

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
AUSTIN, TEXAS

TEXAS FLOODS OF SEPTEMBER AND OCTOBER 1955

by

D. L. Milliken and W. H. Goines
Texas District Surface Water Branch

In cooperation with the
Texas State Board of Water Engineers

Open File Release No. 55, October 1956

57-74

Not reviewed for conformance with the editorial
standards of the Geological Survey

CONTENTS

	Page
General description of the floods	1
Flood in the Nueces River basin	4
Rainfall	4
Discharges	4
Volumes of flow	6
Gaging station records	8
Nueces River at Laguna	9
Nueces River below Uvalde	10
Nueces River near Asherton	11
Nueces River at Cotulla	12
Nueces River near Tilden	13
Nueces River near Three Rivers	14
Flood in the upper Brazos River basin	15
Rainfall	15
Discharges	15
Floods in the Pecos River basin	18
Rainfall	18
Discharges	22

ILLUSTRATIONS

Figure 1 - Isohyetal map of Nueces River basin, storm of Sept. 23-25, 1955	2
2 - Map of Nueces River basin above Lake Corpus Christi	3
3 - Graphs of discharge for Nueces River, Sept. 24 to Oct. 12, 1955	7
4 - Isohyetal map of Brazos River basin, storm of Sept. 24, 25, 1955	16
5 - Map of upper Brazos River basin	17
6 - Graphs of discharge for Brazos River above Possum Kingdom Reservoir, Sept. 24-30, 1955	19
7 - Map of Pecos River basin	21
8 - Graphs of discharge for Pecos River and graph of contents of Red Bluff Reservoir, Sept. 20 to Oct. 15, 1955	23
9 - Graphs of discharge for Delaware River and Salt (Screwbean) Draw, Sept. 20 to Oct. 15, 1955	25

TABLES

Table 1 - Summary of flood discharges in Brazos River basin.	20
2 - Summary of flood discharges in Pecos River basin.	26

PREFACE

This report on the floods of September and October 1955 in the Nueces, Brazos and Pecos River basins, Texas, was prepared in the Texas District Office, Surface Water Branch, under the direction of Trigg Twichell, District Engineer.

Records of discharge were collected and compiled in cooperation with the Texas State Board of Water Engineers, the Pecos River Commission, and other agencies.

The isohyetal map of the upper Brazos River basin, which was the basis for figure 4, was furnished by the Corps of Engineers. The "bucket" survey of rainfall in the Nueces River basin was conducted by the U. S. Weather Bureau, and the "bucket" survey in the upper Brazos River basin was conducted by the U. S. Weather Bureau, the Corps of Engineers, and the U. S. Soil Conservation Service. The U. S. Soil Conservation Service furnished "A Report describing the effects of the storm of September 23-25, 1955, on the Upper Brazos River Watershed, above Possum Kingdom Dam" from which some data in this report were taken.

- - - - -

GENERAL DESCRIPTION OF THE FLOODS

General rains occurred over virtually all of Texas during late September and early October 1955. Flooding occurred on most streams in the State, but record-breaking discharges occurred only in the upper Nueces River basin, the upper Brazos River basin, and on Salt (Screwbean) Draw and Delaware River in the Pecos River basin.

In addition to the rainfall data at regular Weather Bureau stations, "bucket" surveys of rainfall were made at miscellaneous points in the Nueces and Brazos River basins. Maximum rainfall recorded was 24 inches during the 3-day period September 23-25 in the Nueces basin and 15 inches in the Brazos River basin during the same period. Figures 1 and 4 show the total amount and the distribution of the rain in these basins.

Little weather information in the Salt (Screwbean) and Delaware basins is available, but rainfalls of similar amounts must have fallen to have produced the floods of the magnitude which occurred.

Features of the flood on the Nueces River were the rapidity of the rise in the headwaters, the rapid flattening of the crest as it proceeded downstream, and the large loss in total volume of flow as the flood wave moved downstream. Because of these unusual hydrologic features, the Nueces River flood has been treated in more detail than the floods in the other basins. Figure 2 shows the area of the Nueces River basin covered by this report.

FLOOD IN THE NUECES RIVER BASIN

Rainfall

Rain in large amounts and of severe intensity fell during the period September 23-25, 1955, over the extreme upper end of the Nueces River basin, the upper end of the South Llano drainage (in the Colorado River basin), and the eastern part of the Devils River basin (tributary to the Rio Grande). The area within the 4-inch isohyetal covered all or parts of Valverde, Edwards, Real, Kinney, and Uvalde Counties (fig. 1).

There were three centers of rainfall concentration within this area. A 10-inch center northeast of Brackettville and west of Laguna contributed to the flood on the West Nueces River. A 15-inch center west of Rock Springs on the Valverde-Edwards County line produced runoff largely in the Dry Devils River, but contributed some flow to the upper tributaries of the West Nueces. A 24-inch center on the Nueces River, at the mouth of Hackberry Creek at the Edwards-Real County line southeast of Rock Springs, was the principal contributor to the Nueces River flood; most of the rain fell during the night of September 23 and the morning of September 24.

Discharges

A slope-area determination of the peak flow of Hackberry Creek was made at a point about 8 miles above the mouth where the drainage area is 62 square miles. The peak was found to be 53,400 cubic feet per second occurring about 3 to 4 a.m., September 24. A local resident stated that this flood was the largest known, with the possible exception of the flood of 1935. The heaviest rainfall occurred between

the mouth of the creek and the site where the determination was made, but no suitable site could be found for a determination further downstream. It is probable that a considerably larger peak discharge occurred in this lower reach of the creek.

At the gaging station on Nueces River at Laguna, the flow had been steady at about 30 cfs for several days prior to September 24. A small rise occurred in the early morning hours of September 24, reaching a peak of 2,720 cfs at 5 a.m. This flow declined to 1,040 cfs at 7 a.m., and then began to rise again very rapidly. Between 9 and 9:30 a.m. the river rose 16 feet and the discharge increased from 5,430 cfs to 110,000 cfs. The peak of 307,000 cfs was reached at 11 a.m. September 24, following which the stage declined very rapidly, dropping below 100,000 cfs by 4 p.m.

The peak discharge at the Laguna station was determined by slope-area method. It exceeded the maximum discharge previously recorded since 1923, when the station was established, by 85,000 cfs, and was the greatest known flood for at least the last 101 years.

The peak flow at the site of the discontinued gaging station on West Nueces River near Brackettville was determined by the slope-area method as 150,000 cfs. During the period of operation of the gaging station, 1939-50, the maximum discharge of 51,000 cfs occurred in June 1948. However, a peak in excess of 500,000 cfs occurred June 14, 1935, which was the greatest flood known.

The West Nueces River empties into the Nueces River 14 miles downstream from the Laguna gaging station and 15 miles upstream from the Uvalde station. At the Uvalde station, despite the contribution of the West Nueces, the peak discharge was 189,000 cfs, or 118,000 cfs less than the Laguna discharge. A second peak of 128,000 cfs at Uvalde occurred 6 hours after the first and higher peak. The two peaks were caused by difference in timing between the arrival at Uvalde of the water which passed Laguna and that contributed by the West Nueces.

