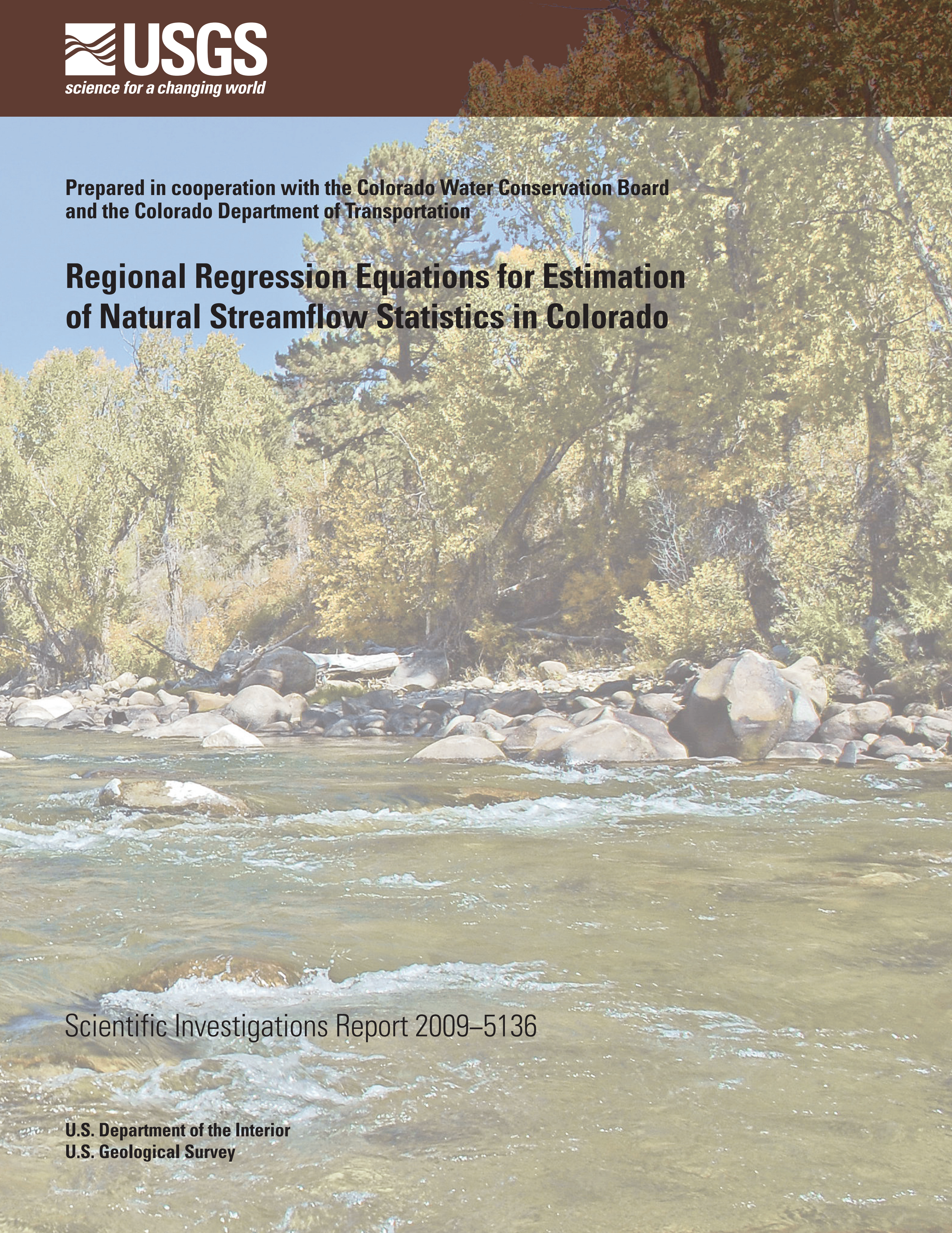

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and the Colorado Department of Transportation

Regional Regression Equations for Estimation of Natural Streamflow Statistics in Colorado

Scientific Investigations Report 2009–5136

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

COVER: Arkansas River near Buena Vista, Colorado.
Photograph by Michael Lewis, U.S. Geological Survey.

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

U.S. Department of the Interior
KEN SALAZAR, Secretary

U.S. Geological Survey
Suzette M. Kimball, Acting Director

U.S. Geological Survey, Reston, Virginia: 2009

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Suggested citation:
Capesius, J.P., and Stephens, V.C., 2009, Regional regression equations for estimation of natural streamflow statistics in Colorado: U.S. Geological Survey Scientific Investigations Report 2009–5136, 46 p.

Library of Congress Cataloging-in-Publication Data

Capesius, Joseph P.
Regional regression equations for estimation of natural streamflow statistics in Colorado / by Joseph P. Capesius and Verlin C. Stephens
p. cm. -- (Scientific investigations report ; 2009-5136)
"Prepared in cooperation with the Colorado Water Conservation Board and the Colorado Department of Transportation."
Includes bibliographic references.
ISBN 978-1-4113-2562-3
1. Stream measurements--Colorado. 2. Streamflow--Colorado. 3. Regression analysis. I. Stephens, Verlin C. II. Geological Survey (U.S.) III. Colorado Water Conservation Board. IV. Colorado Dept. of Transportation. V. Title. VI. Series: Scientific investigations report ; 2009-5136.
GB1225.C6C36 2009
551.48'309788021--dc22

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Conversion Factors and Datum

Inch/Pound to SI

Multiply	By	To obtain
	Length	
inch (in.)	2.54	centimeter (cm)
inch (in.)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
	Area	
square mile (mi^2)	259.0	hectare (ha)
square mile (mi^2)	2.590	square kilometer (km^2)
	Flow rate	
acre-foot per day (acre-ft/d)	0.01427	cubic meter per second (m^3/s)
acre-foot per year (acre-ft/yr)	1,233	cubic meter per year (m^3/yr)
acre-foot per year (acre-ft/yr)	0.001233	cubic hectometer per year (hm^3/yr)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)

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

Horizontal coordinate information is referenced to the North American Datum.

Regional Regression Equations for Estimation of Natural Streamflow Statistics in Colorado

By Joseph P. Capesius and Verlin C. Stephens

Abstract

The U.S. Geological Survey (USGS), in cooperation with the Colorado Water Conservation Board and the Colorado Department of Transportation, developed regional regression equations for estimation of various streamflow statistics that are representative of natural streamflow conditions at ungaged sites in Colorado. The equations define the statistical relations between streamflow statistics (response variables) and basin and climatic characteristics (predictor variables). The equations were developed using generalized least-squares and weighted least-squares multilinear regression reliant on logarithmic variable transformation. Streamflow statistics were derived from at least 10 years of streamflow data through about 2007 from selected USGS streamflow-gaging stations in the study area that are representative of natural-flow conditions. Basin and climatic characteristics used for equation development are drainage area, mean watershed elevation, mean watershed slope, percentage of drainage area above 7,500 feet of elevation, mean annual precipitation, and 6-hour, 100-year precipitation. For each of five hydrologic regions in Colorado, peak-streamflow equations that are based on peak-streamflow data from selected stations are presented for the 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year instantaneous-peak streamflows. For four of the five hydrologic regions, equations based on daily-mean streamflow data from selected stations are presented for 7-day minimum 2-, 10-, and 50-year streamflows and for 7-day maximum 2-, 10-, and 50-year streamflows. Other equations presented for the same four hydrologic regions include those for estimation of annual- and monthly-mean streamflow and streamflow-duration statistics for exceedances of 10, 25, 50, 75, and 90 percent. All equations are reported along with salient diagnostic statistics, ranges of basin and climatic characteristics on which each equation is based, and commentary of potential bias, which is not otherwise removed by log-transformation of the variables of the equations from interpretation of residual plots. The predictor-variable ranges can be used to assess equation applicability for ungaged sites in Colorado.

Introduction

The U.S. Geological Survey (USGS), in cooperation with the Colorado Water Conservation Board and the Colorado Department of Transportation, developed regional regression equations for estimation of various streamflow statistics that are representative of natural streamflow conditions in Colorado. Accurate estimates of various streamflow statistics are important for water-resource management, stream-related structural design, stream-hazard identification, and water-quality management. Streamflow statistics routinely are needed for ungaged watersheds that lack nearby streamflow-gaging stations (stations) from which streamflow statistics could be directly computed. Regional regression equations are a common tool used to estimate streamflow statistics at ungaged sites across the Nation and Colorado.

Regional regression equations are based on statistical relations between (1) streamflow statistics of interest computed from applicable records of the stations and (2) basin and climatic characteristics, for which data are typically readily available. The use of regional equations, along with expressions of predictive uncertainty, generally represents a reliable and cost-effective means for estimating streamflow statistics at ungaged sites.

Purpose and Scope

The purpose of this report is to present regional regression equations, by hydrologic region, for estimation of streamflow statistics for naturally flowing streams in Colorado (fig. 1). The equations were developed using the statistical relations between streamflow statistics (response variables) and basin and climatic characteristics (predictor variables). The current (2009) study updates or refines the equations provided by Kircher and others (1985) and Vaill (1999) and uses streamflow data collected after those studies were completed. Each of these previous studies is described in the section "Previous Studies."

For each of five hydrologic regions in Colorado, peak-streamflow equations based on peak-streamflow data from selected stations are presented for the 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year instantaneous-peak streamflows (peak streamflow). For four of the five hydrologic regions, minimum and maximum 7-day streamflow (7-day, *T*-year) equations based on daily-mean streamflow data from selected stations are presented for 7-day minimum 2-, 10-, and 50-year streamflows as well as for 7-day maximum 2-, 10-, and 50-year streamflows. Other equations presented for the same four hydrologic regions include those for estimation of annual- and monthly-mean streamflow and streamflow-duration statistics for exceedances of 10, 25, 50, 75, and 90 percent. The streamflow-duration statistics collectively are referred to as the "flow-duration curve." The flow-duration values, presented in this report as

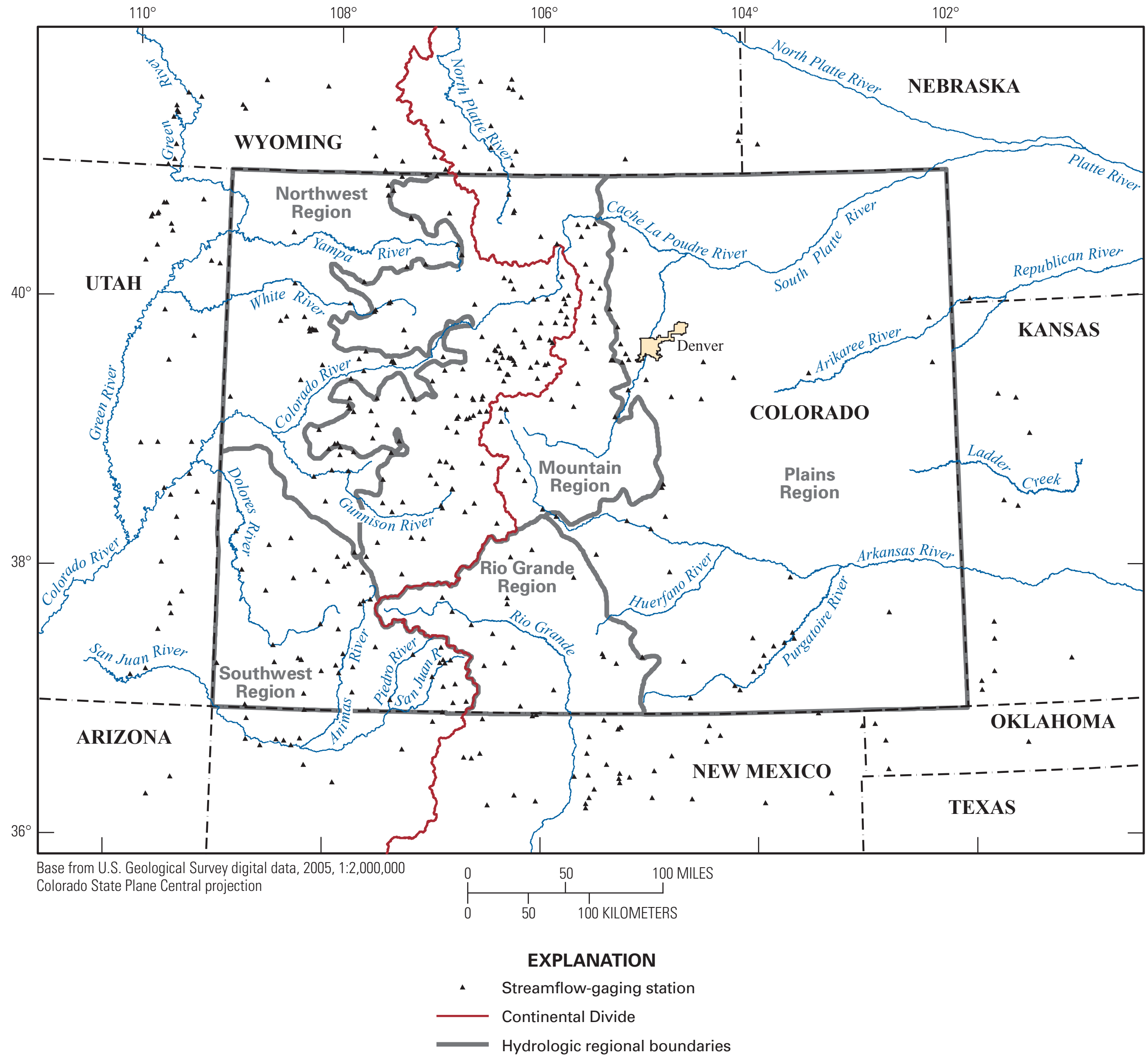

Figure 1. Boundaries of hydrologic regions and locations of streamflow gaging stations in Colorado and adjacent States.

Q10th, *Q25th*, *Q50th*, *Q75th*, and *Q90th,* indicate the percentage of days that a given daily-mean streamflow is exceeded. For example, a 10-percent flow-duration value (*Q10th*) is calculated as the daily-mean streamflow at a given station that is exceeded 10 percent of the time or 10 percent of the days. Finally, this report also describes some limitations associated with the equations, which includes an assessment of prediction errors and assessment of equation applicability for ungaged sites.

The study area of equation applicability is limited to Colorado, even though the study area was extended to include stations within a 50-mile boundary or buffer surrounding Colorado. The study area was extended 50 miles beyond the Colorado for the sole purpose of equation development.

The regional equations for peak-streamflow estimation were developed using annual peak-streamflow data collected through water year 2006 (October 1, 2005, through September 30, 2006). The remaining equations, with the exception of the 7-day, *T*-year minimum streamflow equations, were developed with data through water year 2007. The 7-day, *T*-year minimum streamflow equations were developed with data collected through climate year 2007 (April 1, 2006, through March 31, 2007). The choice of climate year in lieu of water year explicitly was made because the climate year designation splits the daily-mean streamflow record at a time (spring) in which streamflows for a given station generally are larger than at the water year (autumn) or even calendar year transition.

The study is limited by type of statistical procedures used to define the relation between streamflow statistics and basin and climate characteristics. These procedures included generalized least-square and weighted least-square, multilinear regression based on base-10 logarithmic transformations of all included variables. The authors recognize that other transformations of variables could be used.

The study was limited to the use of several selected basin and climatic characteristics described in the section “Basin and Climatic Characteristics.” These characteristics are drainage area; mean watershed slope; mean annual precipitation; mean watershed elevation; 6-hour, 100-year precipitation; and percentage of drainage area above 7,500 feet of elevation.

The equations reported here, as well as equations in all the studies referenced, are or were scoped to estimate natural streamflow statistics for ungaged sites. To clarify, the equations are based on analysis of streamflow data representing streamflow conditions relatively unaffected by anthropogenic influences such as regulation and diversion or return flows such as from a municipality or mining operation, or urban development in a basin. Kircher and others (1985) provide the most quantitative description of natural streamflow. Those authors defined natural streamflow as streamflow from drainage basins relatively unaffected by urban development or water-management activities such as substantial reservoir storage, streamflow diversions, or return flows of previously diverted streamflow. Further, those authors defined natural streamflow as streamflow having less than about 10 percent of the mean-annual streamflow volume at the station affected by anthropogenic activity. The definition by Kircher and others (1985) was used in the current (2009) study. Also, the selection of stations used for the current (2009) study was influenced by those stations selected by Kircher and others (1985), Vaill (1999), and the authors’ general knowledge of hydrologic systems in Colorado.

Description of Study Area

Colorado has a varied and diverse terrain and climate. The State lies within the headwaters of the major river basins of the Colorado River, Missouri River, Rio Grande, and Arkansas River. The geographic variation in Colorado is well characterized by three major physiographic provinces, which trend north to south across the State (Fenneman, 1931).

Encompassing about 40 percent of Colorado on the east, the Great Plains Province is characterized by rolling grasslands broken by occasional hills and bluffs and shallow river valleys. Elevations in the Great Plains range from near 3,500 feet at the eastern border of Colorado to about 6,000 feet in the foothills of the Rocky Mountains at the western edge of the province. The Great Plains have low relative humidity, plentiful sunshine, limited precipitation, substantial and persistent wind, and substantial diurnal variability in air temperatures. Annual temperature extremes generally range from –10 to –15^{o} Fahrenheit in winter to about 100^{o} Fahrenheit in summer. Most precipitation occurs as rain during April through September, largely in the form of thunderstorms. Mean annual precipitation in the Great Plains ranges from 9 to 18 inches per year (Colorado State University, 2008). Precipitation tends to decrease from the eastern border of the Great Plains to a minimum near the foothills at which point it increases rapidly with the increase in elevation of the foothills (Western Regional Climate Center, 2008).

Encompassing central Colorado from north to south, the Southern Rocky Mountains Province lies west of the Great Plains and is characterized by several mountain ranges. Elevations range from about 6,000 feet to more than 14,000 feet. The mountain ranges are characteristically separated by steep valleys and high intermontane parks. The climate of the Southern Rocky Mountains is strongly affected by differences in elevation. Wide variations occur within short distances. Similarly, temperature varies with elevation and decreases with increased elevation (Colorado Geological Survey, 2003; Colorado State University, 2008; Western Regional Climate Center, 2008). Mean annual precipitation is dominated by snowfall and increases with elevation from about 10 inches per year to more than 60 inches per year. Snowfall tends to be associated with eastern-moving winter storms, which originate from the Pacific Ocean and tend to produce more snow on the windward side of the mountain ranges than on the leeward.

Encompassing much of the western quarter of Colorado from north to south, the Colorado Plateaus Province is located between the Utah border to the west and the Southern Rocky Mountains to the east. The terrain is characterized by mesas and plateaus separated by steep and rugged canyons. Like the Great Plains, the Colorado Plateaus Province has low relative humidity, plentiful sunshine, limited precipitation, and substantial and persistent wind. Climatic variability is extreme over relatively short distances because of the microclimates created by the highly irregular landscape. Below 9,000 feet in elevation, mean annual precipitation ranges from 9 to 18 inches per year, whereas, high elevations (above 9,000 feet) receive in excess of 32 inches per year. Snowfall is a substantial component of annual precipitation at high elevations. However, intense summer thunderstorms can account for 20 to 40 percent of the annual precipitation (Robson and Banta, 1995; Colorado Geological Survey, 2003; Colorado State University, 2008).

Previous Studies

Many reports document regression equations developed for estimating streamflow statistics in Colorado. Patterson (1964 and 1965), Patterson and Somers (1966), and Matthai (1968) developed regression equations for major river basins in Colorado. Headman and others (1972) developed equations for streamflow statistics based on channel geometry. The first statewide regional regression study, which focused on peak streamflow, was conducted by McCain and Jarrett

(1976). The hydrologic regions, as described in the section "Definition of Hydrologic Regions of Colorado," originally were defined by McCain and Jarrett (1976) and subsequently adopted by Kircher and others (1985). Kircher and others (1985) developed regional regression equations for a range of high- and low-streamflow characteristics for streams in western Colorado by using USGS streamflow data collected through 1983. Their study is the last regional regression study for nonpeak streamflow statistics in Colorado. Livingston and Minges (1987) developed equations for the estimation of peak streamflows for small drainage basins (less than about 20 square miles) in the Great Plains part of eastern Colorado. Vaill (1999) developed regional regression equations for peak streamflow in Colorado. Vaill (1999) used peak streamflow data collected through 1993 for his study, which represents the most recent regional regression study relative to the current (2009) study for peak streamflow. Other regional regression studies of various streamflow statistics include Waltemeyer (2006) and Thomas and others (1997); however, those studies included only parts of Colorado because of study-specific focus in bordering States.

Regional Regression Equations for Estimation of Natural Streamflow Statistics in Colorado

The development of regional regression equations for the estimation of natural streamflow statistics in Colorado is composed of four major steps:

1. Definition of distinct hydrologic regions,
2. Selection of stations for inclusion in multilinear regression analysis and distribution of the selected stations into their respective hydrologic regions,
3. Computation of streamflow statistics and basin and climate characteristics for the stations, and
4. Computation of the regression equations for each streamflow characteristic for each hydrologic region as applicable.

These steps are further described in the four sections that follow.

Definition of Hydrologic Regions of Colorado

For the current study and several previous studies, five hydrologic regions were defined. These are the Mountain, Northwest, Rio Grande, Southwest, and Plains regions (fig. 1). These regions are the same as those originally defined by McCain and Jarrett (1976) and adopted by Kircher and others (1985). A hydrologic region is qualitatively defined as a region of similar hydrology and climatology.

The five hydrologic regions of Colorado were defined on the basis of the physiographic and climatic characteristics that were used to develop best-fit regression equations. The Mountain region is identified as that region of central Colorado above about 7,500 feet in elevation located between the Colorado-Wyoming border and the Rio Grande basin. The Mountain region encompasses the headwaters of most major river basins in Colorado where the annual peak streamflow generally is produced by snowmelt runoff. The Northwest region is defined as the northwestern part of Colorado below 7,500 feet and encompassing substantial areas of the Yampa, White, and Gunnison River basins. The Rio Grande region ranges in elevation from about 5,000 feet near the Colorado–New Mexico border to more than 14,000 feet in the northern parts and encompasses the Rio Grande basin. The Southwest region is defined as the region located south of the Gunnison River basin and west of the Rio Grande basin and encompasses the Dolores, Animas, and San Juan River basins. The Plains region is east of the Rocky Mountains and below 7,500 feet in the South Platte River basin and below 9,000 feet in the Arkansas River basin.

Selection of Stations

Various selection criteria were used to develop the list of selected stations for regression analysis reported here. This section details the selection criteria used.

Selection of Stations for Peak-Streamflow Statistics

A comprehensive list of all USGS streamflow stations within 50 miles of the Colorado border was acquired from the National Water Information System (NWIS) database (U.S. Geological Survey, 2008). From the comprehensive list of candidate stations, those stations with at least 10 years of streamflow record identified as representative of natural streamflow conditions were selected for this study.

Subsequently, multiple stations on the same stream course were evaluated for data similarity as judged by relative drainage-area magnitude. If the relative drainage-area magnitude was less than a factor of 2.5, data were considered similar. In such cases, stations with the longer applicable record were selected. The reason for excluding stations on the basis of relative drainage-area and stream-course equality enhances the quantity of independent streamflow information (as represented by stations and their respective data). This exclusion process was used in Vaill (1999) and serves the purpose of removing redundant data or hydrologic information from the data base. At the completion of the selection process, 422 stations were identified, with a combined total of 13,054 years of record, and were used in the development of peak-streamflow equations. A map showing the location of the stations is provided in figure 1, and each station, ancillary information, and basin and climatic characteristics are listed in table 1. The "home page" of each station can be accessed online at *http://waterdata.usgs.gov/nwis/nwisman/?site_no=STATION&agency_cd=USGS,* where the word STATION is replaced by the eight-digit station number. The home pages provide authoritative station names and other identifying characteristics.

