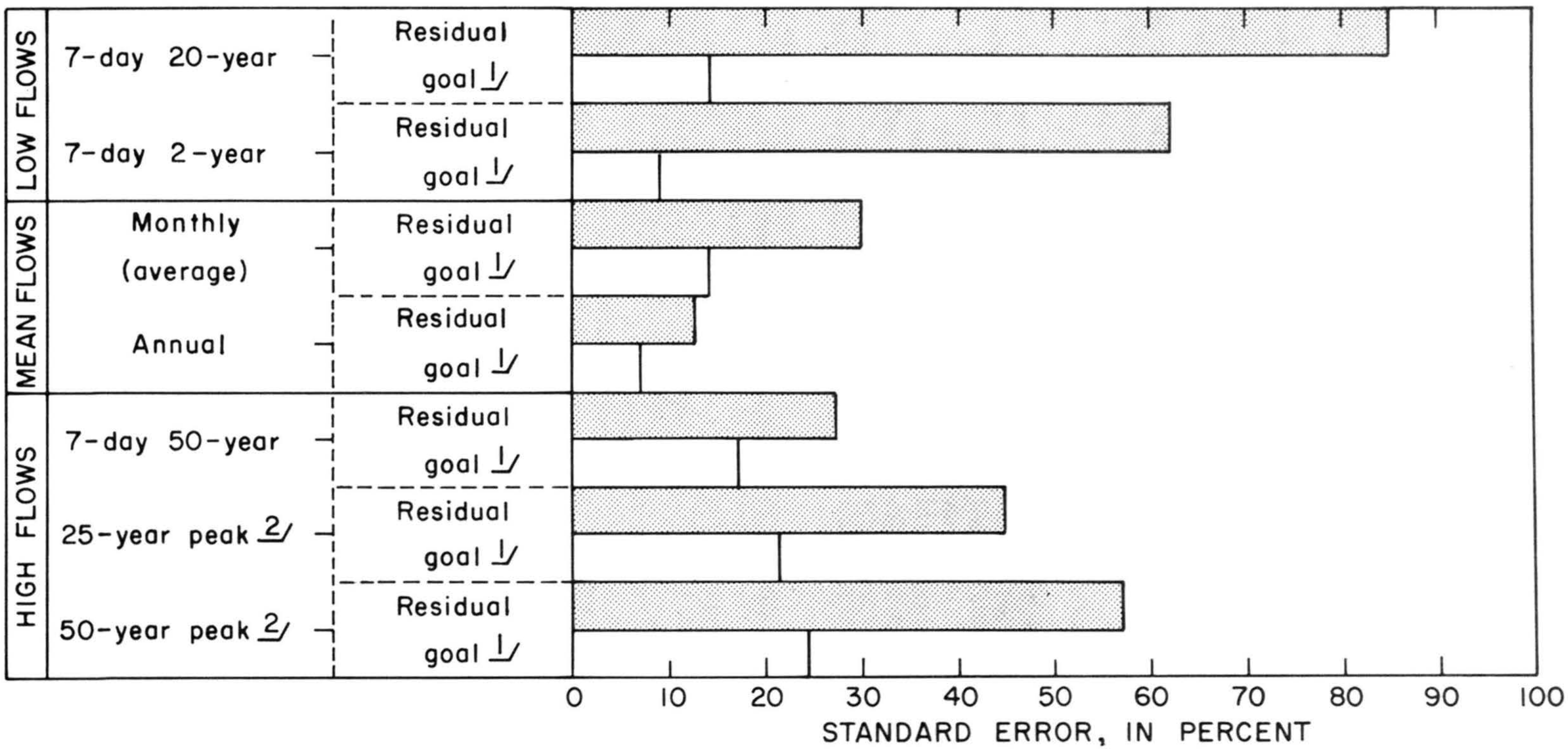
Initially the drainage-basin characteristics were related to the streamflow characteristics for all stations in the State. Examination of the plotting of the difference between computed and observed values of the streamflow characteristic, on a State map, indicated the desirability of dividing the State into eastern and western parts. The crest of the Cascade Range was used as the dividing line (fig. 1). The regression analysis was conducted again, evaluating western and eastern Washington stations separately.

In table 3 the first column indicates the streamflow characteristic studied. The other columns show the regression constant, the regression coefficients for each of the significant drainage-basin characteristics, and the standard error both in log units and in percentage. As an illustration, the regression equation for determining mean annual discharge at a river site in western Washington is

$$Q_a = 0.00324\ A^{0.99} E^{0.12} F^{0.14} P^{1.23} T_1^{0.35},$$

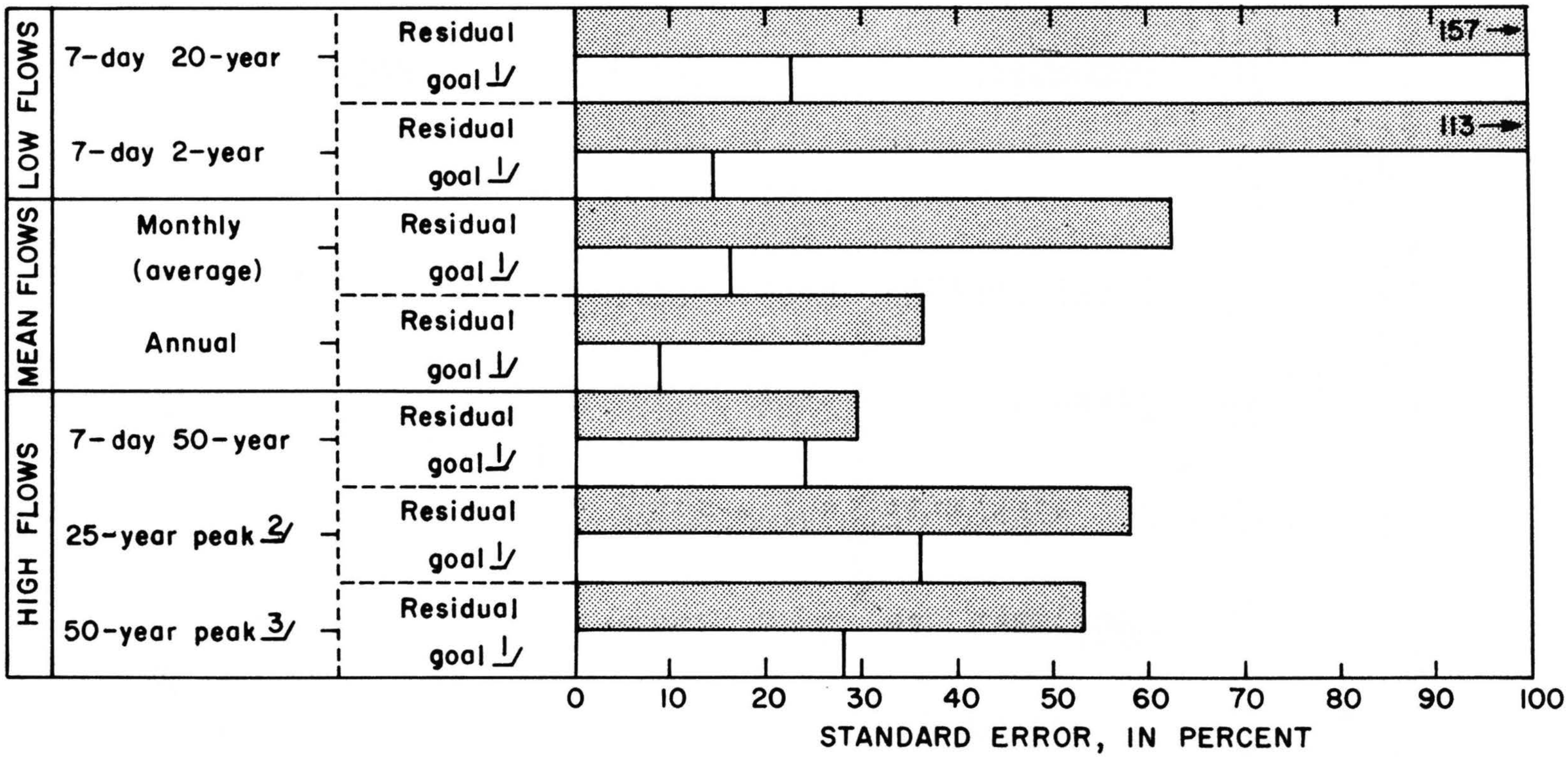
where Q_a is the mean annual discharge, in cubic feet per second; A is drainage area, in square miles; E is mean basin elevation in 1,000 feet above mean sea level; F is percentage of basin with forest cover; P is the mean annual precipitation, in inches; and T_1 is the minimum January temperature, in degrees Fahrenheit.

The standard errors in table 3 are compared with the corresponding values of table 2 to determine whether the accuracy goals have been met. Figures 3 and 4 show these comparisons for minor streams (equivalent



[1] Goal is equivalent to 10 years of data.
[2] Includes data from both partial-record flood stations and recording stations.

FIGURE 3.—Regionalization accuracy and goal comparisons of flow characteristics of minor streams in western Washington. The residual bar indicates the standard error of the regression equation.



[1] Goal is equivalent to 10 years of data.
[2] Includes data from both partial-record flood stations and recording stations.
[3] Recording gages only.

FIGURE 4.—Regionalization accuracy and goal comparisons of flow characteristics of minor streams in eastern Washington. The residual bar indicates the standard error of the regression equation.

TABLE 3.—Summary of regression relations for Washington drainage basins—Continued
(All regression coefficients are significant at the 5% level)

Part A. Western Washington

$$Y = a A^{b_1} S_1^{b_2} L^{b_3} E^{b_4} F^{b_5} P^{b_6} P_{24,2}^{b_7} T_1^{b_8}$$

Flow index, Y	Regression constant, a[1]	Drainage area, A	Channel slope, S_1	Area of lakes, L	Mean basin elevation, E	Forest cover, F	Annual precipitation, P	Precipitation intensity, $P_{24,2}$	Minimum January temperature, T_1	Standard error: Log units	Standard error: Percent
					Regression coefficients for:						
					MEAN FLOWS						
Q_a	3.24(−3)	0.99	--	--	0.12	0.14	1.23	--	0.35	0.051	12
q_1	6.02(−6)	1.02	--	−0.02	--	.26	1.28	--	2.14	.092	21
q_2	7.76(−6)	1.02	--	−.02	--	.29	1.20	--	2.10	.091	21
q_3	2.14(−5)	1.06	--	−.02	--	.24	1.15	--	1.80	.101	24
q_4	1.03(−3)	.99	--	--	.24	.24	1.09	--	.77	.137	32
q_5	.692	.98	--	.03	.45	--	1.04	--	−.86	.103	24
q_6	35.5	.97	--	.06	.58	−.35	1.00	--	−1.61	.118	27
q_7	55.0	1.07	0.14	.07	.37	−.73	1.09	--	−1.80	.160	37
q_8	6.31	1.20	.29	.05	--	−.87	1.17	--	−1.55	.212	50
q_9	11.2	1.02	--	--	.38	−.82	1.34	--	--	.195	46
q_{10}	2.95(−4)	.99	--	--	.26	−.33	1.73	--	.85	.136	32
q_{11}	2.51(−5)	.98	--	−.03	.18	--	1.51	--	1.68	.097	23
q_{12}	1.26(−5)	1.01	--	−.02	.09	.24	1.38	--	1.80	.087	18
					STANDARD DEVIATION OF FLOWS						
SD_a	2.19(−3)	1.02	--	--	.82	.29	1.03	--	--	.165	39
SD_1	4.90(−6)	1.00	--	--	--	.31	1.36	--	1.80	.156	37
SD_2	2.95(−5)	.98	--	--	--	.34	1.25	--	1.36	.122	29
SD_3	4.57(−6)	1.02	--	--	--	.53	1.07	--	1.74	.153	36
SD_4	1.78(−3)	.99	--	--	.07	.35	1.16	--	--	.145	34
SD_5	4.57(−2)	.97	--	--	.31	.25	.98	--	−.63	.129	30
SD_6	2.04	.95	--	.06	.65	--	.95	--	−1.42	.169	40
SD_7	5.25	.95	--	.08	.64	--	1.10	--	−2.06	.283	68
SD_8	.251	.96	--	.07	.43	−.76	1.46	--	−.95	.196	46
SD_9	5.37(−4)	.94	--	--	.32	−.44	2.02	--	--	.231	54
SD_{10}	9.17(−6)	.98	--	--	.31	.32	1.67	--	.93	.173	41
SD_{11}	1.35(−5)	.98	--	--	.21	.52	1.32	--	1.24	.154	36
SD_{12}	6.03(−5)	1.02	--	--	.14	.49	1.12	--	1.07	.155	36
					LOW FLOWS						
$M_{7,2}$	.934	1.06	--	.07	.29	−.40	.74	--	--	.260	62
$M_{7,10}$	1.42(−3)	1.26	.29	.11	--	--	.80	--	--	.329	82
$M_{7,20}$	1.32(−3)	1.27	.28	.11	--	--	.79	--	--	.335	85
					PEAK FLOWS						
P_2	7.08(−4)	.91	--	−.07	.20	−.22	1.57	--	1.58	.161	38
P_5	2.82(−3)	.89	--	−.06	.25	−.26	1.50	--	1.42	.164	39
P_{10}	1.10(−2)	.88	--	−.08	.26	−.28	1.44	--	1.18	.182	43
P_{25}	3.47(−2)	.87	--	−.07	.29	−.32	1.40	--	1.01	.190	45
P_{50}	.309	.82	--	--	.14	--	1.46	--	--	.240	57
					FLOOD VOLUMES						
$V_{7,2}$	2.51(−3)	.96	--	−.03	--	.38	1.32	--	.46	.118	27
$V_{7,10}$	2.40(−2)	.96	--	--	--	.37	1.25	--	--	.191	45
$V_{7,25}$	2.57(−2)	.96	--	--	--	.38	1.25	--	--	.196	46
$V_{7,50}$	2.00(−2)	.89	−.13	--	--	--	1.60	--	--	2.01	47

[1] Number in parentheses is power of 10 to which value must be multiplied.

TABLE 3.—Summary of regression relations for Washington drainage basins—Continued
(All regression coefficients are significant at the 5% level)

Part B. Eastern Washington

$$Y = a A^{b_1} S_1^{b_2} L^{b_3} E^{b_4} F^{b_5} P^{b_6} P_{24,2}^{b_7} T_1^{b_8}$$

		Regression coefficients for:								Standard error	
Flow index, Y	Regression constant, a[1]	Drainage area, A	Channel slope, S_1	Area of lakes, L	Mean basin elevation, E	Forest cover, F	Annual precipitation, P	Precipitation intensity, $P_{24,2}$	Minimum January temperature, T_1	Log units	Percent
					MEAN FLOWS						
Q_a	2.63(−3)	0.98	--	--	--	0.13	1.51	--	--	0.152	36
q_1	1.45(−3)	.91	--	--	--	--	1.24	--	0.71	.200	47
q_2	4.07(−3)	.90	--	--	--	--	.97	--	.78	.215	51
q_3	1.35(−3)	.88	--	--	--	--	.88	--	.58	.197	46
q_4	.589	.79	--	--	--	.27	--	1.68	--	.259	62
q_5	.141	.85	--	--	--	.46	--	2.66	--	.246	59
q_6	4.37(−2)	.89	--	--	--	.50	--	3.38	--	.299	74
q_7	3.47(−2)	.86	--	0.19	--	.50	--	3.03	--	.314	79
q_8	8.92(−3)	.94	0.35	.29	--	.38	--	2.09	--	.316	80
q_9	4.90(−2)	.79	--	.21	--	.45	--	2.07	--	.296	73
q_{10}	6.41(−4)	1.12	--	.04	--	.24	--	.57	--	.252	61
q_{11}	9.78(−4)	.88	--	.11	--	.24	--	1.66	--	.234	56
q_{12}	6.76(−4)	.91	--	--	--	--	--	1.69	.41	.214	51
					STANDARD DEVIATION OF FLOWS						
SD_a	4.79(−3)	1.01	.15	.09	--	--	1.00	--	--	.122	29
SD_1	2.46(−3)	.76	−.31	--	--	--	1.09	--	.92	.301	75
SD_2	2.04(−2)	.72	−.26	--	--	--	.99	--	.71	.279	68
SD_3	9.54(−2)	.74	−.29	--	--	--	.80	--	.44	.270	66
SD_4	6.46(−3)	.96	--	--	--	.19	1.12	--	--	.209	49
SD_5	4.07(−3)	.97	--	--	--	.32	1.49	--	−.45	.171	40
SD_6	6.46(−4)	1.11	.30	.17	--	.29	1.55	--	−.51	.230	55
SD_7	2.63(−4)	1.08	--	.20	--	.27	2.13	--	−.70	.307	77
SD_8	1.03(−3)	.99	--	.24	--	.21	1.61	--	−.56	.288	69
SD_9	5.01(−4)	.96	--	.27	--	.22	1.36	--	--	.266	64
SD_{10}	2.45(−3)	.80	--	.29	--	.25	1.30	--	--	.394	104
SD_{11}	2.51(−3)	.78	--	.18	--	--	1.71	--	--	.365	95
SD_{12}	1.10(−3)	.83	--	--	--	--	1.38	--	.68	.338	88
					LOW FLOWS						
$M_{7,2}$	1.00	.44	--	.50	1.79	--	--	--	--	.423	113
$M_{7,10}$	.676	.34	--	.53	2.21	--	--	--	--	.481	135
$M_{7,20}$	2.51	--	--	.61	2.59	--	--	--	--	.535	157
					PEAK FLOWS						
P_2	16.6	.80	−.22	--	--	−.10	--	2.35	--	.202	48
P_5	10.2	.88	--	--	--	−.19	--	2.01	--	.210	50
P_{10}	7.08	.87	−.20	--	--	--	--	1.86	.34	.205	49
P_{25}	8.13	.86	−.22	--	--	--	--	1.82	.42	.242	58
P_{50}	15.5	.85	--	--	--	--	--	1.50	--	.222	53
					FLOOD VOLUMES						
$V_{7,2}$	2.51	.85	--	--	--	--	--	2.30	--	.204	48
$V_{7,10}$	4.79	.87	--	--	--	--	--	1.89	--	.189	45
$V_{7,25}$	8.95(−2)	.98	--	--	--	--	1.32	--	--	.267	65
$V_{7,50}$	26.9	.80	--	.18	--	--	--	1.03	--	.103	29

[1] Number in parentheses is power of 10 to which value must be multiplied.

of 10 years of record) of western and eastern Washington, respectively. The accuracy goals were not met for either minor streams (the equivalent of 10 years of record), or the principal streams (the equivalent of 25 years of record) as shown in tables 2 and 3.

