FLOOD OF AUGUST 23, 1966 AT
CARLSBAD, NEW MEXICO

The extent of flooding that occurred at Carlsbad, New Mexico, on August 23, 1966, is described in this atlas. Greater floods than the one described have occurred in the past and undoubtedly will recur. The flood boundaries shown are a record of historic fact that reflects channel conditions at the time of the flood. Future protective works may reduce the frequency of flooding in the area but will not necessarily eliminate flooding. Changes in culture such as new highways and bridges and changes in land use may influence the inundation pattern of future floods.

Inundated areas.—The pattern of flooding shown on the map, in the western and southern parts of Carlsbad by Hackberry Draw and Dark Canyon Draw can be attributed primarily to the dike along the Southern Canal. As the flow from Hackberry Draw reached the Southern Canal dike much of it impounded and spread in both a northerly and southerly direction until it could drain southward along the dike to Dark Canyon Draw. Meanwhile the flow in Dark Canyon Draw was retarded by the constriction at the Southern Canal siphon which resulted in Dark Canyon Draw floodwater spreading in both directions from the siphon and along the dike. This also caused the floodwater from Hackberry Draw to drain more slowly than normally would have occurred. Farther downstream near the mouth of Dark Canyon Draw, the relief openings under U.S. Highway 62 and 285 and under the Santa Fe Railway were unable to accommodate the peak discharge. This again caused a backwater condition and flooding as shown on the map.

Acknowledgment.—This atlas was prepared by the U.S. Geological Survey under the administrative direction of William E. Hale, District Chief. Inundated areas were determined by Ronnie L. McCracken and Jerry D. Stevens.

Flood height.—The height of a flood at a gaging station generally is stated in terms of the gage height or stage, which is the elevation of the water surface above a selected datum plane. Gage heights or stages at the gaging station on Pecos River at Carlsbad, New Mexico, on the Greene Street Bridge in Carlsbad, are converted to elevations above mean sea level by adding 3,080.28 feet for 1938 and subsequent years. The gage datum for years prior to 1938 is unknown.

Elevation and year of occurrence of each annual flood (highest peak discharge in each year) above 3,090-foot elevation known to have occurred at the gaging station on Pecos River at Carlsbad during the period 1938-1966, are shown in figure 1. The 3,090-foot elevation was selected for figure 1 because a flood peak lower than this elevation is confined within the channel. It is evident that floods on the Pecos River occur at irregular intervals. Prior to 1938 several outstanding floods have been recorded. (See tabulation of flood data.)

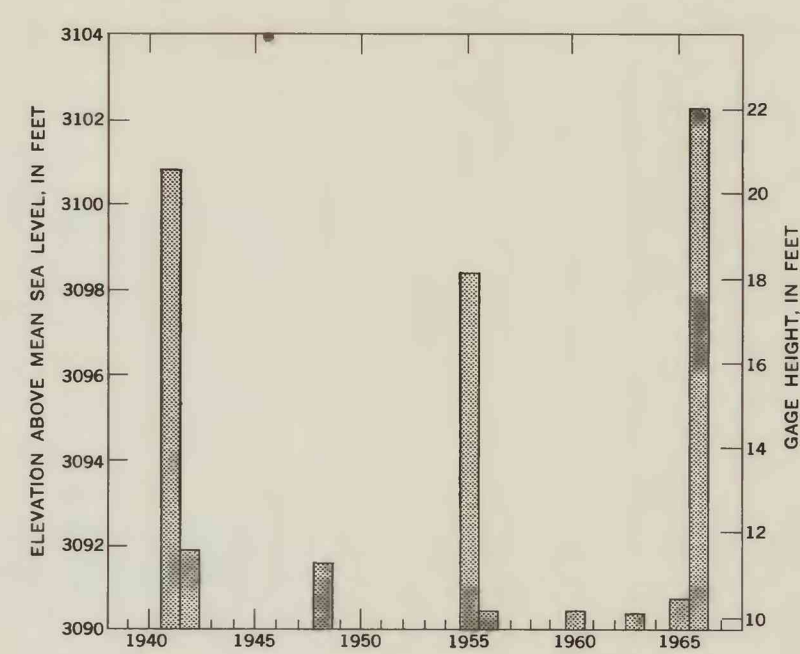


FIGURE 1.—Annual floods of record above 3,090-foot elevation, 1938-66, (water years), on Pecos River at Carlsbad (Greene Street Bridge).

Flood discharge.—The rate of discharge is the volume of flow that passes a particular location in a given period of time. Discharge rates usually are expressed in units of cubic feet per second (cfs). Peak discharge is the maximum discharge reached during a flood. Peak discharge and maximum height of a flood generally occur simultaneously but if a stream is affected by variable backwater, the peak discharge may not coincide with maximum stage. At Carlsbad, according to information obtained from local residents and by observations made by U.S. Geological Survey personnel, many of the greater floods have been affected by backwater from Dark Canyon Draw, a tributary entering the Pecos River 1,500 feet downstream from the gaging station.

