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WATER BULLETIN NUMBER 16

Flow of the Rio Grande
and
Tributary Contributions

*From San Marcial, New Mexico
to the Gulf of Mexico*

1946

WITH MAXIMUMS, MINIMUMS AND NORMALS

STORAGE CAPACITIES AND WATER IN STORAGE

SOURCES OF RIVER FLOW

DIVERSIONS

SILT, CHEMICAL AND SANITARY ASPECTS OF WATER QUALITY

RAINFALL AND EVAPORATION

DRAINAGE BASIN AND IRRIGATED AREAS

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RIO GRANDE DRAINAGE BASIN
CUENCA DEL RIO BRAVO

FOREWORD

This compilation of stream discharges and related data is the sixteenth unified publication relative to the cooperative determination of the flow of the international portion of the Rio Grande. The first such publication was Water Bulletin No. 1, covering the year 1931. These data are published jointly by the United States and Mexican Sections of the International Boundary and Water Commission and represent the results of stream flow measurements and related data from the Rio Grande and important tributaries near their confluence, from San Marcial, New Mexico, which is at the head of Elephant Butte Reservoir, to the Gulf of Mexico, for the year 1946 as well as adjustments to and authentications of hydrographic records.

International stream gaging was begun in 1889 with the operation of the station at El Paso, Texas. A number of stations on the Lower Rio Grande and tributaries below El Paso were established in 1900 and operated until 1914. From 1914 to 1923, all such work was suspended except for a few months in 1919 and 1920. In 1923 the work was resumed and carried on independently by the two countries until 1931, when the present cooperative work began.

The duties and functions of the United States Section of the International Water Commission were transferred to the United States Section of the International Boundary Commission by Act of June 30, 1932. On January 1, 1932, the Mexican Section of the International Boundary Commission similarly took over the duties of the Mexican Section of the International Water Commission. On January 1, 1935, an International Water Commissioner for Mexico was again appointed and, though separated, the two Commissions functioned as one. In January 1941, the two Mexican Commissions were again combined into one. Under the terms of the treaty of February 3, 1944, the name of the Commission was changed to International Boundary and Water Commission, United States and Mexico.

This cooperative arrangement for obtaining hydrologic data is the result of the concurrence and agreement by both sections of the International Commission that a coordinated result should be insured and that an accurate and complete hydrographic record of international flow is necessary.

Of stream gaging stations on the Rio Grande, those at Juarez, Eagle Pass, Laredo, Roma, Las Palmas, and Matamoros were operated in 1946 by the Mexican Section of the Commission, the others by the United States Section. Each section operated the gaging stations on tributaries entering the Rio Grande from its own country, or on floodways or diversions within its borders.

Of the 335,500 square miles of total area within the outer rim of the Rio Grande Basin, about 48.8% yield no run-off to the Rio Grande, leaving 171,887 square miles of productive watershed. Approximately 2,870,000 acre feet per year is the average virgin yield of the upper 61,600 square miles of watershed above Fort Quitman and Girvin (on the Pecos) where approximately 1,140,000 acres are irrigated and 3,574,000 acre feet of reservoir capacity regulates the flow. Above the regulating reservoirs on the Rio Conchos, Rio Salado and Rio San Juan, with an aggregate capacity of 4,110,000 acre feet, the watershed of 33,600 square miles has a virgin yield of about 3,630,000 acre feet per year which irrigates 503,000 acres of land. About 2,562,000 acre feet per year is the average virgin yield of the remaining lower 76,700 square miles of watershed in both countries where 861,000 acres are irrigated and only 290,000 acre feet of reservoir capacity regulates the flow. From the Rio Grande about 3,600,000 acre feet per year, average, escapes to the Gulf of Mexico.

A factual picture of Rio Grande hydrology along the international boundary, the various important aspects of the quantity, quality, sources and disposition of its water, and the uses thereof, is more easily gained from the mass of essential detailed data in the Water Bulletins if the reader will look to the generalizations of the data which appear at the lower side and right hand side of the tabulations and also to the maps and graphs.

For finding all of the data for a particular stream measuring station or a particular subject, etc.; please refer to the index to all Water Bulletins in Water Bulletin No. 14.

Acknowledgments

Some of the data published herein relative to drainage basin and irrigated areas, chemical and bacteriological analyses, stored water, evaporation and rainfall have been furnished by the following agencies within the two countries: U. S. Bureau of Plant Industry, Soils and Agricultural Engineering, U. S. Soil Conservation Service, U. S. Bureau of Reclamation, U. S. Weather Bureau, U. S. Army, Rio Grande Compact Commission, Texas Agricultural and Mechanical College, Texas State Board of Health, El Paso City-County Health Unit, El Paso Department of Water and Sewerage, Laredo City Water Department, Red Bluff Water Power Control District, National Irrigation Commission of Mexico, Cia. Agricola y de Fuerza Electrica del Rio Conchos, S. A., Mexican Department of Agriculture and Development, National Bank of Agricultural Credit of Mexico, Meteorological Service of Mexico, and private individuals and corporations. Specific acknowledgment is made where the data appear.

FOREWORD

General Hydrologic Conditions for 1946

Along and Adjacent to The International Portion of the Rio Grande

In the Rio Grande Basin temperatures were above normal, more so on the United States than on the Mexican side.

Evaporation was above normal on the United States side and about normal on the Mexican side.

Rainfall on both sides of the basin was in general below normal except in the region on both sides below Del Rio and down to Laredo. The rainfall deficiency was generally greater on the north than on the south side of the basin. Below Rio Grande City the rainfall was a little above normal.

The average monthly amounts of water in storage in 1946 were about 71% of normal on the United States side and about 102% of normal on the Mexican side.

In volume, the yearly flow of the Rio Grande was very much below normal, varying from about 29% of normal at San Marcial, New Mexico to about 82% at Laredo, Texas.

The total flow of measured tributaries on each side of the Rio Grande was less than normal. Those from the United States flowed 66% of normal and those from the Mexican side above the Rio San Juan flowed 72% of normal. The Rio San Juan's contribution was 18% of its average flow since Azucar Dam was closed March 10, 1943.

Minimum monthly flow records since 1924 were established for August 1946 along the Rio Grande from Presidio to Eagle Pass and at Lower Brownsville. New minimums were likewise established for Lower Brownsville for March, November and December.

There were no flood peaks of importance in 1946. At Rio Grande City the highest crest was on May 31 when 77,300 second feet was reached. There was no overflow into floodways on the United States side.

There was a very great shortage of irrigation water on the United States side of the Lower Rio Grande Valley. In the 163 days from March 23 to September 11 there were 50 days in which there was no flow a part or all day, at Lower Brownsville Station, 25 of which days were in August.

The greatest acreage ever irrigated on each side of the Lower Rio Grande Valley below Roma was served in 1946. Also the greatest acreage ever irrigated on the Mexican side of the Rio Grande Basin and also on the United States side below San Marcial on the Rio Grande and below Girvin on the Pecos River was irrigated in 1946.

Over the above basin area on both sides of the Rio Grande the water consumed in irrigation, per acre of land irrigated was below normal, partly due to a short water supply, and the total water diverted and consumed in irrigation was the maximum ever so used.

Municipal diversions from the Rio Grande were above normal.

The 1946 sanitary sampling and assaying of Rio Grande water extended from above El Paso to below Laredo.

The annual tonnage of salts, or total dissolved solids, carried by the Rio Grande in 1946 was very much below normal.

The amount of suspended silt passing down the Rio Grande at all sampling points was below normal in 1946.

RIO GRANDE AT SAN MARCIAL STATION

DESCRIPTION: Water-stage recorder, cable with sit-down cable car and winch located at railroad bridge about one mile below San Marcial, N. M., and 177.1 miles above the American Dam at El Paso, Texas. The recorder is on the upstream end of the first bridge pier from the south abutment of the bridge with gage zero at 4,455.38 feet, U. S. C. & G. S. sea level datum.

RECORDS: January 1 through June 30, 1946, were based upon 45 meter measurements by wading and from cable about 1,000 feet above railroad bridge. Computations by shifting channel methods. 1946 records good. After July 1, 1946, the operation of this station was turned over to the U. S. Geological Survey who furnished the record for the last half of 1946. Records available: January 1895 to December 1946. For statement of all records of discharges at this station including those authenticated by this Commission see the last pages of this bulletin.

REMARKS: Reservoirs, diversions and drainage returns modify the river flow at this station. For long time trends of flow see page 6, Water Bulletin 15. For gage history 1895-1946 see Water Bulletins 4 and 7 to 16. For chemical and silt content of water and other related data see index in Water Bulletin 14 and later bulletins.

COMPARATIVE FLOWS FROM RECORDS: **Momentary Peak:** Max. October 11, 1904, 50,000 sec. ft. with water surface level of 4,459.5 feet on U. S. C. & G. S. datum about .25 mile above the present gage. This is the greatest flood peak flow in, at least, the past 118 years. Min. sometimes dry. See Water Bulletin No. 6, page 79, for record of the magnitude and average frequency of floods here since 1828.

		Average Flow in Second Feet			
Daily:	Max.	33,000,	Oct. 11, 1904.	Min.	sometimes dry.
Monthly:	Max.	16,159,	May 1941.	Min.	sometimes dry.
Yearly:	Max.	3,911,	1941.	Min.	277, 1902.
Two Successive Years:	Max.	3,300,	1941-1942.	Min.	487, 1899-1900.
Three Successive Years:	Max.	2,830,	1905-1907.	Min.	609, 1900-1902.
Four Successive Years:	Max.	2,390,	1905-1908.	Min.	539, 1899-1902.
Five Successive Years:	Max.	2,260,	1905-1909.	Min.	697, 1898-1902.
Ten Successive Years:	Max.	1,980,	1903-1912.	Min.	1,140, 1931-1940.
Fifty-two Successive Years:			1,530, 1895-1946.		

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	750	660	733	156	104	2.8	0	0	320	12	109	1,930
2	720	680	740	142	243	2.5	0	0	292	14	114	1,900
3	694	690	710	124	218	2.0	0	0	346	13	94	1,860
4	678	650	756	111	194	2.0	0	1	250	16	151	1,740
5	775	570	693	87.0	177	1.8	0	46	265	206	179	1,700
6	740	531	695	87.5	208	1.5	0	291	179	26	276	1,770
7	612	510	710	100	209	1.2	0	385	104	443	346	1,620
8	597	518	605	105	183	1.0	0	208	77	292	292	1,430
9	675	555	686	105	212	0.8	0	193	52	511	265	1,660
10	681	575	728	88.0	172	0.5	0	196	36	519	240	1,840
11	706	535	634	56.3	77.8	0.2	0	318	30	340	225	1,900
12	623	518	567	26.9	57.7	0	0	672	38	276	255	1,810
13	687	578	551	28.9	61.9	0	0	441	111	235	287	1,880
14	686	610	526	32.9	55.3	0	0	260	48	211	320	1,740
15	685	670	497	35.6	50.1	0	0	172	35	199	340	1,790
16	683	690	486	46.2	42.0	0	0	314	154	199	326	1,700
17	682	708	458	48.7	39.8	0	0	114	78	168	352	1,590
18	681	650	493	43.7	38.9	0	0	276	42	128	602	1,550
19	655	636	469	37.1	39.2	0	0	220	27	120	874	1,490
20	658	565	529	33.3	35.5	0	0	168	160	111	1,270	1,570
21	657	560	520	32.4	30.0	0	21	352	539	128	1,570	1,550
22	686	640	435	31.6	23.9	0	73	320	81	128	1,490	1,550
23	718	665	358	36.5	19.4	0	101	392	44	126	1,250	1,510
24	695	635	370	44.4	17.3	0	35	463	35	168	1,450	1,200
25	727	625	390	44.7	15.8	0	17	314	28	109	1,770	944
26	661	620	426	38.5	12.4	0	4	203	20	74	1,810	930
27	633	682	365	38.3	8.4	0	2	340	18	52	1,860	902
28	603	660	324	63.3	7.4	0	1	326	14	48	1,860	930
29	547	265	81.3	6.4	0	0	0	199	14	74	1,810	900
30	525	230	80.1	4.3	0	0	0	378	13	74	1,930	900
31	727	188		3.0		0	0	455		126		800
Sum	20,837	17,166	16,137	1,986.2	2,566.5	16.5	254	8,017	3,450	5,146	23,697	46,586

Current Year 1946								Period 1924-1946			
Month	Extreme Gage Feet		Extreme Second Feet			Average Second Feet	Total Acre Feet	Acre Feet			
	High	Low	Day	High	Day			Low	Normal	Maximum	Minimum
Jan.	11.80	11.11	17	817	12	390	672	41,300	44,420	72,600	17,400
Feb.	11.80	11.22	1	897	7	465	613	34,000	47,158	77,100	29,600
Mar.	11.73	11.04	9	770	31	157	521	32,000	58,013	119,000	23,400
Apr.	11.05	10.29	1	161	12	23.3	66.2	3,940	122,694	432,000	3,940
May	11.16	9.80	2	269	31	2.5	82.8	5,090	280,136	994,000	4,450
June	9.81		1	2	0	0.6	32.7	157,404	609,000	32.7	0
July			23	101	1	0	8.2	504	56,091	246,000	0
Aug			12	672	1	0	259	15,900	45,569	275,000	1,620
Sept.			21	539	30	13.0	115	6,840	50,522	308,000	2,920
Oct.			10	519	1	12.0	166	10,200	40,248	221,000	0
Nov.			30	1,930	3	94.0	790	47,000	34,693	171,000	2,550
Dec.			1	1,930	31	800	1,500	92,400	46,129	95,300	15,100
Yearly				1,930	0	399	289,206.7	983,077	2,832,100	244,489	

Mean daily † And other days ‡ Estimated

RIO GRANDE AT BELOW ELEPHANT BUTTE DAM STATION

DESCRIPTION: Water-stage recorder one mile below dam and cable with sit-down cable car with winch 100 feet below recorder. Zero of gage is 4,242.09 feet above U. S. C. & G. S. sea level datum. Elephant Butte Dam is 135.1 river miles above the American Dam at El Paso, Texas, and 42.0 river miles below the San Marcial gaging station at the upper end of Elephant Butte Reservoir.

RECORDS: Based upon 44 meter measurements during the year and a stable rating curve. 1946 records excellent. Records furnished by the El Paso office of the United States Bureau of Reclamation. Records available: January 1915 to December 1946. For statement of all records of discharges at this station including those authenticated by this Commission see the last pages of this bulletin.

REMARKS: The station described here is operated by the Reclamation Bureau. It has been the official station since 1931. Reservoirs, diversions and drainage returns modify the river flow at this station. Beginning December 1940 hydro-electric power generation facilities for 27,000 kv.-a began operating here. For silt content of Elephant Butte Reservoir see page 63, Water Bulletin 7 and elsewhere in this bulletin. For other related data see index in Water Bulletin 14 and later bulletins.

COMPARATIVE FLOWS FROM RECORDS:

		Average Flow in Second Feet			
Daily:	Max.	8,220,	May 22, 1942.	Min.	sometimes dry.
Monthly:	Max.	7,590,	May 1942.	Min.	3.0 Jan. 1930.
Yearly:	Max.	2,510,	1942.	Min.	881, 1935.
Two Successive Years:	Max.	1,930,	1941-1942.	Min.	946, 1918-1919.
Three Successive Years:	Max.	1,660,	1941-1943.	Min.	985, 1935-1937.
Four Successive Years:	Max.	1,550,	1941-1944.	Min.	1,020, 1934-1937.
Five Successive Years:	Max.	1,470,	1941-1945.	Min.	1,040, 1933-1937.
Ten Successive Years:	Max.	1,300,	1915-1924.	Min.	1,060, 1928-1937.
Thirty-two Successive Years:	1,210, 1915-1946.				

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,070	1,220	1,030	1,110	1,300	1,220	1,210	1,570	988	1,190	1,180	800
2	1,130	1,270	1,010	1,160	1,320	980	1,270	1,510	1,050	1,150	939	1,010
3	1,190	776	805	1,210	1,320	1,140	1,260	1,410	1,300	1,150	617	1,140
4	1,170	1,110	1,080	1,230	1,150	1,290	1,000	985	1,400	1,260	766	1,110
5	1,230	1,180	1,240	1,250	1,040	1,350	1,040	1,280	1,370	973	968	1,130
6	1,000	1,170	1,220	1,100	1,210	1,380	1,050	1,480	1,350	707	967	1,080
7	1,150	1,200	1,240	944	1,250	1,320	811	1,610	1,170	896	937	1,090
8	1,200	1,170	1,240	1,080	1,200	1,240	1,100	1,750	883	1,390	976	770
9	1,250	1,170	1,160	1,220	1,220	995	1,250	1,740	1,160	1,140	799	1,000
10	1,220	998	957	1,060	1,190	1,230	1,270	1,510	1,290	1,190	555	1,030
11	1,240	1,160	1,280	1,050	1,090	1,230	1,230	1,300	1,260	1,160	689	1,120
12	1,210	1,310	1,170	1,300	918	1,240	1,160	1,590	1,240	1,110	921	1,110
13	1,020	1,310	1,310	1,240	946	1,210	1,030	1,780	1,220	841	924	1,110
14	1,450	1,180	1,480	1,010	1,130	1,160	950	1,820	959	1,300	934	967
15	1,300	1,180	1,230	1,200	1,120	1,060	1,170	1,800	750	1,280	980	753
16	1,300	1,070	1,120	1,290	1,160	849	1,260	1,800	1,010	1,230	803	988
17	1,260	997	910	1,330	1,170	1,100	1,430	1,250	1,110	1,300	535	1,140
18	1,340	1,100	1,200	1,380	1,130	1,180	1,350	959	1,080	1,150	869	1,050
19	1,180	1,210	1,210	1,330	968	1,090	1,380	1,290	1,080	955	980	931
20	967	1,220	1,330	1,340	1,120	1,190	1,160	1,360	1,120	751	996	986
21	1,110	1,150	1,290	1,070	1,300	1,170	907	1,470	977	1,050	957	867
22	1,260	1,170	1,270	1,150	1,200	1,010	1,240	1,440	791	1,250	945	688
23	1,250	1,080	1,220	1,230	1,350	816	1,300	1,390	1,040	1,120	763	846
24	1,190	879	1,030	1,290	1,260	1,210	1,260	1,130	1,260	1,150	594	748
25	1,140	949	1,110	1,240	1,080	1,280	1,310	978	1,330	1,170	820	641
26	1,060	1,070	1,380	1,250	1,040	1,320	1,290	1,340	1,340	967	1,060	824
27	1,000	1,060	1,350	1,190	1,220	1,370	1,010	1,460	1,360	844	1,050	1,017
28	1,170	1,080	1,370	977	1,270	1,300	839	1,450	1,180	1,020	1,030	1,022
29	1,210		1,380	1,220	1,430	1,080	1,210	1,430	898	1,110	1,140	829
30	1,190		1,320	1,350	1,340	965	1,450	1,360	1,290	1,150	1,110	963
31	1,210		1,030		1,370		1,480	1,130		1,130		984
Sum		31,439		35,801		34,975		44,372		34,084		29,744
	36,667		36,972		36,792		36,677		34,256		26,804	

Current Year 1946								Period 1924-1946			
Month	Extreme Gage Feet		#	Extreme Second Feet		Average Second Feet	Total Acre Feet	Acre Feet			
	High	Low		High	Low			Normal	Maximum	Minimum	
Jan.			14	1,450	20	967	1,180	72,700	21,572	86,500	184
Feb.			12	1,310	3	776	1,120	62,400	35,308	76,300	969
Mar.			14	1,480	3	805	1,190	75,500	61,814	88,700	1,520
Apr.			18	1,380	7	944	1,190	71,000	105,883	162,000	57,200
May			29	1,430	12	918	1,190	75,000	113,330	467,000	63,000
June			6	1,380	23	816	1,170	69,400	121,143	363,000	64,400
July			31	1,480	7	811	1,180	72,700	120,270	211,000	72,700
Aug.			14	1,820	18	959	1,430	88,000	114,404	161,000	74,700
Sept.			4	1,400	15	750	1,140	67,900	72,074	129,000	25,000
Oct.			8	1,390	6	707	1,100	67,600	31,301	72,100	506
Nov.			1	1,180	17	535	893	53,200	30,129	158,000	884
Dec.			3	1,140	25	641	959	59,000	29,379	87,300	916
Yearly				1,820		535	1,150	830,200	856,607	1,818,800	637,544

Mean Daily † And other days

RIO GRANDE AT BELOW CABALLO DAM STATION

DESCRIPTION: Water-stage recorder and cable with sit-down cable car and winch located .80 river mile below Caballo Dam, and 106.8 river miles above American Dam at El Paso. Elevation of zero of the gage was 4,147.90 $\pm$.2 feet from February 26, to October 7, 1938, when it was changed to 4,146.90 $\pm$.2 feet. On October 13, 1938, it was changed to 4,145.90 $\pm$.2 feet and on January 1, 1946, it was changed to 4,140.90 $\pm$.2 feet. All elevations are on United States Coast and Geodetic Survey sea level datum.

RECORDS: Based upon 102 meter measurements during the year. Records available: February 26, 1938, to December 31, 1946. 1946 records excellent. Records furnished by the El Paso office of the United States Bureau of Reclamation. For statement of all records of discharge at this station including those authenticated by this Commission see the last pages of this bulletin.

REMARKS: This gaging station was installed by the Bureau of Reclamation on the Rio Grande on February 26, 1938 to measure the flow from the Caballo Reservoir. Reservoirs, diversions and drainage returns, modify the river flow at this station. This station is about 1.5 miles upstream from Percha Dam (a low diversion dam) at which point records have been kept in past years. Small accretions to the river take place between this station and Percha Dam. 2,200 acre feet of water, not accounted for in the tables below, were diverted in 1946 from Caballo Reservoir into a small irrigation canal (Bonito Lateral) just below the dam. For chemical content of water and other related data see index in Water Bulletin 14 and later bulletins.

COMPARATIVE FLOWS FROM RECORDS:

		Average Flow in Second Feet			
Daily:	Max.	7,650, May 20, 1942.	Min.	1.3 Dec. 12, 1940.	
Monthly:	Max.	6,710, May 1942.	Min.	1.4 Dec. 1940.	
Yearly:	Max.	2,480, 1942.	Min.	972, 1941.	
Two Successive Years:	Max.	1,870, 1942-1943.	Min.	990, 1940-1941.	
Three Successive Years:	Max.	1,640, 1942-1944.	Min.	1,020, 1939-1941.	
Four Successive Years:	Max.	1,540, 1942-1945.	Min.	1,040, 1938-1941.	
Five Successive Years:	Max.	1,440, 1942-1946.	Min.	1,350, 1938-1942.	
Six Successive Years:		1,260, 1938-1946.			

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.3	9.0	16.9	2,730	1,530	1,850	2,390	2,660	1,550	478	3.3	3.8
2	3.3	8.5	17.0	2,640	1,360	2,000	2,510	2,400	1,530	870	3.3	4.0
3	3.3	9.1	17.2	2,390	1,290	1,990	2,650	2,410	1,520	800	3.3	4.0
4	3.7	8.6	18.0	2,320	1,500	1,950	2,570	2,590	1,510	747	3.2	4.2
5	3.7	8.1	17.6	2,320	1,240	1,830	2,180	2,510	1,450	697	3.2	4.2
6	4.1	8.0	17.8	2,320	1,000	1,710	2,300	2,390	1,400	578	3.2	4.2
7	2.1	10.2	16.8	2,380	1,000	1,620	2,150	2,350	1,610	454	3.2	4.3
8	2.0	9.5	16.2	2,450	1,150	1,820	2,200	2,290	1,770	293	73.5	4.3
9	2.8	7.2	406	2,410	1,230	1,960	1,760	2,190	1,740	236	265	4.8
10	2.0	9.8	1,510	2,300	1,280	1,960	2,030	2,130	1,660	136	558	4.9
11	1.6	10.3	1,080	2,240	1,390	1,960	1,930	2,110	1,140	98.0	888	5.0
12	1.5	10.2	1,080	2,200	1,390	1,960	1,840	2,050	286	8.5	693	5.2
13	1.9	9.1	1,280	2,100	1,550	1,930	1,940	2,060	142	4.3	422	7.5
14	2.5	8.4	1,390	2,240	1,750	1,760	2,070	1,960	8.1	4.9	342	9.7
15	2.5	10.6	1,380	2,240	1,770	2,040	2,000	1,940	4.7	4.9	247	12.0
16	2.6	628	1,660	2,160	1,750	2,260	1,950	1,900	4.6	4.1	203	635
17	2.6	1,020	1,660	2,000	1,660	2,200	1,800	1,980	4.5	5.1	31.4	836
18	2.6	1,110	1,680	1,880	1,720	2,100	2,280	2,140	4.3	5.1	8.5	674
19	2.6	1,110	1,850	1,640	1,790	2,080	2,370	2,140	4.1	4.4	3.4	462
20	3.0	1,100	1,790	1,640	1,800	1,880	2,420	2,060	3.9	4.7	3.3	197
21	4.9	1,050	1,680	1,640	1,800	1,810	2,240	2,180	3.4	4.5	3.3	55.0
22	6.0	1,050	1,890	1,640	1,920	1,950	2,120	2,140	3.4	4.7	3.3	8.4
23	6.5	817	2,200	1,590	1,970	2,110	2,110	2,040	3.3	4.5	3.3	8.2
24	7.0	602	2,200	1,380	1,870	2,120	2,110	2,170	3.3	4.5	3.5	8.2
25	9.2	459	2,160	1,260	1,850	2,030	2,000	2,170	3.3	4.2	3.5	8.1
26	8.6	76.1	2,120	1,200	1,850	2,000	2,260	2,100	3.3	4.2	3.6	8.1
27	5.9	19.2	2,200	1,490	1,810	2,180	2,590	2,000	3.3	4.4	3.8	8.1
28	5.9	17.4	2,310	1,680	1,750	2,500	2,620	1,800	3.2	3.4	3.9	8.0
29	6.9		2,520	1,680	1,770	2,630	2,670	1,680	3.3	3.4	4.0	8.0
30	6.9		2,590	1,680	1,660	2,450	2,600	1,600	3.2	3.4	3.9	8.0
31	6.3		2,720		1,610		2,710	1,570		3.4		7.8
Sum	127.8	9,195.3	41,493.5	59,840	49,010	60,640	69,370	65,710	17,375.2	5,477.6	3,794.9	3,022.3
Current Year 1946									Period 1938-1946			
Month	Extreme Gage Feet		# Extreme Second Feet				Average Second Feet	Total Acre Feet	Acre Feet			
	High	Low	Day	High	Low				Average	Maximum	Minimum	
					Day							
Jan.			25	9.2	12	1.5	4.1	253	1,603	4,850	97.0	
Feb.			31	1,110	9	7.2	328	18,200	24,462	64,300	7,260	
Mar.			31	2,720	8	16.2	1,340	82,300	80,433	95,100	49,300	
Apr.			1	2,730	26	1,200	1,990	119,000	151,344	212,000	106,000	
May			23	1,970	6	1,000	1,580	97,200	140,244	412,000	91,500	
June			29	2,630	7	1,620	2,020	120,000	147,178	354,000	114,300	
July			31	2,710	9	1,760	2,240	138,000	140,822	234,000	109,000	
Aug.			1	2,660	31	1,570	2,120	130,000	133,867	179,000	110,000	
Sept.			8	1,770	28	3.2	579	34,500	80,233	181,000	34,500	
Oct.			2	870	28	3.4	177	10,900	16,119	35,400	2,840	
Nov.			11	888	4	3.2	126	7,530	8,330	14,400	282	
Dec.			17	836	1	3.8	97.5	5,990	9,297	19,100	83.3	
Yearly				2,730		1.5	1,060	763,873	913,932	1,795,620	703,547	

Mean daily † And other days

RIO GRANDE AT EL PASO STATION

DESCRIPTION: Staff gage and cable with sit-down cable car and winch located in the pass opposite Courchesne quarry, 4 miles northwest of El Paso, Texas, and 5 miles northwest of Juárez, Chihuahua, and .9 river mile above the American Dam. Zero of gage is 3,720.51 feet above U. S. C. & G. S. mean sea level datum. Also water-stage recorder 1 mile further upstream with zero of its gage 3,722.30 feet on the same datum. This latter gage has been the official gage since August 3, 1938.

RECORDS: Discharges in 1946 were computed by taking the sum of the flows in the American Canal and the flows at the Below American Dam Station. 1946 records good. Records available: 1889-1946. For statement of all records of discharge at this station including those authenticated by this Commission, see the last pages of this bulletin.

REMARKS: Reservoirs, diversions and drainage returns modify the river flow at this station. For items of gage history see previous water bulletins. For long term trends of flow see page 9, Water Bulletin No. 15. For chemical, silt and bacterial content of water and other related data, see index in Water Bulletin 14 and later bulletins.

COMPARATIVE FLOW FROM RECORDS: Momentary Peak: Max. 24,000 second feet on June 12, 1905, with 6.0 feet stage (lower gage). This is the greatest peak flow in the past 118 years or since 1828, or possibly longer. Min., sometimes dry. See Water Bulletin No. 6, page 79, for all large peak flows since 1828 and their average frequency. Since Elephant Butte Dam was closed in 1915, the largest peak flow to pass this station was 13,500 second feet on September 3, 1925. See Water Bulletin No. 10, page 77, for peak flood flows 1916-1937.

Average Flow in Second Feet				12, 1905.		sometimes dry.	
Daily:	Max.	23,680,	June 12,	1905.	Min.		
Monthly:	Max.	14,500,	June	1905.	Min.		sometimes dry.
Yearly:	Max.	2,780,		1905.	Min.	70.1	1902.
Two Successive Years:	Max.	2,160,	1905-1906.		Min.	168	1899-1900.
Three Successive Years:	Max.	2,280,	1905-1907.		Min.	269	1900-1902.
Four Successive Years:	Max.	1,880,	1904-1907.		Min.	227	1899-1902.
Five Successive Years:	Max.	1,790,	1903-1907.		Min.	367	1898-1902.
Ten Successive Years:	Max.	1,560,	1903-1912.		Min.	650	1893-1902.
Fifty-eight Successive Years:			 993,	1889-1946.			

