Flood of October 6-7, 1985, in the Ponce-Santa Isabel Area, Puerto Rico

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ABSTRACT

Floods affected most of the south-central and north-central parts of Puerto Rico during October 6-7, 1985, as a result of intense rainfall produced by a nearly stationary tropical depression. This weather system produced 24-hour total rainfall of as much as 625 millimeters at Jayuya. The most severe flooding occurred along the south coast from the city of Ponce, east towards the town of Santa Isabel. Severe floods also occurred along the north-central coast, near the towns of Barceloneta, Dorado, and Toa Baja. These floods were among the largest ever recorded in southern and northern Puerto Rico. The floods caused significant loss of life and widespread property damages. About 170 people died as a result of the floods and landslides that occurred in southern Puerto Rico. Damage estimates to private and public property totalled about $125 million.

INTRODUCTION

Intense rainfall on October 6-7, 1985, caused severe flooding along streams in the Ponce to Santa Isabel area and in the towns of Barceloneta, Dorado, and Toa Baja, Puerto Rico (fig. 1). The rains were produced by a nearly stationary tropical depression. During a 24-hour period, as much as 625 mm of rainfall occurred at Cerro Maravilla, Jayuya; exceeding all previously recorded rainfall amounts during a 24-hour period. The maximum 6-hour rainfall during this period was 284 mm at Cerro Maravilla (Quiñones and Johnson, 1987).

Severe flooding occurred along the north-central coast, in the lower reaches of the Río Grande de Manatí at the town of Barceloneta and in the Río de La Plata near the towns of Dorado and Toa Baja (fig. 1). The most severe flooding occurred along the south coast from the city of Ponce, east towards the town of Santa Isabel (fig. 2). These floods were among the largest ever recorded in northern and southern Puerto Rico.

Floodwaters inundated large housing areas and farmlands near the towns of Ponce, Juana Díaz, and Santa Isabel. About 40 deaths were attributed to the flood of October 6-7, 1985. Most of the deaths resulted from the collapse of the bridge over the Río Coamo on Highway 52 (Las Americas Expressway). An unknown number of vehicles fell into the stream, resulting in at least 24 fatalities. A landslide in Ponce, associated with the intense rains of October 5-8, caused the death of about 130 people. About 1,300 houses were destroyed and about 1,700 others damaged. Damage to private and public property was estimated by the Federal Emergency Management Administration at about $125 million.

This report, prepared by the U.S. Geological Survey in cooperation with the Puerto Rico Department of Natural and Environmental Resources, documents the extent of the October 6-7, 1985 flood for streams in the Ponce to Santa Isabel area. High-water marks and flood discharge data obtained by personnel of the U.S. Geological Survey immediately after the flood were the principal data base used to complete this report. Additional information was also obtained from interviews with residents who live or work in the study area.

