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COMMONWEALTH OF PUERTO RICO
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WATER RESOURCES INVESTIGATIONS
OPEN-FILE REPORT 80-1283
PLATE 1 OF 5

FLOODS OF SEPTEMBER 16, 1975 IN THE TALLABOA VALLEY, PUERTO RICO

INTRODUCTION

This report provides a record of the flood of September 16, 1975, and associated hydrologic data. These data can be used in making rational decisions in formulating effective flood-plain regulations that would minimize flood problems in the Tallaboa Valley.

The Tallaboa Valley (fig. 1) lies on the southwestern coast of Puerto Rico about 12 km (7.5 mi) west of the city of Ponce. The climate is semiarid with a mean annual precipitation of about 1,020 mm (40 in). It is a relatively small valley which until the late fifties was dedicated mainly to the production of sugarcane. Since then, the economy started changing from agriculture to industry. At present the lower part of the valley is completely industrialized. The upper part of the valley is used for agriculture--mostly as pastureland. The reach from Highway 132 downstream to the new Highway 2 is mainly agricultural with a few scattered communities. The lower part of the valley that includes the area from the Highway 2 bridge to the mouth is covered with heavy industry concerned with the refinement of oil, and associated industries.

The continuous growth of industry and consequently of the urban area of Peñuelas has encouraged growth onto the flood plain. The study area is subject to flooding by the Río Tallaboa and the Río Guayanés, its main tributary. The Río Guayanés is the cause of flooding in the urban area of Peñuelas, encompassing the reach from the northern edge of town downstream to Highway 132 where it joins the Río Tallaboa.

Data are generally referred to in SI (International System) units followed by corresponding inch-pound units in parentheses. The SI units may be converted to inch-pound units by multiplying the units given by the factors shown.

THE RIO TALLABOA BASIN

The Río Tallaboa and its tributaries originates on the southern slopes of the Cordillera Central and flows south into Bahía de Tallaboa. A map of the drainage basin is shown in figure 1. The study area covers 10 km (6.2 mi) of reach that begins 2.5 km (1.6 mi) north of the town of Peñuelas and extends to the mouth at Bahía de Tallaboa.

The Río Tallaboa and its major tributary, the Río Guayanés, flow in narrow, steep-gradient valleys through rugged hills until they join at the town of Peñuelas where the valley floor decreases in slope and begins to widen.

The drainage area of the Río Tallaboa at the U.S. Geological Survey gaging station at Peñuelas is 62.7 km^2 (24.2 mi^2). The Río Guayanés at its junction with the Río Tallaboa has a drainage area of 21.0 km^2 (8.1 mi^2). The drainage area at the mouth of the Río Tallaboa is 80 km^2 (31 mi^2).

FLOOD OF SEPTEMBER 16, 1975

The passage of hurricane Eloise near the north coast of Puerto Rico caused torrential rains September 15, 16, and 17, 1975, producing destructive floods in the southwestern part of Puerto Rico. Figure 2 shows precipitation at 10 stations during September 15-17, 1975, and the distribution of precipitation through the island for this period.

The estimate of damages to private and public property is not available but it ranged in the millions of dollars.

On September 16, 1975, the Tallaboa Valley suffered the most severe flood since 1928. The town of Peñuelas, the small communities scattered through the valley, and the industrial complex located in the lower end of the valley, suffered severe damage to property. After the flood the U.S. Geological Survey made an indirect measurement at the new Highway 2 bridge, computing a peak discharge of 535 m^3/s (18,900 ft^3/s). The measurement site is about 300 m above the gaging station (50122000). The discharge of 666 m^3/s of September 16, 1975, shown in table 1 for station 50121000 at Peñuelas was estimated from the stage-discharge relation shown in figure 3 which is based on records from 1959 to 1975. The photographs shown in figures 4-9 illustrate examples of the depth of water at different sites in the valley during the September 16, 1975, flood. Photographs are identified on the topographic maps (plates 2, 3, 4, and 5) by a circular symbol with an identifying letter and an arrow showing the direction in which the photograph was taken.

FLOOD HISTORY

Historical records and interviews with residents in the area subject to flooding by the Río Guayanés and the Río Tallaboa indicate that the valley has suffered extensive flooding at least four times since 1899. The floods in order of magnitude occurred in 1928, 1975, 1958, and 1963 (table 1).

In 1959 the U.S. Geological Survey installed a continuous water-stage recorder on Río Tallaboa at Peñuelas (station 50121000) located about 110 m (350 ft) downstream from the Highway 132 bridge. In 1971 this gaging station was converted to a partial-record station from which only annual peak data were collected. Records from the gaging station indicated that seven sizable floods occurred during the period 1959-76. The largest for this period was the September 16, 1975, flood (table 1).

Discharges for the 1928 and 1958 floods at the Peñuelas gage are not known; at the Tallaboa gage high-water marks for these floods were identified by local residents. Based on these high-water elevations and the stage-discharge relation, the discharges were estimated to be 850 m^3/s (30,000 ft^3/s) and 467 m^3/s (16,500 ft^3/s), respectively, for the 1928 and 1958 floods.