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	245	164	303	1,350	1,030	946	1,440	1,340	1,230	362	218	198
2	234	159	251	1,280	1,050	920	1,200	1,380	1,190	357	216	196
3	222	156	219	1,340	1,020	988	1,120	1,420	1,130	337	214	191
4	222	157	201	1,170	913	1,050	1,090	1,250	1,090	332	210	197
5	216	154	193	950	1,100	985	1,390	1,390	1,030	932	218	194
6	236	155	188	900	1,230	1,050	1,400	1,540	1,050	775	222	192
7	258	157	188	977	1,090	977	1,260	1,530	1,020	1,150	220	192
8	219	162	173	1,030	885	956	1,280	1,520	985	842	222	195
9	208	164	172	1,020	794	882	1,280	1,370	962	714	226	194
10	183	166	172	1,120	759	967	1,220	1,320	1,100	576	221	208
11	183	164	166	1,050	842	1,060	1,150	1,500	1,100	488	215	222
12	176	155	545	937	857	991	1,040	1,480	1,180	476	226	219
13	182	147	463	916	955	972	1,090	1,310	1,140	410	302	208
14	196	151	490	1,010	859	929	1,160	1,180	823	372	444	192
15	210	148	518	994	857	929	1,090	1,150	818	378	364	195
16	200	148	690	1,080	1,090	937	1,120	1,030	725	346	319	190
17	195	146	641	1,050	1,130	1,040	1,010	1,020	607	310	323	180
18	186	145	879	1,090	1,160	1,250	934	1,100	547	292	323	184
19	175	310	815	940	1,090	1,120	893	1,030	518	286	363	218
20	180	521	802	940	1,190	1,010	1,080	1,090	494	286	278	418
21	182	492	852	1,000	1,080	991	1,300	1,020	475	278	* 279	468
22	181	404	882	1,150	1,020	963	1,450	1,040	440	274	* 260	395
23	179	369	847	998	1,040	961	1,280	1,100	420	266	* 250	349
24	176	454	1,180	914	1,030	1,050	1,020	1,160	411	258	* 234	284
25	168	658	1,210	998	1,190	1,070	961	1,220	391	246	* 222	228
26	173	614	1,090	1,010	1,230	984	932	1,380	376	238	* 230	220
27	178	565	1,000	895	1,220	942	887	1,360	369	230	* 221	214
28	181	500	981	891	1,190	868	882	1,320	369	232	* 214	195
29	180		1,050	901	1,120	833	1,340	1,180	371	226	209	180
30	174		1,220	1,060	987	1,180	1,280	1,210	370	222	207	173
31	171		1,000	1,010		1,010	1,280	1,220		224		174
Sum	6,069	7,685	19,381	30,961	31,998	29,801	35,859	39,160	22,731	12,715	7,670	7,063

Current Year 1946								Period 1924-1946			
Month	Extreme Gage Feet		Extreme Second Feet			Average Second Feet	Total Acre Feet	Acre Feet			
	High	Low	Day	High	Day			Low	Normal	Maximum	Minimum
Jan.	3.90	3.57	7	269	25	160	196	12,000	11,305	17,500	8,210
Feb.	4.93	3.49	25	700	13	147	274	15,200	20,473	52,200	7,230
Mar.	5.98	3.44	30	1,410	9	161	625	38,400	40,995	62,500	18,400
Apr.	6.09	5.10	1	1,680	27	855	1,030	61,400	67,487	139,000	44,900
May	5.95	4.92	6	1,340	10	720	1,030	63,500	79,880	357,000	47,600
June	5.97	4.97	30	1,400	28	830	993	59,100	79,815	304,000	56,200
July	6.07	4.93	1	1,500	27	828	1,160	71,100	85,287	198,000	68,900
Aug.	6.17	5.25	6	1,580	17	989	1,260	77,700	88,732	158,000	61,000
Sept.	5.86	3.93	2	1,380	29	359	758	45,100	67,609	171,000	41,700
Oct.	6.70	3.70	5	3,470	29	218	410	25,200	27,745	57,900	17,800
Nov.	4.41	3.62	13	450	3	205	256	15,200	18,077	29,500	11,400
Dec.	4.43	3.55	21	527	31	163	228	14,000	17,081	27,700	9,590
Yearly	6.70	3.44		3,470		147	688	497,900	604,486	1,559,200	453,900

* Estimated * Partly estimated

RIO GRANDE BELOW AMERICAN DAM STATION

DESCRIPTION: Water-stage recorder and cable with sit-down cable car equipped for winch and heavy weights located 3,200 feet below the American Dam and 1.5 miles above the International Dam, west of El Paso, Texas. The zero of the gage is 3,712.30 feet above mean sea level U. S. C. & G. S. datum. The American Dam is 1,241.4 river miles above the Gulf of Mexico.

RECORDS: Based upon 41 meter measurements at normal and low stages during the year. Computations by shifting channel methods. 1946 records good. Records available: June 1, 1938 to December 31, 1946. For statement of all records of discharge at this station, including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: The operation of this station began June 2, 1938, when the American Dam first began operating. At this dam, part of the flow passing the El Paso gaging station (see preceding page) was diverted into the American Canal (see records of "Divisions from the Rio Grande" elsewhere herein) and the remainder, including excess flood flows, passed this station. Reservoirs, diversions and drainage returns, modify the river flow at this station. For other related data see index in Water Bulletin No. 14 and later bulletins.

COMPARATIVE FLOWS FROM RECORDS: Momentary Peak: Max. 6,770 second feet on May 18, 1942, with a gage height of 9.77 feet. Min. " 0.3 second feet on February 14, 1941.

		Average Flow in Second Feet	
<u>Daily:</u>	Max. 6,040, May 20, 1942.	Min. 1.2 Oct. 28-31, 1939.	
<u>Monthly:</u>	Max. 4,880, May 1942.	Min. 2.0 Dec. 1942.	
<u>Yearly:</u>	Max. 1,510, 1942.	Min. 106, 1945.	
<u>Two</u> Successive Years:	Max. 846, 1941-1942.	Min. 110, 1945-1946.	
<u>Three</u> Successive Years:	Max. 608, 1940-1942.	Min. 119, 1944-1946.	
<u>Four</u> Successive Years:	Max. 490, 1939-1942.	Min. 120, 1943-1946.	
<u>Five</u> Successive Years:	Max. 417, 1939-1943.	Min. 398, 1942-1946.	
<u>Eight</u> Successive Years:	305, 1939-1946.		

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	244	164	18.3	126	174	177	157	164	178	* 36.4	# 2.5	# 3.0
2	233	159	27.6	114	214	164	152	184	176	# 6.0	# 2.5	# 3.0
3	222	156	26.4	112	207	160	159	186	171	# 5.0	# 2.5	7.7
4	222	157	25.8	120	191	159	160	183	172	# 5.0	# 2.5	10.4
5	216	154	25.8	120	208	158	158	173	170	397	# 2.5	10.4
6	235	155	26.4	124	201	166	159	230	182	110	# 2.5	10.4
7	257	157	26.7	124	209	174	163	162	184	491	# 2.5	8.8
8	219	162	27.0	124	227	179	161	154	187	92.8	# 2.0	7.4
9	208	164	27.9	122	218	170	159	158	186	# 7.0	# 2.0	6.8
10	183	166	28.2	117	224	175	163	156	173	# 4.0	# 2.0	6.5
11	183	164	27.3	115	237	165	170	160	174	# 2.5	# 2.0	7.2
12	176	155	34.1	116	224	170	174	156	166	# 2.5	# 2.0	8.7
13	182	147	31.7	116	224	174	176	151	166	# 2.5	# 2.0	10.6
14	196	* 63.3	29.7	119	230	167	175	158	178	# 2.5	# 2.0	10.9
15	210	# 3.0	33.5	115	229	168	168	156	173	# 2.5	# 2.0	11.2
16	200	# 3.0	36.2	120	238	170	175	154	157	# 2.5	# 2.0	10.7
17	195	# 3.0	32.6	122	226	170	171	155	148	# 2.5	# 2.0	10.2
18	186	# 3.0	31.2	121	217	161	160	156	160	# 2.5	# 2.0	10.5
19	175	# 3.0	34.2	122	214	168	162	159	170	# 2.5	# 2.0	10.5
20	180	# 3.0	31.6	123	227	180	166	160	165	# 2.5	# 2.0	16.8
21	182	# 2.9	29.8	127	234	181	165	161	164	# 2.5	# 7.0	17.8
22	181	# 2.8	29.2	122	235	173	157	168	170	# 2.5	# 147	14.3
23	179	# 2.7	27.9	119	240	174	159	169	162	# 2.5	# 147	14.3
24	176	# 2.6	76.2	122	233	167	154	162	158	# 2.5	# 6.0	12.1
25	168	# 2.5	53.4	132	221	156	156	161	154	# 2.5	# 5.0	11.3
26	173	# 2.4	33.5	121	223	166	157	159	155	# 2.5	# 4.0	10.5
27	178	# 2.3	28.0	117	221	158	154	166	162	# 2.5	# 3.0	14.3
28	181	# 2.3	28.7	126	220	151	160	164	174	# 2.5	# 3.0	16.8
29	180		26.7	131	218	154	159	166	174	# 2.5	# 3.0	16.8
30	174		28.7	137	197	156	155	167	165	# 2.5	# 3.0	16.8
31	171		23.6		190		148	168		# 2.5		17.8
Sum	6,065	2,161.8	967.9	3,646	6,772	5,011	5,012	5,126	5,066	1,226.7	397.5	344.5

Current Year 1946										Period 1938-1946 @		
Month	Extreme Gage Feet		Extreme Second Feet				Average Second Feet	Total Acre Feet	Acre Feet			
	High	Low	Day		Day	Low			Average	Maximum	Minimum	
Jan.	5.96	5.68	7	269	25	160	196	12,000	9,335	12,000	6,480	
Feb.	5.78		9	177	27	# 2.3	77.2	4,290	6,565	32,800	1,030	
Mar.	6.40	4.54	24	203	1	# 2.3	31.2	1,920	4,439	17,500	1,820	
Apr.	5.92	4.89	1	270	1	37.8	122	7,230	16,051	74,500	6,360	
May	5.95	5.56	8	280	5	160	218	13,400	49,100	300,000	12,500	
June	5.71	5.53	21	187	28	146	167	9,940	39,628	250,000	9,660	
July	5.75	5.40	20	184	2	100	162	9,940	29,560	155,000	9,940	
Aug	6.30	5.51	6	399	12	122	165	10,200	24,002	114,000	6,040	
Sept.	6.25	5.60	14	377	17	131	169	10,000	26,182	124,000	3,530	
Oct.	7.74		5	2,580	# 11	# 2.5	39.6	2,430	4,438	19,000	197	
Nov.	5.56		22	# 260	# 8	# 2.0	# 13.2	# 788	2,893	8,700	# 119	
Dec.	4.92		# 21	17.8	# 1	# 3.0	11.1	683	2,280	7,760	120	
Yearly	7.74			2,580	# 2	0	114	82,821	214,473	1,093,553	76,919	

Estimated * And other days @ The average, maximum and minimum discharges for January through May are for the period 1939-1946. * Partly estimated

OUTFALLS FROM WELLS

Near El Paso, Texas and Juarez, Chihuahua.

Between the Below American Dam Station and the Juárez Station, several outfall ditches or pipe lines discharge water into the Rio Grande, the source of which is wells in the vicinity of El Paso and Juárez, except some of the water from the El Paso Sewage Outfall which is from the Rio Grande. During 1946, such outfalls contributed a total of 12,204 acre feet of water to the Rio Grande flow, which is equivalent to an average steady flow of 16.9 second feet during the year. Of this total flow 16.6 second feet, or 11,987 acre feet, came from the United States side, while 0.3 second feet, or 217 acre feet, came from the Mexican side. On the remainder of this page will be found details concerning these outfalls.

El Paso Electric Company Santa Fe Street Plant Cooling Water Waste

This outfall enters the river 3.3 miles below the American Dam. From the company's pumping records, it is calculated that 1,096 acre feet flowed into the river in 1946. This corresponds to an average flow of 1.5 second feet.

Juarez Sewage Outfall

This outfall enters the river 4.7 miles below the American Dam. From several inspections this outfall is estimated at 217 acre feet for 1946, which corresponds to an average flow of 0.3 second feet.

Peyton Packing Company Waste

This outfall enters the river 5.7 miles below the American Dam. From several inspections, it was found that the flow from this source was too small to be of account.

El Paso Sewage Outfall

This outfall enters the river 6.6 miles below the American Dam. The 1946 record of total outfall consists of flows measured by a Parshall meter and estimates by the Department of Water and Sewerage of the City of El Paso, of amounts which by-passed the meter. The breakdown of this total into water from wells, or from the Rio Grande, is made in co-operation with the El Paso Water and Sewerage Department. Water for 110 acres of land was diverted from this outfall between the sewage plant and the Rio Grande.

Month	1946					Period 1936-1946	
	From Wells		From Rio Grande		Diversions Acres Feet	To Rio Grande Acres Feet	Normal Acres Feet
	Mean Sec. Ft.	Acres Feet	Mean Sec. Ft.	Acres Feet			
Jan.	14.4	887	0	0	0	887	655
Feb.	14.3	795	0	0	0	795	620
Mar.	13.6	834	.5	35	0	869	665
Apr.	10.9	650	3.7	218	91	777	685
May	12.1	741	4.0	250	87	904	735
June	12.5	744	5.2	312	87	969	774
July	13.1	806	5.1	314	100	1,020	820
Aug.	14.0	861	3.9	241	106	996	794
Sept.	15.3	909	1.8	107	79	937	746
Oct.	13.0	800	2.4	145	0	945	749
Nov.	13.2	786	2.7	159	0	945	713
Dec.	10.8	663	3.0	184	0	847	698
Year	13.1	9,476	2.7	1,965	550	10,891	8,654

RIO GRANDE AT JUAREZ DAM

DESCRIPTION: Water-stage recorder and cable with sit-down cable car equipped for winch and heavy weights, located 2.9 river miles downstream from El Paso, Texas, and Juárez, Chihuahua. This station is on the rectified channel of the Rio Grande, 7.0 river miles below the American Dam at El Paso, Texas and 4.9 river miles below the International Dam. On January 1, 1943 the zero of the gage was lowered 3.28 feet. The zero of the present gage is 3,683.98 feet above mean sea level U. S. C. & G. S. datum.

RECORDS: Based upon 175 meter measurements during the year, 154 by the Mexican and 21 by the United States Section. Computations by shifting channel methods. 1946 records good. Records available: April 1, 1938 to December 31, 1946. For statement of all records of discharge at this station, including those authenticated by this Commission, see the last pages of this bulletin.

REMARKS: Reservoirs, irrigation diversions and drainage returns, modify the river flow at this station. For other related data see index in Water Bulletin No. 14 and later bulletins.

COMPARATIVE FLOWS FROM RECORDS: Momentary Peak: Max. 6,600 second feet on May 18, 1942 with a gage height of 11.15 feet. Min. 15.2 sec. ft. on December 22, 1944 with a gage height of 2.17 feet.

Average Flow in Second Feet			
Daily:	Max. 6,460, May 20, 1942.	Min. 17.0 Dec. 21, 1944.	
Monthly:	Max. 5,300, May 1942.	Min. 85.1 Feb. 1941.	
Yearly:	Max. 1,820, 1942.	Min. 371, 1940.	
Two Successive Years:	Max. 1,180, 1942-1943.	Min. 396, 1939-1940.	
Three Successive Years:	Max. 971, 1942-1944.	Min. 417, 1939-1941.	
Four Successive Years:	Max. 851, 1942-1945.	Min. 498, 1943-1946.	
Five Successive Years:	Max. 770, 1941-1945.	Min. 720, 1939-1943.	
Eight Successive Years:	 632, 1939-1946.		

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	213	154	136	975	523	477	978	848	710	86.5	27.5	174
2	218	155	236	893	427	413	763	848	732	89.0	75.6	176
3	220	155	193	925	459	480	639	901	646	81.2	196	168
4	221	156	177	768	367	600	554	802	597	57.9	196	169
5	204	158	165	530	572	494	802	872	544	844	190	182
6	214	167	160	508	724	565	883	1,080	561	830	184	136
7	213	157	159	579	717	459	770	1,010	544	1,150	192	143
8	206	147	141	629	385	424	784	1,010	480	805	184	127
9	213	146	149	653	308	413	844	876	463	731	185	56.5
10	208	144	148	678	267	413	738	869	611	583	178	73.1
11	203	143	148	572	312	569	664	975	622	498	171	95.7
12	201	151	221	498	381	480	526	996	692	498	44.5	191
13	200	159	183	607	473	470	569	819	795	484	60.0	182
14	207	149	204	618	360	420	632	678	* 399	89.3	237	118
15	219	93.9	201	540	318	445	618	682	* 396	117	170	96.8
16	221	61.1	329	657	533	456	660	565	* 317	130	91.1	88.3
17	203	58.3	298	572	565	512	554	533	* 231	97.8	90.1	83.0
18	204	60.4	484	696	600	830	470	653	* 173	70.6	95.3	83.3
19	193	99.9	519	491	519	643	417	554	109	129	121	96.4
20	182	283	487	470	572	516	537	597	89.0	253	59.7	249
21	188	264	505	512	533	516	819	551	176	265	71.0	343
22	185	188	565	639	477	484	911	544	255	266	254	348
23	190	142	491	576	505	505	749	583	248	267	255	293
24	181	219	1,264	452	505	561	675	625	242	260	187	252
25	165	370	925	544	664	614	484	657	236	256	63.2	206
26	166	380	745	695	788	484	445	823	226	248	56.1	78.0
27	160	346	685	445	777	473	410	802	209	202	80.2	48.4
28	170	316	629	477	699	388	374	780	178	43.1	49.8	47.3
29	175	735	445	600	318	780	675	96.1	33.5	63.6	66.7	
30	172	819	618	487	572	780	689	84.0	29.0	183	91.8	
31	167		1,021		512		756	685		25.8		135
Sum	6,082	5,022.6	13,122	18,282	15,929	14,994	20,585	23,582	11,681.1	9,519.7	4,010.7	4,597.3
Current Year 1946									Period 1938-1946			
Month	Extreme Gage Feet		Extreme Second Feet			Average Second Feet	Total Acre Feet	Acre Feet				
	High	Low	Day	High	Low			Average	Maximum	Minimum		
Jan.	3.51	3.25	12	226	31	159	196	12,060	@ 11,806	@ 13,270	@ 9,440	
Feb.	4.07	2.69	25	420	18	50.5	179	9,960	@ 13,248	@ 42,690	@ 4,730	
Mar.	4.99	2.69	24	1,620	1	58.6	423	26,030	@ 28,685	@ 45,790	@ 14,140	
Apr.	4.95	3.44	26	957	20	388	609	36,260		111,500	30,900	
May	5.35	3.25	26	1,110	10	232	514	31,600	65,494	325,100	23,400	
June	5.18	3.77	30	855	29	298	500	29,740	64,610	272,400	29,740	
July	5.64	3.71	21	1,070	28	339	664	40,830	59,866	162,500	40,830	
Aug.	5.84	4.20	6	1,170	18	505	761	46,770	58,104	127,500	38,700	
Sept.	5.58	2.69	1	964	21	65.7	389	23,170	48,237	143,800	22,300	
Oct.	6.14	2.43	5	2,600	31	21.5	307	18,880	21,491	45,390	11,600	
Nov.	3.51	2.40	22	256	#	20.1	134	7,960	11,209	13,670	7,960	
Dec.	4.20	2.66	22	448	28	39.2	148	9,120	11,426	18,060	7,510	
Yearly	6.14	2.40		2,600		20.1	404	292,380	442,645	1,315,890	269,460	

Various days of the month @ Period 1939-1946 * Partly estimated

RIO GRANDE AT ISLAND STATION

DESCRIPTION: Water-stage recorder and cable with sit-down cable car equipped for winch and heavy weights, located near Clint, Texas, and San Augustin, Chihuahua. This station is on the rectified channel of the Rio Grande 27.1 river miles below the American Dam at El Paso, Texas. The zero of the gage is 3,608.99 feet above mean sea level, U. S. C. & G. S. datum.

RECORDS: Based upon 74 meter measurements during the year, 52 by the United States and 22 by the Mexican Section of this Commission. Computations by shifting channel methods. 1946 records good. Records available: August 17, 1938 to December 31, 1946. For a statement of all records of discharge at this station, including those authenticated by this Commission, see the last pages of this bulletin.

REMARKS: Reservoirs, diversions and drainage returns modify the river flow at this station. For other related data see index in Water Bulletin No. 14 and later bulletins.

COMPARATIVE FLOWS FROM RECORDS: Momentary Peak: Max. 6,490 second feet on May 19, 1942 with a gage height of 16.06 feet. Min., sometimes dry.

		Average Flow in Second Feet			
<u>Daily:</u>	Max.	6,140,	May 19, 1942.	Min.	sometimes dry.
<u>Monthly:</u>	Max.	4,880,	May 1942.	Min.	.2 Nov. 1940.
<u>Yearly:</u>	Max.	1,490,	1942.	Min.	60.6 1940.
<u>Two</u> Successive Years:	Max.	824,	1941-1942.	Min.	64.6 1939-1940.
<u>Three</u> Successive Years:	Max.	601,	1941-1943.	Min.	95.2 1939-1941.
<u>Four</u> Successive Years:	Max.	486,	1941-1944.	Min.	117 1943-1946.
<u>Five</u> Successive Years:	Max.	410,	1941-1945.	Min.	386 1939-1943.
<u>Eight</u> Successive Years:			.281, 1939-1946.		

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	150	131	40.2	177	31.7	19.2	39.0	* 62.5	114	20.7	14.2	10.9
2	171	118	41.7	74.8	29.8	20.4	75.3	31.6	153	18.0	12.3	10.9
3	183	121	45.5	82.3	27.8	19.3	29.4	29.6	108	17.7	20.9	11.0
4	186	110	48.5	66.2	30.2	16.3	23.3	32.2	32.6	17.1	16.8	11.1
5	172	107	84.7	14.8	171	16.7	74.4	26.8	51.2	108	15.8	11.2
6	180	107	141	10.6	226	17.1	198	86.9	30.2	753	15.8	11.2
7	188	102	148	12.3	295	15.9	199	134	21.5	700	14.8	119
8	196	103	133	16.3	140	13.6	141	98.2	17.8	484	14.0	160
9	182	113	127	19.2	25.9	13.2	139	38.1	15.9	317	13.6	85.2
10	171	120	114	21.2	19.5	14.3	80.0	22.0	27.3	259	13.7	44.9
11	164	115	104	25.6	17.2	14.4	35.0	39.7	42.6	188	13.8	146
12	164	90.8	90.8	24.3	17.7	15.0	26.8	192	55.4	60.9	12.8	183
13	158	71.4	52.9	23.2	19.4	15.6	19.3	51.6	132	43.6	11.0	184
14	168	47.5	40.0	21.9	21.1	13.7	17.6	18.4	68.5	17.2	11.4	114
15	177	46.2	34.6	45.0	20.2	12.7	17.6	16.0	29.5	14.3	14.6	106
16	174	41.6	30.1	22.9	19.5	33.2	17.1	14.4	26.6	15.3	13.2	98.0
17	159	42.6	35.2	21.6	21.6	79.5	16.6	12.9	23.0	14.9	12.8	92.0
18	172	40.8	36.7	27.3	22.9	28.7	16.1	13.1	18.1	14.0	13.4	88.0
19	157	40.0	32.1	23.0	22.0	28.7	14.7	37.9	15.5	14.1	16.5	15.0
20	142	38.9	29.7	20.3	24.1	22.5	12.1	14.0	13.1	14.2	19.6	15.4
21	142	37.9	29.2	24.5	26.9	18.6	* 44.6	17.0	26.4	18.8	13.2	27.2
22	143	35.4	30.5	38.2	23.1	15.2	* 310	20.2	251	14.5	12.6	31.6
23	153	34.4	30.8	47.7	20.9	15.8	* 120	20.5	83.4	14.6	12.6	39.2
24	145	34.2	197	23.4	18.7	17.0	* 122	16.8	22.3	13.2	12.1	130
25	157	35.6	272	24.2	17.8	17.4	* 29.0	17.2	19.9	12.6	11.7	173
26	155	43.9	135	41.8	71.5	17.9	25.1	54.6	17.6	15.4	10.5	116
27	142	40.2	50.0	18.4	138	18.4	23.4	46.9	19.9	16.8	10.2	30.0
28	153	37.2	30.9	31.7	94.0	18.1	21.5	23.0	26.0	20.7	10.3	17.5
29	151		25.0	42.4	44.3	18.7	* 20.4	18.3	34.0	20.8	10.4	46.3
30	131		21.8	32.4	22.8	20.4	* 21.2	16.4	23.4	16.3	10.5	49.0
31	136		159.0		19.6		* 22.0	17.0		16.7		92.7
Sum	2,005.6		1,074.5		607.5		1,239.8		3,271.4		405.1	
	5,022	2,390.9		1,700.2		1,950.5		1,519.7				2,269.3

Current Year 1946								Period 1938-1946 *			
Month	Extreme Gage Feet		Extreme Second Feet		Average Second Feet	Total Acre Feet	Acre Feet				
	High	Low	Day	Day			Average	Maximum	Minimum		
Jan.	10.22	9.73	2	248	24	92.4	162	9,960	8,995	11,900	7,900
Feb.	10.13	9.13	1	221	24	33.4	71.6	3,980	8,906	37,000	2,930
Mar.	10.90	9.03	24	823	29	25.0	77.1	4,740	6,158	21,000	876
Apr.	10.65	9.17	1	568	20	15.0	35.8	2,130	13,236	70,500	1,190
May	10.55	9.07	27	497	11	16.6	54.8	3,370	41,488	299,800	1,050
June	10.34	9.01	17	371	16	11.3	20.2	1,200	34,566	241,000	1,200
July	11.13	9.04	22	1,190	19	11.9	62.9	3,870	22,688	118,500	3,870
Aug	10.28	9.02	12	334	20	10.9	40.0	2,460	21,839	* 99,400	2,460
Sept.	10.27	9.07	5	328	21	10.7	50.7	3,010	24,901	119,200	1,640
Oct.	11.45	8.96	6	1,810	30	8.2	106	6,490	11,289	42,800	1,620
Nov.	9.32	8.93	3	36.2	27	10.2	13.5	804	2,401	7,270	11.5
Dec.	10.15	8.95	26	188	1	10.6	73.2	4,500	4,979	12,900	1,050
Yearly	11.45	8.93		1,810		8.2	64.2	46,514	212,346	1,079,340	43,965.5

* The average, maximum and minimum discharges for January through August are for the period 1939-1946.

* Partly estimated " Estimated

RIO GRANDE AT COUNTY LINE STATION

DESCRIPTION: Water-stage recorder and cable with sit-down cable car equipped for winch and heavy weights, located 0.8 mile downstream from the El Paso-Hudspeth county line. This gaging station is on the rectified channel of the Rio Grande 47.3 river miles below the American Dam at El Paso, Texas. The zero of the gage is 3,547.59 feet above mean sea level, U. S. C. & G. S. datum.

RECORDS: Based upon 73 meter measurements during the year. 52 by the United States and 21 by the Mexican Section of this Commission. Computations by shifting channel methods. 1946 records good. Records available: January 1, 1938 to December 31, 1946. For statement of all records of discharge at this station, including those authenticated by this Commission, see the last pages of this bulletin.

REMARKS: Reservoirs, diversions and drainage returns modify the river flow at this station. For other related data see index in Water Bulletin No. 14 and later bulletins.

COMPARATIVE FLOWS FROM RECORDS: Momentary Peak: Max. 6,340 second feet on May 19, 1942 with a gage height of 8.66 feet. Min. * 16.9 second feet on August 1, 1946 with a gage height of 2.04 feet.

		Average Flow in Second Feet			
<u>Daily:</u>	Max.	6,180,	May 18, 1942.	Min.	46.8 March 4, 1939.
<u>Monthly:</u>	Max.	4,920,	May 1942.	Min.	104, March 1939.
<u>Yearly:</u>	Max.	1,720,	1942.	Min.	179, 1940.
<u>Two</u> Successive Years:	Max.	1,050,	1941-1942.	Min.	193, 1939-1940.
<u>Three</u> Successive Years:	Max.	820,	1941-1943.	Min.	244, 1938-1940.
<u>Four</u> Successive Years:	Max.	704,	1941-1944.	Min.	277, 1938-1941.
<u>Five</u> Successive Years:	Max.	626,	1941-1945.	Min.	566, 1938-1942.
<u>Nine</u> Successive Years:	* * * * * 454, 1938-1946.				

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	350	270	415	313	218	186	160	117	302	80.1	111	280
2	347	268	320	266	244	198	165	110	333	79.8	115	227
3	340	265	298	251	188	175	160	296	107	135	249	249
4	332	260	240	273	226	185	178	174	250	114	151	230
5	342	257	286	244	488	193	185	116	240	84.7	112	246
6	336	244	275	216	596	176	247	122	213	818	136	240
7	329	229	276	188	553	189	402	156	204	668	135	246
8	336	231	272	198	413	151	396	177	224	822	141	235
9	353	229	276	190	238	183	285	246	287	621	238	192
10	347	226	272	163	192	179	296	245	199	521	246	174
11	328	218	230	194	148	153	245	296	191	410	230	260
12	350	206	214	222	163	156	213	365	188	348	231	296
13	352	171	229	185	145	139	201	343	175	330	178	286
14	337	157	161	170	156	169	201	271	260	278	173	232
15	317	176	146	226	160	162	203	200	239	210	311	202
16	314	169	151	178	188	161	187	194	232	212	316	211
17	296	168	171	195	180	182	171	166	220	169	258	219
18	294	168	141	200	187	167	160	107	182	130	279	200
19	285	158	155	237	178	184	188	123	145	139	256	154
20	272	137	144	211	196	165	192	89.2	126	195	260	139
21	269	153	105	261	218	146	219	80.0	131	226	189	318
22	281	116	90.0	309	167	149	304	77.1	133	180	154	414
23	280	113	94.0	256	182	170	215	78.6	137	147	198	413
24	292	120	124	230	194	174	176	116	150	142	241	386
25	289	164	330	200	186	172	167	145	147	130	249	329
26	287	234	252	191	234	174	183	146	115	119	207	254
27	294	323	184	236	345	166	184	136	62.0	178	183	208
28	279	377	138	211	275	169	173	145	55.0	163	165	212
29	279		114	213	254	161	176	147	100	112	216	200
30	276		122	151	212	157	150	131	102	122	241	185
31	273		203		188		142	180		109		201
Sum	9,626	5,807	6,408	6,578	7,512	5,104	6,539	5,158.9	5,558.0	7,964.6	6,055	7,638

Month	Current Year 1946						Period 1938-1946				
	Extreme Gage Feet		Extreme Second Feet			Average Second Feet	Total Acre Feet	Acre Feet			
			High	Low	Day			Average	Maximum	Minimum	
	High	Low									
Jan.	3.55	2.85	10	473	20	214	311	19,100	16,378	20,000	11,300
Feb.	3.78	2.65	28	420	23	98.0	207	11,500	15,870	47,900	7,360
Mar.	3.81	2.65	25	460	22	85.0	207	12,700	15,387	38,900	6,370
Apr.	3.51	2.74	1	509	10	153	219	13,000	23,916	84,200	7,870
May	3.98	2.65	6	697	11	123	242	14,900	47,304	303,000	6,980
June	3.04	2.55	17	261	13	135	170	10,100	41,102	239,000	6,870
July	3.87	2.50	22	664	31	124	211	13,000	36,589	140,000	11,400
Aug	3.58	2.04	12	385	1	* 16.9	166	10,200	34,756	123,000	10,200
Sept.	3.87	2.18	2	439	28	46.0	185	11,000	39,232	140,000	8,290
Oct.	3.26	2.25	6	2,150	2	63.6	257	15,800	25,267	61,400	11,200
Nov.	3.42	2.49	15	357	1	86.0	202	12,000	15,114	20,400	8,230
Dec.	3.52	2.55	23	472	20	124	246	15,100	17,652	29,700	8,770
Yearly	5.26	2.04		2,150	*	16.9	219	158,400	328,567	1,247,500	129,680

* Partly estimated

RIO GRANDE AT FORT QUITMAN STATION

DESCRIPTION: Water stage recorder and cable with sit-down cable car equipped for winch and heavy weights located on the rectified channel of the Rio Grande 1.5 miles below Old Fort Quitman and 81.1 river miles below the American Dam at El Paso, Texas. The zero of the gage is 3,450.57 feet above mean sea level, U. S. C. & G. S. datum.

