LOW-FLOW CHARACTERISTICS AT SELECTED SITES ON STREAMS IN EASTERN PUERTO RICO

By Luis Santiago-Rivera

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CONVERSION FACTORS

Multiply	By	To obtain
	Length	
inch (in.)	25.4	millimeter
mile (mi)	1.609	kilometer
	Area	
acre	4,047	square meter
square mile (mi^2)	2.590	square kilometer
cubic foot per second (ft^3/s)	0.02832	cubic meter per second

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ABSTRACT

This report presents analyses of low-flow data for 12 continuous-record streamflow gaging stations and 81 partial-record sites in eastern Puerto Rico. Information on low-flow magnitude and frequency is essential in hydrologic studies and for optimum development of surface water resources. The report includes analyses of low-flow data and tabulations of computed low-flow magnitude and frequency for 7, 14, 30, 60, and 90 consecutive days with recurrence intervals of 2 and 10 years for continuous-record gaging stations. Low-flow values are provided for partial-record stations for 7, 14, and 30 consecutive days with recurrence intervals of 2 and 10 years. Low-flow values at partial-record stations were estimated from the relation between base-flow measurements at the partial-record stations and concurrent discharges at nearby continuous-record stations.

INTRODUCTION

A thorough analysis of low-flow magnitude and frequency characteristics of selected streams in Puerto Rico is necessary because of the increasing demand upon water resources by industrial and public supplies, and the legal requirements for pollution control. As water demand and waste discharges to streams increase, the need for accurate low-flow estimates of stream discharge also increases. Low-flow information can be used as an index for water-management regulations, to assess the water-supply potential and to adequately evaluate the capacity of the stream to receive waste loads. A good understanding of minimum streamflow characteristics is also vital to preserve aquatic and wildlife habitats. Low-flow discharge data for streams in Puerto Rico have been collected over the years. Low-flow characteristics have been published in reports by Cobb (1978) and Colón-Dieppa and Quiñones-Aponte, (1985). Since these studies were completed, additional streamflow data have been collected at continuous-record stations. The data obtained from continuous-record stations is used to estimate low-flow characteristics at partial-record stations.

The purpose of this report is to present estimates of low-flow magnitude and frequency at selected sites on streams in eastern Puerto Rico (fig. 1). In response to increasing needs for low-flow information, the U.S. Geological Survey, in cooperation with the Puerto Rico Aqueduct and Sewer Authority (PRASA) and the Puerto Rico Environmental Quality Board (PREQB) began a long-range study in 1983 to estimate low flows of streams in Puerto Rico.

The low-flow network in eastern Puerto Rico includes 12 continuous-record gaging stations (fig. 2) with at least 10 years of record, and 81 partial-record stations (fig. 3). These stations are fairly well distributed throughout eastern Puerto Rico. Partial-record stations were measured at least twice a year (with the exception of 1985 when only 1 measurement was made at each site) during base-flow periods for a total of 7 discharge measurements per station in 4 years. The study includes low-flow frequency analyses for periods of 7, 14, 30, 60, and 90 consecutive days for recurrence intervals of 2 and 10 years at continuous-record stations and estimates of low-flow frequency for 7, 14, and 30 consecutive days with recurrence intervals of 2 and 10 years at selected partial-record sites.

DESCRIPTION OF STUDY AREA

The study area covers the eastern part of Puerto Rico (fig. 1). The tropical rain forest is the most prominent geographic feature in the study area. It is in the Sierra de Luquillo mountain range and has an area of about 27,846 acres and reaches altitudes of 3,524 feet above mean sea level. The Sierra de Cayey, located in southeastern Puerto Rico, also is in the study area. This area is in the eastern part of the Cordillera Central mountain range that extends the entire length of Puerto Rico from the town of Yabucoa on the east to the town of Mayagüez on the west.

The Río Grande de Loíza basin is the largest river basin in eastern Puerto Rico, with a drainage area of about 300 mi^2. The Carraízo reservoir, located within this basin has a drainage area of 208 mi^2 and is one of the largest in Puerto Rico. This reservoir supplies most of the water used for public supply in the San Juan metropolitan area. Most of the river basins in the study area have steep slopes that range from 100 to 1,000 feet per mile in the mountains to 10 feet per mile near the coast. Land-surface elevations range from sea level to 3,524 feet at El Toro, the highest peak in the Sierra de Luquillo mountain range (fig. 1).

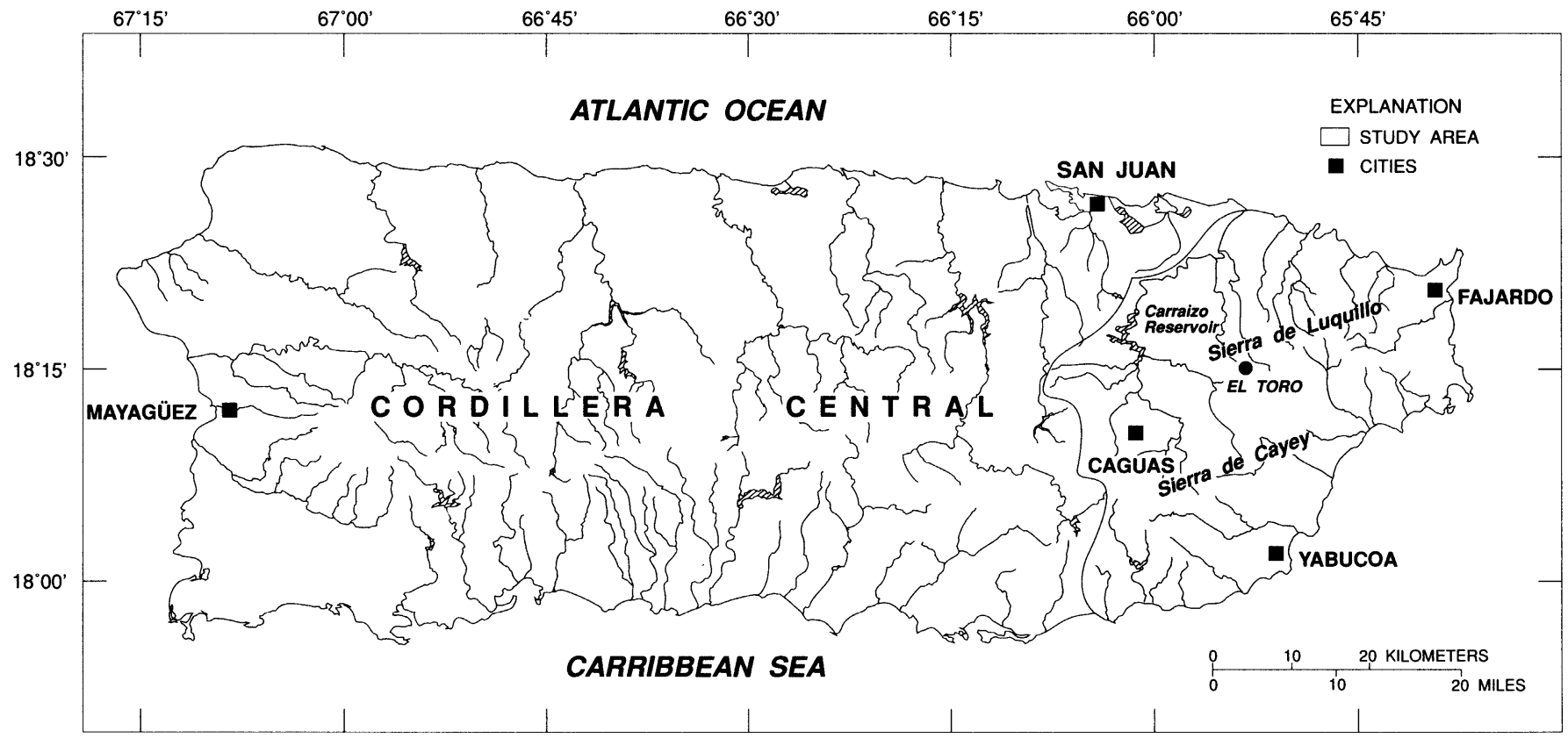

Figure 1.--General features of Puerto Rico.

