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MAGNITUDE AND FREQUENCY OF FLOODS IN NORTH CAROLINA

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Multiple regression techniques are used to define the relation between flood peaks and seven basin and climatic variables. Drainage area is the most significant. Inclusion of the other six variables reduced the standard error of estimate less than 4 percent. Regression equations gave consistently different results for stations in the Coastal Plain than for stations in the mountains and Piedmont. Accordingly, stations were divided into two groups and estimating equations were developed for each geographic area.

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MAGNITUDE AND FREQUENCY OF FLOODS IN NORTH CAROLINA

TECHNIQUE FOR ESTIMATING THE MAGNITUDE AND FREQUENCY OF FLOODS ON NATURAL STREAMS IN NORTH CAROLINA

BY

N. M. JACKSON, JR.

U. S. GEOLOGICAL SURVEY

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For Additional Information Write to:

U. S. Geological Survey
Post Office Box 2857
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March 1976

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The following factors may be used to convert the English units published herein to the International System of Units (SI).

English units	Multiply by	To obtain SI units
inches (in.)	25.4	millimetres (mm)
feet (ft)	.305	metres (m)
miles (mi)	1.61	kilometres (km)
feet per mile (ft/mi)	.189	metres per kilometres (m/km)
square miles (mi^2)	2.59	square kilometres (km^2)
cubic feet per second (ft^3/s)	.028	cubic metres per second (m^3/s)

MAGNITUDE AND FREQUENCY OF FLOODS IN NORTH CAROLINA

By N. M. Jackson, Jr.

ABSTRACT

Methods are provided to estimate the magnitude and frequency of floods on natural North Carolina streams with drainage areas greater than 0.5 square mile (1.3 square kilometres). For 257 gaged sites, the magnitudes of floods having recurrence intervals from 2 to 100 years are provided in tables. For ungaged sites, equations, graphs, and map are presented that allow estimation of flood magnitudes.

Multiple regression techniques were used to define the relation between flood peaks and seven basin and climatic variables. Drainage area is the most significant. Inclusion of the other six variables reduced the standard error of estimate less than 4 percent. Regression equations gave consistently different results for stations in the Coastal Plain than for stations in the mountains and Piedmont. Accordingly, stations were divided into two groups and estimating equations were developed for each geographic area.

INTRODUCTION

Information on the magnitude and frequency of floods that are likely to occur serves both economic and engineering needs in developments along streams and rivers. It is an important criterion in bridge and culvert design, serves as a basis for flood-plain regulation and establishment of equitable flood-insurance rates, and is useful in the design of flood-control and drainage structures. The purpose of this report is to present and illustrate a method for estimating the magnitude of floods with recurrence intervals up to 100 years at gaged and ungaged sites on natural streams in North Carolina.

Three previous reports by Speer and Gamble (1964a, 1964b, 1965) each covering a portion of North Carolina, have presented methods for estimating flood magnitudes for various recurrence intervals. However, each of these methods was developed from data on large streams and are applicable only to streams draining more than about 150 mi^2 (388 km^2). Beginning in 1952, 120 crest-stage stations were established to gage peak flow from drainage basins generally smaller than 50 mi^2 (130 km^2), and records collected from these stations through 1963 were used by Hinson (1965) to fill the urgent need for flood-frequency relations for drainage basins with less than 150 mi^2 (388 km^2). Ten additionsl years of annual peak-flow data have been collected at most stations since the previous studies, and flood-frequency relations, especially for drainage basins with less than 50 mi^2 (130 km^2), are better defined. Generally, the equations herein are applicable to all natural streams in North Carolina except as noted in the section on Limitations and Accuracy.

In a previous study, Putnam (1972) developed equations for estimating the discharge of floods having recurrence intervals up to 100 years for drainage basins in the Piedmont in various degrees of urban and suburban development. Putnam's equations are recommended for estimating flood discharges of urban streams in the Piedmont because, presently, they are the best method available.

This report is divided into two sections; the first section includes and illustrates the use of graphs, equations, map, and tables developed to estimate the magnitude and frequency of floods on unregulated streams in North Carolina. The second section is a description of the analytical techniques used in the study. The first section is intended to serve as a user manual while the second section is for those interested in the details of the study.

ESTIMATING PROCEDURE

Gaged Streams

The best estimates of future flood magnitude generally are obtained from a frequency analysis of gage records. Estimated peak discharges at 257 stream sites for recurrence intervals up to 100 years, depending on the length of record available, as determined by the following criteria,

Recurrence interval, years	10	25	50	100
Minimum length of record, years	10	15	20	25

are given in table 2. Gage sites where at least 10 years of record are available for frequency analysis are shown on the maps in figures 1a-2b.

If flood frequency information is needed at or near one of the gaged points on the same stream, values from table 2 should be used. For sites between gages on the Neuse, Tar, Cape Fear, and French Broad Rivers, it is recommended that flood estimates be made by interpolation between gages.

Ungaged Streams

For ungaged sites, peak discharges P_2, P_5, P_{10}, P_{25}, P_{50}, and P_{100} in cubic feet per second for recurrence intervals of 2, 5, 10, 25, 50, and 100 years, respectively, can be estimated using the following equations.

For sites in the mountains and Piedmont or west of the line shown in figures 2a, 2b use:

$$P_2 = 133A^{.706} \quad (1)$$
$$P_5 = 230A^{.685} \quad (2)$$
$$P_{10} = 313A^{.673} \quad (3)$$
$$P_{25} = 442A^{.659} \quad (4)$$
$$P_{50} = 555A^{.649} \quad (5)$$
$$P_{100} = 698A^{.638} \quad (6)$$

where,

A is drainage area in square miles.

For sites in the Coastal Plain or east of the line in figures 2a, 2b use:

$$P_2 = 59.3A^{.664} \quad (7)$$
$$P_5 = 122A^{.622} \quad (8)$$
$$P_{10} = 189A^{.596} \quad (9)$$
$$P_{25} = 313A^{.567} \quad (10)$$
$$P_{50} \quad 442A^{.547} \quad (11)$$
$$P_{100} = 610A^{.520} \quad (12)$$

where,

A is drainage area in square miles.

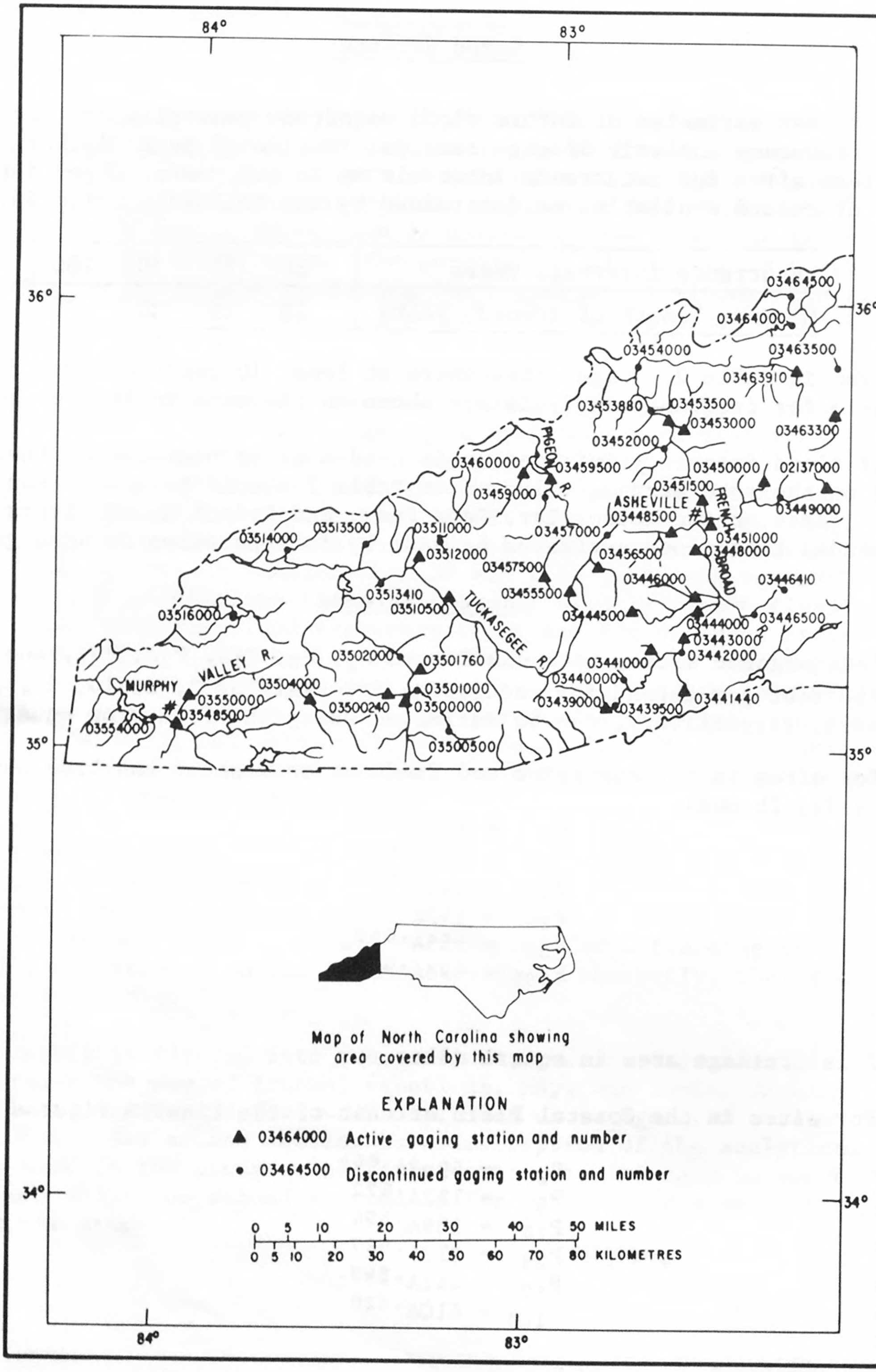

Figure 1a.--Location of gaging stations in western North Carolina.