RECORDS: Based upon 74 meter measurements during the year, 55 by the United States and 19 by the Mexican Section of this Commission. Computations by shifting channel methods. 1946 records good except in January, February, November and December when the gage height - discharge relationship was not reliable. Discharges for these four months were determined from meter measurements and reference to related gaging stations. Records available: January 1923 to December 31, 1946. Careful estimates covering all months in the period 1889 to 1923 are shown in Water Bulletin No. 12. For statement of all records of discharge at this station, including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: Reservoirs, diversions and drainage returns modify the river flow at this station. See Water Bulletin No. 7 for a gage history of this station. For long time trends of flow see page 15 of Water Bulletin No. 15. For chemical, silt and bacterial content of river and tributary water, for watershed and irrigated areas and for other related data see index in Water Bulletin No. 14 and later bulletins.

COMPARATIVE FLOWS FROM RECORDS #: Momentary Peak: Max. 17,000 second feet about June 20, 1905. This is the greatest flow in the last 118 years. Min., frequently dry prior to January 1915. **

Average Flow in Second Feet			
Daily:	Max. @ 17,000, June 20, 1905.	Min. frequently dry prior to Jan. 1915.	
Monthly:	Max. 5,030, May 1942.	Min. frequently dry prior to Jan. 1915.	
Yearly:	Max. 2,140, 1905.	Min. 42.4	1902.
Two Successive Years:	Max. 1,650, 1905-1906.	Min. 83.3	1899-1900.
Three Successive Years:	Max. 1,800, 1905-1907.	Min. 131,	1900-1902.
Four Successive Years:	Max. 1,460, 1904-1907.	Min. 111,	1899-1902.
Five Successive Years:	Max. 1,350, 1903-1907.	Min. 211,	1898-1902.
Ten Successive Years:	Max. 1,150, 1903-1912.	Min. 244,	1931-1940.
Fifty-eight Successive Years:	 569, 1889-1946.		

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	363	"270	309	44.8	141	154	36.6	35.6	56.6	248	114	# 182
2	378	"270	269	70.3	178	162	34.0	34.7	132	212	107	# 187
3	344	"270	226	44.2	244	206	33.6	33.0	166	270	110	# 192
4	306	"270	198	48.3	419	106	34.0	32.1	160	368	117	# 197
5	332	"260	181	47.4	602	73.3	63.1	31.3	161	3,050	192	# 195
6	319	"255	193	44.0	539	68.5	56.6	74.8	180	747	164	# 193
7	321	"255	185	41.8	453	59.0	41.6	42.6	120	966	162	# 191
8	308	"240	168	42.1	402	64.2	55.8	26.0	124	1,390	178	# 188
9	330	"240	153	46.2	368	71.7	69.4	32.3	125	854	186	# 186
10	327	"240	170	58.4	296	79.2	55.1	34.6	138	807	203	# 184
11	319	"240	193	58.7	242	61.6	68.8	38.1	116	578	205	# 182
12	296	"225	182	57.3	191	60.3	70.4	38.0	104	463	212	# 184
13	312	"210	187	54.4	154	65.4	63.9	39.1	67.7	432	201	# 186
14	356	"200	230	60.0	131	75.6	52.8	45.8	125	399	169	# 187
15	327	"200	203	60.0	108	53.7	67.2	43.8	209	369	194	# 189
16	319	"190	134	62.7	61.3	70.3	62.4	44.6	774	363	221	# 191
17	305	"175	106	54.3	61.3	73.8	51.9	44.0	190	336	230	# 193
18	273	"165	103	49.2	62.9	49.9	48.0	41.6	184	316	208	# 194
19	255	145	82.8	56.3	80.8	47.9	59.7	34.4	363	296	196	# 195
20	251	152	77.5	58.4	75.2	47.9	51.4	40.8	491	280	195	# 197
21	243	141	67.1	98.0	73.4	47.2	57.3	38.6	492	272	204	# 198
22	264	112	57.1	146	101	49.2	54.1	* 44.2	248	252	185	# 342
23	261	94.4	47.8	131	80.8	61.8	77.3	* 38.5	261	223	164	# 485
24	263	84.2	52.2	152	45.7	48.2	41.0	36.2	262	235	217	# 414
25	241	89.2	136	132	46.6	46.1	37.5	33.7	269	211	211	# 343
26	204	145	161	130	87.5	45.1	39.0	55.3	240	179	198	# 272
27	215	251	100	121	147	40.4	37.8	47.8	175	220	178	# 200
28	212	314	49.9	146	178	37.6	37.5	47.8	170	230	152	# 202
29	213		41.3	180	141	35.8	38.1	39.5	190	216	148	# 204
30	215		39.2	181	163	34.9	36.9	39.5	238	169	177	# 206
31	207		38.2		182		36.6	49.2		148		# 208
Sum	8,879	*5,702.8		2,475.8		2,096.6		1,257.5		15,099		*6,867
	8,879		4,340.1		6,055.5		1,569.4		6,531.3		5,398	

Current Year 1946							Period 1924-1946			
Month	Extreme Gage Feet		Extreme Second Feet			Average Second Feet	Total Acre Feet	Acre Feet		
	High	Low	Day	High	Low			Normal	Maximum	Minimum
Jan.	3.20	2.20	14	675	30	82.0	286	17,600	13,488	20,900
Feb.	2.92	1.81	28	440	24	71.8	*204	* 11,300	14,240	50,100
Mar.	2.89	1.58	25	310	31	35.9	140	8,610	12,275	38,900
Apr.	2.45	1.57	30	200	9	36.6	82.5	4,910	15,545	77,000
May	3.44	1.72	5	682	24	38.8	195	12,000	28,451	309,000
June	2.55	1.57	3	231	30	34.0	69.9	4,160	25,587	240,000
July	2.33	1.54	22	167	4	32.5	50.6	3,110	25,016	140,000
Aug.	3.29	1.43	6	548	6	22.1	40.6	2,490	31,770	* 127,000
Sept.	6.78	1.85	16	4,110	13	54.2	218	13,000	36,266	147,000
Oct.	10.00	2.27	5	10,600	31	138	487	29,900	26,430	66,500
Nov.	3.00	2.06	25	294	2	97.6	180	10,700	16,197	24,500
Dec.			23	485	1	182	*222	* 13,600	17,067	31,000
Yearly	10.00	1.43		10,600		22.1	181	131,380	262,332	1,270,400
										102,420

♢ Mean daily " Estimated * Partly estimated ** Elephant Butte Reservoir closed January 1915.

♢ Estimated from peak flow at El Paso and Upper Presidio # Including estimated records

♢ See Page 71, Water Bulletin No. 8.

RIO GRANDE AT UPPER PRESIDIO STATION

DESCRIPTION: Water-stage recorder, cable with sit-down cable car equipped for winch and heavy weights, located 7.8 river miles above the confluence of the Rio Conchos and about 10 miles northwest of the towns of Presidio, Texas, and Ojinaga, Chihuahua, and 285.7 river miles below the American Dam at El Paso, Texas. Zero of gage is 2,579.82 feet above mean sea level, U. S. C. & G. S. datum.

RECORDS: Based upon 39 meter measurements during the year. Computations by shifting channel methods. 1946 records good. Records available: January 1889 to December 1946. For statement of all records of discharge at this station including those authenticated by this Commission see the last pages of this bulletin.

REMARKS: Reservoirs, diversions and drainage returns modify the river flow at this station. For long time trends of flow see page 16 of Water Bulletin No. 15. For chemical, silt and bacterial content of river and tributary water, for watershed and irrigated areas, for effect of rain, temperature, e.c., on the river flow and other related data, see index in Water Bulletin No. 14, pages 45, 50 and 51 in Water Bulletin No. 12, and later bulletins. See Water Bulletin No. 12, pages 45 to 48 for explanation of estimated flows included here.

COMPARATIVE FLOWS FROM RECORDS: # Momentary Peak: Max. @ 15,200 sec. ft. on June 12, 1912. From local testimony of flood heights, this is the greatest flow in the past 55 years or longer. Datum of gage in 1912 is unknown. Min., sometimes dry. See pages 71 and 72 of Water Bulletin No. 8 for the magnitude and average frequency of floods during the previous periods of record. On May 26, 1942, a gage height of 10.57 feet was reached with a flow of 5,160 second feet. This level was the highest reached during the years 1923-1946, inclusive, and according to local testimony it was the highest level reached in the past 55 years or longer.

		Average Flow in Second Feet			
Daily @:		Max.	15,200, June 12, 1912.	Min.	sometimes dry.
Monthly †:		Max.	10,150, June 1912.	Min.	sometimes dry.
Yearly ‡:		Max.	1,970, 1907.	Min.	75.0 1934.
Two Successive Years †:		Max.	1,560, 1906-1907.	Min.	125 1899-1900.
Three Successive Years †:		Max.	1,690, 1905-1907.	Min.	152 1900-1902.
Four Successive Years †:		Max.	1,380, 1905-1908.	Min.	144 1899-1902.
Five Successive Years †:		Max.	1,240, 1905-1909.	Min.	188 1933-1937.
Ten Successive Years †:		Max.	1,080, 1905-1914.	Min.	213 1931-1940.
Fifty-eight Successive Years †:		 546, 1889-1946.			

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	361	260	125	50.5	6.5	4.4	3.1	2.2	1.0	184	* 215	166
2	353	265	116	38.8	6.7	5.0	2.9	2.0	269	217	* 191	156
3	340	259	175	33.8	4.5	4.0	652	2.0	259	183	162	148
4	329	259	246	31.1	11.0	3.7	137	2.0	133	1,050	152	159
5	322	265	251	23.3	5.9	4.0	25.2	2.0	32.1	734	141	168
6	331	266	219	18.5	4.6	3.7	5.1	2.0	8.5	925	128	169
7	365	266	211	19.2	29.6	3.5	680	2.0	6.3	2,040	113	160
8	354	268	195	19.9	41.9	3.0	351	2.0	7.4	2,740	115	164
9	358	256	184	17.9	194	3.0	96.0	* 18.4	5.3	2,180	121	169
10	344	248	184	15.9	190	3.0	74.2	2.0	3.0	1,460	147	173
11	333	246	177	14.9	189	3.0	361	1.9	2.5	* 1,200	150	182
12	320	241	162	13.7	177	3.0	301	1.8	2.3	* 743	149	193
13	314	238	158	11.8	120	3.0	119	1.7	2.3	* 640	157	* 183
14	336	237	138	11.6	85.2	3.0	59.5	1.6	2.0	* 538	168	* 172
15	326	237	130	10.3	61.3	3.0	37.0	1.5	152	* 465	171	194
16	300	221	130	10.1	46.4	3.0	19.4	1.5	366	432	174	233
17	326	202	117	9.8	34.6	3.0	10.8	1.5	43.6	408	170	230
18	348	194	115	9.6	20.6	3.0	6.2	1.4	163	* 361	160	203
19	349	192	116	10.0	15.4	3.0	3.4	1.3	715	346	174	174
20	348	186	126	9.2	12.9	3.0	3.6	1.2	1,470	318	206	* 171
21	337	169	111	8.5	10.9	3.0	4.4	1.1	913	290	194	* 179
22	327	165	105	8.4	9.2	3.0	352	1.0	1,890	264	206	172
23	310	154	97.0	7.6	7.5	3.0	153	1.0	1,710	248	206	177
24	305	165	89.0	7.1	6.4	3.0	32.9	1.0	624	250	210	172
25	294	169	78.6	6.9	7.0	90.7	12.2	1.0	373	260	199	271
26	294	147	58.2	6.8	6.4	30.4	6.1	1.0	313	239	176	341
27	290	140	52.5	6.6	6.1	10.0	3.0	1.0	250	217	176	300
28	287	134	48.5	6.4	5.7	6.9	3.9	2.5	320	214	193	312
29	284		44.3	6.4	5.4	4.0	3.9	1.0	248	200	192	277
30	264		43.4	6.6	5.0	3.6	2.8	1.0	206	185	183	237
31	263		52.7		5.0		2.2	1.0		191	* 223	
Sum	10,008	6,045	4,055.2	451.2	1,331.7	224.7	3,523.8	* 64.6	10,490.3	19,722	5,103	6,228

Current Year 1946								Period 1924-1946			
Month	Extreme Gage Feet		Extreme Second Feet			Average Second Feet	Total Acre Feet	Acre Feet			
	High	Low	Day	High	Day			Low	Normal	Maximum	Minimum
Jan.	1.03	.52	7	385	30	251	323	19,900	12,910	24,400	644
Feb.	.61	-.10	3	268	28	132	216	12,000	12,619	40,800	1,420
Mar.	.60	-.75	5	272	30	39.8	131	8,040	10,593	39,100	285
Apr.	.58	-1.15	1	57.1	30	5.9	15.0	895	8,874	41,600	0
May	.66	-1.30	9	298	4	3.2	43.0	2,640	21,039	240,000	0
June	.07	-1.31	25	164	10	1.7	7.5	446	20,241	216,000	446
July	3.67	-1.39	3	1,260	31	1.8	114	6,990	26,854	156,000	13.3
Aug	.10		9	169	422	1.0	* 2.1	* 128	34,923	133,000	* 128
Sept.	5.39	-1.58	23	1,980	* 1	1.0	350	20,800	38,995	* 151,000	602
Oct.	8.40	-.10	8	3,290	1	170	636	39,100	33,971	105,000	0
Nov.	.37	-.20	1	* 219	7	109	170	10,100	16,196	34,500	0
Dec.	.93	-.03	26	354	3	146	201	12,400	15,635	30,900	374
Yearly	8.40			3,290		1.0	184	133,439	252,850	1,176,700	54,315

* And other days † Estimated * Partly estimated

Including estimated records @ Since daily records began in 1900 † Beginning with 1889

RIO CONCHOS AT CUCHILLO PARADO STATION, CHIHUAHUA

DESCRIPTION: Water-stage recorder and cable with cable car. Located in Salineta Canyon, 3.1 miles north of the town of Cuchillo Parado, Chihuahua and 28.6 air-line miles westward from Ojinaga, Chihuahua, and 49.1 river miles above the confluence of the Rio Conchos with the Rio Grande which is 293.5 river miles below the American Dam at El Paso, Texas. Zero of the gage is 2,914.23 feet above mean sea level U. S. C. & G. S. datum.

RECORDS: Based upon 166 meter measurements during the year. Computations by shifting channel methods. 1946 records good. Records available: January 1, 1945 to December 31, 1946. For statement of all records of discharge at this station, including those authenticated by this Commission, see the last pages of this bulletin.

REMARKS: Construction of this station was completed in January 1945 for the purpose of determining discharges at this point where a storage reservoir is under consideration. Gage readings began January 1, 1945, measurements began on January 26 and on January 28 a water-stage recorder was installed. The flow of this stream is modified by irrigation diversions and drainage returns and is also strongly affected by the operation of La Rosetilla, La Colina and La Boquilla reservoirs situated 139, 199 and 206 river miles respectively, above this station. The hydro-electric plants at the reservoirs cited, have the following power generation capacities: 5,150 kw., 3,620 kw. and 14,647 kw., respectively. For chemical content of Rio Conchos water, rainfall on the watershed and its watershed yield and related data, see index in Water Bulletin No. 14 and later bulletins. Records of silt content at this station will be found elsewhere in this bulletin.

EXTREME FLOWS: The greatest recorded flow for the period 1945-1946 was 34,360 second feet on October 9, 1945, with a gage height of 15.85 feet. The lowest recorded flow was 53.3 second feet on September 17, 1945, with a gage height of 2.00 feet. For flood flows on the Rio Conchos since 1829 see pages 71 and 72 of Water Bulletin No. 8.

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	678	833	621	392	323	138	406	200	11,270	2,090	1,170	759
2	441	696	565	434	226	167	569	194	6,110	2,890	950	654
3	639	1,070	473	348	259	333	374	392	5,550	2,440	763	752
4	445	1,090	621	308	307	305	388	342	6,000	2,860	1,380	569
5	388	823	823	351	554	276	403	625	10,350	3,090	802	646
6	357	459	823	306	286	204	576	597	8,580	3,360	706	484
7	484	385	773	276	466	167	1,610	371	6,390	5,970	819	886
8	742	484	674	342	335	247	2,930	319	4,840	6,750	982	985
9	494	487	1,000	312	233	392	2,570	438	4,200	3,780	999	961
10	501	494	1,030	270	185	342	1,520	448	2,420	4,130	989	840
11	600	441	932	213	299	484	1,150	484	2,350	3,170	1,090	544
12	604	837	855	181	312	310	1,060	448	1,880	2,780	853	689
13	* 636	505	448	145	420	203	865	326	1,490	2,790	1,070	516
14	* 855	392	515	544	424	188	586	289	1,290	2,660	876	466
15	901	554	576	1,520	318	182	975	215	1,460	2,000	802	763
16	678	410	664	745	214	203	809	178	1,180	1,800	918	742
17	593	431	886	509	161	198	424	304	1,160	2,050	1,040	819
18	869	710	1,010	728	143	159	315	292	872	1,450	1,040	572
19	724	802	844	699	125	164	526	201	1,620	1,940	848	516
20	576	632	459	1,170	116	141	851	187	1,660	1,760	586	699
21	865	819	343	1,200	107	127	946	173	6,180	1,330	763	632
22	961	537	473	879	124	194	1,030	143	4,270	1,040	639	639
23	731	572	710	713	151	2,590	470	114	3,100	1,410	590	576
24	706	509	537	367	134	1,270	410	94.3	1,900	1,280	720	724
25	650	653	770	278	167	515	289	80.9	957	1,210	512	565
26	625	816	777	280	353	463	205	73.1	3,000	1,130	611	727
27	653	484	420	265	420	343	158	67.8	1,900	1,180	614	554
28	540	788	316	321	298	904	158	92.2	2,180	1,280	770	466
29	833		335	292	244	505	158	125	1,510	1,330	724	413
30	766		335	286	181	604	279	1,270	1,880	1,270	756	413
31	915		371		152		286	2,860		1,130		494
Sum	20,450	17,713	19,979	14,674	8,037	12,318	23,296	11,943.3	107,549	73,350	25,387	20,065
Current Year 1946									Period 1945-1946			
Month	Extreme Gage Feet		Extreme Second Feet				Average Second Feet	Total Acre Feet	Acre Feet			
	High	Low	Day	High	Day	Low			Average	Maximum	Minimum	
Jan.	4.89	3.64	30	1,420	7	346	660	40,560	47,115	* 53,670	40,560	
Feb.	4.76	3.64	3	1,370	11	360	633	35,130	36,625	38,120	35,130	
Mar.	4.92	3.44	9	1,470	28	275	644	39,630	35,955	39,630	32,280	
Apr.	5.58	3.05	20	2,140	13	136	489	29,110	21,845	29,110	14,580	
May	6.07	2.92	4	2,850	20	102	259	15,940	12,740	15,940	9,540	
June	8.46	2.99	23	6,530	2	123	411	24,430	20,125	24,430	15,820	
July	6.86	3.02	8	3,640	#	139	751	46,210	112,355	178,500	46,210	
Aug.	7.81	2.66	31	5,260	27	58.3	385	23,690	27,765	31,840	23,690	
Sept.	10.73	3.94	1	13,910	18	565	3,580	213,300	110,225	213,300	7,150	
Oct.	9.32	3.74	7	8,760	22	752	2,370	145,500	162,850	180,200	145,500	
Nov.	5.12	2.82	4	1,550	27	473	846	50,360	53,290	56,220	50,360	
Dec.	4.76	2.56	7	1,520	29	385	647	39,800	29,705	39,800	19,610	
Yearly	10.73	2.56		13,910		58.3	972	703,660	670,595	703,660	637,530	

* Various days of the month

RIO CONCHOS NEAR OJINAGA, CHIHUAHUA

DESCRIPTION: The Rio Conchos enters the Rio Grande 3.7 miles above the international highway bridge between Presidio, Texas and Ojinaga, Chihuahua, 2.0 miles above the Lower Presidio gaging station on the Rio Grande, 7.8 miles below the Upper Presidio gaging station on the Rio Grande and 293.5 river miles below the American Dam at El Paso, Texas.

RECORDS: Based upon discharge records of the Rio Grande at Upper Presidio and Lower Presidio stations and estimated irrigation diversions and arroyo inflow between these two stations. 1946 records good. Records available: May 1900 through 1913 and 1927 through 1946. Careful estimates covering all the months when dependable measured records were not available in the period 1896-1926, are shown in Water Bulletin No. 12. For statement of all records of discharge at this station, including those authenticated by this Commission, see the last pages of this bulletin.

REMARKS: Reservoirs, diversions and drainage returns modify the river flow at this station. La Colina reservoir with 21,900 acre feet capacity and a maximum surface area of 1,160 acres, located about 10.5 miles downstream from La Boquilla Dam, and La Rosetilla Reservoir, located about 52.7 miles further downstream, with a capacity of 15,400 acre feet and a maximum surface area of 840 acres, are used for power development only. The daily river flow may be modified by these reservoirs, but except for evaporation, the monthly flow is not. Power generation facilities #: La Boquilla 14,647 kw., La Colina 3,620 kw., La Rosetilla 5,150 kw. For chemical and bacterial content of Rio Conchos water, rainfall on the watershed and its watershed yield, watershed and irrigated areas, and other related data, see index in Water Bulletin No. 14 and later bulletins. For long term trends of flow see page 17 Water Bulletin No. 15.

COMPARATIVE FLOWS FROM RECORDS: ** Momentary Peak: Max. 162,000 second feet on September 11, 1904. This is the largest flow from the Rio Conchos for the past 118 years or longer. See pages 71 and 72 of Water Bulletin No. 8 for the magnitude and average frequency of floods from the Rio Conchos since 1828. Min., 3.0 second feet on May 14, 1904. The second lowest recorded flow was 19.0 second feet on August 18, 1937..

Average Flow in Second Feet			
Daily:	Max. @: 148,900, Sept. 11, 1904.	Min.	5.0 May 14, 1904.
Monthly:	Max. @: 24,540, Sept. 1904.	Min.	11.0 May 1902.
Yearly:	Max. @: 3,720, 1914.	Min.	348, 1922.
Two Successive Years:	Max. @: 3,290, 1905-1906.	Min.	647, 1921-1922.
Three Successive Years:	Max. @: 3,210, 1904-1906.	Min.	917, 1935-1937.
Four Successive Years:	Max. @: 2,840, 1904-1907.	Min.	901, 1934-1937.
Five Successive Years:	Max. @: 2,540, 1904-1908.	Min.	1,090, 1933-1937.
Ten Successive Years:	Max. @: 2,030, 1897-1906.	Min.	1,250, 1928-1937.
Fifty-one Successive Years:	1,680, 1896-1946.		

Current Year 1946								Period 1924-1946			
Month	Extreme Gage Feet		Extreme Second Feet			Average Second Feet	Total Acre Feet	Acre Feet			
			High	Day	Low			Normal	Maximum	Minimum	
	High	Low	Day								
Jan.			7	1,760	6	420	711	43,700	61,470	147,000	20,300
Feb.			4	1,120	18	432	657	36,500	51,122	87,700	29,100
Mar.			10	1,150	31	351	652	40,100	46,204	80,800	20,900
Apr.			16	1,230	15	197	465	27,700	34,780	79,700	5,000
May			5	2,650	26	135	284	17,400	41,190	148,000	3,950
June			23	3,570	23	129	359	21,400	46,171	91,900	8,720
July			9	3,210	31	166	762	46,900	97,491	502,000	15,800
Aug.			29	1,720	27	80.0	298	18,300	136,848	601,000	11,300
Sept.			2	11,000	1	930	3,600	214,000	292,773	1,173,000	6,770
Oct.			4	12,400	27	985	2,660	164,000	181,835	798,000	34,600
Nov.			4	1,540	28	511	893	53,100	64,496	110,000	29,000
Dec.			10	1,240	30	454	696	42,800	56,448	97,700	22,200
Yearly				12,400		80.0	1,000	725,900	1,110,828	2,431,850	509,600

Data from June 1934 issue of "Irrigación en Mexico" ** Including estimated records @ Beginning with 1900
 φ Beginning with 1896

RIO GRANDE AT LOWER PRESIDIO STATION

DESCRIPTION: Water-stage recorder, cable with sit-down cable car equipped for winch and heavy weights, located about 1.7 miles above the international highway bridge between Presidio, Texas and Ojinaga, Chihuahua, 2.0 miles below the confluence of the Rio Conchos with the Rio Grande and 25.5 river miles below the American Dam at El Paso, Texas. Zero of gage is 2,556.42 feet above U. S. C. & G. S. sea level datum.

RECORDS: Based upon 47 meter measurements during the year. Computations by shifting channel methods. 1946 records good. Records available: January 1896 to December 1946. For statement of all records of discharge at this station including those authenticated by this Commission see the last pages of this bulletin.

REMARKS: Reservoirs, diversions and drainage returns modify the river flow at this station. For gage history see previous water bulletins. For long time trends of flow see page 19 of Water Bulletin No. 15. For chemical, silt and bacterial content of river and tributary water, for watershed and irrigated areas and for other related data, see index in Water Bulletin No. 14 and later bulletins.

COMPARATIVE FLOWS FROM RECORDS: ** **Momentary Peak:** Max. 162,000 second feet on September 11, 1904. Min. 3.0 second feet on May 14, 1904. See pages 71 and 72 of Water Bulletin No. 8 for the magnitude and average frequency of floods since 1828.

Average Flow in Second Feet			
Daily @:	Max. 149,200, Sept. 11, 1904.	Min. 5.0	May 14, 1904.
Monthly @:	Max. 24,870, Sept. 1904.	Min. 11.0	May 1902.
Yearly @:	Max. 4,870, 1906.	Min. 756,	1922.
Two Successive Years @:	Max. 4,850, 1905-1906.	Min. 982,	1939-1940.
Three Successive Years @:	Max. 4,460, 1905-1907.	Min. 1,090,	1934-1936.
Four Successive Years @:	Max. 4,230, 1904-1907.	Min. 1,070,	1934-1937.
Five Successive Years @:	Max. 3,740, 1904-1908.	Min. 1,270,	1933-1937.
Ten Successive Years @:	Max. 3,100, 1905-1914.	Min. 1,490,	1928-1937.
Fifty-one Successive Years:	2,200, 1896-1946.		

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	781	1,160	860	430	260	185	551	241	5,270	2,130	1,400	939
2	943	1,090	782	428	301	176	444	189	8,210	3,000	1,470	864
3	798	1,060	774	448	260	164	1,130	159	5,630	3,280	1,250	857
4	935	1,250	790	404	351	237	1,070	264	4,580	7,680	1,250	865
5	814	1,220	960	346	913	260	549	308	8,620	3,920	1,530	794
6	754	1,030	1,020	383	464	255	522	508	10,200	3,920	986	810
7	1,270	835	1,020	350	326	223	1,350	482	8,990	8,040	966	694
8	1,070	770	924	318	442	172	2,280	365	4,930	10,500	1,000	1,130
9	1,090	793	864	357	537	154	2,900	335	3,900	8,260	1,180	1,100
10	935	816	1,130	330	460	284	2,180	376	2,830	5,460	1,180	1,180
11	920	810	1,120	289	421	279	1,660	394	2,240	5,250	1,160	992
12	987	756	1,020	261	424	351	1,200	419	1,900	4,100	1,240	809
13	982	923	882	237	427	296	1,200	382	1,640	3,680	981	883
14	1,170	676	641	222	440	221	818	334	1,350	3,100	1,240	757
15	1,200	662	662	590	433	179	735	273	1,350	2,620	1,010	724
16	1,130	787	713	1,100	374	188	828	239	2,420	2,380	955	1,010
17	1,010	677	776	653	284	198	782	204	1,200	1,760	1,110	1,030
18	1,010	655	946	559	236	177	632	220	1,220	2,400	1,190	1,010
19	1,240	927	992	636	207	167	425	240	2,270	1,910	1,220	826
20	1,120	922	845	783	194	156	565	202	3,070	2,200	1,000	750
21	1,060	882	627	910	177	147	751	180	5,790	1,950	854	894
22	1,270	918	544	944	168	140	1,070	166	7,880	1,660	919	836
23	1,180	753	637	766	160	870	1,100	150	5,510	1,360	813	907
24	1,070	796	730	644	164	1,760	559	138	3,300	1,610	837	888
25	1,030	761	678	453	161	921	416	120	2,020	1,500	909	1,010
26	1,050	884	784	361	146	545	350	107	2,060	1,430	752	1,030
27	993	892	737	313	262	459	264	88.1	3,020	1,390	804	1,040
28	1,040	740	527	276	363	473	221	144	2,460	1,410	866	922
29	963		452	301	307	818	196	431	2,660	1,470	915	815
30	1,070		420	291	241	525	174	385	1,990	1,510	897	724
31	1,170		413		209		193	1,230		1,480		729
Sum	32,055	24,445	24,270	14,383	10,112	10,980	27,115	9,273.1	118,510	102,360	31,884	27,819
Current Year 1946									Period 1924-1946			
Month	Extreme Gage Feet		Extreme Second Feet				Average Second Feet	Total Acre Feet	Acre Feet			
	High	Low	Day	High	Day	Low			Normal	Maximum	Minimum	
Jan.	3.83	2.61	7	2,110	6	746	1,030	63,600	74,374	164,000	30,400	
Feb.	3.25	2.45	4	1,380	18	628	873	48,500	63,730	99,700	33,900	
Mar.	3.24	2.05	10	1,340	31	402	783	48,100	56,770	89,400	21,200	
Apr.	3.16	1.67	16	1,240	15	208	479	28,500	43,024	84,100	4,460	
May	4.26	1.46	5	2,690	26	141	326	20,100	61,907	270,000	3,660	
June	4.86	1.47	23	3,570	23	132	366	21,800	66,102	267,000	9,250	
July	4.67	1.55	9	3,350	31	168	875	53,800	123,430	564,000	23,900	
Aug	3.52	1.30	29	1,720	27	80.8	299	18,400	171,313	675,000	18,400	
Sept.	8.30	2.87	2	11,000	1	789	3,950	235,000	331,777	1,324,000	7,370	
Oct.	8.95	3.07	4	12,700	27	1,210	3,300	203,000	215,813	864,000	41,000	
Nov.	3.50	2.45	4	1,690	28	700	1,060	63,200	80,704	141,000	37,800	
Dec.	3.25	2.40	10	1,410	7	666	897	55,200	72,074	116,000	31,400	
Yearly	8.95	1.30		12,700		80.8	1,190	859,200	1,361,018	3,466,700	662,700	

‡ And other days * Partly estimated @ Beginning with 1900 ** Including estimated records

‡ Beginning with 1896

ALAMITO CREEK STATION NEAR PRESIDIO, TEXAS

DESCRIPTION: Water-stage recorder, about 1,800 feet above confluence with the Rio Grande, and six miles below Presidio, Texas, and Ojinaga, Chihuahua. This creek enters the Rio Grande .4 river mile below the lower end of the Presidio Valley and 306.9 river miles below the American Dam at El Paso, Texas. Zero of gage is 2,541.42 feet above mean sea level, United States Coast and Geodetic Survey datum.