Principal streams.—The accuracy goal for principal streams is a standard error which is equivalent to the error existing from 25 years of record (table 2). Because this accuracy was not achieved by regionalization, the goal is to be met by gaging-station operation at selected points on streams and by interpolation between these points. The study for this category consisted of identification of a principal-streams network and evaluation of length of record available at these sites.

The existing principal-streams network includes 13 sites on natural streams and eight sites where monthly and annual mean discharges are adjusted to natural flow by change in reservoir content. These stations are:

Station number	Station name	Years of Record	Drainage area (sq. mi.)
Natural Flow			
12-0275	Chehalis River near Grand Mound	42	895
0310	Chehalis River at Porter	18	1,294
1345	Skykomish River near Gold Bar	42	535
1895	Sauk River near Sauk	42	714
2105	Nooksack River at Deming	28	584
2131	Nooksack River at Ferndale	4	786
4240	Hangman Creek at Spokane	22	689
4310	Little Spokane River at Dartford	26	665
4570	Wenatchee River at Plain	60	591
4650	Crab Creek at Irby	28	1,042
5135	Esquatzel Coulee at Eltopia	9	551
14-2334	Cowlitz River near Randle	3	1,030
2425	Toutle River near Silver Lake	48	474
Stations where discharges are adjusted to natural flow			
12-1015	Puyallup River at Puyallup	55	948
1780	Skagit River at Newhalem	61	1,175
4525	Chelan River at Chelan	66	924
4795	Yakima River at Cle Elum	65	495
4940	Naches River below Tieton Dam, near Naches	62	941
14-2205	Lewis River at Ariel	47	731
2300	Cowlitz River below Mayfield Dam	36	1,400
2430	Cowlitz River at Castle Rock	44	2,238

Of the 13 natural flow sites, 12 are current-purpose stations; the other station, Wenatchee River at Plain is not current purpose but has 60 years of record, indicating that it meets the accuracy requirement.

Of the eight stations with discharges adjusted to natural flow, all are current-purpose stations. Gaging stations are needed at 11 additional sites to meet the criterion that principal streams are gaged at locations where the drainage areas are approximately 500, 1,000, 2,000, ----, square miles.

Evaluation of the Regulated-Flow Systems

The goals for regulated streams are more difficult to attain because (1) the technique of regionalization does not apply, (2) the characteristics are not necessarily stationary in time, and (3) a meaningful correlation seldom exists between flows at two sites if at least one of the flows is regulated. A systems approach may be used to define the characteristics of regulated streamflow under different patterns of regulation, or under the condition of natural flow. Systems studies for all of the regulated-stream systems in Washington will require a major effort. Therefore, the present evaluation is limited to (1) identifying the regulated streams, and (2) describing briefly the approach that would be used.

Regulated principal streams in Washington are gaged as indicated by the list of stations in table 4. Twenty-six of these stations have been in operation for 25 years or more and have a sufficient length of record according to the goals set for this study. However, 25 are current-purpose stations.

A systems analysis may be required to define the flow characteristics of regulated streams at sites other than gaging stations. The product of a systems analysis is a flow-storage model of reservoirs and channels. By using this model, a synthetic record can be computed for any site on the stream for a given condition of regulation. Records of operation of reservoirs and lakes in the system are among the needed inputs to the model. The sites at which this type of information is available are listed in table 5.

TABLE 4.—Data on gaging stations on regulated principal streams in Washington

Station number	Station name	Years of record	Drainage area (sq mi)
12-0884	Nisqually River above Powell Creek, near McKenna	1	431
1005	White River near Sumner	25	470
1133.5	Green River at Tukwila	10	440
1490	Snoqualmie River near Carnation	42	603
1508	Snohomish River near Monroe	7	1,537
1790	Skagit River above Alma Creek, near Marblemount	20	1,274
1940	Skagit River near Concrete	46	2,737
3230	Columbia River at Birchbank, British Columbia (International gaging station)	57	34,000
3965	Pend Oreille River below Box Canyon, near Ione	18	24,900
3986	Pend Oreille River at international boundary (International gaging station)	59	25,200
3995	Columbia River at international boundary (International gaging station)	33	59,700
4045	Kettle River near Laurier (International gaging station)	41	3,800
4090	Colville River at Kettle Falls	48	1,007
4195	Spokane River above Liberty Bridge, near Otis Orchards)	34	3,880
4225	Spokane River at Spokane	79	4,290
4330	Spokane River at Long Lake	31	6,020
4365	Columbia River at Grand Coulee Dam	57	74,700
4380	Columbia River at Bridgeport	18	75,700
4387	Okanogan River near Oliver, British Columbia (International gaging station)	20	2,870
4395	Okanogan River at Oroville	28	3,210
4425	Similkameen River near Nighthawk (International gaging station)	59	3,550
4450	Okanogan River near Tonasket	41	7,280
4472	Okanogan River at Malott	12	8,100
4507	Columbia River below Wells Dam	17	86,100
4537	Columbia River at Rocky Reach Dam	10	87,800
4590	Wenatchee River at Peshastin	42	1,000
4625	Wenatchee River at Monitor	8	1,301
4626	Columbia River below Rock Island Dam	43	89,400
4646.2	Columbia River below Wanapum Dam	7	90,900
4670	Crab Creek near Moses Lake	28	2,228
4726	Crab Creek near Beverly	11	4,842
4728	Columbia River below Priest Rapids Dam	53	96,000
4845	Yakima River at Umtanum	65	1,594
5004.5	Yakima River above Ahtanum Creek, at Union Gap	5	3,479
5050	Yakima River near Parker	63	3,650
5105	Yakima River at Kiona	58	5,615
13-3435	Snake River near Clarkston	55	103,200
3461	Palouse River at Colfax	15	497
3492.1	Palouse River below South Fork, at Colfax	7	796
3510	Palouse River at Hooper	32	2,500
3525	Cow Creek at Hooper	10	679
3530	Snake River below Ice Harbor Dam	20	108,500
14-0185	Walla Walla River near Touchet	19	1,657
1130	Klickitat River near Pitt	44	1,297

TABLE 5.—Regulated reservoirs and lakes in Washington, and length of record

Station number	Station name	Drainage area (sq mi)	Years of record	Outflow stream
12-0450	Lake Mills at Glines Canyon, near Port Angeles	245	1927–	Elwah River
0850	Alder Reservoir at Alder	286	1944–	Nisqually River
0855	La Grande Reservoir at La Grande	289	1945–	Do
0980	Mud Mountain Reservoir near Buckley	400	1943–	White River
1058	Howard A. Hanson Reservoir near Palmer	220	1961–	Green River
1110	Lake Sawyer near Black Diamond	13	1952–	--
1220	Sammamish Lake near Redmond	97.7	1939–	Sammamish River
1274	Lake Ballinger near Edmonds	5.09	1966–	McAleer Creek
1373	Spada Lake near Startup	68.3	1965–	Sultan River
1575	Lake Goodwin near Silvana	5.17	1953–	Tulalip Creek
1580	Lake Shoecraft near Tulalip	6.02	1953–	Do
1750	Ross Reservoir near Newhalem (International gaging station)	999	1940–	Skagit River
1765	Diablo Reservoir near Newhalem	1,125	1929–	Do
1770	Gorge Reservoir near Newhalem	1,159	1960–	Do
1916	Baker Lake at Upper Baker Dam, near Concrete	215	1959–	Baker River
1930	Lake Shannon at Concrete	297	1925–	Do
4060	Deer Lake near Loon Lake	18.2	1952–	Colville River
4065	Loon Lake near Loon Lake	35.8	1950–	Do
4198	Newman Lake near Newman Lake	28.6	1958–	Spokane Valley Irrigation Canal
4200	Liberty Lake at Liberty Lake	13.3	1956–	Spokane River
4325	Long Lake at Long Lake	6,020	1913–	Do
4360	Franklin D. Roosevelt Lake at Grand Coulee Dam	74,100	1938–	Columbia River
4379	Rufus Woods Lake at Bridgeport	75,400	1954–	Do
4390	Osoyoos Lake near Oroville (International gaging station)	3,150	1928–	Okanogan River
4438	Spectacle Lake near Loomis	17.2	1958–	Whitestone Creek
4440	Whitestone Lake near Tonasket	52.3	1958–	Do
4447	Aeneas Lake near Tonasket	32.4	1964–	Aeneas Creek
4520	Lake Chelan at Chelan	924	1897–99, 1905, 1911–	Columbia River
4710	Moses Lake at Moses Lake	3,080	1909–14, 1936–	Crab Creek
4740	Keechelus Lake near Martin	54.7	1906–	Yakima River
4755	Kachess Lake near Easton	63.6	1905–	Do
4785	Cle Elum Lake near Roslyn	203	1906–	Cle Elum River
4875	Bumping Lake near Nile	69.3	1909–	Bumping River
4910	Rimrock Lake at Tieton Dam, near Naches	187	1925–	Tieton River
13-3518	Sprague Lake near Sprague	289	1958–	Cow Creek
14-2176	Swift Reservoir near Cougar	481	1958–	Lewis River
2185	Yale River near Yale	596	1952–	Do
2200	Lake Merwin at Ariel	730	1931–	Do
2254	Packwood Lake near Packwood	19.2	1959–	Lake Creek
2348	Davisson Lake near Mossyrock	1,154	1968–	Cowlitz River
2378	Mayfield Reservoir near Silver Creek	1,400	1962–	Do

Data to Define Long-Term Trends

At present two gaging stations on unregulated streams —North Fork Quinault River near Amanda Park and Andrews Creek near Mazama—are designated as bench mark or long-term stations for indefinite operation. More gaging stations are needed for this purpose.

Data on Stream Environment

Basin and climatic characteristics are listed for 369 gaging stations in table A-1. Flood-prone areas have been determined by drawing 18 inundation maps for various areas and site surveys have been made at 201 partial-record crest-stage stations. Channel cross sections have been measured and mapped on 38 reaches on 12 rivers. However, very few of the goals for this type of data have been attained.

ALTERNATE MEANS OF TRANSFERRING STREAMFLOW DATA

The accuracy of definition of flow characteristics at ungaged sites by regression analysis is limited by the model used and by the amount of information obtainable on those basin characteristics which largely influence streamflow characteristics, principally precipitation and geology. When more detailed geologic and topographic maps and more complete climatic data become available the results may be improved. Another possibility of improving the results may be to divide the State into several parts, more than just the eastern and western division, and preform a regression analysis on basin and streamflow data in each part. But, with the State divided into several parts, each treated as an entity, the number of streamflow stations or number of pieces of data in each part becomes less. A third possibility, which also would preserve the number of pieces of data, would be to apply a residual factor and incorporate this into the regression analysis, as Benson has done (1962, p. 55). However, until the regionalization techniques are substantially improved, some alternate methods of transferring information to ungaged sites should be considered. Most of these methods require some information at the ungaged site, as well as a network of gaging-station records. These methods are described briefly in the following paragraphs.

Moore (1968) has shown that the mean annual flow can be estimated from the width and depth of the stream channel. Different relationships were developed for perennial and ephemeral streams. These relations, at present, provide a means of roughly estimating the mean annual flow at a site and better definition of the relations through research may lead to more exact definition.

Riggs (1969) showed that estimates of the mean annual flow at a site can be determined by measuring the discharge at the site near the middle of each calendar month for a water year if concurrent correlation can be established with a nearby gaging station. This method may have particular application in areas where runoff is seasonal.

Riggs (1965) describes the use of partial-record stations to define low-flow characteristics at numerous sites. A partial-record station is a site at which enough base-flow measurements are obtained to define an adequate relation with concurrent flows at a nearby gaging station. The frequency characteristics of the low flow at a partial-record station can be determined from the relation of concurrent flows and the record at the gaged site.

THE PROPOSED PROGRAM

The information developed in different segments of this study has been merged and applied in planning a streamflow-information program that would eventually attain as many of the remaining goals as possible within the limits of available funds. For the optimum program a balance must be maintained between data collection and data analysis, as continuous interaction between the two is needed, not only to gain a better understanding of the hydrologic system, but also to guide future evaluation of the program in meeting ever-changing needs and in adapting to changing technology.

Data Collection

Data for Current Use

Operation of the 185 stations, identified as presently meeting the needs for current-purpose data (table A-3), should be continued. The changing needs will be assessed continuously, and the data-collection network will be modified by adding or discontinuing stations as needs change for current-purpose data. Also the needs for current-purpose data will be examined for each site, and a determination made as to whether a continuous record of daily discharge is required or whether measurement of specific flow characteristics, such as peak flow or instantaneous flow, would suffice.

The following is a list of streamflow stations, prepared by the hydrology and Hydraulics Committee of the Pacific Northwest River Basin Commission, summarizing the projected State and Federal agency needs for current-purpose gaging sites through the year 1984.

Stream	Basin
Niawaukum River near South Bend	Niawaukum
Falls River near Brooklyn	North River
Newskah Creek near Aberdeen	Newskah
Rock Creek near Pe Ell	Chehalis
Bunker Creek near Adna	do
Scatter Creek near Grand Mound	do
Wildcat Creek near Elma	do
West Fork Satsop River near Grisdale	do
Chehalis River below Elk Creek	do
Big Creek near Grisdale	do
Black Creek near Montesano	do
Wynoochee River, above dam	do
Schaefer Creek	do
West Fork Humptulips River near Amanda Park	Humptulips
Copalis River near Copalis	Copalis
Matheny Creek near Queets	Queets
Clearwater River near Forks	do
Upper Hoh River	Hoh
Bogachiel River near Forks	Quillayute
Ozette River near Ozette	Ozette
Pysht River near Pysht	Pysht
Upper Elwha River	Elwha
Elwha River below Long Creek	do
Graywolf River near Sequim	Dungeness
Dungeness River below Graywolf River	do
Big Quilcene River near Quilcene	Big Quilcene
Eagle Creek near Lilliwaup	Eagle
Stavis Creek near Seabeck	Stavis
Black Jack Creek near Port Orchard	Black Jack
Cranberry Creek near Shelton	Cranberry
Percival Creek near Olympia	Percival
Deschutes River near Shellrock Ridge	Deschutes
Spurgeon Creek near Olympia	do
Kautz Creek near Longmire	Nisqually
Little Nisqually River near Alder	do
Tanwax River near McKenna	do
Clover Creek near Parkland	Chambers
Mowich River near Electron	Puyallup
Gale Creek at Wilkeson	do
Voight Creek near Crocket	do
Power Creek near Mukilteo	Power
Tye River near Skykomish	Snohomish
Foss River near Skykomish	do
Miller River near Skykomish	do
North Fork Skykomish River	do
McCoy Creek near Sultan	do
Taylor River near North Bend	do
Boardman Creek near Silverton	Stillaguamish
Deer Creek near Oso	do
Whitechuck River near Darrington	Skagit
Upper Suiattle River	do
Glacier Creek near Glacier	Nooksack
Ten Mile Creek near Ten Mile	do
Maple Creek near Maple Falls	do
California Creek near Custer	California
Sumas River at Sumas	Fraser
Le Clerc Creek near Ruby	Pend Oreille
Narcisse Creek	do
Lost Creek near Lost Creek	do
Grouse Creek	Colville
China Creek	do
Magee Creek near Daisy	Columbia
Hunters Creek near Hunters	do
Deep Creek near Northport	Deep
Sherman Creek near Kettle Falls	Sherman
Ninemile Creek near Keller	Ninemile
Dragoon Creek near Deer Park	Spokane
Hangman Creek near Tekoa	do
Sanpoil River near Nespelem	Nespelem
Salmon Creek below Conconully Reservoir	Okanogan
Omak Creek near Omak	do
Chewack Creek near Winthrop	Methow
Twisp River near Twisp	do
Nason Creek near Plain	Wenatchee
Peshastin Creek near Peshastin	do
Wilson Creek near Govan	Crab
Crab Creek near Harrington	do
Falls Creek near Manson	Chelan
Little Grade Creek near Manson	do
Poison Creek near Manson	do
Mitchell Creek near Manson	do

Stream	Basin
Little Naches River near Nile	Yakima
Swauk Creek near Cle Elum	do
Manastash Creek near Ellensburg	do
Cowiche Creek near Yakima	do
Simcow Creek near White Swan	do
Tucannon River above Tucannon	Tucannon
Pataha Creek near Columbia Center	do
Pataha Creek near Pomeroy	do
Cow Creek near Sprague	Palouse
Union Flat Creek near La Crosse	do
Walla Walla River near Milton	Walla Walla
Mill Creek near Blue Creek	do
Dry Creek near Lowden	do
Blockhouse Creek	Klickitat
Bacon Creek near Glenwood	do
White Creek near Glenwood	do
Gilmer Creek near Gilmer	White Salmon
Lava Creek near Willard	Little White Salmon
Little White Salmon River at Willard	do
Little White Salmon River above Moss Creek	do
Rock Creek near Stevenson	Rock
Woodward Creek near North Bonneville	Woodward
West Fork Washougal River near Washougal	Washougal
Ohanapecosh River near Packwood	Cowlitz
Silver Creek near Randle	do
North Fork Cispus River near Randle	do
Lacamas Creek near Toledo	do
North Fork Toutle River near Toutle	do
Coweman River upper basin	do
Germany Creek near Longview	Germany

Data for Planning and Design

Regression relations shown in table 3 may be used for estimating flow characteristics needed for some planning and design purposes; however, the standard errors of the relations did not meet the accuracy goals as set by the Geological Survey. It is unlikely that a similar analysis of more or longer streamflow records would appreciably improve estimates of flow at ungaged sites. Thus, it seems unnecessary to continue operation of all the stations now identified with planning and design, particularly those with more than 20 years of record.