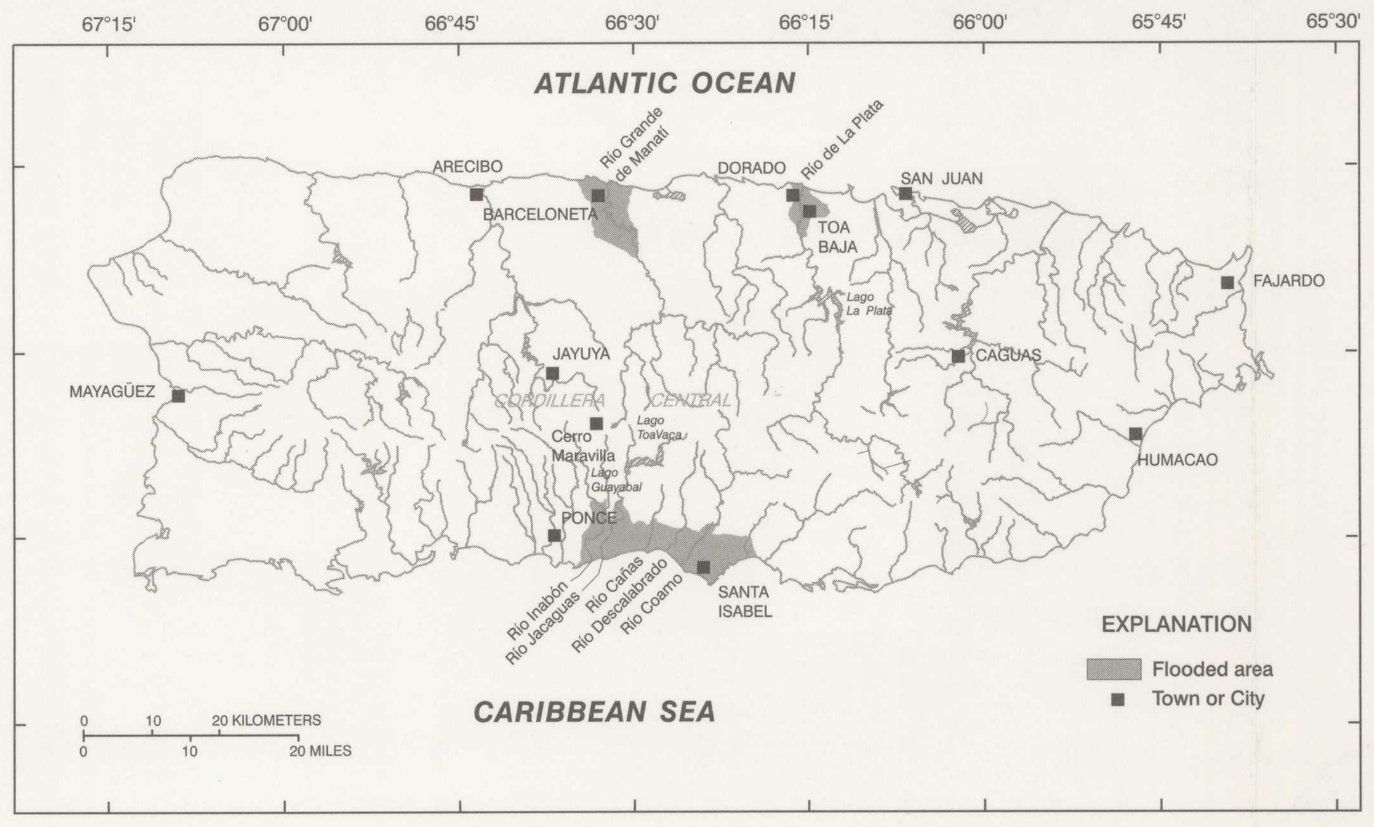


Figure 1. Areas in Puerto Rico where flooding was most severe during October 6-7, 1985.

DRAINAGE BASINS

The Ponce-Santa Isabel study area lies in the south-central part of Puerto Rico, encompasses about 150 km^2, and is composed largely of a coastal plain bordering the Caribbean Sea. About 75 km^2 of this area was inundated by the October 6-7, 1985, flood (fig. 2). The five streams (Río Inabón, Río Jacaguas, Río Cañas, Río Descalabrado, and Río Coamo) that contributed to flooding in the study area originate on the southern slopes and in the foothills of the Cordillera Central and flow south to the Caribbean Sea. The combined drainage area of these five streams is about 496 km^2.

The Río Inabón the westernmost stream in the study area originates in the Cordillera Central and flows east of Coto Laurel before emptying into the Caribbean Sea. The drainage area of the stream at its mouth is about 96 km^2. At the streamflow-gaging station at Real Abajo (station 50112500; site 4, fig. 2) the drainage area is 25.1 km^2. The major tributary of the Río Inabón, the Río Guayo (drainage area 28.7 km^2), flows into the Río Inabón about 10 km from the sea.

The Río Jacaguas, the second largest stream on the southern slope of the Cordillera Central, passes west of the town of Juana Díaz and empties into the Caribbean Sea at Manzanillo. The drainage area of the stream at its mouth is about 155 km^2. At the streamflow-gaging station near Juana Díaz (station 50111500; site 3, fig. 2), the drainage area is 129.0 km^2. There are two large reservoirs in the Río Jacaguas basin, Lago Toa Vaca and Lago Guayabal, which have a large effect on reducing flood flows.