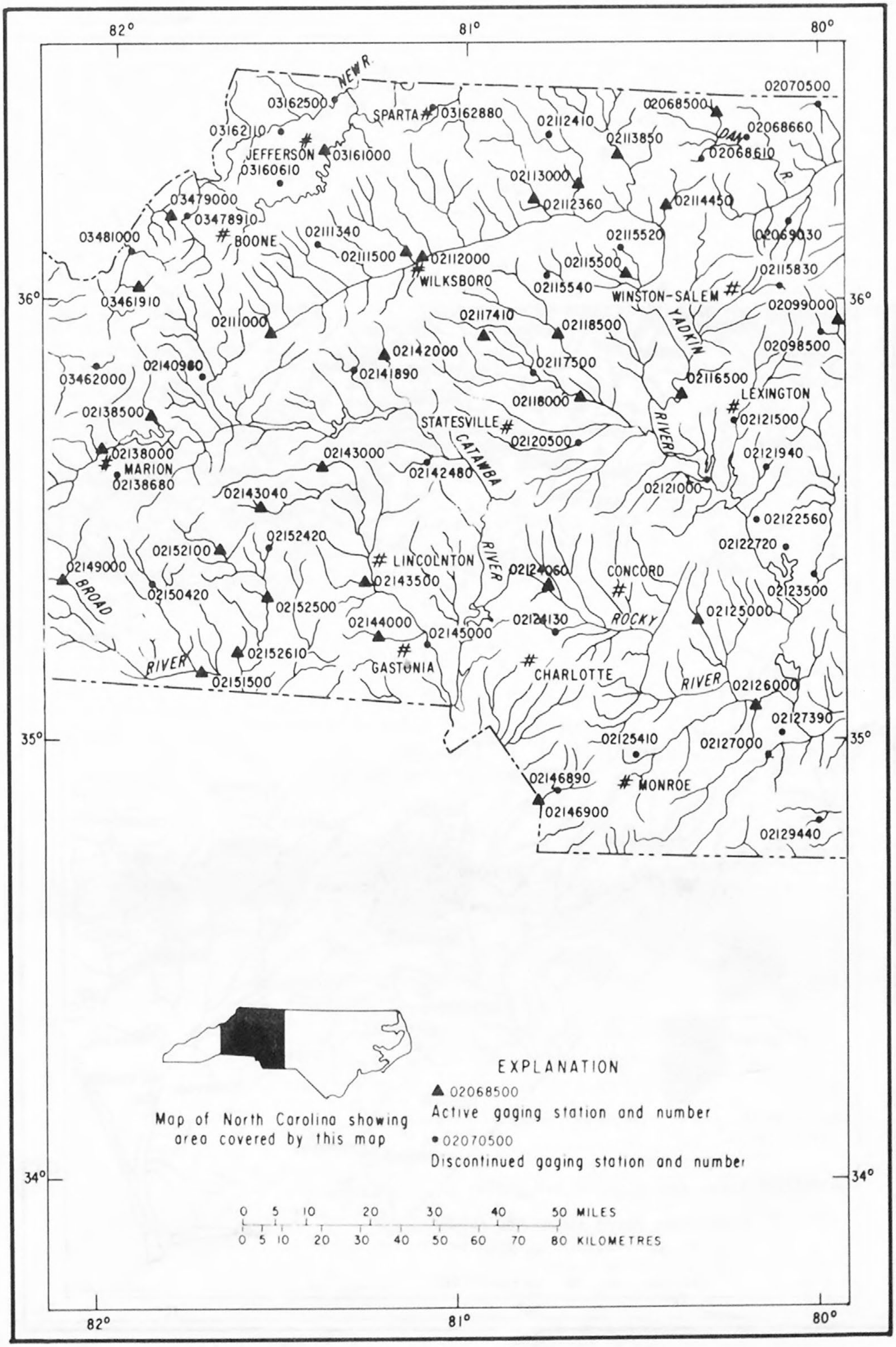

Figure 1b.--Location of gaging stations in western North Carolina.

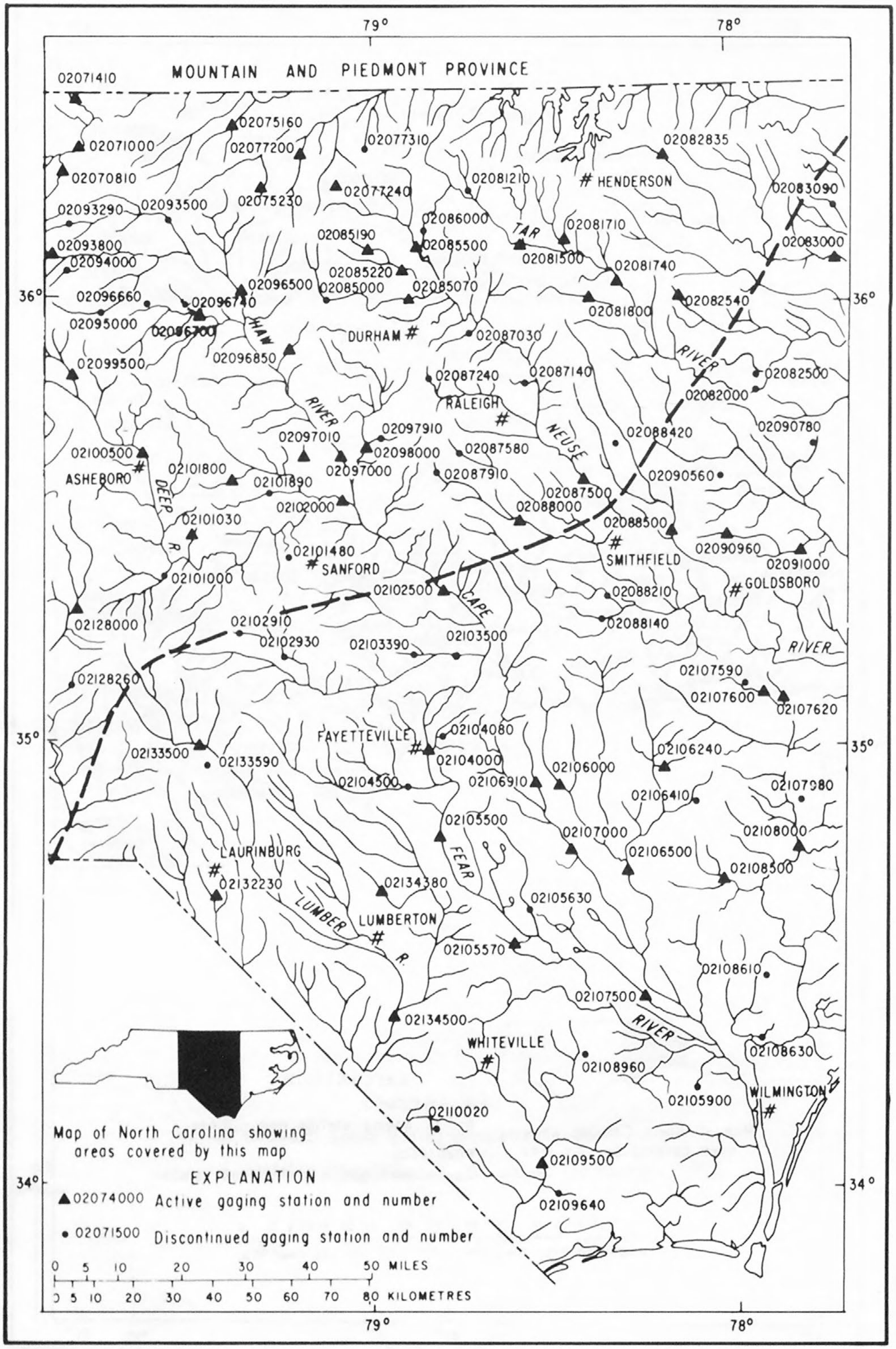

Figure 2a.--Location of gaging stations in eastern North Carolina and boundary between mountain and Piedmont provinces and Coastal Plain province.

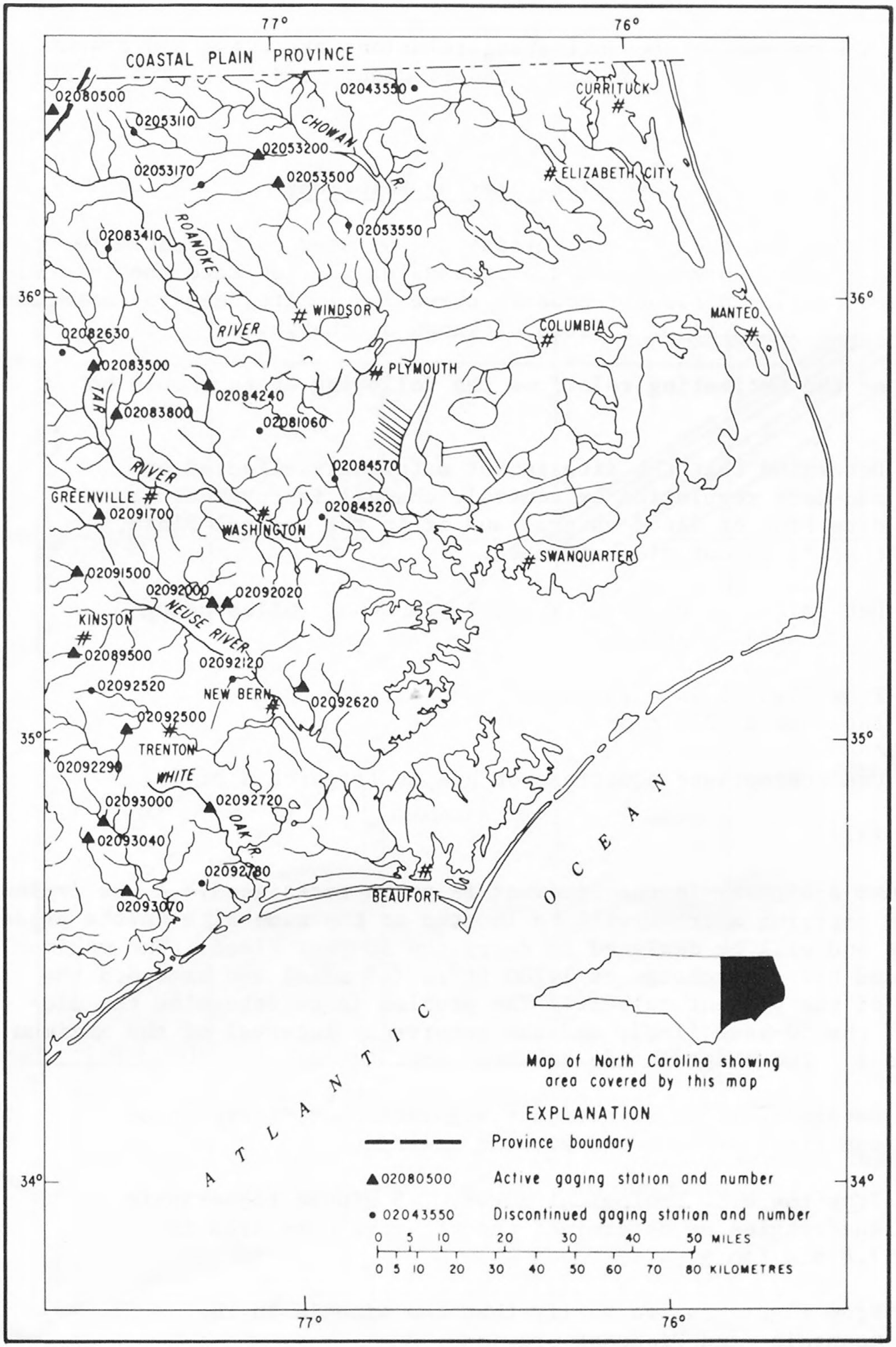

Figure 2b.--Location of gaging stations in eastern North Carolina and boundary between mountain and Piedmont provinces and Coastal Plain province.

For ease of use, these estimating relations are presented graphically in figure 3 for the mountains and Piedmont, and in figure 4 for the Coastal Plain.