Low-flow characteristics cannot be estimated reliably by defined regression relations. However, base-flow discharge measurements at about 350 sites are available. Currently base-flow measurements are being made at about 145 sites. Low-flow characteristics can be defined at many of these sites by correlation with concurrent flows at nearby gaging stations where low-flow characteristics have been defined. A program should be initiated to analyze the available low-flow data so that a sound proposal can be made for a data program to define low-flow characteristics.

Flood-peak characteristics at recurrence intervals of 100 years often are estimated for project design. Although the objective includes only the 50-year flood, it would be desirable to continue collecting flood-peak data at selected sites indefinitely. For each streamflow station recommended for discontinuance, consideration will be given to the continued collection of peak-flow data. The needed data can thus be obtained at a reduced cost by operating a partial-record station.

Natural-flow, minor streams.—Forty-seven natural-flow minor-stream stations having more than 20 years of record, or stations that are correlated with nearby long-term stations, are recommended for discontinuance (table A-3) because it is unlikely the additional record at those sites would appreciably improve definition of the flow characteristics.

As mentioned previously, improvement of the accuracy of the regression relations defined in this study is unlikely by increasing the number of streamflow records available for analysis. Therefore, no new stations are proposed. However, additional stations may be needed in the future to sample areas, climatic conditions, and geologic conditions not sampled at present.

Subsequent to analysis of available low-flow data the needs for low-flow characteristics at additional sites should be assessed and the required base-flow measurements should be made as time and funds permit.

Annual flood peaks should be obtained at the 201 crest-stage gaging stations (fig. 6, in pocket) until a more thorough analysis of the data is completed. The limited success achieved in regionalization by regression may indicate the desirability of collecting flood-peak records at more sites, or it may be necessary to use some method which requires information at each site to which flood-peak characteristics are transferred. Annual flood peaks should be collected at selected discontinued gaging stations indefinitely so that a better basis for defining the 100-year recurrence-interval flood is obtained.

Mean flow at an ungaged site may be defined from individual discharge measurements made once a month. Thus, where regression results are considered inadequate, both the mean-flow and the low-flow characteristics at a site can be obtained at a lesser cost than is needed to establish and maintain a gaging station.

Natural-flow, principal streams.—Eight of the 13 natural-flow stations in this category have 25 or more years of record. However, seven of these are current-purpose stations and only one is recommended for discontinuance.

All of the principal stream stations adjusted to natural flow have sufficient record for discontinuance. But, these stations are also current purpose stations and, at present, cannot be discontinued.

On the other hand, three new stations are recommended for more complete aerial coverage of principal streams. These are:

	Drainage area (sq. mi.)
Quillayute River below Bogachiel River	500
Stillaguamish River near Silvana	600
West Fork Sanpoil River near Republic	500

Regulated-flow, minor streams.—The following stations, which have minor regulation or diversion and about 20 years of record, are not needed in the program. They are:

12-0120	Fork Creek near Lebam
1375	Sultan River near Startup
2035	Whatcom Creek below hatchery, near Bellingham
14-1100	Klickitat River near Glenwood
1120	Little Klickitat River near Goldendale

Regulated-flow, principal streams.—The stations, listed in table 4 and having 25 or more years of record, need not be operated any longer for use in planning and design. However, most of these stations are required for other purposes. The one station that is not needed in the program is 12-1005, White River near Sumner, which has 25 years of record.

The following eight new stations are proposed:

	Drainage area (sq. mi.)
Snohomish River at Everett	1,700
Douglas Creek at Palisades	844
Toppenish Creek near Toppenish	600
Satus Creek near Toppenish	600
Rock Creek near Winona	600
Touchet River near Touchet	700
Sanpoil River near Keller	890
Methow River near Mazama	500

At the major reservoirs in regulated-streams systems, the proposed program should include provisions for continuing the collection of records of inflow, outflow, reservoir contents, diversions, operation schedules, and other pertinent hydrologic data.

Data to Define Long-Term Trends in Streamflow

The two bench-mark stations operated for a short time for this purpose in the current program should be continued in operation indefinitely. As a part of this study, 20 additional stations in the present network have been designated as long-term-trend stations and should be operated indefinitely to meet the needs for this type of data. The additional stations were selected to provide a long-term sample reflecting areal coverage of the State, a range of drainage-area size, and a variety of climatic and physiographic characteristics. The 22 stations identified in this category and proposed for operation indefinitely are listed below, with the drainage areas and periods of record for each station:

Proposed Long-Term Stations for Network

Station number	Station name	Drainage area (sq. mi.)	Period of record
12-0100	Naselle River near Naselle	54.8	1929-
0275[1]	North Fork Quinault River near Amanda Park	74.1	1964-
0480	Dungeness River near Sequim	156	1923-30, 1937-
0540	Duckabush River near Brinnon	66.5	1938-
0565	North Fork Skokomish River below Staircase Rapids, near Hoodsport	57.2	1924-
0975	Greenwater River at Greenwater	73.5	1929-
1140	South Fork Cedar River near Lester	6.0	1944-
1330	South Fork Skykomish River near Index	355	1911-
1781	Newhalem Creek near Newhalem	27.9	1961-
1825	Cascade River at Marblemount	168	1928-
1860	Sauk River above Whitechuck River near Darrington	152	1917-22, 1928-
2090	South Fork Nooksack River near Wickersham	103	1933-
3969	Sullivan Creek above Outlet Creek, near Metaline Falls	70.2	1959-
4473.9[1]	Andrews Creek near Mazama	22.1	1968-
4510	Stehekin River at Stehekin	344	1926-
4540	White River near Plain	150	1954-
4885	American River near Nile	78.9	1909-12, 1939-
13-3347	Asotin Creek near Kearney Gulch, near Asotin	170	1959-
14-1070	Klickitat River above West Fork, near Glenwood	151	1944-
2225	East Fork Lewis River near Heisson	152	1929-
2265	Cowlitz River at Packwood	287	1911-19, 1929-
2450	Coweman River near Kelso	119	1950-

[1] Existing long-term station

Data on Stream Environment

Data on stream environment should be collected as demands for this type of information arise and as time and funds become available. Some environmental data are being collected at the present time in connection with hydrologic investigations and channel surveys for indirect measurements.

Gaging Stations for the Proposed Program

Recommended gaging-station operation for each of the data types are listed in table A-3, where each station is classified as to purpose. Locations are shown in figure 5 (in pocket).

Data Analysis

The streamflow-data network operated through the years supplies a base for analyses and reports. These analyses fall into two categories: those which can be made with available data and those which will require some additional data.

Analyses that can be made with available data include:

1. A regional analysis of flood-peak characteristics.
2. Transfer of low-flow characteristics to sites at which base-flow measurements are available.
3. A regional analysis of mean flows.
4. Development of an improved regression model by finding better and more accurately defined indices of basin and climatic parameters for regionalization.
5. Definition of trends in annual mean streamflow in Washington.
6. Regional analysis of flood-volume characteristics.

Analyses requiring additional data of types which generally can be obtained within a year or two include:

1. Definition of flood profiles in selected stream reaches.
2. Definition of areas along streams inundated by floods.
3. Definition of time of travel of pollutants in selected stream reaches.
4. Definition of flood characteristics in urban and suburban areas.
5. Study of methods of transferring flow characteristics to sites at which a little information, such as a discharge or channel size and shape measurement, has been collected.
6. Definition of relations of streamflow magnitudes to water-quality parameters.
7. System analyses of selected regulated-flow streams, with first priority to the Cedar River.

These are only a few of the hydrologic studies that should and could be made. Changing needs for streamflow information and changes in methods and types of analyses in the water-related fields will dictate the need for continued reporting and updating of all data.

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TABLE A-1.—Basin characteristics at gaging stations in Washington

Station number	Station name	Basin characteristics							
		Drainage area, A	Channel slope, S_1	Percent area of lakes, L	Mean basin elevation, E	Forest cover, F	Annual precipitation, P	Precipitation intensity, $P_{24,2}$	Minimum June temperature, T_1
RECORDING STATIONS IN WESTERN WASHINGTON									
12-0100	Naselle River near Naselle	54.8	75.3	0.01	910	77	124	4	30
0105	Salmon Creek near Naselle	16.4	51.8	.01	480	93	115	4	31
0110	North Nemah River near South Bend	18.0	58.6	.01	689	97	121	4	31
0115	Willapa River at Lebam	41.4	115	.01	754	79	92	4	30
0135	Willapa River near Willapa	130	18	.01	641	84	104	4	30
0145	South Fork Willapa River near Raymond	27.8	48	.01	585	88	100	4	30
0155	North River near Brooklyn	29.8	188	.01	660	99	88	4	30
0170	North River near Raymond	219	20	.01	250	93	88	3.5	30
0200	Chehalis River near Doty	113	55	.01	1,000	90	87	4	32
0210	South Fork Chehalis River at Boistfort	48.0	28.9	.01	830	82	80	3.5	32
0240	South Fork Newaukum River near Onalaska	42.4	167	.03	1,280	91	78	3	29
0250	Newaukum River near Chehalis	155	46	.02	900	90	64	3	30
0260	Skookumchuck River near Centralia	61.7	92	.01	1,700	89	75	3	29
0275	Chehalis River near Grand Mound	895	8.1	.04	800	80	67	3	32
0300	Rock Creek at Cedarville	24.8	80	.01	525	98	80	3	31
0310	Chehalis River at Porter	1,294	8	.12	700	78	64	3	32
0325	Cloquallum Creek at Elma	64.9	25	.63	410	89	77	3.5	32
0342	East Fork Satsop River near Elma	65.9	32	.77	650	99	107	4	30
0350	Satsop River near Satsop	299	19	.25	500	93	116	5	29
0355	Wynoochee River at Oxbow, near Aberdeen	70.7	55.6	.05	2,000	89	175	5.5	27
0360	Wynoochee River above Save Creek, near Aberdeen	74.1	63	.05	2,000	86	174	5.5	27
0390	Humptulips River near Humptulips	130	25	.02	1,000	97	150	5.5	28
0395	Clearwater River at Quinault Lake	264	64	2.09	2,700	92	165	6.5	26
0400	Clearwater River near Clearwater	142	25.3	.01	1,500	98	162	6.5	28
0405	Queets River near Clearwater	445	31.0	.01	1,700	89	156	6.5	28
0410	Hoh River near Forks	208	72	.11	3,000	79	168	6	26
0415	Soleduck River near Fairholm	83.8	146	.49	2,900	88	130	5	27
0440	Lyre River at Piedmont	48.6	256	16.70	2,190	98	77	3	29
0455	Elwha River at McDonald Bridge, near Port Angeles	269	69	.24	3,700	82	100	4.0	25
0475	Siebert Creek near Port Angeles	15.5	321	.01	1,550	97	35	2.5	28
0480	Dungeness River near Sequim	156	187	.07	4,500	83	56	3.5	26
0505	Snow Creek near Maynard	11.2	388	.01	1,800	91	35	2.5	29
0530	Dosewallips River near Brinnon	93.5	197	.12	4,700	80	115	5	25
0540	Duckabush River near Brinnon	66.5	159	.31	4,100	95	136	3.5	26
0545	Hamma Hamma River near Eldon	51.3	377	.50	3,830	89	122	5.0	27
0546	Jefferson Creek near Eldon	21.6	412	.29	2,660	88	113	4.0	28

TABLE A-1.—Basin characteristics at gaging stations in Washington—Continued

Station number	Station name	Basin characteristics							
		Drainage area, A	Channel slope, S_1	Percent area of lakes, L	Mean basin elevation, E	Forest cover, F	Annual precipitation, P	Precipitation intensity, $P_{24,2}$	Minimum June temperature, T_1
12-0565	North Fork Skokomish River below Staircase Rapids, near Hoodsport	57.2	177	0.18	3,700	92	149	6.0	26
0575	North Fork Skokomish River near Hoodsport	93.7	89	6.41	3,100	93	135	5.0	27
0600	South Fork Skokomish River near Potlatch	63.4	80	.17	2,505	98	142	5.5	27
0605	South Fork Skokomish River near Union	76.3	63	.27	2,100	98	138	5.5	28
0630	Union River near Bremerton	3.16	141	.01	924	100	59	3.5	34
0655	Gold Creek near Bremerton	1.51	36	.01	1,120	99	62	3.5	34
0660	Tahuya River near Bremerton	5.99	142	1.68	930	96	63	3.5	34
0675	Tahuya River near Belfair	15.0	35.2	3.54	684	97	64	3.5	34
0685	Dewatto River near Dewatto	18.4	36.0	.72	376	98	60	4.0	34
0700	Dogfish Creek near Poulsbo	5.01	49	.01	289	80	35	3.0	34
0720	Chico Creek near Bremerton	15.3	100	4.59	400	98	56	3.0	34
0735	Huge Creek near Wauna	6.47	55	.16	316	77	55	3.0	34
0765	Goldsborough Creek near Shelton	39.3	32	1.08	420	96	78	4.0	30
0790	Deschutes River near Rainier	89.8	17	.63	1,340	88	58	3.0	29
0800	Deschutes River near Olympia	160	30	.70	950	78	52	3.0	31
0810	Woodland Creek near Olympia	24.6	12	6.84	189	61	47	3.0	31
0825	Nisqually River near National	133	91.2	.39	4,020	82	96	3.5	25
0830	Mineral Creek near Mineral	75.2	155	.67	2,740	92	80	3.5	27
0840	Nisqually River near Alder	249	86.5	.34	3,300	85	86	3.5	26
0845	Little Nisqually River near Alder	28.0	145	.37	2,600	99	72	3.5	28
0865	Nisqually River at La Grande	292	85	1.76	3,200	85	83	3.5	26
0870	Mashel River near La Grande	80.7	112	.01	2,300	93	64	3.5	27
0880	Ohop Creek near Eatonville	34.5	6.0	1.78	1,600	97	53	3.5	28
0912	Leach Creek near Fircrest	4.05	73.1	.01	325	14	35	2.5	33
0913	Leach Creek near Steilacoom	5.88	65.0	.01	315	23	35	2.5	33
0915	Chambers Creek below Leach Creek, near Steilacoom	104	12.5	1.69	385	23	38	2.5	31
0920	Puyallup River near Electron	92.8	224	.55	4,100	70	95	3.5	24
0930	Kapowsin Creek near Kapowsin	25.9	130	2.71	1,500	94	48	3.0	27
0940	Carbon River near Fairfax	78.9	394	.26	4,000	68	98	3.5	24
0950	South Prairie Creek at South Prairie	79.5	174	.64	2,300	97	63	3.0	28
0970	White River at Greenwater	216	151	.47	4,700	77	62	3.0	22
0975	Greenwater River at Greenwater	73.5	129	.28	4,200	93	58	3.0	22
0985	White River near Buckley	401	83	.31	3,800	84	60	3.0	24
1015	Puyallup River at Puyallup	948	78	.32	2,500	79	63	3.0	25
1035	Snow Creek near Lester	11.5	476	.01	3,370	61	99	3.0	20
1040	Friday Creek near Lester	4.67	757	.44	3,190	99	76	3.0	20