Table 1. Drainage-basin and climatic characteristics at streamflow-gaging stations used for regional regression analysis.

[LATDEG, latitude in decimal degrees; LNGDEG, longitude in decimal degrees; YRSPK, years of record for peak streamflow; YRSANN, years of record for annual streamflow; *A*, drainage area, in square miles; *S*, mean watershed slope, in percent; *P*, mean annual precipitation, in inches; *E*, mean watershed elevation, in feet; A_{7500}, percentage of *A* above 7,500 feet elevation plus 1; ${}_6P_{100}$, 6-hour, 100-year precipitation, in inches; NA, not applicable, station operated as peak-only or flood-hydrograph station]

Station number	Hydrologic region	LATDEG	LNGDEG	YRSPK	YRSANN	*A*	*S*	*P*	*E*	A_{7500}	${}_6P_{100}$
06614800	Mountain	40.4961	105.8650	33	34	1.5	43.2	47.1	11,246	100	2.4
06616000	Mountain	40.5494	106.0211	32	32	20.5	25.7	30.9	9,794	100	2.1
06617100	Mountain	40.7411	106.2795	25	24	182.1	16.8	24.4	9,275	100	1.9
06618500	Mountain	40.7264	106.2906	25	24	255.4	13.7	20.5	8,994	100	1.9
06619000	Mountain	40.8616	106.3372	11	10	475.9	14.1	21.3	9,027	100	1.9
06620400	Mountain	41.1833	106.2700	10	NA	22.1	8.9	31.7	9,726	100	2.1
06621000	Mountain	41.0811	106.3075	26	25	118.1	12.8	23.5	9,118	100	2
06622000	Mountain	41.0500	106.5256	12	NA	107	21.7	30.4	9,168	100	2.1
06622500	Mountain	41.2083	106.5173	14	13	59.8	22.6	35.5	9,484	100	2.1
06622700	Mountain	41.3702	106.5206	47	47	38.1	18.5	35.3	9,403	100	2.1
06623800	Mountain	41.0236	106.8248	42	43	65.8	23.2	44.3	9,457	100	2.3
06624500	Mountain	41.2139	106.7784	18	15	201.5	24.3	39.5	9,048	97.8	2.2
06627500	Northwest	41.4000	107.0006	10	10	34	14.3	30.3	8,384	86.6	2.1
06629100	Northwest	41.6989	106.6267	13	NA	14.4	22.9	21.3	8,146	77.7	2
06630800	Mountain	41.6530	106.3453	13	NA	8.9	7.6	15.8	7,759	95.6	2
06631000	Northwest	41.7166	106.3172	11	9	191.4	10.9	22.4	8,319	67.7	2
06631100	Mountain	41.6400	106.3053	13	NA	25.5	11.5	23.4	8,483	99.2	2.1
06632400	Mountain	41.5852	106.2228	41	53	62.8	19.7	35.3	9,799	100	2.1
06696980	Mountain	39.3394	105.9117	14	8	23.7	31.6	29	11,296	100	2.8
06699005	Mountain	39.2869	105.6958	14	NA	230.2	18.4	20.8	10,152	100	2.4
06700500	Mountain	39.2089	105.3036	58	NA	92.6	33.7	29.6	10,054	98.5	2.6
06706000	Mountain	39.4572	105.6586	36	60	126.9	34.8	24.3	11,009	100	2.4
06707000	Plains	39.4089	105.1758	60	NA	475.7	31.7	25	9,464	91	2.5
06709500	Plains	39.4844	105.0025	41	NA	302.6	18.9	21.5	6,987	23.7	3.5
06710385	Mountain	39.6328	105.3367	23	NA	103.2	31.9	24.8	9,606	98.1	2.9
06710400	Mountain	39.6305	105.3217	14	NA	22.2	25.7	23.1	8,303	91.2	2.9
06710600	Plains	39.6803	105.1978	10	NA	7.6	28.2	20.3	7,207	25.2	3.4
06710990	Plains	39.6158	105.2322	13	NA	43.6	23.4	22.8	7,987	78	3.1
06711000	Plains	39.6355	105.1686	27	NA	50.2	25.1	22.4	7,826	69	3.1
06712000	Plains	39.3558	104.7633	67	NA	167.9	7.3	20.6	7,093	8.2	3.5
06716500	Mountain	39.7658	105.6261	49	53	146.6	44.5	27.1	11,182	100	2.4
06717400	Mountain	39.7164	105.5714	12	5	43.7	36.9	25	10,642	100	2.5
06719500	Plains	39.7505	105.2489	62	NA	392.3	39.2	24.4	9,962	94.4	2.6
06721500	Mountain	40.2189	105.5283	15	16	32.5	40.8	38.2	10,825	100	2.8
06722500	Mountain	40.0908	105.5144	24	24	13.4	33.6	38.3	11,119	100	2.8
06723000	Mountain	40.1667	105.4444	19	5	27.8	37.3	31.4	9,959	100	2.9
06725500	Mountain	39.9617	105.5044	51	87	36.5	35.3	33.2	10,345	100	2.8
06726900	Plains	40.0117	105.3486	12	NA	3.9	24.6	20.6	7,294	34.6	3
06729000	Mountain	39.9147	105.5019	7	10	43.6	32.8	30.9	10,174	100	2.8
06730300	Plains	39.8778	105.2772	24	NA	15.2	36.4	23.5	8,255	89.3	3.1
06732000	Mountain	40.3453	105.5856	18	18	24.6	45.0	40.8	10,503	100	2.6
06739500	Plains	40.4539	105.1989	9	NA	134.1	29.9	20.4	7,421	46.2	3.3
06748200	Mountain	40.5516	105.6269	13	13	3.6	44.3	24.8	11,027	100	2.9

Table 1. Drainage-basin and climatic characteristics at streamflow-gaging stations used for regional regression analysis.—Continued

[LATDEG, latitude in decimal degrees; LNGDEG, longitude in decimal degrees; YRSPK, years of record for peak streamflow; YRSANN, years of record for annual streamflow; *A*, drainage area, in square miles; *S*, mean watershed slope, in percent; *P*, mean annual precipitation, in inches; *E*, mean watershed elevation, in feet; A_{7500}, percentage of *A* above 7,500 feet elevation plus 1; ${}_{6}P_{100}$, 6-hour, 100-year precipitation, in inches; NA, not applicable, station operated as peak-only or flood-hydrograph station]

Station number	Hydrologic region	LATDEG	LNGDEG	YRSPK	YRSANN	*A*	*S*	*P*	*E*	A_{7500}	${}_{6}P_{100}$
06748510	Mountain	40.6386	105.6617	13	13	0.9	22.4	24	10,878	100	2.8
06748530	Mountain	40.6230	105.5650	13	13	12.4	26.7	20	9,833	100	2.8
06748600	Mountain	40.6469	105.4936	23	23	92.6	28.9	21.3	9,866	100	2.8
06755000	Plains	41.1264	105.1944	35	21	13.5	10.4	18.9	7,808	89.6	3
06758200	Plains	39.3372	104.4755	10	NA	115.4	7.0	19.8	7,002	5.6	3.5
06758250	Plains	39.6130	104.4508	10	NA	6.5	5.7	18.1	5,923	0	3.3
06758700	Plains	39.4925	104.1633	10	NA	2.7	9.2	17.3	5,849	0	3.3
06761900	Plains	41.2564	104.0811	22	NA	0.6	1.7	15.5	5,300	0	3.4
06762500	Plains	41.2278	103.8931	64	NA	1,216.1	4.0	15.6	5,850	3.8	3.1
06762600	Plains	41.3197	104.0808	25	NA	7.6	2.0	16.8	5,339	0	3.4
06821300	Plains	39.5200	103.4436	11	NA	6.8	2.6	16.3	5,348	0	3.7
06821400	Plains	39.9067	102.2694	11	NA	19.8	2.2	18.2	3,899	0	4.6
06823500	Plains	40.0394	101.8667	65	NA	176.8	4.3	18.3	3,654	0	4.4
06825500	Plains	39.5755	102.2521	26	NA	268.9	3.0	17.7	4,333	0	4.5
06844700	Plains	39.2853	101.4660	22	NA	85.7	1.6	19.5	3,619	0	4.4
06844800	Plains	39.3206	101.6329	33	NA	20.1	1.0	19.5	3,698	0	4.4
06858500	Plains	39.0179	101.3479	33	NA	696.2	2.5	18	3,964	0	4.6
07079500	Mountain	39.2597	106.3406	11	11	51.2	33.4	25.3	11,433	100	2.2
07081000	Mountain	39.2642	106.3409	14	11	45.7	22.8	22	10,800	100	2.2
07082000	Mountain	39.2697	106.3950	8	21	23.8	32.8	30.8	11,146	100	2.5
07083000	Mountain	39.1722	106.3892	60	61	23.5	49.0	34.5	11,955	100	2.7
07089000	Mountain	38.8128	106.2222	48	NA	68.5	45.8	22.2	11,380	100	2.7
07091000	Mountain	38.7336	106.1600	20	NA	83	47.1	22.5	11,379	100	2.7
07093500	Mountain	38.5214	105.9897	14	NA	211.6	36.1	18.3	10,096	98.3	2.5
07093775	Plains	38.4672	105.8600	23	NA	211	22.7	13.8	9,356	97.2	2.4
07095000	Plains	38.1861	105.4836	66	NA	320.5	19.5	21.2	9,189	100	2.7
07096500	Plains	38.4364	105.1914	32	NA	436.3	26.2	16.7	8,428	81.4	2.4
07099100	Plains	38.3742	104.9642	11	NA	213.8	27.9	20.4	8,143	51.7	3.3
07099230	Plains	38.4650	104.8272	28	NA	62.2	25.1	19.2	6,860	23.6	3.6
07105920	Plains	38.6817	104.8586	12	NA	11	48.7	24	8,832	89.1	3.6
07105945	Plains	38.7075	104.8466	28	NA	6.8	48.5	22.5	8,193	75.7	3.6
07107500	Plains	38.0517	104.7936	18	NA	171.4	28.6	22.1	7,964	52.9	3.6
07114000	Rio Grande	37.4200	105.0528	46	NA	53.1	35.4	27.3	9,883	100	3.3
07118000	Plains	37.3864	104.6658	11	NA	140.1	27.0	22	8,062	60	3.5
07120620	Plains	37.5547	104.0216	21	NA	15.6	6.2	14.7	5,582	0	4
07121500	Plains	38.0031	103.6561	41	NA	510.9	3.9	13.6	4,871	0	4
07124300	Plains	37.1147	104.6053	18	NA	100.1	25.5	19.5	7,366	42.7	3.9
07125100	Plains	37.2000	104.1941	13	NA	79.1	10.0	15.6	6,077	6.5	3.9
07125500	Plains	37.1684	104.1450	14	NA	162.2	13.5	18	6,642	24.7	4.1
07126100	Plains	37.3045	104.0155	16	NA	84.8	2.8	14	5,479	0	3.8
07126200	Plains	37.3456	103.9580	41	NA	161.4	2.8	14.3	5,521	0	3.8
07126325	Plains	37.4242	103.9202	24	NA	48.7	4.4	14.1	5,330	0	4.1
07126390	Plains	37.4928	103.8280	21	NA	48.6	4.6	13.9	5,161	0	4.2

Table 1. Drainage-basin and climatic characteristics at streamflow-gaging stations used for regional regression analysis.—Continued

[LATDEG, latitude in decimal degrees; LNGDEG, longitude in decimal degrees; YRSPK, years of record for peak streamflow; YRSANN, years of record for annual streamflow; *A*, drainage area, in square miles; *S*, mean watershed slope, in percent; *P*, mean annual precipitation, in inches; *E*, mean watershed elevation, in feet; A_{7500}, percentage of *A* above 7,500 feet elevation plus 1; ${}_6P_{100}$, 6-hour, 100-year precipitation, in inches; NA, not applicable, station operated as peak-only or flood-hydrograph station]

Station number	Hydrologic region	LATDEG	LNGDEG	YRSPK	YRSANN	*A*	*S*	*P*	*E*	A_{7500}	${}_6P_{100}$
07126415	Plains	37.5153	103.7255	23	NA	48.7	11.2	13.9	4,981	0	4.3
07126470	Plains	37.5439	103.6322	16	NA	421.3	8.6	15.6	5,607	0	4.5
07126480	Plains	37.5892	103.6483	21	NA	56.1	11.3	14.1	4,968	0	4.3
07133200	Plains	37.7242	102.7405	11	NA	2.4	5.2	16	4,431	0	5
07138600	Plains	38.5250	101.6216	39	NA	25.2	1.1	17.7	3,650	0	4.4
07138650	Plains	38.4811	101.4882	20	NA	500.3	1.4	17	3,858	0	4.7
07153500	Plains	36.9875	103.4241	33	NA	529.2	13.5	17.2	6,251	3.4	4.1
07154400	Plains	36.8833	103.0183	53	NA	112.2	11.8	16.7	5,087	0	4.4
07154650	Plains	36.8978	102.9016	22	NA	24.9	12.0	17.2	4,555	0	4.2
07155100	Plains	36.7722	102.8049	18	NA	10.6	1.8	17.1	4,624	0	4.2
07155590	Plains	37.1220	101.8979	35	NA	2,926.6	8.4	17.0	5,001	0.8	4.6
07155900	Plains	37.1909	101.8988	34	NA	57.1	0.6	17.3	3,669	0	4.9
07156010	Plains	37.2584	101.7754	15	NA	411.3	0.9	17.2	3,946	0	5.1
07156100	Plains	37.5000	101.7616	15	NA	584.2	1.5	17	4,411	0	5.1
07156220	Plains	37.6264	101.7616	32	NA	813.3	1.6	17	4,149	0	5.1
07156600	Plains	37.3353	101.0504	33	NA	21.5	1.7	18.6	2,983	0	4.8
07199000	Plains	36.7872	104.4622	40	NA	199.1	23.6	20.1	7,594	59.1	3.6
07201000	Plains	36.9058	104.4361	48	NA	14.6	23.8	20.9	7,608	50.8	3.9
07201200	Plains	36.8308	104.3333	30	NA	5.2	16.2	19	7,120	24	3.9
07203000	Plains	36.6817	104.7867	76	NA	295.2	23.7	20.6	8,016	70.7	3.3
07204000	Rio Grande	36.5539	105.2678	69	NA	78.8	26.3	21.1	9,405	100	3.3
07204500	Rio Grande	36.4853	105.2656	68	NA	73.2	19.4	23.6	9,151	100	3
07205000	Rio Grande	36.5186	105.2753	72	NA	10.5	28.1	21.7	9,405	100	3.1
07206400	Rio Grande	36.5264	105.1750	40	NA	7.2	48.2	25.9	9,810	100	3.3
07207500	Plains	36.5739	104.9461	57	NA	185.4	27.4	21.5	8,589	90.4	3.3
07208500	Plains	36.3725	104.9689	83	NA	60.1	24.2	26.2	9,550	97.1	3.5
07211000	Plains	36.3603	104.5986	75	NA	949	21.6	20.7	8,106	65.6	3.3
07225500	Plains	36.3259	103.9255	12	NA	268.7	6.2	17.2	6,532	2.3	4.1
07227295	Plains	36.3889	103.3186	42	NA	1.2	2.0	16.2	5,182	0	4.6
07232500	Plains	36.7214	101.4896	57	NA	2,033	3.0	17.3	4,463	0.1	4.5
07232650	Plains	36.5564	102.7866	12	NA	33.9	1.1	16.6	4,593	0	4.3
08216500	Rio Grande	37.8561	106.9275	32	31	34.2	40.5	30.6	11,473	100	2.3
08218500	Rio Grande	37.7519	106.8300	36	37	91.9	35.7	37.4	10,723	100	2.4
08219500	Rio Grande	37.6569	106.6492	80	80	210.6	31.3	38.2	10,398	100	2.7
08220500	Rio Grande	37.5917	106.4500	47	38	52.7	30.7	33.6	10,507	100	2.7
08223500	Rio Grande	37.4903	106.2595	25	23	30.7	34.6	31.8	10,356	100	2.5
08224500	Rio Grande	38.2203	106.0897	59	58	45.4	35.8	18.8	10,405	100	2.3
08227000	Rio Grande	38.1633	106.2906	87	87	516.9	22.8	20.8	9,949	100	2.1
08227500	Rio Grande	38.0136	105.6928	46	34	12.9	64.6	30.1	11,294	100	2.6
08230500	Rio Grande	37.8597	106.3195	57	39	106.2	27.6	26.5	10,056	100	2.2
08231000	Rio Grande	37.8133	106.3186	68	47	62.2	27.8	31.1	10,259	100	2.3
08236000	Rio Grande	37.3747	106.3348	54	65	107.6	33.7	38.4	10,872	100	2.6

Table 1. Drainage-basin and climatic characteristics at streamflow-gaging stations used for regional regression analysis.—Continued

[LATDEG, latitude in decimal degrees; LNGDEG, longitude in decimal degrees; YRSPK, years of record for peak streamflow; YRSANN, years of record for annual streamflow; *A*, drainage area, in square miles; *S*, mean watershed slope, in percent; *P*, mean annual precipitation, in inches; *E*, mean watershed elevation, in feet; A_{7500}, percentage of *A* above 7,500 feet elevation plus 1; ${}_6P_{100}$, 6-hour, 100-year precipitation, in inches; NA, not applicable, station operated as peak-only or flood-hydrograph station]

Station number	Hydrologic region	LATDEG	LNGDEG	YRSPK	YRSANN	A	S	P	E	A_{7500}	${}_6P_{100}$
08240500	Rio Grande	37.3747	105.2950	59	48	52.7	41.2	23.2	10,492	100	2.6
08241500	Rio Grande	37.4250	105.4150	58	37	182.9	25.1	19.4	9,169	100	2.5
08242500	Rio Grande	37.4472	105.4258	67	67	40.2	32.5	22.3	10,152	100	2.7
08245500	Rio Grande	37.3539	106.5250	14	17	44.2	35.0	45	11,218	100	2.9
08246500	Rio Grande	37.0539	106.1875	43	97	281.6	27.8	35.3	10,481	100	2.5
08247500	Rio Grande	36.9931	106.0386	82	67	115.7	14.6	25.2	9,353	100	3.4
08248000	Rio Grande	36.9822	106.0736	88	88	152.8	21.7	30.6	9,861	100	3.1
08248500	Rio Grande	37.1770	105.8781	59	59	372.9	15.2	23.5	9,192	100	2.9
08252500	Rio Grande	36.8983	105.2544	68	NA	25.6	23.5	26.9	10,599	100	3.3
08253000	Rio Grande	36.8969	105.2603	70	NA	18.5	29.9	28.7	11,023	100	3.5
08253500	Rio Grande	36.8842	105.2811	69	NA	2.2	39.2	29.6	11,313	100	3.5
08255000	Rio Grande	36.9528	105.4103	10	NA	11.2	35.0	27	10,929	100	3.6
08263000	Rio Grande	36.8292	105.5478	32	25	10.6	41.7	28.9	10,973	100	3.4
08264000	Rio Grande	36.6223	105.3895	24	14	19.2	37.6	30.2	11,077	100	3.5
08265000	Rio Grande	36.7034	105.5686	75	77	112.2	42.4	26.3	10,149	100	3.3
08267500	Rio Grande	36.5419	105.5561	70	73	37.1	55.2	28.3	10,389	100	3.3
08268500	Rio Grande	36.5322	105.6856	51	67	66.6	43.1	23.3	9,401	83.7	3.1
08269000	Rio Grande	36.4394	105.5036	72	56	63	40.2	25.1	9,608	99.8	3
08275000	Rio Grande	36.3756	105.5492	19	17	60.8	31.2	24.6	9,040	98.9	2.9
08275500	Rio Grande	36.2989	105.5817	50	52	80.4	32.7	27.7	9,352	97.7	3.3
08275600	Rio Grande	36.3320	105.5789	24	23	38	33.5	26.6	9,362	99.4	3.2
08281200	Rio Grande	36.9556	106.5367	13	NA	28.1	25.8	34.2	9,724	100	2.9
08284000	Rio Grande	36.6986	106.5575	24	NA	50.6	15.6	26.1	8,856	99.9	2.9
08284100	Rio Grande	36.6625	106.6331	51	52	475.3	20.2	30.2	9,304	94.4	2.9
08284500	Rio Grande	36.6681	106.7048	34	28	192.5	13.6	20	7,792	75.3	2.5
08286650	Rio Grande	36.3172	106.4853	33	NA	143.9	15.6	18.9	8,140	77.7	2.8
08288000	Rio Grande	36.3917	106.2395	33	19	48	20.2	24.6	9,157	99.9	3.2
08289000	Rio Grande	36.3497	106.0442	75	75	411.9	20.2	19.7	8,492	80.5	2.9
09012500	Mountain	40.2533	105.8114	10	8	45.8	42.5	36.8	10,680	100	2.1
09016500	Mountain	40.1125	105.7497	27	28	47.8	50.2	35.8	10,641	100	2.3
09020000	Mountain	40.1805	106.0092	19	18	109.2	29.5	25.8	9,630	100	2.1
09024000	Mountain	39.9000	105.7767	20	97	27.8	38.9	32.8	10,767	100	2.3
09026500	Mountain	39.9100	105.8783	33	73	32.8	36.3	29	10,738	100	2.2
09032000	Mountain	39.9500	105.7656	14	73	19.9	29.7	30.5	10,453	100	2.3
09032500	Mountain	39.9975	105.8236	17	26	51.1	27.0	28.7	9,973	100	2.2
09033000	Mountain	40.0508	105.7775	21	19	8.1	23.3	34.8	10,509	100	2.2
09033500	Mountain	40.0867	105.7947	10	9	11.7	29.3	26.5	9,538	100	2
09034000	Mountain	40.0853	105.9553	5	23	295.9	26.6	25.8	9,756	100	2.1
09034500	Mountain	40.0833	106.0881	28	86	823.9	29.7	26.7	9,737	100	2.1
09034900	Mountain	39.7603	105.9064	41	42	5.5	49.7	32.3	11,793	100	2.3
09035500	Mountain	39.7789	105.9283	28	50	16.4	46.0	30.7	11,559	100	2.3
09035700	Mountain	39.7972	106.0261	32	42	35.2	42.1	28.6	11,106	100	2.2

Table 1. Drainage-basin and climatic characteristics at streamflow-gaging stations used for regional regression analysis.—Continued