Between Uvalde and the next gaging station, at Asherton 78 miles downstream, the flood peak flattened to only 15,100 cfs. From Asherton to Cotulla (52 miles) it was reduced to 10,900 cfs; at Tilden, 95 miles downstream from Cotulla, it was down to 3,570 cfs, and at Three Rivers, 38 miles downstream from Tilden, the peak was only 3,360 cfs. The peak was reduced from 307,000 cfs at Laguna to 3,360 cfs at Three Rivers, or a reduction of 98.9 percent in 292 miles.

Figure 3 shows the discharge hydrographs for all gaging stations on the Nueces River from Laguna to Three Rivers.

Volumes of flow

The most notable feature of the Nueces River flood was the extremely large volume of water lost as the flood progressed downstream. The volume of flow was decreased 82 percent - from about 242,700 acre-feet, which is the flow at Laguna plus estimated contribution by the West Nueces, to 42,690 acre-feet at Three Rivers.

A part of this loss was doubtless due to evaporation and transpiration, but probably the greatest loss was by seepage into the ground. Base flow was, of course, greater immediately after the flood than before.

The Nueces River crosses the Balcones Fault zone just upstream from the Uvalde station, which undoubtedly accounts for much of the loss between Laguna and Uvalde.

The losses are shown in the following table:

Gaging station	Period used to compute volume, 1955	Volume of flow (acre-ft)	Major Inflow (acre-ft)	Loss from preceding station (acre-ft)	Accumulative loss (acre-ft)
Laguna (West Nueces River)	9/24-10/11	162,700	Est. 80,000	-	-
Uvalde	-				
Asherton	9/24-10/11	147,400		95,300	95,300
Cotulla	9/25-10/12	78,840		68,560	163,860
Tilden	9/27-10/14	65,990		12,850	176,710
Three Rivers	9/30-10/17	42,130		23,860	200,570
	10/1-18	42,690		(gain) 560	200,010

The periods shown in the preceding table were selected to cover all identifiable flood runoff, or until the streams returned to base flow.

Gaging-station records

The following pages contain detailed information on discharge during the flood period for the gaging stations on the Nueces River from Laguna to Tilden. Discharges at indicated times are selected at intervals so as to define the shape of the hydrographs. Daily records for the station near Three Rivers are also included.

BUCCAS RIVER BASIN

Buccas River at Laguna, Tex.

Location.--lat 29°25'45", long 99°59'50", on right bank 0.5 mile downstream from Spennore Creek, 1 mile northeast of Laguna, Uvalde County, and at mile 395. Intum of gage is 1,119.72 ft above mean sea level, datum of 1989.

Drainage area.--764 sq mi.

Gage-height record.--Water-stage recorder graph except for period 10 a.m. to 12 m. Sept. 24, for which a graph was drawn on basis of floodmarks and information from local residents.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 40,000 cfs and by slope-area determination of peak flow. Shifting-control method used throughout.

Maxima.--Sept. 24 to Oct. 11, 1955: Discharge, 307,000 cfs 11 a.m. Sept. 24 (gage height, 29.95 ft in gage wall, 32.7 ft from floodmarks).

1923 to Sept. 23, 1955: Discharge, 222,000 cfs July 13, 1939 (gage height, 26.40 ft) from rating curve extended above 40,000 cfs on basis of float measurement at gage height, 21.3 ft and slope-area determination at gage height, 26.0 ft (gage heights in wall, outside gage heights not known).

Flood of Sept. 24, 1955, is the greatest known since at least 1874; flood of June 1913 reached a stage of about 29 ft; flood of Sept. 21, 1923, reached a stage of about 26.5 ft; from information by local residents.

Mean daily discharge, in cubic feet per second, September 24 to October 11, 1955

24	70,300	27	916	30	436	3	314	6	240	9	204
25	4,850	28	665	1	374	4	282	7	228	10	192
26	1,480	29	518	2	374	5	258	8	213	11	180
Runoff, in acre-feet, for the period											162,700

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1955

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
12	1.60	30	11	32.70	307,000		September 25			September 26	
	September 24		N	30.88	257,000	1	10.18	11,200	6	4.14	1,660
12:30	1.70	49	1	28.98	210,000	2	9.61	9,960	N	3.83	1,410
1	2.45	258	2	27.08	170,000	3	9.01	8,710	12	3.41	1,100
1:30	2.81	414	3	24.78	129,000	4	8.56	7,890		September 27	
2	3.07	556	4	22.78	99,200	5	8.10	7,000	N	3.10	900
3	3.80	975	5	20.78	74,900	6	7.63	6,190	12	2.87	764
4	4.58	1,560	6	18.48	52,800	7	7.29	5,600		September 28	
5	5.72	2,720	7	16.48	38,000	8	6.96	5,060	N	2.68	663
6	4.25	1,300	8	15.03	29,200	10	6.43	4,270	12	2.50	570
7	3.90	1,040	9	13.73	22,900	N	5.98	3,650		September 29	
8	4.95	1,900	10	12.53	17,800	6	5.25	2,770	N	2.38	517
9	7.60	5,430	11	11.63	15,000	12	4.58	2,070	12	2.27	470
9:30	23.60	110,000	12	10.83	12,800					September 30	
10	30.63	251,000							N	2.20	439
									12	2.10	398

NUECES RIVER BASIN

Nueces River below Uvalde, Tex.

Location.--Lat 29°08', long 99°54', on right bank at McDaniel Ranch, 5-3/4 miles upstream from bridge on U. S. Highway 83, 9 miles southwest of Uvalde, Uvalde County, 15 miles downstream from West Nueces River, and at mile 366. Datum of gage is 796.12 ft above mean sea level, datum of 1929.

Drainage area.--1,947 sq mi.

Gage-height record.--Water-stage recorder graph corrected to outside gage for drawdown on rising and peak stages on basis of drawdown curve defined by gage readings and floodmarks.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 34,000 cfs and by slope-area determination of peak flow.

Maxima.--Sept. 24 to Oct. 11, 1955: Discharge, 189,000 cfs 6:30 p.m. Sept. 24 (gage height, 21.13 ft in gage well, 24.61 ft from floodmark).

1939 to Sept. 23, 1955: Discharge, 89,000 cfs July 13, 1939 (gage height, 19.25 ft in gage well, 20.42 ft from floodmark), from rating curve extended on basis of discharge at former site.

Stage known since at least 1836, 40.4 ft June 14, 1935, from floodmarks (discharge at former site, 616,000 cfs by slope-area determination).

Remarks.--Part of flow of Nueces River enters Edwards limestone in Balcones fault zone which crosses basin just north of Uvalde. At low stages most of headwater flow enters this formation.

Mean daily discharge, in cubic feet per second, September 24 to October 11, 1955

24	33,900	27	1,130	30	235	3	80	6	39	9	24
25	34,300	28	552	1	157	4	59	7	31	10	23
26	3,220	29	353	2	104	5	48	8	27	11	21
Runoff, in acre-feet, for the period											147,400

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1955

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
12	1.38	0	September 25			September 26			September 28		
September 24			10:30	21.20	128,000	4	7.33	4,500	N	4.93	528
N	1.37	0	1	19.63	105,000	8	6.98	3,610	12	4.78	422
2	1.37	0	2	19.07	97,000	N	6.68	2,940	September 29		
2:30	10.06	15,400	3	18.22	86,600	4	6.43	2,460	12	4.55	284
3	16.98	71,800	4	17.16	73,900	8	6.20	2,050	September 30		
3:30	17.40	76,800	5	15.90	59,400	12	6.00	1,720	12	4.35	186
4	17.20	74,400	6	14.90	49,500	September 27					
4:30	16.99	71,900	8	13.05	33,800	6	5.74	1,350			
5	16.84	70,100	10	11.65	24,400	N	5.52	1,080			
5:30	16.64	67,700	N	10.60	18,300	6	5.30	850			
6	17.18	74,200	2	9.80	14,100	10	5.18	732			
6:30	24.61	189,000	4	9.26	11,500						
7	20.13	111,000	6	8.82	9,680						
8	18.63	91,600	8	8.40	8,000						
9	16.61	67,300	10	8.07	6,800						
9:30	16.63	60,700	12	7.72	5,840						
10	16.75	69,500									
11	18.45	89,400									
12	20.80	122,000									

NUECES RIVER BASIN

Nueces River near Asherton, Tex.