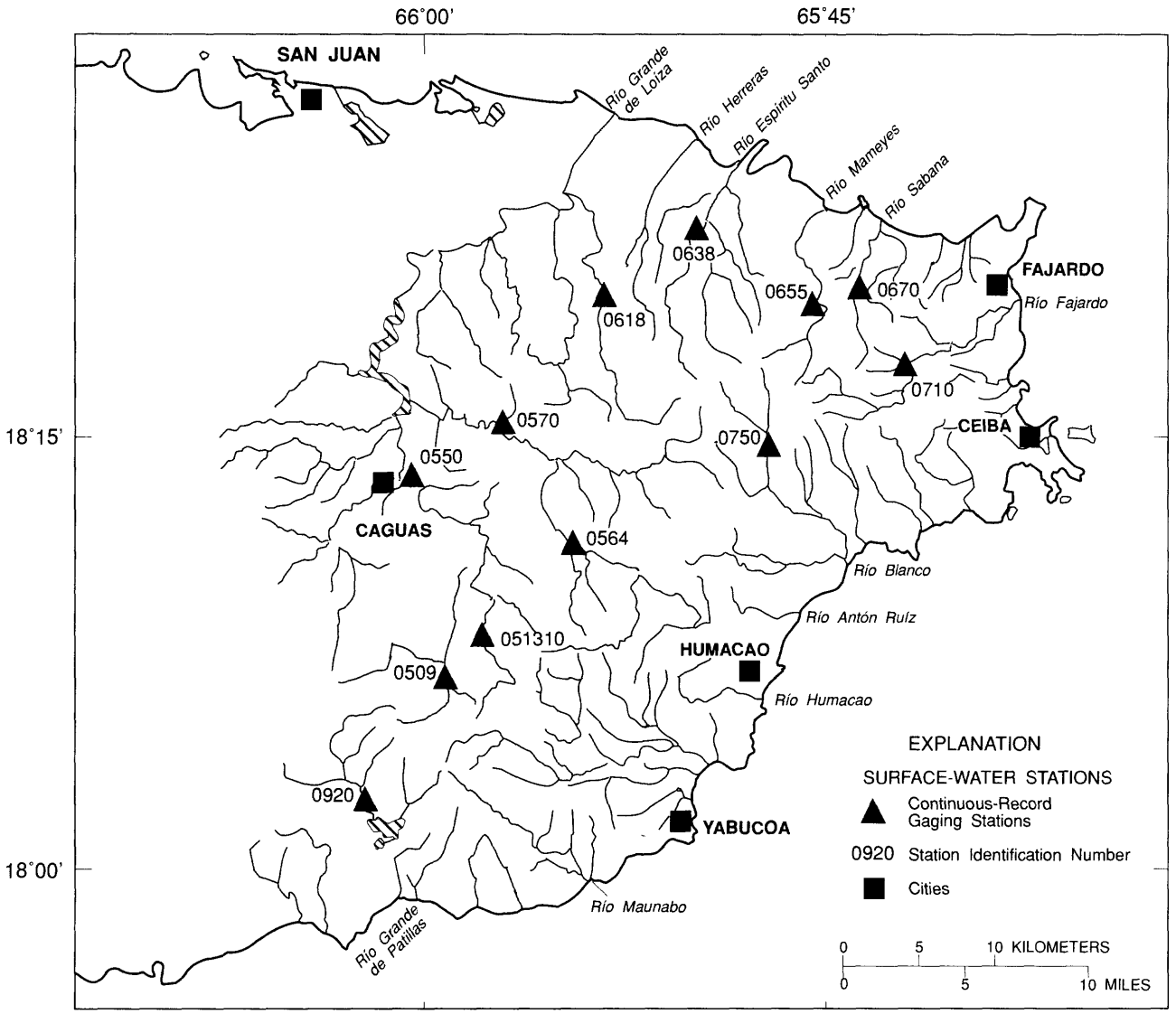

Figure 2.--Location of low-flow continuous-record gaging stations in eastern Puerto Rico that were used in low-flow frequency analyses. Site numbers on map refer to the third through sixth digit of the station number shown in the station headings in appendix 1.

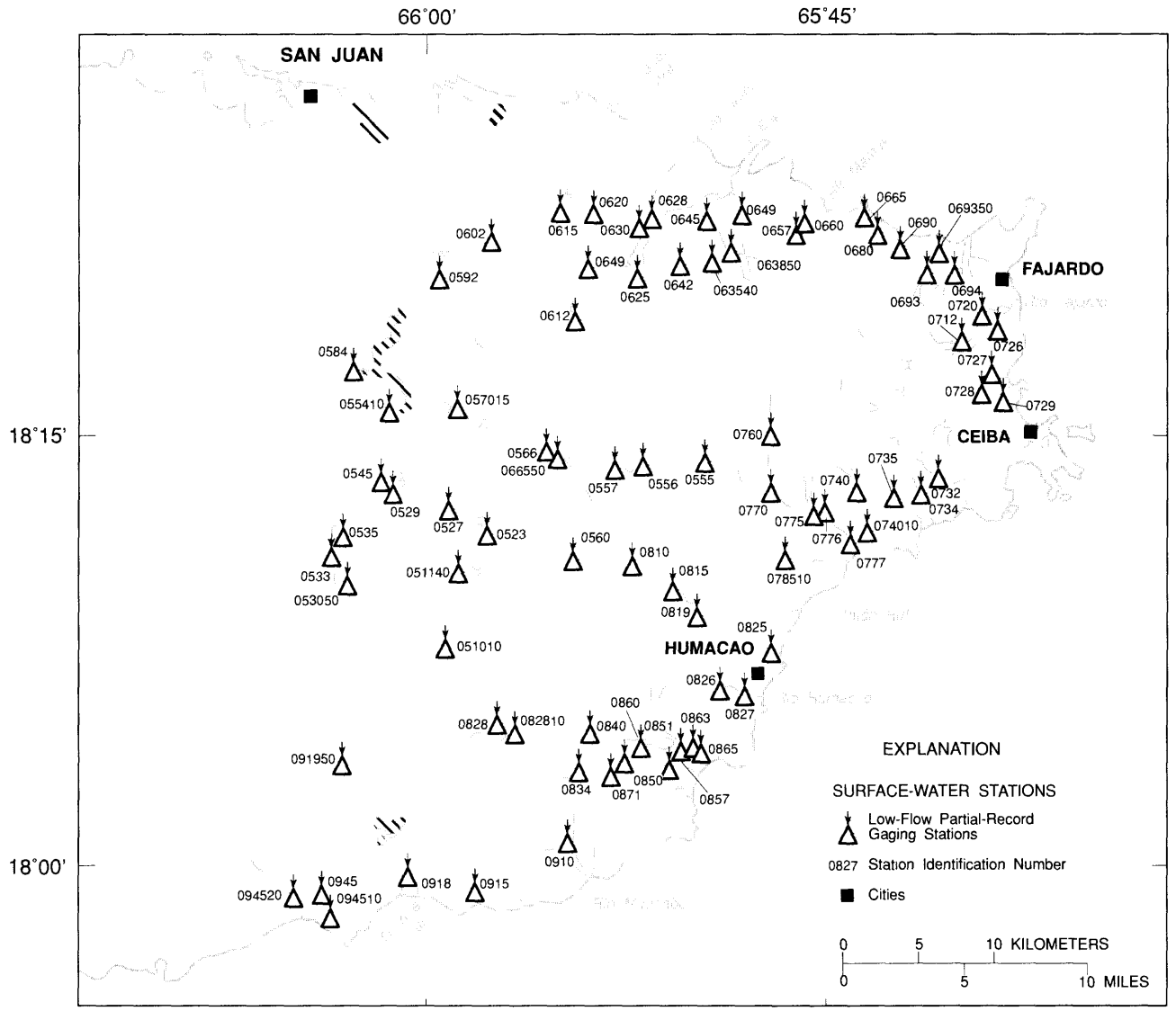

Figure 3.--Location of low-flow partial-record gaging stations in eastern Puerto Rico. Site numbers refer to the third through sixth or eigth digit of the station number shown in the station headings in Appendix 2.

Eastern Puerto Rico has a humid tropical climate with winds predominately from an easterly direction. Average annual rainfall ranges from about 70 inches in the lower altitudes to 160 inches in the Sierra de Luquillo mountain range. Average annual pan evaporation of 72 inches was recorded by the National Oceanic and Atmospheric Administration (NOAA) at Yabucoa from 1981 to 1982 (U.S. Department of Commerce, 1984). The dry season extends from January to April, with increased rainfall from May to July, and the wet season from August to December. Normally, April is the driest month of the year. The minimum annual streamflow normally occurs during April or early May.

METHODS OF ANALYSES

Different techniques were applied to continuous- and partial-record stations. Analyses for continuous-record stations were based on frequency analyses of the annual minimum n-day low-flows. For partial-record stations, base-flow discharge measurements were related to concurrent daily mean-flows at nearby continuous-record stations; low-flow characteristics were then estimated from this relation and the low-flow frequency data at the continuous-record site. A discussion of these techniques and the reliability of the estimates derived from them are provided in the following sections.

Low-Flow at Continuous-Record Gaging Stations

Low-flow frequencies were derived for 12 continuous-record stations (fig. 2) using the method described by Riggs (1972) and by adaptation of the Log-Pearson Type III flood-frequency program described by the Interagency Advisory Committee on Water Data (1982). The fitted log-Pearson Type III probability distribution and the recurrence interval (RI) of the annual n-day low flows were plotted by computer for each continuous-record station. Discharges were arrayed by the computer in order of magnitude and assigned order numbers. The lowest discharge is given the order number 1. The recurrence interval of each value in the array was computed using the plotting position formula currently in use by the U.S. Geological Survey,

$$RI = (n+1)/m,$$

where n is the number of years of record and m is the order number in the array. The graphically fitted curve based on the resulting plotting positions should be considered the basic frequency curve for annual low flows (Riggs, 1972). However, Riggs (1972) recommended that the computer plot be obtained and the log-Pearson Type III mathematical frequency curve (calculated value) be used if it is an adequate fit.

For this report, the mathematical frequency curve was used because the mathematical and graphical frequency curves were similar as shown by a typical computer plot (fig. 4).

A network of 12 streamflow continuous-record gaging stations (fig. 2) located on perennial streams with a minimum of 10 years of record were included in the analyses. The data used for these analyses have been published through the 1989 water year (U.S. Geological Survey Water Resources Data-Puerto Rico and the U.S. Virgin Islands, water years 1958-1989).

The basic data requirement needed to determine low-flow frequency characteristics at a continuous-record station is the annual minimum daily-mean discharge for selected lengths of time. In Puerto Rico, annual minimum discharge usually occurs in April, or early May. Frequency curves for each continuous-record gaging station were derived using the log-Pearson Type III distribution, adapted from the Interagency Advisory Committee on Water Data (1982). This study analyzed the daily mean discharge for continuous-record gaging stations for 7, 14, 30, 60, and 90 consecutive days in each "water year", October 1 to September 30. Seven consecutive days was the shortest period analyzed. Low-flow discharges were determined from the frequency curve for recurrence intervals of 2 and 10 years.

Low-flow characteristics of streams affected by reservoirs or irrigation canals may differ substantially from stations that exist under natural conditions, and data from regulated streams cannot be used to estimate the discharge of nearby unregulated streams. Gaging stations where considerable manmade regulation of stream flow existed were omitted from the study.