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Station number	Hydrologic region	LATDEG	LNGDEG	YRSPK	YRSANN	*A*	*S*	*P*	*E*	A_{7500}	${}_6P_{100}$
09035800	Mountain	39.8005	106.0264	41	42	8.8	37.5	28.3	10,945	100	2.2
09035900	Mountain	39.7958	106.0306	41	42	27.4	42.1	28.7	10,989	100	2.3
09036500	Mountain	39.9075	106.0172	10	10	13.9	36.8	28.2	10,526	100	2.1
09039000	Mountain	40.2175	106.3131	40	40	44.6	36.7	28.3	9,869	100	2.2
09040000	Mountain	40.1575	106.2834	37	36	75.7	30.0	23.2	9,266	100	2.2
09041100	Mountain	40.2405	106.3736	13	13	11.5	25.2	20.6	8,907	100	2
09046530	Mountain	39.4930	106.0447	10	8	11.1	34.2	28	11,034	100	2.2
09047000	Mountain	39.6139	106.0520	44	50	128.2	31.8	27	10,913	100	2.3
09047500	Mountain	39.6055	105.9431	58	58	57.8	41.9	29.8	11,497	100	2.4
09047700	Mountain	39.5944	105.9725	49	50	9.1	35.2	26.2	10,879	100	2.1
09050100	Mountain	39.5753	106.1106	49	50	92.2	35.3	29	11,238	100	2.3
09052400	Mountain	39.7280	106.1734	26	28	8.6	48.9	31.8	11,199	100	2.4
09052800	Mountain	39.7630	106.1925	27	28	14	52.8	32.5	11,029	100	2.3
09055000	Mountain	39.8528	106.2678	10	9	7.6	25.8	24.4	9,600	100	2.1
09058610	Mountain	39.7039	106.4575	33	33	3.3	28.2	28.9	10,024	100	2.2
09058700	Mountain	39.6983	106.4456	40	40	3	22.5	27.6	9,848	100	2.2
09058800	Mountain	39.7317	106.4267	38	40	3.6	28.2	29.6	10,575	100	2.4
09059500	Northwest	39.8000	106.5839	62	63	93.4	33.0	25.8	9,722	99.1	2.2
09060500	Mountain	40.0411	106.6559	28	28	47.8	18.8	29.3	9,390	100	2.2
09063200	Mountain	39.5222	106.3236	40	43	9.5	34.0	26.7	10,823	100	2.2
09063400	Mountain	39.5228	106.3361	43	44	23.8	34.2	28.1	10,721	100	2.2
09064500	Mountain	39.4733	106.3678	32	71	58.2	38.0	27.8	10,922	100	2.4
09065100	Mountain	39.5680	106.4125	46	47	34.2	47.0	30.8	11,184	100	2.3
09065500	Mountain	39.6258	106.2781	50	53	14.5	50.5	30.5	11,116	100	2.4
09066000	Mountain	39.5964	106.2650	51	53	12.5	31.7	28	10,713	100	2.3
09066100	Mountain	39.6400	106.2934	40	44	4.5	60.1	31.4	11,088	100	2.3
09066150	Mountain	39.6436	106.3025	33	41	5.3	58.0	30.6	11,074	100	2.4
09066200	Mountain	39.6483	106.3231	40	43	6.1	53.5	28.5	10,904	100	2.4
09066300	Mountain	39.6458	106.3823	42	43	5.9	36.9	25.7	10,504	100	2.3
09066400	Mountain	39.6828	106.4014	43	44	7.4	30.7	26.6	10,399	100	2.3
09066500	Mountain	39.6147	106.4400	12	12	101	40.6	27.9	10,305	100	2.2
09067005	Mountain	39.6317	106.5225	11	11	395.1	37.1	26.7	10,456	99.9	2.2
09068000	Mountain	39.5572	106.7631	22	22	71.5	39.5	26.1	9,951	99.9	2.2
09069500	Mountain	39.5455	106.9348	11	12	62.6	35.4	24.7	9,689	99.8	2.2
09070000	Mountain	39.6494	106.9537	60	61	944.6	33.6	23.1	9,481	88.3	2.1
09071300	Mountain	39.7166	107.3103	20	20	6.5	9.6	42.7	10,771	100	3
09073500	Mountain	39.1894	106.8145	13	43	107.4	42.0	28.6	11,215	100	2.4
09073700	Mountain	39.2139	106.6559	16	16	6.1	47.9	31.9	11,762	100	2.5
09073800	Mountain	39.1964	106.6900	10	10	8.6	36.7	29.9	11,439	100	2.4
09073900	Mountain	39.1889	106.7184	10	10	6.6	28.1	28.9	11,263	100	2.3
09074000	Mountain	39.2058	106.7975	43	44	42.1	34.1	28.8	10,890	100	2.3
09074800	Mountain	39.0875	106.8123	25	25	32.3	46.9	36.4	11,431	100	2.4

Table 1. Drainage-basin and climatic characteristics at streamflow-gaging stations used for regional regression analysis.—Continued

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Station number	Hydrologic region	LATDEG	LNGDEG	YRSPK	YRSANN	A	S	P	E	A_{7500}	${}_6P_{100}$
09075700	Mountain	39.1236	106.9053	25	25	35.3	60.2	44.3	11,384	100	2.4
09077200	Mountain	39.2455	106.5314	9	19	18.9	53.4	36.1	11,846	100	2.7
09077800	Mountain	39.2417	106.5931	9	19	11.5	48.4	33.2	11,598	100	2.6
09078000	Mountain	39.3308	106.6581	28	41	88.9	41.0	31.6	10,975	100	2.5
09078100	Mountain	39.3589	106.5684	15	17	10.7	48.2	32.6	11,204	100	2.5
09078200	Mountain	39.3342	106.5753	16	17	7.2	38.0	31.9	10,891	100	2.5
09078500	Mountain	39.3428	106.6659	39	41	42.3	37.7	29.5	10,546	100	2.5
09080300	Mountain	39.3617	106.8206	14	14	12.4	44.0	26.8	10,103	100	2.3
09081600	Northwest	39.2322	107.2273	50	52	167.3	49.4	39.5	10,166	97.7	2.3
09082800	Mountain	39.3297	107.3334	16	16	27.9	22.1	34	9,463	100	2.4
09083000	Northwest	39.3305	107.2245	14	14	75.4	30.9	32.6	9,168	94.7	2.3
09084000	Mountain	39.4667	107.0523	15	15	30.3	30.4	27	9,490	100	2.2
09085200	Northwest	39.6053	107.4484	18	17	23.8	38.1	35.8	9,716	87.6	2.7
09085300	Northwest	39.6091	107.4348	15	14	15.8	34.9	34.1	9,661	90.9	2.5
09085400	Northwest	39.5978	107.4239	14	13	6.2	40.6	28.9	9,010	84.6	2.3
09089500	Mountain	39.3311	107.5801	49	44	64.2	26.5	29.9	8,732	97.4	2.3
09091100	Northwest	39.5316	107.7140	14	NA	63.4	23.4	20.2	7,243	40.7	2.1
09091500	Northwest	39.6778	107.6984	8	15	34.9	33.5	26.1	8,550	91.5	2.5
09092000	Northwest	39.6200	107.7634	20	19	137.1	32.4	22.9	7,972	65.5	2.2
09092500	Northwest	39.4719	107.8326	30	30	7.9	29.0	29.4	9,406	94.3	2.2
09093000	Northwest	39.5669	108.1109	24	23	141.5	34.6	21.2	8,134	91	2.1
09095000	Northwest	39.4533	108.3170	23	22	323.1	42.2	20.2	7,624	64.8	2
09096000	Mountain	39.2236	107.8020	13	12	22.8	20.4	31.2	9,365	100	2.2
09096500	Mountain	39.2505	107.8406	37	59	80.4	17.4	34.3	9,743	99.5	2.4
09096800	Mountain	39.2361	107.6339	15	15	49.8	17.5	30.3	9,351	100	2.4
09097500	Mountain	39.2722	107.8506	59	59	143	20.6	26.7	8,622	92.4	2.3
09097600	Mountain	39.3250	107.8423	12	12	9.3	36.9	30.9	9,589	100	2.2
09104500	Northwest	39.0864	108.1267	24	20	5.3	21.5	34.1	9,862	100	2.4
09107000	Mountain	38.8603	106.5667	24	25	127.6	27.3	26.6	10,924	100	2.3
09110000	Mountain	38.6644	106.8453	20	97	477.1	30.9	23.9	10,647	100	2.2
09110500	Mountain	38.8644	106.9098	12	11	89.2	40.7	38.2	10,883	100	2.4
09111500	Mountain	38.8697	106.9695	25	24	68.9	36.8	33.6	10,336	100	2.3
09112000	Mountain	38.8244	106.8528	12	14	32.9	37.8	32	10,808	100	2.4
09112500	Mountain	38.6644	106.8481	76	85	289.3	34.2	31.7	10,272	100	2.3
09113300	Mountain	38.7655	107.0584	12	12	47.7	32.2	31.9	10,202	100	2.3
09113500	Mountain	38.7022	106.9984	26	25	119.3	28.6	27.3	9,894	100	2.1
09114500	Mountain	38.5419	106.9498	78	81	1,010	29.8	25.6	10,210	100	2.2
09115500	Mountain	38.4117	106.4228	55	56	148.3	31.2	21.4	10,237	100	2.2
09117000	Mountain	38.4972	106.7261	14	14	425.9	26.3	18.3	9,606	100	2.1
09118000	Mountain	38.5597	106.6364	24	24	106.9	38.3	23.4	10,619	100	2.2
09119000	Mountain	38.5217	106.9409	68	70	1,059.9	24.2	18.6	9,733	100	2.1
09122000	Mountain	38.2914	107.1145	18	18	339.9	26.4	21.1	10,432	100	2.2

Table 1. Drainage-basin and climatic characteristics at streamflow-gaging stations used for regional regression analysis.—Continued

[LATDEG, latitude in decimal degrees; LNGDEG, longitude in decimal degrees; YRSPK, years of record for peak streamflow; YRSANN, years of record for annual streamflow; *A*, drainage area, in square miles; *S*, mean watershed slope, in percent; *P*, mean annual precipitation, in inches; *E*, mean watershed elevation, in feet; A_{7500}, percentage of *A* above 7,500 feet elevation plus 1; ${}_6P_{100}$, 6-hour, 100-year precipitation, in inches; NA, not applicable, station operated as peak-only or flood-hydrograph station]

Station number	Hydrologic region	LATDEG	LNGDEG	YRSPK	YRSANN	*A*	*S*	*P*	*E*	A_{7500}	${}_6P_{100}$
09122500	Mountain	38.5608	107.3167	11	11	58.2	46.0	27.4	9,862	100	2.2
09123500	Mountain	38.0250	107.3084	13	12	120.5	45.9	34.1	11,435	100	2.5
09124500	Mountain	38.2989	107.2301	69	70	339.2	42.7	28.2	10,884	100	2.4
09125000	Mountain	38.4878	107.4151	27	27	35	38.5	22.7	9,674	100	2.3
09126000	Mountain	38.2572	107.5467	15	53	67	49.6	32.7	10,862	100	2.3
09127500	Mountain	38.5519	107.5062	21	18	42.3	29.4	20.5	9,631	100	2.4
09128500	Northwest	38.7278	107.5067	58	59	43.4	43.6	25.6	9,165	97.3	2.3
09130500	Northwest	39.0133	107.3584	19	19	132.9	28.9	28.7	8,694	86.8	2.3
09130600	Mountain	39.1308	107.5753	10	10	7.3	18.3	29.8	9,418	100	2.5
09132500	Northwest	38.9258	107.4342	72	74	525.6	33.0	28.5	8,886	87.1	2.3
09132900	Mountain	39.0322	107.6137	13	13	2.4	20.9	34	10,397	100	2.5
09134500	Northwest	38.9264	107.7937	29	29	34.7	17.1	33.5	9,723	99.5	2.5
09136200	Northwest	38.7830	107.8378	24	23	5,247.4	28.9	22.0	9,444	91.2	2.1
09137800	Northwest	38.9447	108.0281	12	12	10.8	17.4	32.8	9,663	99.5	2.5
09139200	Mountain	38.9836	107.9720	12	12	12.2	18.6	37.7	10,153	100	2.5
09140200	Mountain	38.9866	107.9437	12	12	5.6	16.1	38.3	9,969	100	2.5
09141200	Northwest	38.9580	107.9187	12	12	10.5	17.3	33.9	9,381	98.1	2.4
09143500	Northwest	38.9016	107.9212	90	82	39.1	16.8	35.7	9,464	94.2	2.5
09144200	Northwest	38.7878	107.9953	23	22	197	17.6	24.4	8,034	58.3	2.2
09146000	Southwest	38.0311	107.6751	16	16	75.2	58.4	38.1	11,267	100	2.4
09146400	Southwest	38.0736	107.8512	15	15	14.1	38.5	30.9	10,215	100	2.3
09146500	Southwest	38.0933	107.8137	16	16	16.5	50.3	35.2	10,939	100	2.4
09146600	Southwest	38.1455	107.9198	12	12	8.2	11.8	25.8	9,053	100	2.2
09147000	Southwest	38.1778	107.7584	49	49	97.2	28.1	26.3	9,163	91.4	2.2
09147100	Mountain	38.1494	107.6448	18	18	45.6	55.6	33.7	10,721	100	2.4
09149450	Northwest	38.5553	108.0459	13	NA	102.7	15.3	18.2	7,839	60.2	2
09150500	Northwest	38.7350	108.1617	24	23	249.1	18.3	17.4	7,274	44.5	2
09153400	Northwest	39.3086	108.9837	10	10	168.4	41.8	15.5	6,525	15.2	2
09163700	Southwest	38.9639	109.3368	15	NA	90.1	15.5	9.9	4,980	0.2	1.8
09165000	Southwest	37.6389	108.0604	53	54	105.6	38.2	36.1	10,631	100	2.7
09166500	Southwest	37.4725	108.4976	92	96	505.2	32.3	31.2	9,694	97.6	2.7
09168100	Southwest	37.8767	108.5831	29	29	147	27.6	21.5	7,932	65.4	2.3
09168700	Southwest	38.0258	108.8148	12	NA	1.7	9.7	12.9	5,836	0	2
09169500	Southwest	38.3103	108.8854	40	41	2,028.6	22.7	21.9	7,862	54.2	2.3
09172000	Southwest	37.9583	108.0059	18	18	33.4	31.2	32.1	10,041	100	2.5
09172500	Southwest	38.0425	108.1323	70	70	309.5	37.6	30.3	9,944	99	2.3
09174500	Southwest	38.2736	108.3629	10	9	38.4	16.1	19.7	7,645	54.7	2.1
09175000	Southwest	37.9758	108.3279	12	18	53.7	16.9	26.2	8,687	100	2.4
09175500	Southwest	38.2178	108.5665	53	53	1,068.6	22.6	23.7	8,483	73.3	2.2
09177500	Southwest	38.5189	109.1098	23	NA	15.4	16.0	30.3	8,986	100	2.4
09181000	Southwest	38.7250	109.3451	13	5	20.5	44.7	13.8	5,637	0.8	1.9
09182000	Southwest	38.5928	109.2657	24	23	7.9	41.1	31.8	9,468	98.4	2.4

Table 1. Drainage-basin and climatic characteristics at streamflow-gaging stations used for regional regression analysis.—Continued

[LATDEG, latitude in decimal degrees; LNGDEG, longitude in decimal degrees; YRSPK, years of record for peak streamflow; YRSANN, years of record for annual streamflow; *A*, drainage area, in square miles; *S*, mean watershed slope, in percent; *P*, mean annual precipitation, in inches; *E*, mean watershed elevation, in feet; A_{7500}, percentage of *A* above 7,500 feet elevation plus 1; ${}_6P_{100}$, 6-hour, 100-year precipitation, in inches; NA, not applicable, station operated as peak-only or flood-hydrograph station]

Station number	Hydrologic region	LATDEG	LNGDEG	YRSPK	YRSANN	*A*	*S*	*P*	*E*	A_{7500}	${}_6P_{100}$
09182600	Southwest	38.9528	109.6590	15	NA	5.8	31.7	11.1	5,743	0	1.9
09183000	Southwest	38.6128	109.5798	31	29	163	14.8	9.6	4,807	0	1.8
09184000	Southwest	38.5622	109.5140	47	43	77.1	29.6	19.9	7,104	37.6	2.2
09185200	Southwest	38.4000	109.4507	15	NA	15.2	25.1	15	6,669	14.1	2.1
09185500	Southwest	38.2433	109.4401	22	21	357.9	9.7	14.2	6,586	1.8	2.1
09187000	Southwest	38.0625	109.5743	17	8	114.3	32.8	17.2	7,338	45.1	2.4
09216400	Northwest	41.5594	109.5112	16	NA	45.9	16.7	9.5	7,042	12.4	1.7
09216537	Northwest	41.6394	108.1293	24	NA	34.4	7.0	7.9	7,011	0.1	1.7
09216550	Northwest	41.6750	108.7368	21	NA	153	7.9	8.5	6,976	4.7	1.7
09216600	Northwest	41.4569	108.9423	22	NA	8.1	15.1	9.2	6,982	3.3	1.7
09216700	Northwest	41.4833	108.9673	18	NA	481.9	12.5	11.2	7,317	31	1.7
09216900	Northwest	41.5327	109.3810	24	NA	1.3	34.2	8.8	6,827	0	1.7
09224810	Northwest	41.4597	109.6229	17	NA	12.1	10.2	8.6	6,654	0	1.7
09224820	Northwest	41.4250	109.6160	20	NA	3.6	11.4	8.6	6,566	0	1.7
09224840	Northwest	41.4111	109.6021	17	NA	1.3	15.0	8.6	6,553	0	1.7
09224980	Northwest	41.3736	109.6451	17	NA	414.9	7.6	9.9	6,840	12.8	1.7
09225200	Northwest	41.1705	109.6101	20	NA	6.7	15.9	10.3	6,653	2.9	1.7
09225300	Northwest	41.0611	109.6188	21	NA	11.9	12.2	10.6	6,578	0	1.7
09229450	Northwest	41.0205	109.6801	10	NA	525.3	15.8	19.3	8,541	67.4	2.2
09235600	Northwest	40.7680	109.3190	35	36	24.9	19.9	20.5	8,139	100	2.6
09238500	Northwest	40.4080	106.7870	20	13	42.3	19.6	47.1	9,493	98.1	2.4
09239500	Northwest	40.4836	106.8323	99	99	567.4	21.7	31.5	8,782	86.3	2.2
09241000	Mountain	40.7175	106.9159	69	68	216.5	27.3	38.1	9,106	99.4	2.4
09244100	Northwest	40.3341	107.1392	18	18	34.5	25.2	26.3	8,292	73.6	2.1
09245000	Northwest	40.6697	107.2851	44	43	67.7	20.4	30.7	8,414	94.5	2.2
09245500	Northwest	40.6805	107.2873	15	15	21.4	22.7	31.4	8,461	89	2.2
09249000	Northwest	40.3125	107.3201	19	18	144.1	23.8	33.7	9,063	92.3	2.3
09250000	Northwest	40.1936	107.7323	34	NA	63.3	21.3	24.3	7,906	62.9	2.2
09251500	Northwest	40.9905	107.0442	10	10	115.4	21.0	33.5	8,707	97.8	2.3
09251800	Northwest	41.0425	106.9572	10	9	13	26.8	47	9,458	100	2.3
09253000	Northwest	40.9994	107.1434	60	60	252.7	22.4	32.8	8,546	91.6	2.3
09253400	Northwest	41.1322	107.0692	12	NA	12.7	24.1	48.6	9,573	100	2.3
09255000	Northwest	40.9825	107.3828	76	76	149.8	19.4	30.5	8,390	85.6	2.2
09256000	Northwest	41.0978	107.3819	38	36	332.4	15.3	26.6	7,837	74.8	2.1
09257000	Northwest	41.0283	107.5492	59	46	1,010.9	18.6	27.8	8,001	71.1	2.2
09257500	Northwest	40.8766	107.4645	10	NA	8.4	18.9	38.1	9,011	100	2.2
09258000	Northwest	40.9155	107.5217	39	39	24.8	18.7	28.2	8,066	70	2.1
09258200	Northwest	41.3400	107.6712	12	NA	51.2	7.4	13.1	6,927	3.2	1.8
09258900	Northwest	41.1319	107.6465	14	NA	920.5	8.7	13	6,988	11.7	1.8
09259500	Northwest	40.8405	107.5151	11	NA	8.5	17.6	31.4	8,405	86.4	2.1
09260000	Northwest	40.5486	108.4243	83	86	4,035.8	11.7	16.6	7,063	21.8	1.9
09263700	Northwest	40.3000	109.1340	15	NA	63.1	19.2	12.6	6,468	12	1.9

Table 1. Drainage-basin and climatic characteristics at streamflow-gaging stations used for regional regression analysis.—Continued

[LATDEG, latitude in decimal degrees; LNGDEG, longitude in decimal degrees; YRSPK, years of record for peak streamflow; YRSANN, years of record for annual streamflow; *A*, drainage area, in square miles; *S*, mean watershed slope, in percent; *P*, mean annual precipitation, in inches; *E*, mean watershed elevation, in feet; A_{7500}, percentage of *A* above 7,500 feet elevation plus 1; $_6P_{100}$, 6-hour, 100-year precipitation, in inches; NA, not applicable, station operated as peak-only or flood-hydrograph station]

Station number	Hydrologic region	LATDEG	LNGDEG	YRSPK	YRSANN	A	S	P	E	A_{7500}	$_6P_{100}$
09263800	Northwest	40.3166	109.2173	14	NA	9.4	10.1	9.2	5,379	0	1.8
09264000	Northwest	40.7333	109.6785	11	11	26.6	10.1	29.2	9,929	100	2.6
09264500	Northwest	40.7333	109.7035	12	12	19.9	18.2	32.2	10,480	100	2.7
09266500	Northwest	40.5775	109.6221	94	92	101.5	20.7	27.4	9,452	96.7	2.5
09268000	Northwest	40.6263	109.8201	37	36	44.6	20.8	31.8	10,353	100	2.7
09268500	Northwest	40.6427	109.8110	44	43	8.8	24.5	30.9	10,138	100	2.7
09268900	Northwest	40.6594	109.7510	29	29	7.5	18.0	30.5	10,030	100	2.6
09269000	Northwest	40.6500	109.7618	18	17	10.4	19.1	29.5	9,832	100	2.6
09270500	Northwest	40.5263	109.6057	35	35	116.2	24.7	26.7	9,279	86.6	2.5
09271800	Northwest	40.4166	109.7507	15	NA	4.3	20.8	12.7	6,542	12.9	1.9
09300500	Northwest	40.3019	109.8532	28	22	544.6	21.6	23.1	8,833	66.2	2.4
09302450	Mountain	40.0503	107.4689	25	25	21.6	21.8	30.3	8,971	100	2.4
09302500	Mountain	40.0383	107.4881	12	12	59.9	25.8	37.8	9,814	100	2.5
09303000	Northwest	39.9875	107.6145	50	56	259.4	25.2	35.5	9,551	98	2.4
09303300	Mountain	39.8433	107.3348	20	20	52.2	21.5	42.1	10,585	100	2.7
09303320	Mountain	39.8428	107.3367	14	14	7.4	14.2	41.8	10,667	100	2.8
09304000	Northwest	39.9744	107.6253	46	47	176.5	27.2	36.9	9,852	97.5	2.5
09304500	Northwest	40.0336	107.8623	98	103	760.3	24.9	30.9	8,938	84	2.4
09306007	Northwest	39.8261	108.1831	25	24	177.3	32.7	19.9	7,634	57.6	2.1
09306036	Northwest	39.8250	108.1993	12	11	3.6	14.3	16.7	6,933	0	2
09306039	Northwest	39.8266	108.2076	11	11	1.2	13.8	16.4	6,744	0	2
09306042	Northwest	39.8336	108.2206	18	16	1.1	15.4	16.5	6,671	0	2
09306052	Northwest	39.8141	108.2437	11	9	7.9	19.5	17.3	7,213	23.8	2
09306058	Northwest	39.8372	108.2443	11	11	48.3	28.8	18.1	7,473	48.9	2
09306200	Northwest	39.9211	108.2976	41	42	505.8	27.9	18.7	7,419	45.1	2.1
09306240	Northwest	39.8883	108.5284	11	11	9.2	28.3	20.5	7,876	78	2
09306242	Northwest	39.9203	108.4729	33	33	31.7	24.2	19.2	7,542	49.6	2
09306255	Northwest	40.1686	108.4012	28	29	262.5	19.5	16.7	6,878	17.7	1.9
09306800	Northwest	39.7533	109.3548	19	19	323.3	29.2	15.9	7,157	32.3	2
09307500	Northwest	39.5664	109.5874	27	27	300	37.6	17.5	7,772	63.2	2.2
09308000	Northwest	39.9389	109.6485	26	17	902.7	28.5	15.1	7,112	35.5	2
09328900	Southwest	38.9422	109.8212	10	NA	22.9	37.8	12.1	6,110	0.4	2
09339900	Southwest	37.3897	106.8412	45	45	65.4	44.4	43	10,235	100	3.1
09340000	Southwest	37.3695	106.8923	46	45	90.8	45.7	41.5	10,071	100	3
09340500	Southwest	37.4856	106.9303	17	16	39.9	46.9	51	11,081	100	3.1
09341500	Southwest	37.3920	106.9073	29	28	85.6	43.3	45	10,380	100	3.1
09342000	Southwest	37.3695	106.9403	13	12	24	40.2	39.9	9,890	100	3.1
09342500	Southwest	37.2667	107.0078	75	72	280.8	38.9	38.8	9,738	96.1	3
09343000	Southwest	37.2128	106.7945	37	36	57.9	46.7	39.2	10,026	100	3.1
09343500	Southwest	37.1936	106.9053	18	17	23.1	32.5	33.1	9,264	99.1	2.8
09344000	Southwest	37.0853	106.6895	41	59	69.2	43.3	40.1	10,255	100	3
09345200	Southwest	37.0756	106.8111	8	25	13.4	26.0	33.2	9,608	100	2.9