TABLE A-1.—Basin characteristics at gaging stations in Washington—Continued

Station number	Station name	Drainage area, A	Channel slope, S_1	Percent area of lakes, L	Mean basin elevation, E	Forest cover, F	Annual precipitation, P	Precipitation intensity, $P_{24,2}$	Minimum June temperature, T_1
		Basin characteristics							
12-0145	Green River near Lester	96.2	111	0.03	3,190	91	84	3.0	20
1050	Smay Creek near Lester	8.56	500	.01	3,220	82	86	3.0	23
1065	Green River near Palmer	230	46	.10	3,100	90	78	3.0	25
1085	Newaukum Creek near Black Diamond	27.4	82	.01	883	47	55	2.5	30
1125	Big Soos Creek near Auburn	59.2	17	4.01	496	81	43	2.5	30
1135	North Fork Cedar River near Lester	9.30	317	5.39	3,830	78	112	3.0	21
1140	South Fork Cedar River near Lester	6.00	317	.01	3,500	78	98	3.0	21
1145	Cedar River below Bear Creek, near Cedar Falls	25.4	189	1.98	3,460	71	102	3.0	22
1150	Cedar River near Cedar Falls	40.7	116	1.48	3,230	77	113	3.0	23
1155	Rex River near Cedar Falls	13.4	386	.01	3,360	87	76	3.0	25
1170	Taylor Creek near Selleck	17.2	289	.01	2,300	100	105	2.5	29
1200	Mercer Creek near Bellevue	12.0	65	.01	305	80	38	2.0	32
1210	Issaquah Creek near Issaquah	27.0	153	.08	940	91	60	2.5	30
1230	Cottage Lake Creek near Redmond	10.7	42	1.41	375	87	45	2.0	32
1240	Evans Creek above mouth, near Redmond	13.0	74	.09	365	92	42	2.0	32
1250	Sammamish River near Redmond	150	65	5.70	600	87	47	2.5	31
1260	North Creek near Bothell	24.6	49	2.08	390	82	41	2.0	33
1265	Sammamish River at Bothell	212	16	4.26	500	80	46	2.5	31
1330	South Fork Skykomish River near Index	355	88	.91	3,800	85	116	4.0	21
1335	Troublesome Creek near Index	10.6	633	3.88	3,500	62	176	4.5	21
1340	North Fork Skykomish River at Index	146	138	.42	3,800	85	134	4.5	21
1345	Skykomish River near Gold Bar	535	63	.74	3,700	85	119	4.5	22
1350	Wallace River at Gold Bar	19.0	319	.85	2,660	75	141	4.0	26
1375	Sultan River near Startup	74.5	94	.41	3,120	83	151	4.0	25
1410	Woods Creek near Monroe	56.4	25	2.12	625	91	59	3.0	31
1415	Middle Fork Snoqualmie River near North Bend	169	119	1.31	3,500	74	127	3.5	23
1420	North Fork Snoqualmie River near Snoqualmie Falls	64.0	82	.79	3,200	77	139	3.5	26
1430	North Fork Snoqualmie River near North Bend	95.7	68	1.68	3,100	75	125	3.0	26
1440	South Fork Snoqualmie River at North Bend	81.7	102	.38	2,900	81	112	3.5	25
1445	Snoqualmie River near Snoqualmie	375	72	1.24	3,300	76	118	3.0	25
1460	Patterson Creek near Fall City	15.5	74	.07	410	90	47	2.5	31
1470	Griffin Creek near Carnation	17.1	53	.24	781	97	65	2.0	30
1475	North Fork Tolt River near Carnation	39.2	106	.04	2,590	73	112	3.5	28
1480	South Fork Tolt River near Carnation	19.7	294	7.12	2,940	59	123	5.0	27
1485	Tolt River near Carnation	81.4	111	1.80	2,300	73	105	5.0	28

TABLE A-1.—Basin characteristics at gaging stations in Washington—Continued

Station number	Station name	Basin characteristics							
		Drainage area, A	Channel slope, S_1	Percent area of lakes, L	Mean basin elevation, E	Forest cover, F	Annual precipitation, P	Precipitation intensity, $P_{24,2}$	Minimum June temperature, T_1
12-1490	Snoqualmie River near Carnation	603	40	1.17	2,400	79	102	4.5	26
1525	Pilchuck River near Granite Falls	54.5	44.7	.19	1,500	96	114	4.0	29
1530	Little Pilchuck Creek near Lake Stevens	17.0	40	.13	376	94	53	3.0	30
1570	Quilceda Creek near Marysville	15.4	80	.07	220	75	47	3.0	31
1610	South Fork Stillaguamish River near Granite Falls	119	62	.09	2,600	94	131	3.5	25
1625	South Fork Stillaguamish River above Jim Creek, near Arlington	199	47	.06	2,300	94	129	3.5	26
1640	Jim Creek near Arlington	46.2	132	.88	1,400	92	94	3.0	29
1650	Squire Creek near Darrington	20.0	308	.01	2,530	70	141	4.5	24
1665	Deer Creek at Oso	65.9	99	.01	2,540	98	126	3.0	30
1670	North Fork Stillaguamish River near Arlington	262	35	.01	2,300	92	118	3.5	28
1685	Pilchuck Creek near Bryant	52.0	81.7	2.49	1,290	91	79	2.5	30
1705	Skagit River near Hope, British Columbia (International gaging station)	357	76	.06	4,610	77	75	3.0	14
1720	Big Beaver Creek near Newhalem	63.2	140	.01	4,400	76	104	3.5	18
1725	Skagit River near Newhalem	780	26	.21	4,800	78	73	3.0	16
1735	Ruby Creek below Panther Creek, near Newhalem	206	285	.06	5,700	79	70	3.0	18
1740	Ruby Creek near Newhalem	210	281	.06	5,700	79	70	3.0	18
1745	Skagit River below Ruby Creek, near Newhalem	999	26	.17	4,990	78	72	3.0	17
1755	Thunder Creek near Newhalem	105	274	.11	5,800	61	112	4.0	22
1760	Thunder Creek near Marblemount	114	244	.10	5,600	63	110	4.0	22
1770	Skagit River at Reflector Bar, near Newhalem	1,125	24	.17	5,040	77	76	3.0	18
1775	Stetattle Creek near Newhalem	22.0	500	.46	5,000	84	110	3.5	24
1780	at Newhalem Skagit River	1,175	34	2.19	5,000	75	76	3.0	17
1825	Cascade River at Marblemount	168	107	.18	4,400	78	97	4.5	23
1860	Sauk River above Whitechuck River near Darrington	152	84	.14	3,700	81	123	4.5	21
1875	Sauk River at Darrington	293	107	.08	3,800	80	124	4.5	21
1890	Suiattle River near Mansford	335	88	.16	4,500	74	113	4.5	20
1895	Sauk River near Sauk	714	40	.11	3,900	79	83	4.5	21
1915	Baker River below Anderson Creek, near Concrete	211	108	.72	3,900	69	141	3.5	20
1935	Baker River at Concrete	297	51	3.31	3,510	72	134	4.0	21
1960	Alder Creek near Hamilton	10.7	197	.01	1,280	99	83	3.0	29
1965	Day Creek near Lyman	34.2	190	.65	2,310	88	78	3.0	34
2015	Samish River near Burlington	87.8	19	1.83	580	87	43	2.0	30

TABLE A-1.—Basin characteristics at gaging stations in Washington—Continued

Station number	Station name	Basin characteristics							
		Drainage area, A	Channel slope, S_1	Percent area of lakes, L	Mean basin elevation, E	Forest cover, F	Annual precipitation, P	Precipitation intensity, $P_{24,2}$	Minimum June temperature, T_1
12-2050	North Fork Nooksack River below Cascade Creek, near Glacier	105	106	0.20	4.300	71	130	3.5	19
2090	South Fork Nooksack River near Wickersham	103	58	.30	3,000	84	136	3.5	25
2095	Skookum Creek near Wickersham	23.1	334	.10	3,020	90	129	3.0	24
2105	Nooksack River at Deming	584	62	.25	3,000	86	104	3.0	22
2115	Nooksack River near Lynden	648	41	.24	2,760	82	98	3.0	23
2120	Fishtrap Creek at Lynden	22.3	23	1.36	154	20	45	2.5	28
14-1213	White Salmon River below Cascades Creek, near Trout Lake	32.4	413	.01	5,190	77	80	2.8	22
1215	Trout Lake Creek near Trout Lake	69.3	149	.59	3,450	92	80	3.2	23
1230	White Salmon River at Husum	294	97.2	.03	3,380	88	64	2.9	23
1235	White Salmon River near Underwood	386	89.8	.27	3,220	86	57	2.9	23
1270	Wind River above Trout Creek, near Carson	108	111	.04	2,740	98	100	4.0	25
1285	Wind River near Carson	225	66	.04	2,460	52	93	4.0	25
1435	Washougal River near Washougal	108	66	.01	1,610	94	83	4.0	28
2120	Salmon Creek near Battle Ground	18.3	313	.01	1,000	93	58	3.5	29
2132	Lewis River near Trout Lake	127	300	.09	3,950	93	94	3.0	23
2135	Big Creek below Skookum Meadow, near Trout Lake	13.2	167	.16	3,780	92	95	3.5	24
2140	Rush Creek above Meadow Creek, near Trout Lake	5.87	346	3.42	4,490	92	95	3.5	25
2145	Meadow Creek below Lone Butte Meadow, near Trout Lake	11.7	239	.18	3,980	96	100	3.5	25
2150	Rush Creek above falls, near Cougar	26.0	321	1.55	4,000	96	105	3.5	25
2155	Curly Creek near Cougar	11.6	403	.87	2,960	100	105	3.5	25
2160	Lewis River above Muddy River, near Cougar	227	178	.45	3,540	95	102	4.0	24
2165	Muddy River below Clear Creek, near Cougar	131	131	.16	3,180	95	106	4.0	26
2168	Pine Creek near Cougar	22.4	460	.01	2,920	78	120	4.0	27
2175	Swift Creek near Cougar	27.5	631	.05	3,140	82	130	4.0	27
2180	Lewis River near Cougar	481	67.3	1.92	3,120	93	109	3.7	25
2190	Canyon Creek near Amboy	64.9	132	.03	2,410	98	115	4.0	27
2195	Lewis River near Amboy	665	52.5	2.57	2,830	95	111	3.7	27
2205	Lewis River at Ariel	731	43.4	7.53	1,788	92	108	4.0	27
2215	Cedar Creek near Ariel	40.8	104	.13	980	91	76	3.5	29
2225	East Fork Lewis River near Heisson	125	93.0	.02	1,940	99	82	3.5	28
2230	Kalama River near Kalama	179	45.3	.29	2,100	99	90	4.0	29
2235	Kalama River below Italian Creek, near Kalama	198	80.3	.02	1,880	98	89	4.0	29
2245	Clear Fork Cowlitz River near Packwood	56.5	180	.03	4,330	91	79	3.0	20

TABLE A-1.—Basin characteristics at gaging stations in Washington—Continued

Station number	Station name	Basin characteristics							
		Drainage area, A	Channel slope, S_1	Percent area of lakes, L	Mean basin elevation, E	Forest cover, F	Annual precipitation, P	Precipitation intensity, $P_{24,2}$	Minimum June temperature, T_1
14-2255	Lake Creek near Packwood	19.2	310	4.18	4,700	74	85	3.0	21
2265	Cowlitz River at Packwood	287	182	.46	4,230	88	88	3.0	21
2300	Johnson Creek near Packwood	50.0	304	.03	4,010	94	68	3.0	22
2325	Cispus River near Randle	321	117	.16	4,130	76	81	3.5	23
2335	Cowlitz River near Kosmos	1,042	36.8	.21	3,760	86	81	4.0	24
2350	Cowlitz River at Mossyrock	1,612	29.1	.19	3,430	86	80	4.0	25
2355	West Fork Tilton River near Morton	16.4	359	.13	2,450	76	87	3.5	28
2362	Tilton River above Bear Canyon Creek, near Cinebar	141	60	.02	2,330	90	80	3.5	28
2365	Tilton River near Cinebar	156	42.8	.02	1,990	90	80	3.5	28
2370	Klickitat Creek at Mossyrock	3.29	49	.01	985	52	70	3.0	29
2375	Winston Creek near Silver Creek	37.8	136	.01	1,640	76	73	3.0	29
2380	Cowlitz River below Mayfield Dam	1,400	12.8	.16	3,150	86	80	3.5	26
2415	South Fork Toutle River at Toutle	120	95.2	.18	2,150	93	75	4.0	29
2425	Toutle River near Silver Lake	474	87.1	.94	2,310	94	75	3.5	29
2430	Cowlitz River at Castle Rock	2,238	10.8	.27	2,540	88	76	3.7	27
2435	Delameter Creek near Castle Rock	19.6	139	.01	906	97	80	4.0	32
2450	Coweman River near Kelso	119	62.8	.09	1,390	99	65	3.5	31
2475	Elochoman River near Cathlamet	65.8	60.8	.03	1,190	88	95	4.0	32
2490	Grays River above South Fork, above Grays River	39.9	170	.01	1,350	90	115	4.0	31
2505	West Fork Grays River near Grays River	15.2	187	.01	1,180	99	125	4.0	30
PARTIAL-RECORD STATIONS IN WESTERN WASHINGTON									
12-0106	Lane Creek near Naselle	2.15	389	.01	750	90	115	4.0	31
0111	North Nemah River tributary near South Bend	.46	118	.01	250	95	99	4.0	33
0122	Green Creek near Lebam	1.79	116	.01	340	85	95	4.0	30
0167	Joe Creek near Cosmopolis	2.05	168	.01	460	95	80	4.0	31
0196	Water Mill Creek near Pe Ell	1.98	82	.01	680	95	80	4.0	32
0205	Elk Creek near Doty	46.7	17.5	.01	810	95	81	4.0	30
0347	West Fork Satsop River tributary near Matlock	.33	1,791	.01	1,600	90	145	5.5	28
0390.5	Big Creek near Hoquiam	.56	171	.01	310	95	130	4.5	31
0391	Big Creek tributary near Hoquiam	.15	130	.01	290	90	130	4.5	31
0394	Higley Creek near Amanda Park	.77	1,132	.01	1,080	95	135	6.0	28
0416	Soleduck River tributary near Fairholm	.42	1,149	.01	1,840	95	90	4.0	29
0427	May Creek near Forks	2.03	206	.01	650	95	120	6.0	32
0429	Grader Creek near Forks	1.67	215	.01	530	95	115	6.0	32
0468	East Valley Creek at Port Angeles	.69	590	.01	1,110	85	28	3.5	31
0471	Lees Creek at Port Angeles	4.77	265	.01	780	65	35	3.5	29

TABLE A-1.—Basin characteristics at gaging stations in Washington—Continued

Station number	Station name	Basin characteristics: Drainage area, A	Channel slope, S_1	Percent area of lakes, L	Mean basin elevation, E	Forest cover, F	Annual precipitation, P	Precipitation intensity, $P_{24,2}$	Minimum June temperature, T_1
12-0494	Dean Creek at Blyn	2.96	596	0.01	1,490	95	29	2.0	29
0524	Penny Creek near Quilcene	6.78	126	1.03	1,450	95	56	3.0	28
0534	Dosewallips River tributary near Brinnon	.62	1,891	.01	1,770	95	70	2.5	29
0563	Annas Bay tributary	.82	329	.01	500	95	75	2.6	34
0612	Fir Creek tributary near Potlatch	.76	388	.01	870	95	110	2.6	30
0786	Schneider Creek tributary near Shelton	1.12	261	.01	470	95	57	3.3	31
0968	Dry Creek near Greenwater	1.01	1,357	.01	4,410	95	59	2.8	21
0977	Cyclone Creek near Enumclaw	2.35	834	.01	2,810	25	50	2.8	27
1022	Swan Creek near Tacoma	2.15	8.62	.01	430	10	40	2.8	32
1032	Joes Creek at Tacoma	.78	165	.01	350	95	40	2.7	33
1072	Deep Creek at Cumberland	2.17	388	.01	1,330	95	65	2.9	30
1132	Mill Creek (formerly Hill Creek (near Auburn	3.14	215	2.55	420	70	40	2.6	31
1133	Mill Creek tributary (formerly Hill Creek tributary) near Auburn	.30	283	.01	420	50	40	2.6	31
1153	Green Point Creek near Cedar Falls	.89	1,465	.01	3,030	70	75	3.5	28
1198	North Branch Mercer Creek near Bellevue	3.05	73.9	.01	360	75	40	2.0	32
1233	Evans Creek tributary near Redmond	2.46	133	.01	450	90	40	2.0	31
1305	South Fork Skykomish River near Skykomish	135	208	1.39	3,870	95	120	4.0	21
1310	Beckler River near Skykomish	96.5	168	.53	3,600	95	115	4.0	21
1327	South Fork Skykomish River tributary at Baring	1.25	1,905	.01	2,260	95	91	4.0	24
1355	Olney Creek near Gold Bar	8.31	505	.01	1,800	90	160	4.0	28
1433	South Fork Snoqualmie River tributary near North Bend	.15	2,605	.01	2,850	70	115	3.9	21
1455	Raging River near Fall City	30.6	174	.01	1,460	95	60	2.7	29
1481	South Fork Tolt River tributary near Carnation	2.19	774	.01	2,290	99	90	3.2	29
1564	Munson Creek near Marysville	.97	148	.01	300	10	42	2.1	31
1695	Fish Creek near Arlington	7.52	58.1	3.46	270	60	40	2.1	31
1894	Sauk River tributary near Darrington	1.11	1,005	.01	1,620	80	70	4.0	28
1972	Parker Creek near Lyman	1.82	1,093	.01	1,970	90	49	2.4	31
2007	Carpenter Creek tributary (formerly Skagit River tributary near Mount Vernon	2.58	26.1	.01	490	70	37	2.0	32
2008	Lake Creek near Bellingham	2.35	441	.01	1,220	95	31	2.5	30
2044	Nooksack River tributary near Glacier	1.15	1,656	.01	4,070	95	75	3.8	22
2127	Tenmile Creek tributary No. 1 near Bellingham	.74	81.7	.01	290	25	36	2.7	29
2128	Tenmile Creek tributary No. 2 near Bellingham	.24	98.8	.01	230	20	36	2.7	29
14-1252	Rock Creek near Willard	4.10	413	.01	1,910	95	57	3.3	25