Low Flow at Partial-Record Gaging Stations

To estimate low-flow characteristics at partial-record stations (fig. 3), a relation curve (fig. 5) was developed by correlating base-flow measurements at partial-record stations with concurrent discharges at continuous-record stations. The estimating technique, illustrated in figure 5, transfers the low-flow characteristic 7-day, 2-year (34.1 ft^3/s) computed by the Log-Pearson Type III frequency distribution for the index station (50055000) to the relation curve to determine the corresponding low-flow characteristic 7-day, 2-year (3.8 ft^3/s) for the partial-record station (50054500). The development of the control-point method (fig. 5) is described by Thomson and Carter (1963). It is based on the observation that if simultaneous natural flows at gaging stations with similar geologic and topographic characteristics were plotted on logarithmic coordinates, the relation curves tended to be straight lines that intersect the line of

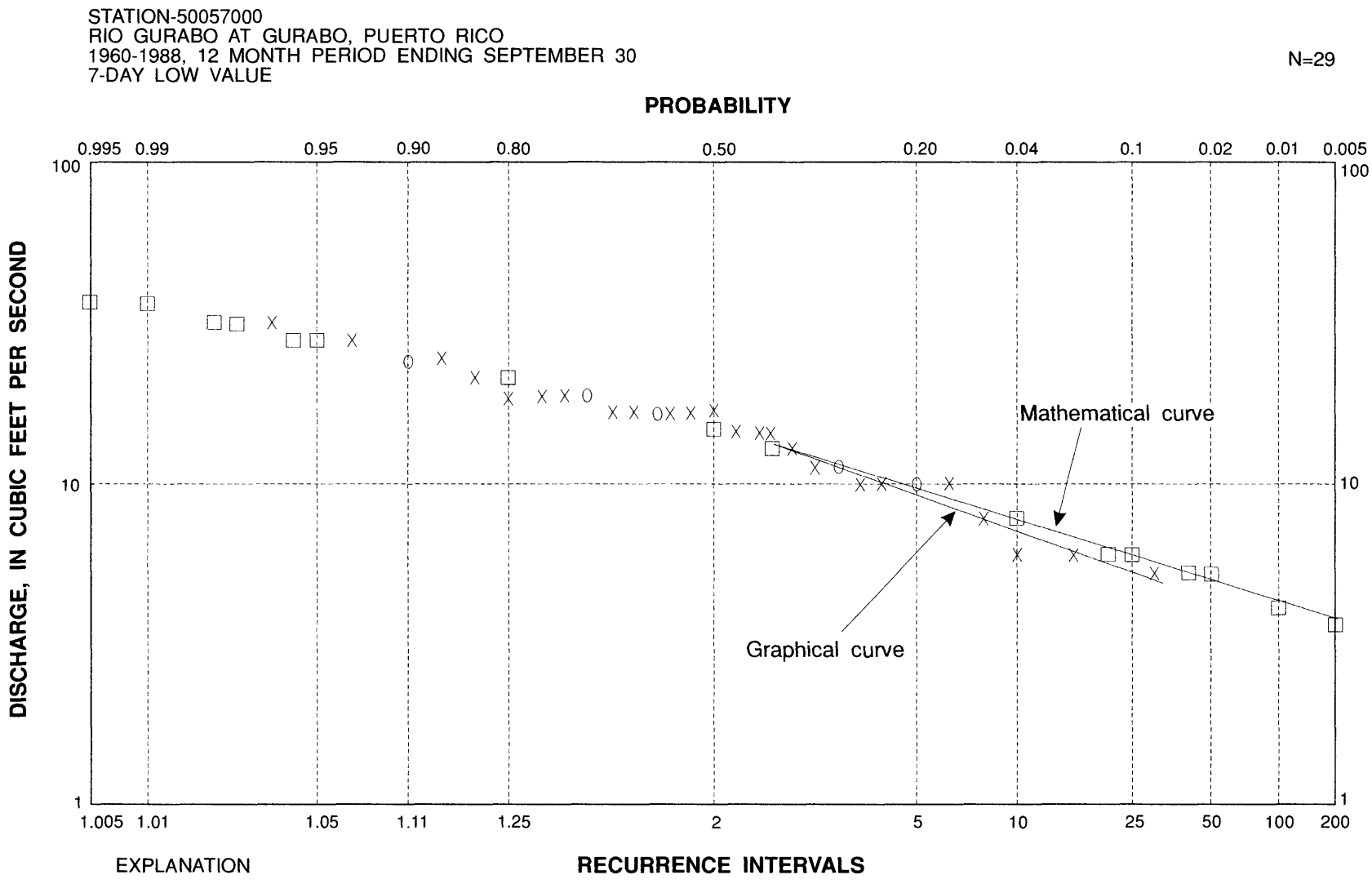

Figure 4.-- Computer generated low-flow frequency curve and graphical low-flow frequency curve for the Río Gurabo station at Gurabo, Puerto Rico.

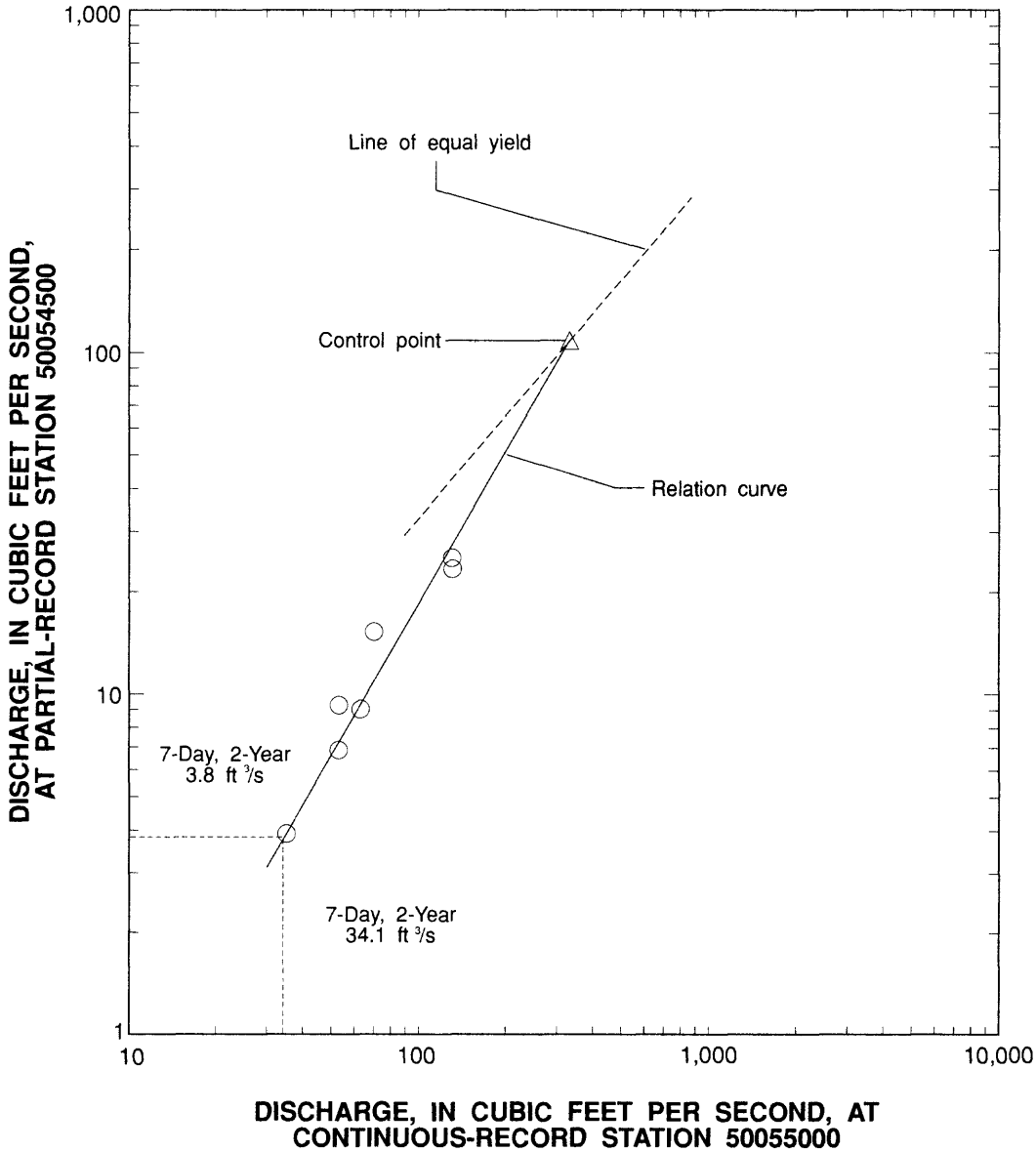

Figure 5.--Relation between concurrent discharges at a partial-record station and a nearby continuous-record station.

equal yield at a discharge about 1.5 times the average discharge at the independent station. The method is useful because the lower part of the relation curve can usually be approximated by a straight line on a logarithmic plot. The relation curve must be defined by a sufficient number of simultaneous flow measurements. The line of "equal yield" (fig. 5) shows equal discharge per unit of drainage area and, in conjunction with the control-point method, helps establish the position of the relation curve which is used to estimate the low-flow frequency at the partial-record station. The analyses and compilations in this report were made using data stored in U.S. Geological Survey data files, Reston, Virginia and San Juan, Puerto Rico.

The 81 low-flow partial-record stations (fig. 3) were analyzed as described above. These are stations where base-flow (flow that remains after storm runoff has ceased) discharge measurements have been made. Measurements were made at least twice a year, with the exceptions of 1985, when only one measurement per station was made, and 1986 through 1988 when none were made. In general, about 7 discharge measurements are available at each site. Discharge measurements obtained at the partial-record stations were related to concurrent measurements at nearby continuous-record "index" gaging stations to estimate low-flow frequency data presented in this report. Flow-frequency data were estimated for periods of 7, 14, and 30 consecutive days and for recurrence intervals of 2 and 10 years.

All continuous-record "index" stations included in this report are located on perennial streams. Partial-record stations were located as near as possible to corresponding index stations that were similar in the size of their drainage area and geologic setting. The number of base-flow discharge measurements and the index station number used in the correlations are included in the station headings of the partial-record sites table presented in appendix 2.

Reliability of Results

Low-flow frequency analyses are subject to errors. These errors are associated with many factors related to time, length of record, variability of flow, number of discharge measurements available for analyses, accuracy of discharge measurements, man-made changes (permanent or transitory) to streamflow, and compatibility of geologic features. The low-flow characteristics presented in this study for continuous-record stations with less than twenty years of data will probably change as the length of record for these stations increase and more streamflow data are collected.