FLOOD FREQUENCY

Historical records were used to define a flood magnitude-frequency relation for the Río Tallaboa at Peñuelas gaging station. Peak-flow data for this site have been collected for 16 years.

Water Resources Council Bulletin 17A (appendix 8, 1977) recommends that the frequency relation at a gaged site be determined by a weighting of the discharge for a selected frequency using the station data and data obtained by a regional flood magnitude-frequency relation. This was done using the relation developed with the 16 years of station data and with results of a regional study accomplished by López and others, 1979. The resulting frequency curve is shown in figure 10. The recurrence intervals shown in table 1 were derived from this figure.

The date of occurrence of a flood of a given magnitude cannot be predicted, but the probable number of such floods during a long period can be estimated with reasonable accuracy. The frequency of occurrence is the average interval of time in which a given flood will be equaled or exceeded once. Stated differently, a 50-year flood has one chance in fifty of being equaled or exceeded in any 1 year.

FLOOD PROFILES

The flood profile for the September 16, 1975, flood for the Río Tallaboa and the Río Guayanés is shown in figure 11. It is referenced to the arbitrary base line shown on the flood map. The base line, and therefore the profile, is not confined to the configuration of the channel but follows a smoother path along the flood plain in the general direction of the floodflow. The profile is based on high-water marks recovered by field survey crews of the U.S. Geological Survey after the flood. Information was also obtained from residents in the study area. There are eight bridges in the study area; three over the Río Guayanés and five over the Río Tallaboa (table 2). In the September 16, 1975, flood, two bridges over the Río Guayanés were destroyed by floodwaters.

All elevations shown in the study are referenced to mean sea-level datum. Permanent reference marks were established at selected points throughout the study area (table 3) and are shown on the flood maps (plates 2, 3, 4, and 5).

WATER-SURFACE CONTOURS

Water-surface contours are based on the elevations of high-water marks recovered after the September 16, 1975, flood. These contours represent equal elevations of the water surface and are normal to the direction of flow. Obstructions to the flow such as sugarcane and manmade obstacles caused irregularities in the contours. In the lower part of the Tallaboa Valley where the industrial complex is located, the water was obstructed by landfills and buildings. This caused irregularities in the shape of the high-water contours. The approximate depth of flooding at any point in the inundated area can be estimated by subtracting the ground elevation (contour) from the water-surface elevation (contour). Intermediate estimates of depth can be obtained by interpolation.

INUNDATED AREA

The area inundated by the September 16, 1975, flood has been delineated on a 1-meter contour interval topographic map as shown in this report. The flood boundaries were delineated using the high-water marks and field inspection of the flooded area immediately after the inundation. Where shallow depth occurred the flood boundaries were not delineated on topographic maps. The pattern of inundation of future floods, even of the same magnitude, will be affected by new highways and bridges, new buildings, landfills, or by relocation or excavation of stream channel. For example, in the reach from the city limits of the town of Peñuelas downstream to below Highway 132, the channel has been widened and two bridges which were destroyed by the September 16, 1975, flood have been rebuilt. Thus, if a flood of the same magnitude occurs now, the pattern of flooding may differ from that shown on the topographic map.

COOPERATION AND ACKNOWLEDGMENTS

This report was prepared under a cooperative agreement between the Puerto Rico Department of Natural Resources, the U.S. Army Corps of Engineers, San Juan office, and the U.S. Geological Survey, San Juan District.

ADDITIONAL INFORMATION

Additional information related to this report can be obtained from the U.S. Geological Survey, San Juan District office, G.P.O. Box 4424, San Juan, Puerto Rico 00936.

SELECTED REFERENCES

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López, M. A., Colón-Dieppa, Eloy, and Cobb, E. D., 1979, Floods in Puerto Rico, magnitude and frequency: Water Resources Investigations 78-141, 66 p.

United States Water Resources Council, 1977, Guidelines for determining flood flow frequency: Bulletin no. 17A of the Hydrology Committee, 163 p.

SI unit	Factor	Inch-pound unit
	Area	
square kilometer (km^2)	0.386	square mile (mi^2)
	Discharge	
cubic meter per second (m^3/s)	35.31	cubic foot per second (ft^3/s)
	Length	
meter (m)	3.2808	foot (ft)
millimeter (mm)	0.0394	inch (in)
kilometer (km)	0.622	mile (mi)

Table 1.--Data for large floods on the Río Tallaboa at Peñuelas gaging station 50121000.

Date	Discharge m^3/s	Discharge ft^3/s	Estimated recurrence interval, years
Sept. 23, 1928	991	35,000 (Est.)	70
May 6, 1958	595	21,000 (Est.)	19
April 29, 1960	273	9,640	4
Aug. 27, 1961	286	10,100	5
Aug. 27, 1963	413	14,600	9
Sept. 10, 1967	264	9,320	4
Oct. 8, 1970	240	8,480	3
Oct. 1974	268	9,480	4
Sept. 16, 1975	1/ 666	23,500	25

1/ Discharge based on high-water marks recovered after the flood and stage-discharge relation shown in figure 3.

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