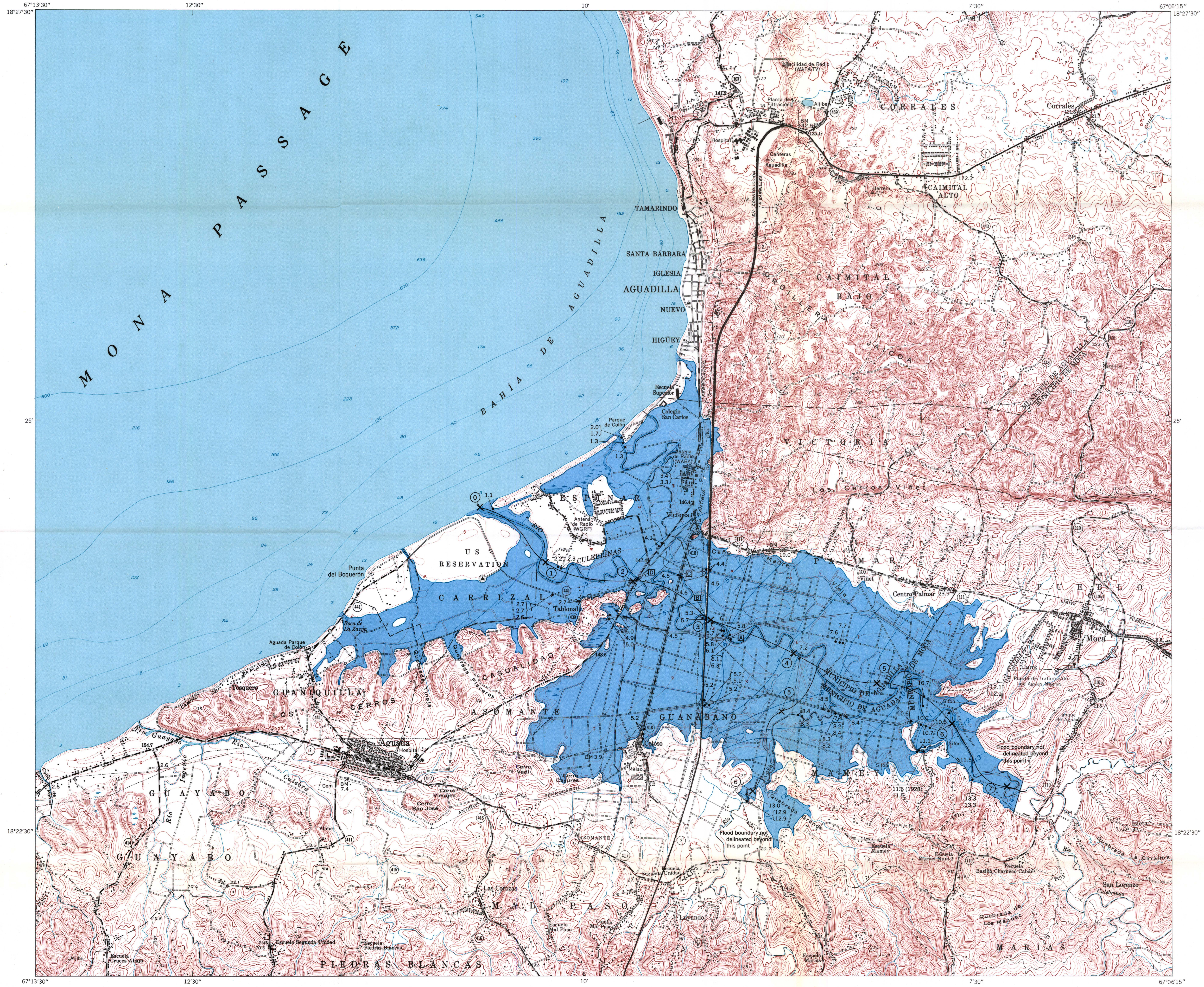
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH
THE COMMONWEALTH OF PUERTO RICO
DEPARTMENT OF PUBLIC WORKS

HYDROLOGIC INVESTIGATIONS
ATLAS HA-457



Base from U.S. Geological Survey
Aguadilla, 1960, Moca, 1964, Rincon,
1955, and Central La Plata, 1964

SCALE 1:20 000
1 .5 0 1 KILOMETER
1 ½ 0 1 MILE

CONTOUR INTERVAL 5 METERS
DOTTED LINES REPRESENT 1- METER CONTOUR
DATUM IS MEAN SEA LEVEL
DEPTH CURVES AND SOUNDINGS IN FEET—DATUM IS MEAN LOW WATER
SHORELINE SHOWN REPRESENTS THE APPROXIMATE LINE OF MEAN HIGH WATER
THE MEAN RANGE OF TIDE IS APPROXIMATELY 0.3 METER