TABLE A-1.—Basin characteristics at gaging stations in Washington—Continued

Station number	Station name	Basin characteristics: Drainage area, A	Channel slope, S_1	Percent area of lakes, L	Mean basin elevation, E	Forest cover, F	Annual precipitation, P	Precipitation intensity, $P_{24,2}$	Minimum June temperature, T_1
14-1263	Columbia River tributary at Home Valley	.54	577	0.01	710	80	60	3.5	25
1432	Canyon Creek near Washougal	2.74	320	.01	1,310	80	65	4.0	29
1440	Little Washougal River near Washougal	23.8	77.6	.01	1,010	85	58	3.9	29
1445.5	Shanghai Creek near Hockinson	2.14	352	.01	750	95	53	2.9	30
1446	Groeneveld Creek near Camas	.51	255	.01	560	50	35	3.0	31
2119	Burntbridge Creek at Vancouver	21.6	2.10	.01	240	10	42	2.9	31
2183	Dog Creek at Cougar	2.31	782	.01	1,660	99	107	4.1	28
2227	East Fork Lewis River tributary near Woodland	.53	88.3	.01	250	35	48	2.9	31
2238	Columbia River tributary at Carrolls	1.06	444	.01	580	95	48	3.8	32
2268	Skate Creek tributary near Packwood	1.22	1,244	.01	4,360	95	100	4.0	24
2269	Skate Creek tributary No. 2 near Packwood	1.82	1,134	.01	3,760	95	94	4.0	24
2311	Miller Creek (formerly Mill Creek) at Randle	2.29	1,093	.01	2,460	80	80	3.3	26
2320	Niggerhead Creek near Randle	66.3	128	.01	3,740	75	92	3.0	25
2353	Tilton River near Mineral	.79	892	.01	2,580	99	79	3.9	28
2391	North Fork Lacamas Creek near Ethel	.36	110	.01	650	95	55	3.0	30
2397	Olequa Creek tributary near Winlock	.38	445	.01	470	80	50	3.9	31
2426	Toutle River tributary near Castle Rock	.64	330	.01	540	80	55	4.1	31
2481	Risk Creek near Skamokawa	1.13	223	.01	280	90	95	4.1	32
RECORDING STATIONS IN EASTERN WASHINGTON									
12-3960	Calispell Creek near Dalkena	68.3	126	.42	3,650	99	32	1.4	16
3990	Salmo River near Waneta, British Columbia (International gaging station)	500	22	.01	4,840	87	30	2.0	17
4005	Sheep Creek near Northport	225	95	.05	4,120	96	25	2.0	15
4015	Kettle River near Ferry (International gaging station)	2,220	20	.21	4,560	96	27	2.0	13
4075	Sheep Creek at Springdale	48.2	55	7.27	2,390	85	25	1.3	16
4077	Chewelah Creek at Chewelah	94.1	138	.02	3,160	94	28	1.3	16
4083	Little Pend Oreille River near Colville	132	62	.62	3,475	98	29	1.3	16
4085	Mill Creek near Colville	83.0	103	.01	3,510	96	28	1.3	16
4090	Colville River at Kettle Falls	1,007	2.0	.64	3,000	89	22	1.3	16
4240	Hangman Creek at Spokane	689	13	.05	2,710	78	20	1.5	20
4270	Little Spokane River at Elk	115	63	1.34	2,800	91	28	1.5	17
4310	Little Spokane River at Dartford	665	33	.55	2,400	60	26	1.5	17
4375	Nespelem River at Nespelem	122	22.0	.21	3,100	91	20	1.2	15
4420	Toats Coulee Creek near Loomis	130	224	.01	5,520	79	24	1.9	10
4425	Similkameen River near Nighthawk (International gaging station)	3,550	22	.23	5,110	85	30	2.5	7

TABLE A-1.—Basin characteristics at gaging stations in Washington—Continued

Station number	Station name	Basin characteristics							
		Drainage area, A	Channel slope, S_1	Percent area of lakes, L	Mean basin elevation, E	Forest cover, F	Annual precipitation, P	Precipitation intensity, $P_{24,2}$	Minimum June temperature, T_1
12-4435	Similkameen River near Oroville	3,580	21	0.23	4,310	84	30	2.5	7
4495	Methow River at Twisp	1,301	56	.14	5,180	76	35	1.7	9
4510	Stehekin River at Stehekin	344	101	.32	5,130	83	87	2.8	16
4515	Railroad Creek at Lucerne	64.8	219	.43	4,930	68	55	2.8	16
4525	Chelan River at Chelan	924	12.7	5.82	4,530	76	55	2.5	18
4528	Entiat River near Ardenvoir	203	125	.11	5,230	91	44	2.0	16
4530	Entiat River at Entiat	419	92	.06	4,390	92	38	2.0	17
4540	White River near Plain	150	89	.08	4,590	51	112	3.5	17
4550	Wenatchee River below Wenatchee Lake	273	45	2.30	4,720	64	105	3.5	17
4565	Chiwawa River near Plain	172	41	.41	4,440	87	78	2.6	16
4570	Wenatchee River at Plain	591	59	1.07	4,540	76	66	3.1	16
4580	Icicle Creek above Snow Creek, near Leavenworth	193	107	.49	5,260	85	74	3.3	17
4590	Wenatchee River at Peshastin	1,000	43	.94	4,590	80	78	2.8	16
4650	Crab Creek at Irby	1,042	13	.40	2,200	2.9	14	1.0	18
4685	Park Creek below Park Lake, near Coulee City	36.0	7	3.65	1,950	3.9	10	1.0	18
4705	Rocky Ford Creek near Ephrata	12.0	10	15.0	1,200	15	9	.8	18
4745	Yakima River near Martin	54.7	46.7	13.83	3,920	48	145	3.5	20
4760	Kachess River near Easton	63.6	45.4	11.16	3,630	58	93	3.0	19
4790	Cle Elum River near Roslyn	203	51.4	4.73	4,340	80	112	3.0	19
4795	Yakima River at Cle Elum	495	20.0	4.96	3,700	77	98	3.0	19
4805	Teanaway River near Cle Elum	200	88.9	.01	3,700	94	50	1.8	17
4838	Naneum Creek near Ellensburg	69.5	190	.01	4,830	90	32	1.5	17
4880	Bumping River near Nile	70.7	85.1	3.66	4,830	91	82	2.5	20
4885	American River near Nile	78.9	62	.19	4,860	91	83	3.5	19
4915	Tieton River at Tieton Dam, near Naches	187	70.8	2.64	4,860	88	73	2.5	19
4925	Tieton River at headworks of Tieton Canal, near Naches	239	68.8	2.08	4,740	90	69	2.2	19
4940	Naches River below Tieton River, near Naches	941	48.5	.82	4,440	90	60	2.0	18
5005	North Fork Ahtanum Creek near Tampico	68.9	188	.01	4,700	95	50	1.5	18
5010	South Fork Ahtanum Creek at Conrad Ranch, near Tampico	24.8	243	.01	4,280	98	40	1.5	18
13-3345	Asotin Creek near Asotin	156	143	.01	3,760	49	28	1.5	22
3445	Tucannon River near Starbuck	431	73	.01	3,000	35	24	1.5	25
3460	Palouse River near Colfax	491	18	.05	3,060	57	31	1.4	21
3480	South Fork Palouse River at Pullman	132	12	.01	2,770	8.3	22	1.3	26
3485	Missouri Flat Creek at Pullman	27.1	30	.01	2,670	.4	22	1.3	24
3505	Union Flat Creek near Colfax	189	21	.01	2,680	.1	20	1.3	26

TABLE A-1.—Basin characteristics at gaging stations in Washington—Continued

Station number	Station name	Basin characteristics							
		Drainage area, A	Channel slope, S_1	Percent area of lakes, L	Mean basin elevation, E	Forest cover, F	Annual precipitation, P	Precipitation intensity, $P_{24,2}$	Minimum June temperature, T_1
13-3510	Palouse River at Hooper	2,500	14	0.29	2,410	15	20	1.3	22
14-0135	Blue Creek near Walla Walla	17.0	294	.01	3,190	55	40	2.0	24
0160	Dry Creek near Walla Walla	48.4	176	.01	2,360	81	29	2.0	25
0165	East Fork Touchet River near Dayton	102	170	.01	3,750	85	34	1.8	25
0170	Touchet River at Bolles	361	87	.01	2,950	40	30	1.8	25
1070	Klickitat River above West Fork, near Glenwood	151	57	.08	4,690	88	55	2.5	19
1100	Klickitat River near Glenwood	360	47.9	.29	4,520	87	55	2.5	20
1120	Little Klickitat River near Goldendale	83.5	131	.01	3,160	92	20	1.3	21
1125	Little Klickitat River near Wahkiacus	280	45	.05	2,600	70	20	1.4	21
1130	Klickitat River near Pitt	1,297	44.8	.10	3,140	77	35	2.5	21
PARTIAL-RECORD STATIONS IN EASTERN WASHINGTON									
12-3958	Deer Creek near Dalkena	4.75	73.2	.01	2,430	85	26	1.5	17
3959	Davis Creek near Dalkena	16.8	52.0	1.49	2,490	86	26	1.5	17
3961	Winchester Creek near Cusick	16.8	160	.01	3,630	99	33	1.5	17
3964.5	Little Muddy Creek at Ione	11.3	223	.01	3,510	99	30	1.5	17
4037	Third Creek near Curlew	1.18	779	.01	4,560	80	31	1.4	14
4054	Nancy Creek near Kettle Falls	11.9	673	.01	3,180	99	19	1.3	15
4076	Thomason Creek (formerly Thomson Creek) near Chewelah	4.08	523	0.01	3,210	90	25	1.3	16
4082	Bighorn Creek near Tiger (formerly Thomas Lake tributary)	1.65	281	.01	3,690	99	37	1.5	17
4084	Narcisse Creek near Colville	11.1	255	.01	3,420	99	25	1.4	16
4106	South Fork Harvey Creek near Cedonia	18.1	219	.01	3,370	90	20	1.3	15
4106.5	North Fork Harvey Creek near Cedonia	6.96	309	.01	3,330	90	20	1.3	15
4239	Stevens Creek tributary near Moran	2.02	450	.01	2,680	10	19	1.4	19
4298	Mud Creek near Deer Park	1.83	69.4	.01	2,600	80	20	1.4	16
4333	Spring Creek tributary near Rearden	1.14	230	.01	2,580	.01	19	1.3	18
4338	Granite Creek near Republic	4.25	155	.01	4,030	95	20	1.4	13
4379.5	East Fork Foster Creek tributary near Bridgeport	4.75	351	.01	2,100	.01	18	1.2	17
4392	Dry Creek tributary near Molson	1.68	453	.01	4,180	.01	24	1.4	12
4444	Siwash Creek tributary near Tonasket	.66	750	.01	2,020	.01	24	1.4	12
4458	Omak Creek tributary near Disautel	4.12	375	.01	3,740	99	20	1.3	15
4474	Doe Creek near Winthrop	3.80	819	.01	4,760	99	30	1.9	7
4573	Skinney Creek at Winton	2.55	429	.01	2,760	95	39	2.0	15
4611	East Branch Mission Creek near Cashmere	15.4	465	.01	3,530	90	24	1.5	17

TABLE A-1.—Basin characteristics at gaging stations in Washington—Continued

Station number	Station name	Basin characteristics							
		Drainage area, A	Channel slope, S_1	Percent area of lakes, L	Mean basin elevation, E	Forest cover, F	Annual precipitation, P	Precipitation intensity, $P_{24,2}$	Minimum June temperature, T_1
12-4612	East Branch Mission Creek tributary near Cashmere	2.49	592	0.01	2,980	99	24	1.5	17
4615	Sand Creek near Cashmere	18.6	414	.01	3,060	95	25	1.5	16
4620	Mission Creek at Cashmere	81.2	201	.01	3,100	80	25	1.5	17
4627	Moses Creek at Waterville	3.48	80.7	.01	2,770	.02	18	1.1	18
4628	Moses Creek at Douglas	15.4	167	.01	2,810	.05	18	1.1	18
4646	Schnebly Coulee tributary near Vantage	.82	168	.01	2,460	.01	9	.9	17
4646.5	South Fork Crab Creek tributary at Waukon	.68	50.0	.01	2,480	.01	18	1.3	18
4651	Connawai Creek tributary near Govan	.25	105	.01	2,100	.01	11	.9	17
4653	Broadax Draw tributary near Wilbur	1.12	207	.01	2,450	.01	15	1.0	18
4674	Grand Coulee tributary near Coulee City	2.7	169	.01	2,400	.01	11	.9	18
4703	Iron Springs near Winchester	1.57	67.4	.01	2,620	.01	9	.9	19
4807	Hovey Creek near Cle Elum	2.65	562	.01	3,990	95	37	1.4	17
4833	South Fork Manastash Creek tributary near Ellensburg	2.12	471	.01	3,280	.02	32	.9	16
4846	McPherson Canyon Creek at Wymer	5.48	316	.01	2,250	.01	9	1.0	15
4883	American River tributary near Nile	1.10	1,274	.01	4,800	99	75	2.5	19
4917	Hause Creek near Rimrock	3.91	914	.01	4,300	99	45	2.4	18
5076	Shenando Creek tributary near Goldendale	.28	925	.01	3,520	95	20	1.5	21
5127	Hatton Coulee tributary near Hatton	3.71	43.5	.01	1,300	.01	10	.9	21
13-3352	Critchfield Draw near Clarkston	1.80	281	.01	1,520	.01	13	1.5	24
3436.6	Smith Gulch tributary near Pataha	1.85	96.3	.01	2,540	.01	14	1.5	25
3484	Missouri Flat Creek tributary near Pullman	.88	90.5	.01	2,570	.01	20	1.5	24
3493	Palouse River tributary at Colfax	2.10	136	.01	2,270	.01	20	1.3	22
3493.5	Hardman Draw tributary at Plaza	1.64	75.3	.01	2,500	.01	18	1.4	21
3522	Cow Creek tributary near Ritzville	1.51	44.4	.01	1,900	.01	13	1.2	20
3525.5	Stewart Canyon tributary near Riparia	1.27	119	.01	1,640	.01	13	1.0	25
14-0159	Spring Creek tributary near Walla Walla	1.94	179	.01	1,850	.01	26	1.6	25
0166	Hatley Creek near Dayton	4.12	379	.01	2,850	5	27	1.5	24
0166.5	Davis Hollow Creek near Dayton	3.01	272	.01	2,440	.01	25	1.5	24
0172	Badger Hollow Creek near Clyde	4.16	125	.01	1,730	.01	14	1.0	27