RECORDS: Based upon 4 meter measurements during the year and a rating curve, the high points of which are determined by slope-area calculations, and the medium and low points of which are determined by meter measurements; also, upon numerous estimates by the hydrographer at low flow. Computations by shifting channel methods. 1946 records fair. Records available: January 1, 1932, to December 31, 1946. For statement of all records of discharge at this station including those authenticated by this Commission see the last pages of this bulletin.

REMARKS: The flow of this spring-fed creek is modified by a small irrigation reservoir (San Estaban) 10.5 miles south of Marfa and by irrigation diversions for about 805 acres of land below the reservoir. The low flow is steady, being from springs. The high flow is erratic, being from storms. The drainage area above this station is 1,504 square miles, all in the United States, 461 square miles of which are above San Estaban Dam and 1,043 square miles below it. On October 2, 1932, backwater from the Rio Grande reached a gage height of 8.33 feet at this station. This is the highest recorded gage height. For chemical content of water and other related data see index in Water Bulletin 14 and later bulletins.

COMPARATIVE FLOWS FROM RECORDS: Momentary Peak: Max. 9,670 second feet on July 20, 1937 with a gage height of 5.33 feet. Min. .87 second feet in May 1932.

		Average Flow in Second Feet			
Daily:	Max.	3,290, Oct. 24, 1941.	Min.	.87 May 1-22, 1932.	
Monthly:	Max.	329, Sept. 1936.	Min.	2.0 Feb. 1935.	
Yearly:	Max.	55.9 1941.	Min.	8.8 1934.	
Two Successive Years:	Max.	49.7 1935-1936.	Min.	9.5 1933-1934.	
Three Successive Years:	Max.	40.8 1935-1937.	Min.	17.5 1938-1940.	
Four Successive Years:	Max.	35.0 1935-1938.	Min.	18.9 1937-1940.	
Five Successive Years:	Max.	32.5 1932-1936.	Min.	19.1 1942-1946.	
Ten Successive Years:	Max.	29.8 1935-1944.	Min.	22.7 1937-1946.	
Fifteen Successive Years:	 26.0, 1932-1946.				

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.0	3.5	3.5	3.5	3.5
2	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.0	21.6	3.5	3.5	3.5
3	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.0	33.7	3.5	3.5	3.5
4	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.0	4.0	17.9	3.5	3.5
5	3.5	3.5	3.5	3.5	5.0	3.5	9.4	3.0	3.5	392	3.5	3.5
6	3.5	3.5	3.5	3.5	5.0	3.5	53.4	3.5	3.5	52.9	3.5	3.5
7	3.5	3.5	3.5	3.5	4.5	3.5	95.4	5.0	3.5	983	3.5	3.5
8	3.5	3.5	3.5	3.5	5.4	3.5	12.9	10.0	3.5	1,560	3.5	3.5
9	3.5	3.5	3.5	3.5	48.4	3.5	7.0	3.5	3.5	218	3.5	3.5
10	3.5	3.5	3.5	3.5	6.0	3.5	5.0	8.0	3.5	49.5	3.5	3.5
11	3.5	3.5	3.5	3.5	5.5	3.5	6.0	3.5	3.5	12.0	3.5	3.5
12	3.5	3.5	3.5	3.5	5.0	3.5	4.0	3.5	3.5	5.0	3.5	3.5
13	3.5	3.5	3.5	3.5	4.5	3.5	3.0	3.5	3.5	4.5	3.5	3.5
14	3.5	3.5	3.5	3.5	4.0	3.5	3.0	3.5	3.5	4.0	3.5	3.5
15	3.5	3.5	3.5	3.5	3.5	3.5	3.0	3.5	3.5	3.5	3.5	3.5
16	3.5	3.5	3.5	3.5	3.5	3.5	3.0	3.5	10.0	3.5	3.5	3.5
17	3.5	3.5	3.5	3.5	3.5	3.5	3.0	3.5	3.5	3.5	3.5	3.5
18	3.5	3.5	3.5	3.5	3.5	14.0	20.9	3.5	3.5	3.5	3.5	3.5
19	3.5	3.5	3.5	3.5	3.5	9.1	5.0	3.5	82.0	3.5	3.5	3.5
20	3.5	3.5	3.5	3.5	3.5	10.8	4.0	3.5	276	3.5	3.5	3.5
21	3.5	3.5	3.5	3.5	3.5	7.0	3.0	3.5	168	3.5	3.5	3.5
22	3.5	3.5	3.5	3.5	3.5	7.5	3.0	3.5	53.3	3.5	3.5	3.5
23	3.5	3.5	3.5	3.5	3.5	7.0	3.0	3.5	5.0	3.5	3.5	3.5
24	3.5	3.5	3.5	3.5	3.5	6.0	3.0	3.5	3.5	3.5	3.5	3.5
25	3.5	3.5	3.5	3.5	3.5	5.0	3.0	3.5	3.5	3.5	3.5	3.5
26	3.5	3.5	3.5	3.5	3.5	4.0	3.0	3.5	3.5	3.5	3.5	3.5
27	3.5	3.5	3.5	3.5	3.5	4.5	6.0	3.5	3.5	3.5	3.5	3.5
28	3.5	3.5	3.5	3.5	3.5	4.0	3.0	3.5	3.5	3.5	3.5	3.5
29	3.5	3.5	3.5	3.5	3.5	3.5	3.0	10.0	3.5	3.5	3.5	3.5
30	3.5	3.5	3.5	3.5	3.5	3.5	3.0	6.0	3.5	3.5	3.5	3.5
31	3.5	3.5	3.5	3.5	3.5	3.5	3.0	5.0	3.5	3.5	3.5	3.5
Sum	108.5	98.0	108.5	105.0	166.8	145.4	288.0	129.0	727.1	3,368.8	105.0	108.5
Current Year 1946									Period 1932-1946			
Month	Extreme Gage Feet		Extreme Second Feet				Average Second Feet	Total Acre Feet	Acre Feet			
			High		Low				Normal	Maximum	Minimum	
	High	Low	Day		Day							
Jan.			‡ 1	3.5	‡ 1	3.5	3.5	215	205	273	123	
Feb.			‡ 1	3.5	‡ 1	3.5	3.5	194	188	234	111	
Mar.			‡ 1	3.5	‡ 1	3.5	3.5	215	203	270	123	
Apr.			‡ 1	3.5	‡ 1	3.5	3.5	208	247	743	119	
May	‡ 4.23		9	153	‡ 1	3.5	5.4	331	1,577	8,520	184	
June	3.62		18	53.5	‡ 1	3.5	4.8	288	2,023	6,360	206	
July	4.28		7	195	‡ 11	3.0	9.3	571	2,987	6,650	249	
Aug.	4.26		7	54.0	‡ 1	3.0	4.2	256	3,725	16,330	216	
Sept.	5.46		19	4,300	‡ 1	3.5	24.2	1,440	4,329	19,600	179	
Oct.	5.86		8	7,000	‡ 1	3.5	109	6,680	2,858	19,200	157	
Nov.			‡ 1	3.5	‡ 1	3.5	3.5	208	267	807	119	
Dec.			‡ 1	3.5	‡ 1	3.5	3.5	215	232	408	117	
Yearly	5.86			7,000		3.0	14.9	10,821	18,821	40,444	6,397	

‡ Estimated * Partly estimated ‡ And other days

TERLINGUA CREEK STATION NEAR TERLINGUA, TEXAS

DESCRIPTION: Water-stage recorder located about 12 miles south of Terlingua, Texas, 2.4 miles above the confluence with the Rio Grande at the lower end of Santa Helena Canyon. Zero of gage is 2,192.01 ft. 5 feet above mean sea level, United States Geological Survey datum. This creek enters the Rio Grande 371.6 river miles below the American Dam at El Paso, Texas.

RECORDS: Based upon 47 meter measurements during the year at low flow, and the rating curve, the higher points of which were determined by slope-area calculations and the medium and low points of which were determined by meter measurements. Computations by shifting channel methods. 1946 records fair. Records available: January 1, 1932, to December 31, 1946. For statement of all records of discharge at this station including those authenticated by this Commission see the last pages of this bulletin.

REMARKS: The flow of this spring-fed creek is modified by irrigation diversions above the station. The low flow is steady, being from springs; the high flows are erratic, being from storms. On September 2, 1943, the "A" frame at this station on the east side of the creek was washed away and has not been replaced. The cable anchorage in the rock hill and the gage well on the west side were undamaged. For chemical content of water and other related data see index in Water Bulletin 14.

COMPARATIVE FLOWS FROM RECORDS: Momentary Peak: Max. 34,900 second feet on May 24, 1935, with a gage height of 17.59 feet. Min., " 0 second feet on September 29-30, 1937.

Average Flow in Second Feet			
Monthly:	Max. 17,200, June 1, 1937.	Min. " 0	Sept. 29-30, 1937.
Monthly:	Max. 921, June 1937.	Min. .83	Oct. 1934.
Yearly:	Max. 146, 1937.	Min. 5.5	1943.
Two Successive Years:	Max. 114, 1936-1937.	Min. 8.6	1942-1943.
Three Successive Years:	Max. 111, 1935-1937.	Min. 11.5	1942-1944.
Four Successive Years:	Max. 101, 1935-1938.	Min. 12.9	1942-1945.
Five Successive Years:	Max. 99.7 1935-1939.	Min. 13.8	1942-1946.
Ten Successive Years:	Max. 66.5 1932-1941.	Min. 44.5	1937-1946.
Fifteen Successive Years:	49.0, 1932-1946.		

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.1	4.6	4.3	4.1	4.2	3.2	4.2	2.6	4.6	10.5	3.3	2.8
2	3.2	4.7	4.3	4.2	4.2	3.0	29.8	2.6	4.6	9.4	3.3	2.8
3	3.4	4.8	4.4	4.2	4.2	2.9	52.4	2.6	4.6	8.3	3.2	2.8
4	3.5	4.8	4.5	4.2	616	2.8	4.4	2.6	4.6	7.2	3.1	2.8
5	3.6	4.8	4.6	4.2	616	2.7	149	2.6	4.6	6.1	3.0	2.8
6	3.7	4.9	4.6	4.3	86.0	2.5	338	2.6	4.6	5.0	3.0	2.8
7	3.8	5.0	4.7	4.4	34.0	2.4	286	5.7	4.6	410	2.9	2.8
8	3.9	5.0	4.8	4.4	18.5	2.4	23.5	4.0	4.4	315	2.8	2.8
9	4.1	5.0	4.8	4.5	202	2.4	4.6	2.7	4.1	255	2.7	2.8
10	4.2	5.0	4.9	4.6	62.8	2.4	4.1	2.7	3.8	11.0	2.7	52.8
11	4.3	5.0	5.0	4.6	5.6	2.4	4.1	2.7	3.6	9.9	2.6	43.2
12	4.4	5.0	5.0	4.7	5.2	2.4	4.1	2.7	3.4	8.7	2.6	5.0
13	79.4	5.0	4.8	4.8	4.8	2.4	4.1	2.7	3.1	7.6	2.6	4.0
14	25.5	5.0	4.7	4.8	4.4	2.4	4.1	2.6	3.1	6.4	2.7	4.0
15	4.6	5.0	4.5	4.8	4.0	2.4	4.1	2.5	218	5.3	2.7	3.9
16	4.7	5.0	4.4	4.8	3.8	2.4	4.1	2.4	320	4.9	2.7	3.9
17	4.8	5.0	4.2	4.8	3.5	2.4	4.1	2.3	13.5	4.7	2.8	3.9
18	4.9	5.0	4.0	4.8	3.2	2.4	46.0	2.3	17.1	4.4	2.8	3.8
19	4.9	5.0	3.9	4.8	3.0	20.6	4.1	2.2	17.8	4.2	2.8	3.8
20	5.0	4.9	3.9	26.9	2.8	9.0	3.8	2.2	18.5	4.0	2.8	3.7
21	5.1	4.8	3.9	4.2	2.5	3.0	3.6	2.2	19.2	3.8	2.8	3.7
22	5.0	4.7	4.0	4.2	2.6	127	3.3	2.2	19.9	3.6	2.8	3.7
23	5.0	4.6	4.0	4.2	2.7	108	3.1	2.2	20.6	3.4	2.8	3.6
24	5.0	4.6	4.0	4.2	2.7	42.0	2.8	2.2	21.2	3.4	2.8	3.6
25	4.9	4.5	4.0	4.2	2.8	68.0	2.8	2.2	20.0	3.4	2.8	3.5
26	4.8	4.4	4.0	4.2	2.9	24.2	2.7	2.2	168	3.4	2.8	3.5
27	4.8	4.3	4.1	4.2	3.0	5.2	2.7	2.2	19.5	3.4	2.8	3.5
28	4.8	4.2	4.1	4.2	3.1	4.9	2.7	59.1	16.9	3.4	3.8	3.4
29	4.7		4.1	4.2	3.1	4.5	2.7	4.2	14.3	3.4	2.8	3.4
30	4.6		4.1	4.2	3.2	4.2	2.6	4.0	11.6	3.4	2.8	3.3
31	4.6		4.1		3.3		2.6	26.9		3.4		3.3
Sum	232.3	134.6	134.7	154.9	1,720.1	466.5	* 1,010.2	164.9	993.8	1,135.6	85.1	195.7

Current Year 1946								Period 1932-1946			
Month	Extreme Gage Feet		Extreme Second Feet			Average Second Feet	Total Acre Feet	Acre Feet			
	High	Low	Day	High	Day			Low ϕ	Normal	Maximum	Minimum
Jan.	2.26		13	231	1	3.1	7.5	461	202	743	82.7
Feb.			7	5.0	28	4.2	4.8	267	137	267	73.4
Mar.			11	5.0	20	3.9	4.3	267	179	489	72.4
Apr.	1.87		20	145	1	4.1	5.2	307	1,310	15,500	55.1
May	9.00		4	5,850	21	2.5	55.5	3,410	5,262	* 26,000	117
June	3.90		22	745	7	2.4	15.6	925	7,798	54,800	59.5
July	4.30		7	940	30	2.6	* 32.6	* 2,000	5,762	26,800	621
Aug.	3.60		28	620	19	2.2	5.3	327	4,280	* 26,680	123
Sept.	10.00		16	7,800	13	3.1	33.1	1,970	6,960	24,600	223
Oct.	4.08		7	830	23	3.4	36.6	2,250	2,514	8,100	50.8
Nov.			2	3.3	11	2.6	2.8	169	417	2,980	64.9
Dec.	3.00		10	410	2	2.8	6.3	388	389	3,080	90.0
Yearly	10.00			7,800		2.2	17.6	12,741	35,474	105,807	3,958.0

Estimated * Partly estimated ϕ And other days ϕ Mean daily

RIO GRANDE AT JOHNSON RANCH STATION

DESCRIPTION: Water-stage recorder and cable with stand-up cable car with winch, located about 2 miles above Johnson Ranch, 14 miles below Castolon, Brewster County, Texas and Santa Helena Ranch, Chihuahua and 392.9 river miles below the American Dam at El Paso, Texas. Zero of the gage is 2,045.30 feet above mean sea level according to adjustment of 1943, in U. S. C. & G. S. datum.

RECORDS: Based upon 48 meter measurements during the year. Computations by shifting channel methods. 1946 records good. Records available: April 1936 to December 1946. For statement of all records of discharge at this station, including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: Reservoirs, diversions and drainage returns modify the river flow at this station. For watershed and irrigated areas and for other related data, see index in Water Bulletin No. 14 and later bulletins.

COMPARATIVE FLOWS FROM RECORDS: Momentary Peak: Max. 58,800 second feet on September 23, 1938 with a gage height of 19.75 feet. Also an estimated 97,000 second feet on October 3, 1932, with a stage of 24.6 feet. Min. 23.1 second feet on June 6, 1938 with a gage height of .84 feet.

Average Flow in Second Feet			
Daily:	Max. 56,900, Sept. 10, 1942.	Min. 27.2	June 14, 1938.
Monthly:	Max. 23,600, Sept. 1942.	Min. 144,	May 1945.
Yearly:	Max. 4,780, 1942.	Min. 1,020,	1940.
Two Successive Years:	Max. 4,360, 1941-1942.	Min. 1,090,	1939-1940.
Three Successive Years:	Max. 3,390, 1941-1943.	Min. 1,410,	1944-1946.
Four Successive Years:	Max. 2,920, 1941-1944.	Min. 1,420,	1943-1946.
Five Successive Years:	Max. 2,940, 1938-1942.	Min. 1,750,	1936-1940.
Eleven Successive Years:	2,100, 1936-1946.		

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	756	1,030	825	442	290	268	627	175	202	1,970	11,520	929
2	764	1,210	832	440	279	234	570	154	6,540	2,060	11,470	947
3	857	1,150	846	426	264	296	767	287	8,210	2,640	11,520	999
4	902	1,040	783	430	302	202	687	276	6,030	3,820	11,480	981
5	903	1,130	772	442	5,660	164	1,550	212	5,350	8,760	11,370	1,010
6	895	1,210	802	427	2,580	137	1,680	185	8,850	4,810	11,350	954
7	914	1,190	989	390	1,220	181	2,340	327	9,260	9,280	11,550	930
8	1,240	988	968	394	692	215	1,340	435	7,200	12,100	11,330	918
9	1,340	854	973	390	1,070	217	1,910	429	5,080	14,900	11,200	1,400
10	1,140	800	892	352	1,200	182	2,680	426	4,150	8,370	1,090	1,350
11	1,050	820	902	342	655	150	2,180	338	3,140	6,360	1,180	1,450
12	975	820	1,100	334	498	161	1,650	349	2,280	5,160	1,180	1,210
13	994	818	1,070	293	428	225	1,250	345	2,060	4,210	1,230	955
14	1,200	790	990	273	419	234	1,080	355	1,690	3,610	1,190	864
15	1,260	910	794	244	425	258	985	324	1,520	3,140	1,120	756
16	1,240	751	648	226	438	214	729	295	6,350	2,680	1,210	726
17	1,260	786	665	533	444	176	733	240	2,800	2,530	1,070	920
18	1,110	779	708	820	399	152	1,170	214	1,650	2,510	1,050	2,000
19	1,060	718	774	582	345	163	854	187	1,730	2,510	1,210	2,030
20	1,100	737	888	684	285	401	557	155	3,640	2,060	1,230	875
21	1,210	1,000	926	677	254	197	421	159	3,820	2,230	1,160	801
22	1,070	853	746	792	234	3,900	539	157	8,400	2,040	971	802
23	1,120	955	613	919	218	2,110	705	132	6,910	1,790	1,010	899
24	1,270	836	563	925	201	674	1,120	119	5,690	1,490	954	874
25	1,110	789	668	743	184	1,850	709	115	3,660	1,590	901	850
26	1,090	801	669	611	165	1,760	511	106	7,640	1,530	950	985
27	1,020	788	664	482	148	881	426	99.0	3,220	1,490	920	978
28	1,040	953	737	405	141	1,880	343	623	3,330	1,450	880	1,060
29	1,020		658	332	143	651	282	735	2,640	1,460	869	953
30	998		534	305	253	511	242	436	2,650	1,520	1,000	902
31	1,080		476		483		207	202		1,570		901
Sum	32,988	25,506	24,475	14,655	20,317	18,644	30,844	8,591.0	135,692	121,640	335,165	32,189

Current Year 1946							Period 1936-1946 ⚡				
Month	Extreme Gage Feet		Extreme Second Feet			Average Second Feet	Total Acre Feet	Acre Feet			
	High	Low	Day	High	Day			Low	Normal	Maximum	Minimum
Jan.	2.70	1.75	9	1,710	2	748	1,060	65,400	67,610	86,400	35,900
Feb.	2.30	1.66	2	1,270	19	688	911	50,600	59,290	80,900	49,300
Mar.	2.27	1.36	12	1,170	31	444	790	48,500	50,680	85,300	31,100
Apr.	2.11	.90	21	1,090	17	219	488	29,100	28,799	79,500	8,990
May	* 9.63	.75	5	* 21,800	28	141	655	40,300	70,039	240,000	8,830
June	8.70	.72	22	17,800	6	134	621	37,000	82,627	251,000	12,600
July	4.85	.83	7	5,260	31	186	995	61,200	172,945	620,000	43,900
Aug	5.25	.61	28	6,270	27	92.0	277	17,000	160,382	485,000	17,000
Sept.	10.39	" .80	16	25,000	1	" 202	4,520	269,000	434,573	1,404,000	20,000
Oct.	8.55	2.36	9	17,900	28	1,370	3,920	241,000	252,445	929,000	* 75,600
Nov.		1.78	7	" 1,550	# 30	802	* 1,170	* 69,700	82,136	164,000	40,500
Dec.	2.95		10	2,030	16	" 726	# 1,040	* 63,800	69,464	* 110,000	29,600
Yearly	10.39	.61		25,000		92.0	1,370	992,600	1,530,990	⊕ 3,461,400	⊕ 741,300

Estimated * Partly estimated † Beginning April 1, 1936 @ For the period 1937 to 1946

Mean daily

RIO GRANDE AT LANGTRY STATION, TEXAS

DESCRIPTION: Water-stage recorder, and cable with stand-up cable car and winch, located at Langtry, Texas, 79.5 miles above Villa Acuna, Coahuila, and 614.1 river miles below the American Dam at El Paso, Texas. Zero of the gage is 1,091.69 feet above mean sea level, United States Coast and Geodetic Survey datum.

RECORDS: Based upon 25 meter measurements during the year. Computations by shifting channel methods. 1946 records good. Records available: May 1900 to October 1914; December 1919 to March 1920; and January 1924 to December 1946. For statement of all records of discharge at this station including those authenticated by this Commission see the last pages of this bulletin.

REMARKS: Reservoirs, diversions and drainage returns modify the river flow at this station. For chemical, silt and bacterial content of river and tributary water, for watershed and irrigated areas, and for other related data, see index in Water Bulletin No. 14 and later bulletins.

EXTREME FLOWS: The highest recorded gage height was about 3:00 P. M. June 17, 1922, when the extreme gage height was 56.9 feet; the estimated discharge for this stage from extension of the rating curve was 204,000 second feet. The lowest flow ever recorded was in May 1904, with an extreme of 270 second feet. On pages 75 and 76 of Water Bulletin No. 9 will be found a record of the magnitude and average frequency of floods at this station since 1864.

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,050	1,300	1,070	926	768	492	1,770	666	860	* 2,800	1,770	1,140
2	1,050	1,270	1,040	832	699	495	1,150	595	898	* 2,700	1,820	1,150
3	1,080	1,350	1,150	779	648	592	948	554	756	* 2,470	1,840	1,260
4	1,050	1,350	1,100	734	628	721	977	537	7,440	2,450	1,770	1,220
5	1,030	1,460	1,060	708	1,710	961	952	931	= 6,560	2,940	1,680	1,250
6	1,110	1,400	1,080	694	6,020	676	1,080	548	= 5,410	12,200	1,710	1,290
7	1,170	1,320	1,040	742	3,640	591	1,070	566	= 6,310	13,100	1,590	1,190
8	1,180	1,420	1,020	736	2,750	546	1,990	572	= 8,910	9,550	1,580	1,250
9	1,230	1,460	1,040	723	2,200	523	2,580	542	= 8,360	12,700	1,820	1,170
10	1,190	1,410	1,170	724	1,690	496	1,650	492	= 6,210	11,500	1,600	1,200
11	1,480	1,260	1,190	657	1,850	479	1,660	519	4,800	10,300	1,340	1,760
12	1,460	1,170	1,240	627	1,280	489	2,620	650	3,970	7,390	1,340	1,360
13	1,370	1,110	1,170	622	1,260	515	2,440	644	3,170	= 6,600	1,400	1,790
14	1,300	1,110	1,150	615	992	552	2,000	644	2,480	= 5,400	1,480	1,690
15	1,260	1,110	1,280	615	873	487	1,780	582	2,460	= 4,500	1,480	1,440
16	1,270	1,100	1,240	610	783	465	1,460	565	2,130	= 3,900	1,520	1,260
17	1,430	1,130	1,190	593	747	465	1,320	565	4,720	= 3,450	1,410	1,210
18	1,460	1,160	1,080	564	712	490	1,240	571	3,680	= 2,950	1,420	1,140
19	1,460	1,080	964	546	685	624	1,070	565	2,950	2,900	1,410	1,090
20	1,440	1,030	915	590	685	644	1,030	547	= 2,380	2,790	1,330	1,120
21	1,340	1,080	953	4,980	671	712	1,470	519	= 2,190	2,840	1,340	1,230
22	1,290	1,030	1,010	1,160	640	1,040	1,540	503	* 3,160	2,510	1,450	1,310
23	1,360	1,010	1,110	1,350	613	9,510	1,010	481	4,530	2,570	1,470	1,200
24	1,410	1,200	1,150	1,060	595	6,020	947	471	7,910	2,620	1,440	1,140
25	1,510	1,140	1,040	987	569	2,660	897	455	6,350	2,290	1,260	1,110
26	1,410	1,190	913	1,070	548	1,780	879	455	= 4,800	2,100	1,230	1,190
27	1,460	1,120	842	1,090	524	1,260	1,170	461	= 7,400	1,880	1,190	1,180
28	1,350	1,060	840	979	533	2,330	1,020	455	= 7,800	2,000	1,160	1,170
29	1,350		932	924	525	1,600	871	461	* 6,010	1,900	1,240	1,240
30	1,510		890	832	512	1,520	794	450	* 4,100	1,830	1,190	1,230
31	1,510		943		499		721	471		1,770		1,350
Sum	39,970	33,830	32,812	28,069	36,849	39,535	42,106	17,037	*138,704	*146,900	44,280	39,330
Current Year 1946									Period 1924-1946			
Month	Extreme Gage Feet		Extreme Second Feet			Average Second Feet	Total Acre Feet	Acre Feet				
	High	Low	Day	High	Day			Low	Normal	Maximum	Minimum	
Jan.	1.81	1.13	11	1,690	2	1,020	1,290	79,300	97,647	* 245,000	52,300	
Feb.	1.59	1.06	5	1,490	23	984	1,210	67,100	82,390	* 117,000	48,900	
Mar.	1.46	.90	15	1,320	28	818	1,060	65,100	78,948	118,000	48,100	
Apr.	7.72	.47	21	12,100	20	536	936	55,700	65,004	105,000	30,100	
May	7.78	.36	6	12,200	31	494	1,190	73,100	104,772	271,000	26,900	
June	12.82	.28	23	23,400	17	460	1,320	78,400	105,842	299,000	25,400	
July	2.93	.72	9	3,240	31	694	1,360	83,500	167,684	719,000	56,100	
Aug.	1.49	.30	5	1,320	31	445	550	33,800	211,796	* 730,000	33,800	
Sept.	8.05	.32	27	* 12,100	1	446	* 4,620	* 275,000	395,786	1,410,000	35,700	
Oct.	9.28	1.78	6	15,300	31	1,740	* 4,740	* 291,000	276,566	1,063,000	55,200	
Nov.	1.90	1.22	3	1,900	30	1,140	1,480	87,800	106,851	* 211,000	56,600	
Dec.	2.44	1.13	11	2,560	20	1,050	1,270	78,000	93,746	135,000	49,800	
Yearly	12.82	.28		23,400		445	1,750	1,267,800	1,787,032	3,851,500	879,000	

* Estimated * Partly estimated

PECOS RIVER STATION NEAR COMSTOCK, TEXAS

DESCRIPTION: Water-stage recorder, and cable with sit-down calbe car and winch, located at the Pecos High Bridge on the railroad 12 miles northwest of Comstock, Texas, 5.5 miles above the confluence with the Rio Grande. This river enters the Rio Grande 638.2 river miles below the American Dam at El Paso, Texas. Zero of the gage is 1,058.01 feet above mean sea level, United States Coast and Geodetic Survey datum.

RECORDS: Based upon 23 meter measurements during the year. Water-stage recorder installed May 11, 1942. Computations by shifting channel methods. 1946 records good. Records available: March 17, 1898, to December 3, 1898, and May 1900 to December 31, 1946. For statement of all records of discharge at this station including those authenticated by this Commission see the last pages of this bulletin.

REMARKS: Reservoirs, diversions and drainage returns modify the river flow at this station. For dry weather losses and gains in the Pecos River channel from Sheffield to the Rio Grande, see page 47, Water Bulletin No. 11, and the last table on page 70, Water Bulletin No. 12. For salt inflow to the Rio Grande from the Pecos River see page 70, Water Bulletin No. 12. For chemical, silt and bacterial content of river and tributary water, for watershed and irrigated areas and for other related data, see index in Water Bulletin No. 14 and later bulletins.

EXTREME FLOWS: The greatest recorded flow was on September 1, 1932, when the extreme gage height was 38.25 feet and the extreme flow was 116,000 second feet. An extreme gage height of 35.75 feet was reported on April 6, 1900; discharge based upon 1935 rating curve was 107,000 second feet. The lowest flow ever recorded was on August 31, 1930, when the extreme gage height was - 0.15 foot and the extreme flow was 97 second feet. On pages 75 and 76 of Water Bulletin No. 9 will be found a record of the magnitude and average frequency of floods at this station since 1899.

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	255	303	302	278	220	199	180	179	178	482	297	255
2	256	306	301	268	214	198	190	175	178	292	297	252
3	257	304	304	260	211	195	190	171	175	265	292	252
4	263	306	313	254	1,280	196	182	173	583	250	285	252
5	260	309	316	248	704	189	187	169	461	238	282	251
6	261	306	320	243	427	185	183	168	310	28,100	279	254
7	261	302	320	243	303	181	186	165	240	4,070	279	257
8	266	307	319	238	270	180	188	164	212	2,210	279	257
9	271	303	311	238	701	182	188	161	201	921	279	254
10	267	299	306	234	262	178	187	162	189	643	275	257
11	272	299	302	240	240	177	192	162	184	* 578	266	276
12	273	305	299	227	315	173	194	163	181	" 565	266	294
13	273	301	317	219	264	172	197	162	173	" 496	266	409
14	288	297	294	215	242	169	199	162	169	" 462	268	316
15	294	294	291	215	233	168	202	162	196	" 434	271	279
16	289	294	287	211	428	164	204	162	277	" 414	271	264
17	285	299	282	208	354	158	203	161	208	" 396	265	255
18	280	299	282	207	257	154	199	161	208	" 386	265	250
19	281	300	282	207	234	153	196	162	207	" 372	265	250
20	286	291	289	207	226	457	192	161	204	" 365	262	251
21	287	291	292	986	224	191	196	158	204	" 360	262	252
22	288	294	292	474	224	174	198	158	200	* 346	261	249
23	283	293	293	387	225	4,260	197	158	196	338	261	247
24	286	284	286	292	225	934	196	159	193	331	261	247
25	288	284	286	252	233	290	190	159	195	331	260	248
26	291	283	283	239	217	225	185	156	205	317	254	246
27	285	282	283	236	205	205	181	156	210	315	254	247
28	292	290	283	226	203	196	180	157	221	311	254	251
29	299		284	230	206	186	179	161	282	304	253	249
30	302		284	226	204	180	184	180	551	301	253	243
31	305		281		205		188	181		296		263
Sum	8,644	8,325	9,184	8,208	9,758	10,669	5,913	5,088	7,191	45,489	8,082	8,127
Current Year 1946												
Period 1924-1946												
Month	Extreme Gage Feet		Extreme Second Feet				Average Second Feet	Total Acre Feet	Acre Feet			
	High	Low	Day	High	Day	Low			Normal	Maximum	Minimum	
Jan.	1.66	1.58	31	310	2	252	279	17,100	25,715	78,200	12,900	
Feb.	1.62	1.52	2	310	28	277	297	16,500	20,318	62,300	10,900	
Mar.	1.68	1.52	13	336	31	277	296	18,200	19,227	40,700	11,100	
Apr.	3.97	1.32	21	2,850	119	204	274	16,300	17,644	42,400	9,520	
May	3.92	1.37	4	2,760	28	200	315	19,400	36,155	156,000	10,800	
June	9.70	1.23	23	12,400	18	151	356	21,200	37,021	197,000	9,340	
July	1.56	1.22	2	225	29	176	191	11,700	24,867	84,200	7,620	
Aug.	1.29	1.15	30	190	20	154	164	10,100	20,488	50,400	7,620	
Sept.	2.50	1.21	4	877	14	169	240	14,300	45,710	324,420	6,190	
Oct.	24.50	.98	6	65,000	5	238	1,470	90,200	57,794	486,000	9,520	
Nov.	.98	.85	7	297	29	253	269	16,000	30,895	209,000	10,300	
Dec.	1.42	.84	13	451	3	249	262	16,100	25,337	91,800	12,200	
Yearly	24.50	.84		65,000		151	369	267,100	361,171	1,330,900	176,780	

" Estimated * Partly estimated † And other days

GOODENOUGH SPRING STATION NEAR COMSTOCK, TEXAS

DESCRIPTION: Water-stage recorder and light cable (winch operated, for carrying current meter and light weights only), located 4,000 feet above confluence with Rio Grande and 11.75 miles southwest of Comstock, Val Verde County, Texas. The stream from this spring enters the Rio Grande 664.9 river miles below the American Dam at El Paso. Zero of gage is 971.9 feet above mean sea level, United States Coast and Geodetic Survey datum.