PRESENTATION OF LOW-FLOW CHARACTERISTICS OF STREAMS

Low-flow characteristics of streams are presented appendices 1 and 2. Data for the 12 continuous-record gaging stations is presented first (appendix 1), followed by the data for the 81 partial-record stations (appendix 2). The heading for continuous-record gaging stations includes:

1. Location and description of the gaging site.
2. Drainage area.
3. Period of record analyzed.
4. Remarks.

The heading for partial-record gaging stations includes:

1. Location and description of the gaging site.
2. Drainage area.
3. Number of base-flow discharge measurements used in the correlations and the number of the index gaging station used.
4. Remarks.

SUMMARY

Low-flow frequency characteristics are essential in hydrologic studies for optimum development and utilization of streams. This report provides low-flow frequency analyses for 12 continuous-record streamflow gaging stations and 81 partial-record stations. Low-flow frequency characteristics for 7, 14, 30, 60, and 90 consecutive days for recurrence intervals of 2 and 10 years are presented for continuous-record stations. The log-Pearson Type III frequency distribution was used to analyze the annual n-day minimum streamflow records. Low flows for 7, 14, and 30 consecutive days for 2 and 10 years recurrence intervals are presented for partial-record sites. This information was estimated by relating discharges at partial-record sites with concurrent discharges at nearby continuous-record stations with similar geologic, climatic and topographic characteristics. Low-flow data from gaging stations where flows are affected by reservoirs or irrigation canals was not included in this report. The user is cautioned to review each relation between the partial-record and index stations carefully before applying the information presented in this report. Factors such as the length of record, location of site, flow diversions, number of measurements, and the period during which the discharge was measured can affect the accuracy of the low-flow characteristics.

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Appendix 1

CONTINUOUS-RECORD STATIONS

RIO GRANDE DE LOIZA BASIN

50050900 Río Grande de Loíza at Quebrada Arenas, PR.

LOCATION.--Lat 18°07'10", long 65°59'22", Hydrologic unit 21010005, at intersection of Highways 181 and 9920, 0.2 mi (0.3 km) upstream from confluence with Río Emajagua and about 7.1 mi (11.4 km) southwest of San Lorenzo.

DRAINAGE AREA.--6.0 mi^2 (16 km^2).

PERIOD OF RECORD ANALYZED.--October 1977 to September 1989.

REMARKS.--Diversions are made above the station for public-water supply.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days				
	7	14	30	60	90
2	5.7	6.1	6.8	8.4	10
10	4.2	4.5	5.0	5.6	6.4

50051310 Río Cayaguas at Cerro Gordo, PR.

LOCATION.--Lat 18°09'13", long 65°57'20", Hydrologic unit 21010005, on downstream side of bridge on Highway 912 at Barrio Cerro Gordo, 2.8 mi (4.5 km) south of San Lorenzo.

DRAINAGE AREA.--10 mi^2 (26 km^2).

PERIOD OF RECORD ANALYZED.--October 1977 to September 1989.

REMARKS.--Diversions are made above the station to filter plant for public-water supply.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days				
	7	14	30	60	90
2	11	12	14	17	19
10	8.7	9.4	11	12	14

50055000 Río Grande de Loíza at Caguas, PR.

LOCATION.--Lat 18°14'33", long 66°00'34", Hydrologic unit 21010005, on right bank 250 ft (76 m) upstream from bridge on Highway 189, 1.2 mi (1.9 km) downstream from Río Turabo, and 1.8 mi (2.9 km) east of Plaza de Caguas.

DRAINAGE AREA.--90 mi^2 (233 km^2).

PERIOD OF RECORD ANALYZED.--December 1959 to September 1989.

REMARKS.--Diversions are made above the station to filter plants for public-water supply.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days				
	7	14	30	60	90
2	34	39	50	63	73
10	18	21	27	35	41

RIO GRANDE DE LOIZA BASIN

50056400 Río Valenciano near Juncos, PR.

LOCATION.--Lat 18°12'58", long 65°55'34", Hydrologic unit 21010005, on left bank at Highway 919, 0.5 mi (0.8 km) upstream from Quebrada Don Víctor, 1.7 mi (2.7 km) upstream from Río Gurabo and 1.0 mi (1.6 km) south of Juncos.

DRAINAGE AREA.--16 mi² (42 km²).

PERIOD OF RECORD ANALYZED.--January 1971 to September 1989.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days				
	7	14	30	60	90
2	6.0	6.6	8.1	10	13
10	3.6	4.0	5.4	6.3	7.3

50057000 Río Gurabo at Gurabo, PR.

LOCATION.--Lat 18°15'30", long 65°58'05", Hydrologic unit 21010005, on left bank at bridge on Highway 181, 0.3 mi (0.5 km) east of Gurabo, 4.5 mi (7.6 km) upstream from Río Grande de Loíza.

DRAINAGE AREA.--60 mi² (156 km²).

PERIOD OF RECORD ANALYZED.--October 1959 to September 1989.

REMARKS.--Diversions are made above the station to filter plants for public-water supply.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days				
	7	14	30	60	90
2	15	17	21	26	32
10	7.7	9.0	11	15	17

50061800 Río Canóvanas near Campo Rico, PR.

LOCATION.--Lat 18°19'08", long 65°53'21", Hydrologic unit 21010005, at center of pier on the downstream side of bridge on paved secondary road, 0.4 mi (0.6 km) northeast of intersection of Highways 185 and 186, and 1.5 mi (2.4 km) south of Campo Rico, 4.4 mi (7.1 km) south of Loíza.

DRAINAGE AREA.--9.8 mi² (25 km²).

PERIOD OF RECORD ANALYZED.--March 1967 to September 1989.

REMARKS.--Diversions are made above the station to filter plant for public-water supply.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days				
	7	14	30	60	90
2	4.4	4.8	5.6	7.5	8.9
10	2.5	2.8	3.3	4.2	4.9

RIO ESPIRITU SANTO BASIN

50063800 Río Espíritu Santo near Río Grande, PR.

LOCATION.--Lat 18°21'37", long 65°48'49", Hydrologic unit 21010005, on left abutment, downstream side of bridge on Highway 966, 0.1 mi (0.2 km) upstream from Quebrada Giménez, and 1.9 mi (3.1 km) southeast of Río Grande.

DRAINAGE AREA.--8.6 mi² (22 km²).

PERIOD OF RECORD ANALYZED.--August 1967 to September 1989.

REMARKS.--Diversions are made above the station for public-water supply.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days				
	7	14	30	60	90
2	8.0	10	14	20	24
10	5.4	6.3	8.3	12	14

RIO MAMEYES BASIN

50065500 Río Mameyes near Sabana, PR.

LOCATION.--Lat 18°19'46", long 65°45'04", Hydrologic unit 21010005, on left bank about 50 ft (15 m) upstream from bridge on Highway 988, 1.4 mi (2.3 km) west of Sabana, 2.0 mi (3.2 km) downstream from Río de La Mina, 3.2 mi (5.1 km) southeast of Mameyes.

DRAINAGE AREA.--6.9 mi² (18 km²).

PERIOD OF RECORD ANALYZED.--August 1967 to December 1973, June 1983 to September 1989.

REMARKS.--Diversions are made above the station for public-water supply.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days				
	7	14	30	60	90
2	11	13	17	23	28
10	9.5	10	12	18	21

RIO SABANA BASIN

50067000 Río Sabana at Sabana, PR.

LOCATION.--Lat 18°19'52", long 65°43'52", Hydrologic unit 21010005, on right bank along Highway 988, 0.3 mi (0.5 km) north of intersection of Highways 988 and 983 in Sabana, 3.3 mi (5.3 km) south of Luquillo.

DRAINAGE AREA.--4.0 mi² (10 km²).

PERIOD OF RECORD ANALYZED.--October 1979 to September 1989.

REMARKS.--Diversions are made above the station to filter plant for public-water supply.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days				
	7	14	30	60	90
2	2.0	2.2	3.0	4.2	6.0
10	1.2	1.3	1.5	2.4	3.6

CONTINUOUS-RECORD STATIONS

RIO FAJARDO BASIN

50071000 Río Fajardo near Fajardo, PR.

LOCATION.--Lat 18°17'56", long 65°41'42", Hydrologic unit 21010005, on left bank off Highway 976, 0.1 mi (0.2 km) upstream from Highway 977 bridge, 0.3 mi (0.5 km) downstream from Quebrada Peñón, 1.1 mi (1.8 km) northeast of Colonia Paraíso, and 3.3 mi (5.3 km) southwest of Fajardo.

DRAINAGE AREA.--15 mi^2 (39 km^2).

PERIOD OF RECORD ANALYZED.--March 1961 to September 1989.

REMARKS.--Diversions are made above the station to filter plant for public-water supply.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days				
	7	14	30	60	90
2	8.8	11	15	22	25
10	3.7	4.8	7.1	11	14

RIO BLANCO BASIN

50075000 Río Icacos near Naguabo, PR.

LOCATION.--Lat 18°16'38", long 65°47'09", Hydrologic unit 21010005, in Caribbean National Forest off Highway 191 at El Yunque, 1.6 mi (2.6 km) upstream from confluence with Río Cubuy, 2.8 mi (4.5 km) north of Florida, and 5.3 mi (8.5 km) northwest of Naguabo Plaza.

DRAINAGE AREA.--1.3 mi^2 (3.3 km^2).

PERIOD OF RECORD ANALYZED.--July 1945-October 1979 to September 1989.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days				
	7	14	30	60	90
2	3.8	4.2	5.5	7.5	8.2
10	2.6	2.8	3.5	4.7	6.2

RIO GRANDE DE PATILLAS BASIN

50092000 Río Grande de Patillas near Patillas, PR.

LOCATION.--Lat 18°02'04", long 66°01'58", Hydrologic unit 21010005, on left bank at pedestrian bridge off Highway 184, 1.2 mi (1.9 km) upstream from Lago Patillas, and 2.2 mi (3.5 km) northwest of Patillas.

DRAINAGE AREA.--18 mi^2 (47 km^2).

PERIOD OF RECORD ANALYZED.--January 1966 to September 1989.