Table 1. Drainage-basin and climatic characteristics at streamflow-gaging stations used for regional regression analysis.—Continued

[LATDEG, latitude in decimal degrees; LNGDEG, longitude in decimal degrees; YRSPK, years of record for peak streamflow; YRSANN, years of record for annual streamflow; *A*, drainage area, in square miles; *S*, mean watershed slope, in percent; *P*, mean annual precipitation, in inches; *E*, mean watershed elevation, in feet; A_{7500}, percentage of *A* above 7,500 feet elevation plus 1; ${}_6P_{100}$, 6-hour, 100-year precipitation, in inches; NA, not applicable, station operated as peak-only or flood-hydrograph station]

Station number	Hydrologic region	LATDEG	LNGDEG	YRSPK	YRSANN	*A*	*S*	*P*	*E*	A_{7500}	${}_6P_{100}$
09346000	Southwest	37.0028	106.9075	36	71	176	32.3	31.4	9,180	95.4	2.8
09346200	Southwest	36.9333	107.0006	39	NA	129.5	18.1	20.9	7,637	67.1	2.5
09347500	Southwest	37.4286	107.1934	14	13	82.6	41.9	37.8	10,137	100	3
09349800	Southwest	37.0883	107.3978	44	45	624.9	29.3	27.2	8,564	78.5	2.7
09350800	Southwest	36.7231	107.2797	49	NA	60.2	18.2	18	7,394	32.5	2.5
09352900	Southwest	37.4775	107.5437	43	45	72.5	57.9	39.5	11,350	100	3.5
09355000	Southwest	37.0111	107.5970	56	56	58.3	16.7	17.4	6,940	20.6	2.1
09357200	Southwest	36.4667	107.9173	35	NA	0.2	14.4	10.5	6,934	0	2.1
09357230	Southwest	36.5900	108.1848	21	NA	0.3	9.9	9.6	5,958	0	2
09357500	Southwest	37.8331	107.5995	47	47	57.6	54.4	44.7	11,936	100	2.7
09358550	Southwest	37.8197	107.6637	14	15	20.1	54.5	40.5	11,445	100	2.7
09359000	Southwest	37.7975	107.6953	14	13	44.4	51.9	41.2	11,571	100	2.8
09361000	Southwest	37.4219	107.8451	50	48	168.4	46.7	33.7	9,592	98.7	2.8
09361400	Southwest	37.3342	107.9095	20	6	25.5	53.9	34.1	9,413	97.5	3.1
09361500	Southwest	37.2792	107.8803	83	95	709.6	46.6	35.9	10,146	93.5	2.9
09362000	Southwest	37.6039	107.8937	22	22	63.2	33.0	24.8	8,174	68.7	2.7
09363000	Southwest	37.3253	107.7490	45	42	97.4	34.1	34.4	9,999	99.4	3.5
09363100	Southwest	37.1397	107.7534	23	23	17.8	6.8	16.9	6,762	0	2.2
09365500	Southwest	37.2897	108.0406	92	90	33.4	49.2	39.8	10,228	100	3
09366000	Southwest	37.1189	108.1987	23	22	75.6	23.3	21.4	7,835	59.6	2.4
09366500	Southwest	36.9997	108.1887	86	87	309.3	18.0	20.3	7,605	39.5	2.4
09367400	Southwest	36.7861	108.2259	27	4	1.1	15.3	9.8	5,650	0	2
09367530	Southwest	36.7333	108.3006	35	NA	3	7.6	9.2	5,503	0	1.9
09367550	Southwest	36.7667	108.3701	21	NA	4.6	6.6	9	5,468	0	1.9
09367561	Southwest	36.7733	108.4412	16	15	136.3	13.0	10.7	5,776	0	2
09367950	Southwest	36.7244	108.5915	30	18	4,390.7	7.3	9.9	6,328	4.5	2.2
09367980	Southwest	36.7706	108.7262	17	NA	21.7	3.5	7.9	5,227	0	2
09368020	Southwest	36.9258	108.7250	21	NA	2.1	6.1	8.8	5,334	0	2
09368500	Southwest	37.3817	108.2581	16	15	39.5	26.3	33.4	9,705	99.9	2.8
09369000	Southwest	37.3703	108.2315	15	14	12.1	43.0	33.1	9,690	100	2.7
09369500	Southwest	37.3739	108.2306	15	13	12.1	25.3	31	9,388	100	2.7
09371000	Southwest	37.0275	108.7415	72	78	526.7	26.4	19	7,216	28.8	2.3
09371300	Southwest	37.3475	108.4829	11	NA	4.5	22.6	17.3	6,856	7.8	2.3
09372000	Southwest	37.3242	109.0157	56	56	347.5	15.5	14.9	6,407	3.4	2.2
09378170	Southwest	37.8467	109.3696	21	22	8.4	27.7	26.8	8,621	91.4	2.7
09378630	Southwest	37.7556	109.4765	41	42	3.8	35.7	26.3	8,680	93.6	2.7
09378650	Southwest	37.6808	109.4626	17	18	37.4	26.1	22.5	7,917	58.4	2.6
09378700	Southwest	37.5606	109.5787	29	23	205	28.9	15.4	6,807	21.7	2.4
09379000	Southwest	37.2661	109.6757	10	9	278.9	22.8	10.6	5,861	5.5	2.2
09379030	Southwest	36.3333	109.6243	15	NA	76.9	12.3	8.3	5,905	0	2.2
09379060	Southwest	36.4694	109.4062	14	NA	1.3	3.3	8.9	5,826	0	2.1
09379300	Southwest	37.2167	109.8173	15	NA	64.4	21.1	8.6	5,383	0	2

Selection of Stations for Other Streamflow Statistics

Many USGS streamflow-gaging stations in the study area operate as peak-only or flood-hydrograph stations and as such do not record daily-mean streamflow data. However, the remaining streamflow statistics or "other streamflow statistics" (nonannual peak) considered in this report are computed from continuous daily-mean streamflow. Hence, a subset of the 422 stations needed to be identified for the purposes of this study.

Stations used for development of equations for estimating the annual- and monthly-mean flow characteristics, the minimum and maximum streamflow characteristics, and the flow-duration curve are a subset of the 422 stations described in the previous section. A total of 288 sites with a combined record of 9,877 years of annual mean streamflow were selected. These stations are identified in table 1 as those with an applicable count of annual streamflow values. The actual number of stations used in the other streamflow-statistic equations is slightly reduced to counts between 210 and 280 because of factors such as the presence of zero-flow values or periods of partial streamflow record.

Finally, the authors concluded that the number of stations in the Plains hydrologic region was inadequate for regression-equation development for any of the streamflow statistics other than peak streamflow. Additionally, the presence of substantial record of zero flows at many stations throughout the region, which is attributed in part to the lack of abundant precipitation and sandy soils, makes direct application of conventional regional-regression techniques, such as shown in this report, difficult and any resulting equations of questionable applicability.

Computation of Streamflow Statistics and Basin and Climatic Characteristics

The methods used for computing the streamflow statistics and basin and climatic characteristics used in the development of the regression equations are described in this section. The resulting streamflow statistics and basin and climate characteristics are used as the respective response and predictor variables in the regression analysis.

Peak-Streamflow Frequency

The annual peak-streamflow data by station were used to estimate station-specific peak-streamflow magnitude by recurrence intervals, such as the 100-year peak streamflow. Peak streamflow estimates by station and *T*-year recurrence interval provide the basis for computing regional peak-streamflow regression equations.

The station-specific peak-streamflow values used for this report were computed using the computer program `PeakFQ` (Flynn and others, 2006) for all annual-peak streamflows representative of natural-flow conditions. `PeakFQ` is based on the guidelines for estimating peak-streamflow frequency that are described by the Interagency Advisory Committee on Water Data (1982). The guidelines are commonly referred to by practitioners as "Bulletin 17B."

The Bulletin 17B guidelines fit a Pearson Type III distribution to the product moments of the logarithms of annual peak streamflow. The product moments are mean, standard deviation, and skew. To compensate for effects of short record at a station, station skew is combined or weighted with a generalized value that is derived from a generalized skew map, which is included in Bulletin 17B. The program also provides for conditional probability adjustments for sites with zero-flow values for the annual peak. All other default settings of `PeakFQ` were used, and the program was operated in a batch or automated mode by using default settings to estimate station-specific, peak streamflow by recurrence intervals for this study. These station-specific, peak-streamflow values are considered the results of intermediate computations and are not reported here.

Annual- and Monthly-Mean Streamflow and Flow-Duration Curves

Daily-mean streamflow data for the 288 stations were used to compute the annual- and monthly-mean streamflows and the station-specific flow-duration curves. Not all 288 stations could be used, however, because of zero-flow conditions. Four sites have annual-mean streamflow values of zero, and various stations have one or more monthly-mean streamflows of zero. Station-specific annual- and monthly-mean streamflows and flow-duration curve values provide the basis for developing regional equations for estimation of these streamflow statistics. Annual-mean streamflows are computed as the arithmetic mean of all annual-mean streamflows representative of natural-flow conditions. Monthly-mean streamflows are computed as the arithmetic mean of all monthly-mean streamflows representative of natural-flow conditions. The flow-duration values are computed by sorting or ranking the daily-mean streamflow data and linearly interpolating to the five exceedance percentiles of interest (10, 25, 50, 75, and 90).

Minimum and Maximum 7-Day Streamflow

Minimum- and maximum 7-day, *T*-year streamflows are computed from analysis of the 7-day minimum and maximum daily-mean streamflow for each year of record representative of natural-flow conditions. The 7-day, *T*-year statistics are the minimum or maximum consecutive 7-day mean streamflow expected to occur once every *T*-years or that has an exceedance probability of 1/*T*, and these statistics provide the basis for developing regional equations for estimation of minimum and maximum 7-day streamflow.

Minimum- and maximum-streamflow frequency statistics were estimated using the methods described by Riggs (1972) implemented by the computer program `SWSTAT` (Lumb and others, 1990). The use of `SWSTAT` in the context of this report requires the explicit assumption that the log-Pearson Type III distribution is simultaneously suitable for low- and high-flow frequency analysis in Colorado. The general approach implemented by `SWSTAT` includes the following: Annual series of the minimum or maximum *7*-day streamflows by station are computed by a "sliding window," and the product moments of mean, standard deviation, and skew of the logarithms of the streamflow values are computed. Finally, a log-Pearson Type III distribution is fit to the product moments, and the quantiles for the 2-year, 10-year, and 50-year recurrence intervals are extracted to produce the station-specific minimum and maximum 7-day, *T*-year streamflow statistics.

Basin and Climatic Characteristics

Based on the results of previous regional streamflow studies conducted in Colorado and neighboring States (Kircher and others, 1985; Thomas and others, 1997; Vaill, 1999; Hortness and Berenbrock, 2001; Berenbrock, 2002; Miller, 2003; Hortness, 2006; Waltemeyer, 2006; and Kenney and others, 2007) and on the availability of readily accessible data, a total of 17 characteristics (11 basin and 6 climatic characteristics) that are listed in table 2 were evaluated as candidate predictor variables in the regression analysis. For each of the 422 stations utilized in this study for the development of the regression equations, values for all 17 characteristics were calculated using various techniques involving geographic information system technology and multiple data sources that are listed in table 3.

Exploratory graphical and statistical analysis of relations between the basin and climatic characteristics was conducted to narrow the list of candidate characteristics into those that are appropriate or applicable variables for regression analysis. The graphical and statistical analysis considered strength of correlation or concordance, linearity, and cross-correlation between variables. For example, mean annual precipitation and mean watershed elevation are strongly related in Colorado; so, to a degree, having one is equivalent to having the other. The decision process also is influenced by the number of stations (degrees of freedom) by region. The graphical and statistical analysis resulted in selection of the six predictor variables of drainage area (A) in square miles; mean watershed elevation (E) in feet; mean watershed slope (S) in percent; percentage of drainage area above 7,500 feet of elevation (A_{7500}); mean annual precipitation (P) in inches; and 6-hour, 100-year precipitation ($_6P_{100}$) in inches. Only these six variables are considered for the remainder of this report.

Table 2. Basin and climatic characteristics evaluated for use in regional regression equations.

[NED, National Elevation Dataset; PRISM, Parameter-Elevation Regressions on Independent Slopes Model; km, kilometer; NOAA, National Oceanic and Atmospheric Administration; DAYMET, Daymet project]

Characteristic	Unit	Datasets used
Drainage area	square miles	Watershed Polygon generated using StreamStats process
Maximum elevation	feet	10-meter NED
Minimum elevation	feet	10-meter NED
Relief (difference between maximum and minimum elevations)	feet	10-meter NED
Mean watershed elevation	feet	10-meter NED
Mean watershed slope (not channel slope)	percent	10-meter NED
Percentage of area with slopes greater than 30 percent	percent	10-meter NED
Percentage of area with slopes greater than 30 percent and facing north	percent	10-meter NED
Percentage of area with slopes greater than 15 percent	percent	10-meter NED
Percentage of area with slopes greater than 15 percent and facing north	percent	10-meter NED
Percentage of area above 7,500 feet	percent	10-meter NED
Mean annual precipitation	inches	PRISM 4 km,[a] 8 km[b]
6-hour, 2-year precipitation	inches	NOAA-Atlas 14,[c] NOAA-Atlas 2[d]
24-hour, 2-year precipitation	inches	NOAA-Atlas 14,[c] NOAA-Atlas 2[4]
6-hour, 100-year precipitation	inches	NOAA-Atlas 14,[c] NOAA-Atlas 2[d]
24-hour, 100-year precipitation	inches	NOAA-Atlas 14,[c] NOAA-Atlas 2[d]
Mean annual number of wet days	days	DAYMET

[a]Used for Colorado, Utah, Arizona, New Mexico, and Wyoming.

[b]Used for Nebraska, Kansas, Oklahoma, and Texas.

[c]Used for Utah, Arizona, and New Mexico.

[d]Used for Colorado, Wyoming, Nebraska, Kansas, Oklahoma, and Texas.

Table 3. Sources of data used to compute basin and climatic characteristics.

Dataset name	Source description
Parameter-elevation Regressions on Independent Slopes Model climate mapping system (PRISM) Total Precipitation (30-year average, 1971–2000)	Daly, Christopher, Nielson, R.P., and Phillips, D.L., 1994, A statistical-topographic model for mapping climatological precipitation over mountainous terrain: Journal of Applied Meteorology, v. 33, no. 2, p. 140–158, accessed August 15, 2007, at *http://www.prism.oregonstate.edu/products/*
Daily surface weather and climatological summaries	Daymet Project, Daily surface weather and climatological summaries at 1-kilometer resolution over the conterminous United States, accessed August 15, 2007, at *http://www.daymet.org*
Precipitation frequency atlas for the Western United States (National Oceanic and Atmospheric Administration Atlas 14)	Bonnin, G., Martin, D., Lin, B., Parzybok, T., Yekta, M., and Riley, D., 2006, Precipitation frequency Atlas of the United States: National Weather Service, National Oceanic and Atmospheric Administration Atlas 14, Volume 1, version 4.0, accessed August 16, 2007, at *http://hdsc.nws.noaa.gov/hdsc/pfds/docs/NA14Vol1.pdf*
Precipitation frequency atlas for the Western United States (National Oceanic and Atmospheric Administration Atlas 2)	Miller, J.F., Frederick, R.H., and Tracy, R. J., 1973, Precipitation frequency Atlas of the United States: National Weather Service, National Oceanic and Atmospheric Administration Atlas 2, Volume III, accessed August 16, 2007, at *http://www.nws.noaa.gov/oh/hdsc/noaaatlas2.htm*
National Elevation Dataset (NED) 10-meter resolution	U.S. Geological Survey, 2007, National elevation dataset: accessed August 13, 2007, at *http://ned.usgs.gov/*

Computation of Regional Regression Equations

The computation of the regional regression equations is described in this section. Multilinear regression was used to define statistical relations between each of the streamflow statistics and two or more basin and climatic characteristics. A description of the principles of regional regression is beyond the scope of this report. Descriptions of the principles are available in references such as Helsel and Hirsch (2002) or Montgomery and others (2001). For the current (2009) investigation, logarithmic transformations (base-10) were made on all streamflow statistics and basin and climatic characteristics prior to the development of the regression equations. The data were logarithmically transformed in order to increase linearity between the regression variables and to acquire a constant variance of the regression residuals. For the A_{7500} variable, which is presented as a percentage from 0 to 100, a value of 1 percent was added before logarithmic transformation to avoid null values associated with the inability to take a logarithm of zero.

For the current (2009) investigation, two forms of related regression techniques were used—generalized least-squares (GLS) and weighted least-squares (WLS) regression analysis. GLS regression was used exclusively to compute equations for peak-streamflow and 7-day minimum and maximum streamflow estimation. WLS was used exclusively to compute equations for annual- and monthly-mean streamflow and flow-duration curve estimation.

Generalized Least-Squares Regression

The regionalized regression equations for computing the peak-, minimum-, and maximum-streamflow equations were developed using the GLS method described by Stedinger and Tasker (1985) and Tasker and Stedinger (1989). For the regional streamflow-frequency regression analysis reported here, GLS regression was preferred over WLS regression because GLS is an extension of WLS that accounts for cross correlation between response variables. WLS regression only accounts for differences in station record length and uncertainty in the station-specific streamflow statistics and assumes independence between response variables. A summary of variables, units, and regression diagnostics reported for the GLS and WLS regression equations is shown in figure 2.

The regression equations from GLS regression for estimation of peak, minimum, and maximum streamflow are listed by region in the left-hand page of figures 3–7. The figures identify the streamflow statistic, the regression method, the number of respective stations used to develop the equations, numerical values of regression diagnostics, and a “check mark” that signifies the general reliability of the equation based on inspection of residual plots. For the 7-day minimum streamflow equations the station count decreases as the recurrence interval increases because of increases in the number of zero values in the station-specific estimates of the 7-day minimum streamflow.

Figures 3–7 provide appropriate GLS-regression diagnostics for each equation. These are the standard error of prediction, the pseudo R-squared statistic, and the standard model error. Readers are directed to Stedinger and Tasker (1985) and Tasker and Stedinger (1989) for details. Each equation is statistically significant with a p-value less than 0.01. The ranges of the predictor variables also are listed in the figures. These ranges can be used to assess equation applicability. The applicability of the equations for ungaged sites with basin and climate characteristics outside the range of the predictor variables is questionable.

Regression Equation Response Variables	
Variable	**Variable definition**
Q_T	*T*-year peak streamflow, in cubic feet per second
${}_7Q_T^{min}$	7-day, *T*-year minimum streamflow, in cubic feet per second
${}_7Q_T^{max}$	7-day, *T*-year maximum streamflow, in cubic feet per second
Q_{ann}	Annual-mean streamflow, in cubic feet per second
Q_{month}	Monthly-mean streamflow by abbreviation, in cubic feet per second
$Q_{\#th}$	Daily-mean streamflow as exceedance probability as percent, in cubic feet per second
Regression Equation Predictor Variables	
Variable	**Variable definition**
A	Drainage area, in square miles
A_{7500}	Percentage of *A* above 7,500 feet of elevation plus 1
E	Mean elevation of watershed, in feet
P	Mean annual precipitation, in inches
${}_6P_{100}$	6-hour, 100-year precipitation, in inches
S	Mean watershed slope, in percent
Regression Equation Diagnostics for GLS and WLS Regression Equations	
Diagnostic	**Diagnostic Definition**
SEP	Standard error of prediction (WLS and GLS), in percent
adjR^2	100 × adjusted R-squared (WLS only), dimensionless
pseudoR^2	100 × pseudo R-squared (GLS only), dimensionless
SME	Standard model error (GLS only), in percent
√	Mark that qualifies (see text) the reliability of regression residuals

Figure 2. Summary of variables and regression diagnostics for regional equations. GLS, Generalized Least Squares; WLS, Weighted Least Squares.

Weighted Least-Squares Regression

The regionalized regression equations for computing the annual-and monthly-mean streamflow equations and the equations for the flow-duration curve were developed using WLS regression. For the regional regression analysis reported here, WLS regression was preferred over GLS regression because GLS regression was specifically developed for use with *T*-year type streamflow statistics and is difficult to extend to other streamflow statistics. The weights used for the WLS regression for the annual-mean and monthly-mean equations are based on the variance of the logarithms of the observed values. Specifically, stations with lesser variance received greater weighting. The weights for flow-duration equations are based on length of available record in years. The equations for estimating monthly- and annual-mean streamflows and flow-duration curves for four of the five hydrologic regions are listed in figures 3–7. Equations were not developed for the Plains hydrologic region for reasons outlined in section “Selection of Stations for Other Streamflow Statistics.”

The figures also provide appropriate WLS-regression diagnostics for each equation. These include the standard error of prediction and the adjusted R-squared statistic. Each equation is statistically significant with a p-value less than 0.01. Readers are directed to standard texts on regression such as Helsel and Hirsch (2002) or Montgomery and others (2001) for details. Similar to the GLS-regression equations, the ranges of the predictor variables also are listed in the figures.

Discussion of Selection of Variables

The six selected basin and climatic characteristics were examined as predictor variables for the regression equations reported in figures 3–7. Regression-equation development is an inherently iterative process, and the modeler must balance several competing objectives, including the tradeoff between number of variables to include in the equation and the degrees of freedom (data points) used to estimate regression coefficients.

One goal in the early stages of regression-equation development is to identify and select those basin and climatic characteristics that have a statistically significant effect on the dependent variables and to generally exclude those predictor variables having limited influence. For example, P and E are strongly coupled in the study area in which the latter influences the former through orographic effects that enhance the formation of precipitation; hence, it is not always optimal to have both variables present in an equation. Other variables can be selected on professional judgment and logic and confirmed by statistical significance. For example, A is a vital predictor variable for streamflow statistics and is the only common variable used in all regional equations developed by Kircher and others (1985) and Vaill (1999). For the regression equations reported here, A is similarly included.