RECORDS: Based upon 15 meter measurements during the year. Computations by shifting channel methods. 1946 records fair. Records available: February 23, 1929, to December 1946. Annual discharges for the years 1924 to 1928, inclusive, were estimated as were the monthly discharges for January and February 1929. See page 52, Water Bulletin No. 6. For statement of all records of discharge at this station, including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: The flow of this spring channel is very uniform and is not modified by diversions or storage. When the Rio Grande reaches a flow of about 35,000 second feet near this station, then backwater from the Rio Grande reaches this gaging station. Backwater from the Rio Grande reached a gage height of 17.30 on September 1, 1932, 13.86 on September 4, 1935 and 14.48 on June 23, 1946. On June 23, 1946 an old dam, about 3,000 feet below the water-stage recorder, was washed out causing the 3,000 feet of channel to degrade about 2 feet, rendering the gage well unusable. For this reason the water-stage recorder has not been used since June 23, 1946. For chemical and bacterial content of spring water, for watershed area and for other related data, see index in Water Bulletin No. 14 and later bulletins.

COMPARATIVE FLOWS FROM RECORDS: Momentary Peak: Max. 846 second feet on September 18, 1941 with a gage height of 4.57-feet. Min. 75.7 second feet on August 28, 1944 with a gage height of .43 feet.

Average Flow in Second Feet			
Daily:	Max. # 455,	Oct. 1, 1932.	Min. 77.2 Aug. 28, 1944.
Monthly:	Max. * 421,	Oct. 1932.	Min. 88.6 Aug. 1944.
Yearly:	Max. 266,	1933.	Min. 108, 1944.
Two Successive Years:	Max. 252,	1932-1933.	Min. 110, 1943-1944.
Three Successive Years:	Max. 224,	1932-1934.	Min. 111, 1943-1945.
Four Successive Years:	Max. 207,	1932-1935.	Min. 116, 1942-1945.
Five Successive Years:	Max. 197,	1931-1935.	Min. 121, 1941-1945.
Eighteen Successive Years:	1944, 1929-1946.		

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	118	100	105	105	109	145	265	219	180	111	167	154
2	118	99.4	102	105	108	143	262	219	177	109	167	154
3	118	100	105	105	108	141	259	220	175	107	166	154
4	119	101	105	102	107	140	257	220	173	134	165	154
5	120	101	106	102	130	140	254	220	170	161	164	154
6	118	98.9	104	102	141	140	251	221	168	188	163	154
7	116	98.8	105	102	142	140	248	221	166	215	163	154
8	117	98.7	105	101	140	139	245	220	163	242	162	154
9	115	98.6	106	100	141	137	242	219	161	241	161	154
10	115	98.5	105	99.6	142	137	240	217	159	240	160	154
11	114	98.4	107	97.3	141	135	237	216	157	239	159	154
12	113	98.2	109	96.5	140	135	234	215	154	238	159	154
13	112	98.1	110	97.0	140	134	231	214	152	237	158	154
14	114	97.9	109	97.7	139	134	228	213	150	236	157	154
15	112	98.4	110	97.2	139	133	225	211	147	235	156	154
16	110	101	109	96.2	138	133	223	210	145	229	156	154
17	109	101	107	96.2	136	133	220	209	143	224	155	154
18	109	100	107	96.1	136	133	217	208	140	218	154	154
19	111	100	107	96.1	140	132	214	207	138	212	154	154
20	109	99.0	108	97.4	140	135	214	205	136	206	154	154
21	106	102	108	102	139	135	215	204	133	201	154	154
22	105	102	107	105	138	135	215	203	131	195	154	154
23	104	102	106	112	137	260	215	201	129	189	154	154
24	103	101	107	112	135	274	216	198	126	183	154	154
25	104	104	107	113	137	272	216	196	124	178	154	154
26	103	104	105	112	158	271	217	194	122	172	154	154
27	100	103	105	112	165	270	217	191	119	171	154	154
28	101	103	105	111	161	269	217	189	117	170	154	154
29	103	105	105	111	156	268	218	187	117	170	154	154
30	103	104	110	110	152	266	218	184	117	169	154	154
31	100		103		148		218	182		168		154
Sum	3,419	2,807.9	3,289	3,085.3	5,159		* 7,148	* 6,433		* 5,988		* 4,774
Current Year 1946									Period 1924-1946			
Month	Extreme Gage Feet		Extreme Second Feet				Average Second Feet	Total Acre Feet	Acre Feet			
	High	Low	Day	High	Day	Low			Normal	Maximum	Minimum	
Jan.	.98	.72	4	124	27	100	110	6,780	8,500	19,620	6,130	
Feb.	.77	.68	25	106	14	96.9	100	5,570	7,557	17,030	5,350	
Mar.	.74	.58	15	112	31	102	106	6,520	8,028	17,770	5,900	
Apr.	1.95	.51	20	168	18	95.6	103	6,120	7,617	16,580	5,560	
May	2.71	.76	5	209	4	107	138	8,500	8,347	16,840	5,850	
June	3.75	1.20	23	569	19	131	172	10,200	8,471	16,040	5,330	
July			1	265	4	214	* 231	* 14,200	8,980	16,460	5,930	
Aug			7	221	31	182	* 208	* 12,800	8,671	15,840	5,450	
Sept.			1	180	28	117	* 146	* 8,710	10,051	25,000	6,550	
Oct.			8	242	3	107	* 193	* 11,900	9,936	25,870	6,840	
Nov.			1	167	18	154	* 153	* 9,400	9,096	21,850	6,340	
Dec.			7	154	1	154	* 154	* 9,470	8,941	20,470	6,380	
Yearly				569		95.6	* 152	* 110,170	104,195	192,840	78,490	

Estimated * Partly estimated † And other days ‡ Mean daily @ Period 1929-1946

DEVILS RIVER STATION NEAR DEL RIO, TEXAS

DESCRIPTION: Water-stage recorder on main highway bridge, 12 miles northwest of Del Rio, Texas and 4.5 miles above confluence with the Rio Grande. Devils River enters the Rio Grande 680.1 river miles below the American Dam at El Paso, Texas. High-stage measurements from highway bridge, low-stage measurements by wading. Zero of gage is 951.80 feet above mean sea level, U. S. C. & G. S. datum.

RECORDS: Based upon 12 meter measurements during the year. Computations by shifting channel methods. 1946 records good. Records available: May 1900 to March 1914 at a point .8 mile below Southern Pacific railroad bridge; December 1923 to September 1, 1932, at a point .2 mile above Southern Pacific railroad bridge; September 2, 1932 to December 31, 1946 at highway bridge 2 miles upstream from railroad bridge. For statement of all records of discharge at this station, including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: The monthly flow of this spring-fed river is not modified but the daily flow is modified by two power dams with a combined hydro-electric generating capacity of 3,100 kv-a., the operation of which began in 1929. For chemical and bacterial content of Devils River water, for watershed and irrigated areas and for other related data, see index in Water Bulletin No. 14 and later bulletins.

EXTREME FLOWS: The highest recorded gage height was on September 1, 1932, when the extreme was 41.0 feet at the present station and the extreme flow was 597,000 second feet. (See Special Flood Report, 1932, by the United States Section of this Commission.) This corresponds to a flow of 143 second feet per square mile of watershed. Zero flow sometimes occurs for a few hours at this station. When this happens, the gage height falls to .84 foot or below. On pages 75 and 76 of Water Bulletin No. 9 will be found a record of the magnitude and average frequency of floods at this station since 1830.

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	261	262	246	194	206	200	312	230	249	273	264	238
2	241	269	223	164	205	205	166	207	264	232	288	220
3	287	272	209	189	208	190	393	213	267	266	258	253
4	250	280	248	184	214	195	336	231	217	254	237	225
5	286	276	245	195	195	196	306	221	202	276	232	258
6	282	267	192	185	341	200	285	230	206	248	248	240
7	257	250	212	191	241	187	269	200	200	484	264	243
8	275	270	200	186	225	202	285	267	200	1,370	262	223
9	258	275	206	194	211	194	266	208	199	1,800	275	263
10	292	191	197	206	222	208	286	212	210	2,150	258	268
11	271	219	195	170	262	215	270	226	213	884	256	304
12	274	243	217	202	211	211	230	212	207	462	247	275
13	251	255	247	205	216	196	255	200	196	415	253	266
14	316	223	213	171	210	189	281	234	194	384	253	246
15	281	240	232	200	219	193	243	224	199	336	249	239
16	294	258	170	186	217	198	221	198	235	286	272	241
17	286	219	218	191	215	181	256	228	213	338	248	234
18	257	251	209	181	207	183	220	215	210	309	241	212
19	270	249	207	175	213	237	238	211	240	293	245	254
20	272	213	222	191	189	1,830	235	217	225	364	255	248
21	281	221	220	845	203	1,830	281	203	214	274	256	245
22	237	232	197	3,200	201	702	240	221	220	279	244	230
23	276	253	208	530	214	172	220	196	194	254	248	246
24	268	231	250	278	215	349	248	205	206	298	258	231
25	270	201	187	240	347	11,600	230	226	239	276	261	242
26	271	228	229	224	221	2,420	211	215	486	280	230	251
27	251	209	207	211	207	855	212	197	473	277	220	244
28	241	254	213	205	186	630	213	181	254	266	243	248
29	256	208	206	207	207	549	225	266	490	265	237	231
30	248	196	206	206	217	538	238	212	433	251	232	235
31	267		204		207		228	213		263		204
Sum	8,327	6,791	6,625	9,905	7,311	25,253	7,899	6,689	7,555	14,409	7,534	7,607

Month	Current Year 1946						Period 1924-1946				
	Extreme Gage Feet		Extreme Second Feet			Average Second Feet	Total	Acre Feet			
			High	Low	Day			Normal	Maximum	Minimum	
	High	Low	Day				Acre Feet				
Jan.	1.59	1.10	5	476	12	145	269	16,500	23,411	45,250	14,500
Feb.	1.57	1.12	9	458	24	148	243	13,500	20,843	36,880	13,300
Mar.	1.56	.87	7	439	28	62.4	214	13,100	21,784	39,420	13,100
Apr.	4.48	.93	22	9,670	2	76.5	330	19,600	24,265	67,800	11,100
May	1.97	1.10	5	966	28	140	236	14,500	43,441	356,900	10,500
June	6.70	.98	25	22,200	4	98.9	842	50,100	39,626	285,000	11,100
July	1.64	1.10	1	527	118	141	255	15,700	42,813	377,000	13,900
Aug.	1.53	1.10	29	414	2	143	216	13,300	24,367	51,000	12,100
Sept.	1.69	1.11	29	563	15	140	252	15,000	86,705	895,990	11,200
Oct.	2.89	.90	10	3,140	30	55.9	465	28,600	51,398	349,000	18,600
Nov.	1.70	.89	25	588	25	70.0	251	14,900	26,024	60,300	14,900
Dec.	1.62	.99	10	598	4	111	245	15,100	24,090	49,520	15,100
Yearly	6.70	.87		22,200		55.9	318	229,900	428,767	1,284,080	229,900

‡ And other days " Estimated

ARROYO LAS VACAS STATION NEAR VILLA ACUNA, COAHUILA

DESCRIPTION: Water-stage recorder and cable with sit-down cable car, located 1.5 miles upstream from Villa Acuña, Coahuila, and 1.8 miles upstream from the confluence of Arroyo las Vacas with the Rio Grande at a point just above the Del Rio-Villa Acuña International Bridge. This confluence is 693.5 river miles below the American Dam at El Paso, Texas. Zero of the gage is 884.15 feet above mean sea level, U. S. C. & G. S. datum. Prior to September 7, 1939 a staff gage at the same location and on the same datum was used.

RECORDS: Based upon 175 meter measurements during the year, 174 by the Mexican and 1 by the United States Section of this Commission. Computations by shifting channel methods. 1946 records good. Records available: Occasional estimates from June 1935 to March 20, 1938, after which the present record extends to December 31, 1946. For statement of all records of discharge at this station, including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: The low flow of this stream is from springs. Backwater from the Rio Grande reaches this station whenever the stage at Del Rio Station reaches about 20.5 feet on the present gage, or a flow of about 110,000 second feet. For bacterial content of this water, for watershed and irrigated areas and for other related data, see index in Water Bulletin No. 14 and later bulletins.

COMPARATIVE FLOWS FROM RECORDS: Momentary Peak: Max. 25,640 second feet on October 3, 1944 with a gage height of 17.45 feet. Min. 0.7 second feet on various days in November 1938 and on March 16, 1940 with a gage height of 0.98 foot.

Average Flow in Second Feet			
Daily:	Max. 3,530, Oct. 3, 1944.	Min. 0.7 Nov. 1938 & Mar. 1940.	
Monthly:	Max. 153, Oct. 1944.	Min. 1.1 Jan. 1938.	
Yearly:	Max. 25.8 1944.	Min. 9.2 1938.	
Two Successive Years:	Max. 25.4 1943-1944.	Min. 8.1 1938-1939.	
Three Successive Years:	Max. 20.8 1942-1944.	Min. 11.5 1938-1940.	
Four Successive Years:	Max. 19.4 1941-1944.	Min. 12.4 1938-1941.	
Five Successive Years:	Max. 19.1 1940-1944.	Min. 12.4 1938-1942.	
Nine Successive Years:	 15.2, 1938-1946.		

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.2	3.1	3.2	2.5	4.2	3.9	8.5	3.2	2.5	4.2	4.6	3.5
2	3.2	3.2	2.8	2.5	3.9	4.2	7.8	3.2	2.1	4.2	4.6	3.5
3	3.2	2.5	2.8	2.5	3.5	4.2	6.7	3.2	2.1	3.9	5.0	3.5
4	2.8	2.5	2.8	2.5	3.9	3.9	5.0	2.8	2.1	3.5	5.3	3.5
5	3.2	2.5	2.8	2.5	95.7	3.9	5.0	2.8	2.1	3.9	5.3	3.5
6	3.5	2.1	2.8	2.5	9.2	3.9	5.3	2.8	2.1	4.2	5.3	5.0
7	3.2	2.4	2.8	2.1	7.1	4.2	5.3	2.8	2.1	4.6	5.3	5.0
8	3.2	3.2	2.8	2.1	5.3	4.6	5.3	2.8	2.1	5.7	5.3	4.9
9	3.2	2.1	2.8	2.1	4.9	4.6	5.7	2.8	2.1	4.6	3.9	5.0
10	3.2	2.8	2.5	2.1	4.6	3.5	6.4	2.5	2.1	5.3	3.5	4.9
11	3.2	2.8	2.5	2.1	3.2	2.8	4.2	2.5	2.1	4.2	3.5	5.0
12	3.2	2.8	2.5	2.1	4.6	2.8	4.2	2.5	2.1	4.2	3.5	3.9
13	3.2	2.1	2.5	2.1	4.6	2.8	4.2	2.4	2.1	4.2	3.5	3.5
14	3.5	2.4	2.5	2.8	4.9	2.8	4.2	2.5	2.1	4.6	3.5	3.5
15	2.8	2.5	2.8	2.8	6.4	2.5	4.2	2.5	2.1	4.6	3.5	3.5
16	2.8	3.1	2.8	2.1	52.6	2.5	3.9	1.8	2.1	4.2	2.5	3.5
17	2.8	3.2	2.8	2.1	30.4	2.5	3.9	2.1	2.1	4.2	3.5	3.9
18	2.8	3.2	2.5	2.1	74.9	2.5	3.5	2.5	2.1	4.2	3.5	3.9
19	2.8	3.2	2.5	2.1	85.5	371	3.5	2.5	2.5	5.7	3.9	5.3
20	2.1	2.5	2.1	2.1	9.2	431	3.5	2.4	3.2	10.6	3.9	3.9
21	2.1	3.1	2.5	636	6.0	182	3.5	2.5	3.2	10.6	3.9	3.9
22	2.8	3.2	2.5	96.1	8.8	60.7	3.5	2.5	2.8	11.7	3.5	3.9
23	2.8	2.5	2.5	360	7.1	56.1	3.5	2.5	55.5	9.2	3.5	3.9
24	2.1	2.5	2.5	22.6	7.4	671	3.5	2.5	5.0	5.0	3.5	3.9
25	2.8	2.5	2.1	14.5	7.1	59.2	3.5	2.4	5.0	5.3	3.2	3.5
26	2.4	2.5	2.5	6.7	11.3	25.0	3.2	2.5	8.5	5.3	3.2	3.5
27	2.8	3.2	2.8	4.6	6.4	19.7	3.2	2.1	5.3	4.9	3.2	4.6
28	2.8	3.1	2.8	4.6	6.4	10.9	3.2	3.2	3.9	5.0	3.5	4.9
29	2.8		2.5	4.2	6.0	11.2	3.2	2.5	4.2	4.9	3.5	3.9
30	2.8		2.5	4.2	4.9	8.5	3.2	2.5	4.2	5.0	3.9	6.1
31	2.4		2.2		5.3		3.2	2.5		4.6		6.1
Sum	89.7	76.8	81.0	1,199.3	495.3	1,968.4	137.0	80.3	141.5	166.3	117.8	130.4
Current Year 1946												
Month	Extreme Gage Feet		Extreme Second Feet				Average Second Feet	Total	Period 1938-1946			
	High	Low	Day	High	Low	Day	Acre Feet	Acre Feet				
								Average	Maximum	Minimum		
Jan.	1.18	1.02	8	4.9	19	2.1	2.9	178	405	910	"	79.4
Feb.	1.15	.98	2	4.2	9	1.8	2.7	152	444	1,380	"	113
Mar.	1.12	1.02	#	3.2	26	2.1	2.6	161	961	2,600	"	161
Apr.	4.92	1.05	21	3,260	#	2.1	40.0	2,380	1,250	4,580	"	168
May	3.02	1.35	5	565	2	2.8	16.0	982	1,317	4,310	"	156
June	7.81	1.31	19	4,450	#	2.5	65.6	3,900	856	3,900	"	118
July	1.57	1.44	1	11.7	31	2.1	4.4	272	1,501	7,040	"	176
Aug.	1.57	1.41	28	7.8	20	1.4	2.6	159	741	1,650	"	129
Sept.	3.15	1.41	23	417	12	1.4	4.7	281	1,217	6,850	"	95.6
Oct.	1.61	1.41	22	11.7	4	3.5	5.4	330	1,415	9,390	"	134
Nov.	1.51	1.44	#	5.3	16	2.5	3.9	234	458	1,670	"	106
Dec.	1.51	1.48	#	6.0	#	3.5	4.2	259	376	704	"	132
Yearly	7.81	.98		4,450		1.4	12.8	9,288	10,941	18,808		5,130

Various days of the month " Estimated

RIO GRANDE AT DEL RIO STATION

DESCRIPTION: Water-stage recorder located on the downstream side of a pier of the international highway bridge between Del Rio, Texas, and Villa Acuña, Coahuila and 693.6 river miles below the American Dam at El Paso, Texa. Measurements from highway bridge. Zero of gage is 863.80 feet above mean sea level, U. S. C. & G. S. datum. Prior to February 20, 1942, the zero of this gage was one foot higher.

RECORDS: Based upon 20 meter measurements during the year, made jointly by the United States and Mexican Sections of this Commission. Computations by shifting channel methods. 1946 records good. Records available: July 2, 1941 to December 1946. Records are also available for a station 11 miles upstream from May 1900 to April 1915 and for a station 7.5 miles upstream at McKee's Switch, from December 1919 to March 1920, and for a station 900 feet above the international highway bridge from December 1923 to July 2, 1941. Several small springs as well as Cienegas and Las Vacas Creeks enter the river between the upper and lower station sites. For statement of all records of discharge at this station, including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: Reservoirs, diversions and drainage returns modify the river flow at this station. For chemical and bacterial content of river and tributary water, for watershed and irrigated areas and other related data, see index in Water Bulletin No. 14 and later bulletins.

EXTREME FLOWS: The highest recorded gage height was on September 1, 1932, when the extreme gage height was 34.5 feet with a discharge of 605,000 second feet. This is the greatest rate of discharge ever recorded at any point on the Rio Grande. (See Special Flood Report, 1932, by the United States Section of this Commission). The lowest flow ever recorded was on June 15, 1945, when the extreme gage height was 0.19 feet and the extreme flow was 863 second feet. Numerous records of extreme flows may be found in previous water bulletins.

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,890	2,090	1,860	1,680	1,580	* 1,280	2,600	1,490	* 1,050	4,380	2,700	2,010
2	1,860	2,080	1,850	1,670	1,470	* 1,240	2,690	1,410	1,260	3,560	2,770	1,930
3	1,870	2,040	1,850	1,600	1,430	* 1,240	2,410	1,350	1,430	3,420	2,740	1,950
4	1,950	2,150	1,980	* 1,490	1,520	* 1,240	2,130	1,310	1,830	3,110	2,720	2,010
5	1,920	2,180	2,010	* 1,440	4,360	* 1,330	2,070	1,300	8,280	3,320	2,650	1,940
6	1,820	2,260	1,910	* 1,400	3,250	1,530	2,040	1,600	6,430	21,400	2,600	2,000
7	1,950	2,210	1,910	* 1,380	8,180	* 1,580	2,020	1,360	6,000	36,600	2,560	2,050
8	2,020	2,160	1,870	* 1,410	4,220	* 1,290	2,070	1,260	8,820	15,700	2,450	1,970
9	1,980	2,270	1,840	1,450	4,010	* 1,240	2,900	1,280	9,230	15,000	2,410	2,030
10	2,070	2,230	1,800	1,390	3,670	* 1,120	3,370	1,250	7,580	14,600	2,630	2,040
11	2,020	2,160	1,900	* 1,380	2,860	* 1,090	2,560	* 1,220	5,680	13,700	2,210	2,400
12	2,270	2,050	1,940	* 1,330	2,820	* 1,060	2,500	* 1,160	4,850	9,360	2,050	2,660
13	2,310	1,980	2,030	* 1,260	2,440	* 1,100	3,380	1,290	4,110	6,970	2,050	2,280
14	2,300	1,860	1,910	* 1,240	2,370	* 1,050	3,190	1,310	3,890	6,430	2,160	2,690
15	2,220	1,860	1,830	* 1,270	2,180	* 1,010	2,760	1,310	* 3,210	5,550	2,250	2,320
16	2,130	1,890	1,960	* 1,270	2,020	* 1,080	2,570	1,260	* 3,190	5,060	2,310	2,350
17	2,180	1,900	1,860	* 1,230	2,040	* 1,180	2,330	1,210	3,280	4,600	2,320	2,060
18	2,330	1,890	1,820	* 1,180	1,910	* 1,180	2,230	1,220	5,600	4,330	2,220	2,020
19	2,360	1,940	1,710	* 1,160	1,830	1,590	2,110	1,210	4,230	3,860	2,190	2,020
20	2,340	1,830	1,600	* 1,160	1,680	3,250	1,990	1,200	3,420	3,770	2,200	1,960
21	2,320	1,780	1,570	5,970	* 1,620	4,360	1,930	* 1,140	3,030	3,610	2,050	1,980
22	2,160	1,840	1,570	8,680	* 1,650	2,420	2,320	* 1,120	3,280	3,660	2,140	2,060
23	2,110	1,810	1,650	3,550	* 1,590	45,000	2,380	* 1,090	3,890	3,360	2,230	2,150
24	2,180	1,810	1,780	2,430	* 1,530	27,000	1,900	* 1,060	6,060	3,450	2,300	2,060
25	2,220	1,860	1,850	1,940	* 1,530	15,700	1,690	* 1,050	7,760	3,380	2,240	1,980
26	2,140	1,890	1,760	1,810	2,230	6,250	1,570	* 1,050	# 7,060	3,130	2,040	1,970
27	2,170	1,910	1,670	1,840	* 1,430	3,850	1,630	* 1,010	# 7,060	2,940	2,020	2,040
28	2,220	1,880	1,620	1,860	* 1,380	3,110	1,930	* 1,030	# 10,900	2,800	2,000	2,010
29	2,120	1,650	1,740	* 1,380	3,830	3,830	1,840	* 1,030	# 8,100	2,810	2,000	1,980
30	2,140	1,710	1,680	* 1,360	2,990	2,990	1,660	* 1,070	* 7,650	2,730	2,060	2,000
31	2,110	1,680		* 1,300			1,590	* 1,030		2,700		2,100
Sum	65,680	55,810	55,950	* 58,890	72,840	* 140,990	70,360	* 37,680	* 158,160	219,290	69,270	65,220
Current Year 1946									Period 1924-1946			
Month	Extreme Gage Feet		Extreme Second Feet				Average Second Feet	Total Acre Feet	Acre Feet			
	High	Low	Day	High	Day	Low			Normal	Maximum	Minimum	
Jan.	1.63	1.06	13	2,600	6	1,720	2,120	130,000	168,251	344,000	103,000	
Feb.	1.47	1.00	6	2,390	23	1,700	1,990	111,000	142,760	229,970	96,200	
Mar.	1.34	.88	13	2,190	28	1,560	1,800	111,000	141,194	224,670	94,700	
Apr.	6.72	* .58	22	14,500	20	* 1,100	* 1,960	* 117,000	129,737	200,000	83,300	
May	5.48	.56	7	11,400	31	1,240	2,350	144,000	209,228	* 742,000	68,200	
June	20.85	.39	23	112,000	15	* 1,010	* 4,700	* 280,000	215,336	704,000	61,700	
July	2.55	.96	10	4,040	26	1,450	2,270	140,000	254,879	* 1,228,000	97,800	
Aug	1.30	* .60	6	1,890	27	* 939	* 1,220	* 74,700	276,829	865,000	* 74,700	
Sept.	* 6.57	* .66	28	* 13,500	1	* 964	* 5,270	* 314,000	569,773	2,754,590	72,600	
Oct.	14.50	1.90	7	58,400	31	2,590	7,070	435,000	423,911	1,634,000	110,000	
Nov.	1.99	1.39	1	2,800	29	1,880	2,310	137,000	188,118	467,000	108,000	
Dec.	2.01	1.33	12	2,930	29	1,850	2,100	129,000	167,745	295,180	102,000	
Yearly	20.85	.39		112,000		* 939	2,930	2,122,700	2,887,761	6,041,720	1,639,000	

* Estimated * Partly estimated

SAN FELIPE CREEK STATION NEAR DEL RIO, TEXAS

DESCRIPTION: Water-stage recorder at Silos farm road bridge 1.75 miles south of Del Rio, Texas, 2 miles above the confluence with the Rio Grande which is 1.6 miles below the Del Rio gaging station on the Rio Grande. This stream enters the Rio Grande 695.2 river miles below the American Dam at El Paso, Texas. Low and medium flow measurements by wading or from bridge. High flows by slope-area measurements. Zero of the gage is 675.05 feet above mean sea level, U. S. C. & G. S. datum.

RECORDS: Based upon 12 meter measurements during the year. Computations by shifting channel methods. 1946 records good. Records available: September 1, 1931 to December 31, 1946. For statement of all records of discharge at this station, including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: The flow of this spring-fed creek was greatly modified in 1946 by municipal diversions at Del Rio of 1,811 acre feet and by irrigation diversions above this station. Backwater from the Rio Grande reaches this station whenever the stage at Del Rio Station reaches 15 feet or a flow of about 60,000 second feet. For chemical and bacterial content of San Felipe Creek water, for watershed and irrigated areas and other related data, see index in Water Bulletin No. 14 and later bulletins.

COMPARATIVE FLOWS FROM RECORDS: Momentary Peak: Max. 45,000 second feet on June 14, 1935, with a gage height of 23.20 feet. Min. 2.2 second feet on December 19, 1934.

Average Flow in Second Feet			
Daily:	Max. " 16,200, June 14, 1935.	Min.	2.5 Nov. 30, 1934.
Monthly:	Max. 805, June 1935.	Min.	8.8 Feb. 1935.
Yearly:	Max. 136, 1935.	Min.	30.7 1934.
Two Successive Years:	Max. 107, 1935-1936.	Min.	34.0 1945-1946.
Three Successive Years:	Max. 86.1 1935-1937.	Min.	41.9 1944-1946.
Four Successive Years:	Max. 79.1 1932-1935.	Min.	48.7 1943-1946.
Five Successive Years:	Max. 78.9 1932-1936.	Min.	49.0 1942-1946.
Ten Successive Years:	Max. 64.4 1932-1941.	Min.	49.5 1937-1946.
Fifteen Successive Years:	***** 56.5, 1932-1946.		