The Río Cañas is a small stream that begins in the foothills of the Cordillera Central and discharges into the Caribbean Sea at Punta Pastillo, about 0.7 km south of Highway PR-1. The total drainage area of this stream is about 17 km^2; mostly on the coastal plain.

The Río Descalabrado also originates in the foothills of the Cordillera Central and discharges into the Caribbean Sea about 1.0 km west of Playita Cortada. The drainage area of this stream is about 49 km^2, most of which is on the coastal plain. At the streamflow-gaging station near Los Llanos (station 50108000; site 2, fig. 2) the drainage area is 33.4 km^2.

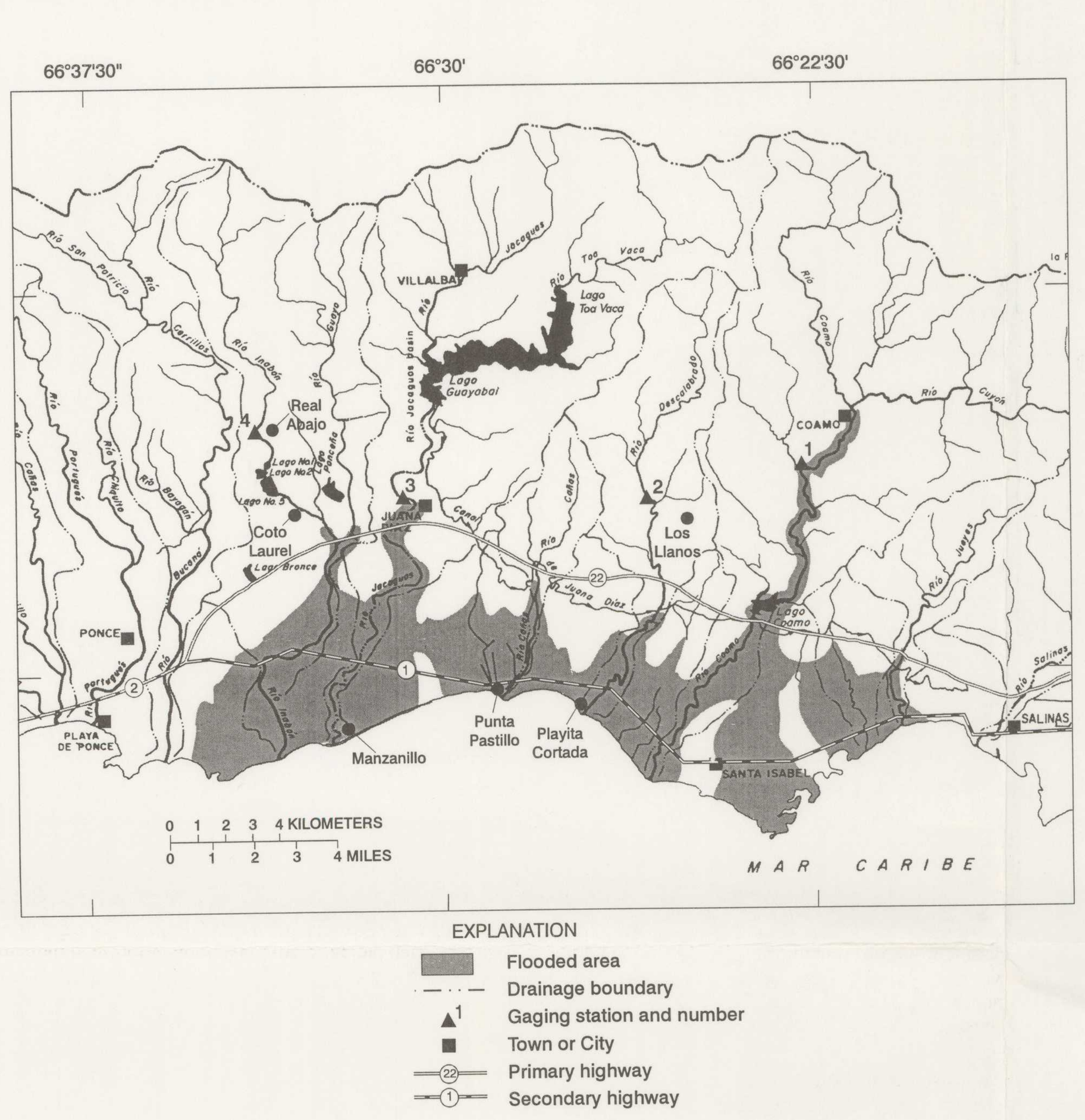
The Río Coamo rises on the Cordillera Central and has the largest basin on the south slope. The drainage area of the Río Coamo at its mouth is about 179 km^2. At the streamflow-gaging station near Coamo (station 50106500; site 1, fig. 2), the drainage area is 119.0 km^2. The only reservoir in the Río Coamo basin is the Lago Coamo. The storage capacity of this reservoir, 3.45 hm^3, has been significantly reduced by siltation.