The selection of variables also is influenced by various regression diagnostics such as statistical significance (as measured by p-values), residual standard error, the distribution of regression residuals, several coefficient-of-determination statistics (R-squared statistics) or R-squared-like statistics (pseudo R-squared for the GLS regression; see Griffis and Stedinger [2007]) and others. Selection of variables can also be influenced by the preference to maintain a consistent structural form to a set of estimating equations in order to help ensure physically consistent estimates. By maintaining a regionally consistent set of included variables in the equations with ensembles of T-year peak streamflow, situations such as the 50-year peak streamflow being estimated as less than the 25-year peak streamflow are virtually eliminated. By maintaining a regionally consistent set of included variables in the equation ensembles for monthly streamflow, a smooth month-to-month variation in estimated streamflow, which is presumably more reflective of actual seasonal variations, is provided.

Application and Limitations of Regional Regression Equations

Application and limitations of the regional regression equations in figures 3–7 exist. The number of equations reported here is too large for a comprehensive discussion of the subtle details of each. However, all of the equations reported in the figures are statistically significant, with a p-value less than 0.01, and represent reasonably reliable equations that were developed from USGS data, available sample sizes, and techniques that are within the scope of the report.

The authors have assessed each equation and assigned a qualification as a “boxed check mark” to each equation based on visual interpretation of the residual plots (not reported here) for each equation. A boxed check mark is provided in figures 3–7 for each equation for which no bias was identified. A boxed check mark is not provided for those equations for which the residual plots indicate that bias (as either overestimation or underestimation) could exist for some combinations of basin and climatic characteristics. Such biases are indicated by nonlinear relations in the residual plots or the presence of heteroscedasticity (nonconstant variance). The magnitude and direction of bias are difficult to systematically quantify and mitigate for each of those equations within the scope of this report. For each of the equations listed in the figures, however, the qualification provides a mechanism by which the potential for biased estimation can be communicated to practitioners.

All streamflow statistics estimated from the equations are considered to be associated with natural basin and climatic characteristics and are not representative of anthropogenically influenced conditions, such as site-specific situations involving factors like the placement or removal of a dam or substantial diversion and return flows. In general, the equations and their associated errors are most valid for ungaged watersheds with basin and climatic characteristics well within the ranges of the predictor variables for each equation. Estimates and associated errors for ungaged sites having basin or climate characteristics outside the reported range of the independent variables are less applicable and could be erroneous. As a result, consideration of these and other limitations requires substantial judgment on the part of the practitioners for reliable application of the regional equations for estimation of natural streamflow statistics in Colorado.

The USGS has developed a Web-based computer program called `StreamStats` (Ries and others, 2004). The software facilitates the computation of streamflow statistics using regional regression equations or other procedures that have been published previously. `StreamStats` allows the user to obtain streamflow statistics for both gaged and ungaged sites by selecting a specific stream location on a map interface. If the location of interest lacks a station, the algorithms in `StreamStats` delineate the watershed for the location, compute basin and climatic characteristics, and provide estimates of the streamflow statistics using the available regression equations. In general, the computational algorithms used to generate basin and climatic characteristics for the regression equations reported here are consistent with those of `StreamStats`. As a result, predictor variables used to develop the equations presented in this report are compatible for use with `StreamStats`, which represents a unique contribution to ungaged-site, regional-streamflow estimation in Colorado. Finally, regression equations reported here for Colorado have been included in `StreamStats` to ease the computation of estimates of streamflow statistics for practitioners.

Peak Streamflow Equations for Mountain Hydrologic Region

Generalized least-squares (GLS) regression, 141 stations

Approximate range of predictor variables

A: 1–1,060 square miles; S: 7.6–60.2 percent; and P: 18–47 inches

$Q_2 = 10^{-2.05} A^{0.78} S^{0.17} P^{2.10}$ √ $SEP = 49$, pseudo$R^2 = 83$, $SME = 48$,

$Q_5 = 10^{-1.51} A^{0.77} S^{0.16} P^{1.85}$ √ $SEP = 44$, pseudo$R^2 = 86$, $SME = 43$,

$Q_{10} = 10^{-1.20} A^{0.77} S^{0.14} P^{1.71}$ √ $SEP = 41$, pseudo$R^2 = 87$, $SME = 40$,

$Q_{25} = 10^{-0.90} A^{0.75} S^{0.16} P^{1.55}$ √ $SEP = 40$, pseudo$R^2 = 88$, $SME = 39$,

$Q_{50} = 10^{-0.68} A^{0.75} S^{0.16} P^{1.45}$ √ $SEP = 39$, pseudo$R^2 = 88$, $SME = 37$,

$Q_{100} = 10^{-0.46} A^{0.75} S^{0.14} P^{1.35}$ √ $SEP = 36$, pseudo$R^2 = 90$, $SME = 34$,

$Q_{200} = 10^{-0.28} A^{0.75} S^{0.13} P^{1.26}$ √ $SEP = 36$, pseudo$R^2 = 90$, $SME = 34$, and

$Q_{500} = 10^{-0.06} A^{0.74} S^{0.15} P^{1.14}$ √ $SEP = 33$, pseudo$R^2 = 91$, $SME = 31$.

Minimum Streamflow for Mountain Hydrologic Region

Generalized least-squares (GLS) regression, 124, 118, and 111 stations

Approximate range of predictor variables

A: 1–1,060 square miles; P: 18–47 inches; and E: 8,600–12,000 feet elevation

${}_7Q_2^{\min} = 10^{-26.56} A^{1.13} P^{1.26} E^{5.85}$ √ $SEP = 89$, pseudo$R^2 = 80$, $SME = 87$,

${}_7Q_{10}^{\min} = 10^{-33.76} A^{1.20} P^{2.25} E^{7.20}$ √ $SEP = 153$, pseudo$R^2 = 67$, $SME = 148$, and

${}_7Q_{50}^{\min} = 10^{-18.56} A^{1.17} P^{1.86} E^{3.56}$ √ $SEP = 126$, pseudo$R^2 = 72$, $SME = 122$.

Maximum Streamflow for Mountain Hydrologic Region

Generalized least-squares (GLS) regression, 130 stations

Approximate range of predictor variables

A: 1–1,060 square miles and P: 18–47 inches

${}_7Q_2^{\max} = 10^{-1.99} A^{0.82} P^{2.08}$ √ $SEP = 46$, pseudo$R^2 = 86$, $SME = 45$,

${}_7Q_{10}^{\max} = 10^{-1.38} A^{0.85} P^{1.78}$ √ $SEP = 35$, pseudo$R^2 = 92$, $SME = 34$, and

${}_7Q_{50}^{\max} = 10^{-0.94} A^{0.85} P^{1.57}$ √ $SEP = 31$, pseudo$R^2 = 94$, $SME = 30$.

Summary of Variables, Units, and Regression Diagnostics is shown in figure 2.

Figure 3. Regional regression equations for the Mountain hydrologic region.

Annual and Monthly Mean Streamflow for Mountain Hydrologic Region

Weighted least-squares (WLS) regression, 129 stations

Approximate range of predictor variables

A: 1–1,060 square miles and *P*: 18–47 inches

$Q_{ann} = 10^{-2.31} A^{0.88} P^{1.71}$ √ $SEP = 33$, adj$R^2 = 93$,

$Q_{oct} = 10^{-3.29} A^{0.97} P^{1.98}$ √ $SEP = 45$, adj$R^2 = 89$,

$Q_{nov} = 10^{-3.14} A^{0.98} P^{1.78}$ √ $SEP = 46$, adj$R^2 = 90$,

$Q_{dec} = 10^{-2.90} A^{1.00} P^{1.52}$ √ $SEP = 47$, adj$R^2 = 89$,

$Q_{jan} = 10^{-2.99} A^{1.02} P^{1.53}$ √ $SEP = 50$, adj$R^2 = 88$,

$Q_{feb} = 10^{-2.92} A^{1.02} P^{1.46}$ √ $SEP = 51$, adj$R^2 = 88$,

$Q_{mar} = 10^{-2.87} A^{1.06} P^{1.42}$ √ $SEP = 49$, adj$R^2 = 89$,

$Q_{apr} = 10^{-2.95} A^{1.14} P^{1.64}$ √ $SEP = 44$, adj$R^2 = 92$,

$Q_{may} = 10^{-1.60} A^{0.94} P^{1.44}$ √ $SEP = 46$, adj$R^2 = 87$,

$Q_{jun} = 10^{-1.29} A^{0.82} P^{1.52}$ $SEP = 46$, adj$R^2 = 87$,

$Q_{jul} = 10^{-2.80} A^{0.84} P^{2.23}$ $SEP = 76$, adj$R^2 = 72$,

$Q_{aug} = 10^{-2.73} A^{0.85} P^{1.91}$ $SEP = 80$, adj$R^2 = 75$, and

$Q_{sep} = 10^{-2.93} A^{0.92} P^{1.84}$ $SEP = 59$, adj$R^2 = 86$.

Flow-Duration Curve for Mountain Hydrologic Region

Weighted least-squares (WLS) regression, 129 stations

Approximate range of predictor variables

A: 1–1,060 square miles and *P*: 18–47 inches

$Q_{10th} = 10^{-2.64} A^{0.89} P^{2.22}$ √ $SEP = 45$, adj$R^2 = 90$,

$Q_{25th} = 10^{-2.86} A^{0.96} P^{1.92}$ √ $SEP = 55$, adj$R^2 = 88$,

$Q_{50th} = 10^{-2.69} A^{0.98} P^{1.49}$ √ $SEP = 55$, adj$R^2 = 88$,

$Q_{75th} = 10^{-2.85} A^{1.01} P^{1.40}$ √ $SEP = 64$, adj$R^2 = 86$, and

$Q_{90th} = 10^{-3.46} A^{1.10} P^{1.59}$ √ $SEP = 85$, adj$R^2 = 82$.

Summary of Variables, Units, and Regression Diagnostics is shown in figure 2.

Figure 3. Regional regression equations for the Mountain hydrologic region.—Continued

Peak Streamflow Equations for Northwest Hydrologic Region

Generalized least-squares (GLS) regression, 90 stations

Approximate range of predictor variables

A: 1–5,250 square miles; A_{7500}: 0–100 percent, and P: 8–49 inches

$Q_2 = 10^{-1.15} A^{0.75} A_{7500}^{-0.41} P^{2.15}$	√	SEP = 113,	pseudoR^2 = 72,	SME = 108,
$Q_5 = 10^{-0.49} A^{0.76} A_{7500}^{-0.54} P^{2.00}$	√	SEP = 88,	pseudoR^2 = 75,	SME = 84,
$Q_{10} = 10^{-0.10} A^{0.75} A_{7500}^{-0.63} P^{1.93}$	√	SEP = 79,	pseudoR^2 = 77,	SME = 75,
$Q_{25} = 10^{0.35} A^{0.75} A_{7500}^{-0.72} P^{1.82}$	√	SEP = 74,	pseudoR^2 = 79,	SME = 70,
$Q_{50} = 10^{0.65} A^{0.74} A_{7500}^{-0.77} P^{1.74}$	√	SEP = 74,	pseudoR^2 = 79,	SME = 69,
$Q_{100} = 10^{0.93} A^{0.74} A_{7500}^{-0.81} P^{1.65}$	√	SEP = 75,	pseudoR^2 = 79,	SME = 70,
$Q_{200} = 10^{1.20} A^{0.73} A_{7500}^{-0.85} P^{1.56}$		SEP = 76,	pseudoR^2 = 79,	SME = 70, and
$Q_{500} = 10^{1.53} A^{0.72} A_{7500}^{-0.88} P^{1.44}$		SEP = 79,	pseudoR^2 = 79,	SME = 72.

Minimum Streamflow for Northwest Hydrologic Region

Generalized least-squares (GLS) regression, 52, 47, and 42 stations

Approximate range of predictor variables

A: 5–5,250 square miles; E: 6,880–10,480 feet

${}_7Q_2^{\min} = 10^{-34.73} A^{0.83} E^{8.56}$	√	SEP = 212,	pseudoR^2 = 42,	SME = 199,
${}_7Q_{10}^{\min} = 10^{-38.52} A^{0.90} E^{9.42}$	√	SEP = 280,	pseudoR^2 = 41,	SME = 259, and
${}_7Q_{50}^{\min} = 10^{-36.44} A^{0.94} E^{8.84}$	√	SEP = 338,	pseudoR^2 = 39,	SME = 307.

Maximum Streamflow for Northwest Hydrologic Region

Generalized least-squares (GLS) regression, 59 stations

Approximate range of predictor variables

A: 5–5,250 square miles, P: 8–49 inches, and A_{7500}: 0–100 percent

${}_7Q_2^{\max} = 10^{-7.19} A^{1.03} P^{3.60} A_{7500}^{1.25}$	√	SEP = 86,	pseudoR^2 = 84,	SME = 82,
${}_7Q_{10}^{\max} = 10^{-5.35} A^{1.00} P^{2.48} A_{7500}^{1.31}$	√	SEP = 59,	pseudoR^2 = 89,	SME = 56, and
${}_7Q_{50}^{\max} = 10^{-3.90} A^{0.94} P^{1.80} A_{7500}^{1.23}$	√	SEP = 51,	pseudoR^2 = 90,	SME = 48.

Summary of Variables, Units, and Regression Diagnostics is shown in figure 2.

Figure 4. Regional regression equations for the Northwest hydrologic region.

Annual and Monthly Mean Streamflow for Northwest Hydrologic Region

Weighted least-squares (WLS) regression, 56 stations

Approximate range of predictor variables

A: 1–5,250 square miles and *P*: 8–49 inches

$Q_{ann} = 10^{-4.98} A^{0.95} P^{3.32}$	√	$SEP = 55$,	adj$R^2 = 88$,
$Q_{oct} = 10^{-4.32} A^{1.01} P^{2.54}$		$SEP = 94$,	adj$R^2 = 78$,
$Q_{nov} = 10^{-4.68} A^{1.08} P^{2.62}$		$SEP = 83$,	adj$R^2 = 83$,
$Q_{dec} = 10^{-4.53} A^{1.07} P^{2.46}$		$SEP = 79$,	adj$R^2 = 82$,
$Q_{jan} = 10^{-4.73} A^{1.05} P^{2.62}$		$SEP = 85$,	adj$R^2 = 81$,
$Q_{feb} = 10^{-4.63} A^{1.14} P^{2.46}$		$SEP = 77$,	adj$R^2 = 85$,
$Q_{mar} = 10^{-4.39} A^{1.14} P^{2.36}$		$SEP = 68$,	adj$R^2 = 90$,
$Q_{apr} = 10^{-4.77} A^{1.06} P^{3.02}$	√	$SEP = 84$,	adj$R^2 = 85$,
$Q_{may} = 10^{-4.54} A^{0.96} P^{3.40}$	√	$SEP = 71$,	adj$R^2 = 84$,
$Q_{jun} = 10^{-6.90} A^{1.00} P^{4.87}$	√	$SEP = 80$,	adj$R^2 = 82$,
$Q_{jul} = 10^{-4.37} A^{0.83} P^{3.09}$		$SEP = 75$,	adj$R^2 = 68$,
$Q_{aug} = 10^{-3.03} A^{0.84} P^{1.98}$		$SEP = 90$,	adj$R^2 = 67$, and
$Q_{sep} = 10^{-2.62} A^{0.92} P^{1.55}$		$SEP = 104$,	adj$R^2 = 70$.

Flow-Duration Curve for Northwest Hydrologic Region

Weighted least-squares (WLS) regression, 62 stations

Approximate range of predictor variables

A: 1–5,250 square miles and *P*: 8–49 inches

$Q_{10th} = 10^{-6.03} A^{1.03} P^{4.23}$	√	$SEP = 73$,	adj$R^2 = 86$,
$Q_{25th} = 10^{-5.86} A^{1.05} P^{3.72}$	√	$SEP = 77$,	adj$R^2 = 85$,
$Q_{50th} = 10^{-6.07} A^{1.05} P^{3.61}$	√	$SEP = 83$,	adj$R^2 = 83$,
$Q_{75th} = 10^{-6.91} A^{1.07} P^{3.98}$	√	$SEP = 100$,	adj$R^2 = 80$, and
$Q_{90th} = 10^{-8.32} A^{1.06} P^{4.80}$	√	$SEP = 154$,	adj$R^2 = 70$.

Summary of Variables, Units, and Regression Diagnostics is shown in figure 2.

Figure 4. Regional regression equations for the Northwest hydrologic section.—Continued

Peak Streamflow Equations for Rio Grande Hydrologic Region

Generalized least-squares (GLS) regression, 44 stations

Approximate range of predictor variables

A: 2–517 square miles and *P*: 19–45 inches

$Q_2 = 10^{-3.00} A^{1.00} P^{2.46}$	$\boxed{\surd}$	$SEP = 67$,	pseudo$R^2 = 80$,	$SME = 64$,
$Q_5 = 10^{-2.04} A^{0.95} P^{2.02}$	$\boxed{\surd}$	$SEP = 57$,	pseudo$R^2 = 83$,	$SME = 55$,
$Q_{10} = 10^{-1.55} A^{0.93} P^{1.80}$	$\boxed{\surd}$	$SEP = 54$,	pseudo$R^2 = 84$,	$SME = 51$,
$Q_{25} = 10^{-1.01} A^{0.91} P^{1.55}$	$\boxed{\surd}$	$SEP = 52$,	pseudo$R^2 = 84$,	$SME = 49$,
$Q_{50} = 10^{-0.66} A^{0.89} P^{1.39}$	$\boxed{\surd}$	$SEP = 51$,	pseudo$R^2 = 85$,	$SME = 48$,
$Q_{100} = 10^{-0.19} A^{0.87} P^{1.17}$	$\boxed{\surd}$	$SEP = 51$,	pseudo$R^2 = 85$,	$SME = 48$,
$Q_{200} = 10^{-0.03} A^{0.86} P^{1.11}$	$\boxed{\surd}$	$SEP = 52$,	pseudo$R^2 = 84$,	$SME = 49$, and
$Q_{500} = 10^{0.52} A^{0.84} P^{0.85}$	$\boxed{\surd}$	$SEP = 54$,	pseudo$R^2 = 84$,	$SME = 49$.

Minimum Streamflow for Rio Grande Hydrologic Region

Generalized least-squares (GLS) regression, 28, 27, and 24 stations

Approximate range of predictor variables

A: 13–517 square miles and *E*: 8,600–12,000 feet elevation

${}_7Q_2^{min} = 10^{-44.17} A^{1.03} E^{10.71}$	$\boxed{\surd}$	$SEP = 111$,	pseudo$R^2 = 51$,	$SME = 103$,
${}_7Q_{10}^{min} = 10^{-46.35} A^{1.09} E^{11.15}$	$\boxed{\surd}$	$SEP = 189$,	pseudo$R^2 = 37$,	$SME = 170$, and
${}_7Q_{50}^{min} = 10^{-49.44} A^{1.13} E^{11.88}$	$\boxed{\surd}$	$SEP = 165$,	pseudo$R^2 = 47$,	$SME = 148$.

Maximum Streamflow for Rio Grande Hydrologic Region

Generalized least-squares (GLS) regression, 31 stations

Approximate range of predictor variables

A: 13–517 square miles and *P*: 19–45 inches

${}_7Q_2^{max} = 10^{-3.83} A^{0.98} P^{2.89}$	$\boxed{\surd}$	$SEP = 81$,	pseudo$R^2 = 68$,	$SME = 76$,
${}_7Q_{10}^{max} = 10^{-2.22} A^{0.92} P^{2.11}$	$\boxed{\surd}$	$SEP = 55$,	pseudo$R^2 = 77$,	$SME = 52$, and
${}_7Q_{50}^{max} = 10^{-1.38} A^{0.86} P^{1.74}$	$\boxed{\surd}$	$SEP = 31$,	pseudo$R^2 = 94$,	$SME = 30$.

Summary of Variables, Units, and Regression Diagnostics is shown in figure 2.

Figure 5. Regional regression equations for the Rio Grande hydrologic region.

Annual and Monthly Mean Streamflow for Rio Grande Hydrologic Region

Weighted least-squares (WLS) regression, 32 stations

Approximate range of predictor variables

A: 2–517 square miles and E: 7,790–11,500 feet

$Q_{ann} = 10^{-33.58} A^{1.12} E^{8.24}$	√	$SEP = 73$,	adj$R^2 = 72$,
$Q_{oct} = 10^{-32.88} A^{0.95} E^{8.04}$	√	$SEP = 55$,	adj$R^2 = 72$,
$Q_{nov} = 10^{-24.79} A^{0.90} E^{6.02}$	√	$SEP = 53$,	adj$R^2 = 73$,
$Q_{dec} = 10^{-17.71} A^{0.86} E^{4.26}$	√	$SEP = 63$,	adj$R^2 = 68$,
$Q_{jan} = 10^{-13.34} A^{0.83} E^{3.18}$	√	$SEP = 64$,	adj$R^2 = 66$,
$Q_{feb} = 10^{-11.68} A^{0.87} E^{2.75}$	√	$SEP = 56$,	adj$R^2 = 74$,
$Q_{mar} = 10^{-9.32} A^{0.97} E^{2.14}$	√	$SEP = 49$,	adj$R^2 = 82$,
$Q_{apr} = 10^{-5.09} A^{1.10} E^{1.16}$	√	$SEP = 79$,	adj$R^2 = 75$,
$Q_{may} = 10^{-37.25} A^{1.26} E^{9.23}$	√	$SEP = 84$,	adj$R^2 = 71$,
$Q_{jun} = 10^{-61.30} A^{1.23} E^{15.22}$	√	$SEP = 84$,	adj$R^2 = 74$,
$Q_{jul} = 10^{-53.30} A^{1.07} E^{13.17}$	√	$SEP = 74$,	adj$R^2 = 72$,
$Q_{aug} = 10^{-43.00} A_{1.03} E^{10.59}$	√	$SEP = 53$,	adj$R^2 = 80$, and
$Q_{sep} = 10^{-41.49} A^{0.99} E^{10.19}$	√	$SEP = 57$,	adj$R^2 = 75$.

Flow-Duration Curve for Rio Grande Hydrologic Region

Weighted least-squares (WLS) regression, 32 stations

Approximate range of predictor variables

A: 2–517 square miles and E: 7,790–11,500 feet

$Q_{10th} = 10^{-32.35} A^{1.13} E^{8.04}$	√	$SEP = 81$,	adj$R^2 = 66$,
$Q_{25th} = 10^{-41.33} A^{1.07} E^{10.18}$	√	$SEP = 67$,	adj$R^2 = 72$,
$Q_{50th} = 10^{-38.61} A^{0.96} E^{9.46}$	√	$SEP = 75$,	adj$R^2 = 64$,
$Q_{75th} = 10^{-42.09} A^{0.90} E^{10.30}$	√	$SEP = 112$,	adj$R^2 = 48$, and
$Q_{90th} = 10^{-50.71} A^{0.89} E^{12.42}$	√	$SEP = 145$,	adj$R^2 = 44$.

Summary of Variables, Units, and Regression Diagnostics is shown in figure 2.

Figure 5. Regional regression equations for the Rio Grande hydrologic region.—Continued

Peak Streamflow Equations for Southwest Region
Generalized least-squares (GLS) regression, 78 stations
Approximate range of predictor variables

A: 1–4,390 square miles and A_{7500}: 0–100 percent

$Q_2 = 10^{1.67} A^{0.64} A_{7500}^{-0.10}$	√	$SEP = 90$,	pseudo$R^2 = 70$,	$SME = 87$,
$Q_5 = 10^{2.13} A^{0.62} A_{7500}^{-0.19}$	√	$SEP = 71$,	pseudo$R^2 = 75$,	$SME = 69$,
$Q_{10} = 10^{2.36} A^{0.61} A_{7500}^{-0.23}$	√	$SEP = 67$,	pseudo$R^2 = 77$,	$SME = 64$,
$Q_{25} = 10^{2.61} A^{0.60} A_{7500}^{-0.27}$	√	$SEP = 66$,	pseudo$R^2 = 78$,	$SME = 63$,
$Q_{50} = 10^{2.77} A^{0.59} A_{7500}^{-0.30}$	√	$SEP = 67$,	pseudo$R^2 = 78$,	$SME = 63$,
$Q_{100} = 10^{2.91} A^{0.59} A_{7500}^{-0.33}$	√	$SEP = 69$,	pseudo$R^2 = 78$,	$SME = 65$,
$Q_{200} = 10^{3.04} A^{0.58} A_{7500}^{-0.36}$	√	$SEP = 71$,	pseudo$R^2 = 77$,	$SME = 67$, and
$Q_{500} = 10^{3.21} A^{0.58} A_{7500}^{-0.39}$	√	$SEP = 75$,	pseudo$R^2 = 77$,	$SME = 70$.