Use of Estimating Relations

The estimating equations or graphs can be used to (1) estimate flood discharges for the noted recurrence intervals, (2) estimate the information needed to plot a flood frequency curve for a site, and (3) determine the recurrence interval of a flood of known discharge.

To use the estimating relations the following steps should be followed:

1. Determine that the site is not materially affected by man-made regulation or control, channel improvement or diversion of flood waters, and if in the Coastal Plain, that it is not tide-affected.

2. Determine the drainage area, A, in square miles using the best available map.

3. From figures 1a - 2b, determine whether the site is in the Coastal Plain or in the mountains and Piedmont.

4. Use appropriate equations or graphs (figures 3 or 4).

For example:

Assume a highway in the Piedmont is to be redesigned. A new drainage structure carrying a creek will be located at the same site as the present structure and will be designed to carry the 50-year flood. The maximum known flood had a discharge of 1,700 ft^3/s (48 m^3/s) and exceeded the capacity of the present culvert. The problem is to determine the discharge of the 50-year flood, and the recurrence interval of the maximum known flood. The steps in the solution are:

1. Determine if no significant regulation or diversion on the creek affects the site in question.

2. From the U.S. Geological Survey 7.5 minute topographic quadrangles we determined that the drainage area is 7.8 mi^2 (20.2 km^2).

3. From figure 2a, we verify that the site is in the mountain and Piedmont province.

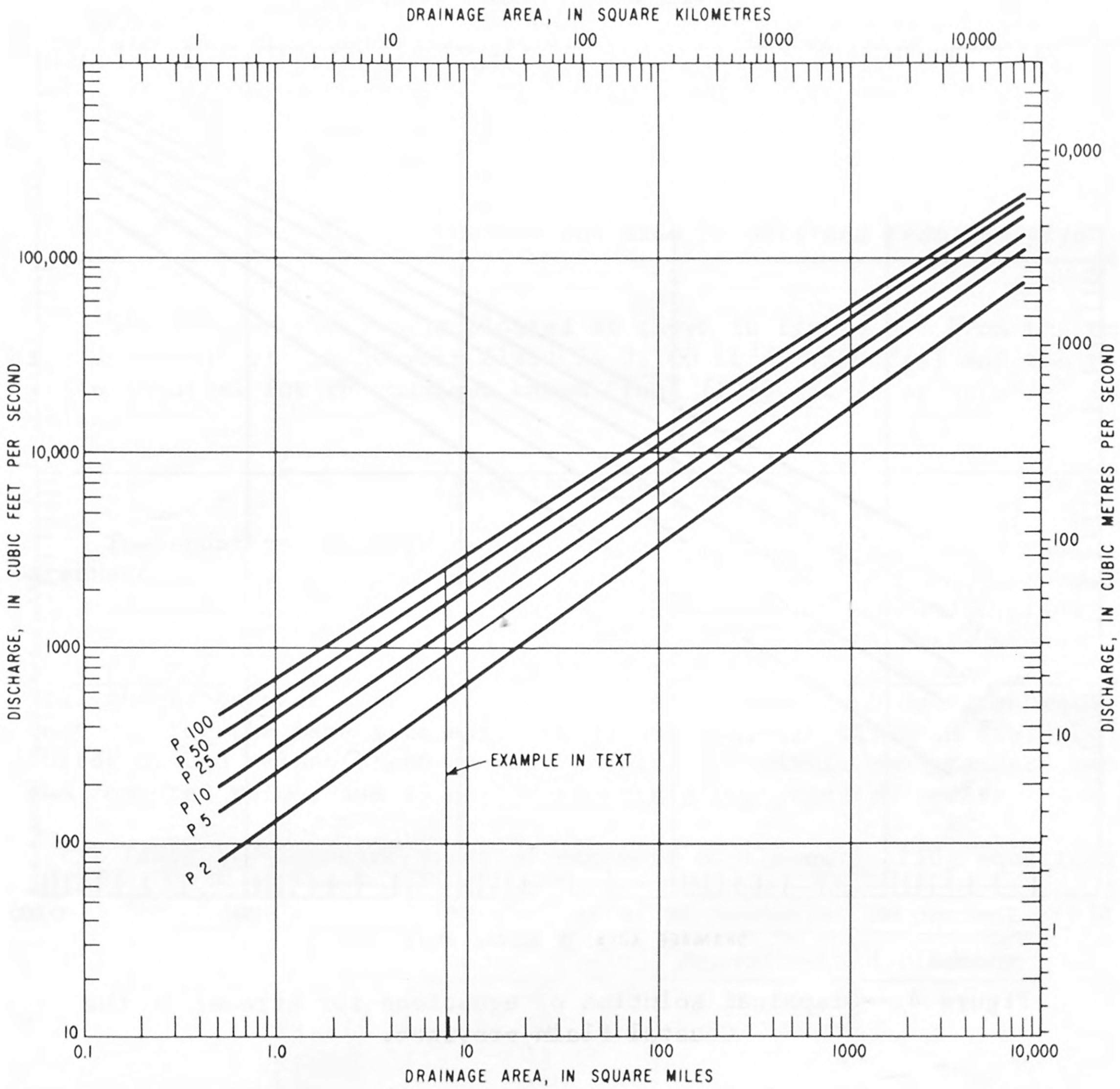

Figure 3.--Graphical solution of equations for streams in the mountain and Piedmont provinces.

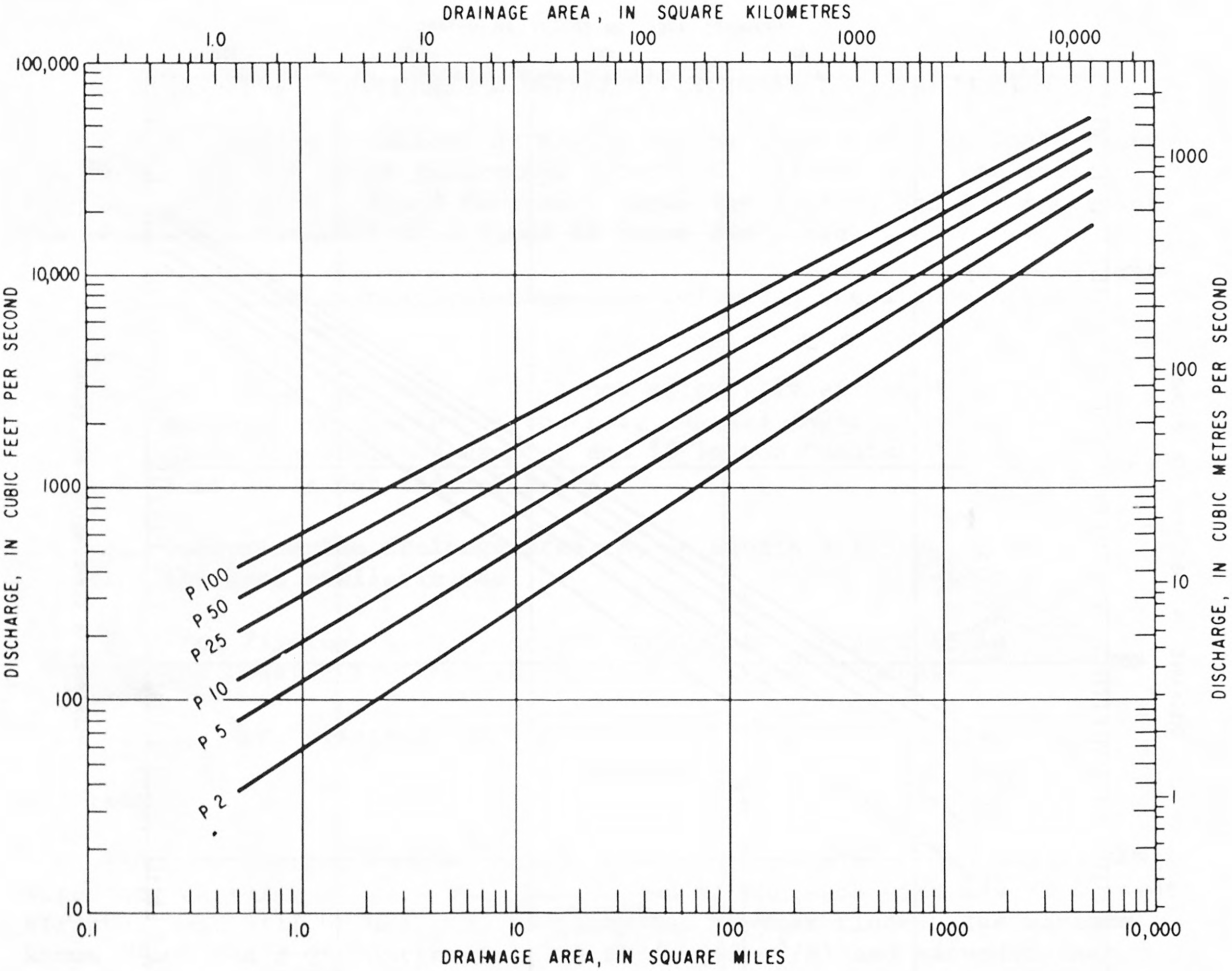

Figure 4.--Graphical solution of equations for streams in the Coastal Plain province.

Using the equations 1-6 for the mountain and Piedmont province, the points for plotting a frequency curve are:

$$P_2 = 133A^{.706} = 133\ (7.8)^{.706} = 570\ ft^3/s = 16\ m^3/s$$
$$P_5 = 230A^{.685} = 230\ (7.8)^{.685} = 940\ ft^3/s = 26\ m^3/s$$
$$P_{10} = 313A^{.673} = 313\ (7.8)^{.673} = 1{,}200\ ft^3/s = 33\ m^3/s$$
$$P_{25} = 442A^{.659} = 442\ (7.8)^{.659} = 1{,}700\ ft^3/s = 48\ m^3/s$$
$$P_{50} = 555A^{.649} = 555\ (7.8)^{.649} = 2{,}100\ ft^3/s = 59\ m^3/s$$
$$P_{100} = 698A^{.638} = 698\ (7.8)^{.638} = 2{,}600\ ft^3/s = 73\ m^3/s$$

These values for flood discharges can also be obtained from the graph in figure 3.

The frequency curve is plotted as shown in figure 5. From the curve, the discharge of the 50-year flood is 2,100 ft^3/s (59 m^3/s) and the recurrence interval for the maximum known flood (1,700 ft^3/s or 48 m^3/s) is 25 years.

Limitations and Accuracy

The equations in this report can be used to estimate the magnitude and frequency of floods on any stream in North Carolina with more than 0.5 mi^2 (1.3 km^2) of drainage area, except those subject to regulation, tide effect, urbanization, or those where the stream channels have been canalized to improve drainage. The standard error of estimate, a measure of how well the flood peaks estimated from gaging station records agree with those computed for the same site using the equations, are given in table 1. Two-thirds of the values based on gage records are within one standard error of the computed value, and 19 of 20 are within two standard errors.