TABLE A-2.—Selected streamflow characteristics at gaging stations in Washington

Station number	Characteristic						
	Mean annual flow (Q_a)	Std. Dev. of mean annual (SD_a)	20 year, 7-day mean low flow ($M_{7,20}$)	2-year flood (P_2)	25-year flood (P_{25})	50-year flood (P_{50})	50 year 7-day mean flood flow ($V_{7,50}$)
GAGING STATIONS IN WESTERN WASHINGTON							
12-0100	429	77.6	22	5,630	9,460	10,200	3,850
0105	114	19.0	1.4	1,680	2,850	--	--
0110	120	15.3	5.3	1,400	2,120	--	--
0115	190	34.3	3.0	2,870	4,570	4,920	--
0135	655	111	18	--	--	--	--
0145	162	25.7	17	1,560	2,610	--	--
0155	112	18.6	5.0	1,700	2,830	--	--
0170	954	230	30	7,630	20,800	27,000	12,300
0200	573	119	20	9,390	16,300	18,100	4,880
0210	199	31.0	--	3,190	5,230	5,730	--
0240	199	26.2	20	2,060	3,410	--	--
0250	502	108	19	5,540	7,970	8,460	3,810
0260	247	56.7	19	3,680	6,360	6,950	1,880
0275	2,822	652	105	24,700	43,300	47,900	29,000
0300	88.2	14.8	.6	1,120	1,500	1,550	718
0310	4,180	789	177	28,700	42,000	44,800	--
0325	270	48.6	15	3,120	5,220	5,670	2,260
0342	370	59.1	64	3,080	4,440	--	--
0350	1,983	373	195	23,200	42,500	46,900	19,100
0355	771	142	86	9,900	16,600	18,000	8,170
0360	863	108	96	13,500	25,700	--	--
0390	1,319	199	91	19,000	32,900	35,800	10,300
0395	2,797	466	312	20,600	44,000	50,700	22,600
0400	1,161	139	62	19,100	37,900	41,000	--
0405	4,115	738	408	61,300	114,000	128,000	44,500
0410	2,028	294	401	18,600	37,200	42,300	14,600
0415	627	116	67	9,100	20,400	23,800	6,680
0440	218	51.0	--	747	1,320	--	--
0455	1,480	289	--	--	--	--	--
0475	17.4	7.74	2.0	468	1,940	--	--
0480	376	85.8	83	3,110	6,600	7,360	2,080
0505	16.1	3.84	1.4	224	670	--	--
0530	445	75.3	79	4,360	10,200	11,800	--
0540	414	74.0	47	4,560	8,030	8,750	2,860
0545	361	54.6	41	3,600	6,860	--	--
0546	148	25.7	--	2,230	3,590	--	--
0565	493	97.4	30	6,330	17,800	21,800	4,010
0575	748	139	--	5,600	1,590	--	--
0600	603	119	48	9,910	20,300	23,100	5,480
0605	721	128	66	12,100	22,400	24,600	7,430
0630	12.8	2.48	.4	314	566	--	--
0655	5.85	1.13	.3	122	225	243	59
0660	22.3	5.10	.1	339	558	--	248
0675	48.4	10.5	--	--	--	--	--
0685	68.0	11.0	10	1,080	2,210	2,490	--
0700	8.78	1.35	2.1	123	286	342	91
0720	33.5	7.46	--	--	--	--	--
0735	11.5	2.95	3.6	130	410	508	123
0765	116	24.8	17	924	1,520	--	--
0790	264	54.4	24	3,610	5,500	5,930	--
0800	405	73.4	74	3,900	6,450	6,990	--
0810	26.9	8.21	8.0	91	187	213	--
0825	772	110	143	5,300	11,000	12,600	4,410
0830	376	70.0	22	4,700	8,360	9,110	2,990
0840	1,158	275	154	9,780	22,500	--	--
0845	117	31.4	3.8	1,900	2,880	3,050	--
0865	1,507	236	--	10,700	20,100	--	--
0870	232	59.0	7.4	2,710	6,420	--	--
0880	66.8	15.4	3.7	637	1,640	1,980	682
0912	3.79	.57	1.0	--	--	--	--

TABLE A-2.—Selected streamflow characteristics at gaging stations in Washington Continued

Station number	Characteristic						
	Mean annual flow (Q_a)	Std. Dev. of mean annual (SD_a)	20 year, 7-day mean low flow ($M_{7,20}$)	2-year flood (P_2)	25-year flood (P_{25})	50-year flood (P_{50})	50 year 7-day mean flood flow ($V_{7,50}$)
12-0913			4.8	--	--	--	--
0915	112	33.3	32	322	729	837	693
0920	536	67.1	118	4,290	11,600	14,000	3,450
0930	49.7	13.2	1.2	354	726	808	463
0940	425	73.8	67	4,060	9,330	10,700	2,980
0950	242	44.9	27	2,980	6,680	7,560	--
0970	856	167	177	4,540	13,200	16,300	5,510
0975	209	55.3	26	1,190	4,260	5,680	1,930
0985	1,514	268	256	--	--	--	--
1015	3,355	588	--	21,100	50,300	58,300	--
1035	68.9	11.2	3.9	888	2,530	3,050	684
1040	27.2	4.87	1.5	272	878	1,140	230
1045	414	82.5	26	4,610	14,700	18,400	5,200
1050	51.3	9.35	5.1	438	1,560	2,030	561
1065	1,094	249	92	11,600	24,800	28,100	10,500
1085	64.2	13.2	13	715	2,210	2,900	563
1125	117	29.2	--	643	1,410	--	--
1135	71.0	10.9	6.4	837	2,660	3,370	585
1140	39.2	6.57	2.3	459	1,670	2,250	338
1145	180	29.2	15	1,570	4,500	5,800	--
1150	275	45.0	24	2,960	7,930	9,430	2,130
1155	105	16.2	5.6	1,510	3,550	4,100	963
1170	103	18.6	16	971	3,100	--	--
1200	20.1	2.83	3.0	206	267	--	--
1210	69.6	14.8	11	638	1,820	2,290	--
1230	13.8	2.30	--	79	161	--	--
1240	21.9	3.48	5.7	116	162	--	--
1250	287	78.2	48	742	1,480	1,660	--
1260	35.8	6.71	5.1	302	538	601	297
1265	365	87.2	64	1,150	1,900	2,050	1,820
1330	2,424	496	256	22,600	54,400	63,300	18,900
1335	114	29.5	10	920	2,760	--	--
1340	1,209	260	98	--	--	--	10,200
1345	3,904	822	422	36,100	87,800	102,000	29,200
1350	163	29.2	8.1	1,990	3,570	4,000	1,430
1375	798	143	50	16,700	35,200	39,600	7,840
1410	1,542	29.3	12	1,210	2,300	2,580	1,230
1415	1,176	227	115	12,500	27,100	--	--
1420	492	85.9	36	7,440	16,600	19,100	3,360
1430	697	115	56	--	--	--	5,380
1440	550	111	74	4,190	8,080	--	4,060
1445	2,529	461	--	26,500	63,500	--	--
1460	32.2	6.57	7.1	201	309	--	--
1470	41.5	8.81	1.8	393	944	1,120	348
1475	382	69.4	39	5,000	9,540	--	--
1480	198	42.6	14	3,450	6,700	--	--
1485	609	123	59	7,780	16,100	17,900	4,190
1490	3,775	757	427	28,200	59,400	67,400	28,400
1525	344	52.8	28	5,080	9,120	10,200	--
1530	31.2	6.36	.7	281	627	--	294
1570	25.1	4.55	3.0	163	274	301	179
1610	1,064	204	68	16,000	28,800	31,600	10,000
1625	1,592	299	104	19,600	28,600	30,100	11,300
1640	206	39.7	6.7	2,760	4,710	5,150	--
1650	184	31.6	10	3,030	5,620	6,210	--
1665	494	86.2	19	7,290	10,400	--	--
1670	1,840	370	159	20,470	31,800	33,700	14,600
1685	279	51.8	1.1	4,130	6,480	--	--
1705	971	289	94	5,960	10,800	12,000	8,590
1720	401	70.7	71	--	--	--	--

TABLE A-2.—Selected streamflow characteristics at gaging stations in Washington
Continued

Station number	Characteristic						
	Mean annual flow (Q_a)	Std. Dev. of mean annual (SD_a)	20 year, 7-day mean low flow ($M_{7,20}$)	2-year flood (P_2)	25-year flood (P_{25})	50-year flood (P_{50})	50 year 7-day mean flood flow ($V_{7,50}$)
12-1725	2,689	595	--	13,300	25,000	--	--
1735	714	130	54	--	--	--	--
1740	625	158	69	4,270	7,800	8,570	--
1745	3,110	681	385	18,900	43,300	--	--
1755	619	82.8	63	3,960	9,920	11,900	3,040
1760	651	84.7	54	4,840	15,900	--	--
1770	4,247	796	--	--	--	--	--
1775	182	31.6	15	1,920	5,560	6,940	995
1780	4,438	905	--	--	--	--	--
1825	1,023	175	162	6,760	16,000	18,600	5,380
1860	1,131	214	142	8,330	22,700	27,900	8,190
1875	1,984	397	287	16,100	40,600	--	--
1890	1,750	297	453	10,000	29,300	--	--
1895	4,315	803	706	27,300	66,100	77,300	26,000
1925	1,999	280	308	18,200	44,300	--	15,500
1935	2,658	380	--	--	--	--	--
1960	35.2	7.49	5.7	297	731	885	283
1965	268	44.7	8.6	4,390	5,940	6,250	--
2015	244	54.1	19	2,370	5,570	6,440	2,390
2050	766	100	129	5,470	10,200	11,300	3,640
2090	730	107	69	9,570	18,100	19,900	5,200
2095	134	18.4	17	1,150	2,440	2,960	867
2105	3,244	521	585	24,700	42,400	46,100	18,200
2115	3,708	488	714	29,100	49,400	53,400	20,500
2120	37.9	9.13	1.6	360	564	608	--
14-1213	146	12.6	--	542	940	--	--
1215	264	44.2	--	1,770	3,720	--	--
1230	979	199	385	2,580	9,500	--	4,180
1235	1,290	1,269	403	4,810	8,510	9,140	7,660
1270	2,179	7,696	61	5,370	8,860	9,600	4,880
1285	1,172	243	140	13,100	24,300	26,700	9,010
1435	872	114	46	13,600	20,300	21,700	8,520
2120	61.2	10.8	1.4	847	1,570	1,720	659
2132	683	75.2	--	5,910	12,400	--	--
2135	59.4	13.5	4.4	519	1,080	--	--
2140	23.3	4.93	--	470	1,180	--	--
2145	94.5	14.4	49	305	586	--	--
2150	166	29.5	77	770	1,320	--	--
2155	61.9	9.95	8.8	341	1,390	--	--
2160	1,271	268	187	8,050	20,400	--	12,000
2165	847	177	101	5,580	10,500	--	--
2168	190	18.0	--	975	2,040	--	--
2175	201	39.1	--	--	--	--	--
2180	2,888	648	506	18,700	40,400	46,200	22,000
2190	424	119	18	5,790	11,800	--	--
2195	4,095	80.0	667	34,200	73,900	82,800	42,400
2205	4,900	952	--	--	--	--	--
2215	169	19.6	--	--	--	--	--
2225	746	135	36	9,000	15,200	16,600	7,220
2230	1,060	263	155	8,370	14,400	--	--
2235	1,229	172	173	9,890	16,500	18,200	8,480
2245	237	65.2	34	1,750	6,920	--	--
2255	101	19.3	19	394	1,260	--	642
2265	1,649	356	207	12,900	31,350	37,260	10,400
2300	201	34.5	28	--	--	--	--
2325	1,312	265	229	7,320	15,000	17,200	8,500
2335	5,004	780	680	25,700	46,200	52,300	27,400
2350	5,373	1,199	659	--	--	--	38,500
2355	122	22.0	4.9	2,120	4,910	5,840	--
2362	843	133	59	11,800	22,200	--	--

TABLE A-2.—Selected streamflow characteristics at gaging stations in Washington
Continued

Station number	Characteristic						
	Mean annual flow (Q_a)	Std. Dev. of mean annual (SD_a)	20 year, 7-day mean low flow ($M_{7,20}$)	2-year flood (P_2)	25-year flood (P_{25})	50-year flood (P_{50})	50 year 7-day mean flood flow ($V_{7,50}$)
14-2365	927	180	61	10,700	22,700	--	--
2370	9.70	2.05	.0	101	188	207	--
2375	118	20.6	2.1	1,200	2,930	3,500	--
2380	6,221	1,335	831	32,400	57,700	64,100	42,200
2415	615	140	63	6,150	11,900	13,700	--
2425	2,024	420	287	16,500	29,000	32,300	18,900
2430	9,135	2,090	1,170	51,800	94,000	104,000	72,500
2435	91.5	16.5	1.7	1,280	2,610	2,960	--
2450	427	72.8	24	4,700	9,090	10,400	--
2475	373	71.7	20	4,970	7,860	8,440	3,080
2490	338	55.9	20	5,640	9,140	--	--
2505	126	20.3	4.8	2,330	4,250	4,780	--
PARTIAL-RECORD STATIONS IN WESTERN WASHINGTON							
12-0106	--	--	--	176	236	246	--
0111	--	--	--	49	85	93	--
0122	--	--	--	127	241	276	--
0167	--	--	--	158	298	331	--
0196	--	--	--	91	161	175	--
0205	--	--	--	1,610	3,190	3,590	--
0347	--	--	--	45	97	--	--
0390.5	--	--	--	65	132	147	--
0391	--	--	--	17	26	27	--
0394	--	--	--	202	409	--	--
0416	--	--	--	24	64	--	--
0427	--	--	--	495	764	807	--
0429	--	--	--	327	581	638	--
0468	--	--	--	22	54	--	--
0471	--	--	--	101	348	431	--
0494	--	--	--	29	81	96	--
0524	--	--	--	216	539	603	--
0534	--	--	--	36	73	83	--
0563	--	--	--	59	230	288	--
0612	--	--	--	156	304	--	--
0786	--	--	--	57	101	111	--
0968	--	--	--	19	71	--	--
0977	--	--	--	133	800	1,200	--
1022	--	--	--	84	171	198	--
1032	--	--	--	11	16	--	--
1072	--	--	--	70	139	158	--
1132	--	--	--	45	83	89	--
1133	--	--	--	5.5	16	--	--
1153	--	--	--	60	167	--	--
1198	--	--	--	37	71	79	--
1233	--	--	--	24	54	63	--
1305	--	--	--	6,920	17,400	20,900	--
1310	--	--	--	5,550	13,700	16,500	--
1327	--	--	--	111	217	238	--
1355	--	--	--	912	3,170	4,260	--
1433	--	--	--	25	44	47	--
1455	--	--	--	1,800	3,190	3,550	--
1481	--	--	--	113	262	--	--
1564	--	--	--	25	48	53	--
1695	--	--	--	95	245	--	--
1894	--	--	--	107	198	218	--
1972	--	--	--	137	209	224	--
2007	--	--	--	35	86	99	--
2008	--	--	--	118	281	327	--
2044	--	--	--	65	207	--	--
2127	--	--	--	25	57	65	--
2128	--	--	--	19	35	--	--

TABLE A-2.—Selected streamflow characteristics at gaging stations in Washington
Continued

Station number	Characteristic						
	Mean annual flow (Q_a)	Std. Dev. of mean annual (SD_a)	20 year, 7-day mean low flow ($M_{7,20}$)	2-year flood (P_2)	25-year flood (P_{25})	50-year flood (P_{50})	50 year 7-day mean flood flow ($V_{7,50}$)
14-1252	--	--	--	188	450	537	--
1263	--	--	--	42	93	108	--
1432	--	--	--	128	292	345	--
1440	--	--	--	1,250	2,410	2,700	--
1445.5	--	--	--	72	150	170	--
1446	--	--	--	40	95	--	--
2119	--	--	--	75	142	161	--
2183	--	--	--	302	568	--	--
2227	--	--	--	36	133	177	--
2238	--	--	--	51	102	117	--
2268	--	--	--	59	153	--	--
2269	--	--	--	102	200	--	--
2311	--	--	--	84	138	150	--
2320	--	--	--	2,630	4,360	--	--
2353	--	--	--	87	141	151	--
2391	--	--	--	24	38	41	--
2397	--	--	--	22	46	53	--
2426	--	--	--	40	102	121	--
2481	--	--	--	87	173	189	--
GAGING STATIONS IN EASTERN WASHINGTON							
12-3960	72.4	19.0	5.3	527	1,110	--	--
3990	1,013	249	82	7,270	10,400	--	--
4005	219	74.5	11	1,700	2,550	--	--
4015	1,486	371	38	11,800	18,300	19,600	16,000
4075	12.4	4.04	5.0	--	--	--	--
4077	35.7	10.6	3.6	171	395	--	--
4083	58.5	22.4	--	336	1,100	--	--
4085	48.6	16.2	4.8	321	680	747	523
4090	299	125	14	1,160	2,730	3,040	2,780
4020	252	87.9	4.5	6,630	18,200	22,200	--
4270	57.7	7.29	34	106	160	172	--
4310	323	87.4	80	1,530	2,450	2,600	--
4375	44.6	22.9	--	175	664	800	--
4420	47.4	13.9	3.3	701	1,560	--	--
4425	2,320	690	207	16,400	31,000	35,000	30,500
4435	2,132	542	--	--	--	--	--
4495	1,352	427	152	12,100	27,200	31,400	18,000
4510	1,402	279	109	9,500	16,100	17,500	11,100
4515	204	47.2	14	1,350	3,050	3,570	1,810
4525	2,030	440	--	--	--	--	--
4528	360	60.0	42	2,750	4,480	--	--
4530	509	127	55	3,250	6,300	--	4,520
4540	817	119	103	4,790	5,990	--	--
4550	1,317	305	132	6,990	11,200	11,900	9,320
4565	488	130	58	2,760	5,300	--	4,920
4570	2,246	491	251	11,700	18,900	20,200	15,900
4580	620	135	61	4,380	8,840	10,000	5,410
4590	3,090	749	321	16,000	25,300	27,000	22,900
4650	79.5	59.4	3.4	1,020	8,240	11,600	4,340
4685	10.4	3.02	--	--	--	--	--
4705	80.3	22.8	33	102	171	189	188
4745	333	67.5	--	--	--	--	--
4760	290	65.5	--	--	--	--	--
4790	920	200	--	--	--	--	--
4795	2,005	449	--	--	--	--	--
4805	377	80.5	--	--	--	--	--
4838	55.8	10.8	10	421	1,020	--	--
4880	293	73.4	--	--	--	--	--
4885	236	53.2	28	1,380	2,610	2,890	1,930
4915	496	122	--	--	--	--	--