Location.--Lat 28°30', long 99°42', on right bank just downstream from bridge on county road between Asherton and Brundage, 1.2 miles downstream from El Moro Creek, 5.5 miles northeast of Asherton, Dimmit County, and at mile 268. Datum of gage is 470.92 ft above mean sea level, datum of 1929.

Drainage area.--4,082 sq mi.

Gage-height record.--Water-stage recorder.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used throughout.

Maxim.--Sept. 25 to Oct. 12, 1955: Discharge, 15,100 cfs 2 p.m. Sept. 27 (gage height, 29.64 ft). 1939 to Sept. 24, 1955: Discharge, 24,000 cfs Sept. 2, 1944 (gage height, 30.40 ft).

Stage known, about 33 ft June 17, 1935, present site and datum (based on relation determined from levels to floodmarks of the June 17, 1935, and the Sept. 2, 1944, floods at farmhouse on left bank 0.8 mile upstream from gage).

Remarks.--Part of flow of Nueces River and its headwater tributaries enters Edwards limestone in Balcones fault zone which crosses basin just north of Uvalde. At low stages most of headwater enters this formation. Flow slightly regulated by several small reservoirs above station. Diversions for irrigation above station.

Mean daily discharge, in cubic feet per second, September 25 to October 12, 1955

25	682	28	9,690	1	823	4	188	7	20	10	48
26	6,280	29	5,640	2	412	5	100	8	29	11	26
27	13,000	30	2,560	3	274	6	36	9	28	12	11
Runoff, in acre-feet, for the period											78,840

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 19 55

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
12	1.32	0	September 28			October 3			October 8		
	September 25		6	29.07	10,800	6	6.31	308	8	2.55	31
N	1.30	0	N	28.69	9,560	N	6.05	277	N	2.60	33
5	1.29	0	6	28.18	8,420	12	5.45	214	4	2.59	33
5:30	5.50	249	12	27.52	7,370	October 4			12	2.52	30
6	9.00	734	September 29			6	5.24	199	October 9		
6:30	12.10	1,310	6	26.68	6,410	N	5.12	192	N	2.38	24
7	14.00	1,710	N	25.68	5,610	6	4.96	179	4	2.35	23
9	18.50	2,870	6	24.35	4,820	12	4.59	152	8	2.50	29
12	22.20	3,940	12	22.60	4,070	October 5			12	2.85	44
September 26			September 30			N	3.81	97	October 10		
6	25.30	5,350	6	20.13	3,300	12	3.07	54	2	2.97	49
N	26.60	6,200	N	17.22	2,490	October 6			4	3.04	52
6	27.61	7,110	6	14.42	1,770	6	2.80	42	6	3.06	54
12	28.65	8,960	12	12.10	1,270	N	2.63	34	8	3.06	54
September 27			October 1			6	2.48	28	N	3.00	50
4	29.22	10,900	6	10.50	963	12	2.38	24	6	2.86	44
8	29.52	13,100	N	9.47	776	October 7			12	2.69	37
N	29.62	14,500	6	8.70	647	6	2.36	24	October 11		
2	29.64	15,100	12	8.05	544	N	2.28	20	6	2.51	30
6	29.58	14,500	October 2			6	2.22	17	N	2.40	25
12	29.38	12,600	6	7.50	464	12	2.22	17	12	2.20	16
			N	7.06	404				October 12		
			6	6.67	352				N	2.08	11
			12	6.37	315				12	1.98	6.3

MUECES RIVER BASIN

Mueces River at Cotulla, Tex.

Location.--Lat 28°26', long 99°16', near left bank on downstream side of bridge on U. S. Highway 81, at Cotulla, La Salle County, a third of a mile upstream from International-Grand Northern Railroad bridge, and at mile 236. Datum of gage is 368.08 ft above mean sea level, datum of 1929.

Drainage area.--5,260 sq mi.

Gage-height record.--From graph based on one or more-daily readings of wire-weight gage furnished by the U. S. Weather Bureau.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used Sept. 27 to Oct. 2.

Maxima.--Sept. 27 to Oct. 14, 1955: Discharge, 10,900 cfs 12 p.m. Sept. 30 (gage height, 18.25 ft). 1923 to Sept. 26, 1955: Discharge, 82,600 cfs June 18, 1935 (gage height, 32.4 ft, from floodmarks), by slope-area determination.
Stage known since at least 1899, that of June 18, 1935. Flood of June 19, 1899, reached a stage of 29.7 ft, from information by local residents.

Remarks.--Part of flow of Mueces River and its headwater tributaries enters Edwards limestone in Balcones fault zone which crosses basin just north of Uvalde. At low stages most of headwater flow enters this formation. Low flow slightly regulated by small storage reservoirs above station; most of it is diverted above station by pumping.

Mean daily discharge, in cubic feet per second, September 27 to October 14, 1955

27	113	30	8,910	3	2,740	6	332	9	52	12	32
28	1,000	1	8,930	4	1,560	7	211	10	35	13	35
29	3,070	2	5,400	5	701	8	94	11	33	14	23
Runoff, in acre-feet, for the period											65,990

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1955

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
12	7.48	0									
	September 27		6	September 30			October 2			October 5	
6	7.47	0	8	16.60	7,800	6	15.70	6,300	N	9.87	651
7	7.46	0	10	16.86	8,220	N	15.08	5,400	17	9.28	413
10	7.75	8.6	N	17.20	8,800	6	14.42	4,470		October 6	
N	7.97	37	4	17.38	9,160	12	13.78	3,660	N	8.47	319
6	8.64	215	8	17.64	9,610		October 3		11	8.04	175
12	9.32	427	8	18.00	10,400	6	13.16	3,080		October 7	
	September 28		10	18.18	10,600	N	12.76	2,680	N	8.64	115
6	10.06	743	12	18.25	10,900	6	12.40	2,360	12	8.36	138
N	10.64	1,060		October 1		12	11.03	2,030			
6	11.02	1,290	8	18.16	10,700		October 4				
12	11.20	1,400	6	17.72	9,780	N	11.42	1,550			
	September 29		N	17.20	8,800	12	10.68	1,090			
2	11.27	1,450	6	16.76	8,020						
4	11.40	1,540	12	16.25	7,200						
6	11.56	1,650									
8	11.78	1,820									
10	12.06	2,050									
N	12.44	2,400									
2	12.94	2,860									
4	13.70	3,610									
6	14.47	4,540									
8	15.00	5,280									
10	15.40	5,820									
12	15.74	6,300									

NUECES RIVER BASIN

Nueces River near Tilden, Tex.