Flood frequency.—Frequency of flooding on Pecos River at Carlsbad (fig. 2) has been determined from streamflow records of the U.S. Geological Survey gaging station on Greene Street Bridge. Records for years prior to 1938 have been used in deriving this frequency curve and because of variable backwater conditions, recurrence intervals are referred to discharge. The flood-frequency curve should not be considered reliable if extrapolated beyond the limits shown.

Additional data.—Other information pertaining to floods in the Carlsbad, New Mexico area, may be obtained at the offices of the U.S. Geological Survey in Santa Fe, Carlsbad, and Albuquerque, New Mexico.

As applied to flood events, the recurrence interval is the number of years, on the average, within which a given flood discharge will be equaled or exceeded once. Floods greater than the 10-year flood are virtually inversely related to the chance of a specific flood being equaled or exceeded in any one year. Thus, a 20-year flood would have one chance in 20 of being equaled or exceeded in any one year, or a 25-year flood would have one chance in 25 of being equaled or exceeded in any one year.

The general relation between recurrence interval and peak discharge at the Carlsbad gaging station at the downstream side of the Greene Street Bridge is tabulated below:

Recurrence interval (years)	Discharge (cubic feet per second)
60	93,000
50	88,000
40	80,000
30	71,000
20	57,000
10	34,000
5	16,000
2	5,000

It is emphasized that recurrence intervals are average figures—the average number of years that will elapse between occurrences of floods that equal or exceed a certain discharge. Thus a flood discharge that reaches 57,000 cubic feet per second at the gaging station is said to have a 20-year recurrence interval. However, because of the erratic nature of flood occurrence, the 57,000 cubic feet-per-second discharge may not occur in any one 20 year period, or it may occur more than once. Another factor complicating the flood-frequency relation at this gaging station is the fact that Avalon Dam, approximately 5 miles upstream on the Pecos River, has failed at least partially, several times during the early years of record, thus causing greater discharges at Carlsbad than normally would have occurred.

Flood profiles.—The profile of the water surface along the Pecos River at Carlsbad, constructed from marks left by the flood of August 23, 1966, is shown in figure 3.

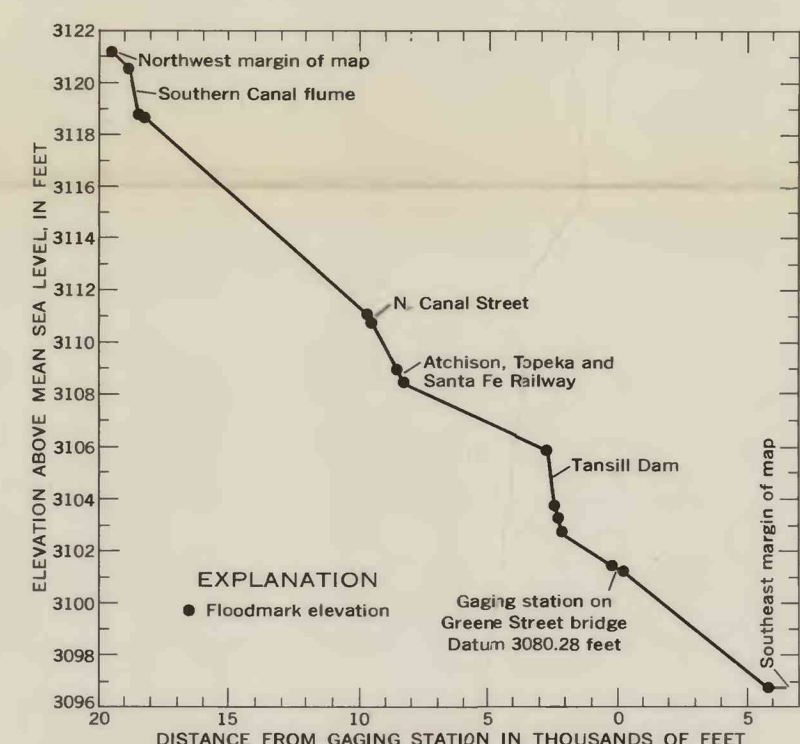


FIGURE 3.—Water-surface profile of August 23, 1966, flood on Pecos River at Carlsbad.

The abrupt changes in profile, shown at the flume and at some street and railroad locations, indicate the difference in water surface elevations at the upstream and downstream sides of bridges and the flume. Base line for the profile is along the main channel. Distances in feet were measured upstream and downstream from the gaging station on Greene Street Bridge.

Pecos River flood data.—Tabulated below are flood data pertaining to Pecos River at Carlsbad, New Mexico. Indicated water-surface elevations refer to gaging station location on downstream side of Greene Street Bridge.