REMARKS.--Diversions are made above the station for public-water supply.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days				
	7	14	30	60	90
2	10	11	13	16	19
10	6.6	7.0	7.9	10	12

Appendix 2

PARTIAL-RECORD STATIONS

RIO GRANDE DE LOIZA BASIN

50051010 Río Grande de Loíza below Río Emajagua, PR.

LOCATION.--Lat 18°07'23", long 65°59'18", Hydrologic unit 21010005, about 200 ft (61 m) downstream from Río Emajagua, and 400 ft (122 m) north of intersection of Highways 181 and 745.

DRAINAGE AREA.--12 mi² (32 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50050900.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	11	12	14
10	8.5	9.3	10

50051140 Río Grande de Loíza at Jagual, PR.

LOCATION.--Lat 18°09'29", long 65°58'48", Hydrologic unit 21010005, about 200 ft (61 m) east of Jagual school on Highway 181 and 1.7 mi (2.8 km) upstream from Río Cayaguas.

DRAINAGE AREA.--18 mi² (46 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base-flows at gaging station 50050900.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	16	17	19
10	12	13	14

50052300 Río Grande de Loíza at San Lorenzo Norte, PR.

LOCATION.--Lat 18°11'39", long 65°57'46", Hydrologic unit 21010005, upstream from sewage treatment plant on north side of San Lorenzo, 0.2 mi (0.3 km) northwest of the town plaza, and 1.6 mi (2.6 km) downstream from Río Cayaguas.

DRAINAGE AREA.--46 mi² (119 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50050900.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	22	24	28
10	14	16	18

RIO GRANDE DE LOIZA BASIN

50052700 Río Grande de Loíza at Hwy 183, PR.

LOCATION.--Lat 18°12'22", long 65°59'23", Hydrologic unit 21010005, 2.1 mi (3.4 km) northwest of plaza de San Lorenzo and 1.8 mi (2.9 km) downstream from bridge on Hyghway 181.

DRAINAGE AREA.--51 mi² (132 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50050900.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	24	25	30
10	15	17	20

50052900 Quebrada Las Bambúas at mouth, PR.

LOCATION.--Lat 18°13'31", long 66°00'58", Hydrologic unit 21010005, 300 ft (91 m) upstream from bridge on Hyghway 183, and 900 ft (275 m) upstream from Río Grande de Loíza.

DRAINAGE AREA.-- 2.3 mi² (6.0 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50050900.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	.1	.1	.2
10	<.1	<.1	<.1

50053050 Río Turabo at Borinquen, PR.

LOCATION.--Lat 18°10'10", long 66°02'37", Hydrologic unit 21010005, at right upstream end of bridge on Highway 765, 0.5 mi (0.8 km) south of Villa Borinquen, and 7.3 mi (11.7 km) upstream from Río Grande de Loíza.

DRAINAGE AREA.--7.89 mi² (20.4 km²).

LOW FLOW ESTIMATES.--Based on correlation of 5 base-flow measurements with concurrent base flows at gaging station 50050900.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	6.0	6.5	7.5
10	4.4	4.7	5.2

RIO GRANDE DE LOIZA BASIN

50053300 Quebrada Beatriz above Río Turabo, PR.

LOCATION.--Lat 18°11'15", long 66°03'04", Hydrologic Unit 21010005, 1,400 ft (425 m) downstream from bridge on Highway 765 and 400 ft (120 m) upstream from Río Turabo.

DRAINAGE AREA.--5.6 mi² (15 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50055000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	2.2	2.4	3.1
10	1.1	1.3	1.7

50053500 Río Turabo below Quebrada Beatriz, PR.

LOCATION.--Lat 18°11'22", long 66°03'02", Hydrologic unit 21010005, 0.9 mi (1.4 km) downstream from bridge on Highway 765, and 400 ft (120 m) downstream from Quebrada Beatriz.

DRAINAGE AREA.--17 mi² (45 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50055000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	8.2	9.2	12
10	4.6	5.2	6.8

50054500 Río Turabo at Caguas, PR.

LOCATION.--Lat 18°13'36", long 66°01'40", Hydrologic unit 21010005, at bridge on Highway 183, 0.9 mi (1.5 km) southeast of Caguas Plaza, and 1.3 mi (2.1 km) upstream from Río Grande de Loíza.

DRAINAGE AREA.--29 mi² (76 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50055000.

REMARKS.--Diversions are made above the station to filter plant for public-water supply.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	3.8	4.5	6.5
10	1.4	1.8	2.7

RIO GRANDE DE LOIZA BASIN

50055410 Río Bairoa at mouth, PR.

LOCATION.--18°15'47", long 66°01'09", Hydrologic unit 21010005, 0.8 mi (1,2 km) downstream from bridge on Highway 30, and 0.4 mi (0,6 km) upstream from Río Grande de Loíza.

DRAINAGE AREA.--7.5 mi² (19 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50055000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	1.9	2.2	3.0
10	.8	1.0	1.4

50055500 Quebrada Honda at Las Torres, PR.

LOCATION.--Lat 18°13'15", long 65°49'57", Hydrologic unit 21010005, at bridge on Highway 31, 100 ft (30 m) east of intersection of Highway 31 and 936, and 1.8 mi (2.9 km) upstream from Río Gurabo.

DRAINAGE AREA.--1.2 mi² (3.0 km²).

LOW FLOW ESTIMATES.--Based on correlation of 5 base-flow measurements with concurrent base flows at gaging station 50057000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	<.1	<.1	.1
10	<.1	<.1	<.1

50055600 Río Gurabo at Ceiba Norte, PR.

LOCATION.--Lat 18°13"29", long 65°51'34", Hydrologic unit 21010005, 0.4 mi (0.6 km) downstream from bridge on Highway 31, and 0.2 mi (0.4 km) downstream from Quebrada Honda.

DRAINAGE AREA.--12 mi² (31 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50057000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	1.8	2.3	3.1
10	.5	.7	1.2

RIO GRANDE DE LOIZA BASIN

50055700 Río Gurabo at El Mangó, PR.

LOCATION.--Lat 18°13'56", long 65°52'52", Hydrologic unit 21010005, 1.2 mi (2.0 km) upstream from bridge on Highway 31, and 0.2 mi (0.4 km) upstream from Quebrada Grande.

DRAINAGE AREA.--16 mi² (43 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50057000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Low, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	2.3	2.9	3.8
10	0.9	1.1	1.6

50056000 Río Valenciano near Las Piedras, PR.

LOCATION.--Lat 18°10'37", long 65°54'21", Hydrologic unit 21010005, at bridge on Highway 183 km 17.3, and 3.2 mi (5.1 km) west of Las Piedras.

DRAINAGE AREA.--6.8 mi² (18 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50056400.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Concurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	4.6	4.8	5.8
10	3.1	3.4	4.2

50056550 Río Valenciano at mouth, PR.

LOCATION.--Lat 18°14'13", long 65°55'13", Hydrologic unit 21010005, 0.6 mi (1.0 km) downstream from bridge on Highway 31, and 1,000 ft (305 m) upstream from Río Gurabo.

DRAINAGE AREA.--19 mi² (49 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50056400.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	7.5	8.2	10
10	4.6	5.2	6.5

PARTIAL-RECORD STATIONS

RIO GRANDE DE LOIZA BASIN

50056600 Río Gurabo near Juncos, PR.

LOCATION.--Lat 18°14'38", long 65°55'25", Hydrologic unit 21010005, at bridge on Highway 185, and 0.4 mi (0.6 km) downstream from Río Valenciano.

DRAINAGE AREA.--50 mi² (130 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50057000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	12	14	17
10	6.2	7.5	9.5

50057015 Río Gurabo below Hwy 943, PR.

LOCATION.--Lat 18°15'50", long 65°58'41", Hydrologic unit 21010005, 0.6 mi (0.9 km) northeast of Plaza de Gurabo, and 0.7 mi (1.2 km) downstream from bridge on Highway 181.

DRAINAGE AREA.--62 mi² (162 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent low flows at gaging station 50057000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	15	18	21
10	8.0	9.5	12

50058400 Río Cañas above Lago Loíza, PR.

LOCATION.--Lat 18°17'34", long 66°02'33", Hydrologic unit 21010005, at bridge about 2,000 ft (610 m) from Highway 1, and 1.0 mi (1.6 km) upstream from Lago Loíza, and 4.0 mi (6.4 km) north of Caguas.

DRAINAGE AREA.--7.6 mi² (20 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50055000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	1.3	1.6	2.6
10	.2	.3	.8

RIO GRANDE DE LOIZA BASIN

50059200 Quebrada Grande at La Gloría, PR.

LOCATION.--Lat 18°20'28", long 65°59'20", Hydrologic unit 21010005, 400 ft (122 m) downstream from bridge on Highway 181, 200 ft (61 m) downstream from Quebrada Grande, and 1.5 mi (2.4 km) upstream from Río Grande de Loíza.

DRAINAGE AREA.--12 mi² (31 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50061800.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	1.3	1.5	2.2
10	.3	.4	.6

50060200 Quebrada Maracuta at Trujillo Bajo, PR.

LOCATION.--Lat 18°22'11", long 65°57'28", Hydrologic unit 21010005, at bridge on Highway 853, and 0.3 mi (0.5 km) upstream from Río Grande de Loíza.

DRAINAGE AREA.--10 mi² (26 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50061800.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	.8	1.0	1.4
10	.2	.3	.4

50061200 Río Canovanillas at Carruzos, PR.

LOCATION.--Lat 18°19'03", long 65°54'16", Hydrologic unit 21010005, at bridge on side road about 500 ft (152 m) off Highway 185, and 0.7 mi (1.1 km) east of Jesús T. Piñero School.

DRAINAGE AREA.--9.1 mi² (24 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50061800.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	1.2	1.4	1.8
10	.5	.6	.8

RIO GRANDE DE LOIZA BASIN

50061500 Río Canovanillas at Loíza, PR.

LOCATION.--Lat 18°22'44", long 65°55'00", Hydrologic unit 21010005, at bridge on Highway 3, 0.9 mi (1.4 km) upstream from Río Grande de Loíza , and 1.0 mi (1.6 km) west of Loíza.