Location.--Lat 28°18', long 98°34', on left bank at downstream side of pier of bridge on State Highway 173, 2 miles upstream from Cow Creek, 10.5 miles south of Tilden, McMullen County, and at mile 141. Datum of gage is 183.5 ft above mean sea level, datum of 1929 (levels by Topographic Division).

Drainage area.--8,192 sq mil.

Gage height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements.

Maxima.--Sept. 30 to Oct. 17, 1955: Discharge, 3,570 cfs 6 a.m. Oct. 8 (gage height, 17.23 ft). 1942 to Sept. 29, 1955: Discharge, 57,500 cfs Oct. 11, 1946 (gage height, 26.46 ft), from rating curve extended above 30,000 cfs.

Remarks.--Part of flow of Nueces River and its headwater tributaries enters Edwards limestone in Balcones fault zone which crosses basin just north of Uvalde. At low stage most of headwater flow enters this formation. Diversions for irrigation above station.

Mean daily discharge, in cubic feet per second, September 30 to October 17, 1955											
30	9.0	3	839	6	1,580	9	2,960	12	1,180	15	66
1	396	4	1,000	7	2,900	10	2,500	13	257	16	38
2	632	5	1,220	8	3,460	11	2,060	14	120	17	26
Runoff, in acre-feet, for the period										42,130	

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1955

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
12	2.39	3.2	October 3			October 8			October 13		
	September 30		N	11.01	848	6	17.23	3,570	4	7.48	333
N	2.35	2.6	12	11.38	913	N	17.19	3,520	8	6.97	277
8	2.30	1.9	October 4			12	16.98	3,230	N	6.59	239
9	2.35	2.8	N	11.83	993	October 9			6	6.13	195
10	3.55	30	12	12.38	1,100	N	16.71	2,960	12	5.76	162
11	4.40	69	October 5			12	16.43	2,690	October 14		
12	5.25	122	N	12.95	1,210	October 10			N	5.15	116
	October 1		12	13.50	1,340	N	15.19	2,500	12	4.69	86
2	6.43	223	October 6			12	15.93	2,310	October 15		
4	7.09	290	N	14.17	1,520	October 11			N	4.31	64
6	7.53	338	12	15.27	1,940	N	15.56	2,080	12	4.00	49
9	7.94	383	October 7			6	15.27	1,940	October 16		
N	8.24	421	6	16.10	2,430	12	14.85	1,770	N	3.73	37
6	8.67	477	10	16.64	2,890	October 12			12	3.54	30
12	9.05	534	N	16.80	3,050	4	14.47	1,620	October 17		
October 2			4	17.00	3,250	8	13.97	1,460	N	3.38	25
N	9.65	624	8	17.13	3,430	N	13.12	1,240	12	3.30	23
12	10.42	747	12	17.20	3,530	4	11.75	980			
						8	9.90	561			
						12	8.37	438			

NUECES RIVER BASIN

Nueces River near Three Rivers, Tex.

Location.--Lat 28°16'10", long 98°11'10", on left bank 100 ft downstream from San Antonio, Uvalde & Gulf (Missouri Pacific) Railroad bridge, half a mile downstream from Frio River, 2, miles south of Three Rivers, Live Oak County, and at mile 103. Datum of gage is 101.13 ft above mean sea level, datum of 1929, Houston Supplementary Adjustment of 1943.

Drainage area.--15,600 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Artificial concrete control. Stage-discharge relation defined by current-meter measurements. Shifting-control method used Oct. 15-18.

Maxima.--Oct. 1-18, 1955: Discharge, 3,360 cfs 7 p.m. Oct. 10 (gage height, 15.78 ft).
1915 to Sept. 30, 1955: Discharge observed, 85,000 cfs Sept. 18, 1919 (gage height, 46.0 ft), from rating curve extended above 55,000 cfs.
Stage known, that of Sept. 18, 1919.

Remarks.--Part of flow of Nueces and Frio Rivers and their headwater tributaries enters Edwards limestone in Balcones fault zone which crosses basin just north of Uvalde. At low stages most of headwater flow enters this formation. Diversions above station for irrigation.

Mean daily discharge, in cubic feet per second, October 1-18, 1955												
1	34	4	65	7	1,360	10	3,290	13	1,370	16	78	
2	512	5	945	8	2,350	11	3,100	14	259	17	55	
3	685	6	1,110	9	2,860	12	2,530	15	122	18	38	
Runoff, in acre-feet, for the period											42,690	

FLOOD IN THE UPPER BRAZOS RIVER BASIN

Rainfall

Excessive rains fell over the upper Brazos River watershed on September 24 and 25. The bulk of this rain fell in a period of less than 24 hours ending about noon on September 25. In addition to the regular U. S. Weather Bureau rainfall stations, supplemental rainfall data at 48 points were obtained by "bucket" survey. As shown in figure 4, the storm was general over the area, but there were areas of heavy local rainfall where the total was from 10 to 15 inches. The largest of such areas covered parts of Crosby, Garza, and Kent Counties, with smaller areas of high rainfall in Stonewall, Shackleford, Young, and Stephens Counties. The heaviest rain occurred in southern Garza County where 15 inches was recorded.

Discharges

Complete streamflow records were obtained at the points shown on the location map, figure 5. Daily mean discharges for selected stations are shown in the following table:

Date September 1955	Mean daily discharges in cfs			
	Salt Fork Brazos nr. Aspermont	Double Mt. Fork Brazos nr. Aspermont	Brazos at Seymour	Brazos nr. South Bend
24	97	43	24	464
25	21,800	19,400	3,550	23,000
26	23,300	55,600	18,300	47,400
27	1,410	4,180	46,800	40,600
28	660	870	40,500	31,400
29	475	466	4,350	36,200
30	370	331	1,960	35,500

Discharge hydrographs for these stations are shown as figure 6. The maximum stages and discharges for this flood, as well as the maximums for previous floods, are summarized in table 1.

Also included in table 1 is the peak discharge for Ku Creek, 3-1/2 miles northwest of Aspermont at U. S. Highway 83. Because of the soil in the drainage basin, which ranges from sandy loam to sand, Ku Creek was chosen as being typical of small creeks in the area of intense rainfall in the Texas Rolling Plains.

FLOODS IN THE PECOS RIVER BASIN

Rainfall

Two storms, on September 22-27, 1955, and October 2-5, 1955, caused flooding on the Pecos River and tributaries in the New Mexico-Texas State line area (fig. 7). The rain gage coverage of the area is poor, and no rainfall records are available in the Delaware River and Salt (Screwbean) Draw basins, where the maximum amounts of rain fell to cause the record-breaking peaks of October 2.