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	28.8	43.2	14.9	19.1	36.5	35.0	29.3	16.7	17.0	34.5	35.6	35.4
2	29.6	42.3	15.0	19.5	34.4	33.5	28.0	15.6	16.5	33.1	35.7	35.4
3	29.6	43.8	16.7	19.5	33.1	32.6	28.7	14.6	15.9	34.5	35.8	35.4
4	30.3	42.9	16.2	19.5	36.8	35.0	31.8	14.1	16.4	32.5	35.9	35.4
5	30.3	42.8	15.7	19.4	96.5	32.8	28.1	15.6	15.9	37.4	35.9	35.2
6	29.6	41.1	15.8	19.3	42.3	31.2	28.2	15.1	16.4	37.4	36.0	36.6
7	29.6	41.0	15.8	19.3	42.3	28.3	28.2	15.9	* 16.9	35.9	36.1	35.9
8	39.5	41.7	15.4	19.3	41.6	27.4	27.7	15.0	16.9	41.4	36.2	37.3
9	45.8	42.4	16.6	18.7	* 42.5	27.8	26.5	15.0	16.9	40.5	* 37.0	36.5
10	45.8	43.1	16.0	18.0	* 41.8	27.0	24.7	15.9	16.8	38.8	37.1	36.4
11	45.8	43.0	17.8	19.1	41.9	26.1	24.7	14.4	16.8	38.1	36.4	36.4
12	45.8	43.7	17.9	20.2	43.5	24.6	24.0	14.9	16.8	36.6	36.5	36.4
13	46.6	42.8	19.0	19.8	40.6	23.4	22.4	14.9	* 16.3	36.6	40.3	36.3
14	57.1	35.8	18.5	19.3	35.5	21.1	21.3	15.4	16.3	35.8	40.4	37.1
15	47.4	24.6	19.8	19.4	38.5	20.5	21.4	14.8	18.4	34.4	42.7	37.9
16	46.6	18.4	19.3	19.5	35.6	20.6	21.4	14.8	18.4	33.7	41.9	37.9
17	45.8	18.5	18.6	16.7	33.0	20.6	19.8	15.3	19.0	34.4	41.9	38.0
18	46.6	18.4	18.6	15.7	35.1	20.2	19.8	15.7	20.1	34.4	41.9	36.6
19	46.6	18.3	17.5	15.8	39.6	191	19.9	15.3	21.7	34.4	41.0	38.2
20	47.4	18.2	18.0	16.5	37.4	466	19.9	15.3	21.7	35.0	40.2	45.1
21	46.6	18.1	19.0	115	39.0	176	21.7	15.6	23.4	34.3	40.1	45.2
22	45.8	18.0	19.0	377	35.5	54.3	21.1	15.2	24.1	34.3	40.1	45.3
23	45.7	18.0	20.1	119	32.9	* 46.6	21.1	15.6	26.6	34.3	39.4	45.4
24	45.6	17.9	21.1	55.2	35.0	38.1	21.1	16.6	27.2	34.3	40.0	43.8
25	45.5	17.3	21.0	53.5	39.6	31.1	19.9	16.1	39.7	35.0	39.3	41.7
26	45.4	16.9	21.0	53.6	40.2	31.8	19.9	16.1	74.0	34.4	* 37.0	40.2
27	45.3	17.0	20.5	54.5	39.5	34.6	21.0	16.1	39.8	34.5	35.5	38.0
28	44.4	16.4	20.4	53.7	40.4	34.6	20.4	16.5	33.9	34.6	35.5	36.6
29	44.3		19.7	49.6	50.1	31.5	21.5	18.6	38.9	36.8	35.5	34.6
30	44.2		19.7	45.6	45.1	31.3	18.5	18.1	38.2	36.1	35.4	33.4
31	44.1		19.7		43.4		20.3	18.1		35.5		31.3
Sum	1,311.5	845.6	564.3	1,350.3	1,269.2	1,654.4	722.3	486.9	716.9	1,103.5	*1,142.3	*1,174.9

Current Year 1946										Period 1931-1946 @		
Month	Extreme Gage Feet		Extreme Second Feet				Average Second Feet	Total Acre Feet	Acre Feet			
	High	Low	Day	High	Day	Low			Normal	Maximum	Minimum	
Jan.	1.38	.65	14	87.9	6	25.8	42.3	2,600	4,033	7,070	934	
Feb.	.99	.47	13	48.5	28	13.8	30.2	1,680	2,820	5,490	487	
Mar.	.65	.43	30	24.6	1	12.0	18.2	1,120	2,571	4,190	1,120	
Apr.	6.84	.43	22	1,800	17	12.2	45.0	2,680	2,802	* 6,120	566	
May	3.80	.68	5	540	14	28.7	40.9	2,520	3,822	6,700	1,770	
June	9.90	.51	20	4,020	18	17.4	55.1	3,280	6,139	* 47,900	1,110	
July	.92	.30	4	45.5	30	9.2	23.3	1,430	3,141	* 6,650	1,080	
Aug.	.58	.28	31	22.0	1	8.5	15.7	966	2,916	5,590	838	
Sept.	2.82	.43	26	307	*13	13.9	23.9	1,420	4,456	19,100	872	
Oct.	1.22	.68	8	71.7	1	27.7	35.6	2,190	4,011	8,470	1,710	
Nov.	.89	##	.72	44.7	30	##	31.3	* 38.1	* 2,270	3,068	5,560	
Dec.	.94	##	.71	47.8	31	##	31.3	* 37.9	* 2,330	3,143	5,820	
Yearly	9.90	.28		4,020		8.5	33.8	24,486	42,922	98,137	22,202	

" Estimated * Partly estimated † And other days @ Record began September 1, 1931

PINTO CREEK STATION NEAR DEL RIO, TEXAS

DESCRIPTION: Water-stage recorder and cable with sit-down cable car equipped for winch and heavy weights, and concrete control dam, 0.6 mile below the Del Rio-Eagle Pass highway and 5.5 miles above the confluence with the Rio Grande. This creek enters the Rio Grande 717.7 river miles below the American Dam at El Paso, Texas. Zero of the gage is 854.61 feet above mean sea level, U. S. C. & G. S. datum. Also a series of pipe gages (high stage indicating gages) 750 feet upstream from the gage well.

RECORDS: Based upon 4 meter measurements during the year and a stable rating curve. 1946 records good. Records available: November 1928 to December 31, 1946. For a statement of all records of discharge at this station, including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: The flow of this spring-fed creek is modified by small irrigation diversions above the gaging station. For watershed and irrigated areas and other related data, see index in Water Bulletin No. 14 and later bulletins.

COMPARATIVE FLOWS FROM RECORDS: Momentary Peak: Max. 54,650 second feet on August 31, 1932 with a gage height of 21.08 feet. Min. sometimes dry.

Average Flow in Second Feet			
Daily:	Max. 24,380, Aug. 31, 1932.	Min.	sometimes dry.
Monthly:	Max. 792, Aug. 1932.	Min.	sometimes dry.
Yearly:	Max. 105, 1932.	Min.	1.8 1945.
Two Successive Years:	Max. 60.9 1932-1933.	Min.	4.6 1945-1946.
Three Successive Years:	Max. 45.5 1931-1933.	Min.	6.0 1944-1946.
Four Successive Years:	Max. 58.5 1932-1935.	Min.	7.0 1942-1945.
Five Successive Years:	Max. 49.8 1932-1936.	Min.	7.1 1942-1946.
Ten Successive Years:	Max. 34.1 1929-1938.	Min.	12.4 1937-1946.
Eighteen Successive Years:	 22.8, 1929-1946.		

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	0	0	0	0	0	3.1	0.2	0	0	0	0	0
2	0	0	0	0	0	1.5	0.4	0	0	0	0	0
3	0	0	0	0	0	0.8	0.3	0	0	0	0	0
4	0	0	0	0	0	0.7	0.1	0	0	0	0	0
5	0	0	0	0	109	0.6	0.1	0	0	0	0	0
6	0	0	0	0	1,030	0.5	2.3	0	0	0	0	0
7	0	0	0	0	39.2	0.4	0.8	0	0	0	0	0
8	0	0	0	0	11.8	0.3	0.7	0	0	0	0	0
9	0	0	0	0	6.7	0.1	0.5	0	0	0	0	0
10	0	0	0	0	4.2	0	0.4	0	0	0	0	0
11	0	0	0	0	3.1	0	0.3	0	0	0	0	0
12	0	0	0	0	2.8	0	0.1	0	0	0	0	0
13	0	0	0	0	2.8	0	0	0	0	0	0	0
14	0	0	0	0	3.3	0	0	0	0	0	0	0
15	0	0	0	0	3.1	0	0	0	0	0	0	0
16	0	0	0	0	4.2	0	0	0	0	0	0	0
17	0	0	0	0	4.2	0	0	0	0	0	0	0
18	0	0	0	0	4.2	0	0	0	0	0	0	0
19	0	0	0	0	2.8	84.3	0	0	0	0	0	0
20	0	0	0	0	9.5	685	0	0	0	0	0	0
21	0	0	0	43.7	10.6	270	0	0	0	0	0	0
22	0	0	0	16.6	2.4	32.7	0	0	0	0	0	0
23	0	0	0	78.7	4.7	8.1	0	0	0	0	0	0
24	0	0	0	9.4	3.8	5.3	0	0	0	0	0	0
25	0	0	0	2.9	41.5	3.0	0	0	0	0	0	0
26	0	0	0	1.0	39.9	2.4	0	0	0	0	0	0
27	0	0	0	0.7	38.8	1.6	0	0	0	0	0	0
28	0	0	0	0.2	13.5	0.7	0	0	0	0	0	0
29	0	0	0	0	6.9	0.5	0	0	0	0	0	0
30	0	0	0	0	5.4	0.2	0	0	0	0	0	0
31	0	0	0	0	4.2	0	0	0	0	0	0	0
Sum	0	0	0	153.2	1,412.6	1,101.8	6.2	0	0	0	0	0
Current Year 1946									Period 1929-1946			
Month	Extreme Gage Feet		Extreme Second Feet				Average Second Feet	Total Acre Feet	Acre Feet			
	High	Low	Day	High	Day	Low			Normal	Maximum	Minimum	
Jan.			‡ 1	0	‡ 1	0	0	0	449	2,110	0	
Feb.			‡ 1	0	‡ 1	0	0	0	431	1,860	0	
Mar.			‡ 1	0	‡ 1	0	0	0	547	2,500	0	
Apr.	5.15		23	742	‡ 1	0	5.1	304	790	3,600	43.0	
May	8.04		6	3,180	‡ 1	0	45.6	2,800	2,425	20,500	28.0	
June	9.00		20	4,500	‡ 10	0	36.7	2,190	2,251	30,000	0	
July	3.12		6	19.0	‡ 13	0	0.2	12.3	3,016	30,000	0	
Aug.			‡ 1	0	‡ 1	0	0	0	2,994	48,700	0	
Sept.			‡ 1	0	‡ 1	0	0	0	1,932	17,300	0	
Oct.			‡ 1	0	‡ 1	0	0	0	849	4,000	0	
Nov.			‡ 1	0	‡ 1	0	0	0	374	2,150	0	
Dec.			‡ 1	0	‡ 1	0	0	0	‡ 461	‡ 2,180	‡ 0	
Yearly	9.00			4,500		0	7.3	5,306.3	16,519	# 76,259.3	# 1,325.2	

‡ And other days † Period 1928-1946 # Partly estimated for the period 1924-1946

RIO SAN DIEGO STATION AT JIMENEZ, COAHUILA

DESCRIPTION: Water-stage recorder and cable with sit-down cable car. Masonry and concrete Cipoletti weir control for measuring discharges up to 700 second feet. The station is located 4.4 miles west of Jimenez, Coahuila, and 5.0 miles above the confluence with the Rio Grande. This stream enters the Rio Grande 722.4 river-miles below the American Dam at El Paso, Texas. Zero of the gage is 828.90 feet above mean sea level, U. S. C. & G. S. datum.

RECORDS: Based upon 3 meter measurements during the year and the weir discharge table. 1946 records good. Records available: 1922 to 1946. The records from 1922 to September 1932 are considered doubtful. For a statement of all discharge records at this station, including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: The weir control at this station was constructed in November 1932. The flow of this spring-fed stream is modified by two small storage reservoirs, San Miguel and Centenario on the Irrigation District of San Carlos, Coahuila, and by irrigation of Dolores Hacienda just above this station. One-fourth mile downstream from this gaging station, water was diverted for irrigating about 1,236 acres of land in the Jimenez community. For chemical content of this stream, for watershed and irrigated areas and other related data, see index in Water Bulletin No. 14 and later bulletins.

COMPARATIVE FLOWS FROM RECORDS: Momentary Peak: Max. about 75,200 second feet on September 18, 1941, with a gage height of 20.96 feet. According to local inhabitants, the water level at the present gage reached the same height in 1905 as on September 18, 1941, but because of channel conditions, it is thought that the maximum flow in 1905 was less than in 1941, even though the gage heights were the same. Min. the river was dry on several occasions from April to June 1939.

Average Flow in Second Feet			
Daily:	Max. 23,200, Sept. 18, 1941.	Min.	sometimes dry.
Monthly:	Max. 1,960, May 1935.	Min.	18.7 April 1939.
Yearly:	Max. 526, 1935.	Min.	37.8 1939.
Two Successive Years:	Max. 334, 1935-1936.	Min.	58.3 1938-1939.
Three Successive Years:	Max. 288, 1933-1935.	Min.	54.0 1937-1939.
Four Successive Years:	Max. 251, 1933-1936.	Min.	63.9 1937-1940.
Five Successive Years:	Max. 210, 1933-1937.	Min.	79.1 1936-1940.
Fourteen Successive Years:	164, 1933-1946.		

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	87.2	87.2	52.3	42.0	100	245	883	325	246	304	367	227
2	87.2	87.2	52.3	32.9	87.2	227	865	325	246	304	367	227
3	87.3	100	52.3	32.9	87.2	209	848	304	227	304	367	227
4	87.2	100	63.1	42.0	87.2	192	830	304	209	284	346	227
5	87.2	101	63.1	52.3	192	175	777	304	209	304	325	227
6	87.3	100	52.3	42.0	2,140	175	759	304	209	325	325	209
7	87.2	101	52.3	42.0	227	159	742	304	209	367	325	209
8	87.2	87.2	42.0	42.0	143	143	742	265	209	484	325	209
9	87.3	87.2	42.0	42.0	128	143	742	265	192	659	304	209
10	87.2	74.9	42.0	42.0	114	129	696	265	192	659	304	209
11	87.2	87.2	42.0	24.0	143	114	611	284	192	611	304	209
12	87.3	63.2	52.3	24.0	245	114	586	284	175	639	304	209
13	87.2	63.2	52.3	32.8	245	87.2	558	284	175	639	304	192
14	100	63.2	52.3	32.8	209	87.2	558	265	175	611	304	192
15	101	63.2	52.3	32.8	209	74.9	533	265	175	611	284	192
16	87.3	63.2	52.3	32.8	175	63.2	509	265	227	611	284	175
17	87.2	63.2	52.3	32.8	159	52.3	484	265	227	586	284	175
18	87.2	63.2	42.0	32.8	456	42.0	484	265	209	558	284	175
19	87.3	63.2	42.0	32.8	572	52.3	459	265	175	558	284	175
20	87.2	63.2	42.0	32.8	209	713	459	265	175	533	265	175
21	87.2	52.3	42.0	153	175	572	434	265	175	484	265	192
22	87.2	52.3	42.0	223	143	855	413	265	175	459	245	192
23	87.2	52.3	52.3	509	143	2,490	413	265	192	459	245	175
24	87.2	52.3	52.3	209	159	5,010	389	245	245	459	245	175
25	87.2	52.3	52.3	175	192	1,170	367	245	209	435	245	175
26	87.2	52.3	52.3	159	159	1,020	367	245	209	434	227	159
27	87.2	52.3	52.3	129	143	982	367	245	227	435	227	159
28	87.2	52.3	52.3	114	128	961	346	245	284	413	227	143
29	87.2	52.3	52.3	114	143	939	346	245	304	413	227	143
30	87.2	52.3	52.3	100	325	922	325	245	304	413	227	143
31	87.2	52.3	52.3		284		325	245		389		129
Sum	2,000.1		2,607.5		18,118.1		8,427		14,704		5,834	
	2,730.4		1,550.2		7,921.6		17,217		6,377		8,636	
Current Year 1946								Period 1933-1946				
Month	Extreme Gage Feet		Extreme Second Feet				Average Second Feet	Total Acre Feet	Acre Feet			
	High	Low	Day	High	Day	Low			Normal	Maximum	Minimum	
Jan.	3.02	2.95	14	114	#	87.2	88.1	5,420	7,955	36,430	2,910	
Feb.	2.99	2.82	#	100	26	42.0	71.4	3,970	5,380	25,760	1,970	
Mar.	2.89	2.82	25	63.2	#	42.0	50.0	3,070	4,867	21,500	2,140	
Apr.	4.56	2.76	23	1,080	#	24.0	86.9	5,170	5,404	16,820	1,110	
May	10.73	2.95	6	11,050	#	87.2	256	15,710	15,364	120,000	1,290	
June	11.81	2.82	23	14,440	#	42.0	604	35,940	11,698	62,240	1,420	
July	4.27	3.38	1	901	31	304	555	34,150	9,211	34,150	1,210	
Aug.	3.44	3.22	1	346	8	209	272	16,710	7,454	19,950	2,030	
Sept.	3.41	3.12	#	325	#	159	213	12,650	17,844	84,620	2,120	
Oct.	3.90	3.35	9	696	#	284	474	29,170	@ 24,206	@ 146,640	@ 1,950	
Nov.	3.51	3.25	1	388	#	227	288	17,130	@ 14,479	@ 68,290	@ 1,960	
Dec.	3.25	3.05	#	227	31	129	188	11,570	@ 9,309	@ 45,160	@ 2,060	
Yearly	11.81	2.76		14,440		24.0	263	190,660	133,171	381,720	27,460	

Various days of the month @ Period 1932-1946

RIO SAN RODRIGO STATION NEAR EL MORAL, COAHUILA

DESCRIPTION: Water-stage recorder and cable with sit-down cable car. Re-inforced concrete control weir for measuring the flow up to 177 second feet. This station is located 10.6 miles west of the town of El Moral, Coahuila, 19.3 miles northwest from Piedras Negras and 11.2 miles above the confluence with the Rio Grande. Zero of the gage is 879.95 feet above mean sea level, U. S. C. & G. S. datum. This stream enters the Rio Grande 735.4 river miles below the American Dam at El Paso, Texas.

RECORDS: Based upon 1 meter measurement during the year and the 1942 rating table, the lower portion of which conforms to the weir table. The upper portion of the rating table is based upon meter measurements. 1946 records good. Records available: 1922 to 1946. The records from 1922 to September 1932 are considered doubtful. For a statement of all records of discharge at this station, including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: This station was constructed in October 1932 at a point 1,640 feet upstream from Paso de las Mulas. Zero of this gage was 884.22 feet above mean sea level. In December 1938, the station was moved 3,300 feet downstream to the present site. The flow of this stream is modified by irrigation diversions above and below this station. For chemical content of this stream, for watershed and irrigated areas and other related data, see index in Water Bulletin No. 14 and later bulletins.

COMPARATIVE FLOWS FROM RECORDS: Momentary Peak: Max. 81,200 second feet on September 7, 1932 with a gage height of 16.08 feet at the first station location. Min. frequently dry with a gage height of 0.0 feet.

		Average Flow in Second Feet				
Daily:	Max.	27,900,	Sept. 7,	1932.	Min.	frequently dry.
Monthly:	Max.	4,270,	Sept.	1932.	Min.	dry during July 1939.
Yearly:	Max.	576,		1932.	Min.	10.2 1939.
Two Successive Years:	Max.	335,	1932-1933.		Min.	21.5 1938-1939.
Three Successive Years:	Max.	235,	1932-1934.		Min.	20.1 1937-1939.
Four Successive Years:	Max.	226,	1932-1935.		Min.	26.1 1937-1940.
Five Successive Years:	Max.	195,	1932-1936.		Min.	33.2 1936-1940.
Ten Successive Years:	Max.	121,	1932-1941.		Min.	64.6 1934-1943.
Fifteen Successive Years:				111,	1932-1946.	

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	57.2	43.8	31.4	21.2	31.4	123	583	71.7	79.5	152	113	104
2	57.2	43.8	31.4	16.2	31.4	96.1	505	71.7	71.7	123	114	96.1
3	57.2	43.8	31.4	16.2	31.4	79.5	431	71.7	71.7	105	113	105
4	57.2	43.8	31.4	16.2	31.4	71.7	367	71.7	64.3	96.1	113	96.1
5	57.2	43.8	31.4	16.2	31.4	64.3	339	71.7	64.3	105	114	96.1
6	57.2	37.4	26.1	12.0	600	57.2	311	71.7	64.3	105	123	96.1
7	57.2	37.4	26.1	12.0	152	57.2	297	71.7	57.2	105	113	96.1
8	57.2	37.4	26.1	12.0	79.5	57.2	270	71.7	57.2	242	123	96.1
9	57.2	37.4	26.1	12.0	97.1	50.1	256	71.7	57.2	206	113	96.1
10	57.2	37.4	26.1	12.0	498	50.1	228	71.7	57.2	142	123	104
11	57.2	37.4	26.1	12.0	142	50.1	218	71.7	57.2	162	123	105
12	57.2	37.4	26.1	12.0	87.6	43.8	195	71.7	57.2	206	113	104
13	57.2	37.4	31.4	12.0	71.7	43.8	162	71.7	57.2	218	114	96.1
14	71.7	37.4	26.1	12.0	71.7	43.8	142	64.3	57.2	206	113	96.1
15	57.2	37.4	26.1	12.0	64.3	37.4	123	64.3	57.2	206	113	96.1
16	57.2	37.4	26.1	12.0	57.2	37.4	105	64.3	64.3	195	113	105
17	57.2	43.8	26.1	12.0	57.2	37.4	87.6	64.3	64.3	184	113	96.1
18	57.2	37.4	26.1	12.0	57.2	31.4	79.5	64.3	64.3	173	113	96.1
19	50.2	43.8	26.1	12.0	50.1	43.8	71.7	64.3	64.3	162	113	96.1
20	50.1	43.8	26.1	12.0	50.1	204	105	64.3	64.3	152	113	96.1
21	50.2	43.8	26.1	823	50.1	186	79.5	64.3	57.2	142	113	96.1
22	50.1	37.4	26.1	858	50.1	484	71.7	64.3	57.2	132	113	96.1
23	50.2	37.4	26.1	229	50.1	2,450	71.7	71.7	64.3	123	105	104
24	43.8	37.4	26.1	113	50.1	5,900	71.7	71.7	71.7	123	105	96.1
25	43.8	37.4	26.1	79.5	43.8	3,810	71.7	71.7	71.7	123	113	96.1
26	43.8	37.4	26.1	57.2	113	2,440	71.7	64.3	71.7	113	113	96.1
27	43.8	31.4	21.2	50.1	113	1,650	71.7	71.7	71.7	113	105	96.1
28	43.8	31.4	21.2	43.8	593	1,210	71.7	71.7	164	113	105	96.1
29	43.8		21.2	37.4	1,444	897	71.7	79.5	540	113	105	96.1
30	43.8		21.2	37.4	381	696	71.7	71.7	242	113	105	96.1
31	43.8		21.2		173		71.7	71.7		113		96.1
Sum	1,092.8		2,594.4		21,002.3		2,156.5		2,663.6	4,566.1	3,385	3,037.4
	1,645.3		816.4		5,353.9		5,672.3					

		Current Year 1946						Period 1932-1946			
Month	Extreme Gage Feet		Extreme Second Feet			Average Second Feet	Total Acre Feet	Acre Feet			
	High	Low	Day	High	Day			Low	Normal	Maximum	Minimum
Jan.	.46	.30	14	71.7	31	37.4	53.1	3,260	3,683	14,850	171
Feb.	.33	.26	#	43.8	#	31.4	39.0	2,170	2,607	11,580	555
Mar.	.26	.20	#	31.4	#	21.2	26.3	1,620	2,425	9,900	576
Apr.	3.35	.10	22	1,700	17	8.1	86.5	5,150	2,259	6,870	382
May	6.53	.26	28	5,090	#	31.4	173	10,620	5,690	42,330	58.0
June	9.09	.26	24	8,760	#	31.4	700	41,660	7,488	41,660	30.0
July	1.84	.43	1	639	#	64.3	183	11,250	4,055	12,170	0
Aug.	.49	.43	29	79.5	#	64.3	69.6	4,280	4,159	13,710	39.0
Sept.	2.79	.39	28	1,260	#	57.2	88.8	5,280	25,314	* 253,960	383
Oct.	1.67	.36	8	547	4	96.1	147	9,060	12,107	81,360	815
Nov.	.66	.59	#	123	#	105	113	6,710	5,592	24,450	535
Dec.	.59	.36	#	105	#	96.1	98.0	6,020	4,625	19,060	131
Yearly	9.09	.10		8,760		8.1	148	107,080	80,004	414,310	7,436

* Partly estimated # Various days of the month

RIO GRANDE AT EAGLE PASS STATION

DESCRIPTION: Water-stage recorder and cable with stand-up cable car and winch located .5 mile above the international highway bridge between Eagle Pass, Texas and Piedras Negras, Coahuila and 754.6 river miles below the American Dam at El Paso, Texas. Zero of the gage is 682.91 feet above mean sea level, U. S. C. & G. S. datum.

RECORDS: Based upon 165 meter measurements during the year, 153 by the Mexican and 12 by the United States Section of this Commission. Computations by shifting channel methods. 1946 records good. Records available: May 1900 to March 1914; August 1914 to April 1916; September 1916; September and October 1917; October 1918; September and October 1919; August and September 1920; June 1922; September, November and December 1923; January 1924 through December 1946; also flood peak discharges for June 1899 and April 1900. For a statement of all records of discharge at this station, including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: Reservoirs, diversions and drainage returns modify the river flow at this station. In April 1939 the operation and maintenance of this station was turned over from the United States Section to the Mexican Section of this Commission. For chemical, silt and bacterial content of river and tributary water, for watershed and irrigated areas and other related data, see index in Water Bulletin No. 14 and later bulletins.

EXTREME FLOWS: The greatest recorded flow was on September 2, 1932, when the extreme gage height was 49.00 feet, discharge 569,000 second feet. (See Special Flood Report 1932 by the United States Section of this Commission.) In 1938 some tradition indicated a flood in 1865 reached a stage here of about 58 feet. Most tradition indicated that since 1849 the 1932 flood was the greatest and the 1922 flood the second greatest. The lowest flow ever recorded was on June 25, 1945, when the extreme gage height was 1.31 feet and the extreme flow 597 second feet. Numerous records of extremes may be found in previous Water Bulletins.

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,040	2,190	1,840	1,470	1,860	1,820	4,730	1,820	1,260	7,030	3,090	2,260
2	2,030	2,180	1,790	1,530	1,750	1,660	4,270	1,710	1,300	5,330	3,100	2,200
3	1,980	2,120	1,780	1,470	1,680	1,640	4,100	1,640	1,440	4,240	3,130	2,170
4	1,920	2,150	1,780	1,450	1,620	1,660	3,740	1,590	1,670	3,780	3,080	2,280
5	2,040	2,180	1,850	1,430	2,910	1,680	3,390	1,600	4,420	3,350	3,040	2,300
6	2,010	2,160	1,840	1,400	14,510	1,620	3,150	1,570	7,520	4,100	3,000	2,270
7	1,950	2,320	1,760	1,320	8,720	1,730	3,040	1,720	6,320	29,840	2,960	2,300
8	2,100	2,360	1,780	1,330	6,460	1,570	2,930	1,560	6,250	21,430	2,910	2,270
9	2,270	2,210	1,790	1,320	4,630	1,380	2,950	1,440	8,860	15,790	2,810	2,190
10	2,190	2,220	1,710	1,370	5,150	1,310	4,100	1,470	9,040	16,420	2,840	2,410
11	2,150	2,220	1,760	1,500	3,710	1,210	3,880	1,450	6,990	14,480	2,930	2,360
12	2,110	2,150	1,950	1,280	3,160	1,120	3,230	1,470	5,860	13,170	2,620	2,660
13	2,370	2,050	2,040	1,270	3,030	1,100	3,290	1,350	4,910	9,220	2,390	2,800
14	2,570	1,900	2,080	1,150	3,180	1,120	3,990	1,320	4,270	8,480	2,400	2,480
15	2,490	1,790	1,960	1,170	2,990	1,080	3,740	1,370	3,600	7,450	2,470	2,840
16	2,290	1,850	1,900	1,160	2,500	1,050	3,250	1,360	3,320	6,670	2,540	2,720
17	2,250	1,760	1,950	1,180	2,250	1,080	3,030	1,340	3,410	5,860	2,560	2,490
18	2,210	1,850	1,920	1,180	2,170	1,050	2,840	1,330	3,810	5,400	2,630	2,220
19	2,320	1,770	1,870	1,140	2,980	1,050	2,810	1,350	5,350	5,300	2,490	2,150
20	2,320	1,840	1,750	1,110	2,080	8,440	2,600	1,290	3,890	4,870	2,450	2,130
21	2,450	1,770	1,660	4,700	1,790	10,730	2,450	1,270	3,380	4,770	2,460	2,070
22	2,390	1,750	1,640	12,680	1,780	7,490	2,310	1,280	2,850	4,520	2,380	2,010
23	2,200	1,810	1,650	8,580	1,740	6,750	2,520	1,210	3,390	4,380	2,390	2,070
24	2,160	1,730	1,700	3,990	1,710	48,030	2,620	1,250	4,770	3,990	2,500	2,160
25	2,280	1,850	1,890	2,990	1,920	25,280	2,310	1,200	8,350	4,130	2,570	2,110
26	2,340	1,840	1,810	2,440	3,040	15,780	2,020	1,220	7,310	3,850	2,460	2,010
27	2,200	1,850	1,650	2,100	2,380	8,260	1,900	1,210	7,420	3,570	2,250	1,960
28	2,320	1,880	1,510	2,060	2,050	6,110	1,880	1,280	8,330	3,500	2,260	2,010
29	2,420	1,530	2,120	2,250	2,750	5,610	2,140	1,280	10,950	3,300	2,210	1,960
30	2,360	1,490	1,920	2,570	2,570	5,540	2,080	1,270	7,800	3,190	2,210	1,960
31	2,300	1,460		2,020	2,020		1,930	1,350		3,110		2,050
Sum	69,010	55,730	55,030	69,610	101,090	173,950	93,220	43,550	157,980	234,530	79,130	69,870
Current Year 1946												
Month	Extreme Gage Feet		Extreme Second Feet				Average Second Feet	Total Acre Feet	Period 1924-1946			
	High	Low	Day	High	Low	Day			Acre Feet			
									Normal	Maximum	Minimum	
Jan.	3.08	2.40	13	2,830	3	1,800	2,230	136,900	183,735	365,000	104,400	
Feb.	2.92	2.20	6	2,510	24	1,570	1,990	110,500	151,494	254,250	99,200	
Mar.	2.66	1.87	13	2,400	30	1,250	1,780	109,200	148,773	247,440	95,900	
Apr.	8.07	1.71	22	16,490	14	1,000	2,320	138,100	139,493	219,000	89,790	
May	11.32	2.17	6	31,320	3	1,550	3,260	200,500	245,312	* 918,000	70,210	
June	17.91	1.51	24	62,500	19	788	5,800	345,000	250,804	1,005,000	48,710	
July	4.20	2.23	10	4,980	31	1,660	3,010	184,900	267,795	* 1,225,000	92,890	
Aug.	2.49	1.64	1	2,060	27	957	1,400	86,400	287,695	* 947,000	86,400	
Sept.	7.45	1.74	29	14,730	1	1,080	5,270	313,400	608,220	3,079,000	69,920	
Oct.	12.57	3.15	7	36,020	31	3,000	7,560	465,200	465,391	1,680,300	121,000	
Nov.	3.38	2.56	4	3,500	29	2,070	2,640	157,000	214,589	512,800	109,000	
Dec.	3.18	2.46	15	3,130	22	1,870	2,250	138,600	184,002	369,760	105,620	
Yearly	17.91	1.51		62,500		788	3,300	2,385,700	3,147,303	6,946,510	1,798,000	

* Partly estimated

RIO ESCONDIDO STATION AT VILLA FUENTE, COAHUILA

DESCRIPTION: Water-stage recorder and cable with sit-down cable car, located 3.1 miles southwest of Piedras Negras, Coahuila, on the outskirts of Villa de Fuente, 5 miles above the confluence with the Rio Grande and 5.6 miles below the confluence of the Rio San Antonio. This stream enters the Rio Grande 758.2 river miles below the American Dam at El Paso, Texas. Zero of the gage is 717.78 feet above mean sea level, U. S. C. & G. S. datum.