EXPLANATION

Area flooded November 27, 1968	🟦	Elevation of high-water marks, in meters, for 1968 flood except as noted. Multiple elevations indicate flood marks too close together to be shown separately	•——8.4
Boundary of 1968 flood	——	Bridge	▯——A
Water-surface contour for 1968 flood. Contour interval 1-meter (above 2-meter line)	— —		
Kilometer measured upstream from mouth	⑤——✕		

FLOODS IN THE AGUADILLA-AGUADA AREA, NORTHWESTERN PUERTO RICO

This report presents hydrologic data that can be used to aid individuals, government agencies, and others seeking solutions to flood problems in the Aguadilla-Aguada area in western Puerto Rico. More specifically, it is useful to those responsible for formulating effective flood-plain regulations that would minimize the creation of flood problems.

The report is a compilation of hydrologic data pertaining to flooding along lower Río Culebrinas and is based upon information obtained from residents in the study area and field surveys by the U.S. Geological Survey. All elevations given are in meters above mean sea level.

The study area lies in the northwestern part of Puerto Rico between the towns of Aguadilla and Aguada. It is a relatively small valley devoted largely to the production of sugarcane, and is subject to flooding by Río Culebrinas and by Río Caño, main tributary of Río Culebrinas within the valley. Highway 2, Highway 418, and Highway 114 cross the valley perpendicular to the direction of flow. Highway 2 is the only one with an embankment above natural ground level. The other two highways, 418 and 114, largely are at ground level.