Table 1.--Standard error of estimate of the estimating equations

Flood Peak	Standard error of estimate, in percent	
	Coastal Plain	Mountains and Piedmont
P_2	39	40
P_5	39	41
P_{10}	41	43
P_{25}	45	47
P_{50}	49	50
P_{100}	52	53

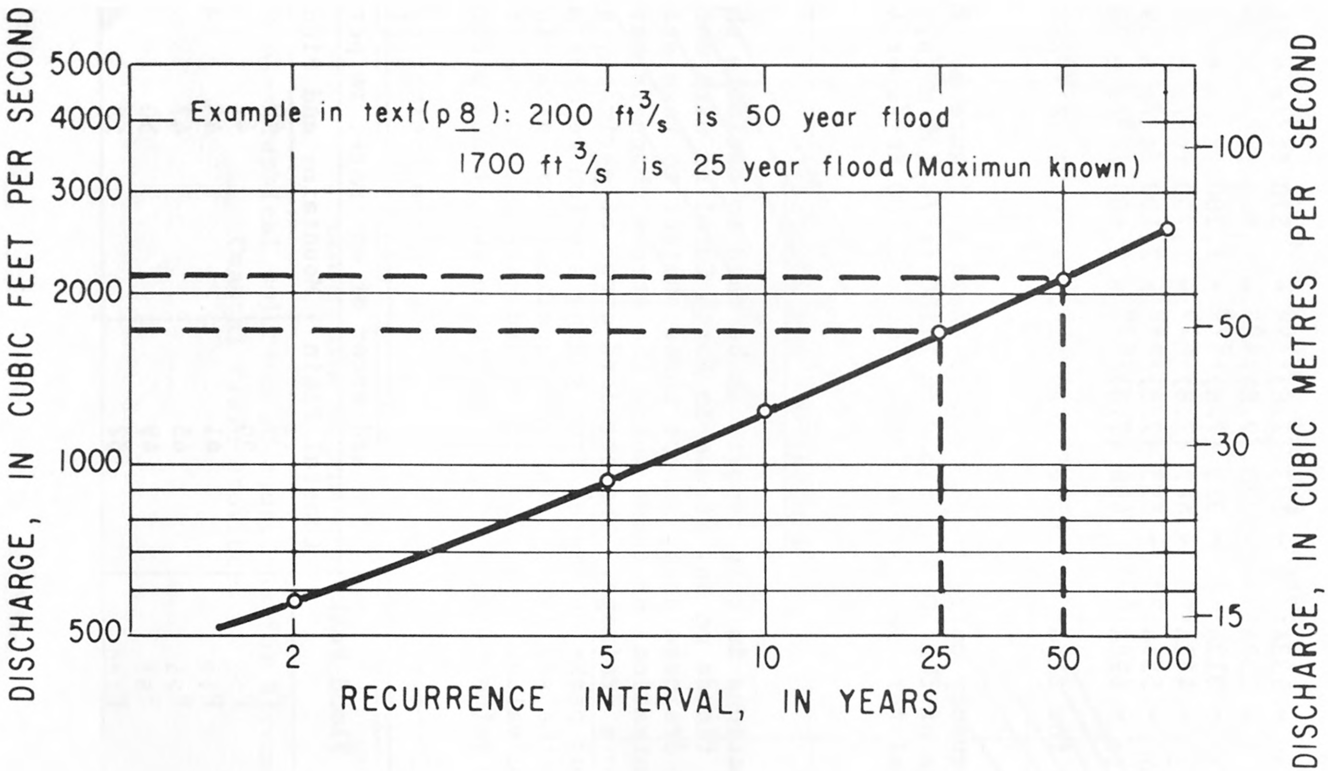

Figure 5. Computed frequency curve for creek used in the example.

Maximum-Known Floods

Many designs are based on maximum-known, maximum-probable or other similarly designated floods which are the very rare, extremely large floods. The recurrence intervals of these floods are unknown and are usually reported as exceeding 100, 200 years, and so on. Formulas describing an enveloping curve of the maximum floods experienced in a region are available. Probably the most familiar is the Myers Curve (Dalrymple, 1964) which relates unit-discharge to the square root of drainage area.

A Myers Curve of the maximum discharges recorded at the gaging stations in cubic feet per second per square mile versus drainage area is shown in figure 6 for stations in the Coastal Plain, and in figure 7 for the mountains and Piedmont. For comparative purpose, the equation for the 100-year flood, P_{100}, is shown in figure 6 and 7.

The lines defined by the equations:

$$Q/A = 5{,}000A^{-0.5} \text{ for the mountains and Piedmont} \quad (13)$$

$$Q/A = 1{,}200A^{-0.5} \text{ for the Coastal Plain} \quad (14)$$

where: Q is discharge in cubic feet per second

A is drainage area in square miles

are shown for reference only. Based on the Myers Curves, the maximum unit-flood discharges at stations in the mountains and Piedmont have been roughly four times as great as those recorded in the Coastal Plain.

ANALYTICAL TECHNIQUE

The regional flood-frequency relations given in the preceding section were developed using multiple-regression techniques. Flood discharges for selected recurrence intervals as determined from gaging station records were regressed with basin and climatic factors considered most likely to influence the magnitude and frequency of floods. The flood data, basin and climatic factors, and methods of analysis are described in the following sections.

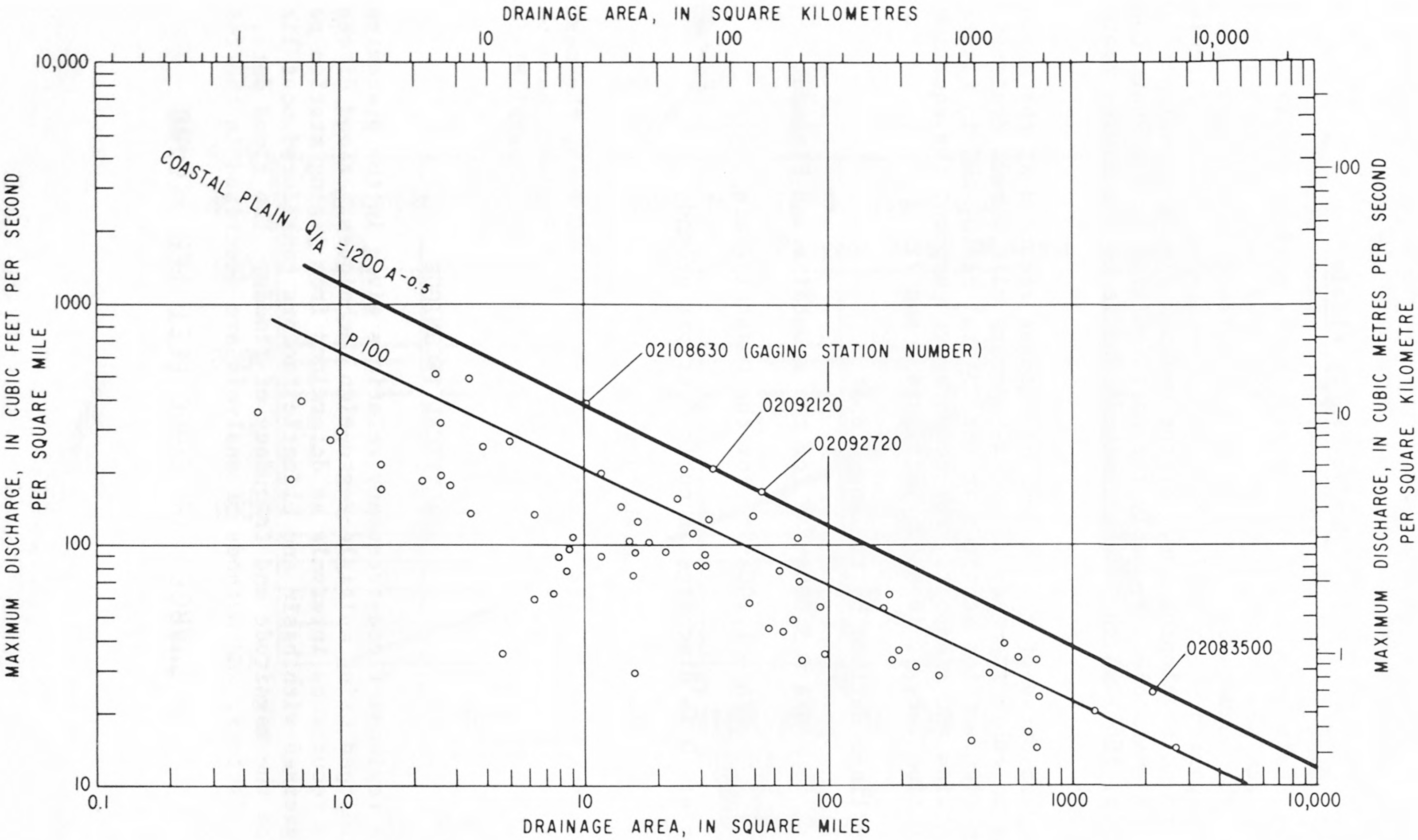

Figure 6.--Myers Curve of maximum discharges recorded at stations in the Coastal Plain province.