RECORDS: Based upon 46 meter measurements during the year. Computations by shifting channel methods. 1946 records good. Records available: 1922 through 1946. The records from 1922 to September 1932 are considered doubtful. For a statement of all discharge records at this station, including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: This station was built in September 1932. Diversions and drainage returns modify the flow of this spring-fed stream at this station. When the flow of the Rio Grande at Eagle Pass reaches approximately 380,000 second feet, Rio Grande backwater reaches this station. For watershed and irrigated areas and other related data see index in Water Bulletin No. 14 and later bulletins.

COMPARATIVE FLOWS FROM RECORDS: **Momentary Peak:** Max. 24,000 second feet on June 29, 1936 with a gage height of 19.15 feet. On September 2, 1932 backwater from the Rio Grande reached a gage height of 9.91 feet at this station. Min. .35 second feet on November 4, 1934 with a gage height of .75 feet.

Average Flow in Second Feet			
<u>Daily:</u>	Max. 6,710, June 29, 1936.	Min. 0.7	frequently.
<u>Monthly:</u>	Max. 646, Oct. 1932.	Min. 1.0	Sept. 1945.
<u>Yearly:</u>	Max. 174, 1932.	Min. 11.0	1943.
<u>Two Successive Years:</u>	Max. 123, 1932-1933.	Min. 13.4	1942-1943.
<u>Three Successive Years:</u>	Max. 96.8 1932-1934.	Min. 16.2	1937-1939.
<u>Four Successive Years:</u>	Max. 93.2 1932-1935.	Min. 18.0	1942-1945.
<u>Five Successive Years:</u>	Max. 88.6 1932-1936.	Min. 19.1	1941-1945.
<u>Ten Successive Years:</u>	Max. 55.8 1932-1941.	Min. 21.5	1937-1946.
<u>Fifteen Successive Years:</u>	 43.8, 1932-1946.		

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	16.6	15.5	8.5	9.9	20.5	27.5	42.7	2.1	7.8	41.3	9.9	7.1
2	26.8	13.1	8.8	9.9	16.2	23.0	43.1	2.1	7.8	37.1	9.5	8.5
3	29.7	13.4	8.8	9.5	15.2	19.1	25.8	1.4	7.4	18.4	9.2	8.5
4	29.7	13.8	9.2	9.5	73.5	18.7	15.2	1.1	8.1	12.7	8.8	8.5
5	32.1	15.5	8.8	8.1	114	15.5	15.5	.7	7.4	12.7	8.8	8.8
6	26.5	14.5	8.8	8.1	179	15.2	12.7	.7	8.1	17.7	10.2	6.0
7	20.8	10.9	8.5	7.8	90.8	12.7	13.1	1.1	3.2	12.4	8.1	5.0
8	20.5	10.2	8.5	7.8	100	8.5	13.1	1.1	3.5	20.8	9.5	3.9
9	20.5	7.8	8.5	8.1	60.0	6.0	12.7	1.1	3.2	40.6	9.2	4.2
10	15.9	9.9	8.1	8.5	206	4.9	12.4	1.1	3.2	24.0	10.2	3.9
11	* 20.1	8.8	8.1	8.5	89.3	6.0	10.2	1.4	3.2	11.7	7.4	3.9
12	* 23.0	10.2	17.7	7.4	41.3	24.4	5.3	1.4	3.2	13.4	4.2	4.2
13	* 30.7	7.1	11.7	7.8	35.7	13.8	4.2	1.4	3.2	15.2	5.3	3.5
14	* 30.4	6.7	10.3	7.8	45.2	9.2	4.2	1.4	3.2	14.1	4.2	3.9
15	30.0	6.7	10.3	6.7	33.2	7.8	4.2	1.4	60.7	14.5	4.9	5.7
16	27.5	6.4	10.3	6.7	24.7	6.4	4.2	1.8	59.3	12.4	4.9	5.3
17	27.2	6.4	10.2	5.3	25.8	3.5	4.6	1.4	16.2	10.2	4.6	6.7
18	27.2	6.0	10.2	5.3	22.6	2.8	4.9	1.4	11.3	8.8	4.6	6.7
19	26.8	6.0	8.1	4.2	19.8	60.4	3.9	1.4	9.2	8.8	4.6	6.7
20	26.8	6.0	8.1	4.2	20.5	1,123	3.9	1.4	9.2	8.8	4.6	8.5
21	24.0	5.7	7.1	773	19.1	162	3.5	1.4	7.4	9.2	5.7	8.5
22	24.4	5.7	7.1	2,055	17.3	547	3.5	1.4	9.2	7.4	5.7	8.8
23	19.4	5.7	8.8	477	15.9	69.2	3.5	1.4	42.4	7.8	5.7	8.8
24	15.5	5.3	8.8	42.4	12.0	51.2	3.5	1.1	16.6	7.8	5.7	8.8
25	13.1	5.3	8.8	96.1	44.8	31.8	3.2	1.1	16.6	8.1	5.7	8.9
26	13.4	6.4	9.2	59.7	22.6	26.8	2.8	1.1	16.6	8.1	6.7	8.8
27	11.3	8.1	9.2	41.0	19.4	27.2	2.8	1.1	16.6	8.5	6.7	8.8
28	13.8	8.1	9.2	34.6	38.1	31.4	2.5	1.1	43.4	8.5	5.7	8.8
29	14.1		9.5	29.0	62.5	35.7	2.5	2.1	299	8.5	5.7	8.8
30	14.5		9.5	26.1	37.8	40.3	2.5	16.6	81.6	8.1	7.1	8.9
31	12.7		9.5		32.8		2.5	7.8		9.9		8.8
Sum	685.0	245.2	288.2	3,785.0	1,555.6	2,431.0	288.7	63.1	1,178.4	447.5	203.1	216.2
Current Year 1946									Period 1932-1946			
Month	Extreme Gage Feet		Extreme Second Feet				Average Second Feet	Total Acre Feet	Acre Feet			
	High	Low	Day	High	Day	Low			Normal	Maximum	Minimum	
Jan.	2.76	2.53	13	30.7	27	11.3	22.1	1,360	2,855	15,990	375	
Feb.	2.59	2.49	1	15.5	#	5.3	8.8	486	1,669	9,990	179	
Mar.	3.58	2.56	12	96.1	#	7.1	9.3	572	1,474	6,910	206	
Apr.	11.91	2.33	22	6,820	30	21.5	126	7,510	2,155	7,510	195	
May	5.48	2.26	4	1,120	25	10.6	50.2	3,090	4,093	23,850	494	
June	10.56	2.10	20	3,250	19	2.5	81.0	4,820	3,511	19,730	291	
July	2.40	1.90	1	43.1	#	2.5	9.3	573	1,886	9,290	106	
Aug.	2.33	1.74	29	39.6	#	1.1	2.0	125	1,896	14,530	77.8	
Sept.	8.66	1.77	28	2,770	#	3.2	39.3	2,340	2,708	14,340	57.5	
Oct.	2.66	2.03	8	50.5	22	7.4	14.4	888	4,288	39,790	117	
Nov.	2.10	1.94	#	10.2	#	3.9	6.8	403	2,605	25,590	101	
Dec.	2.10	1.90	#	8.8	9	3.2	7.0	429	2,664	20,720	260	
Yearly	11.91	1.74		6,820		1.1	31.2	22,596	31,804	126,090	7,969	

Various days of the month

RIO GRANDE AT LAREDO STATION

DESCRIPTION: Water-stage recorder and cable with sit-down cable car. Until May 22, 1942 the water-stage recorder was attached to the north abutment of the railroad bridge between Laredo, Texas and Nuevo Laredo, Tamaulipas 884.3 river miles below the American Dam at El Paso, Texas. On June 10, 1942 the water-stage recorder was installed on the downstream side of the first pier of the same bridge on the Mexican side. The elevation of the zero of the gage was not changed. Zero of the gage at the recorder is at elevation 351.50 feet. The cable is located 2 miles upstream from the railroad bridge. Zero of the gage at the cable is elevation 353.15 feet. All gage elevations are on U. S. C. & G. S. sea level datum.

RECORDS: Based upon 161 meter measurements during the year. Computations by shifting channel methods. 1946 records good. Records available: May 1900 through December 1913; May, June and October 1914; September 1916; September and October 1917; October 1918; September and October 1919; August and September 1920; June, November and December 1922; January 1923 through December 1946; also flood peak discharges for June 1899 and April 1900. Gage height records are available for January, February and March 1914. For a statement of all records of discharges at this station, including those authenticated by this Commission, see the last pages of this bulletin.

REMARKS: Reservoirs, diversions and drainage returns, modify the river flow at this station. For chemical, silt and bacterial content of river and tributary water, for watershed and irrigated areas and other related data see index in Water Bulletin No. 14 and later bulletins.

EXTREME FLOWS: The greatest recorded flow at this station since 1894 was on September 3, 1932, when the peak gage reading was 52.20 feet, the flow being 335,000 second feet. In 1894 the records of this Commission indicated that the flood of 1894 reached the highest stage since the 1865 flood. The 1894 flood reached a stage here of about 35.1 feet. On June 27, 1945 a minimum flow of 572 second feet was reached with a gage height of 3.54 feet. Numerous records of extreme flows may be found in previous Water Bulletins, especially bulletin no. 15 pages 49 and 50.

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,980	2,150	1,820	1,340	2,170	4,240	6,110	2,160	1,660	8,020	3,500	2,570
2	1,980	2,240	1,830	1,270	2,020	2,410	5,330	2,010	1,650	8,090	3,420	2,420
3	1,940	2,210	1,830	1,380	1,920	1,890	4,870	1,780	1,630	5,510	3,330	2,450
4	1,960	2,190	1,730	1,460	1,880	1,510	4,450	1,660	1,520	4,870	3,320	2,420
5	1,960	2,180	1,760	1,470	5,260	1,570	4,060	1,590	1,530	4,560	3,190	2,420
6	1,950	2,240	1,850	1,380	6,890	1,410	3,740	1,550	1,770	4,170	3,140	2,420
7	2,000	2,270	1,800	1,330	*16,030	1,310	3,440	1,550	7,280	4,800	3,130	2,490
8	1,920	2,300	1,820	1,340	9,250	1,510	3,220	1,500	6,780	37,080	3,200	2,510
9	1,900	2,460	1,680	1,280	8,760	1,950	3,070	1,650	6,180	24,650	3,220	2,590
10	2,010	2,430	1,700	1,260	5,330	1,780	3,070	1,630	9,220	15,820	3,240	2,520
11	2,170	2,270	1,620	1,720	6,070	1,810	3,170	1,420	9,460	17,300	3,110	2,580
12	2,230	2,260	1,560	1,600	4,980	1,530	4,520	1,360	7,660	14,830	3,110	2,640
13	2,240	2,310	1,710	1,240	3,450	1,300	3,780	1,370	6,220	13,450	2,970	2,640
14	2,360	2,240	1,840	1,210	3,430	1,270	3,390	1,370	5,400	9,680	2,820	3,020
15	2,730	2,060	1,870	1,250	3,850	1,200	3,850	1,300	5,190	8,830	2,660	3,130
16	2,730	1,960	1,910	1,440	3,810	1,130	4,060	1,340	6,250	8,260	2,810	3,040
17	2,600	1,870	1,910	1,310	3,230	1,070	3,640	1,430	6,920	7,170	2,960	3,190
18	2,410	1,880	1,750	1,210	2,620	1,030	3,380	1,500	5,470	6,750	2,980	2,870
19	2,380	1,880	1,820	1,190	2,320	1,020	3,100	1,520	3,780	6,110	2,880	2,660
20	2,470	2,030	1,830	1,180	4,770	1,380	2,920	1,410	5,790	5,610	2,900	2,450
21	2,630	1,930	1,820	1,250	4,240	13,350	2,790	1,430	4,590	4,940	2,830	2,370
22	2,560	2,050	1,710	9,220	2,440	13,170	2,960	1,370	4,200	4,910	2,820	2,280
23	2,550	1,950	1,620	19,320	1,960	9,500	2,570	1,320	4,270	4,700	2,710	2,250
24	2,540	1,850	1,600	10,490	1,850	7,130	2,480	1,330	3,850	4,660	2,660	2,250
25	2,320	1,850	1,610	6,000	2,620	44,500	2,900	1,330	4,700	4,310	2,750	2,340
26	2,260	1,820	1,660	3,460	*17,590	28,150	2,610	1,290	7,350	4,240	2,730	2,420
27	2,380	1,830	1,870	3,050	5,970	16,950	2,260	1,260	7,590	4,200	2,840	2,380
28	2,380	1,850	1,820	2,460	3,600	9,220	2,060	1,870	7,660	3,990	2,710	2,350
29	2,340		1,610	2,200	2,590	7,030	14,960	10,310	7,700	3,810	2,560	2,370
30	2,480		1,580	2,490	8,300	6,000	1,880	7,130	13,070	3,710	2,600	2,340
31	2,380		1,460		9,150		2,180	2,940		3,600		2,360
Sum	70,740	58,560		86,800		187,320		62,680		262,630		78,740
	70,740		54,000		158,350		103,820		166,340		89,100	
Current Year 1946									Period 1924-1946			
Month	Extreme Gage Feet		Extreme Second Feet				Average Second Feet	Total Acre Feet	Acre Feet			
	High	Low	Day	High	Day	Low			Normal	Maximum	Minimum	
Jan.	5.31	4.72	15	2,870	1	1,880	2,280	140,300	184,369	351,700	113,600	
Feb.	5.12	4.63	9	2,520	26	1,710	2,090	116,200	151,657	237,400	99,400	
Mar.	4.82	4.36	16	1,960	31	1,370	1,740	107,100	148,294	223,000	95,700	
Apr.	10.89	4.04	22	29,280	21	1,180	2,890	172,200	147,523	312,000	92,900	
May	10.66	4.43	26	27,260	24	1,760	5,110	314,100	278,378	856,000	81,540	
June	17.19	3.77	25	54,740	19	961	6,240	371,500	287,855	1,357,000	46,850	
July	6.43	4.53	1	6,390	30	1,830	3,350	205,900	285,250	1,250,000	83,570	
Aug.	8.79	4.10	29	15,860	26	1,250	2,020	124,300	296,681	883,000	93,740	
Sept.	8.69	4.23	30	15,820	5	1,450	5,540	329,900	624,897	2,943,000	65,840	
Oct.	12.86	5.38	8	44,850	31	3,450	8,470	520,900	505,908	1,951,000	125,800	
Nov.	5.45	4.89	1	3,570	30	2,480	2,970	176,700	221,981	570,800	122,100	
Dec.	5.28	4.79	17	3,340	24	2,140	2,540	156,200	187,953	352,700	106,700	
Yearly	17.19	3.77		54,740		961	3,780	2,735,300	3,320,746	7,017,110	1,862,800	

* Partly estimated

RIO SALADO STATION AT CD. GUERRERO, TAMAULIPAS

DESCRIPTION: Water-stage recorder and cable with sit-down cable car. and two reinforced concrete Cipoletti weirs, with a combined capacity of 636 second feet. These weirs were constructed in December 1938. This station is located at a place called "El Cable" about 6.2 miles above the confluence of the Rio Salado with the Rio Grande and 2 miles southwest of Ciudad Guerrero, Tamaulipas. This stream enters the Rio Grande 946.1 river miles below the American Dam at El Paso, Texas. Zero of the gage is 265.74 feet above mean sea level, U. S. C. & G. S. datum.

RECORDS: Based upon 101 meter measurements during the year and the weir discharge records. Computations by shifting channel methods for flows greater than 636 second feet. 1946 records good. Records available: 1900-1913 and 1923-1946. For a statement of all records of discharge at this station, including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: This station was entirely rebuilt by the Mexican Section of this Commission in December 1932 and an automatic water-stage recorder was installed. Prior to 1932, 3 gage readings were made here daily. The flow of the Rio Salado was greatly modified by irrigation diversions above this station and by the Don Martin Reservoir, which forms a part of the irrigation system of the Rio Salado. For chemical and sanitary content of this stream, for watershed and irrigated areas and other related data, see index in Water Bulletin No. 14 and later bulletins.

EXTREME FLOWS: The greatest recorded flow at this station was on September 7, 1933, when an extreme gage height of 18.86 feet was reached with a discharge of 43,800 second feet. The stream is sometimes dry. Numerous records of extreme flows may be found in previous water bulletins.

CORRECTION: See page 52 of Water Bulletin No. 15 for daily discharges for the year 1925. These supersede the monthly figures for 1925 in Water Bulletins 5 and 6.

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	35.7	26.5	33.2	12.7	45.9	2,193	113	357	2,440	124	24.4	16.6
2	35.7	28.6	26.5	12.7	54.4	791	88.3	1,130	1,257	268	24.4	16.6
3	38.1	28.6	22.2	11.3	353	399	79.8	220	717	360	24.4	16.6
4	38.1	28.6	18.4	11.3	3,405	399	319	84.0	452	228	24.4	16.6
5	38.1	26.5	14.5	9.9	717	441	410	45.9	381	162	22.2	16.6
6	38.1	24.4	14.5	9.9	607	269	197	28.6	244	351	22.2	18.4
7	38.1	24.4	22.2	8.5	1,003	197	124	22.2	175	313	22.2	18.4
8	38.1	22.2	28.6	8.5	713	149	182	18.4	143	175	22.2	18.4
9	35.7	22.2	26.5	6.7	313	3,351	169	14.5	108	3,143	22.2	18.4
10	38.1	20.5	22.2	6.7	227	890	108	11.3	79.8	1,624	24.4	22.2
11	45.9	20.5	18.4	46.6	149	590	75.6	11.3	72.4	565	24.4	24.4
12	48.7	18.4	18.4	227	149	473	72.4	11.3	66.0	260	24.4	22.2
13	45.9	18.4	18.4	385	97.8	204	60.0	9.9	54.4	149	22.2	20.5
14	45.9	14.5	16.6	331	75.6	103	45.9	8.5	43.4	103	22.2	18.4
15	43.4	14.5	14.5	244	60.0	66.0	35.7	8.5	97.8	298	20.5	18.4
16	40.6	14.5	14.5	252	51.6	75.6	31.1	6.7	908	277	20.5	16.6
17	38.1	16.6	16.6	175	40.6	63.2	26.5	6.7	1,045	108	20.5	16.6
18	38.1	16.6	20.5	156	35.7	45.9	24.4	5.3	313	75.6	20.5	16.6
19	38.1	14.5	20.5	269	51.6	33.2	24.4	5.3	156	66.0	20.5	18.4
20	35.7	14.5	18.4	227	92.9	33.2	22.3	5.3	611	57.2	20.5	18.4
21	33.2	14.5	16.6	130	572	501	22.3	3.9	277	51.6	20.5	18.4
22	31.1	14.5	16.6	108	331	392	117	3.9	205	43.4	20.5	18.4
23	31.1	14.5	16.6	69.2	97.8	936	119	3.9	197	40.6	20.5	18.4
24	33.2	14.5	18.4	54.4	60.0	551	54.4	3.9	1,600	63.2	20.5	20.5
25	31.1	12.7	18.4	48.7	177	636	40.6	3.9	6,533	51.6	18.4	20.5
26	31.1	14.5	18.4	75.6	1,622	742	45.9	3.9	1,335	38.1	18.4	22.2
27	28.6	22.2	18.4	220	3,637	452	92.9	6.7	851	33.2	22.2	22.2
28	26.5	40.6	18.4	124	1,112	304	69.2	2,981	399	31.1	22.2	22.2
29	26.5		16.6	79.8	473	204	48.7	3,602	227	28.6	18.4	22.2
30	26.5		14.5	60.0	7,310	149	35.7	3,245	156	26.5	18.4	22.2
31	26.5		14.5		5,369		28.6	1,808		26.5		22.2
Sum	563.5		3,380.5		15,633.1		13,676.8		9,141.2		598.7	
	1,119.6		593.0		29,002.9		2,882.7		21,143.8		649.2	
Current Year 1946												
Period 1924-1946												
Month	Extreme Gage Feet		Extreme Second Feet				Average Second Feet	Total Acre Feet	Acre Feet			Normal 1930-1946
	High	Low	Day	High	Day	Low	Normal		Maximum	Minimum		
Jan.	2.17	1.87	12	48.7	#	26.5	36.1	2,220	16,109	144,110	0	13,172
Feb.	2.07	1.61	28	40.6	25	11.3	20.1	1,120	11,286	98,520	0	9,916
Mar.	2.03	1.64	1	38.1	6	12.7	19.1	1,180	11,591	95,740	52.0	11,455
Apr.	4.76	1.51	13	720	#	6.7	113	6,710	12,723	54,500	56.4	13,263
May	13.29	1.97	30	15,260	18	33.2	936	57,530	44,266	* 253,000	3,200	39,169
June	8.60	1.90	9	5,260	20	28.6	521	31,010	38,067	192,000	1,620	35,479
July	5.09	1.77	4	904	#	20.5	93.0	5,720	19,816	100,000	228	17,811
Aug.	9.35	1.44	30	6,250	#	3.9	441	27,130	27,613	260,180	81.0	32,503
Sept.	11.32	2.03	25	10,350	15	38.1	705	41,940	94,006	600,000	3,310	74,205
Oct.	9.25	1.84	9	6,220	31	24.4	295	18,130	72,396	673,070	1,710	67,296
Nov.	1.84	1.71	#	24.4	30	16.6	21.6	1,290	25,091	248,590	246	22,921
Dec.	1.84	1.71	11	24.4	#	16.6	19.3	1,190	17,847	198,160	46.0	17,652
Yearly	13.29	1.44		15,260		3.9	270	195,170	390,811	1,350,260	101,770	354,842

Various days of the month * Partly estimated

RIO GRANDE AT ZAPATA STATION

DESCRIPTION: Water-stage recorder and cable with stand-up cable car and winch, located about 3 miles below the town of Zapata, Texas, 7.5 miles northeast of Guerrero, Tamaulipas, 1.4 miles below the confluence of the Rio Salado with the Rio Grande, and 947.5 river miles below the American Dam at El Paso, Texas. Zero of the gage is at mean sea level U. S. C. & G. S. datum.

RECORDS: Based upon 56 meter measurements during the year, 44 by the United States and 12 by the Mexican Section of this Commission. Computations by shifting channel methods. 1946 records good. Records available: January 1932 to December 31, 1946. For a statement of all records of discharge at this station, including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: Reservoirs, diversions and drainage returns modify the river flow at this station. For bacterial content, for watershed and irrigated areas and other related data, see index in Water Bulletin No. 14 and later bulletins.

EXTREME FLOWS: The greatest recorded flow was on September 4, 1932, when the extreme gage height was 262.07 feet and the extreme flow was 261,000 second feet. (See Special Flood Report 1932, by the United States Section of this Commission.) In 1938 tradition and a diary at Querrero, Tamaulipas, indicated a Rio Grande flood in June 1865 reached a stage here between 278.5 and 285 feet and was the only flood since 1812 to be greater than that of 1932. The lowest flow recorded was on June 29, 1945, when the extreme gage height was 219.28 feet and the extreme flow 639 second feet.

CORRECTION: Corrections to the September 1941 record will be found on page 18 of Water Bulletin No. 15.

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,210	2,300	1,920	1,440	2,230	10,700	5,810	2,580	4,960	9,910	3,490	2,580
2	2,190	2,210	1,860	1,350	2,040	4,640	5,750	3,680	2,970	7,850	3,380	2,600
3	2,200	2,260	1,780	1,300	2,120	2,740	5,150	2,300	2,320	7,080	3,320	2,540
4	2,160	2,190	1,790	1,360	5,820	2,190	4,700	1,870	1,960	5,650	3,290	2,560
5	2,140	2,140	1,740	1,440	3,960	2,100	4,710	1,740	1,920	4,720	3,290	2,540
6	2,130	2,120	1,750	1,480	10,300	1,840	5,490	1,580	1,880	4,390	3,240	2,500
7	2,130	2,160	1,780	1,440	14,700	1,700	3,810	1,480	2,120	4,330	3,210	2,490
8	2,180	2,160	1,800	1,390	14,900	1,580	3,510	1,440	5,300	14,700	3,140	2,540
9	2,130	2,290	1,890	1,340	10,700	6,210	3,310	1,420	4,820	52,700	3,100	2,570
10	2,090	2,330	1,930	1,310	7,770	3,910	3,140	1,480	5,220	30,700	3,110	2,600
11	2,240	2,310	1,820	1,500	5,140	3,300	3,070	1,550	8,940	*19,500	3,050	2,570
12	2,360	2,220	1,820	2,080	7,120	2,800	3,420	1,410	8,620	16,200	2,960	2,580
13	2,430	2,310	1,760	2,180	4,860	1,920	4,120	1,230	6,950	14,900	2,970	2,610
14	2,480	2,370	1,790	1,820	3,580	1,530	3,440	1,230	9,520	11,900	2,900	2,590
15	2,400	2,290	1,910	1,660	3,920	1,360	3,140	1,240	13,800	9,420	2,660	2,940
16	2,750	2,170	1,930	2,470	3,710	1,320	3,550	1,210	* 7,350	9,560	2,620	2,870
17	2,680	2,190	1,970	3,160	3,790	1,250	3,620	1,210	* 8,820	8,280	2,640	2,810
18	2,740	2,010	1,920	1,980	3,090	1,150	3,270	1,350	* 8,990	7,160	2,810	3,020
19	2,580	1,930	1,790	1,830	2,790	1,060	3,030	1,380	* 6,250	6,590	2,770	2,830
20	2,510	1,930	1,800	1,780	2,530	1,200	2,850	1,410	* 4,940	5,930	2,790	2,650
21	2,560	2,030	1,790	1,690	7,200	6,090	2,680	1,340	6,070	5,620	2,820	2,500
22	2,680	1,980	1,810	2,210	4,300	14,400	2,780	1,340	4,370	5,070	2,610	2,450
23	2,630	2,030	1,720	17,400	2,450	14,200	2,890	1,300	4,400	* 4,810	2,670	2,460
24	2,640	1,970	1,660	14,300	2,040	9,110	2,480	1,280	7,130	* 4,530	2,640	2,410
25	2,590	1,890	1,620	8,160	2,920	22,400	2,430	1,280	10,600	* 4,320	2,610	2,460
26	2,440	1,890	1,580	4,130	28,100	*41,300	2,740	1,340	4,660	* 4,150	2,620	2,570
27	2,340	1,850	1,580	2,850	19,300	22,700	2,570	1,220	7,840	* 4,120	2,710	2,660
28	2,440	1,910	1,780	2,470	6,990	11,900	2,240	10,900	7,750	* 4,040	2,790	2,570
29	2,410		1,800	2,030	3,780	8,290	2,020	12,700	7,060	* 3,850	2,670	2,500
30	2,310		1,670	1,830	22,800	6,370	1,890	11,300	8,460	* 3,740	2,530	2,460
31	2,380		1,740		23,000		1,850	8,050		3,550		2,480
Sum	74,350	59,440	55,500	91,380	237,950	211,260	105,460	84,840	185,990	299,270	87,410	80,510
Current Year 1946												
Period 1932-1946												
Month	Extreme Gage Feet		Extreme Second Feet			Average Second Feet	Total Acre Feet	Acre Feet				
	High	Low	Day	High	Day			Normal	Maximum	Minimum		
Jan.	220.95	220.54	16	2,920	5	2,070	2,400	147,000	200,718	* 484,450		119,000
Feb.	220.79	220.37	14	2,440	26	1,810	2,120	118,000	163,879	* 361,350		111,000
Mar.	220.52	220.20	18	2,020	31	1,520	1,790	110,000	170,005	292,000		110,000
Apr.	226.04	219.85	23	24,600	11	1,160	3,050	181,000	158,198	233,000		97,800
May	231.33	220.38	30	47,800	3	1,920	7,680	472,000	321,323	682,000		89,900
June	230.88	219.72	26	46,900	20	1,020	7,040	419,000	344,051	1,517,000		59,000
July	222.00	220.35	6	6,340	31	1,810	3,400	209,000	354,600	1,238,000		92,300
Aug.	224.82	219.91	29	18,600	16	1,160	2,740	168,000	317,892	* 721,000		108,000
Sept.	224.38	220.41	15	16,400	6	1,870	6,200	369,000	835,571	2,895,330		76,400
Oct.	234.10	221.09	9	61,500	31	3,410	9,650	594,000	661,249	2,396,440		165,000
Nov.	221.16	220.74	1	3,600	30	2,480	2,910	173,000	252,969	748,020		133,000
Dec.	221.00	220.64	18	3,100	25	2,400	2,600	160,000	209,944	591,380		116,000
Yearly	234.10	219.72		61,500		1,020	4,310	3,120,000	3,990,379	8,038,070		2,231,000

* Partly estimated # Estimated

RIO ALAMO STATION AT CD. MIER, TAMAULIPAS

DESCRIPTION: Water-stage recorder and cable with sit-down cable car and re-inforced concrete weir for measurement of flows up to 177 second feet, located about 3.1 miles above the confluence of the Rio Alamo with the Rio Grande and .6 mile west of Ciudad Mier, Tamaulipas at a point called "El Paso del Cántaro". This stream enters the Rio Grande 984.6 river miles below the American Dam at El Paso, Texas. Zero of the gage is 187.04 feet above mean sea level, U. S. C. & G. S. datum.

RECORDS: Based upon 8 meter measurements at high flows during the year and the weir discharge tables at low flows. High flow computations by shifting channel methods. 1946 records good. Records available: July 1, 1923 to December 31, 1946. For a statement of all records of discharge at this station, including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: The flow of this spring-fed stream is modified by small storage and irrigation diversions above this station. For silt and bacterial content of this stream, for watershed and irrigated areas and other related data, see index in Water Bulletin No. 14 and later bulletins.

COMPARATIVE FLOWS FROM RECORDS: Momentary Peak: Max. 76,600 second feet on September 7, 1933, with a gage height of 26.90 feet. Min. dry in all years of record except 1934 and 1935.

		Average Flow in Second Feet			
Daily:	Max.	42,020, Sept. 7, 1933.	Min.	frequently dry.	
Monthly:	Max.	3,200, Sept. 1933.	Min.	frequently dry.	
Yearly:	Max.	505, 1944.	Min.	16.6	1929.
Two Successive Years:	Max.	339, 1932-1933.	Min.	64.6	1936-1937.
Three Successive Years:	Max.	270, 1926-1928.	Min.	72.0	1935-1937.
Four Successive Years:	Max.	271, 1925-1928.	Min.	77.0	1934-1937.
Five Successive Years:	Max.	268, 1924-1928.	Min.	81.6	1934-1938.
Ten Successive Years:	Max.	233, 1924-1933.	Min.	112,	1934-1943.
Twenty-three Successive Years:	 182, 1924-1946.				