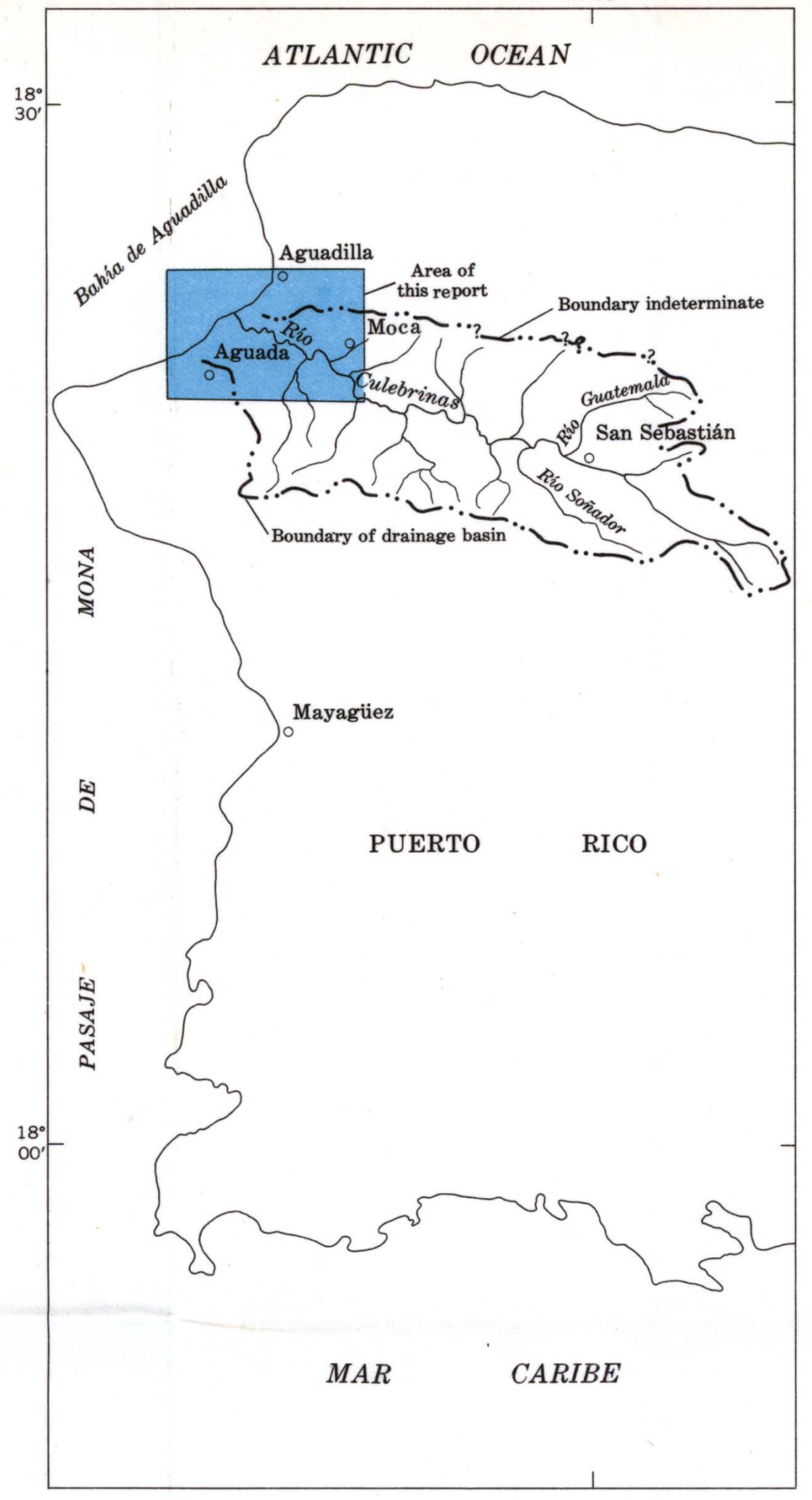


FIGURE 1. —*Location of drainage basin and study area*

Río Culebrinas basin.—Río Culebrinas flows northwest and west from the uplands near Lares to Bahía de Aguadilla (fig. 1). It discharges floodwaters to Bahía de Aguadilla through the several outlets shown on the topographic map.

The drainage area indicated on Geological Survey topographic maps is 103 square miles at the mouth of Río Culebrinas. There may be additional drainage area in the limestone terrane along the northern side of the basin that cannot be identified on the maps.

Flood history.—The flood plain of lower Río Culebrinas has been inundated extensively at least three times since 1928. The greatest known flood occurred on September 13, 1928. Only a few high-water marks could be recovered, and consequently the flood boundaries could not be defined for that flood.

The flood of November 27, 1968, was only about 0.1 meter lower than the flood of 1928 and many high-water marks were recovered by the U.S. Geological Survey immediately after the flood.

The flood of July 1, 1960, caused damage in a small section of the city of Aguadilla.

Flood frequency.—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 of time can be estimated with reasonable accuracy. The frequency of occurrence is the average interval of time within which a given flood will be equaled or exceeded once. For example, two floods of at least the magnitude of a 50-year flood can be expected to occur in a 100-year period. Stated differently, a 50-year flood has 1 chance in 50 of being equaled or exceeded in any one year.

The record of floods on Río Culebrinas is fragmentary and not of sufficient length to determine a reliable flood-frequency relation. However, since the 1928 flood was the highest during the period 1928–70, it has an indicated frequency of 43 years.

Flood profile.—The profile of the water surface for the flood of November 27, 1968, on Río Culebrinas and on Río Caño, a tributary that flows into Río Culebrinas 1.5 km (kilometers) upstream from Highway 2 during normal flow, is shown in figure 2. This profile is referenced to the arbitrary valley base line shown on the topographic 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 flow.

There are four bridges over Río Culebrinas in the study area (see table 1). None of these bridges were overtopped by the flood of November 27, 1968.

Table 1.—*Bridge elevations in flooded area*

Map symbol	Stationing along base line (kilometers)	Bridge	Top of deck (meters)	Low beam (meters)
A	3.25	Railroad bridge above Highway 2	6.5	6.0
B	2.94	Highway 2 bridge	8.8	7.7
C	2.50	Highway 418 bridge	4.7	4.0
D	2.03	Highway 114 bridge	5.7	4.6

Inundated area.—The area inundated by the flood of November 27, 1968, has been delineated on the topographic map. This flood was only about 0.1 meter lower than the 1928 flood. The inundation pattern of future floods may be affected by new highways and bridges, by new buildings, or by relocation or excavation of stream channels.

Water-surface contours.—Water-surface contours based on floodmarks of the November 27, 1968, flood are shown on the topographic map. These lines are a representation of equal elevations of the water surface and are normal to the direction of flow. Obstructions to the flow such as sugarcane, manmade obstacles, and tributaries cause irregularities in the contours. Floodwaters from Río Caño and the Highway 2 embankment were two main obstructions to flow. Water from the 1968 flood backed up until it overtopped the Highway 2 embankment at the low spot shown on the topographic map.

Depth of flooding.—Both ground-surface and water-surface elevations are represented on the topographic map by contour lines. Depth of flooding at any point in the inundated area can be estimated by subtracting the ground elevation from the water elevation. Intermediate estimates of depth can be obtained by interpolation.