FLOOD HISTORY

The Ponce-Santa Isabel area has been severely affected by floods at least six times during the period from 1928 to 1985. Floods that have inundated sizable areas and for which some water-surface elevation data are available occurred in 1928, 1940, 1954, 1962, 1970, and 1985. Accurate water-surface profiles were determined for the floods of October 5-10, 1970 and October 6-7, 1985 only. The flood of October 6-7, 1985 was larger than the flood of 1970 in this area (Haire, 1971).

FLOOD DISCHARGE

Data for the October 6-7, 1985 flood were obtained from four gaging stations in the study area. Previous annual-maximum discharges were exceeded at all four gaging stations. Maximum flow data are listed in table 1 and locations of the sites are shown in figure 2. For comparison, the table also includes the maximum recorded stage and discharge prior to October 1985. The maximum recorded discharges for the Río Coamo near Coamo were 623 m^3/s in 1970 and 1,530 m^3/s for the 1985 flood.



EXPLANATION

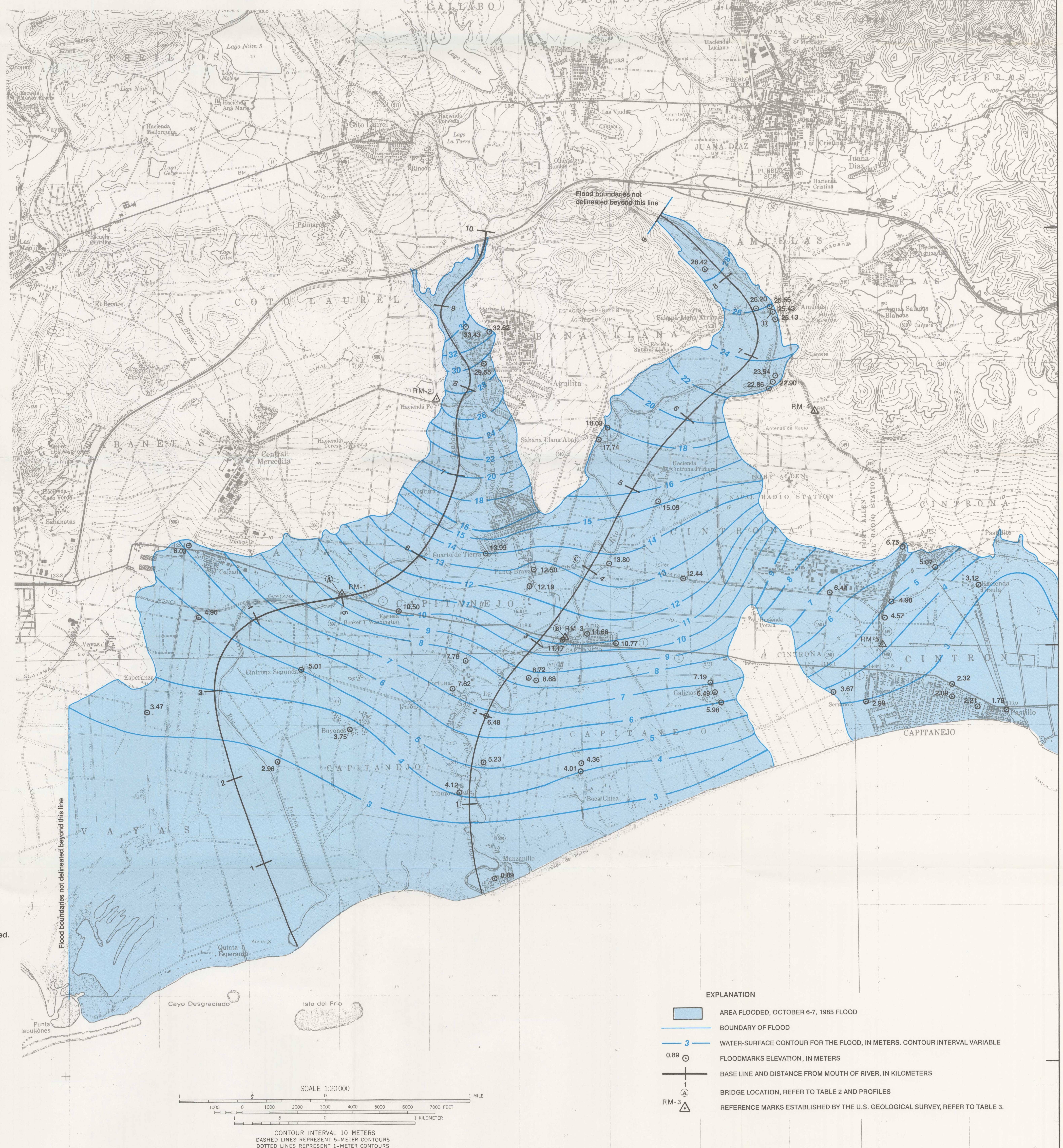
- Flooded area
- Drainage boundary
- Gaging station and number
- Town or City
- Primary highway
- Secondary highway