The following table shows total amounts of rainfall at all available stations surrounding the area:

Rain gage	Total rainfall in inches	
	Sept. 22-27, 1955	Oct. 2-5, 1955
Carlsbad Caverns	2.53	3.11
Salt Flat	1.22	2.01
Sierra Blanca	0	1.34
Van Horn	.58	1.93
Kent	.10	1.30
Tinnin Ranch	2.45	1.42
Toyah	1.15	.97
Pecos	2.55	.56
Mentone	3.79	.51
Red Bluff Dam	.75	2.08

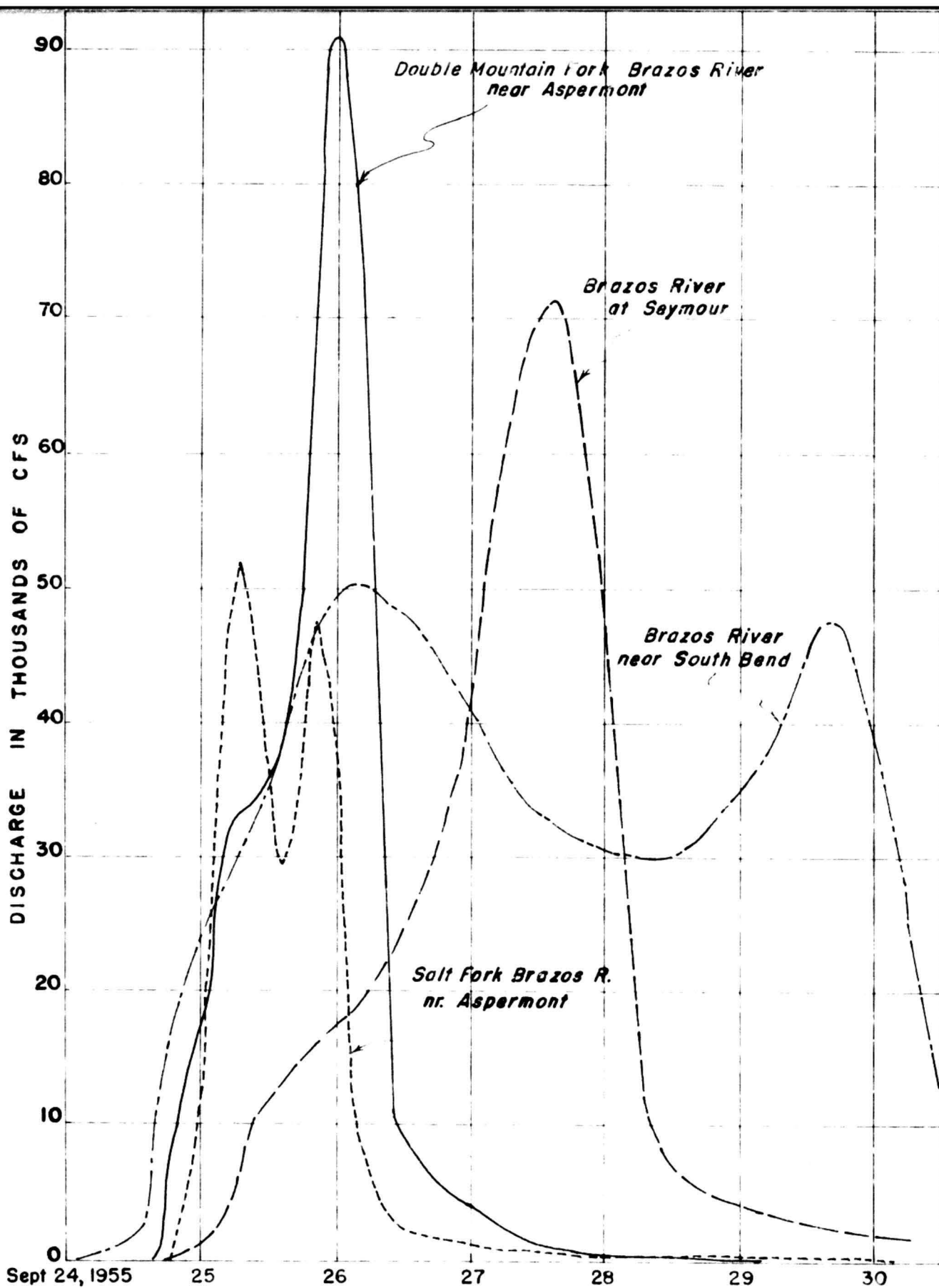


Figure 6
 GRAPHS OF DISCHARGE FOR BRAZOS RIVER ABOVE POSSUM KINGDOM RESERVOIR

TABLE 1

Summary of flood discharges in *Brazos River Basin upstream from Possum Kingdom Reservoir* for the flood of *September, 1955*

NO.	STREAM AND PLACE OF DETERMINATION	DRAINAGE AREA (square miles)	PERIOD OF RECORD	MAXIMUM FLOOD PREVIOUSLY FLOWN				MAXIMUM DURING PRESENT FLOOD				REMARKS
				Date	Gage height (Feet)	Discharge		Time	Gage height (Feet)	Discharge		
						Second-feet	Second-feet per square mile			Second-feet	Second-feet per square mile	
1	Double Mountain Fork Brazos River near Aspermont	1510	1923-34 1939-55	Oct 15, 1926	18.14	52,000	34.4	Sept 26, 12m	2750 ^b	91,400	60.5	^b Max. known since at least 1895
2	Salt Fork Brazos River near Aspermont	2060	1923-24 1939-55	December 13, 1914	-	-	-	Sept 25 6pm	1492 ^c	52,200	-	
3	Ku Creek near Aspermont	3.15	-	-	-	-	-	Sept 25	-	^d 3,000	952	^d highest known in last 50 years
4	Brazos River near Seymour	5,250	1923-55	Oct 6, 1926	15.16	95,400	18.2	Sept 20, 3.1m	^e 2100	71,200	13.6	^e Flood in about 1906 reached about same stage
5	Clear Fork Brazos River at Nugent	2,220	1924-55	-	1876	30	-	Sept. 27, 10:30am	1260 ^f	4,740	2.1	
6	Clear Fork Brazos River at Fort Griffin	3,974	1924-55	-	1900	30	-	Sept 25, 6am	3124	17,200	4.3	
7	Hubbard Creek near Brackenridge	1067	1955	July 20, 1953	33.0	-	-	Sept. 25, 4:30pm	3130	11,200	10.3	^f Max. stage known since at least 1926
8	Brazos River near South Bend	12,360	1939-55	-	1876	36.2	-	Sept. 26, 3pm	2873	50,500	4.1	

NOTE.— Do not type on this form. Use as many lines per station as necessary. Give supplementary information in space below.