Minimum Streamflow for Southwest Region
Generalized least-squares (GLS) regression, 46, 37, and 33 stations
Approximate range of predictor variables

A: 4–4,390 square miles, P: 10–51 inches, E: 5,600–11,600 feet

${}_7Q_2^{min} = 10^{-22.24} A^{1.16} P^{1.51} E^{4.65}$	√	$SEP = 226$,	pseudo$R^2 = 67$,	$SME = 207$,
${}_7Q_{10}^{min} = 10^{-18.74} A^{0.97} P^{1.35} E^{3.88}$	√	$SEP = 255$,	pseudo$R^2 = 52$,	$SME = 226$, and
${}_7Q_{50}^{min} = 10^{-26.29} A^{0.49} P^{0.11} E^{6.45}$	√	$SEP = 354$,	pseudo$R^2 = 33$,	$SME = 300$.

Maximum Streamflow for Southwest Region
Generalized least-squares (GLS) regression, 59 stations
Approximate range of predictor variables

A: 4–4,390 square miles and P: 10–51 inches

${}_7Q_2^{max} = 10^{-4.07} A^{0.99} P^{3.10}$	√	$SEP = 64$,	pseudo$R^2 = 88$,	$SME = 61$,
${}_7Q_{10}^{max} = 10^{-2.68} A^{0.93} P^{2.44}$	√	$SEP = 43$,	pseudo$R^2 = 93$,	$SME = 40$, and
${}_7Q_{50}^{max} = 10^{-1.86} A^{0.89} P^{2.03}$	√	$SEP = 33$,	pseudo$R^2 = 95$,	$SME = 30$.

Summary of Variables, Units, and Regression Diagnostics is shown in figure 2.

Figure 6. Regional regression equations for the Southwest hydrologic region.

Annual and Monthly Mean Streamflow for Southwest Region

Weighted least-squares (WLS) regression, 57 stations

Approximate range of predictor variables

A: 1–4,390 square miles and *P*: 10–51 inches

$Q_{ann} = 10^{-4.37} A^{0.91} P^{2.98}$		$SEP = 60$,	adj$R^2 = 85$,
$Q_{oct} = 10^{-4.80} A^{1.00} P^{2.89}$	√	$SEP = 106$,	adj$R^2 = 77$,
$Q_{nov} = 10^{-4.59} A^{0.91} P^{2.78}$	√	$SEP = 80$,	adj$R^2 = 76$,
$Q_{dec} = 10^{-4.22} A^{0.91} P^{2.45}$	√	$SEP = 75$,	adj$R^2 = 75$,
$Q_{jan} = 10^{-4.28} A^{0.96} P^{2.39}$	√	$SEP = 77$,	adj$R^2 = 77$,
$Q_{feb} = 10^{-3.97} A^{0.98} P^{2.18}$	√	$SEP = 58$,	adj$R^2 = 83$,
$Q_{mar} = 10^{-3.79} A^{1.00} P^{2.12}$	√	$SEP = 47$,	adj$R^2 = 82$,
$Q_{apr} = 10^{-4.98} A^{1.12} P^{3.11}$		$SEP = 50$,	adj$R^2 = 95$,
$Q_{may} = 10^{-5.16} A^{1.01} P^{3.63}$	√	$SEP = 62$,	adj$R^2 = 88$,
$Q_{jun} = 10^{-6.13} A^{1.05} P^{4.30}$		$SEP = 121$,	adj$R^2 = 85$,
$Q_{jul} = 10^{-5.19} A^{0.91} P^{3.58}$		$SEP = 180$,	adj$R^2 = 63$,
$Q_{aug} = 10^{-4.60} A^{0.94} P^{2.95}$		$SEP = 119$,	adj$R^2 = 64$, and
$Q_{sep} = 10^{-8.72} A^{0.98} P^{5.46}$		$SEP = 120$,	adj$R^2 = 79$.

Flow-Duration Curve for Southwest Region

Weighted least-squares (WLS) regression, 57 stations

Approximate range of predictor variables

A: 1–4,390 square miles and *P*: 10–51 inches

$Q_{10th} = 10^{-5.44} A^{1.02} P^{3.79}$	√	$SEP = 79$	adj$R^2 = 85$,
$Q_{25th} = 10^{-5.27} A^{1.00} P^{3.40}$	√	$SEP = 96$,	adj$R^2 = 78$,
$Q_{50th} = 10^{-5.08} A^{0.98} P^{3.01}$	√	$SEP = 98$,	adj$R^2 = 75$,
$Q_{75th} = 10^{-5.99} A^{1.02} P^{3.37}$	√	$SEP = 100$,	adj$R^2 = 78$, and
$Q_{90th} = 10^{-7.30} A^{1.01} P^{4.11}$	√	$SEP = 148$,	adj$R^2 = 72$.

Summary of Variables, Units, and Regression Diagnostics is shown in figure 2.

Figure 6. Regional regression equations for the Southwest hydrologic region.—Continued

Peak Streamflow Equations for Plains Hydrologic Region

Generalized least-squares (GLS) regression, 69 stations

Approximate range of predictor variables

A: 0.5–2,930 square miles and ${}_6P_{100}$: 2.4–5.1 inches

$$Q_2 = 10^{1.26} A^{0.52}\ {}_6P_{100}^{0.35} \quad \boxed{\surd} \quad SEP = 183, \quad \text{pseudo}R^2 = 40, \quad SME = 174,$$

$$Q_5 = 10^{0.94} A^{0.57}\ {}_6P_{100}^{1.64} \quad \boxed{\surd} \quad SEP = 142, \quad \text{pseudo}R^2 = 54, \quad SME = 134,$$

$$Q_{10} = 10^{0.85} A^{0.59}\ {}_6P_{100}^{2.15} \quad \boxed{\surd} \quad SEP = 136, \quad \text{pseudo}R^2 = 58, \quad SME = 128,$$

$$Q_{25} = 10^{0.84} A^{0.61}\ {}_6P_{100}^{2.57} \quad \boxed{\surd} \quad SEP = 137, \quad \text{pseudo}R^2 = 62, \quad SME = 128,$$

$$Q_{50} = 10^{0.85} A^{0.62}\ {}_6P_{100}^{2.79} \quad \boxed{\surd} \quad SEP = 139, \quad \text{pseudo}R^2 = 64, \quad SME = 129,$$

$$Q_{100} = 10^{0.88} A^{0.63}\ {}_6P_{100}^{2.98} \quad \boxed{\surd} \quad SEP = 141, \quad \text{pseudo}R^2 = 65, \quad SME = 131,$$

$$Q_{200} = 10^{0.95} A^{0.63}\ {}_6P_{100}^{3.37} \quad \boxed{\surd} \quad SEP = 160, \quad \text{pseudo}R^2 = 65, \quad SME = 147, \text{ and}$$

$$Q_{500} = 10^{0.81} A^{0.64}\ {}_6P_{100}^{3.59} \quad \boxed{\surd} \quad SEP = 141, \quad \text{pseudo}R^2 = 70, \quad SME = 128.$$

Summary of Variables, Units, and Regression Diagnostics is shown in figure 2.

Figure 7. Regional regression equations for the Plains hydrologic region.

Summary

The U.S. Geological Survey (USGS), in cooperation with the Colorado Water Conservation Board and the Colorado Department of Transportation, developed regional regression equations for estimation of various streamflow statistics that are representative of natural streamflow conditions in Colorado. Accurate estimates of various streamflow statistics are important for water-resource management, stream-related structural design, stream-hazard identification, and water-quality management. Streamflow statistics routinely are needed for sites in ungaged watersheds (ungaged sites) that lack nearby streamflow-gaging stations (stations) from which streamflow statistics could be directly computed. Regional regression equations are a common tool used to estimate streamflow statistics at ungaged sites across the Nation and Colorado.

Regional regression equations are based on statistical relations between (1) streamflow statistics of interest computed from applicable records of the stations and (2) basin and climatic characteristics, for which data are typically readily available. The use of regional equations generally represents a reliable and cost-effective means for estimating streamflow statistics at ungaged sites, along with expressions of predictive uncertainty.

The purpose of this report is to present regional regression equations by hydrologic region for estimation of streamflow statistics for naturally flowing streams in Colorado. The equations were developed using the statistical relations between streamflow statistics (response variables) and basin and climatic characteristics (predictor variables).

For each of five hydrologic regions in Colorado, peak-streamflow equations that are based on peak-streamflow data from selected stations are presented for the 2-, 5-, 10-, 25-, 50-, 100-, 200- and 500-year instantaneous-peak streamflows (peak streamflow). For four of the five hydrologic regions, minimum and maximum 7-day streamflow (7-day, *T*-year) equations based on daily-mean streamflow data from selected stations are presented for 7-day minimum 2-, 10-, and 50-year streamflows, as well as for 7-day maximum 2-, 10-, and 50-year streamflows. Other equations presented for the same four hydrologic regions include those for estimation of annual- and monthly-mean streamflow and streamflow-duration statistics for exceedances of 10, 25, 50, 75, and 90 percent. The streamflow-duration statistics collectively are referred to as the “flow-duration curve.” The flow-duration values, presented in this report as *Q10th*, *Q25th*, *Q50th*, *Q75th*, and *Q90th,* indicate the percentage of days that a given daily-mean streamflow is exceeded. For example, a 10-percent flow-duration value (*Q10th*) is calculated as the daily-mean streamflow at a given station that is exceeded 10 percent of the time or 10 percent of the days. Finally, this report also describes some limitations associated with the equations, including an assessment of prediction errors and assessment of equation applicability for ungaged sites.

The regional equations for peak-streamflow estimation were developed using annual peak-streamflow data collected through water year 2006 (October 1, 2005, through September 30, 2006). The remaining equations, with the exception of the 7-day, *T*-year minimum streamflow equations, were developed using data through water year 2007. The 7-day, *T*-year minimum streamflow equations were developed using data collected through climate year 2007 (April 1, 2006, through March 31, 2007).

The study was limited to the use of several selected basin and climatic characteristics including drainage area; mean watershed elevation; mean watershed slope; percentage of drainage area above 7,500 feet of elevation; mean annual precipitation; and 6-hour, 100-year precipitation.

The computation of the regional regression equations used multilinear regression to define statistical relations between each of the streamflow statistics and two or more basin and climatic characteristics. For the investigation, logarithmic transformations (base-10) were made on all streamflow statistics and basin and climatic characteristics prior to the development of the regression equations. The data were logarithmically transformed to increase linearity between the regression variables and to acquire a constant variance of the regression residuals.

For the investigation, two forms of related regression techniques were used—generalized least-squares (GLS) and weighted least-squares (WLS) regression analyses. GLS regression was used exclusively to compute equations for peak-streamflow and 7-day minimum and maximum streamflow estimation. WLS was used exclusively to compute equations for annual- and monthly-mean streamflow and flow-duration curve estimation.

The regionalized regression equations for computing the peak-, minimum-, and maximum-streamflow equations were developed using the GLS method. For the regional streamflow-frequency regression analysis reported here, GLS regression was preferred over WLS regression because GLS is an extension of WLS that accounts for cross correlation between response variables. WLS regression only accounts for differences in station record length and uncertainty in the station-specific streamflow statistics and assumes independence between response variables.

WLS regression was used for the development of regionalized regression equations for computing the annual- and monthly-mean streamflow equations and the equations for the flow-duration curve. WLS regression was preferred over GLS regression because GLS regression was specifically developed for use with *T*-year type streamflow statistics and is difficult to extend to other streamflow statistics. The weights used for the WLS regression for the annual-mean and monthly-mean equations are based on the variance of the logarithms of the observed values. The weights for flow-duration equations are based on length of available record in years.

Appropriate diagnostics for each of the equations are reported. These are standard error of prediction in percent (GLS and WLS), the adjusted R-squared statistic in percent (WLS only), the pseudo R-squared statistics in percent (GLS only), and the standard model error in percent (GLS only). Each of the equations is statistically significant with p-values less than 0.01. The ranges of the predictor variables also are provided. These ranges can be used to assess equation applicability. The applicability of the equations for ungaged sites with basin and climate characteristics outside the range of the predictor variables is questionable.

Application and limitations of the regional regression equations exist. All of the equations reported in the figures are statistically significant and represent reasonably reliable equations that have been developed from USGS data, available sample sizes, and techniques that are within the scope of the report.

The authors have assessed each equation and assigned a qualification to each equation based on visual interpretation of the residual plots (not reported here) for each equation. For some equations the residual plots indicate that bias (as either overestimation or underestimation) could exist for some combinations of basin and climatic characteristics. Such biases are indicated by nonlinear relations in the residual plots or the presence of heteroscedasticity (nonconstant variance). The magnitude and direction of bias are difficult to systematically quantify and mitigate for each of those equations within the scope of this report. For each of the equations listed in the figures, however, the qualification provides a mechanism by which the potential for biased estimation can be communicated to practitioners.

All streamflow statistics estimated from the equations are considered to be associated with natural basin and climatic characteristics and are not representative of anthropogenically influenced conditions, such as site-specific situations involving factors like the placement or removal of a dam or substantial diversion and return flows. In general, the equations and their associated errors are most valid for ungaged watersheds with basin and climatic characteristics well within the ranges of the predictor variables for each equation. Estimates and associated errors for ungaged sites having basin or climate characteristics outside the reported range of the independent variables are less applicable and could be erroneous. As a result, consideration of these and other limitations requires substantial judgment on the part of the practitioner for reliable application of the regional equations for estimation of natural streamflow statistics in Colorado.

Acknowledgments

The authors recognize John England of the Bureau of Reclamation and William H. Asquith, Kenny Eng, Robert Jarrett, Terry Kenney, Julie Kiang, and Karen Ryberg of the USGS for providing invaluable technical guidance and review for this study and report.

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Supplemental Information

Table 4. Streamflow-gaging stations used in the development of the regional streamflow regression equations.

[Peak flow, 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year peak flow; Maximum ${}_7Q_2$, maximum 7-day, 2-year flow; Maximum ${}_7Q_{10}$, maximum 7-day, 10-year flow; Maximum ${}_7Q_{50}$, maximum 7-day, 50-year flow; Minimum ${}_7Q_2$, minimum 7-day, 2-year flow; Minimum ${}_7Q_{10}$, minimum 7-day, 10-year flow; Minimum ${}_7Q_{50}$, minimum 7-day, 50-year flow; Flow duration, 10-, 25-, 50-, 75-, and 90-percent flow duration; X, station used in the development of regional regression equation for the indicated streamflow characteristic and hydrologic region; --, station not used in the development of regional regression equation for the indicated streamflow characteristic and hydrologic region]

Station number	Station name	Hydrologic region (fig. 1)	Streamflow characteristic									
			Peak flow	Maximum			Minimum			Mean flow		Flow duration
				${}_7Q_2$	${}_7Q_{10}$	${}_7Q_{50}$	${}_7Q_2$	${}_7Q_{10}$	${}_7Q_{50}$	Annual	Monthly	
06614800	Michigan River near Cameron Pass, CO	Mountain	X	X	X	X	X	X	X	X	X	X
06616000	North Fork Michigan River near Gould, CO	Mountain	X	X	X	X	X	X	--	X	X	X
06617100	Michigan River at Walden, CO	Mountain	X	X	X	X	X	X	X	X	X	X
06618500	Illinois Creek at Walden, CO	Mountain	X	X	X	X	X	X	--	X	X	X
06619000	Michigan River near Cowdrey, CO	Mountain	X	X	X	X	X	--	--	X	X	X
06620400	Douglas Creek above Keystone, WY	Mountain	X	X	X	X		--	--	--	--	--
06621000	Douglas Creek near Foxpark, WY	Mountain	X	X	X	X	X	X	X	X	X	X
06622000	Big Creek at Big Creek Ranger Station, WY	Mountain	X	--	--	--	--	--	--	--	--	--
06622500	French Creek near French, WY	Mountain	X	X	X	X	X	X	X	X	X	X
06622700	North Brush Creek near Saratoga, WY	Mountain	X	X	X	X	X	X	X	X	X	X
06623800	Encampment River above Hog Park Creek, near Encampment, WY	Mountain	X	X	X	X	X	X	X	X	X	X
06624500	Encampment River at Encampment, WY	Mountain	X	--	--	--	--	--	--	X	X	--
06627500	Jack Creek at Matheson Ranch near Saratoga, WY	Northwest	X	--	--	--	--	--	--	X	X	--
06629100	Rattlesnake Creek near Walcott, WY	Northwest	X	--	--	--	--	--	--	--	--	--
06630800	Bear Creek near Elk Mountain, WY	Mountain	X	--	--	--	--	--	--	--	--	--
06631000	Medicine Bow River near Medicine Bow, WY	Northwest	X	--	--	--	--	--	--	X	X	--
06631100	Wagonhound Creek near Elk Mountain, WY	Mountain	X	--	--	--	--	--	--	--	--	--
06632400	Rock Creek above King Canyon Canal, near Arlington, WY	Mountain	X	X	X	X	X	X	X	X	X	X
06696980	Tarryall Creek at Upper Station near Como, CO	Mountain	X	X	X	X	--	--	--	X	X	X
06699005	Tarryall Creek below Rock Creek near Jefferson, CO	Mountain	X	--	--	--	--	--	--	--	--	--
06700500	Goose Creek above Cheesman Lake, CO	Mountain	X	--	--	--	--	--	--	--	--	--
06706000	North Fork South Platte River below Geneva Creek, at Grant, CO	Mountain	X	X	X	X	X	X	X	X	X	X
06707000	North Fork South Platte River at South Platte, CO	Plains	X	--	--	--	--	--	--	--	--	--
06709500	Plum Creek near Louviers, CO	Plains	X	--	--	--	--	--	--	--	--	--
06710385	Bear Creek above Evergreen, CO	Mountain	X	--	--	--	--	--	--	--	--	--
06710400	Cub Creek at Evergreen, CO	Mountain	X	--	--	--	--	--	--	--	--	--
06710600	Mount Vernon Creek near Morrison, CO	Plains	X	--	--	--	--	--	--	--	--	--
06710990	Parmalee Gulch at Mouth, at Indian Hills, CO	Plains	X	--	--	--	--	--	--	--	--	--
06711000	Turkey Creek near Morrison, CO	Plains	X	--	--	--	--	--	--	--	--	--
06712000	Cherry Creek near Franktown, CO	Plains	X	--	--	--	--	--	--	--	--	--
06716500	Clear Creek near Lawson, CO	Mountain	X	X	X	X	X	X	X	X	X	X
06717400	Chicago Creek below Devils Canyon near Idaho Sprgs CO	Mountain	X	X	X	X	X	X	X	X	X	X
06719500	Clear Creek near Golden, CO	Plains	X	--	--	--	--	--	--	--	--	--
06721500	North St. Vrain Creek near Allens Park, CO	Mountain	X	X	X	X	X	X	X	X	X	X
06722500	South St. Vrain Creek near Ward, CO	Mountain	X	X	X	X	X	X	X	X	X	X
06723000	Middle St. Vrain Creek near Allens Park, CO	Mountain	X	X	X	X	--	--	--	X	X	X
06725500	Middle Boulder Creek at Nederland, CO	Mountain	X	X	X	X	X	X	X	X	X	X

Table 4. Streamflow-gaging stations used in the development of the regional streamflow regression equations.—Continued

[Peak flow, 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year peak flow; Maximum $_7Q_2$, maximum 7-day, 2-year flow; Maximum $_7Q_{10}$, maximum 7-day, 10-year flow; Maximum $_7Q_{50}$, maximum 7-day, 50-year flow; Minimum $_7Q_2$, minimum 7-day, 2-year flow; Minimum $_7Q_{10}$, minimum 7-day, 10-year flow; Minimum $_7Q_{50}$, minimum 7-day, 50-year flow; Flow duration, 10-, 25-, 50-, 75-, and 90-percent flow duration; X, station used in the development of regional regression equation for the indicated streamflow characteristic and hydrologic region; --, station not used in the development of regional regression equation for the indicated streamflow characteristic and hydrologic region]

Station number	Station name	Hydrologic region (fig. 1)	Streamflow characteristic									
			Peak flow	Maximum			Minimum			Mean flow		Flow duration
				$_7Q_2$	$_7Q_{10}$	$_7Q_{50}$	$_7Q_2$	$_7Q_{10}$	$_7Q_{50}$	Annual	Monthly	
06726900	Bummers Gulch near El Vado, CO	Plains	X	--	--	--	--	--	--	--	--	--
06729000	South Boulder Creek near Rollinsville, CO	Mountain	X	X	X	X	X	X	X	X	X	X
06730300	Coal Creek near Plainview, CO	Plains	X	--	--	--	--	--	--	--	--	--
06732000	Glacier Creek near Estes Park, CO	Mountain	X	X	X	X	X	X	X	X	X	X
06739500	Buckhorn Creek near Masonville, CO	Plains	X	--	--	--	--	--	--	--	--	--
06748200	Fall Creek near Rustic, CO	Mountain	X	X	X	X	X	X	X	X	X	X
06748510	Little Beaver Creek near Idylwilde, CO	Mountain	X	X	X	X	X	X	X	X	X	X
06748530	Little Beaver Creek near Rustic, CO	Mountain	X	X	X	X	X	X	X	X	X	X
06748600	South Fork Cache La Poudre River near Rustic, CO	Mountain	X	X	X	X	X	X	X	X	X	X
06755000	South Crow Creek near Hecla, WY	Plains	X	--	--	--	--	--	--	X	X	--
06758200	Kiowa Creek at Kiowa, CO	Plains	X	--	--	--	--	--	--	--	--	--
06758250	Kiowa Creek Tributary near Bennett, CO	Plains	X	--	--	--	--	--	--	--	--	--
06758700	Middle Bijou Creek Tributary near Deer Trail, CO	Plains	X	--	--	--	--	--	--	--	--	--
06761900	Lodgepole Creek Tributary near Pine Bluffs, WY	Plains	X	--	--	--	--	--	--	--	--	--
06762500	Lodgepole Creek at Bushnell, Nebr.	Plains	X	--	--	--	--	--	--	--	--	--
06762600	Lodgepole Creek Tributary No. 2 near Albin, WY	Plains	X	--	--	--	--	--	--	--	--	--
06821300	North Fork Arikaree River Tributary near Shaw, CO	Plains	X	--	--	--	--	--	--	--	--	--
06821400	North Fork Black Wolf Creek near Vernon, CO	Plains	X	--	--	--	--	--	--	--	--	--
06823500	Buffalo Creek near Haigler, NE	Plains	X	--	--	--	--	--	--	--	--	--
06825500	Landsman Creek near Hale, CO	Plains	X	--	--	--	--	--	--	--	--	--
06844700	South Fork Sappa Creek near Brewster, KS	Plains	X	--	--	--	--	--	--	--	--	--
06844800	South Fork Sappa Creek Tributary near Goodland, KS	Plains	X	--	--	--	--	--	--	--	--	--
06858500	North Fork Smoky Hill River near Mcallaster, KS	Plains	X	--	--	--	--	--	--	--	--	--
07079500	East Fork Arkansas River near Leadville, CO	Mountain	X	X	X	X	X	X	X	X	X	X
07081000	Tennessee Creek near Leadville, CO	Mountain	X	X	X	X	X	X	X	X	X	X
07082000	Lake Fork above Sugar Loaf Reservoir, CO	Mountain	X	X	X	X	X	X	X	X	X	X
07083000	Halfmoon Creek near Malta, CO	Mountain	X	X	X	X	X	X	X	X	X	X
07089000	Cottonwood C below Hot Springs, near Buena Vista, CO	Mountain	X	--	--	--	--	--	--	--	--	--
07091000	Chalk Creek near Nathrop, CO	Mountain	X	--	--	--	--	--	--	--	--	--
07093500	South Arkansas River near Salida, CO	Mountain	X	--	--	--	--	--	--	--	--	--
07093775	Badger Creek, Lower Station, near Howard, CO	Plains	X	--	--	--	--	--	--	--	--	--
07095000	Grape Creek near Westcliffe, CO	Plains	X	--	--	--	--	--	--	--	--	--
07096500	Fourmile Creek near Canon City, CO	Plains	X	--	--	--	--	--	--	--	--	--
07099100	Beaver Creek near Portland, CO	Plains	X	--	--	--	--	--	--	--	--	--
07099230	Turkey Creek above Teller Reservoir near Stone City, CO	Plains	X	--	--	--	--	--	--	--	--	--
07105920	Little Fountain Creek above Keaton Reservoir, near Fort Carson, CO	Plains	X	--	--	--	--	--	--	--	--	--
07105945	Rock Creek above Fort Carson Reservation, CO	Plains	X	--	--	--	--	--	--	--	--	--
07107500	St. Charles River at Burnt Mill, CO	Plains	X	--	--	--	--	--	--	--	--	--