Figure 2. Streams in the Ponce-Santa Isabel area for which flood information is provided.

Table 1. Summary of gage heights and discharges during flood of October 6-7, 1985, at selected U.S. Geological Survey streamflow-gaging stations in the Ponce to Santa Isabel area

[km^2, square kilometer; m, meters above an arbitrary datum; m^3/s, cubic meter per second; --, not determined ; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or data base]

					Maximum prior to October 1985				Maximum in October 1985			
Site number (fig. 2)	Station number	Station name	Drainage area (km^2)	Period of record	Date	Gage height (m)	Discharge (m^3/s)	Recurrence interval (years)	Day	Gage height (m)	Discharge (m^3/s)	Recurrence interval (years)
1	50106500	Río Coamo near Coamo	119.0	1960 1965-75 1978-80 1982 1984-86	10/09/70	6.52	623	10	7	--	1,530	90
2	50108000	Río Descalabrado near Los Llanos	33.4	1966-69 1971-72 1975 1977-78 1982 1984-86	10/09/70	5.97	292	10	7	7.43	850	40
3	50111500	Río Jacaguas at Juana Díaz	129.0	1985-86	05/18/85	5.72	360	3	7	8.97	1,130	20
4	50112500	Río Inabón at Real Abajo	25.1	1964-86	10/09/70	6.28	162	12	7	--	538	>100



EXPLANATION

- AREA FLOODED, OCTOBER 6-7, 1985 FLOOD
- BOUNDARY OF FLOOD
- 3 WATER-SURFACE CONTOUR FOR THE FLOOD, IN METERS. CONTOUR INTERVAL VARIABLE
- 0.89 FLOODMARKS ELEVATION, IN METERS
- 1 BASE LINE AND DISTANCE FROM MOUTH OF RIVER, IN KILOMETERS
- (A) BRIDGE LOCATION, REFER TO TABLE 2 AND PROFILES
- RM-3 REFERENCE MARKS ESTABLISHED BY THE U.S. GEOLOGICAL SURVEY, REFER TO TABLE 3.

CONVERSION FACTORS

Multiply	By	To obtain
cubic meter per second (m^3/s)	35.31	cubic feet per second
cubic hectometer (hm^3)	810.7	acre-foot
kilometer (km)	0.6214	mile
meter (m)	3.281	foot
millimeter (mm)	0.03937	inch
square kilometer (km^2)	0.3861	square mile

Base from U.S. Geological Survey Quadrangle Río Descalabrado, 1972, Ponce, 1970, Playa de Ponce, 1970, and Santa Isabel, 1970 Puerto Rico, Photorevised 1982. Lambert Conic Conformal Projection.