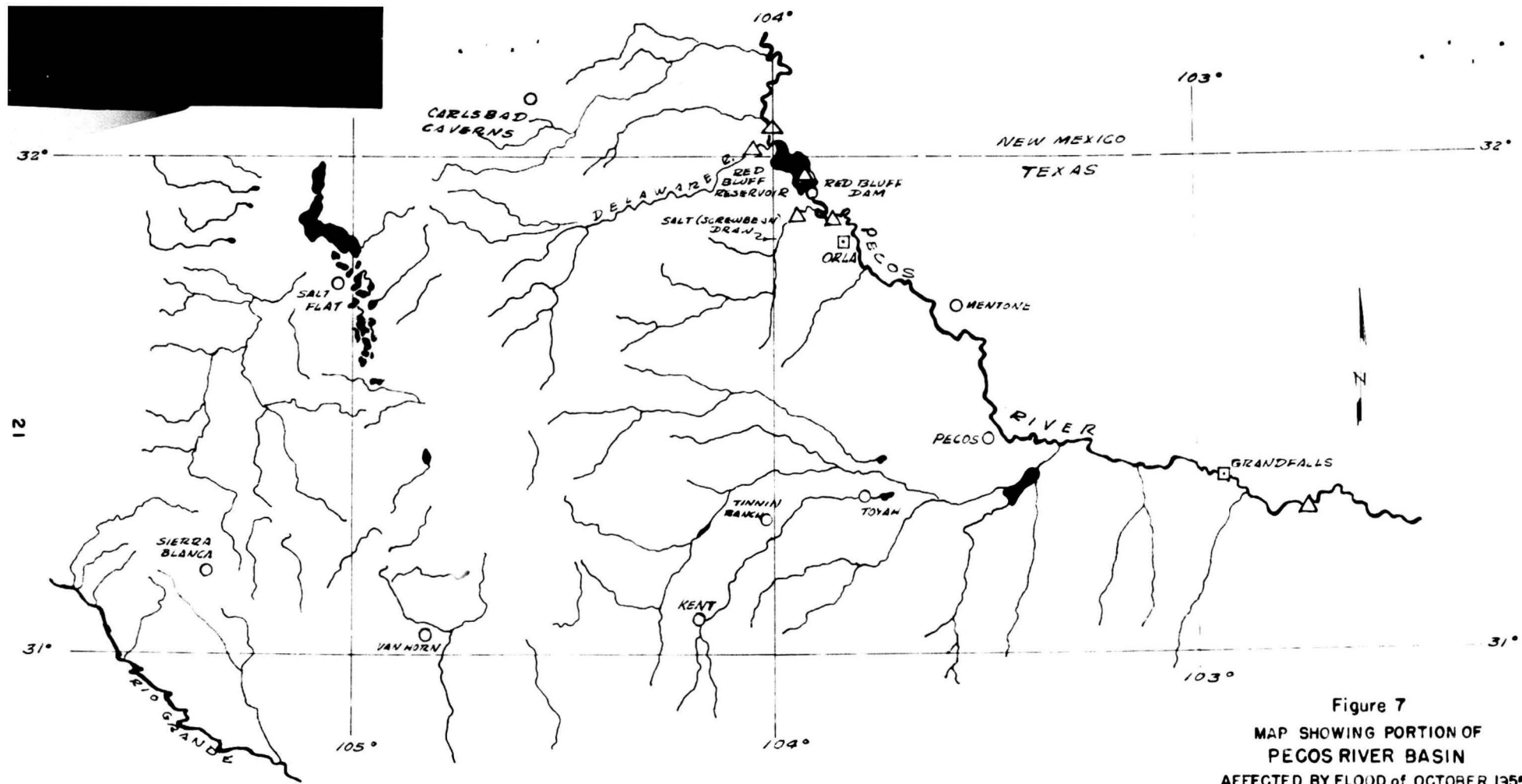
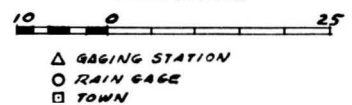


Figure 7
 MAP SHOWING PORTION OF
 PECOS RIVER BASIN
 AFFECTED BY FLOOD OF OCTOBER 1955
 Scale: Miles



It is evident that several times as much rain as is shown above must have fallen in the Delaware River and Salt (Screwbean) Draw basins to have caused the peak flows which occurred in October. Unfortunately, no "bucket" survey was made, so that no detailed data on rainfall are available.

Discharges

Peak discharge of the Pecos River above Red Bluff Reservoir was not uncommonly large, and more than 70,000 acre-feet of the flood flow was retained in the reservoir, as shown in figure 8. Thus, only moderate flow resulted in the Pecos River below the dam.

The Delaware River, on October 2, 1955, reached a stage about 9 feet higher than the previous maximum stage known in at least the last 44 years. The peak discharge of 81,400 cfs was nearly 2-1/2 times greater than the previous maximum. The gaging station on the Delaware River was destroyed by the flood so it was necessary to determine the peak stage from floodmarks.

Salt (Screwbean) Draw also produced an unprecedented flood on October 2, 1955. The peak discharge was 40,600 cfs, and the peak stage was more than 12 feet above the previous maximum for the period of record of the Orla gage. Local residents state that earlier floods have reached stages of 18 or 19 feet, which would be 7 or 8 feet lower than the 1955 flood. The Orla gage was severely damaged.

The following table shows the mean daily discharges for Delaware River and Salt (Screwbean) Draw for the period of the floods:

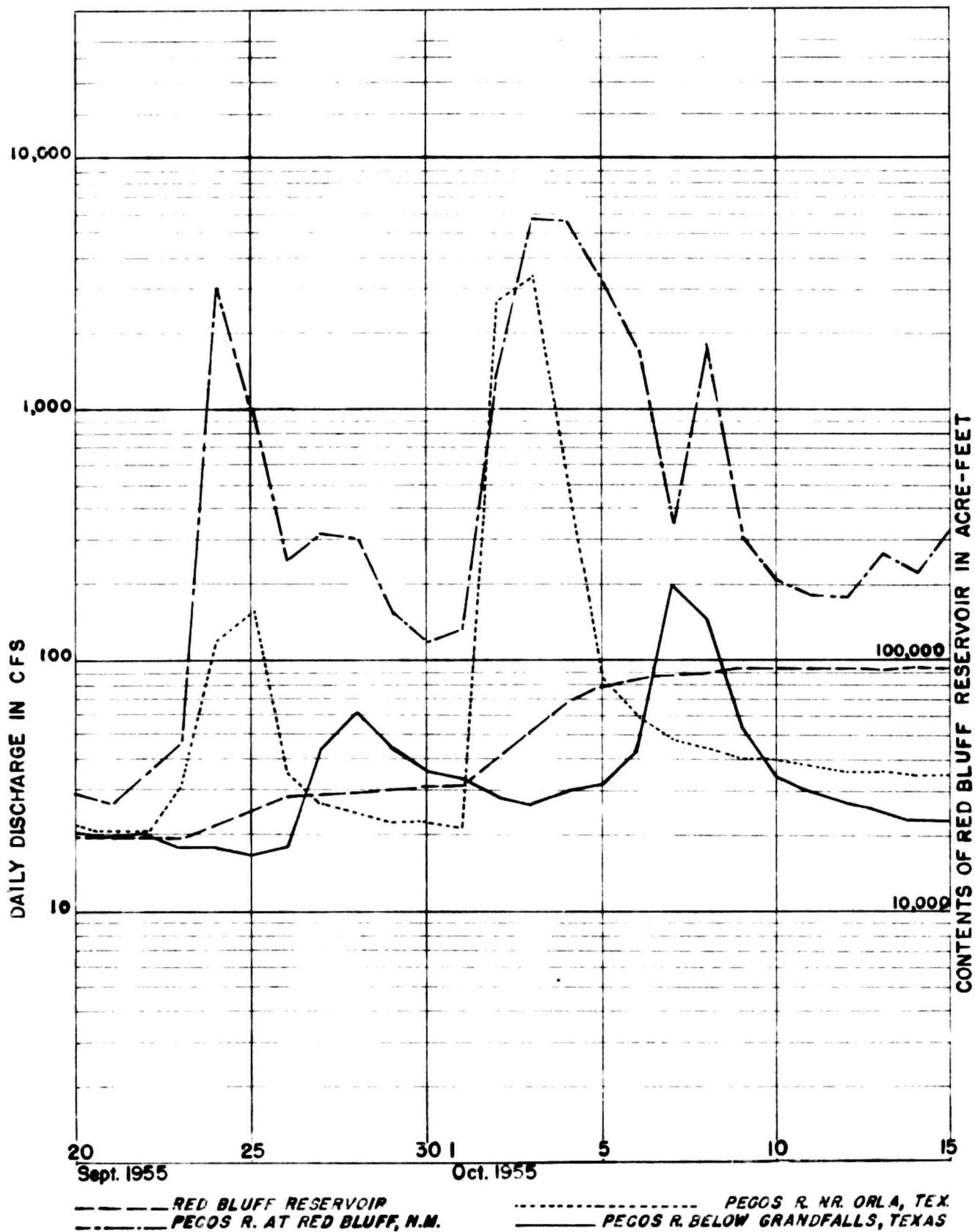


Figure 8
GRAPHS OF DISCHARGE FOR PECOS RIVER
AND
GRAPH OF CONTENTS OF RED BLUFF RESERVOIR

Date 1955	Mean daily discharge in cfs	
	Delaware River nr. Red Bluff, N. Mex.	Salt (Screwbean) Draw nr. Orla, Tex.
Sept. 20	0	0
21	0	0
22	0	0
23	254	107
24	57	122
25	14	22
26	110	4.3
27	15	1.8
28	4.7	1.0
29	2.9	.5
30	1.8	.2
Oct. 1	30	.1
2	22,000	7,000
3	343	1,250
4	421	140
5	91	20
6	61	8.1
7	58	5.1
8	40	3.4
9	20	2.6
10	13	2.2
11	9.9	2.1
12	8.4	1.9
13	7.6	1.7
14	7.1	1.5
15	6.6	1.4

Figure 9 shows the hydrographs for Delaware River and Salt (Screwbean) Draw during this period, and table 2 gives previous maximum peak discharges and those occurring during the 1955 flood.

- - - - -

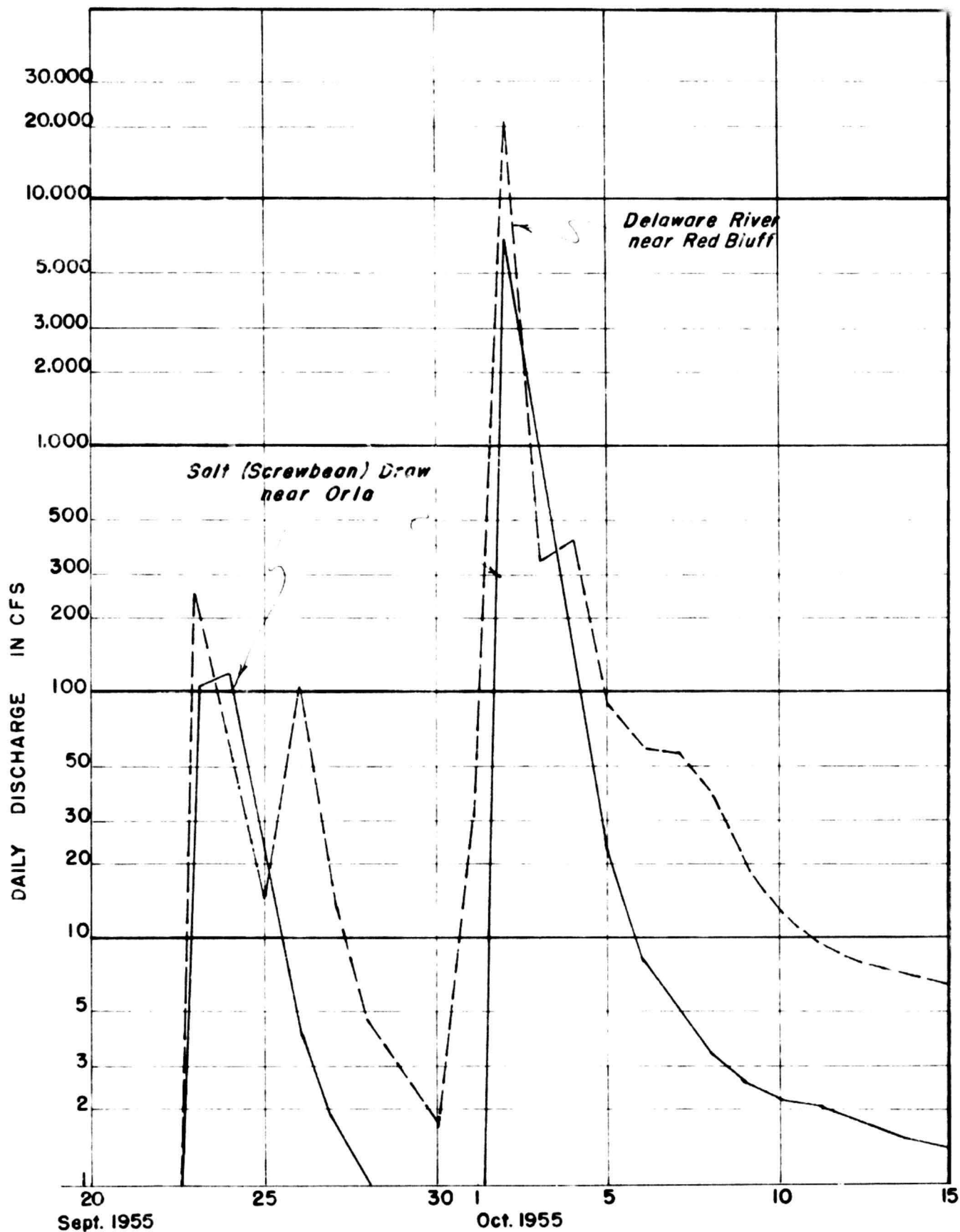


Figure 9
GRAPHS OF DISCHARGE OF DELAWARE RIVER
AND SALT (SCREWBEAN) DRAW

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY—WATER RESOURCES DIVISION

File No.

TABLE 2

Summary of flood discharges in *Pecos River Basin*for the flood of *October, 1955*

No.	STREAM AND PLACE OF DETERMINATION	DRAINAGE AREA (square miles)	PERIOD OF RECORD	MAXIMUM FLOOD PREVIOUSLY KNOWN			MAXIMUM DURING PRESENT FLOOD				REMARKS
				Date	Gage height (Feet)	Discharge (second-foot)	Date	Gage height (Feet)	Discharge (second-foot)		
1	Pecos River at Red Bluff, N. Mex.	1954	1937-55	May 24, 1941	28.3	52,600	Oct. 2, 1955	13.16	10,000		
2	Delaware River near Red Bluff, N. Mex.	689	¹⁹¹²⁻¹³ ¹⁹¹⁴⁻¹⁵ 1937-55	June 27, 1938	18.0	34,600	Oct. 2, 1955	27.0	81,410		
3	Red Bluff Reservoir, N. Mex.	20,720	1937-55	Sept 27-28, 1941	^{284.2} 352,000*		Oct. 10, 1955	^{28.48} 93,000*		* Max. Contents Observed	
4	Salt (Gerechian) Reservoir, N. Mex.	464	¹⁹³⁹⁻⁴⁰ 1943-55	Apr. 17, 1952	393	4,070	Oct. 2, 1955	26.1	40,600		
5	Pecos River near Orla, Tex.	21,300	1937-55	Sept 29, 1941	^{207.4} 23,700		Oct. 2, 1955	13.30	8,050		
6	Pecos River Below Grandfalls, Tex.	27,820	¹⁹²¹⁻²⁶ 1939-55	Oct. 2, 1941	20.98	22,000	Oct. 7, 1955	5.17	234		

NOTE.-- Do not type on this form. Use as many lines per station as necessary. Give supplementary information in space below.