DRAINAGE AREA.--16 mi² (43 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50061800.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	2.4	2.7	3.4
10	1.0	1.3	1.6

50061900 Río Canóvanas at La Marina, PR.

LOCATION.--Lat 18°01'21", long 65°53'51", Hydrologic unit 21010005, 100 ft (30 m) east of Highway 185, and 0.9 mi (1.5 km) downstream from bridge on Highway 957.

DRAINAGE AREA.--15 mi² (38 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50061800.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	6.0	6.4	7.8
10	3.3	3.8	4.4

50062000 Río Canóvanas at Loíza, PR.

LOCATION.--Lat 18°22'53", long 65°53'33", Hydrologic unit 21010005, at bridge on Highway 958, and 0.3 mi (0.5 km) east of Loíza.

DRAINAGE AREA.--17 mi² (44 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50061800.

REMARKS.--Diversions are made above the station to filter plant for public-water supply.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in (Cubic Feet per Second, for indicated Number of Consecutive Days		
	7	14	30
2	.8	1.0	1.9
10	<.1	<.1	<.1

RIO HERRERA BASIN

50062500 Río Herrera near Colonia Dolores, PR.

LOCATION.--Lat 18°21'02", long 65°52'00", Hydrologic unit 21010005, at bridge on Highway 958, 0.2 mi (3.2 km) south of Colonia Dolores, and 3.2 mi (5.1 km) southwest of Río Grande.

DRAINAGE AREA.--2.8 mi² (7.1 km²)

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50061800.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	1.6	1.8	2.0
10	1.0	1.1	1.3

50062800 Río Herrera near Loíza, PR.

LOCATION.--Lat 18°22'48", long 65°51'33", Hydrologic unit 21010005, at bridge on Highway 3, 1.9 mi (3.1 km) west of Río Grande, and 2.8 mi (4.5 km) east of Loíza.

DRAINAGE AREA.--3.9 mi² (10 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50061800.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	2.3	2.8	3.2
10	1.7	1.8	2.1

50063000 Quebrada Cambalache near Loíza, PR.

LOCATION.--Lat 18°22'49", long 65°52'04", Hydrologic unit 21010005, at bridge on Highway 3, 2.2 mi (3.5 km) east of Loíza, and 2.5 mi (4.0 km) west of Río Grande.

DRAINAGE AREA.--1.3 mi² (3.4 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50063800.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	.1	.2	.4
10	<.1	<.1	.1

RIO ESPIRITU SANTO BASIN

50063540 Río Espíritu Santo at Camp Eliza Colberg, PR.

LOCATION.--18°20'22", long 65°49'42", Hydrologic unit 21010005, 3.1 mi (4.9 km) northwest of Pico El Yunque and 0.8 mi (1.3 km) downstream from Quebrada Sonadora.

DRAINAGE AREA.--5.3 mi² (14 km²).

LOW FLOW ESTIMATES.--Based on correlation of 6 base-flow measurements with concurrent base flows at gaging station 50063800.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	5.0	6.0	8.8
10	3.3	3.9	5.2

50063850 Quebrada Jiménez near Río Grande, PR.

LOCATION.--Lat 18°21'36", long 65°48'47", Hydrologic unit 21010005, 300 ft (91 m) upstream from Río Espíritu Santo, and 1.9 mi (3.1 km) Southeast of Río Grande.

DRAINAGE AREA.--3.6 mi² (9.4 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50063800.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	2.4	3.0	4.6
10	1.5	1.8	2.5

50064200 Río Grande near El Verde, PR.

LOCATION.--Lat 18°20'43", long 65°50'30", Hydrologic unit 21010005, 400 ft (120 m) upstream from bridge on Highway 960, 500 ft (150 m) southwest of intersection of Highways 956 and 960, 1.1 mi (1.8 km) west of El Verde, and 2.7 mi (4.3 km) south of Río Grande.

DRAINAGE AREA.--7.3 mi² (19 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50063800.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	5.0	6.5	9.8
10	3.2	3.8	5.4

RIO ESPIRITU SANTO BASIN

50064500 Río Grande at Río Grande, PR.

LOCATION.--Lat 18°22'40", long 65°49'28", Hydrologic unit 21010005, at Bridge on Highway 3, 0.5 mi (0.8 km) southeast of Río Grande, and 0.8 mi (1.3 km) upstream from Río Espíritu Santo.

DRAINAGE AREA.--10 mi^2 (27 km^2).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50063800.

REMARKS.--Diversions are made above the station to filter plant for public-water supply.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	2.2	3.2	5.6
10	1.2	1.5	2.4

50064900 Quebrada Juan González near Río Grande, PR.

LOCATION.--Lat 18°22'37", long 65°48'04, Hydrologic unit 21010005, at bridge on Highway 955, 800 ft (244 m) upstream from bridge on Highway 3, and 1.5 mi (2.4 km) upstream from Río Espíritu Santo.

DRAINAGE AREA.--2.2 mi^2 (5.6 km^2).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50063800.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	.7	1.0	1.6
10	.4	.5	.8

RIO MAMEYES BASIN

50065700 Río Mameyes at Hwy 191 at Mameyes, PR.

LOCATION.--Lat 18°22'03", long 65°46'14", Hydrologic unit 21010005, 0.2 mi (0.3 km) upstream from Quebrada Anón, 0.3 mi (0.5 km) downstream from Quebrada Tabonuco, and 0.3 mi (0.5 km) south of Mameyes.

DRAINAGE AREA.--12 mi² (31 km²).

LOW FLOW ESTIMATES.--Based on correlation of 6 base-flow measurements with concurrent base flows at gaging station 50065500.

REMARKS.--Diversions are made above the station for public-water supply.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	10	12	17
10	8.2	9.0	11

50066000 Rio Mameyes at Mameyes, PR.

LOCATION.--18°22'30", long 65°45'50", Hydrologic unit 21010005, at bridge on Highway 3, 0.5 mi (0.8 km) downstream from Quebrada Anón, 0.5 mi (0.8 km) east of Mameyes (Palmer Post Office), and 3.1 mi (5.0 km) west of Luquillo.

DRAINAGE AREA.--14 mi² (35 km²).

LOW FLOW ESTIMATES.--Based on correlation of 6 base-flow measurements with concurrent base flows at gaging station 50065500.

REMARKS.--Diversions are made above the station for public-water supply.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	9.5	12	18
10	7.5	8.4	11

QUEBRADA MATA DE PLATANO BASIN

50066500 Quebrada Mata de Plátano near Luquillo, PR.

LOCATION.--Lat 18°22'52", long 65°43'16", Hydrologic unit 21010005, at bridge on Highway 3, 0.4 mi (0.6 km) northwest of Luquillo Plaza, 0.3 mi (0.5 km) upstream from mouth.

DRAINAGE AREA.--2.4 mi^2 (6.2 km^2).

REMARKS.--Estimated minimum average 7, 14, 30-day flow with 2 and 10-year recurrence interval is 0.0 on the basis of 7 observations of no flow under base-flow conditions.

RIO SABANA BASIN

50068000 Río Sabana at Luquillo, PR.

LOCATION.--Lat 18°22'15", long 65°42'51", Hydrologic unit 21010005, at bridge on Highway 3, and 0.4 mi (0.6 km) southwest of Luquillo.

DRAINAGE AREA.--7.0 mi^2 (18 km^2).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50067000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	3.2	3.6	4.8
10	1.9	2.1	2.3

RIO PITAHAYA BASIN

50069000 Río Pitahaya near Luquillo, PR.

LOCATION.--Lat 18°21'32", long 65°42'03", Hydrologic unit 21010005, at bridge on Highway 3, 1.6 mi (2.6 km) southeast of Luquillo, and 1.7 mi (2.7 km) upstream from Río Sabana.

DRAINAGE AREA.--4.5 mi^2 (17 km^2).

LOW FLOW ESTIMATES.--Based on correlation of 6 base-flow measurements with concurrent base flows at gaging station 50067000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	2.3	2.5	3.4
10	1.4	1.5	1.7

PARTIAL-RECORD STATIONS

RIO JUAN MARTIN BASIN

50069300 Tributary to Río Juan Martín at Hwy 3, PR.

LOCATION.--Lat 18°21'14", long 65°40'59", Hydrologic unit 21010005, at bridge on Highway 3, and 200 ft (61 m) upstream from Río Juan Martín.

DRAINAGE AREA.--0.5 mi² (1.4 km²).

LOW FLOW ESTIMATES.--Based on correlation of 5 base-flow measurements with concurrent base flows at gaging station 50067000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	<.1	<.1	<.1
10	<.1	<.1	<.1

50069350 Río Juan Martín above mouth, PR.

LOCATION.--Lat 18°21'44", long 65°40'35", Hydrologic unit 21010005, 0.8 mi (1.2 km) downstream from bridge on Highway 3, and 0.4 mi (0.7 km) upstream from mouth.

DRAINAGE AREA.--2.4 mi² (6.2 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50067000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	.2	.3	.4
10	<.1	.1	.1

QUEBRADA FAJARDO BASIN

50069400 Quebrada Fajardo at Hwy 194, PR.

LOCATION.--Lat 18°20'49", long 65°39'55", Hydrologic unit 21010005, at bridge on Highway 194, 0.5 mi (0.8 km) east of intersection of Highway 194 and 3, and 1.5 mi (2.4 km) upstream from mouth.

DRAINAGE AREA.--1.2 mi² (3.0 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50067000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	<.1	<.1	<.1
10	<.1	<.1	<.1

PARTIAL-RECORD STATIONS

RIO FAJARDO BASIN

50071200 Río Fajardo at Vapor below Confluence, PR.

LOCATION.--Lat 18°28'18", long 65°40'10", Hydrologic unit 21010005, 1.7 mi (2.8 km) southwest of Plaza de Fajardo and 1.4 mi (2.3 km) upstream from bridge on Highway 3.

DRAINAGE AREA.--19 mi² (50 km²).

LOW FLOW ESTIMATES.--Based on correlation of 6 base-flow measurements with concurrent base flows at gaging station 50071000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	12	15	20
10	5.2	6.8	10

50072000 Río Fajardo at Fajardo, PR.

LOCATION.--Lat 18°19'11", long 65°39'07", Hydrologic unit 21010005, at bridge on Highway 3, 0.5 mi (0.8 km) south of Fajardo, and 2.5 mi (4.0 km) upstream from mouth.