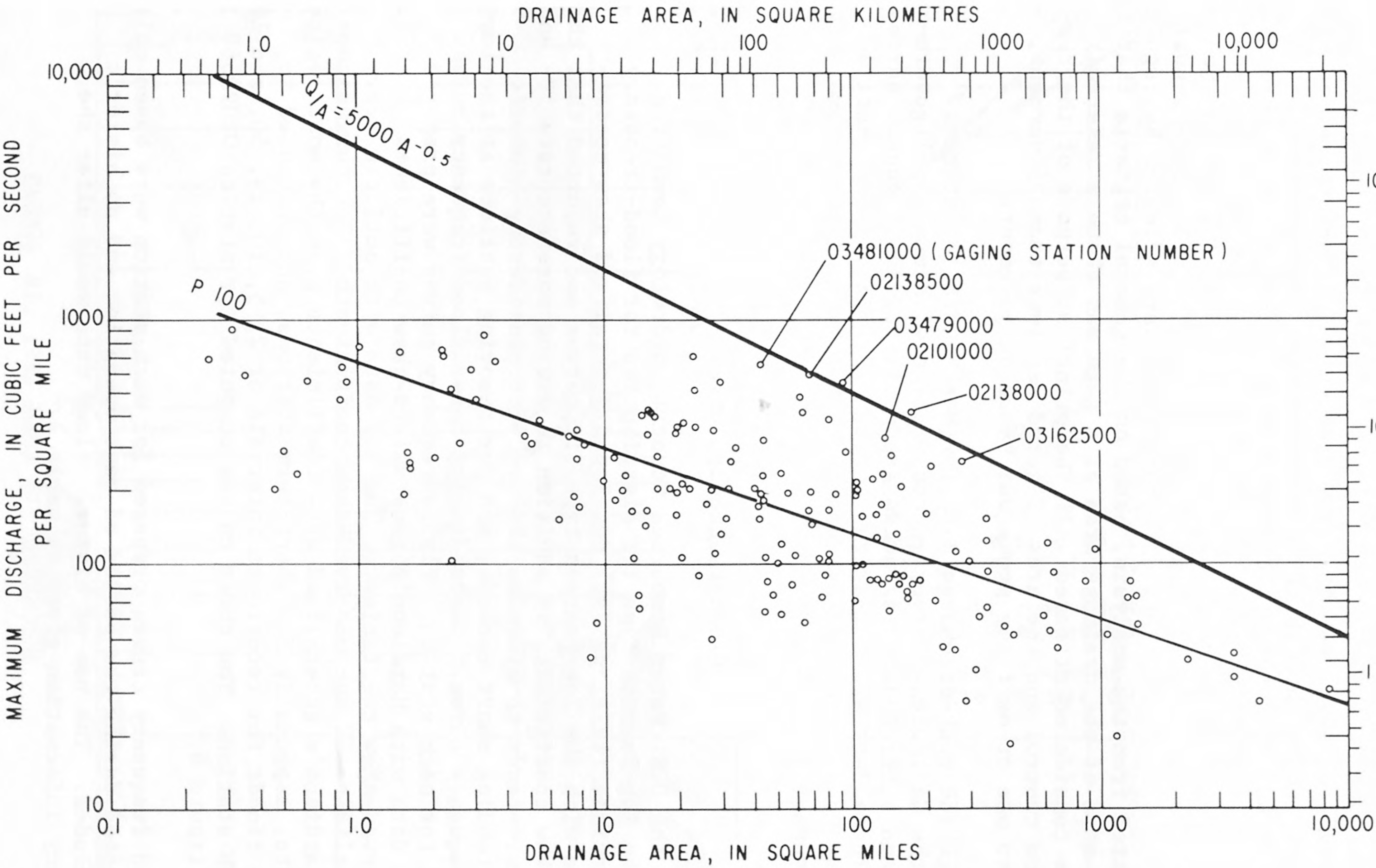

Figure 7.--Myers Curve of maximum discharges recorded at stations in the mountain and Piedmont provinces.

Basic Data

Peak-discharge data

Annual peak discharges for 257 gaging stations in North Carolina with 10 years or more record through the 1973 water year were used in this analysis. Of these, 182 are in the mountains and Piedmont and 75 are in the Coastal Plain. Drainage areas of the stations in the mountains and Piedmont range from 0.25 to 8,410 mi^2 (0.64 to 21,780 km^2), and in the Coastal Plain, from 0.46 to 4,810 mi^2 (1.19 to 12,460 km^2). Some annual peaks measured at gaging stations on streams that were affected by regulation were omitted from the analysis, based on the general criteria that if 25 percent or more of the drainage area of a gage was above a reservoir the peaks were considered affected. If the principal purpose of the reservoir is flood control and the area affected was less than 25 percent, the decision to use or omit the peaks was based on judgment.

Peak-stage and peak-discharge data for North Carolina streams collected by the Geological Survey in cooperation with municipal governments, State and other Federal agencies are published in an annual series of reports. These data are summarized through 1973 in a report entitled "Annual Maximum Peak Stages and Discharges of North Carolina Streams," by Thomas and Bonham (1976).

Flood-frequency curves

In 1967, the U.S. Water Resources Council, Hydrology Committee, recommended the log-Pearson type III distribution for flood-frequency analysis. Hardison (1974, p. 745) developed generalized skew coefficients for use with the log-Pearson type III curves and reported that the generalized skew coefficient "in addition to giving more accurate 50- and 100-year peaks;--tends to minimize the need for considering historic peaks, for extending short records, and for removing outliers at the low end of the frequency curve." Accordingly, three flood-frequency curves were prepared for each station. Flood-frequency curves were prepared using (1) all data with Hardison's generalized-skew coefficients, (2) all data and observed-skew coefficients, and (3) data with outliers (very rare events) eliminated and observed-skew coefficients. The curves computed using Hardison's generalized-skew coefficients give the most logical fit of the data, especially for short-term stations, and were used to determine the floods for recurrence intervals of 2, 5, 10, 25, 50, and 100 years for each station. The three curves computed for station 02090560 are shown in figure 8.

The flood frequency cruves prepared for each station were based only on data collected during the period of gage operation and no historic data were included. The use of historic flood data would alter the flood-frequency information given in table 2.

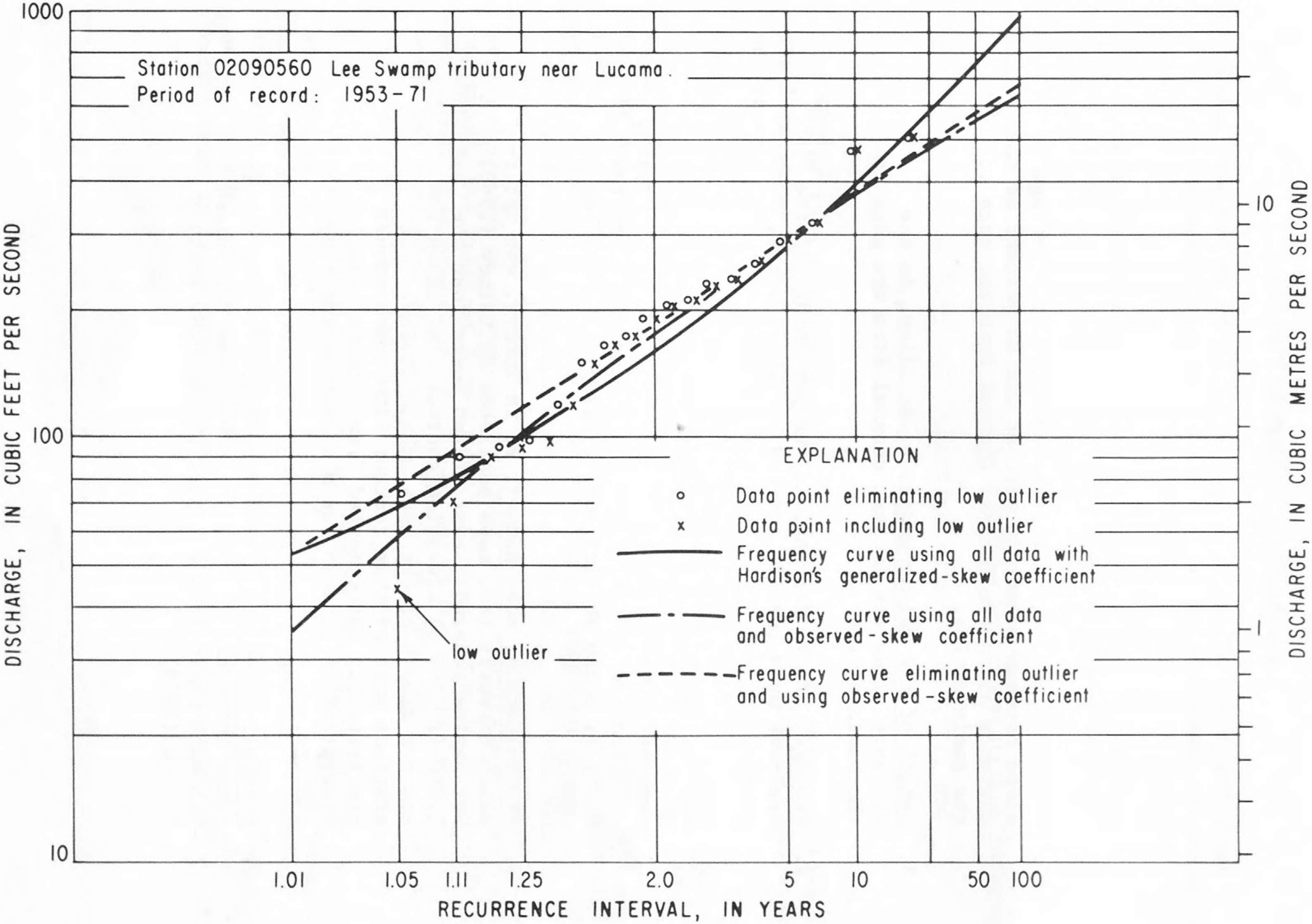

Figure 8.--Types of frequency curves prepared for most gaging stations.

Basin and climatic factors

Seven basin and climatic factors were chosen as the most likely to influence the magnitude of flow. The factors selected were:

1. Drainage area, A, in square miles, as determined from the best available map.

2. Channel slope, S, in feet per mile, is the average slope between points 10 percent and 85 percent of the distance along the longest channel from the gage to the basin divide.

3. Length of the main channel, L, in miles, is the distance along the longest channel from the gage to the basin divide.

4. Storage, St, in percent, is the percentage of the drainage area that is covered by lakes, ponds, swamps, etc.

5. Soil-infiltration index, SI, in inches per hour is an index to soil infiltration capacity. The indices were determined from soil samples collected, analyzed, and reported by Lutz (1969), and generalized on the basis of a map showing soil types prepared by Lee (1955).

6. Precipitation, mean annual, P, in inches, was determined directly from maps published by Carney (1960) for basins generally east of and lower than the 1,000-ft (305 m) elevation contour line along the eastern slopes of the Appalachian divide. For stations west of that contour line, mean annual precipitation was computed from a curve relating precipitation to mean basin elevation and orographic factors.

7. Rainfall intensity, 24-hour duration, 2-year recurrence interval ($P_{24,2}$), in inches, was determined for each basin from a report by the U.S. Weather Bureau (1958).

Regression Analysis

Many regional flood studies by the Geological Survey in recent years have defined flood-estimating equations in the general form:

$$P_t = cA^{c_1}B^{c_2} \text{-----} N^{c_n} \qquad (15)$$

where P_t = flood magnitude having t-year recurrence interval

A, B -----N = basin and climatic factors, and

c, c_1, c_2 -----c_n = constants

Use of this form requires the assumption of a linear relation between the logarithms of the variables. For this study, linearity was assumed and tested.

Development of the relation between flood discharges for each selected recurrence interval (dependent variables) and the basin and climatic factors (independent variables) was done using step-backward and step-forward multiple-regression computer programs. In step-backward multiple regression, a set of equations is computed relating the dependent variable to all independent variables then proceeding step-wise where, at each step, the least significant independent variable, as indicated by a Students-t test, is deleted from the equation. Step-forward multiple-regression differs in that at each step all variables are tested and the one making the greatest reduction in standard error is retained in the equation. This procedure continues, retaining one variable at each step, until all variables are retained. Results indicated that either method would have been satisfactory.

Previous regression studies by Goddard and others (1970) indicated an areal variation across the State in the relation of flood peaks to basin variables. However, for a first trial, regressions were made on a statewide basis. In these equations, defined in the first trial, drainage area, storage, and soil-infiltration index, in that order of significance, were common to all equations, and all standard errors exceeded 45 percent.

To test for areal variation, maps of the ratios of observed discharge to that computed from the regression equations for each station were prepared. These maps showed that the regression equations gave discharges that were consistently high for stations in the Coastal Plain and low for stations in the mountains and Piedmont. Accordingly, using these maps and a geologic map of North Carolina, the stations were divided into two groups, one group being stations in the Coastal Plain and the other, stations in the mountains and Piedmont. Step-backward multiple-regressions were then run using data from the two groups of stations separately, and standard errors were generally reduced about 5 percent.