Date	Gage height (feet)	Elevation above mean sea level (feet)	Discharge (cubic feet per second)
Oct. 2, 1904	24.4		50,000
April 17, 1915	20.5	(*)	39,000
Aug. 7, 1916	21.0	(*)	70,000
June 7, 1931	10.2	(*)	15,300
Sept. 30, 1932	11.8	(*)	20,000
May 31, 1937	16.84	(*)	41,000
May 22, 1941	20.5	3,100.78	60,000
Oct. 3, 1941	11.62	3,091.90	19,600
June 2, 1948	11.28	3,091.56	17,800
Oct. 7, 1954	18.12	3,098.40	39,500
Aug. 23, 1966	21.9	3,102.20	54,400

* Unknown.
* Affected by failure of Avalon Dam.
* Affected by backwater from Dark Canyon Draw.
NOTE.—Change of gage datum January 6, 1938.

Additional data.—Other information pertaining to floods in the Carlsbad, New Mexico area, may be obtained at the offices of the U.S. Geological Survey in Santa Fe, Carlsbad, and Albuquerque, New Mexico.

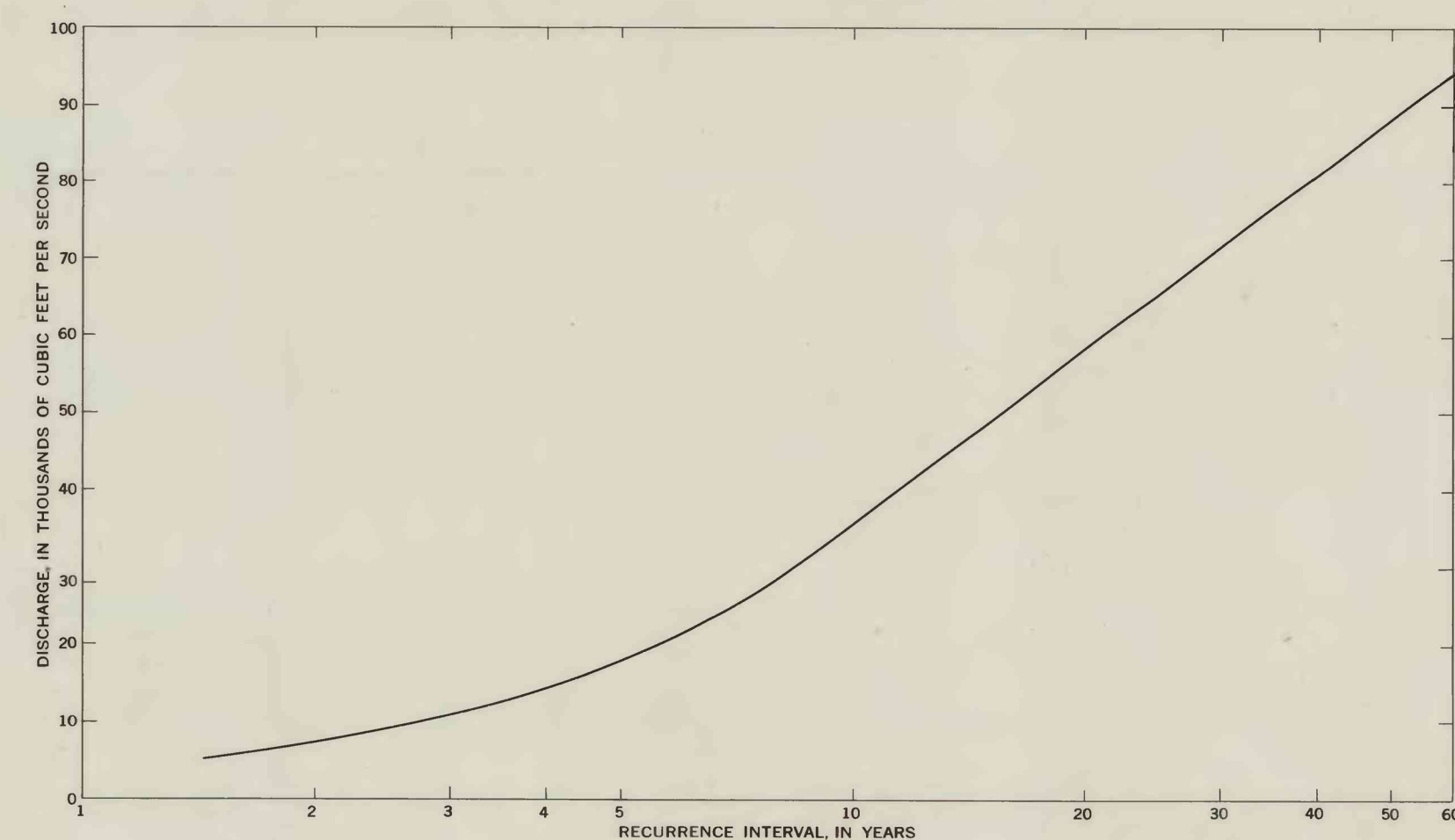


FIGURE 2.—Frequency of floods above 5,000 cubic feet per second on Pecos River at Carlsbad (Greene Street Bridge).

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