TABLE A-2.—Selected streamflow characteristics at gaging stations in Washington
Continued

Station number	Characteristic						
	Mean annual flow (Q_a)	Std. Dev. of mean annual (SD_a)	20 year, 7-day mean low flow ($M_{7,20}$)	2-year flood (P_2)	25-year flood (P_{25})	50-year flood (P_{50})	50 year 7-day mean flood flow ($V_{7,50}$)
12-4925	553	136	--	--	--	--	--
4940	1,702	457	--	--	--	--	--
5005	68.4	20.1	7.3	369	735	820	576
5010	19.5	6.53	3.4	99	320	395	179
13-3345	68.4	17.9	20	328	921	1,120	463
3445	155	56.8	21	1,590	10,100	--	--
3460	310	92.9	--	4,370	9,450	--	--
3480	29.9	11.2	.4	--	--	--	--
3485	6.22	2.90	.0	--	--	--	--
3505	35.6	18.8	.0	803	3,380	--	--
3510	595	268	1.6	7,350	27,000	--	16,200
14-0135	15.4	4.53	.2	318	752	850	246
0160	22.0	6.78	.4	604	2,360	--	--
0165	124	35.7	30	697	3,670	--	--
0170	217	66.7	7.1	2,170	6,440	--	3,060
1070	328	67.7	--	1,770	3,320	3,790	2,760
1100	832	173	272	3,040	6,060	6,910	4,220
1120	60.9	23.7	.7	930	5,240	--	--
1125	170	80.9	16	2,930	11,200	13,600	--
1130	1,577	469	508	7,910	24,800	30,400	12,100
PARTIAL-RECORD STATIONS IN EASTERN WASHINGTON							
12-3958	--	--	--	45	90	--	--
3959	--	--	--	95	179	--	--
3961	--	--	--	77	167	--	--
3964.5	--	--	--	90	259	--	--
4037	--	--	--	9.9	18	--	--
4054	--	--	--	49	146	--	--
4076	--	--	--	6.5	15	--	--
4082	--	--	--	10	28	--	--
4084	--	--	--	29	85	--	--
4106	--	--	--	22	41	--	--
4106.5	--	--	--	5.4	14	--	--
4239	--	--	--	22	112	--	--
4298	--	--	--	12	28	--	--
4333	--	--	--	46	131	--	--
4338	--	--	--	12	33	--	--
4379.5	--	--	--	33	480	--	--
4392	--	--	--	8.5	97	--	--
4444	--	--	--	6.6	93	--	--
4458	--	--	--	7.3	15	--	--
4474	--	--	--	20	62	--	--
4578	--	--	--	27	68	--	--
4611	--	--	--	18	57	--	--
4612	--	--	--	5.1	19	--	--
4615	--	--	--	59	254	--	--
4620	--	--	--	148	372	--	--
4627	--	--	--	40	160	--	--
4628	--	--	--	61	469	--	--
4646	--	--	--	6.0	63	--	--
4646.5	--	--	--	16	95	--	--
4651	--	--	--	4.8	109	--	--
4653	--	--	--	38	188	--	--
4674	--	--	--	15	152	--	--
4703	--	--	--	17	123	--	--
4807	--	--	--	32	66	--	--
4833	--	--	--	28	91	--	--

TABLE A-2.—Selected streamflow characteristics at gaging stations in Washington Continued

Station number	Characteristic						
	Mean annual flow (Q_a)	Std. Dev. of mean annual (SD_a)	20 year, 7-day mean low flow ($M_{7,20}$)	2-year flood (P_2)	25-year flood (P_{25})	50-year flood (P_{50})	50 year 7-day mean flood flow ($V_{7,50}$)
12-4846	--	--	--	25	248	--	--
4883	--	--	--	17	33	--	--
4917	--	--	--	21	56	--	--
5076	--	--	--	2.8	24	--	--
5127	--	--	--	1.8	150	--	--
13-3352	--	--	--	23	1,120	--	--
3436.6	--	--	--	65	580	--	--
3484	--	--	--	37	240	--	--
3493	--	--	--	23	168	--	--
3493.5	--	--	--	30	440	--	--
3522	--	--	--	24	190	--	--
3525.5	--	--	--	14	310	--	--
14-0159	--	--	--	14	178	--	--
0166	--	--	--	55	322	--	--
0166.5	--	--	--	8.0	470	--	--
0172	--	--	--	43	550	--	--

TABLE A-3.—Washington gaging stations in operation and proposed for network

Column 1: "B," bench mark or long-term-trend station.

Column 2: "C," current-purpose station.

Columns 3-5: If column 2 is "C" then the purpose is: 1, accounting; 2, operation; 3, forecasting; 4, disposal; 5, water quality; 6, compact or legal; 7, research or special studies.

Column 6: "P," principal unregulated streamflow station; "H," hydrologic station for regional streamflow characteristics, except when station is P; "R," regulated stream for systems analysis objectives; "U," not recommended for inclusion in future program.

Column 7: The effect of regulation or diversion on monthly and low flows; blank, no appreciable effect; 1, no effect on daily flow; 2, no effect on weekly low flow; 3, no effect or effect less than 10 percent of monthly flow; 4, monthly flow affected, but adjustable to natural conditions within an error of 10 percent or less; 5, effect of regulation not evaluated; 6, effect on daily flow is appreciable; 7, effect on weekly flow is appreciable; 8, monthly flow affected by more than 10 percent and available data does not permit adjustment to natural conditions; 9, effect varies by month or season.

Column 8: The effect of regulation or diversion on annual peak flow; blank, no effect; 1, affected by less than 10 percent; 2, affected by more than 10 percent; 3, effect undetermined.

Column 9: Financing of station; 1, Federal; 2, cooperative program with State or local governments; 3, other Federal agency; 4, combination of 1 and 2; 5, 1 and 3; 6, 2 and 3; 7, 1, 2, and 3; 8, Federal Power Commission.

Station number	Station name	Column								
		1	2	3	4	5	6	7	8	9
	STATIONS IN OPERATION AND PROPOSED DELETIONS									
12-0095	Bear Branch near Naselle	--	--	--	--	--	H	--	--	2
0100	Naselle River near Naselle	B	--	--	--	--	H	--	--	2
0107	South Fork Naselle River near Naselle	--	--	--	--	--	H	2	--	2
0112	Williams Creek near South Bend	--	--	--	--	--	H	--	--	2
0115	Willapa River at Lebam	--	--	--	--	--	U	2	--	2
0120	Fork Creek near Lebam	--	--	--	--	--	U	3	--	2
0135	Willapa River near Willapa	--	--	--	--	--	H	2	--	2
0145	South Fork Willapa River near Raymond	--	--	--	--	--	U	1	--	2
0151	Clearwater Creek near Raymond	--	--	--	--	--	H	2	--	2
0170	North River near Raymond	--	C	1	--	--	H	1	--	2
0200	Chehalis River near Doty	--	--	--	--	--	U	--	--	2
0205	Elk Creek near Doty	--	--	--	--	--	U	--	--	3
0209	South Fork Chehalis River near Boistfort	--	--	--	--	--	R	3	--	2
0240	South Fork Newaukum River near Onalaska	--	--	--	--	--	H	1	--	2
0250	Newaukum River near Chehalis	--	C	3	--	--	R	9	--	2
0253	Salzer Creek near Centralia	--	C	2	--	--	H	--	--	2
0257	Skookumchuck River near Vail	--	C	2	--	--	H	--	--	2
0261.5	Skookumchuck River below Bloody Run near Centralia	--	C	2	--	--	R	5	--	2
0264	Skookumchuck River near Bucoda	--	C	2	--	--	R	5	--	2
0275	Chehalis River near Grand Mound	B	C	1	2	--	P	2	--	2
0300	Rock Creek at Cedarville	--	--	--	--	--	U	2	--	2
0310	Chehalis River at Porter	--	C	1	5	--	P	2	--	2
0325	Cloquallum Creek at Elma	--	--	--	--	--	U	2	--	2
0342	East Fork Satsop River neor Elma	--	--	--	--	--	U	--	--	2
0350	Satsop River near Satsop	--	C	2	--	--	H	--	--	2
0354	Wynoochee River near Grisdale	--	C	2	--	--	R	5	--	3
0360	Wynoochee River above Save Creek, near Aberdeen	--	C	2	--	--	R	5	--	2
0374	Wynoochee River above Black Creek, near Montesano	--	C	2	--	--	R	5	--	2
0390	Humptulips River near Humptulips	--	--	--	--	--	U	--	--	2
0393	North Fork Quinault River near Amanda Park	B	--	--	--	--	H	--	--	1
0395	Quinault River at Quinault Lake	--	C	1	--	--	H	--	--	1
0412	Hoh River at U.S. Highway 101, near Forks	--	C	1	--	--	H	--	--	2
0415	Soleduck River near Fairholm	--	--	--	--	--	U	--	--	2
0431	Dickey River near La Push	--	--	--	--	--	H	--	--	2
0433	Hoko River near Sekiu	--	--	--	--	--	H	--	--	2
0434.3	East Twin River near Pysht	--	--	--	--	-	H	--	--	2
0455	Elwha River at McDonald Bridge, near Port Angeles	--	C	6	--	--	R	4	3	8
0473	Morse Creek near Port Angeles	--	--	--	--	--	R	4	--	2
0480	Dungeness River near Sequim	B	--	--	--	--	H	--	--	2
0505	Snow Creek near Maynard	--	--	--	--	--	U	--	--	2
0540	Duckabush River near Brinnon	B	--	--	--	--	H	--	--	2
0545	Hamma Hamma River near Eldon	--	--	--	--	--	U	--	--	2
0546	Jefferson Creek near Eldon	--	--	--	--	--	U	--	--	2
0565	North Fork Skokomish River below Staircase Rapids, near Hoodsport	B	C	2	--	--	H	--	--	2
0575	North Fork Skokomish River near Hoodsport	--	C	2	--	--	R	4	2	2

TABLE A-3.—Washington gaging stations in operation and proposed for network—Continued

Station number	Station name	Column 1	2	3	4	5	6	7	8	9
12-0580	Dear Meadow Creek near Hoodsport	--	C	2	--	--	R	6	--	2
0595	North Fork Skokomish River near Potlatch	--	C	2	--	--	R	6	2	2
0598	South Fork Skokomish River near Hoodsport	--	--	--	--	--	U	--	--	2
0605	South Fork Skokomish River near Union	--	C	2	--	--	H	--	--	2
0615	Skokomish River near Potlatch	--	C	2	--	--	R	6	2	2
0655	Gold Creek near Bremerton	--	--	--	--	--	U	--	--	2
0685	Dewatto River near Dewatto	--	--	--	--	--	U	--	--	2
0695.5	Big Beef Creek near Seabeck	--	C	7	--	--	H	1	1	2
0700	Dogfish Creek near Poulsbo	--	--	--	--	--	U	1	--	2
0720	Chico Creek near Bremerton	--	C	1	--	--	R	3	3	2
0765	Goldsborough Creek near Shelton	--	--	--	--	--	U	--	--	2
0784	Kennedy Creek near Kamilche	--	--	--	--	--	U	1	--	2
0790	Deschutes River near Rainier	--	--	--	--	--	H	--	--	2
0816	Nisqually River near Paradise	--	C	7	--	--	H	--	--	1
0825	Nisqually River near National	--	C	2	--	--	H	--	--	2
0830	Mineral Creek near Mineral	--	C	2	--	--	H	--	--	2
0865	Nisqually River at La Grande	--	C	2	6	--	R	4	2	8
0880	Ohop Creek near Eatonville	--	--	--	--	--	U	--	--	2
0884	Nisqually River above Powell Creek, near McKenna	--	C	2	--	--	R	3	2	2
0902	Muck Creek at Roy	--	C	1	--	--	R	5	3	2
0910.4	Chambers Creek above Flett Creek, near Steilacoom	--	C	1	--	--	H	--	--	2
0910.6	Flett Creek at Mountain View Memorial Park, at Tacoma	--	C	2	--	--	R	5	3	2
0911	Flett Creek at Tacoma	--	C	2	--	--	R	5	3	2
0911.8	Leach Creek at holding pond, at Fircrest	--	C	2	--	--	R	5	3	2
0912	Leach Creek near Fircrest	--	C	2	--	--	R	5	3	2
0913	Leach Creek near Steilacoom	--	C	2	--	--	R	5	3	2
0920	Puyallup River near Electron	--	C	2	3	--	H	--	--	2
0935	Puyallup River near Orting	--	C	2	3	--	R	3	--	3
0939	Carbon River at Fairfax	--	C	3	--	--	H	--	--	3
0950	South Prairie Creek at South Prairie	--	--	--	--	--	U	2	--	2
0966	White River near Greenwater	--	C	7	--	--	H	--	--	1
0970	White River at Greenwater	--	--	--	--	--	U	--	--	2
0975	Greenwater River at Greenwater	B	--	--	--	--	H	--	--	2
0985	White River near Buckley	--	C	2	--	--	R	--	2	3
1005	White River near Sumner	--	--	--	--	--	U	6	2	2
1011	Lake Tapps diversion at Dieringer	--	C	2	--	--	R	6	2	2
1015	Puyallup River at Puyallup	--	C	1	3	--	R	4	2	2
1034	Green River below Intake Creek, near Lester	--	C	2	--	--	H	--	--	2
1040	Friday Creek near Lester	--	C	2	--	--	H	--	--	2
1045	Green River near Lester	--	C	2	--	--	H	--	--	2
1047	Green Canyon Creek near Lester	--	--	--	--	--	U	--	--	2
1050	Smay Creek near Lester	--	--	--	--	--	U	--	--	2
1057.1	North Fork Green River near Lemolo	--	C	2	--	--	H	--	--	2
1059	Green River below Howard A. Hanson Dam	--	C	2	3	--	R	4	2	3
1067	Green River at purification plant, near Palmer	--	C	2	--	--	R	6	2	6
1085	Newaukum Creek near Black Diamond	--	C	2	3	--	R	2	--	3
1126	Big Soos Creek above hatchery, near Auburn	--	C	2	3	--	R	2	--	3
1130	Green River near Auburn	--	C	2	3	--	R	6	2	3
1135.5	Green River at Tukwila	--	C	3	4	7	R	6	2	6
1140	South Fork Cedar River near Lester	B	--	--	--	--	H	--	--	2
1150	Cedar River near Cedar Falls	--	C	2	--	--	H	--	--	2
1155	Rex River near Cedar Falls	--	C	2	--	--	H	--	--	2
1161	Canyon Creek near Cedar Falls	--	C	2	--	--	R	5	--	2
1165	Cedar River at Cedar Falls	--	C	2	--	--	R	6	2	2
1170	Taylor Creek near Selleck	--	--	--	--	--	H	--	--	2
1175	Cedar River near Landsburg	--	C	2	3	--	R	6	2	2
1185	Rock Creek near Maple Valley	--	C	2	--	--	R	6	--	2
1190	Cedar River at Renton	--	C	3	--	--	R	6	2	6
1196	May Creek at mouth, near Renton	--	--	--	--	--	H	1	--	6
1200	Mercer Creek near Bellevue	--	--	--	--	--	H	1	--	2

TABLE A-3.—Washington gaging stations in operation and proposed for network—Continued