DRAINAGE AREA.--22 mi² (56 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50071000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	15	18	24
10	6.7	8.7	12

50072600 Quebrada Mata Redonda near Fajardo, PR.

LOCATION.--Lat 18°19'34", long 65°39'00", Hydrologic unit 21010005, at bridge on Highway 3, 1.2 mi (2.0 km) south of Plaza de Fajardo, and 1.7 mi (2.7 km) upstream from Río Fajardo.

DRAINAGE AREA.--1.3 mi² (3.5 km²).

REMARKS.--Estimated minimum average 7, 14, 30-day flow with a 2 and 10-year recurrence interval is 0.0 on the basis of 7 observations of zero flow under base-flow conditions.

RIO DEMAJAGUA BASIN

50072700 Río Demajagua at Demajagua, PR.

LOCATION.--Lat 18°17'10", long 65°38'21", Hydrologic unit 21010005 at bridge on Highway 3, 200 ft (61 m) south of intersection of Highway 3 and Highway 982, and 0.3 mi (0.5 km) upstream from mouth.

DRAINAGE AREA.--1.6 mi² (4.2 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50071000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	.2	.3	.5
10	<.1	<.1	.2

QUEBRADA CEIBA BASIN

50072800 Quebrada Ceiba at Ceiba, PR.

LOCATION.--Lat 18°16'25", long 65°38'25", Hydrologic unit 21010005, at bridge on Highway 3, 0.8 mi (1.3 km) northeast of Plaza de Ceiba, and 0.8 mi (1.3 km) upstream from mouth.

DRAINAGE AREA.--2.2 mi² (5.6 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50075000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	.4	.5	1.0
10	.1	.2	.3

QUEBRADA AGUAS CLARAS BASIN

50072900 Quebrada Aguas Claras near Ceiba, PR.

LOCATION.--Lat 18°16'03", long 65°38'20", Hydrologic unit 21010005, at bridge on Highway 979, and 0.6 mi (0.9 km) upstream from mouth.

DRAINAGE AREA.--0.8 mi² (2.2 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50075000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	<.1	<.1	.1
10	<.1	<.1	<.1

RIO DAGUAO BASIN

50073200 Río Daguao at Daguao, PR.

LOCATION.--Lat 18°13'42", long 65°40'39", Hydrologic unit 21010005, at railroad bridge, 0.1 mi (0.2 km) downstream from bridge on Highway 3, 0.3 mi (0.5 km) east of Daguao, and 2.8 mi (4.5 km) upstream from mouth.

DRAINAGE AREA.--2.3 mi² (5.8 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50075000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	.1	.2	.5
10	<.1	<.1	.1

QUEBRADA PALMA BASIN

50073400 Quebrada Palma at Daguao, PR.

LOCATION.--Lat 18°13'16", long 65°41'30", Hydrologic unit 21010005, at bridge on Highway 3, 0.8 mi (1.3 km) southwest of Daguao, and 1.7 mi (2.7 km) upstream from mouth.

DRAINAGE AREA.--4.8 mi² (12 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50075000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	.2	.3	.8
10	<.1	<.1	.2

QUEBRADA BOTIJA BASIN

50073500 Quebrada Botija at Hwy 31, PR.

LOCATION.--Lat 18°12'55", long 65°42'25", Hydrologic unit 21010005, at bridge on Highway 31, 500 ft (152 m) upstream from bridge on Highway 3, and 1.6 mi (2.6 km) upstream from mouth.

DRAINAGE AREA.--1.1 mi² (2.8 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50075000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	<.1	<.1	<.1
10	<.1	<.1	<.1

RIO SANTIAGO BASIN

50074000 Río Santiago at Naguabo, PR.

LOCATION.--Lat 18°12'57", long 65°43'41", Hydrologic unit 21010005, at bridge on Highway 31, 0.3 mi (0.5 km) northeast of Naguabo, 0.4 mi (0.6 km) downstream from Quebrada Grande, and 2.2 mi (3.5 km) upstream from mouth.

DRAINAGE AREA.--5.0 mi^2 (13 km^2).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50075000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	.6	.7	1.6
10	.2	.2	.4

50074010 Tributary to Río Santiago at Hwy 192, PR.

LOCATION.--Lat 18°12'04", long 65°43'33", Hydrologic unit 21010005, at bridge on Highway 192, and 0.7 mi (1.1 km) upstream from Río Santiago.

DRAINAGE AREA.--1.1 mi^2 (2.8 km^2).

REMARKS.--Estimated minimum average 7, 14, 30-day flow with a 2 and 10-year recurrence interval is 0.0 on the basis of 7 observations of zero flow under base-flow conditions.

RIO BLANCO BASIN

50076000 Río Blanco near Florida, PR.

LOCATION.--Lat 18°13'45", long 65°47'06", Hydrologic unit 21010005, 0.5 mi (0.8 km) uptream from Quebrada Sonadora, 0.7 mi (1.1 km) upstream from intersection of Highways 191 and 31, and 0.8 mi (1.3 km) south of Florida.

DRAINAGE AREA.--12 mi² (32 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50075000.

REMARKS.--Diversions are made above the station to filter plant for public-water supply.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	14	16	24
10	7.2	8.5	12

50077000 Río Blanco at Río Blanco, PR.

LOCATION.--Lat 18°13'09", long 65°46'57", Hydrologic unit 21010005, at bridge on Highway 31, and 0.4 mi (0.6 km) east of Río Blanco.

DRAINAGE AREA.--18 mi² (46 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50075000.

REMARKS.--Diversions are made above the station to filter plant for public-water supply.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	4.2	5.4	12
10	1.1	1.5	3.0

50077500 Río Blanco below La Fé, PR.

LOCATION.--Lat 18°12'17", long 65°45'31", Hydrologic unit 21010005, 1.9 mi (3.0 km) downstream from bridge on Highway 31, and 0.7 mi (1.7 km) south of intersection of Highways 31 and 970.

DRAINAGE AREA.--21 mi² (54 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50075000.

REMARKS.--Diversions are made above the station for public-water supply.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	3.0	3.8	9.5
10	.6	.8	2.0

PARTIAL-RECORD STATIONS

RIO BLANCO BASIN

50077600 Quebrada Vaca below La Fé, PR.

LOCATION.--Lat 18°12'25", long 65°45'04", Hydrologic unit 21010005, 1.1 mi (1.8 km) downstream from bridge on Highway 31, and 0.8 mi (1.4 km) southeast of intersection of Highways 31 and 970.

DRAINAGE AREA.--3.5 mi² (9.0 km²).

LOW FLOW ESTIMATES.--Based on correlation of 3 base-flow measurements with concurrent base flows at gaging station 50075000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	.7	.9	1.8
10	.2	.3	.5

50077700 Río Blanco at mouth, PR.

LOCATION.--Lat 18°11'17", long 65°43'47", Hydrologic unit 21010005, at bridge on Highway 3 at mouth, and 0.8 mi (1.2 km) southwest of intersection of Highways 31 and 192.

DRAINAGE AREA.--27 mi² (70 km²).

LOW FLOW ESTIMATES.--Based on correlation of 4 base-flow measurements with concurrent base flows at gaging station 50075000.

REMARKS.--Diversions are made above the station for public-water supply.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	6.5	8.0	18
10	1.7	2.5	5.0

RIO ANTON RUIZ BASIN

50078510 Río Antón Ruíz at Pasto Viejo, PR.

LOCATION.--Lat 18°10'26", long 65°47'05", Hydrologic unit 21010005, at bridge on unimproved road, 300 ft (91 m) north of Highway 925, and 1.5 mi (2.4 km) north of intersection of Highways 3 and 925.

DRAINAGE AREA.--5.8 mi² (15 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50075000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	.6	.8	1.8
10	.2	.2	.5

RIO HUMACAO BASIN

50081000 Río Humacao at Las Piedras, PR.

LOCATION.--Lat 18°10'27", long 65°52'11", Hydrologic unit 21010005, On left bank about 60 ft (18 m) off brige on Highway 921 at km 1.1, and 0.8 mi (1.3 km) downstream from Quebrada Blanca, and 0.8 mi (1.3 km) south of Las Piedras.

DRAINAGE AREA.--6.6 mi² (17 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50056400.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	7.1	7.5	8.5
10	5.4	5.6	6.7

50081500 Río Humacao near Humacao, PR.

LOCATION.--Lat 18°09'37", long 65°50'41", Hydrologic unit 21010005, at bridge on Highway 914, and 1.3 mi (2.1 km) northwest of Humacao.

DRAINAGE AREA.--9.2 mi² (24 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50056400.

REMARKS.--Diversions are made above the station to filter plant for public-water supply.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	2.5	2.9	4.2
10	.5	.8	1.9

50081900 Quebrada Mariana at Patagonia, PR.

LOCATION.--Lat 18°08'46", long 65°49'40", Hydrologic unit 21010005, at bridge on Highway 908, and 450 ft (137 m) upstream from Río Humacao.

DRAINAGE AREA.--5.8 mi² (15 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50056400.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	3.9	4.1	4.8
10	2.6	2.9	3.5

RIO HUMACAO BASIN

50082500 Río Humacao Flood Channel near mouth, PR.

LOCATION.--Lat 18°07'28", long 65°47'23", Hydrologic unit 21010005, 3.1 mi (4.9 km) southeast of Plaza the Humacao, and 0.6 mi (.9 km) upstream from mouth.

DRAINAGE AREA.--25 mi² (65 km²).

LOW FLOW ESTIMATES.--Based on correlation of 6 base-flow measurements with concurrent base flows at gaging station 50056400.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	14	16	18
10	9.7	10	14

RIO CANDELERO BASIN

50082600 Río Candelero at Hwy 906, PR.

LOCATION.--Lat 18°06'17", long 65°48'54", Hydrologic unit 21010005, at bridge on Highway 906, 1.4 mi (2.2 km) downstream from bridge on Highway 3, and 1.7 mi (2.7 km) upstream from mouth.