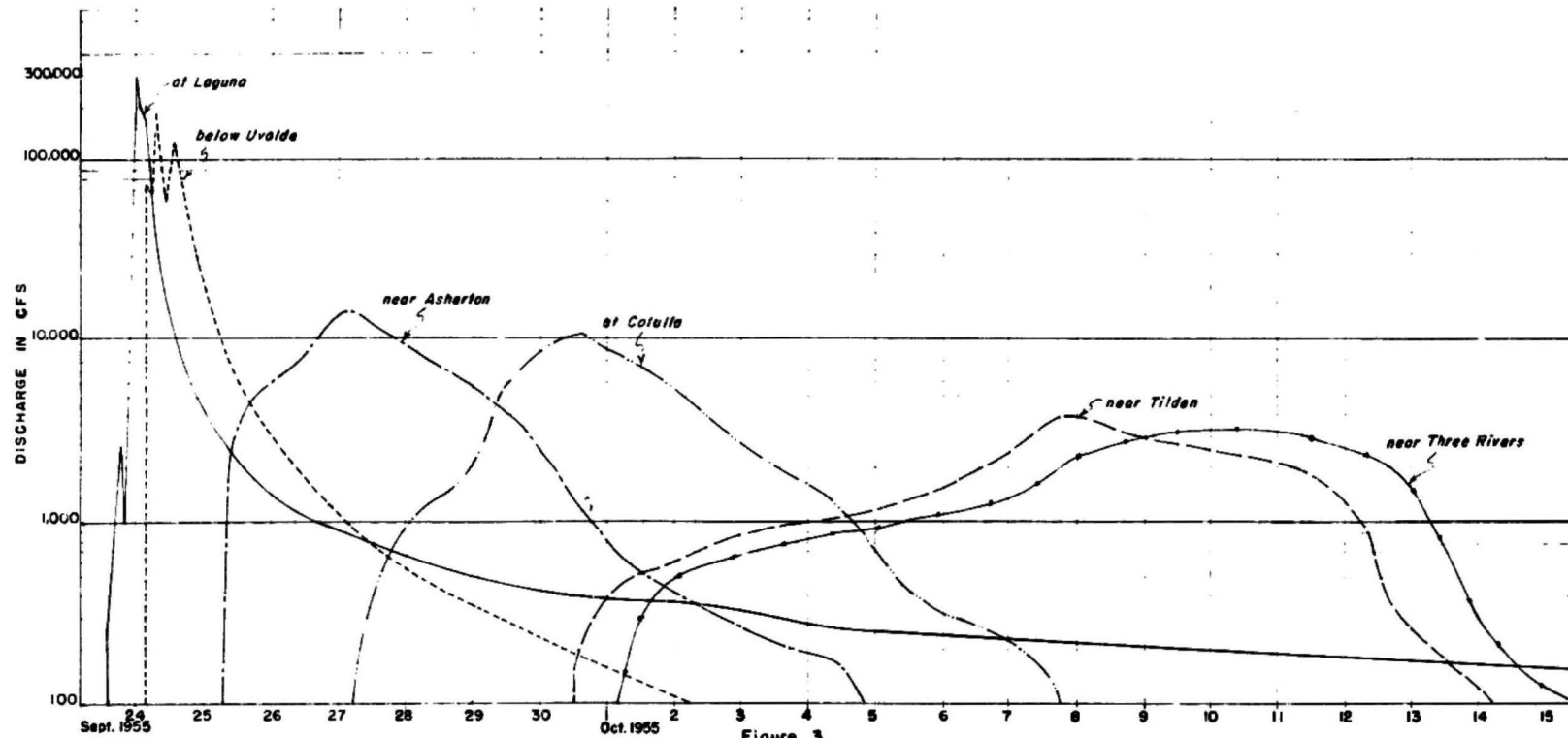


Figure 3
GRAPHS OF DISCHARGE FOR NUECES RIVER

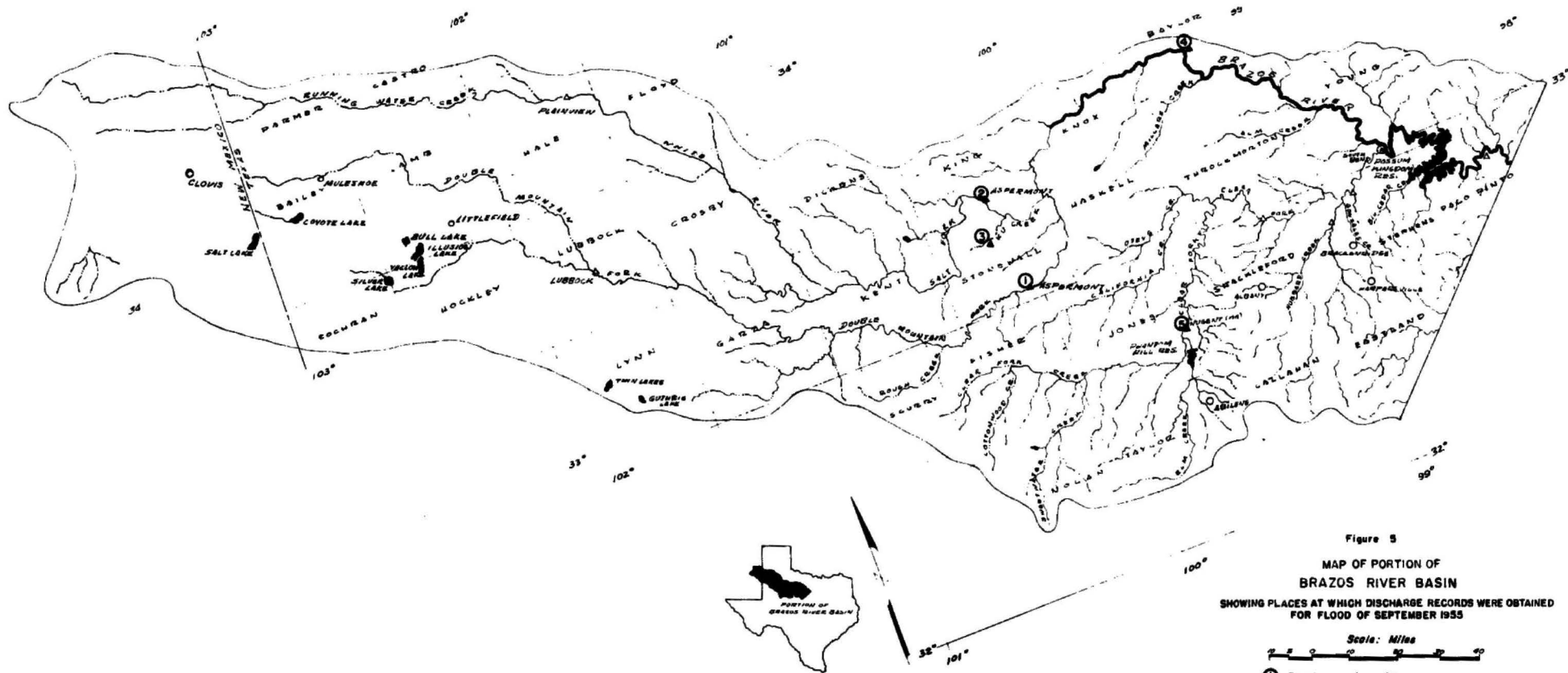


Figure 5

MAP OF PORTION OF
BRAZOS RIVER BASIN

SHOWING PLACES AT WHICH DISCHARGE RECORDS WERE OBTAINED
FOR FLOOD OF SEPTEMBER 1935

Scale: Miles

① Flood measuring point
Numbers refer to items in Table 1.