Table 4. Streamflow-gaging stations used in the development of the regional streamflow regression equations.—Continued

[Peak flow, 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year peak flow; Maximum ${}_7Q_2$, maximum 7-day, 2-year flow; Maximum ${}_7Q_{10}$, maximum 7-day, 10-year flow; Maximum ${}_7Q_{50}$, maximum 7-day, 50-year flow; Minimum ${}_7Q_2$, minimum 7-day, 2-year flow; Minimum ${}_7Q_{10}$, minimum 7-day, 10-year flow; Minimum ${}_7Q_{50}$, minimum 7-day, 50-year flow; Flow duration, 10-, 25-, 50-, 75-, and 90-percent flow duration; X, station used in the development of regional regression equation for the indicated streamflow characteristic and hydrologic region; --, station not used in the development of regional regression equation for the indicated streamflow characteristic and hydrologic region]

Station number	Station name	Hydrologic region (fig. 1)	Streamflow characteristic									
			Peak flow	Maximum			Minimum			Mean flow		Flow duration
				${}_7Q_2$	${}_7Q_{10}$	${}_7Q_{50}$	${}_7Q_2$	${}_7Q_{10}$	${}_7Q_{50}$	Annual	Monthly	
07114000	Cucharas River at Boyd Ranch, near La Veta, CO	RioGrande	X	--	--	--	--	--	--	--	--	--
07118000	Apishapa River near Aguilar, CO	Plains	X	--	--	--	--	--	--	--	--	--
07120620	Big Arroyo near Thatcher, CO	Plains	X	--	--	--	--	--	--	--	--	--
07121500	Timpas Creek at Mouth near Swink, CO	Plains	X	--	--	--	--	--	--	--	--	--
07124300	Long Canyon Creek near Madrid, CO	Plains	X	--	--	--	--	--	--	--	--	--
07125100	Frijole Creek near Alfalfa, CO	Plains	X	--	--	--	--	--	--	--	--	--
07125500	San Francisco Creek near Alfalfa, CO	Plains	X	--	--	--	--	--	--	--	--	--
07126100	Luning Arroyo near Model, CO	Plains	X	--	--	--	--	--	--	--	--	--
07126200	Van Bremer Arroyo near Model, CO	Plains	X	--	--	--	--	--	--	--	--	--
07126325	Taylor Arroyo below Rock Crossing, near Thatcher, CO	Plains	X	--	--	--	--	--	--	--	--	--
07126390	Lockwood Canyon Creek near Thatcher, CO	Plains	X	--	--	--	--	--	--	--	--	--
07126415	Red Rock Canyon Creek at Mouth near Thatcher, CO	Plains	X	--	--	--	--	--	--	--	--	--
07126470	Chacuaco Creek at Mouth near Timpas, CO	Plains	X	--	--	--	--	--	--	--	--	--
07126480	Bent Canyon Creek at Mouth near Timpas, CO	Plains	X	--	--	--	--	--	--	--	--	--
07133200	Clay Creek Tributary near Deora, CO	Plains	X	--	--	--	--	--	--	--	--	--
07138600	White Woman C Tributary near Selkirk, KS	Plains	X	--	--	--	--	--	--	--	--	--
07138650	White Woman C near Leoti, KS	Plains	X	--	--	--	--	--	--	--	--	--
07153500	Dry Cimarron R near Guy, NM	Plains	X	--	--	--	--	--	--	--	--	--
07154400	Carrizozo Creek near Kenton, OK	Plains	X	--	--	--	--	--	--	--	--	--
07154650	Tesesquite Creek near Kenton, OK	Plains	X	--	--	--	--	--	--	--	--	--
07155100	Cpld Springs Creek near Wheeless, OK	Plains	X	--	--	--	--	--	--	--	--	--
07155590	Cimarron River near Elkhart, KS	Plains	X	--	--	--	--	--	--	--	--	--
07155900	North Fork Cimarron River Tributary near Elkhart, KS	Plains	X	--	--	--	--	--	--	--	--	--
07156010	North Fork Cimarron River at Richfield, KS	Plains	X	--	--	--	--	--	--	--	--	--
07156100	Sand Arroyo Creek near Johnson, KS	Plains	X	--	--	--	--	--	--	--	--	--
07156220	Bear Creek near Johnson, KS	Plains	X	--	--	--	--	--	--	--	--	--
07156600	Cimarron River Tributary near Moscow, KS	Plains	X	--	--	--	--	--	--	--	--	--
07199000	Canadian River near Hebron, NM	Plains	X	--	--	--	--	--	--	--	--	--
07201000	Raton Creek at Raton, NM	Plains	X	--	--	--	--	--	--	--	--	--
07201200	Chicorica Cr Tributary near Raton, NM	Plains	X	--	--	--	--	--	--	--	--	--
07203000	Vermejo River near Dawson, NM	Plains	X	--	--	--	--	--	--	--	--	--
07204000	Moreno Creek at Eagle Nest, NM	RioGrande	X	--	--	--	--	--	--	--	--	--
07204500	Cieneguilla Cr near Eagle Nest, NM	RioGrande	X	--	--	--	--	--	--	--	--	--
07205000	Sixmile Creek near Eagle Nest, NM	RioGrande	X	--	--	--	--	--	--	--	--	--
07206400	Clear C near Ute Park, NM	RioGrande	X	--	--	--	--	--	--	--	--	--
07207500	Ponil Creek near Cimarron, NM	Plains	X	--	--	--	--	--	--	--	--	--
07208500	Rayado Creek near Cimarron, NM	Plains	X	--	--	--	--	--	--	--	--	--
07211000	Cimarron River at Springer, NM	Plains	X	--	--	--	--	--	--	--	--	--
07225500	Ute Creek near Gladstone, NM	Plains	X	--	--	--	--	--	--	--	--	--

Table 4. Streamflow-gaging stations used in the development of the regional streamflow regression equations.—Continued

[Peak flow, 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year peak flow; Maximum ${}_7Q_2$, maximum 7-day, 2-year flow; Maximum ${}_7Q_{10}$, maximum 7-day, 10-year flow; Maximum ${}_7Q_{50}$, maximum 7-day, 50-year flow; Minimum ${}_7Q_2$, minimum 7-day, 2-year flow; Minimum ${}_7Q_{10}$, minimum 7-day, 10-year flow; Minimum ${}_7Q_{50}$, minimum 7-day, 50-year flow; Flow duration, 10-, 25-, 50-, 75-, and 90-percent flow duration; X, station used in the development of regional regression equation for the indicated streamflow characteristic and hydrologic region; --, station not used in the development of regional regression equation for the indicated streamflow characteristic and hydrologic region]

Station number	Station name	Hydrologic region (fig. 1)	Streamflow characteristic									
			Peak flow	Maximum			Minimum			Mean flow		Flow duration
				${}_7Q_2$	${}_7Q_{10}$	${}_7Q_{50}$	${}_7Q_2$	${}_7Q_{10}$	${}_7Q_{50}$	Annual	Monthly	
07227295	Sandy Arroyo Tributary near Clayton, NM	Plains	X	--	--	--	--	--	--	--	--	--
07232500	Beaver River near Guymon, OK	Plains	X	--	--	--	--	--	--	--	--	--
07232650	Aqua Frio Creek near Felt, OK	Plains	X	--	--	--	--	--	--	--	--	--
08216500	Willow Creek at Creede, CO	RioGrande	X	X	X	X	X	X	X	X	X	X
08218500	Goose Creek at Wagonwheel Gap, CO	RioGrande	X	X	X	X	X	X	X	X	X	X
08219500	South Fork Rio Grande at South Fork, CO	RioGrande	X	X	X	X	X	X	X	X	X	X
08220500	Pinos Creek near Del Norte, CO	RioGrande	X	X	X	X	X	X	X	X	X	X
08223500	Rock Creek near Monte Vista, CO	RioGrande	X	X	X	X	X	X	X	X	X	X
08224500	Kerber Cr above Little Kerber Cr near Villa Grove, CO	RioGrande	X	X	X	X	X	X	--	X	X	X
08227000	Saguache Creek near Saguache, CO	RioGrande	X	X	X	X	X	X	X	X	X	X
08227500	North Crestone Creek near Crestone, CO	RioGrande	X	X	X	X	X	X	X	X	X	X
08230500	Carnero Creek near La Garita, CO	RioGrande	X	X	X	X	X	X	--	X	X	X
08231000	La Garita Creek near La Garita, CO	RioGrande	X	X	X	X	X	X	X	X	X	X
08236000	Alamosa River above Terrace Reservoir, CO	RioGrande	X	X	X	X	X	X	X	X	X	X
08240500	Trinchera C above Turners Ranch, Nr Ft Garland, CO	RioGrande	X	X	X	X	X	X	X	X	X	X
08241500	Sangre De Cristo Creek near Fort Garland, CO	RioGrande	X	X	X	X	X	--	--	X	X	X
08242500	Ute Creek near Fort Garland, CO	RioGrande	X	X	X	X	X	X	--	X	X	X
08245500	Conejos River at Platoro, CO	RioGrande	X	X	X	X	X	X	X	X	X	X
08246500	Conejos River near Mogote, CO	RioGrande	X	X	X	X	X	X	X	X	X	X
08247500	San Antonio River at Ortiz, CO	RioGrande	X	X	X	X	--	--	--	X	X	X
08248000	Los Pinos River near Ortiz, CO	RioGrande	X	X	X	X	X	X	X	X	X	X
08248500	San Antonio River at Mouth, near Manassa, CO	RioGrande	X	X	X	X	--	--	--	X	X	X
08252500	Costilla Creek above Costilla Dam, NM	RioGrande	X	--	--	--	--	--	--	--	X	--
08253000	Casias Creek near Costilla, NM	RioGrande	X	--	--	--	--	--	--	--	X	--
08253500	Santistevan Creek near Costilla, NM	RioGrande	X	--	--	--	--	--	--	--	X	--
08255000	Ute Creek near Amalia, NM	RioGrande	X	--	--	--	--	--	--	--	X	--
08263000	Latir Creek near Cerro, NM	RioGrande	X	--	--	--	--	--	--	X	X	X
08264000	Red River near Red River, NM	RioGrande	X	X	X	X	X	X	X	X	X	X
08265000	Red River near Questa, NM	RioGrande	X	X	X	X	X	X	X	X	X	X
08267500	Rio Hondo near Valdez, NM	RioGrande	X	X	X	X	X	X	X	X	X	X
08268500	Arroyo Hondo at Arroyo Hondo, NM	RioGrande	X	X	X	X	X	X	X	X	X	X
08269000	Rio Pueblo De Taos near Taos, NM	RioGrande	X	X	X	X	X	X	X	X	X	X
08275000	Rio Fernando De Taos near Taos, NM	RioGrande	X	X	X	X	X	X	X	X	X	X
08275500	Rio Grande Del Rancho near Talpa, NM	RioGrande	X	X	X	X	X	X	X	X	X	X
08275600	Rio Chiquito near Talpa, NM	RioGrande	X	X	X	X	X	X	X	X	X	X
08281200	Wolf Creek near Chama, NM	RioGrande	X	--	--	--	--	--	--	--	--	--
08284000	Rito De Tierra Amarilla at Tierra Amar, NM	RioGrande	X	--	--	--	--	--	--	--	--	--
08284100	Rio Chama near La Puente, NM	RioGrande	X	X	X	X	X	X	X	X	X	X
08284500	Willow Creek near Park View, NM	RioGrande	X	X	X	X	--	--	--	X	X	X

Table 4. Streamflow-gaging stations used in the development of the regional streamflow regression equations.—Continued

[Peak flow, 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year peak flow; Maximum $_{7}Q_{2}$, maximum 7-day, 2-year flow; Maximum $_{7}Q_{10}$, maximum 7-day, 10-year flow; Maximum $_{7}Q_{50}$, maximum 7-day, 50-year flow; Minimum $_{7}Q_{2}$, minimum 7-day, 2-year flow; Minimum $_{7}Q_{10}$, minimum 7-day, 10-year flow; Minimum $_{7}Q_{50}$, minimum 7-day, 50-year flow; Flow duration, 10-, 25-, 50-, 75-, and 90-percent flow duration; X, station used in the development of regional regression equation for the indicated streamflow characteristic and hydrologic region; --, station not used in the development of regional regression equation for the indicated streamflow characteristic and hydrologic region]

Station number	Station name	Hydrologic region (fig. 1)	Streamflow characteristic									
			Peak flow	Maximum			Minimum			Mean flow		Flow duration
				$_{7}Q_{2}$	$_{7}Q_{10}$	$_{7}Q_{50}$	$_{7}Q_{2}$	$_{7}Q_{10}$	$_{7}Q_{50}$	Annual	Monthly	
08286650	Canjilon Creek above Abiquiu Reservoir, NM	RioGrande	X	--	--	--	--	--	--	--	--	--
08288000	El Rito near El Rito, NM	RioGrande	X	X	X	X	X	X	X	X	X	X
08289000	Rio Ojo Caliente at La Madera, NM	RioGrande	X	X	X	X	X	X	X	X	X	X
09012500	North Inlet at Grand Lake, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09016500	Arapaho Creek at Monarch Lake Outlet, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09020000	Willow Creek near Granby, CO	Mountain	X	X	X	X	--	--	--	X	X	X
09024000	Fraser River at Winter Park, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09026500	St. Louis Creek near Fraser, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09032000	Ranch Creek near Fraser, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09032500	Ranch Creek near Tabernash, CO	Mountain	X	X	X	X	X	X	--	X	X	X
09033000	Meadow Creek near Tabernash, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09033500	Strawberry Creek near Granby, CO	Mountain	X	X	X	X	X	--	--	X	X	X
09034000	Fraser River at Granby, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09034500	Colorado River at Hot Sulphur Springs, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09034900	Bobtail Creek near Jones Pass, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09035500	Williams Fork below Steelman Creek, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09035700	Williams Fork above Darling Creek, Nr Leal, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09035800	Darling Creek near Leal, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09035900	South Fork of Williams Fork near Leal, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09036500	Keyser Creek near Leal, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09039000	Troublesome Creek near Pearmont, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09040000	East Fork Troublesome Creek near Troublesome, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09041100	Antelope Creek near Kremmling, CO	Mountain	X	X	X	X	X	X	--	X	X	X
09046530	French Gulch at Breckenridge, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09047000	Blue River at Dillon, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09047500	Snake River near Montezuma, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09047700	Keystone Gulch near Dillon, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09050100	Ten Mile Creek below North Ten Mile Creek, at Frisco, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09052400	Boulder Creek at Upper Station, near Dillon, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09052800	Slate Creek at Upper Station, near Dillon, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09055000	Otter Creek above Green Mountain Reservoir, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09058610	Dickson Creek near Vail, CO	Mountain	X	X	X	X	X	--	--	X	X	X
09058700	Freeman Creek near Minturn, CO	Mountain	X	X	X	X	X	--	--	X	X	X
09058800	East Meadow Creek near Minturn CO	Mountain	X	X	X	X	X	X	X	X	X	X
09059500	Piney River near State Bridge, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09060500	Rock Creek near Toponas, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09063200	Wearyman Creek near Red Cliff, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09063400	Turkey Creek near Red Cliff, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09064500	Homestake Creek near Red Cliff, CO	Mountain	X	X	X	X	X	X	X	X	X	X

Table 4. Streamflow-gaging stations used in the development of the regional streamflow regression equations.—Continued

[Peak flow, 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year peak flow; Maximum ${}_7Q_2$, maximum 7-day, 2-year flow; Maximum ${}_7Q_{10}$, maximum 7-day, 10-year flow; Maximum ${}_7Q_{50}$, maximum 7-day, 50-year flow; Minimum ${}_7Q_2$, minimum 7-day, 2-year flow; Minimum ${}_7Q_{10}$, minimum 7-day, 10-year flow; Minimum ${}_7Q_{50}$, minimum 7-day, 50-year flow; Flow duration, 10-, 25-, 50-, 75-, and 90-percent flow duration; X, station used in the development of regional regression equation for the indicated streamflow characteristic and hydrologic region; --, station not used in the development of regional regression equation for the indicated streamflow characteristic and hydrologic region]

Station number	Station name	Hydrologic region (fig. 1)	Streamflow characteristic									
			Peak flow	Maximum			Minimum			Mean flow		Flow duration
				${}_7Q_2$	${}_7Q_{10}$	${}_7Q_{50}$	${}_7Q_2$	${}_7Q_{10}$	${}_7Q_{50}$	Annual	Monthly	
09065100	Cross Creek near Minturn, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09065500	Gore Creek at Upper Station, near Minturn, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09066000	Black Gore Creek near Minturn, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09066100	Bighorn Creek near Minturn, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09066150	Pitkin Creek near Minturn, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09066200	Booth Creek near Minturn, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09066300	Middle Creek near Minturn, CO	Mountain	X	X	X	X	X	X		X	X	X
09066400	Red Sandstone Creek near Minturn, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09066500	Gore Creek near Minturn, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09067005	Eagle River at Avon, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09068000	Brush Creek near Eagle, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09069500	Gypsum Creek near Gypsum, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09070000	Eagle River below Gypsum, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09071300	Grizzly Creek near Glenwood Springs, CO	Mountain	X	X	X	X	X	--	--	X	X	X
09073500	Roaring Fork River at Aspen, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09073700	Hunter Creek above Midway Creek, near Aspen, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09073800	Midway Creek near Aspen, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09073900	No Name Creek near Aspen, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09074000	Hunter Creek near Aspen, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09074800	Castle Creek Above Aspen, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09075700	Maroon Creek Above Aspen, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09077200	Fryingpan River near Ivanhoe Lake, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09077800	South Fork Fryingpan River at Upper Station, near Norrie, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09078000	Fryingpan River at Norrie, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09078100	North Fork Fryingpan River above Cunningham C, near Norrie, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09078200	Cunningham Creek near Norrie, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09078500	North Fork Fryingpan River near Norrie, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09080300	Rocky Fork Creek near Meredith, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09081600	Crystal River above Avalanche Creek, near Redstone, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09082800	North Thompson Creek near Carbondale, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09083000	Thompson Creek near Carbondale, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09084000	Cattle Creek near Carbondale, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09085200	Canyon Creek above New Castle, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09085300	East Canyon Creek near New Castle, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09085400	Possum Creek near New Castle, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09089500	West Divide Creek near Raven, CO	Mountain	X	X	X	X	X	--	--	X	X	X
09091100	Mamm Creek near Silt, CO	Northwest	X	--	--	--	--	--	--	--	--	--
09091500	East Rifle Creek near Rifle, CO	Northwest	X	X	X	X	X	X	X	X	X	X

Table 4. Streamflow-gaging stations used in the development of the regional streamflow regression equations.—Continued

[Peak flow, 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year peak flow; Maximum $_7Q_2$, maximum 7-day, 2-year flow; Maximum $_7Q_{10}$, maximum 7-day, 10-year flow; Maximum $_7Q_{50}$, maximum 7-day, 50-year flow; Minimum $_7Q_2$, minimum 7-day, 2-year flow; Minimum $_7Q_{10}$, minimum 7-day, 10-year flow; Minimum $_7Q_{50}$, minimum 7-day, 50-year flow; Flow duration, 10-, 25-, 50-, 75-, and 90-percent flow duration; X, station used in the development of regional regression equation for the indicated streamflow characteristic and hydrologic region; --, station not used in the development of regional regression equation for the indicated streamflow characteristic and hydrologic region]

Station number	Station name	Hydrologic region (fig. 1)	Streamflow characteristic									
			Peak flow	Maximum			Minimum			Mean flow		Flow duration
				$_7Q_2$	$_7Q_{10}$	$_7Q_{50}$	$_7Q_2$	$_7Q_{10}$	$_7Q_{50}$	Annual	Monthly	
09092000	Rifle Creek near Rifle, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09092500	Beaver Creek near Rifle, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09093000	Parachute Creek near Parachute CO	Northwest	X	X	X	X	X	--	--	X	X	X
09095000	Roan Creek near De Beque, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09096000	Plateau Creek at Upper Station, near Collbran, CO	Mountain	X	X	X	X	X	X	--	X	X	X
09096500	Plateau Creek near Collbran, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09096800	Buzzard Creek below Owens Creek, near Heiberger, CO	Mountain	X	X	X	X	--	--	--	X	X	X
09097500	Buzzard Creek near Collbran, CO	Mountain	X	X	X	X	X	X	--	X	X	X
09097600	Brush Creek near Collbran, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09104500	Mesa Creek near Mesa, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09107000	Taylor River at Taylor Park, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09110000	Taylor River at Almont, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09110500	East River near Crested Butte, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09111500	Slate River near Crested Butte, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09112000	Cement Creek near Crested Butte, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09112500	East River at Almont CO	Mountain	X	X	X	X	X	X	X	X	X	X
09113300	Ohio Creek at Baldwin, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09113500	Ohio Creek near Baldwin, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09114500	Gunnison River near Gunnison, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09115500	Tomichi Creek at Sargents, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09117000	Tomichi Creek at Parlin, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09118000	Quartz Creek near Ohio City, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09119000	Tomichi Creek at Gunnison, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09122000	Cebolla Creek at Powderhorn, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09122500	Soap Creek near Sapinero, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09123500	Lake Fork at Lake City, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09124500	Lake Fork at Gateview, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09125000	Curecanti Creek near Sapinero, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09126000	Cimarron River near Cimarron, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09127500	Crystal Creek near Maher, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09128500	Smith Fork near Crawford, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09130500	East Muddy Creek near Bardine, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09130600	West Muddy Creek near Ragged Mountain, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09132500	North Fork Gunnison River near Somerset, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09132900	West Hubbard Creek near Paonia, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09134500	Leroux Creek near Cedaredge, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09136200	Gunnison River near Lazear, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09137800	Dirty George Creek near Grand Mesa, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09139200	Ward Creek near Grand Mesa, CO	Mountain	X	X	X	X	X	X	X	X	X	X