DRAINAGE AREA.--3.6 mi² (9.4 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50056400.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	.3	.4	.5
10	.1	.2	.3

RIO GUAYANES BASIN

50082800 Río Guayanés near Colonia Laura, PR.

LOCATION.--Lat 18°04'55", long 65°57'32", Hydrologic unit 21010005, on left bank about 1,000 ft (305 m) south of Highway 182, and 4.5 mi (7.2 km) west of Colonia Laura, and 5.8 mi (9.3 km) north-northwest of Yabucoa.

DRAINAGE AREA.--4.7 mi² (12 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50050900.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	7.2	7.5	8.2
10	5.6	6.0	6.5

50082810 Río Guayanés below Río Arenas, PR.

LOCATION.--Lat 18°04'44", long 65°56'54", Hydrologic unit 21010005. About 100 ft (30 m) downstream from Río Arenas and 2.8 mi (4.6 km) upstream from Quebrada Guayabo.

DRAINAGE AREA.--7.4 mi² (19 km²).

LOW FLOW ESTIMATES.--Based on correlation of 4 base-flow measurements with concurrent base flows at gaging station 50050900.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	9.7	10	11
10	7.5	8.0	8.7

50083400 Río Guayanés at Calabazas, PR.

LOCATION.--Lat 18°03'33", long 65°54'03", Hydrologic unit 21010005, at bridge on Highway 182, and 1.4 mi (2.2 km) upstream from Río Limones.

DRAINAGE AREA.--17 mi² (44 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50050900.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	18	19	21
10	13	14	15

PARTIAL-RECORD STATIONS

RIO GUAYANES BASIN

50084000 Río Limones near Yabucoa, PR.

LOCATION.--Lat 18°04'35", long 65°53'42", Hydrologic unit 21010005, at bridge on Highway 904, 1.2 mi (2.0 km) upstream from Río Guayanés, and 2.0 mi (3.2 km) northwest of Yabucoa.

DRAINAGE AREA.--7.9 mi^2 (13 km^2).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50051310.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	8.2	9.0	10
10	6.2	7.0	7.7

50085000 Río Guayanés at Yabucoa, PR.

LOCATION.--Lat 18°03'42", long 65°52'33", Hydrologic unit 21010005, at bridge on Highway 3, 0.5 mi (0.8 km) downstream from Río Limones, and 0.7 mi (1.1 km) north of Yabucoa.

DRAINAGE AREA.--26 mi^2 (69 km^2).

LOW FLOW ESTIMATES.--Based on correlation of 5 base-flow measurements with concurrent base flows at gaging station 50050900.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	25	27	30
10	18	20	22

50085100 Río Guayanés at Central Roig, PR.

LOCATION.--Lat 18°03'57", long 65°52'22", Hydrologic unit 21010005, at abandoned lake control structure, 0.2 mi (0.3 km) northeast of Central Roig, 1.0 mi (1.6 km) downstream from Río Limones, and 1.0 mi (1.6 km) northeast of Yabucoa.

DRAINAGE AREA.--27 mi^2 (69 km^2).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50050900.

REMARKS.--Diversions are made above the station to filter plant for public-water supply.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	23	24	27
10	16	18	19

RIO GUAYANES BASIN

50085700 Río Guayanés near mouth near Playa de Guayanés, PR.

LOCATION.--Lat 18°04'16", long 65°50'14", Hydrologic unit 21010005, at dirt road crossing south of Highway 909, and 3.1 mi (5.0 km) northeast of Yabucoa.

DRAINAGE AREA.--28 mi² (72 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50050900.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second for Indicated Number of Consecutive Days		
	7	14	30
2	23	24	27
10	16	18	20

50086000 Río del Ingenio near Yabucoa, PR.

LOCATION.--Lat 18°05'03", long 65°51'27", Hydrologic unit 21010005, at bridge on Highway 3, 0.2 mi (0.3 km) upstream from Quebrada Cortadera and Aguacate, and 2.6 mi (4.2 km) northeast of Yabucoa.

DRAINAGE AREA.--2.5 mi² (6.4 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50051310.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	1.7	1.9	2.3
10	1.2	1.4	1.6

50086300 Río del Ingenio near Playa de Guayanés, PR.

LOCATION.--Lat 18°04'20", long 65°50'02", Hydrologic unit 21010005, 1.8 mi (2.9 km) downstream from bridge on Highway 3, and 0.6 mi (1.0 km) upstream from Río Guayanés.

DRAINAGE AREA.--12 mi² (30 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50051310.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	2.3	2.8	3.6
10	1.5	1.7	2.1

PARTIAL-RECORD STATIONS

RIO GUAYANES BASIN

50086500 Río Guayanés at Playa de Guayanés, PR.

LOCATION.--Lat 18°03'25", long 65°49'42", Hydrologic unit 21010005, at old railroad crossing, 0.2 mi (0.3 km) from mouth, and 0.4 mi (0.6 km) west of Playa de Guayanés, and 3.5 mi (5.6 km) northeast of Yabucoa.

DRAINAGE AREA.--34 mi^2 (88 km^2).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50051310.

REMARKS.--Diversions are made above the station for public-water supply. Exist the possibility that discharge measurements were affected by the tide.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	21	25	34
10	12	15	19

PARTIAL-RECORD STATIONS

CAÑO SANTIAGO BASIN

50087100 Caño Santiago at Hwy 3, PR.

LOCATION.--Lat 18°03'25", long 65°52'33", Hydrologic unit 21010005, at bridge on Highway 3, 0.5 mi (0.8 km) north of Plaza de Yabucoa, and 0.3 mi (0.5 km) downstream from Quebradas Aguas Largas.

DRAINAGE AREA.--3.8 mi² (10 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50051310.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	.9	1.1	1.4
10	.6	.7	.8

50087200 Caño Santiago near Central Roig, PR.

LOCATION.--Lat 18°03'18", long 65°50'59", Hydrologic unit 21010005, at service road and railroad bridge, 1.8 mi (2.9 km) east of Central Roig, and 2.0 mi (3.2 km) east of Yabucoa.

DRAINAGE AREA.--6.0 mi² (16 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50051310.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	2.5	2.9	3.6
10	1.7	1.9	2.3

RIO MAUNABO BASIN

50091000 Río Maunabo at Maunabo, PR.

LOCATION.--Lat 18°00'24", long 65°54'19", Hydrologic unit 21010005, at bridge on Highway 3, 0.4 mi (0.6 km) southeast of Maunabo, and 1.3 mi (2.1 km) upstream from mouth.

DRAINAGE AREA.--12 mi² (32 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50051310.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	5.6	6.5	8.2
10	3.9	4.4	5.2

RIO JACABOA BASIN

50091500 Río Jacaboa at Hacienda San Isidro, PR.

LOCATION.--Lat 17°58'48", long 65°58'03", Hydrologic unit 21010005, at bridge on Highway 3, 0.4 mi (0.6 km) upstream from mouth, 0.4 mi (0.6 km) east of Hacienda San Isidro, and 4.8 mi (7.7 km) southwest of Maunabo.

DRAINAGE AREA.--5.2 mi^2 (14 km^2).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 500092000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	.1	.2	.3
10	<.1	<.1	<.1

RIO CHICO BASIN

50091800 Río Chico at Providencia, PR.

LOCATION.--Lat 17°59'16", long 66°00'18", Hydrologic unit 21010005, at bridge 200 ft (61 m) south of Highway 3, 0.5 mi (0.8 km) upstream from mouth, and 1.5 mi (2.4 km) southeast of Patillas.

DRAINAGE AREA.--4.9 mi^2 (13 km^2).

LOW FLOW ESTIMATES.--Based on correlation of 6 base-flow measurements with concurrent base flows at gaging station 50092000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	<.1	<.1	.1
10	<.1	<.1	<.1

RIO GRANDE DE PATILLAS BASIN

50091950 Río Grande de Patillas below Quebrada Sonadora, PR.

LOCATION.--Lat 18°03'48", long 66°02'57", Hydrologic unit 21010005, about 1,300 ft (395 m) downstream from bridge on Highway 184, and 1,000 ft (305 m) downstream from Quebrada Sonadora.

DRAINAGE AREA.--8.8 mi^2 (23 km^2).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50092000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	8.2	8.8	10
10	6.0	6.4	6.9

RIO NIGUA BASIN

50094500 Río Nigua at Arroyo, PR.

LOCATION.--Lat 17°58'10", long 66°03'41", Hydrologic unit 21010005, at bridge on Highway 178, 0.2 mi (0.3 km) north of Arroyo, and 3.7 mi (6.0 km) east of Guayama.

DRAINAGE AREA.--8.0 mi² (21 km²).

LOW FLOW ESTIMATES.--Based on correlation of 4 base-flow measurements with concurrent base flows at gaging station 50050900.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	<.1	<.1	<.1
10	<.1	<.1	<.1

QUEBRADA SALADA BASIN

50094510 Quebrada Salada near Arroyo, PR.

LOCATION.--Lat 17°58'50", long 66°04'23", Hydrologic unit 21010005, at bridge on Highway 3, and 0.9 mi (1.4 km) upstream from mouth.

DRAINAGE AREA.--0.8 mi² (2.0 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50050900.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	<.1	<.1	.1
10	<.1	<.1	<.1

QUEBRADA CORAZON BASIN

50094520 Quebrada Corazón near Arroyo, PR.

LOCATION.--Lat 17°58'58", long 66°04'41", Hydrologic unit 21010005, at bridge on Highway 3, and 1.0 mi (1.6 km) upstream from mouth.

DRAINAGE AREA.--4.3 mi² (11 km²).

LOW FLOW ESTIMATES.--Based on correlation of 7 base-flow measurements with concurrent base flows at gaging station 50092000.

MAGNITUDE AND FREQUENCY OF ANNUAL LOW FLOWS

Recurrence interval, in years	Lowest Average Flow, in Cubic Feet per Second, for Indicated Number of Consecutive Days		
	7	14	30
2	<.1	<.1	.1
10	<.1	<.1	<.1

*U.S. Government Printing Office: 1992 — 631-117/60004