Acknowledgments.—The selection of the area for this project was made in collaboration with the Area de Prevención de Inundaciones, Departamento de Obras Públicas de Puerto Rico. Historical flood data were obtained from residents in the Río Culebrinas basin.

Additional information.—Supporting data and computations related to this report are on file at the U.S. Geological Survey, San Juan, Puerto Rico, and at the Area de Prevención de Inundaciones, Departamento de Obras Públicas de Puerto Rico, Santurce, Puerto Rico.

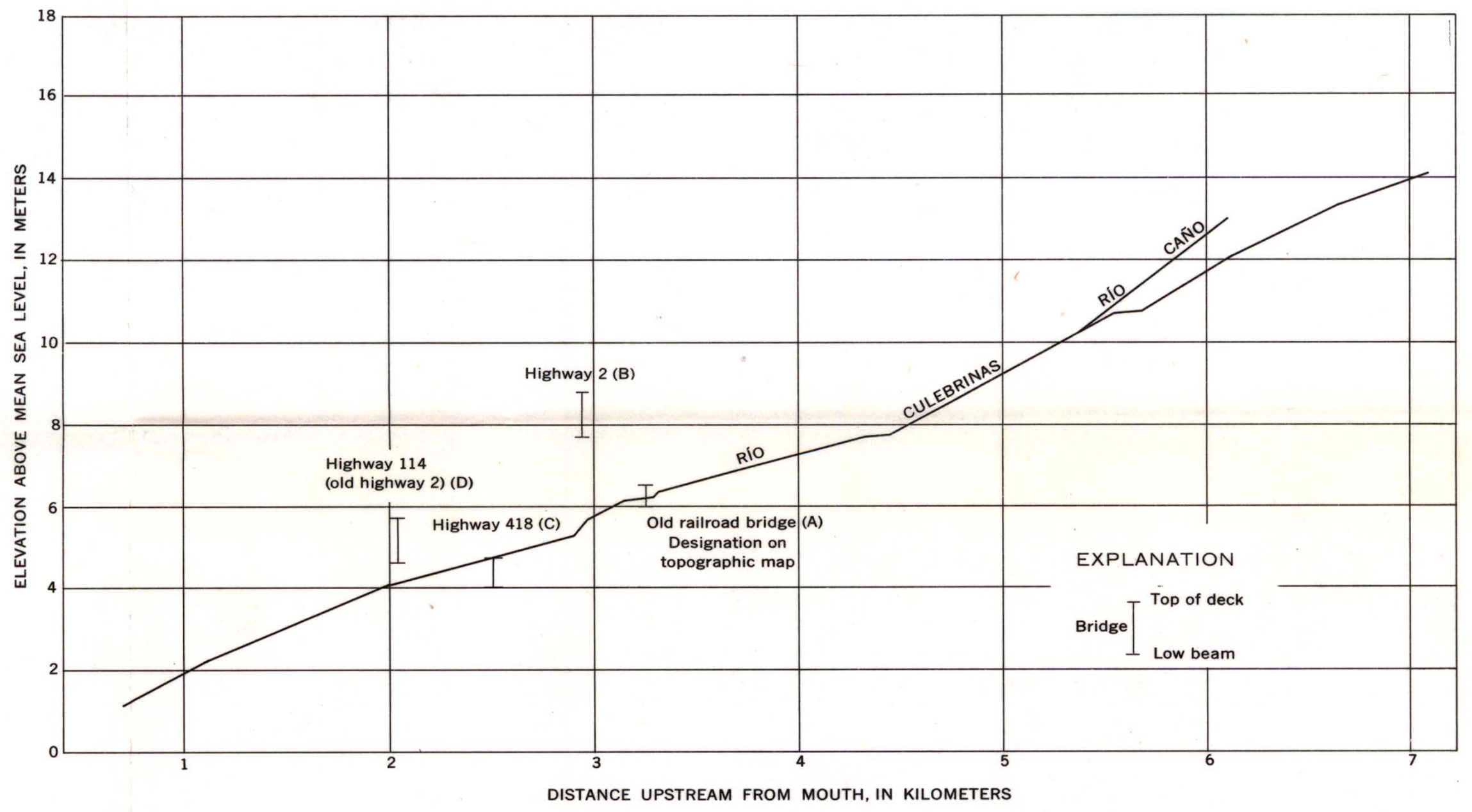


FIGURE 2. —*Profile of flood of November 27, 1968, on Río Culebrinas*

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For sale by U.S. Geological Survey, price $1.00