Station number	Station name	Column 1	2	3	4	5	6	7	8	9
12-1205	Juanita Creek near Kirkland	--	--	--	--	--	H	1	--	6
1216	Issaquah Creek near mouth, near Issaquah	--	--	--	--	--	R	6	--	6
1240	Evans Creek above mouth, near Redmond	--	--	--	--	--	H	1	--	2
1252	Sammamish River near Woodinville	--	C	7	--	--	H	2	--	6
1260	North Creek near Bothell	--	--	--	--	--	U	1	--	2
1271	Swamp Creek at Kenmore	--	--	--	--	--	H	1	--	6
1276	McAleer Creek at Lake Forest Park	--	--	--	--	--	H	1	--	2
1330	South Fork Skykomish River near Index	B	--	--	--	--	H	--	--	1
1345	Skykomish River near Gold Bar	--	C	1	--	--	P	--	--	2
1350	Wallace River at Gold Bar	--	--	--	--	--	U	--	--	2
1375	Sultan River near Startup	--	--	--	--	--	U	6	2	8
1410	Woods Creek near Monroe	--	--	--	--	--	U	1	--	2
1413	Middle Fork Snoqualmie River near Tanner	--	C	3	--	--	H	--	--	2
1420	North Fork Snoqualmie River near Snoqualmie Falls	--	C	3	--	--	H	--	--	2
1423	Hancock Creek near Snoqualmie	--	--	--	--	--	H	--	--	8
1430	North Fork Snoqualmie River near North Bend	--	C	2	3	--	H	--	--	2
1434	South Fork Snoqualmie River above Alice Creek, near Garcia	--	C	2	3	--	H	--	--	2
1437	Boxley Creek near Cedar Falls	--	C	2	--	--	R	5	--	2
1440	South Fork Snoqualmie River at North Bend	--	C	2	3	--	H	--	--	2
1445	Snoqualmie River near Snoqualmie	--	C	2	--	--	R	6	--	2
1455	Raging River near Fall City	--	C	3	--	--	H	1	--	2
1460	Patterson Creek near Fall City	--	--	--	--	--	U	1	--	2
1470	Griffin Creek near Carnation	--	--	--	--	--	U	1	--	2
1475	North Fork Tolt River near Carnation	--	C	1	--	--	H	--	--	2
1476	South Fork Tolt River near Index	--	C	2	--	--	H	--	--	2
1480	South Fork Tolt River near Carnation	--	C	2	--	--	R	6	2	2
1485	Tolt River near Carnation	--	C	2	--	--	R	6	3	2
1490	Snoqualmie River near Carnation	--	C	1	3	--	P	6	--	2
1508	Snohomish River near Monroe	--	C	3	--	--	R	5	--	3
1530	Little Pilchuck Creek near Lake Stevens	--	--	--	--	--	U	1	--	2
1610	South Fork Stillaguamish River near Granite Falls	--	C	3	--	--	H	--	--	2
1670	North Fork Stillaguamish River near Arlington	--	C	3	--	--	H	--	--	2
1685	Pilchuck Creek near Bryant	--	--	--	--	--	U	--	--	2
1755	Thunder Creek near Newhalem	--	C	6	--	--	H	--	--	8
1775	Stetattle Creek near Newhalem	--	C	6	--	--	H	--	--	8
1780	Skagit River at Newhalem	--	C	6	--	--	R	4	2	8
1781	Newhalem Creek near Newhalem	B	--	--	--	--	H	--	--	2
1790	Skagit River above Alma Creek, near Marblemount	--	--	--	--	--	R	4	2	2
1811	South Fork Cascade River at South Cascade Glacier, near Marblemount	--	C	7	--	--	H	--	--	1
1812	Salix Creek at South Cascade Glacier, near Marblemount	--	C	7	--	--	H	--	--	1
1825	Cascade River at Marblemount	B	--	--	--	--	H	--	--	2
1860	Sauk River above Whitechuck River near Darrington	B	--	--	--	--	H	--	--	2
1895	Sauk River near Sauk	--	C	3	--	--	P	--	--	1
1918	Sulphur Creek near Concrete	--	--	--	--	--	H	--	--	2
1935	Baker River at Concrete	--	C	2	6	--	R	4	2	8
1940	Skagit River near Concrete	--	C	3	--	--	R	6	2	2
1960	Alder Creek near Hamilton	--	--	--	--	--	U	--	--	2
1962	Day Creek below Day Lake, near Lyman	--	--	--	--	--	H	--	--	2
1998	East Fork Nookachamps Creek near Big Lake	--	--	--	--	--	H	--	--	2
2005	Skagit River near Mount Vernon	--	C	1	--	--	R	6	2	3
2015	Samish River near Burlington	--	--	--	--	--	U	1	--	2
2019.5	Anderson Creek near Bellingham	--	--	--	--	--	U	6	--	2
2020	Austin Creek near Bellingham	--	--	--	--	--	U	--	--	2
2020.5	Smith Creek near Bellingham	--	--	--	--	--	U	--	--	2
2023	Olsen Creek near Bellingham	--	--	--	--	--	U	6	--	2
2035	Whatcom Creek below hatchery, near Bellingham	--	--	--	--	--	U	6	2	2
2050	North Fork Nooksack River below Cascade Creek, near Glacier	--	C	3	--	--	H	1	--	2
2072	North Fork Nooksack River near Deming	--	--	--	--	--	H	--	--	2
2080	Middle Fork Nooksack River near Deming	--	--	--	--	--	H	6	--	3

TABLE A-3.—Washington gaging stations in operation and proposed for network—Continued

Station number	Station name	Column 1	2	3	4	5	6	7	8	9
12-2090	South Fork Nooksack River near Wickersham	B	--	--	--	--	H	--	--	2
2105	Nooksack River at Deming	--	C	3	--	--	P	1	--	2
2120	Fishtrap Creek at Lynden	--	--	--	--	--	U	2	--	2
2129	Tenmile Creek at Laurel	--	C	2	--	--	H	--	--	2
2131	Nooksack River at Ferndale	--	C	1	3	--	P	1	--	3
2500	Judd Creek near Burton	--	--	--	--	--	H	2	--	2
3230	Columbia River at Birchbank, British Columbia (International gaging station)	--	C	6	--	--	R	6	3	3
3960	Calispell Creek near Dalkena	--	C	2	--	--	R	6	--	2
3965	Pend Oreille River below Box Canyon, near Ione	--	C	2	6	--	R	6	2	8
3969	Sullivan Creek above Outlet Creek, near Metaline Falls	B	--	--	--	--	H	--	--	2
3971	Outlet Creek near Metaline Falls	--	C	2	6	--	R	6	3	8
3986	Pend Oreille River at international boundary (International gaging station)	--	C	1	6	--	R	6	2	8
3995	Columbia River at international boundary (International gaging station)	--	C	1	5	6	R	6	2	3
4015	Kettle River near Ferry	--	C	1	6	--	R	5	--	3
4045	Kettle River near Laurier (International gaging station)	--	C	1	6	--	R	5	--	3
4075	Sheep Creek at Springdale	--	C	6	--	--	R	6	2	2
4075.2	Deer Creek near Valley	--	--	--	--	--	H	1	--	2
4077	Chewelah Creek at Chewelah	--	--	--	--	--	R	6	--	2
4083	Little Pend Oreille River near Colville	--	--	--	--	--	H	1	--	2
4084.2	Haller Creek near Arden	--	--	--	--	--	R	6	--	2
4085	Mill Creek near Colville	--	C	2	6	--	H	1	--	2
4090	Colville River at Kettle Falls	--	C	2	--	--	R	6	--	2
4195	Spokane River above Liberty Bridge, near Otis Orchards	--	C	2	--	--	R	6	2	2
4225	Spokane River at Spokane	--	C	1	2	--	R	6	2	2
4240	Hangman Creek at Spokane	--	C	2	--	--	P	1	--	2
4270	Little Spokane River at Elk	--	--	--	--	--	U	1	--	2
4310	Little Spokane River at Dartford	--	C	7	--	--	P	1	--	2
4330	Spokane River at Long Lake	--	C	1	--	--	R	6	2	2
4355	Feeder Canal at Grand Coulee	--	C	2	--	--	R	5	3	3
4365	Columbia River at Grand Coulee Dam	--	C	2	6	--	R	6	2	1
4380	Columbia River at Bridgeport	--	C	1	2	--	R	6	2	3
4387	Okanagan River near Oliver, British Columbia (International gaging station)	--	C	6	--	--	R	6	3	3
4393	Tonasket Creek at Oroville	--	C	7	--	--	H	--	--	3
4395	Okanogan River at Oroville	--	C	6	--	--	R	6	3	3
4425	Similkameen River near Nighthawk (International gaging station)	--	C	1	6	--	P	1	--	3
4441	Whitestone Creek near Tonasket	--	--	--	--	--	R	6	3	2
4444.9	Bonaparte Creek near Wauconda	--	C	2	--	--	R	6	--	2
4450	Okanogan River near Tonasket	--	C	7	--	--	R	6	3	2
4472	Okanogan River at Malott	--	C	2	--	--	R	6	3	3
4473.9	Andrews Creek near Mazama	B	--	--	--	--	H	--	--	1
4496	Beaver Creek below South Fork, near Twisp	--	--	--	--	--	H	--	--	2
4499.5	Methow River near Pateros	--	C	2	--	--	R	6	--	2
4507	Columbia River below Wells Dam	--	C	1	6	--	R	6	2	8
4510	Stehekin River at Stehekin	B	C	2	--	--	H	--	--	2
4525	Chelan River at Chelan	--	C	2	6	--	R	4	2	8
4528	Entiat River near Ardenvoir	--	--	--	--	--	H	--	--	1
4537	Columbia River at Rocky Reach Dam	--	C	2	6	--	R	6	2	8
4540	White River near Plain	B	--	--	--	--	H	--	--	2
4570	Wenatchee River at Plain	--	--	--	--	--	U	--	--	2
4580	Icicle Creek above Snow Creek, near Leavenworth	--	--	--	--	--	U	--	--	2
4590	Wenatchee River at Peshastin	--	C	2	--	--	R	9	--	2
4614	Mission Creek above Sand Creek, near Cashmere	--	--	--	--	--	H	--	--	2
4625	Wenatchee River at Monitor	--	C	1	2	6	R	9	--	8

TABLE A-3.—Washington gaging stations in operation and proposed for network—Continued

Station number	Station name	Column 1	2	3	4	5	6	7	8	9
12-4626	Columbia River below Rock Island Dam	--	C	1	2	6	R	6	2	8
4646.2	Columbia River below Wanapum Dam	--	C	6	--	--	R	6	2	8
4648	Coal Creek at Mohler	--	--	--	--	--	H	--	--	2
4650	Crab Creek at Irby	--	C	2	--	--	P	1	--	6
4654	Wilson Creek below Corbett Draw, near Almira	--	C	7	--	--	H	--	--	3
4655	Wilson Creek at Wilson Creek	--	--	--	--	--	H	--	--	2
4670	Crab Creek near Moses Lake	--	C	2	--	--	R	5	--	3
4705	Rocky Ford Creek near Ephrata	--	C	2	--	--	H	1	--	3
4712.7	Farrier Coulee near Schrag	--	--	--	--	--	H	--	--	2
4726	Crab Creek near Beverly	--	C	1	--	--	R	6	2	3
4728	Columbia River below Priest Rapids Dam	--	C	2	6	--	R	6	2	8
4745	Yakima River near Martin	--	C	2	--	--	R	4	2	3
4760	Kachess River near Easton	--	C	2	--	--	R	4	2	3
4790	Cle Elum River near Roslyn	--	C	2	--	--	R	4	2	3
4795	Yakima River at Cle Elum	--	C	2	--	--	R	4	2	2
4800	Teanaway River below Forks, near Cle Elum	--	C	7	--	--	H	1	--	3
4838	Naneum Creek near Ellensburg	--	--	--	--	--	H	1	--	2
4845	Yakima River at Umtanum	--	C	2	--	--	R	6	2	2
4880	Bumping River near Nile	--	C	2	--	--	R	4	2	2
4885	American River near Nile	B	--	--	--	--	H	--	--	2
4915	Tieton River at Tieton Dam, near Naches	--	C	2	--	--	R	4	2	3
4925	Tieton River at headworks of Tieton Canal, near Naches	--	C	2	--	--	R	4	2	3
4940	Naches River below Tieton River, near Naches	--	C	2	--	--	R	4	2	2
5004.5	Yakima River above Ahtanum Creek, at Union Gap	--	C	2	--	--	R	6	2	2
5005	North Fork Ahtanum Creek near Tampico	--	C	2	--	--	H	--	--	2
5010	South Fork Ahtanum Creek at Conrad Ranch, near Tampico	--	C	2	--	--	H	1	--	2
5050	Yakima River near Parker	--	C	2	5	--	R	6	2	3
5105	Yakima River at Kiona	--	C	1	2	5	R	6	2	1
5125	Providence Coulee at Cunningham	--	C	2	--	--	H	--	--	3
5130	Esquatzel Coulee at Connell	--	C	2	--	--	H	--	--	3
5135	Esquatzel Coulee at Eltopia	--	C	2	--	--	P	--	--	3
13-3347	Asotin Creek below Kearney Gulch, near Asotin	B	--	--	--	--	H	--	--	2
3435	Snake River near Clarkston	--	C	2	5	--	R	6	2	1
3438	Meadow Creek near Central Ferry	--	--	--	--	--	R	6	--	2
3445	Tucannon River near Starbuck	--	C	7	--	--	H	1	--	3
3461	Palouse River at Colfax	--	C	2	--	--	R	6	--	3
3480	South Fork Palouse River at Pullman	--	C	7	--	--	R	6	--	3
3485	Missouri Flat Creek at Pullman	--	C	7	--	--	H	2	--	6
3492.1	Palouse River below South Fork, at Colfax	--	C	2	6	--	R	6	--	3
3494	Pine Creek at Pine City	--	--	--	--	--	H	2	--	2
3505	Union Flat Creek near Colfax	--	--	--	--	--	H	2	--	2
3510	Palouse River at Hooper	--	C	2	5	--	R	6	--	3
3525	Cow Creek below Ice Harbor Dam	--	--	--	--	--	R	--	3	2
3530	Snake River below Ice Harbor Dam	--	C	2	--	--	R	6	2	3
14-0130	Mill Creek near Walla Walla	--	C	7	--	--	R	6	--	3
0135	Blue Creek near Walla Walla	--	C	7	--	--	H	1	--	3
0150	Mill Creek at Walla Walla	--	C	7	--	--	R	6	3	3
0170	Touchet Creek at Bolles	--	C	2	--	--	H	2	--	2
0185	Walla Walla River near Touchet	--	C	2	--	--	R	6	--	3
1070	Klickitat River above West Fork, near Glenwood	B	--	--	--	--	H	--	--	2
1100	Klickitat River near Glenwood	--	--	--	--	--	U	6	--	2
1120	Little Klickitat River near Goldendale	--	--	--	--	--	U	6	--	3
1124	Mill Creek near Blockhouse	--	--	--	--	--	R	9	--	2
1125	Little Klickitat River near Wahkiacus	--	C	2	--	--	H	1	--	3
1130	Klickitat River near Pitt	--	C	2	3	--	R	6	--	1
1213	White Salmon River below Cascades Creek, near Trout Lake	--	--	--	--	--	H	--	--	2
1235	White Salmon River near Underwood	--	C	2	--	--	R	6	--	2
1255	Little White Salmon River near Cook	--	--	--	--	--	H	1	--	2
1285	Wind River near Carson	--	C	2	--	--	H	1	--	2

TABLE A-3.—Washington gaging stations in operation and proposed for network—Continued

Station number	Station name	Column 1	2	3	4	5	6	7	8	9
14-1435	Washougal River near Washougal	--	C	2	--	--	H	1	--	3
2120	Salmon Creek near Battle Ground	--	--	--	--	--	U	1	--	2
2132	Lewis River near Trout Lake	--	--	--	--	--	H	--	--	2
2135	Big Creek below Skookum Meadow, near Trout Lake	--	--	--	--	--	U	--	--	8
2150	Rush Creek above falls, near Cougar	--	C	2	7	--	H	--	--	8
2155	Curley Creek near Cougar	--	--	--	--	--	U	--	--	8
2160	Lewis River above Muddy River, near Cougar	--	--	--	--	--	U	--	--	8
2165	Muddy River below Clear Creek, near Cougar	--	C	2	7	--	H	--	--	8
2168	Pine Creek near Cougar	--	--	--	--	--	U	--	--	8
2198	Speelyai Creek near Cougar	--	C	6	--	--	H	--	--	8
2205	Lewis River at Ariel	--	C	2	6	--	R	6	--	8
2225	East Fork Lewis River near Heisson	B	--	--	--	--	H	--	--	1
2229.2	Kalama River near Cougar	--	C	7	--	--	H	--	--	2
2229.5	Dry Creek near Cougar	--	C	7	--	--	H	--	--	2
2229.7	Spring Creek near Cougar	--	C	7	--	--	H	--	--	2
2229.8	Kalama River below falls, near Cougar	--	C	7	--	--	H	--	--	2
2235	Kalama River below Italian Creek, near Kalama	--	C	2	--	--	H	--	--	2
2255	Lake Creek near Packwood	--	C	2	6	--	R	4	3	8
2260	Lake Creek at mouth, near Packwood	--	C	2	6	--	R	4	2	8
2265	Cowlitz River at Packwood	--	C	2	--	--	H	2	--	2
2325	Cispus River near Randle	B	C	2	3	--	H	--	--	2
2334	Cowlitz River near Randle	--	C	2	6	--	P	1	--	8
2355	West Fork Tieton River near Morton	--	--	--	--	--	U	--	--	2
2362	Tilton River above Bear Canyon Creek, near Cinebar	--	C	2	3	--	H	1	--	2
2370	Klickitat Creek at Mossyrock	--	--	--	--	--	U	--	--	2
2375	Winston Creek near Silver Creek	--	--	--	--	--	U	2	--	8
2380	Cowlitz River below Mayfield Dam	--	C	2	6	--	R	4	2	8
2390	Salmon Creek near Toledo	--	--	--	--	--	H	--	--	2
2412	Coldspring Creek near Cougar	--	C	7	--	--	H	--	--	2
2425	Toutle River near Silver Lake	--	C	2	3	--	P	--	--	2
2430	Cowlitz River at Castle Rock	--	C	2	6	--	R	4	2	1
2450	Coweman River near Kelso	B	--	--	--	--	H	--	--	2
2475	Elochoman River near Cathlamet	--	--	--	--	--	U	--	--	2
2482	Jim Crow Creek near Grays River	--	--	--	--	--	H	--	--	2
2490	Grays River above South Fork, near Grays River	--	--	--	--	--	H	--	--	2

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