Table 4. Streamflow-gaging stations used in the development of the regional streamflow regression equations.—Continued

[Peak flow, 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year peak flow; Maximum $_7Q_2$, maximum 7-day, 2-year flow; Maximum $_7Q_{10}$, maximum 7-day, 10-year flow; Maximum $_7Q_{50}$, maximum 7-day, 50-year flow; Minimum $_7Q_2$, minimum 7-day, 2-year flow; Minimum $_7Q_{10}$, minimum 7-day, 10-year flow; Minimum $_7Q_{50}$, minimum 7-day, 50-year flow; Flow duration, 10-, 25-, 50-, 75-, and 90-percent flow duration; X, station used in the development of regional regression equation for the indicated streamflow characteristic and hydrologic region; --, station not used in the development of regional regression equation for the indicated streamflow characteristic and hydrologic region]

Station number	Station name	Hydrologic region (fig. 1)	Streamflow characteristic									
			Peak flow	Maximum			Minimum			Mean flow		Flow duration
				$_7Q_2$	$_7Q_{10}$	$_7Q_{50}$	$_7Q_2$	$_7Q_{10}$	$_7Q_{50}$	Annual	Monthly	
09140200	Kiser Creek near Grand Mesa, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09141200	Youngs Creek near Grand Mesa, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09143500	Surface Creek at Cedaredge, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09144200	Tongue Creek at Cory, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09146000	Uncompahgre River below Ouray, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09146400	West Fork Dallas Creek near Ridgway, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09146500	East Fork Dallas Creek near Ridgway, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09146600	Pleasant Valley Creek near Noel, CO	Southwest	X	X	X	X	X	X		X	X	X
09147000	Dallas Creek near Ridgway, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09147100	Cow Creek near Ridgway, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09149450	Dry Creek near Olathe, CO	Northwest	X	--	--	--	--	--	--	--	--	--
09150500	Roubideau Creek at Mouth, near Delta, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09153400	West Salt Creek near Mack, CO	Northwest	X	X	X	X	--	--	--	X	X	X
09163700	Cisco Wash near Cisco, UT	Southwest	X				--	--	--			
09165000	Dolores River below Rico, CO	Southwest	X	X	X	X	--	--	--	X	X	X
09166500	Dolores River at Dolores, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09168100	Disappointment Creek near Dove Creek, CO	Southwest	X	X	X	X	X	--	--	X	X	X
09168700	Disappointment Creek Tributary near Slick Rock, CO	Southwest	X	--	--	--	--	--	--	--	--	--
09169500	Dolores River at Bedrock, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09172000	Fall Creek near Fall Creek, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09172500	San Miguel River near Placerville, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09174500	Cottonwood Creek near Nucla, CO	Southwest	X	X	X	X		--	--	X	X	X
09175000	West Naturita Creek near Norwood, CO	Southwest	X	X	X	X	X	--	--	X	X	X
09175500	San Miguel River at Naturita, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09177500	Taylor Creek near Gateway, CO	Southwest	X	--	--	--	--	--	--	--	--	--
09181000	Onion Creek near Moab, UT	Southwest	X	X	X	X	X	X	X	X	X	X
09182000	Castle Creek above Diversions, near Moab, UT	Southwest	X	X	X	X	X	--	--	X	X	X
09182600	Salt Wash near Thompson, UT	Southwest	X	--	--	--	--	--	--	--	--	--
09183000	Courthouse Wash near Moab, UT	Southwest	X	X	X	X	X	--	--	X	X	X
09184000	Mill Creek near Moab, UT	Southwest	X	X	X	X	X	X	X	X	X	X
09185200	Kane Springs Canyon near Moab, UT	Southwest	X	--	--	--	--	--	--	--	--	--
09185500	Hatch Wash near La Sal, UT	Southwest	X	X	X	X	--	--	--	X	X	X
09187000	Cottonwood Creek near Monticello, UT	Southwest	X	X	X	X	--	--	--	X	X	X
09216400	Greasewood Canyon near Green River, WY	Northwest	X	--	--	--	--	--	--	--	--	--
09216537	Delaney Draw near Red Desert, WY	Northwest	X	--	--	--	--	--	--	--	--	--
09216550	Deadman Wash near Point of Rocks, WY	Northwest	X	--	--	--	--	--	--	--	--	--
09216600	Cutthroat Draw near Rock Springs, WY	Northwest	X	--	--	--	--	--	--	--	--	--
09216700	Salt Wells Creek near Rock Springs, WY	Northwest	X	--	--	--	--	--	--	--	--	--
09216900	Bitter Cr Tributary near Green River WY	Northwest	X	--	--	--	--	--	--	--	--	--

Table 4. Streamflow-gaging stations used in the development of the regional streamflow regression equations.—Continued

[Peak flow, 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year peak flow; Maximum ${}_7Q_2$, maximum 7-day, 2-year flow; Maximum ${}_7Q_{10}$, maximum 7-day, 10-year flow; Maximum ${}_7Q_{50}$, maximum 7-day, 50-year flow; Minimum ${}_7Q_2$, minimum 7-day, 2-year flow; Minimum ${}_7Q_{10}$, minimum 7-day, 10-year flow; Minimum ${}_7Q_{50}$, minimum 7-day, 50-year flow; Flow duration, 10-, 25-, 50-, 75-, and 90-percent flow duration; X, station used in the development of regional regression equation for the indicated streamflow characteristic and hydrologic region; --, station not used in the development of regional regression equation for the indicated streamflow characteristic and hydrologic region]

Station number	Station name	Hydrologic region (fig. 1)	Streamflow characteristic									
			Peak flow	Maximum			Minimum			Mean flow		Flow duration
				${}_7Q_2$	${}_7Q_{10}$	${}_7Q_{50}$	${}_7Q_2$	${}_7Q_{10}$	${}_7Q_{50}$	Annual	Monthly	
09224810	Blacks Fork Tributary No 2 near Green River, WY	Northwest	X	--	--	--	--	--	--	--	--	--
09224820	Blacks Fork Tributary No 3 near Green River, WY	Northwest	X	--	--	--	--	--	--	--	--	--
09224840	Blacks Fork Tributary No 4 near Green River, WY	Northwest	X	--	--	--	--	--	--	--	--	--
09224980	Summers Dry Creek near Green River, WY	Northwest	X	--	--	--	--	--	--	--	--	--
09225200	Squaw Hollow near Burntfork, WY	Northwest	X	--	--	--	--	--	--	--	--	--
09225300	Green River Tributary No 2 near Burntfork, WY	Northwest	X	--	--	--	--	--	--	--	--	--
09229450	Henrys Fork Tributary near Manila, UT	Northwest	X	--	--	--	--	--	--	--	--	--
09235600	Pot Creek Above Diversions, near Vernal, UT	Northwest	X	X	X	X	--	--	--	X	X	X
09238500	Walton Creek near Steamboat Springs, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09239500	Yampa River at Steamboat Springs, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09241000	Elk River at Clark, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09244100	Fish Creek near Milner, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09245000	Elkhead Creek near Elkhead, CO	Northwest	X	X	X	X	X	X	--	X	X	X
09245500	North Fork Elkhead Creek near Elkhead, CO	Northwest	X	X	X	X	X	--	--	X	X	X
09249000	East Fork Williams Fork near Pagoda, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09250000	Milk Creek near Thornburgh, CO	Northwest	X	--	--	--	--	--	--	--	--	--
09251500	Middle Fork Little Snake River near Battle Creek, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09251800	North Fork Little Snake River near Encampment, WY	Northwest	X	X	X	X	X	X	X	X	X	X
09253000	Little Snake River near Slater, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09253400	Battle Creek near Encampment, WY	Northwest	X	X	X	X	X	X	X	--	--	--
09255000	Slater Fork near Slater, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09256000	Savery Creek near Savery, WY	Northwest	X	X	X	X	X	X	--	X	X	X
09257000	Little Snake River near Dixon, WY	Northwest	X	X	X	X	X	X	X	X	X	X
09257500	Willow Creek near Baggs, WY	Northwest	X	--	--	--	--	--	--	--	--	--
09258000	Willow Creek near Dixon, WY	Northwest	X	X	X	X	X	X	--	X	X	X
09258200	Dry Cow Creek near Baggs, WY	Northwest	X	--	--	--	--	--	--	--	--	--
09258900	Muddy Creek above Baggs, WY	Northwest	X	--	--	--	--	--	--	--	--	--
09259500	Fourmile Creek near Baggs, WY	Northwest	X	--	--	--	--	--	--	--	--	--
09260000	Little Snake River near Lily, CO	Northwest	X	X	X	X	X	--	--	X	X	X
09263700	Cliff Creek near Jensen, UT	Northwest	X	--	--	--	--	--	--	--	--	--
09263800	Cow Wash near Jensen, UT	Northwest	X	--	--	--	--	--	--	--	--	--
09264000	Ashley C Below Trout C near Vernal, UT	Northwest	X	X	X	X	X	X	X	X	X	X
09264500	South Fork Ashley Creek nearVernal, UT	Northwest	X	X	X	X	X	X	X	X	X	X
09266500	Ashley Creek near Vernal, UT	Northwest	X	X	X	X	X	X	X	X	X	X
09268000	Dry Fork Above Sinks, near Dry Fork, UT	Northwest	X	X	X	X	X	X	X	X	X	X
09268500	North Fork Of Dry Fork near Dry Fork, UT	Northwest	X	X	X	X	X	X	X	X	X	X
09268900	Brownie Canyon Above Sinks, near Dry Fork, UT	Northwest	X	X	X	X	X	X	X	X	X	X
09269000	East Fork Of Dry Fork near Dry Fork, UT	Northwest	X	X	X	X	--	--	--	X	X	X
09270500	Dry Fork at Mouth near Dry Fork, UT	Northwest	X	X	X	X	X	--	--	X	X	X

Table 4. Streamflow-gaging stations used in the development of the regional streamflow regression equations.—Continued

[Peak flow, 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year peak flow; Maximum $_7Q_2$, maximum 7-day, 2-year flow; Maximum $_7Q_{10}$, maximum 7-day, 10-year flow; Maximum $_7Q_{50}$, maximum 7-day, 50-year flow; Minimum $_7Q_2$, minimum 7-day, 2-year flow; Minimum $_7Q_{10}$, minimum 7-day, 10-year flow; Minimum $_7Q_{50}$, minimum 7-day, 50-year flow; Flow duration, 10-, 25-, 50-, 75-, and 90-percent flow duration; X, station used in the development of regional regression equation for the indicated streamflow characteristic and hydrologic region; --, station not used in the development of regional regression equation for the indicated streamflow characteristic and hydrologic region]

Station number	Station name	Hydrologic region (fig. 1)	Streamflow characteristic									
			Peak flow	Maximum			Minimum			Mean flow		Flow duration
				$_7Q_2$	$_7Q_{10}$	$_7Q_{50}$	$_7Q_2$	$_7Q_{10}$	$_7Q_{50}$	Annual	Monthly	
09271800	Halfway Hollow Tributary near Lapoint, UT	Northwest	X	--	--	--	--	--	--	--	--	--
09300500	Uintah River at Fort Duchesne, UT	Northwest	X	X	X	X	X	X	--	X	X	X
09302450	Lost Creek near Buford, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09302500	Marvine Creek near Buford, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09303000	North Fork White River at Buford, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09303300	South Fork White River at Budges Resort, CO	Mountain	X	X	X	X	X	X	X	X	X	X
09303320	Wagonwheel Creek at Budges Resort, CO	Mountain	X	X	X	X	--	--	--	X	X	X
09304000	South Fork White River at Buford, CO	Northwest	X	X	X	X	--	--	--	X	X	X
09304500	White River near Meeker, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09306007	Piceance Creek below Rio Blanco, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09306036	Sorghum Gulch at mouth, near Rio Blanco, CO	Northwest	X	--	--	--	--	--	--	--	--	X
09306039	Cottonwood Gulch near Rio Blanco, CO	Northwest	X	--	--	--	--	--	--	--	--	X
09306042	Piceance Creek Tributary near Rio Blanco, CO	Northwest	X	--	--	--	--	--	--	--	X	X
09306052	Scandard Gulch at Mouth, near Rio Blanco, CO	Northwest	X	--	--	--	--	--	--	--	X	X
09306058	Willow Creek near Rio Blanco, CO	Northwest	X	X	X	X	--	--	--	X	X	X
09306200	Piceance Creek below Ryan Gulch, near Rio Blanco, CO	Northwest	X	X	X	X	X	X	X	X	X	X
09306240	Box Elder Gulch near Rangely, CO	Northwest	X	X	X	X	--	--	--	X		X
09306242	Corral Gulch near Rangely, CO	Northwest	X	X	X	X	--	--	--	X	X	X
09306255	Yellow Creek near White River, CO	Northwest	X	X	X	X	X	X	--	X	X	X
09306800	Bitter Creek near Bonanza, UT	Northwest	X	X	X	X	--	--	--	X	X	X
09307500	Willow Creek above Diversions near Ouray, UT	Northwest	X	X	X	X	X	X	X	X	X	X
09308000	Willow Creek near Ouray, UT	Northwest	X	X	X	X	X	--	--	X	X	X
09328900	Cresent Wash near Cresent Junction, UT	Southwest	X	--	--	--	--	--	--	--	--	--
09339900	East Fork San Juan River above Sand Creek, near Pagosa Springs, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09340000	East Fork San Juan River near Pagosa Springs, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09340500	West Fork San Juan River above Borns Lake, near Pagosa Springs, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09341500	West Fork San Juan River near Pagosa Springs, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09342000	Turkey Creek near Pagosa Springs, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09342500	San Juan River at Pagosa Springs, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09343000	Rio Blanco near Pagosa Springs, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09343500	Rito Blanco near Pagosa Springs, CO	Southwest	X	X	X	X	X	--	--	X	X	X
09344000	Navajo River at Banded Peak Ranch, near Chromo, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09345200	Little Navajo River Below Lake Oso Diversion Dam, near Chromo, CO	Southwest	X	X	X	X	X	X	--	X	X	X
09346000	Navajo River at Edith, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09346200	Rio Amargo at Dulce, NM	Southwest	X	--	--	--	--	--	--	--	--	--
09347500	Piedra R at Bridge Ranger Station, near Pagosa Spgs, CO	Southwest	X	X	X	X	X	X	X	X	X	X

Table 4. Streamflow-gaging stations used in the development of the regional streamflow regression equations.—Continued

[Peak flow, 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year peak flow; Maximum ${}_7Q_2$, maximum 7-day, 2-year flow; Maximum ${}_7Q_{10}$, maximum 7-day, 10-year flow; Maximum ${}_7Q_{50}$, maximum 7-day, 50-year flow; Minimum ${}_7Q_2$, minimum 7-day, 2-year flow; Minimum ${}_7Q_{10}$, minimum 7-day, 10-year flow; Minimum ${}_7Q_{50}$, minimum 7-day, 50-year flow; Flow duration, 10-, 25-, 50-, 75-, and 90-percent flow duration; X, station used in the development of regional regression equation for the indicated streamflow characteristic and hydrologic region; --, station not used in the development of regional regression equation for the indicated streamflow characteristic and hydrologic region]

Station number	Station name	Hydrologic region (fig. 1)	Streamflow characteristic									
			Peak flow	Maximum			Minimum			Mean flow		Flow duration
				${}_7Q_2$	${}_7Q_{10}$	${}_7Q_{50}$	${}_7Q_2$	${}_7Q_{10}$	${}_7Q_{50}$	Annual	Monthly	
09349800	Piedra River near Arboles, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09350800	Vaqueros Canyon near Gobernador, NM	Southwest	X	--	--	--	--	--	--	--	--	--
09352900	Vallecito Creek near Bayfield, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09355000	Spring Creek at La Boca, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09357200	Gallegos Canyon Tributary near Nageezi, NM	Southwest	X	--	--	--	--	--	--	--	--	--
09357230	West Draw near Farmington, NM	Southwest	X	--	--	--	--	--	--	--	--	--
09357500	Animas River at Howardsville, CO	Southwest	X	X	X	X	--	--	--	X	X	X
09358550	Cement Creek at Silverton, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09359000	Mineral Creek near Silverton, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09361000	Hermosa Creek near Hermosa, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09361400	Junction Creek near Durango, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09361500	Animas River at Durango, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09362000	Lightner Creek near Durango, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09363000	Florida River near Durango, CO	Southwest	X	X	X	X	X	X	--	X	X	X
09363100	Salt Creek near Oxford, CO	Southwest	X	X	X	X	X	--	--	X	X	X
09365500	La Plata River at Hesperus, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09366000	Cherry Creek near Red Mesa, CO	Southwest	X	X	X	X	--	--	--	X	X	X
09366500	La Plata River at CO-NM State Line	Southwest	X	X	X	X	X	--	--	X	X	X
09367400	La Plata River Tributary near Farmington, NM	Southwest	X	--	--	--	--	--	--	--	X	X
09367530	Locke Arroyo near Kirtland, NM	Southwest	X	--	--	--	--	--	--	--	--	--
09367550	Stevens Arroyo near Kirtland, NM	Southwest	X	--	--	--	--	--	--	--	--	--
09367561	Shumway Arroyo near Waterflow, NM	Southwest	X	X	X	X	--	--	--	X	X	X
09367950	Chaco River near Waterflow , NM	Southwest	X	X	X	X	--	--	--	X	X	X
09367980	Rattlesnake Arroyo near Shiprock, NM	Southwest	X	--	--	--	--	--	--	--	--	--
09368020	Malpais Arroyo near Shiprock, NM	Southwest	X	--	--	--	--	--	--	--	--	--
09368500	West Mancos River near Mancos, CO	Southwest	X	X	X	X	X	X	X	X	X	X
09369000	East Mancos River near Mancos, CO	Southwest	X	X	X	X	X	X	--	--	--	--
09369500	Middle Mancos River near Mancos, CO	Southwest	X	X	X	X	X	--	--	X	X	X
09371000	Mancos River near Towaoc, CO	Southwest	X	X	X	X	--	--	--	X	X	X
09371300	Mcelmo Creek Tributary near Cortez, CO	Southwest	X	--	--	--	--	--	--	--	--	--
09372000	Mcelmo Creek near CO-UT State Line	Southwest	X	X	X	X	X	X	X	X	X	X
09378170	South Creek Above Reservoir near Monticello, UT	Southwest	X	X	X	X	X	--	--	X	X	X
09378630	Recapture Creek near Blanding, UT	Southwest	X	X	X	X	--	--	--		X	X
09378650	Recapture Creek below Johnson Creek near Blanding, UT	Southwest	X	X	X	X	--	--	--	X	X	X
09378700	Cottonwood Wash near Blanding, UT	Southwest	X	X	X	X	--	--	--	X	X	X
09379000	Cob Wash near Bluff, UT	Southwest	X	X	X	X	--	--	--	X	X	X
09379030	Black Mountain Wash near Chinle, AZ	Southwest	X	--	--	--	--	--	--	--	--	X
09379060	Lukachukai Creek Tributary near Lukachukai, AZ	Southwest	X	--	--	--	--	--	--	--	--	X
09379300	Lime Creek near Mexican Hat, UT	Southwest	X	--	--	--	--	--	--	--	--	X

Publishing support provided by:
Denver Publishing Service Center, Denver, Colorado
Manuscript approved for publication, June 17, 2009
Edited by Mary Kidd
Graphics and layout by Joy Monson

For more information concerning this publication, contact:
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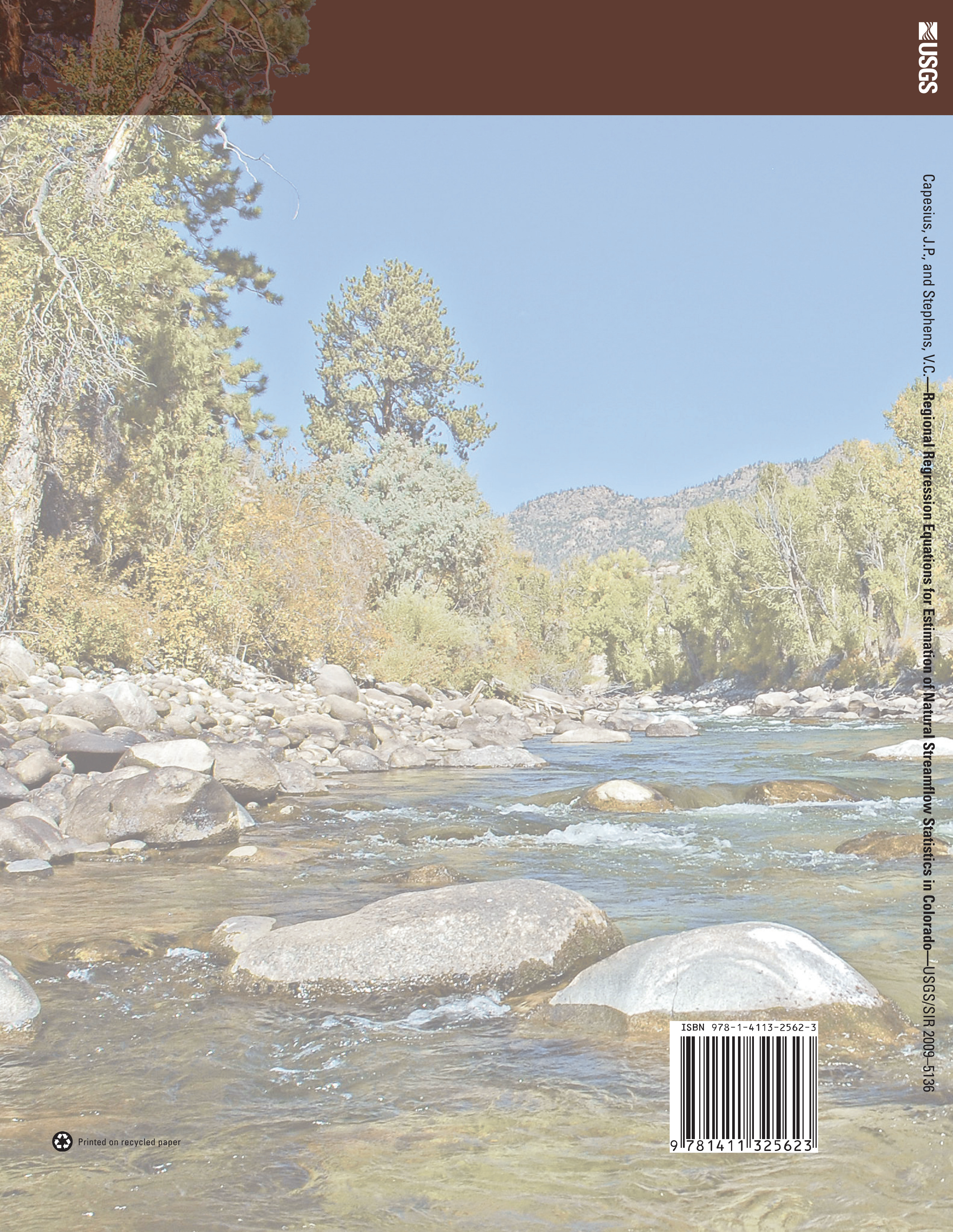
Or visit the Colorado Water Science Center Web site at:
http://co.water.usgs.gov/

This publication is available online at:
http://pubs.usgs.gov/sir/2009/5136/



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Capesius, J.P., and Stephens, V.C.—**Regional Regression Equations for Estimation of Natural Streamflow Statistics in Colorado**—USGS/SIR 2009–5136

ISBN 978-1-4113-2562-3

9 781411 325623

Printed on recycled paper