In the mountains and Piedmont, the most significant variables in order of significance were drainage area, soil index, and slope (or sometimes storage). In the Coastal Plain, drainage area, soil index, annual precipitation (or sometimes storage) were most significant. However, the standard error of the equations using all variables is but 1 to 2 percent less than those using drainage area alone, except in one case where the reduction in standard error is 4 percent. This minor reduction in standard error does not justify the effort needed to determine the basin variables, and the final estimating equations include only drainage area. Maps showing the ratio of observed to computed discharge were prepared, and no areal inconsistencies were apparent.

Logarithmic plots of the final equations and the flood data used to define them were made to check the assumption of linearity. The scatter of points around the line appeared balanced throughout the range of basin sizes, indicating a linear relation. However, as a further check, several trial regressions to fit the data to the curvilinear model

$$P_t = cA^{c_1}A^{c_2} \qquad (16)$$

were attempted. No improvement in the standard error of estimate was obtained using the curvilinear model and the assumption of linearity was considered valid.

SUMMARY AND DISCUSSION

The first section of this report provides maps, graphs, equations, and tables to be used for estimating flood discharges for recurrence intervals of 2 to 100 years for most streams in North Carolina. Also included are Myers Curves of maximum-known floods for the Coastal Plain and the mountains and Piedmont. Maximum known unit-flood discharges in the mountains and Piedmont to date are about four times greater than those in the Coastal Plain.

The methods presented in the first section were developed by regressing flood frequency data determined for 257 stations using log-Pearson type III distributions and regional skew coefficients with basin and climatic factors considered most likely to influence the magnitude of flow. Multiple regressions were first run on a statewide basis but plots of residual errors showed a regional pattern with peaks for stations in the mountains and Piedmont being underestimated and for stations in the Coastal Plain being overestimated. Subsequent multiple regressions were run using data divided into two groups, (1) Coastal Plain and (2) mountains and Piedmont. No further subdivision was indicated by residual-error plots.

For the final estimating equations, flood peaks are related to only one variable, drainage area. Inclusion of one or all of the other factors in the equations reduces the standard error of estimate about 2 percent.

The regression equations developed in this study for estimating flood discharge are based on many records at many locations. The standard errors of estimate of the equations range from 39 to 40 percent for 2-year floods to 52 to 53 percent for 100-year floods. The utility of the equations should not be judged on the size of the standard error of estimate alone, because errors in flood-frequency determination exist even if streamflow records are available. This is especially true of short-term records. Measurement errors in streamflow discharge values and time-sampling errors, which may be quite large, also exist. The regression equations, however, tend to average out these errors.

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Table 2.--Drainage area, years of unregulated record, regional skew, and magnitude of floods for selected recurrence intervals at gaging stations in North Carolina

Station number	Station name	Drainage area (mi^2)	Years of record	Regional skew	Magnitude of flood in cubic feet per second for indicated recurrence interval					
					2-year	5-year	10-year	25-year	50-year	100-year
02043550	Folly Swamp near Sunbury............	3.43	18	0.600	220	290	350	430	-	-
02053110	Wildcat Swamp near Jackson..........	.7	19	.600	49	97	150	230	-	-
02053170	Cutawiskie Creek near Woodland.......	11.8	19	.600	315	630	940	1,500	-	-
02053200	Potecasi Creek near Union...........	191	16	.600	2,020	2,710	3,230	3,960	-	-
02053500	Ahoskie Creek at Ahoskie............	57	13	.600	785	1,350	1,870	-	-	-
02053550	Chinkapin Creek near Colerain........	8.9	19	.600	210	420	630	1,000	-	-
02068500	Dan River near Francisco............	124	48	.300	3,580	5,810	7,600	10,200	12,500	15,000
02068610	Hog Rock Creek tributary near Moores Springs	.31	15	.300	127	185	228	287	-	-
02068660	Little Snow Creek near Lawsonville...	5.44	18	.300	605	925	1,170	1,520	-	-
02069030	Belews Creek near Kenersville........	14.9	17	.300	875	1,500	2,030	2,840	-	-
02070500	Mayo River near Price...............	260	42	.400	6,900	11,900	16,300	23,100	29,200	36,400
02070810	Jacobs Creek near Wentworth..........	16.2	18	.400	865	1,540	2,140	3,110	-	-
02071000	Dan River near Wentworth............	1,050	34	.400	17,700	24,800	30,000	37,200	43,000	49,200
02071410	Matrimony Creek near Leaksville......	12.0	14	.400	995	1,690	2,270	-	-	-
02075160	Moon Creek near Yanceyville.........	29.9	20	.400	780	1,650	2,530	4,100	5,670	-
02075230	South Country Line Creek near Hightowers	7.13	18	.400	870	1,210	1,450	1,800	-	-
02077200	Hyco Creek near Leasburg............	44.0	10	.400	1,220	2,370	3,450	-	-	-
02077240	Double Creek near Roseville..........	7.47	10	.400	610	950	1,220	-	-	-
02077310	Storys Creek near Roxboro...........	2.04	18	.400	170	255	325	425	-	-
02080500	Roanoke River at Roanoke Rapids......	8,410	38	.550	76,800	107,000	129,000	161,000	188,000	216,000
02081060	Smithwick Creek tributary near Williamston	.92	19	.600	65	145	225	380	-	-
02081210	Shelton Creek near Oxford...........	22.2	18	.500	1,020	1,500	1,870	2,410	-	-
02081500	Tar River near Tar River............	167	34	.500	4,780	7,190	9,100	11,900	14,300	17,000
02081710	Long Creek at Kittrell..............	3.26	12	.500	430	880	1,330	-	-	-
02081740	Tar River at Louisburg..............	430	10	.500	4,720	5,920	6,740	-	-	-
02081800	Cedar Creek near Louisburg...........	47.8	20	.500	1,120	1,960	2,690	3,880	4,980	-
02082000	Tar River near Nashville............	701	42	.500	6,440	9,160	11,200	14,200	16,600	19,200
02082500	Sapony Creek near Nashville..........	64.8	20	.500	880	1,600	2,260	3,350	4,390	-
02082540	Wildcat Branch near Mapleville.......	.35	11	.500	54	113	174	-	-	-
02082630	Harts Mill Run near Tarboro..........	8.58	18	.600	260	390	505	670	-	-
02082835	Fishing Creek near Warrenton.........	45	12	.550	1,260	2,300	3,260	-	-	-
02083000	Fishing Creek near Enfield..........	521	59	.550	4,480	7,380	9,870	13,800	17,300	21,500
02083090	Beaverdam Swamp near Heathsville.....	9.44	19	.600	200	410	630	1,030	-	-
02083410	Deep Creek near Scotland Neck........	11.7	20	.600	360	790	1,260	2,150	3,100	-
02083500	Tar River at Tarboro................	2,140	68	.600	13,700	20,300	25,600	33,600	40,300	48,100
02083800	Conetoe Creek near Bethel...........	78.1	17	.600	1,080	1,620	2,050	2,700	-	-
02084240	Collie Swamp near Everetts...........	29.0	21	.600	685	1,220	1,720	2,540	3,320	-
02084520	Upper Goose Creek near Yeatsville....	1.49	21	.600	97	185	275	430	585	-
02084570	Acre Swamp near Pinetown............	32.2	17	.600	595	1,130	1,640	2,540	-	-
02085000	Eno River at Hillsborough...........	66.5	43	.450	2,550	4,020	5,210	7,000	8,550	10,300
02085070	Eno River at Durham.................	141	10	.500	3,950	7,200	10,200	-	-	-
02085190	North Fork Little River tributary near Rougemont	1.02	20	.500	170	285	385	545	690	-
02085220	Little River near Orange Factory.....	81.6	12	.500	3,210	5,090	6,650	-	-	-
02085500	Flat River at Bahama................	150	48	.500	6,710	9,980	12,500	16,300	19,500	23,000
02086000	Dial Creek near Bahama..............	4.71	45	.500	330	610	870	1,300	1,720	2,220
02087030	Lick Creek near Durham..............	13.8	18	.500	690	825	910	1,030	-	-
02087140	Lower Barton Creek tributary near Raleigh	.63	18	.500	105	190	270	405	-	-
02087240	Stirrup Iron Creek tributary near Nelson	.25	20	.500	49	87	120	175	230	-
02087500	Neuse River near Clayton............	1,140	46	.500	9,580	12,900	15,300	18,700	21,400	24,200
02087580	Swift Creek near Apex...............	19.5	18	.500	1,350	2,080	2,660	3,540	-	-
02087910	Middle Creek near Holly Springs......	8.23	18	.500	520	965	1,380	2,090	-	-
02088000	Middle Creek near Clayton...........	80.7	33	.500	1,440	2,620	3,720	5,530	7,240	9,330
02088140	Stone Creek near Newton Grove........	27.9	19	.600	560	1,100	1,640	2,610	-	-
02088210	Hannah Creek near Benson............	2.59	19	.600	130	290	460	780	-	-
02088420	Long Creek near Selma...............	7.64	19	.600	455	995	1,580	2,680	-	-
02088500	Little River near Princeton..........	229	42	.600	2,200	3,490	4,570	6,250	7,760	9,510
02089500	Neuse River at Kinston..............	2,690	46	.600	12,700	18,500	23,000	29,700	35,400	41,700
02090560	Lee Swamp tributary near Lucama......	2.83	19	.600	165	285	400	590	-	-
02090780	Whiteoak Swamp tributary near Wilson	2.60	19	.600	120	250	390	650	-	-
02090960	Nahunta Swamp near Pikeville.........	18.6	19	.600	370	645	890	1,290	-	-
02091000	Nahunta Swamp near Shine............	77.6	19	.600	1,090	1,810	2,440	3,440	-	-
02091500	Contentnea Creek at Hookerton........	729	45	.600	3,900	6,420	8,660	12,200	15,500	19,500
02091700	Little Contentnea Creek near Farmville	93.3	17	.600	1,400	2,120	2,700	3,570	-	-
02092000	Swift Creek near Vanceboro...........	182	13	.600	1,680	2,860	3,920	-	-	-

Table 2.--Drainage area, years of unregulated record, regional skew, and magnitude of floods for selected recurrence intervals at gaging stations in North Carolina--Continued

Station number	Station name	Drainage area (mi^2)	Years of record	Regional skew	Magnitude of flood in cubic feet per second for indicated recurrence interval					
					2-year	5-year	10-year	25-year	50-year	100-year
02092020	Palmetto Swamp near Vanceboro.......	24	21	0.600	545	1,250	2,020	3,540	5,210	-
02092120	Bachelor Creek near New Bern........	33.6	19	.600	835	1,560	2,250	3,440	-	-
02092290	Rattlesnake Branch near Comfort.....	2.5	19	.600	210	380	545	825	-	-
02092500	Trent River near Trenton...........	168	22	.600	1,980	3,580	5,070	7,580	10,000	-
02092520	Vine Swamp near Kinston............	6.3	19	.600	220	425	625	985	-	-
02092620	Upper Broad Creek tributary near Grantsboro	3.31	20	.600	140	370	660	1,290	2,030	-
02092720	White Oak River at Belgrade.........	53.3	21	.600	580	1,270	2,030	3,470	5,030	-
02092780	Bell Swamp near Hubert.............	4.95	18	.600	115	255	410	705	-	-
02093000	New River near Gum Branch...........	74.5	19	.600	1,560	3,080	4,600	7,290	-	-
02093040	Southwest Creek tributary near Jacksonville	1.00	19	.600	105	210	320	520	-	-
02093070	Southwest Creek near Jacksonville...	26.9	20	.600	730	1,530	2,370	3,920	5,550	-
02093290	Haw River near Summerfield..........	26.3	18	.400	460	750	995	1,360	-	-
02093500	Haw River near Benaja...............	168	43	.400	1,670	3,070	4,340	6,420	8,350	10,700
02093800	Reedy Fork Creek near Oak Ridge.....	19.9	18	.400	820	1,580	2,290	3,470	-	-
02094000	Horsepen Creek at Battle Ground.....	15.9	30	.400	670	1,190	1,660	2,400	3,070	3,880
02095000	South Buffalo Creek at Greensboro...	33.6	29	.400	1,670	3,010	4,210	6,130	7,910	10,000
02096500	Haw River at Haw River.............	599	45	.450	11,300	16,300	20,000	25,000	29,000	33,200
02096660	Rock Creek near Whitsett...........	14.4	17	.450	1,220	2,290	3,300	4,970	-	-
02096700	Big Alamance Creek near Elon College	116	16	.400	3,480	5,160	6,450	8,290	-	-
02096740	Gun Branch near Alamance...........	5.02	18	.450	230	590	1,000	1,840	-	-
02096850	Cane Creek near Teer................	31.3	14	.450	1,770	2,830	3,700	-	-	-
02097000	Haw River near Pittsboro...........	1,310	45	.500	24,000	33,000	39,700	49,100	56,600	64,800
02097010	Robeson Creek near Pittsboro........	1.13	20	.500	175	385	610	1,030	1,470	-
02097910	White Oak Creek near Wilsonville....	23.6	19	.500	810	1,220	1,550	2,030	-	-
02098000	New Hope River near Pittsboro.......	285	23	.500	3,690	5,370	6,680	8,560	10,100	-
02098500	West Fork Deep River near High Point	32.1	42	.400	1,580	2,600	3,450	4,750	5,890	7,190
02099000	East Fork Deep River near High Point	14.7	45	.400	1,570	2,580	3,420	4,690	5,810	7,080
02099500	Deep River near Randleman...........	124	43	.400	4,580	6,940	8,780	11,400	13,700	16,200
02100500	Deep River at Ramseur..............	346	51	.400	11,700	17,400	21,800	28,200	33,400	39,200
02101000	Bear Creek at Robbins..............	134	32	.450	6,290	11,700	16,600	24,700	32,400	41,700
02101030	Falls Creek near Bennett...........	2.97	20	.450	510	850	1,140	1,600	2,000	-
02101480	Sugar Creek near Tramway...........	.85	20	.450	260	380	575	765	-	-
02101800	Tick Creek near Mount Vernon Springs	15.3	15	.450	1,080	1,930	2,700	3,940	-	-
02101890	Bear Creek near Goldston...........	43.2	19	.450	2,900	4,640	6,070	8,220	-	-
02102000	Deep River at Moncure..............	1,410	43	.500	21,600	29,200	34,800	42,400	48,500	55,100
02102500	Cape Fear River at Lillington.......	3,440	50	.500	44,000	59,400	70,600	85,900	98,300	112,000
02102910	Dunhams Creek tributary near Carthage	2.19	18	.500	90	165	235	360	-	-
02102930	Crane Creek near Vass..............	32.4	18	.500	835	1,470	2,030	2,950	-	-
02103390	South Prong Anderson Creek near Lillington	7.56	19	.500	120	195	265	370	-	-
02103500	Little River near Linden...........	46.0	44	.500	3,530	5,510	7,130	9,570	11,700	14,100
02104000	Cape Fear River at Fayetteville.....	4,370	71	.500	45,300	63,000	76,100	94,600	110,000	126,000
02104080	Reese Creek near Fayetteville.......	7.89	17	.500	170	315	450	680	-	-
02104500	Rockfish Creek near Hope Mills......	284	16	.500	2,030	3,560	4,920	7,120	-	-
02105500	Cape Fear River at William O. Huske Lock near Tarheel	4,810	24	.500	38,100	46,900	52,900	60,600	66,500	-
02105570	Browns Creek near Elizabethtown.....	14.1	16	.600	130	290	470	805	-	-
02105630	Turnbull Creek near Elizabethtown...	71.6	17	.600	445	830	1,200	1,840	-	-
02105900	Hood Creek near Leland.............	21.6	21	.600	585	1,110	1,630	2,530	3,420	-
02106000	Little Coharie Creek near Roseboro..	96.4	23	.600	770	1,350	1,880	2,760	3,600	-
02106240	Turkey Creek near Turkey...........	15.7	18	.600	370	745	1,120	1,790	-	-
02106410	Stewarts Creek tributary near Warsaw	.46	16	.600	55	95	130	190	-	-
02106500	Black River near Tomahawk...........	680	22	.600	3,640	5,900	7,830	10,900	13,600	-
02106910	Big Swamp near Roseboro............	32.3	20	.600	535	1,100	1,690	2,760	3,870	-
02107000	South River near Parkersburg........	382	22	.600	1,900	3,030	3,980	5,470	6,810	-
02107500	Colly Creek near Kelly.............	103	15	.600	435	665	860	1,150	-	-
02107590	N.E. Cape Fear River tributary near Mount Olive	.63	18	.600	26	70	125	240	-	-
02107600	N.E. Cape Fear River near Seven Springs	47.5	15	.600	980	1,670	2,300	3,310	-	-
02107620	Mathews Creek near Pink Hill........	8.61	13	.600	145	350	600	-	-	-
02107980	Limestone Creek near Beulaville.....	49.7	19	.600	1,020	2,060	3,100	4,980	-	-
02108000	N.E. Cape Fear River near Chinquapin	600	33	.600	4,800	8,200	11,200	16,200	20,800	26,300
02108500	Rockfish Creek near Wallace.........	63.8	19	.600	1,420	2,530	3,560	5,290	-	-
02108610	Pike Creek near Burgaw.............	1.1	18	.600	120	320	570	1,120	-	-
02108630	Turkey Creek near Castle Hayne......	10.2	19	.600	310	710	1,160	2,040	-	-

Table 2.--Drainage area, years of unregulated record, regional skew, and magnitude of floods for selected recurrence intervals at gaging stations in North Carolina--Continued

Station number	Station name	Drainage area (mi^2)	Years of record	Regional skew	Magnitude of flood in cubic feet per second for indicated recurrence interval					
					2-year	5-year	10-year	25-year	50-year	100-year
02108960	Buckhead Branch near Bolton.........	15.3	19	0.600	370	705	1,030	1,580	-	-
02109500	Waccamaw River at Freeland..........	706	34	.600	3,480	5,640	7,500	10,400	13,000	16,100
02109640	Wet Ash Swamp near Ash.............	16	18	.600	395	775	1,160	1,830	-	-
02110020	Mill Branch near Tabor City.........	3.85	18	.600	140	315	500	865	-	-
02111000	Yadkin River at Patterson...........	29.0	33	.200	1,460	2,980	4,400	6,750	8,960	11,600
02111340	South Prong Lewis Fork Creek near North Wilkesboro	11	16	.200	460	770	1,020	1,390	-	-
02111500	Reddies River at Wilkesboro.........	93.9	34	.200	3,490	5,980	8,020	11,100	13,700	16,700
02112000	Yadkin River at Wilkesboro..........	493	47	.200	11,900	17,000	20,600	25,500	29,300	33,400
02112360	Mitchell River near State Road......	80.4	10	.300	3,430	7,710	12,100	-	-	-
02112410	Fisher River near Bottom............	44.7	16	.300	1,790	2,640	3,270	4,160	-	-
02113000	Fisher River near Copeland..........	121	51	.300	4,990	7,980	10,300	13,800	16,800	20,100
02113850	Ararat River at Ararat..............	231	10	.300	5,000	8,130	10,600	-	-	-
02114450	Little Yadkin River at Dalton.......	42.8	13	.300	3,200	5,580	7,610	-	-	-
02115500	Forbush Creek near Yadkinville......	21.7	33	.300	1,170	1,820	2,320	3,040	3,640	4,300
02115520	Logan Creek near Smithtown..........	0.9	18	.300	195	380	555	840	-	-
02115540	South Deep Creek near Yadkinville...	19.5	13	.300	1,550	2,880	4,070	-	-	-
02115830	Kerners Mill Creek near Kernersville	2.2	18	.300	210	400	575	865	-	-
02116500	Yadkin River at Yadkin College......	2,280	34	.300	30,100	42,800	52,000	64,700	74,800	85,600
02117410	McClelland Creek near Statesville...	1.6	19	.300	230	315	380	460	-	-
02117500	Rocky Creek at Turnersburg..........	102	33	.300	2,600	4,460	6,010	8,380	10,500	12,900
02118000	South Yadkin River near Mocksville..	313	35	.300	3,760	6,110	8,000	10,800	13,200	15,900
02118500	Hunting Creek near Harmony..........	153	22	.300	4,560	6,990	8,850	11,500	13,700	-
02120500	Third Creek at Cleveland............	87.4	32	.300	1,420	1,950	2,330	2,840	3,250	3,670
02121000	Yadkin River near Salisbury.........	3,470	30	.300	52,600	79,100	99,200	128,000	151,000	177,000
02121500	Abbotts Creek near Lexington........	174	17	.300	4,550	7,570	10,000	13,700	-	-
02121940	Flat Swamp Creek near Lexington.....	6.56	18	.300	445	685	865	1,130	-	-
02122560	Cabin Creek near Jackson Hill.......	13.7	17	.400	800	1,010	1,160	1,340	-	-
02122720	Beaverdam Creek tributary near Denton	2.90	18	.400	390	710	995	1,460	-	-
02123500	Uwharrie River near Eldorado........	347	33	.400	7,700	10,700	12,800	15,800	18,100	20,700
02124060	North Prong Clarke Creek near Huntersville	3.61	20	.300	565	1,070	1,530	2,270	2,960	-
02124130	Mallard Creek near Charlotte........	20.7	18	.300	1,660	2,410	2,970	3,740	-	-
02125000	Big Bear Creek near Richfield.......	55.7	19	.400	4,840	6,980	8,590	10,800	-	-
02125410	Chinkapin Creek near Monroe.........	8.49	18	.400	1,370	2,300	3,080	4,300	-	-
02126000	Rocky River near Norwood............	1,370	44	.400	31,500	46,200	57,600	73,700	87,000	102,000
02127000	Brown Creek near Polkton............	110	36	.400	2,040	3,650	5,070	7,340	9,440	11,900
02127390	Palmetto Branch at Ansonville.......	.86	17	.400	170	280	370	510	-	-
02128000	Little River near Star..............	105	19	.400	3,910	5,590	6,850	8,600	-	-
02128260	Cheek Creek near Pekin..............	15.4	18	.400	1,010	1,740	2,370	3,350	-	-
02129440	South Fork Jones Creek near Morven..	16.7	18	.400	835	1,210	1,490	1,900	-	-
02132230	Bridge Creek tributary at Johns.....	6.23	16	.500	96	180	255	380	-	-
02133500	Drowning Creek near Hoffman.........	178	34	.500	1,430	2,850	4,240	6,660	9,060	12,100
02133590	Beaver Dam Creek near Aberdeen......	4.66	18	.500	70	120	160	225	-	-
02134380	Tenmile Swamp near Lumberton........	16.1	18	.500	225	340	430	565	-	-
02134500	Lumber River at Boardman............	1,220	44	.500	4,730	7,330	9,440	12,600	15,300	18,400
02137000	Mill Creek at Old Fort..............	20.7	13	.100	1,080	1,570	1,920	-	-	-
02138000	Catawba River at Marion.............	171	33	.100	6,820	11,500	15,200	20,500	25,000	29,900
02138500	Linville River at Nebo..............	67.2	51	.100	4,180	7,390	10,000	13,900	17,300	21,000
02138680	White Branch near Marion............	.50	12	.100	54	86	110	-	-	-
02140980	Carroll Creek near Collettsville....	2.38	17	.200	230	420	585	840	-	-
02141890	Duck Creek near Taylorsville........	18.6	18	.300	935	1,550	2,050	2,800	-	-
02142000	Lower Little River near All Healing Springs	31.2	21	.300	1,320	2,260	3,050	4,250	5,310	-
02142480	Hagan Creek near Catawba............	7.80	15	.300	845	1,430	1,910	2,630	-	-
02143000	Henry Fork near Henry River.........	80.0	39	.200	5,040	8,620	11,500	15,900	19,700	23,900
02143040	Jacob Fork at Ramsey................	25.4	12	.200	2,160	3,190	3,940	-	-	-
02143500	Indian Creek near Laboratory........	68.4	22	.300	2,210	3,900	5,330	7,560	9,560	-
02144000	Long Creek near Bessemer City.......	31.4	21	.300	1,460	2,460	3,290	4,540	5,640	-
02145000	South Fork Catawba River at Lowell..	630	31	.300	9,920	15,100	19,000	24,700	29,400	34,500
02146890	East Fork Twelve Mile Creek near Waxhaw.	42	18	.300	2,370	3,200	3,780	4,560	-	-
02146900	Twelve Mile Creek near Waxhaw.......	72.4	13	.300	2,990	4,470	5,590	-	-	-
02149000	Cove Creek near Lake Lure...........	77.0	22	.100	2,770	4,240	5,330	6,810	8,000	-
02150420	Camp Creek near Rutherfordton.......	13	17	.100	600	965	1,250	1,650	-	-
02151500	Broad River near Boiling Springs....	864	47	.200	16,800	25,800	32,600	42,200	50,000	58,400
02152100	First Broad River near Casar........	59.5	14	.200	2,700	3,890	4,750	-	-	-
02152420	Big Knob Creek near Fallston........	16.4	18	.200	1,070	1,680	2,150	2,800	-	-
02152500	First Broad River near Lawndale.....	198	34	.200	7,310	11,000	13,700	17,500	20,600	23,900

Table 2.--Drainage area, years of unregulated record, regional skew, and magnitude of floods for selected recurrence intervals at gaging stations in North Carolina--Continued

Station number	Station name	Drainage area (mi^2)	Years of record	Regional skew	Magnitude of flood in cubic feet per second for indicated recurrence interval					
					2-year	5-year	10-year	25-year	50-year	100-year
02152610	Sugar Branch near Boiling Springs...	1.49	20	.200	460	800	1,090	1,510	1,880	-
03160610	Old Field Creek near West Jefferson	2.4	16	.200	100	145	175	215	-	-
03161000	South Fork New River near Jefferson	207	48	.200	4,590	7,530	9,850	13,200	16,100	19,300
03162110	Buffalo Creek at Warrensville.......	23	17	.200	1,100	1,640	2,050	2,610	-	-
03162500	North Fork New River at Crumpler....	277	41	.200	6,300	11,100	15,100	21,100	26,400	32,300
03162880	Vile Creek near Sparta.............	3.51	17	.400	190	290	365	470	-	-
03439000	French Broad River at Rosman........	67.9	38	.100	4,040	6,120	7,640	9,710	11,400	13,100
03439500	French Broad River at Calvert.......	103	31	.100	4,730	7,200	9,010	11,500	13,500	15,600
03440000	Catheys Creek near Brevard..........	11.7	11	.100	560	910	1,180	-	-	-
03441000	Davidson River near Brevard.........	40.4	53	.100	2,680	4,190	5,330	6,900	8,180	9,540
03441440	Little River above High Falls near Cedar Mountain	26.8	11	.100	1,870	3,010	3,880	-	-	-
03442000	Crab Creek near Penrose............	10.9	13	.100	530	815	1,020	-	-	-
03443000	French Broad River at Blantyre......	296	53	.100	7,110	11,300	14,500	19,000	22,600	26,500
03444000	Boylston Creek near Horseshoe.......	14.8	13	.100	465	635	755	-	-	-
03444500	South Fork Mills River at The Pink Beds	9.99	31	.100	670	1,130	1,490	2,010	2,450	2,930
03446000	Mills River near Mills River........	66.7	39	.100	2,510	3,980	5,090	6,650	7,920	9,280
03446410	Laurel Branch near Edneyville.......	.57	12	.100	80	110	130	-	-	-
03446500	Clear Creek near Hendersonville.....	42.2	10	.100	1,430	2,310	2,990	-	-	-
03448000	French Broad River at Bent Creek....	676	39	.100	10,900	15,600	18,900	23,300	26,700	30,200
03448500	Hominy Creek at Candler............	79.8	31	.100	1,850	3,020	3,920	5,210	6,260	7,410
03449000	North Fork Swannanoa River near Black Mountain	23.8	28	.100	1,950	3,630	5,060	7,230	9,140	11,300
03450000	Beetree Creek near Swannanoa........	5.46	47	.100	245	395	515	680	820	970
03451000	Swannanoa River at Biltmore.........	130	46	.100	2,980	5,080	6,750	9,200	11,200	13,500
03451500	French Broad River at Asheville.....	945	78	.100	15,300	23,000	28,500	36,100	42,000	48,400
03452000	Sandymush Creek near Alexander......	79.5	13	.100	2,070	3,090	3,830	-	-	-
03453000	Ivy River near Marshall............	158	39	.100	4,060	6,650	8,660	11,500	13,900	16,500
03453500	French Broad River at Marshall......	1,332	31	.100	18,600	27,400	33,600	41,900	48,500	55,300
03453880	Brush Creek at Walnut..............	7.96	17	.100	630	940	1,170	1,480	-	-
03454000	Big Laurel Creek near Stackhouse....	126	39	.100	3,380	5,430	6,990	9,190	11,000	12,900
03455500	West Fork Pigeon River above Lake Logan near Hazelwood	27.6	19	.100	3,920	5,740	7,040	8,770	-	-
03456500	East Fork Pigeon River at Canton....	51.5	19	.100	3,990	6,580	8,590	11,500	-	-
03457000	Pigeon River at Canton.............	133	45	.100	7,560	11,300	14,000	17,600	20,500	23,500
03457500	Allen Creek near Hazelwood..........	14.4	24	.100	770	1,120	1,360	1,690	1,940	-
03459000	Jonathan Creek near Cove Creek......	65.3	43	.100	1,940	2,710	3,240	3,930	4,470	5,010
03459500	Pigeon River near Hepco............	350	46	.100	10,900	16,000	19,700	24,600	28,500	32,500
03460000	Cataloochee Creek near Cataloochee..	49.2	29	.100	2,020	3,200	4,080	5,320	6,330	7,410
03461910	North Toe River at Newland..........	9.24	19	.100	360	435	480	540	-	-
03462000	North Toe River at Altapass.........	104	24	.100	3,010	5,040	6,650	8,960	10,900	-
03463300	South Toe River near Celo..........	43.4	16	.100	5,000	7,700	9,700	12,400	-	-
03463500	South Toe River at Newdale.........	60.8	18	.100	5,960	10,600	14,400	20,100	-	-
03463910	Phipps Creek near Burnsville........	1.61	14	.100	145	225	280	-	-	-
03464000	Cane River near Sioux..............	157	38	.100	5,090	9,100	12,400	17,400	21,600	26,400
03464500	Nolichucky River at Poplar.........	608	31	.100	16,200	25,800	33,000	43,200	51,400	60,300
03478910	Cove Creek at Sherwood.............	23.1	18	.100	1,030	1,890	2,610	3,700	-	-
03479000	Watauga River at Sugar Grove........	90.8	34	.100	5,420	9,700	13,200	18,500	23,100	28,200
03481000	Elk River near Elk Park............	42.0	21	.100	2,500	4,650	6,480	9,280	11,700	-
03500000	Little Tennessee River near Prentiss	140	29	.100	3,320	5,020	6,270	7,970	9,320	10,700
03500240	Cartoogechaye Creek near Franklin...	57.1	12	.100	2,180	3,190	3,920	-	-	-
03500500	Cullasaja River at Highlands........	14.9	44	.100	985	1,550	1,970	2,560	3,040	3,550
03501000	Cullasaja River at Cullasaja........	86.5	50	.100	3,080	4,900	6,290	8,230	9,810	11,500
03501760	Coon Creek near Franklin...........	1.60	17	.100	125	255	375	570	-	-
03502000	Little Tennessee River at Iotla.....	323	17	.100	6,440	9,610	11,900	15,000	-	-
03504000	Nantahala River near Rainbow Springs	51.9	34	.100	2,500	3,500	4,180	5,070	5,750	6,440
03510500	Tuckasegee River at Dillsboro.......	347	14	.100	7,590	13,400	18,200	-	-	-
03511000	Oconaluftee River at Cherokee.......	131	28	.100	5,370	7,370	8,720	10,500	11,800	13,100
03512000	Oconaluftee River at Birdtown.......	184	26	.100	9,240	12,600	14,900	17,800	20,100	22,300
03513410	Jenkins Branch tributary at Bryson City	.46	13	.100	20	37	51	-	-	-
03513500	Noland Creek near Bryson City.......	13.8	36	.100	950	1,290	1,530	1,830	2,050	2,280
03514000	Hazel Creek at Proctor.............	44.4	10	.100	2,330	3,650	4,640	-	-	-
03516000	Snowbird Creek near Robbinsville....	42.0	10	.100	2,950	4,160	4,990	-	-	-
03548500	Hiwassee River above Murphy.........	406	44	.100	11,300	15,800	18,800	22,900	25,900	29,100
03550000	Valley River at Tomotla............	104	63	.100	3,950	5,950	7,410	9,400	11,000	12,600
03554000	Nottely River near Ranger..........	272	26	.100	5,860	8,520	10,400	12,900	14,900	16,900

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