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	27.9	10.6	10.6	10.6	47.3	334	10.6	6.0	47.3	47.3	15.9	15.9
2	27.9	10.6	10.6	10.6	33.9	104	13.1	157	43.8	40.6	15.9	15.9
3	27.9	10.6	10.6	13.1	27.9	67.1	137	43.8	27.9	43.8	36.7	15.9
4	27.9	10.6	10.6	15.9	51.2	43.8	40.6	15.9	18.7	197	30.7	15.9
5	27.9	10.6	10.6	15.9	160	33.9	43.8	8.1	13.1	40.6	43.8	15.9
6	27.9	10.6	8.1	13.1	104	30.7	94.3	6.0	10.6	210	18.7	24.7
7	27.9	10.6	8.1	13.1	883	27.9	27.9	4.2	8.1	115	15.9	27.9
8	24.7	13.1	8.1	8.1	185	90.1	37.1	4.2	304	2,730	15.9	24.7
9	21.5	10.6	8.1	8.1	223	4,626	51.2	2.5	206	8,016	15.9	27.9
10	18.7	10.6	8.2	8.1	43.8	929	21.5	2.5	15.9	236	15.9	24.7
11	18.7	10.6	8.1	8.1	15.9	208	10.6	2.5	8.1	71.3	13.0	27.9
12	18.7	10.6	8.1	21.5	10.6	67.1	8.1	1.1	18.7	33.9	10.6	24.7
13	15.9	10.6	10.6	43.8	8.1	47.3	6.0	0	24.7	27.9	10.6	27.9
14	15.9	10.6	8.1	18.7	8.1	33.9	6.0	0	8.1	24.7	10.6	24.7
15	13.1	10.6	8.1	10.6	8.1	24.7	4.2	0	10.6	1,243	10.6	24.7
16	10.6	10.6	8.2	308	8.1	21.5	4.2	0	27.9	487	13.1	24.7
17	10.6	10.6	8.1	40.6	6.0	18.7	4.2	0	30.7	67.1	13.1	24.7
18	10.6	10.6	8.1	18.7	6.0	13.1	4.2	0	67.1	37.1	13.1	24.7
19	10.6	10.6	8.1	10.6	6.0	10.6	4.2	0	131	27.9	10.6	27.9
20	10.6	10.6	8.1	8.1	6.0	51.2	4.2	0	58.3	24.7	13.1	24.7
21	10.6	10.6	8.1	111	4.2	120	2.5	0	427	21.5	13.1	24.7
22	10.6	10.6	10.6	94.3	113	519	4.2	0	104	21.5	15.9	24.7
23	10.6	10.6	10.6	24.7	33.9	71.3	10.6	0	157	21.5	15.9	24.7
24	10.6	8.1	10.6	10.6	15.9	33.9	4.2	0	5,580	18.7	15.9	24.7
25	8.1	10.6	10.6	8.1	18.7	21.5	4.2	0	3,267	18.7	15.9	21.5
26	8.1	10.6	10.6	6.0	208	13.1	4.2	0	600	18.7	15.9	24.7
27	8.1	31.1	10.6	6.0	54.7	10.6	13.1	0	89.7	18.7	13.1	21.5
28	8.1	10.6	10.6	6.0	30.7	10.6	10.6	1,338	51.2	15.9	13.1	24.7
29	8.1	10.6	4.2	15.9	10.6	8.1	4,096	24.7	15.9	15.9	15.9	21.5
30	8.1	10.6	63.2	2,853	10.6	6.0	1,593	21.5	15.9	15.9	15.9	24.7
31	8.1	10.6	10.6	2,497		6.0	104		15.9			24.7
Sum	494.6	317.3	291.3	939.4	7,687.0	7,603.8	606.7	7,384.8	11,402.7	13,923.8	494.3	728.1

Current Year 1946							Period 1924-1946				
Month	Extreme Gage Feet		Extreme Second Feet			Average Second Feet	Total Acre Feet	Acre Feet			
	High	Low	Day	High	Day			Low	Normal	Maximum	Minimum
Jan.	1.71	1.48	#	27.9	#	8.1	16.0	981	5,331	34,920	0
Feb.	2.53	1.48	27	137	#	8.1	11.3	629	3,644	25,550	67.2
Mar.	1.51	1.48	#	10.6	#	8.1	9.4	578	3,402	19,830	64.0
Apr.	5.51	1.41	16	2,140	#	4.2	31.3	1,860	6,249	26,710	86.0
May	9.12	1.41	7	6,390	#	4.2	248	15,250	16,527	* 137,000	209
June	9.19	1.48	9	6,290	29	8.1	253	15,080	15,331	83,240	0
July	3.87	1.38	3	759	#	2.5	19.6	1,200	8,939	37,590	255
Aug	9.28		29	7,880	#	0	238	14,650	16,389	194,200	0
Sept.	9.84	1.41	24	7,660	#	4.2	380	22,620	30,567	190,520	* 135
Oct.	15.35	1.57	9	19,920	#	15.9	449	27,620	16,431	51,620	0
Nov.	3.28	1.51	3	438	#	10.6	16.5	980	4,295	21,940	0
Dec.	1.71	1.57	#	27.9	#	15.9	23.5	1,440	4,382	15,000	124
Yearly	15.35			19,920		0	142	102,888	131,487	366,826	11,906.7

Various days of the month * Partly estimated

RIO GRANDE AT ROMA STATION

DESCRIPTION: Water-stage recorder at international bridge between Roma, Texas and San Pedro, Tamaulipas and 992.0 river miles below the American Dam at El Paso, Texas and 14.9 river miles above the confluence of the Rio San Juan from Mexico. Zero of the gage is 145.93 feet above mean sea level, U. S. C. & G. S. datum.

RECORDS: Based upon 188 meter measurements during the year from bridge, 179 by the Mexican and 9 by the United States Section of this Commission. Computations by shifting channel methods. 1946 records good. Records available: May 1900 and September 1900 through December 1913; October 1914; September and October 1917; September and October 1919; August and September 1920; June 1922 and November 1922 through December 1946; also flood peak discharges for June 1899 and April 1900. Gage height records are available for January, February and March 1914. For a statement of all records of discharge at this station, including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: Reservoirs, diversions and drainage returns modify the river flow at this station. This station was operated by the Mexican Section until March 1929, when operation and maintenance was begun by the United States Section. On August 1, 1939, the operation and maintenance of this station was again turned over to the Mexican Section of this Commission. Backwater from the Rio San Juan sometimes reaches this station. See Water Bulletin No. 3, page 50. For chemical, silt and bacterial content of river and tributary water, for watershed and irrigated areas and other related data, see index in Water Bulletin No. 14 and later bulletins.

EXTREME FLOWS: The greatest recorded flow was on September 5, 1932, when the extreme gage height was 35.4 feet and the extreme flow 203,000 second feet. (See Special Flood Report 1932 by the United States Section of this Commission.) In 1938, 1941 and 1943 tradition indicated a flood in 1865 reached a stage here of about 43 feet which was the only flood known greater than that of 1932. In 1902 this Commission's records indicated a flood in September 1874 reached a stage here of 29.2 feet. The lowest flow ever recorded was on June 30, 1945, when the extreme flow was 618 second feet at a stage of -1.02 feet. Records of other extreme flows may be found in previous Water Bulletins.

CORRECTION: See pages 50 and 51 of Water Bulletin No. 15 for flood flows and corrected flows for the years 1899 through 1926.

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,130	2,640	1,800	1,510	2,420	15,080	5,720	1,870	6,070	12,080	3,490	2,380
2	2,140	2,550	1,880	1,370	2,550	7,280	5,860	4,340	4,200	7,940	3,410	2,350
3	2,160	2,410	1,890	1,270	2,280	3,990	5,510	3,290	2,710	7,910	3,340	2,370
4	2,140	2,440	1,860	1,280	4,800	2,870	5,720	2,240	2,240	6,140	3,710	2,280
5	2,080	2,340	1,780	1,380	6,140	2,390	5,050	1,770	1,950	5,190	3,560	2,320
6	2,030	2,300	1,640	1,400	7,520	2,110	5,400	1,640	1,770	5,190	3,280	2,210
7	2,020	2,220	1,800	1,420	11,850	1,870	4,700	1,480	1,620	5,230	3,140	2,110
8	2,010	2,230	1,680	1,370	21,050	1,810	3,530	1,350	4,630	5,540	3,050	2,220
9	2,050	2,280	1,670	1,340	11,650	8,760	3,350	1,340	7,060	52,260	3,050	2,330
10	2,030	2,270	1,720	1,280	9,290	7,660	3,120	1,430	5,900	39,900	3,010	2,340
11	2,020	2,320	1,680	1,360	5,580	3,500	2,990	1,450	8,510	20,590	2,970	2,430
12	2,220	2,280	1,680	1,570	5,370	3,450	3,040	1,410	9,110	17,340	2,920	2,400
13	2,330	2,150	1,650	2,240	5,900	2,550	4,030	1,280	7,420	14,730	2,880	2,420
14	2,450	2,200	1,590	2,000	4,060	1,850	3,880	1,220	5,720	13,000	2,930	2,490
15	2,490	2,210	1,690	1,550	3,530	1,520	3,230	1,220	8,830	11,270	2,860	2,580
16	2,480	2,140	1,820	1,860	4,130	1,360	3,110	1,190	8,970	10,130	2,650	2,940
17	2,860	2,020	1,850	3,230	3,640	1,260	3,670	1,180	11,050	8,690	2,560	2,700
18	2,700	1,950	1,880	2,340	3,500	1,190	3,470	1,190	7,660	7,270	2,590	2,830
19	2,580	1,930	1,810	1,550	2,820	1,120	3,210	1,260	6,460	6,460	2,750	2,910
20	2,450	1,910	1,700	1,430	2,590	1,120	3,000	1,320	4,700	6,000	2,680	2,800
21	2,480	1,820	1,730	1,450	4,270	2,120	2,800	1,510	6,890	5,510	2,720	2,650
22	2,550	1,920	1,720	1,590	6,820	13,070	2,690	1,280	6,040	5,090	2,730	2,490
23	2,680	1,890	1,720	7,200	3,110	14,270	2,880	1,250	4,590	4,980	2,660	2,450
24	2,620	1,960	1,640	17,800	2,220	10,380	2,650	1,230	12,500	4,700	2,670	2,410
25	2,620	1,940	1,570	10,840	2,010	10,170	2,260	1,230	18,760	4,590	2,650	2,370
26	2,500	1,810	1,560	6,640	17,800	40,960	2,240	1,250	8,370	4,380	2,590	2,410
27	2,330	1,900	1,550	4,130	26,340	24,930	2,520	1,260	7,630	4,100	2,670	2,540
28	2,270	1,770	1,610	3,320	9,990	14,760	2,250	4,560	8,300	4,100	2,710	2,570
29	2,510	1,760	2,900	4,980	9,150	2,030	14,370	7,590	4,240	2,790	2,440	
30	2,480	1,720	2,510	40,960	6,920	1,850	16,100	7,980	3,780	2,520	2,340	
31	2,430	1,640		30,760		1,770	9,290		3,600		2,360	
Sum	72,840	59,800	53,290	91,110	269,910	219,470	86,600	205,230	311,930	87,340	76,440	

Current Year 1946							Period 1924-1946				
Month	Extreme Gage Feet		Extreme Second Feet		Average Second Feet	Total Acre Feet	Acre Feet				
	High	Low	Day	Day			Normal	Maximum	Minimum		
Jan.	1.02	.36	17	2,920	8	1,970	2,350	144,500	213,851	467,400	119,500
Feb.	.75	.07	1	2,700	28	1,720	2,140	118,600	174,675	349,000	108,400
Mar.	.23	-.13	2	1,910	27	1,550	1,720	105,700	176,650	325,500	99,000
Apr.	8.07	-.43	23	20,100	10	1,240	3,040	180,700	174,097	285,000	91,400
May	*20.77	.26	30	82,300	25	1,900	8,710	535,400	361,257	706,300	91,320
June	14.24	-.13	26	47,700	20	1,070	7,320	435,300	375,297	1,586,000	53,990
July	3.87	.33	4	6,920	31	1,700	3,470	213,300	341,097	1,217,000	94,100
Aug.	8.07	-.26	30	21,100	18	1,160	2,790	171,800	345,670	904,000	109,400
Sept.	7.97	.30	25	22,100	7	1,590	6,840	407,100	757,924	3,048,000	69,900
Oct.	18.47	1.61	9	67,500	31	3,530	10,060	618,700	614,888	2,372,000	163,500
Nov.	2.66	.72	4	5,230	30	2,400	2,910	173,200	255,960	736,000	126,800
Dec.	1.15	.59	16	3,030	7	2,080	2,470	151,600	215,674	565,100	114,000
Yearly	*20.77	-.43		82,300		1,070	4,500	3,255,900	4,006,960	8,098,000	2,227,000

* Estimated * Partly estimated

CONTRIBUTIONS FROM RIO SAN JUAN

Above Rio Grande City Station

DESCRIPTION: Azucar Dam is located on the Rio San Juan channel 12.4 river miles above the confluence with the Rio Grande. This confluence is 7.9 river miles above the Rio Grande City gaging station and 1,007.4 river miles below the American Dam at El Paso, Texas. The zero of the reservoir gage at Azucar Dam is 7.64 feet above mean sea level, U. S. C. & G. S. datum. Contributions to the Rio Grande from the Rio San Juan all pass through the Azucar Reservoir and reach the Rio Grande between the Roma and the Hidalgo gaging stations. The portion of such contributions reported on this page reach the Rio Grande above the Rio Grande City gaging station. Reported on the second page hereafter is the portion which reached the Rio Grande below the Rio Grande City Station. The flow reported here consisted of small seepage through the bank near the dam which was measured by weir, leakage and releases from openings in the spillway which were measured by current meter about 1,000 feet downstream, and wastes from canals of the first unit. In 1946 there were no overflows from the reservoir spillway.

RECORDS: All discharge records reported below were furnished by the National Irrigation Commission of Mexico. 1946 records good. Records available: March 10, 1943 to December 31, 1946. In Water Bulletin No. 13 14 and 15 this station record was published as "Rio San Juan below Azucar Dam". For a statement of all records of discharge at this station and an earlier station located on the Rio San Juan at Santa Rosalia, Tamaulipas, including records authenticated by this Commission, see last pages of this bulletin.

REMARKS: In order to lower the water level in Azucar Reservoir for completion of the spillway crest, 58,410 acre feet of water were released through openings in the spillway between January 1 and March 12, 1946. From March 28 to April 12, 1946, 2,900 acre feet of the water reported below were released through spillway openings in order to relieve a shortage of irrigation water on the United States side of the Lower Rio Grande Valley. 25,010 acre feet of additional water for this purpose is reported on the second page hereafter. On July 5, 1946 the spillway was completed. Its crest level is 76.30 meters on the reservoir gage at which level the reservoir capacity is 871,500 acre feet. In 1946, 132,146 acre feet of water were released from the reservoir for irrigating 21,182 acres of land in Mexico tributary to the Rio Grande between Roma and Rio Grande City gaging stations. On 10,205 acres of this land more than one crop was produced. On October 2, 1946, Azucar Dam was officially named Presa Marte R. Gomez. For chemical, silt and bacterial content of the Rio San Juan for watershed and irrigated areas and other related data, see index to Water Bulletin No. 14 and later bulletins.

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	595	436	294	132	4.1	4.1	4.1	4.1	4.1	4.5	4.6	4.6
2	591	432	291	121	4.1	4.1	4.1	7.3	4.1	7.7	4.5	4.5
3	591	432	287	114	4.1	4.1	4.1	6.3	17.9	7.0	4.6	4.6
4	588	432	280	103	5.2	4.1	4.1	9.8	5.5	4.8	4.5	4.5
5	588	435	276	110	5.5	4.1	6.5	5.5	5.9	5.5	4.6	4.6
6	584	431	273	103	5.9	5.9	17.1	11.2	8.3	4.5	4.5	8.1
7	584	426	266	92.5	17.9	7.3	18.5	8.4	9.4	4.5	4.6	4.6
8	589	424	256	85.4	13.6	11.5	7.6	8.7	9.7	4.5	4.5	7.4
9	581	420	249	71.3	5.9	17.9	9.3	4.1	8.3	4.5	4.6	7.0
10	596	413	243	67.8	5.5	13.3	14.6	4.1	6.2	4.5	4.6	6.0
11	588	407	240	60.7	4.1	5.2	9.7	4.1	8.1	4.5	6.6	5.6
12	600	396	106	35.9	7.0	5.2	6.5	4.1	4.2	4.5	8.0	8.1
13	642	385	11.2	11.2	8.0	8.4	7.6	4.1	6.3	4.5	4.5	6.0
14	642	393	12.3	9.7	9.4	5.2	6.5	4.0	6.3	4.5	4.6	6.7
15	631	374	9.0	9.4	12.6	5.2	7.6	4.0	8.1	4.5	4.5	6.0
16	622	377	9.0	10.1	11.5	7.3	9.4	4.0	10.5	4.5	4.6	6.7
17	588	359	9.0	10.8	6.6	8.7	15.3	4.0	5.2	4.5	4.6	8.8
18	518	356	8.7	9.0	11.2	4.1	9.4	4.0	6.6	4.5	4.5	7.0
19	513	349	7.9	11.2	13.3	13.0	10.1	4.0	8.1	7.3	4.7	9.9
20	506	340	7.9	5.5	7.7	10.8	10.1	4.0	7.3	6.6	4.7	6.7
21	499	335	9.7	4.8	7.7	15.1	9.7	4.0	8.1	4.5	4.7	5.6
22	492	334	11.1	5.9	7.7	9.8	14.0	4.0	8.4	4.5	4.7	8.1
23	485	326	11.8	8.3	16.8	8.4	10.5	4.0	10.5	4.5	4.7	4.5
24	493	322	8.7	8.7	16.1	8.7	10.5	4.0	19.4	4.5	8.5	4.6
25	508	310	7.6	7.3	16.5	7.0	8.3	4.0	10.5	4.5	6.8	4.5
26	538	305	4.4	5.9	17.2	7.0	12.9	4.1	4.2	4.5	4.7	4.6
27	461	302	4.4	5.5	8.4	6.3	11.5	4.1	4.2	4.5	4.7	6.0
28	450	294	92.7	5.5	7.7	8.7	10.5	4.1	4.2	4.5	4.7	4.5
29	443	156	6.6	6.6	5.2	11.9	38.4	4.1	4.2	4.5	4.7	4.6
30	439	146	5.5	5.5	4.1	4.1	16.5	4.1	4.2	4.5	4.7	4.5
31	436	139			4.1		5.9	4.1		4.5		5.6
Sum	16,981	10,545	3,727.4	1,237.5	274.7	236.5	330.9	154.4	228.0	151.4	149.8	184.5

Current Year 1946								Period 1943-1946			
Month	Extreme Gage Feet #		Extreme Second Feet @			Average Second Feet	Total Acre Feet	Acre Feet **			
	High	Low	Day	High	Low			Normal	Maximum	Minimum	
Jan.	231.69	229.13	13	642	31	436	548	33,680	26,695	46,150	254
Feb.	229.07	227.49	1	436	28	294	377	20,920	15,575	25,550	255
Mar.	227.46	224.18	1	294	26	4.4	120	7,390	3,442	7,390	0
Apr.	227.39	224.34	1	132	21	4.8	41.2	2,450	3,011	9,340	0
May	231.53	227.36	7	17.9	1	4.1	8.9	545	2,081	4,030	0
June	232.45	231.56	9	17.9	1	4.1	7.9	469	15,130	41,390	0
July	232.12	231.04	29	38.4	1	4.1	10.7	656	19,012	66,820	656
Aug.	231.13	228.41	6	11.2	14	4.0	5.0	306	140,508	557,800	148
Sept.	235.17	230.54	24	19.4	1	4.1	7.6	452	165,013	653,300	452
Oct.	242.26	235.50	2	7.7	1	4.5	4.9	300	161,350	333,900	300
Nov.	242.52	242.26	24	8.5	2	4.5	5.0	297	24,656	50,270	297
Dec.	242.65	242.52	19	9.9	2	4.5	6.0	366	12,262	38,360	366
Yearly	242.65	224.18		642		4.0	93.7	67,831	588,735	1,717,159	67,831

@ Mean daily † And other days ** Combined with record of Rio San Juan below Azucar Dam

Period 1944-1946 * Deduced from Roma and Rio Grande City discharges

Water surface elevations in Azucar Reservoir

RIO GRANDE AT RIO GRANDE CITY STATION

DESCRIPTION: Water-stage recorder and cable with stand-up cable car and winch, located about 4 river miles below Rio Grande City, Texas 3.7 miles northeast of Camargo, Tamaulipas, 7.9 miles below the confluence of the Rio San Juan with the Rio Grande and 1,015.3 river miles below the American Dam at El Paso, Texas. Zero of the gage is at mean sea level, U. S. C. & G. S. datum.

RECORDS: Based upon 104 meter measurements during the year, 92 by the United States and 12 by the Mexican Section of this Commission. Computations by shifting channel methods. 1946 records good. Records available: May, June and October 1914; September 1916; September and October 1917; October 1918; September and October 1919; August and September 1920; June 1922; September 1923; January 1924 through December 1946. For a statement of all records of discharge at this station, including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: Reservoirs, diversions and drainage returns modify the river flow at this station. When the water at this station rises above a gage height of about 149.20 feet, water overflows the left river bank beyond the station cable, but such water is measured. For chemical and bacterial content of river and tributary flow, for watershed and irrigated areas and other related data, see index in Water Bulletin No. 14 and later bulletins.

EXTREME FLOWS: The greatest recorded flow was on September 5, 1932 when the peak stage was 157.4 feet and the flow was 198,800 second feet. The 1932 flood was the greatest since that of August 30, 1909 which reached a stage here of between 157.8 and 159.1 feet. By tradition in 1914 and 1931 and by some evidence it is indicated that great floods occurred here in 1865 and 1874 and that one of these floods reached a stage here of about 160 feet.

CORRECTION: See pages 51 and 52 of Water Bulletin No. 15 for flood flows and corrected flows, for the years 1914 to 1926.

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,920	2,950	2,100	1,670	2,410	25,700	6,350	1,700	7,470	12,700	3,650	2,530
2	2,950	2,950	2,120	1,560	2,470	11,700	5,810	3,020	5,290	9,910	3,630	2,500
3	2,910	2,850	2,140	1,460	2,340	6,450	5,980	4,160	3,460	8,500	3,560	2,510
4	2,900	2,840	2,100	1,410	2,690	4,150	6,110	2,590	2,570	7,530	3,890	2,450
5	2,860	2,780	2,100	1,420	5,330	3,020	5,920	1,830	2,140	5,800	3,570	2,420
6	2,810	2,720	2,020	1,460	4,490	2,450	5,500	1,590	1,910	4,850	3,530	2,410
7	2,810	2,680	1,970	1,540	10,400	1,820	5,730	1,430	1,830	5,950	3,380	2,360
8	2,820	2,680	1,950	1,540	21,000	1,470	4,400	1,330	2,420	4,870	3,320	2,350
9	2,860	2,720	1,940	1,540	15,100	5,920	3,800	1,290	7,200	36,700	3,300	2,400
10	2,890	2,730	1,990	1,560	11,700	9,860	3,520	1,310	6,280	61,700	3,240	2,410
11	2,880	2,780	1,970	1,540	8,080	4,900	3,150	1,310	6,210	29,600	3,180	2,450
12	2,940	2,770	1,940	1,520	5,750	3,460	3,070	1,450	8,610	19,400	3,150	2,430
13	3,120	2,650	1,900	1,620	7,100	2,950	3,220	1,400	8,250	15,900	3,040	2,420
14	3,200	2,640	1,780	2,270	5,340	2,160	3,970	1,260	6,650	15,400	3,060	2,490
15	3,220	2,670	1,730	2,180	4,000	1,670	3,540	1,200	6,960	13,400	3,060	2,490
16	3,180	2,520	1,790	1,960	3,970	1,430	3,240	1,170	12,700	11,500	2,890	2,730
17	3,350	2,440	1,860	2,560	4,100	1,370	3,500	1,150	9,300	9,950	2,800	2,760
18	3,380	2,350	1,880	3,040	3,760	1,260	3,650	1,110	9,120	8,530	2,820	2,580
19	3,160	2,280	1,860	1,970	3,580	1,230	3,340	1,150	7,580	7,480	2,960	2,810
20	3,040	2,190	1,760	1,600	2,950	1,160	3,090	1,220	4,970	6,650	2,940	2,690
21	2,990	2,150	1,760	1,560	3,210	1,960	2,820	1,250	5,030	6,070	2,890	2,550
22	3,060	2,190	1,780	1,690	6,590	3,540	2,780	1,250	6,130	5,710	2,770	2,410
23	3,140	2,200	1,820	2,440	5,120	12,000	2,910	1,200	4,280	5,230	2,760	2,370
24	3,130	2,260	1,800	17,400	3,150	11,200	2,980	1,210	8,210	4,880	2,750	2,390
25	3,150	2,240	1,730	12,400	2,650	6,140	2,460	1,190	18,100	4,650	2,720	2,360
26	3,140	2,170	1,670	8,250	11,200	32,800	2,180	1,220	12,400	4,570	2,650	2,330
27	3,000	2,160	1,620	5,300	25,800	32,500	2,340	1,260	7,760	4,240	2,620	2,420
28	2,870	2,190	1,600	3,890	13,500	16,400	2,350	1,380	9,570	4,180	2,670	2,490
29	2,930		1,730	3,240	6,460	9,640	2,110	12,700	8,400	4,140	2,740	2,410
30	2,950		1,900	2,620	24,900	7,880	1,920	16,200	7,950	3,950	2,650	2,310
31	2,870		1,790		61,700		1,770	10,100		3,770		2,240
Sum	70,710		58,100		94,210		228,150		81,610		347,470	
	93,390				290,640		113,490		208,750		92,190	
Current Year 1946									Period 1924-1946			
Month	Extreme Gage Feet		Extreme Second Feet				Average Second Feet	Total	Acre Feet			
	High	Low	Day	High	Day	Low			Normal	Maximum	Minimum	
Jan.	125.26	124.46	17	3,490	6	2,770	3,010	185,000	255,177	* 521,000	140,000	
Feb.	124.64	123.69	1	2,970	28	2,100	2,530	140,000	201,087	368,690	125,000	
Mar.	123.77	123.04	3	2,170	27	1,600	1,870	115,000	199,729	401,000	108,000	
Apr.	132.19	122.80	24	19,400	5	1,400	3,140	187,000	193,975	340,000	97,700	
May	142.60	123.88	31	77,300	25	2,140	9,380	576,000	419,738	833,000	98,900	
June	138.33	123.55	27	43,000	20	1,100	7,600	453,000	495,753	1,737,000	74,500	
July	128.53	124.04	1	7,080	31	1,710	3,660	225,000	429,282	1,240,000	152,000	
Aug.	132.28	123.28	30	18,600	18	1,100	2,630	162,000	419,346	1,280,000	121,000	
Sept.	132.82	124.00	25	21,100	7	1,810	6,960	414,000	1,012,899	3,723,800	79,400	
Oct.	141.87	125.77	10	68,900	31	3,700	11,200	689,000	793,486	2,852,270	204,000	
Nov.	126.25	124.69	4	4,350	30	2,600	3,070	183,000	312,762	829,260	156,000	
Dec.	125.00	124.21	19	2,840	31	2,210	2,470	152,000	259,959	625,260	143,000	
Yearly	142.60	122.80		77,300		1,100	4,810	3,481,000	4,993,193	9,554,530	2,643,000	

* Partly estimated

CONTRIBUTIONS FROM RIO SAN JUAN

Below Rio Grande City Station

DESCRIPTION: Azucar Dam is located on the Rio San Juan channel 12.4 river miles above the confluence with the Rio Grande. This confluence is 7.9 river miles above the Rio Grande City gaging station and 1,007.4 river miles below the American Dam at El Paso, Texas. The zero of the reservoir gage at Azucar Dam is 7.64 feet above mean sea level, U. S. C. & G. S. datum. Contributions to the Rio Grande from the Rio San Juan all pass through the Azucar Reservoir and reach the Rio Grande between the Roma and the Hidalgo gaging stations. The portion of such contributions reported on this page reach the Rio Grande below the Rio Grande City gaging station. Reported on the second page heretofore is the portion which reached the Rio Grande above the Rio Grande City Station. All of the water contributions listed below reached the Rio Grande at a point about 5 river miles below the Rio Grande City gaging station and were measured at the head of the main canal near Azucar Dam.

RECORDS: All discharge records reported below were furnished by the National Irrigation Commission of Mexico. Records began January 1, 1946. 1946 records good. Records available January 1 to December 31, 1946. REMARKS: In order to lower the water level in Azucar Reservoir for completion of the spillway crest from January 1 to March 12, 1946, 15,960 acre feet of water was released through the main canal and discharged therefrom at kilometer 21.4 and conveyed thence by drainage canal to the Rio Grande. From March 28 to April 21 and from August 10 to 29, 1946, 25,010 acre feet of water were likewise released to the Rio Grande to relieve a shortage of irrigation water on the United States side of the Lower Rio Grande Valley. 2,900 acre feet of additional water for this purpose is reported on the second page heretofore. On October 2, 1946 Azucar Dam was officially named Presa Marte R. Gomez.

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	0	0	0	353	0	0	0	0	0	0	0	0
2	0	0	0	339	0	0	0	0	0	0	0	0
3	0	0	0	371	0	0	0	0	0	0	0	0
4	0	0	0	456	0	0	0	0	0	0	0	0
5	0	0	0	283	0	0	0	0	0	0	0	0
6	0	0	0	215	0	0	0	0	0	0	0	0
7	0	0	0	360	0	0	0	0	0	0	0	0
8	0	0	0	321	0	0	0	0	0	0	0	0
9	0	0	0	258	0	0	0	0	0	0	0	0
10	0	0	0	251	0	0	0	138	0	0	0	0
11	0	0	0	261	0	0	0	353	0	0	0	0
12	194	0	0	111	0	0	0	353	0	0	0	0
13	427	0	0	0	0	0	0	406	0	0	0	0
14	427	0	0	0	0	0	0	431	0	0	0	0
15	417	0	0	0	0	0	0	413	0	0	0	0
16	396	0	0	0	0	0	0	466	0	0	0	0
17	410	0	0	0	0	0	0	512	0	0	0	0
18	431	0	0	0	0	0	0	501	0	0	0	0
19	420	0	0	0	0	0	0	477	0	0	0	0
20	410	0	0	0	0	0	0	441	0	0	0	0
21	441	0	0	0	0	0	0	413	0	0	0	0
22	452	0	0	0	0	0	0	396	0	0	0	0
23	441	0	0	0	0	0	0	388	0	0	0	0
24	431	0	0	0	0	0	0	371	0	0	0	0
25	487	0	0	0	0	0	0	360	0	0	0	0
26	519	0	0	0	0	0	0	343	0	0	0	0
27	516	0	0	0	0	0	0	332	0	0	0	0
28	509	0	184	0	0	0	0	367	0	0	0	0
29	448		344	0	0	0	0	187	0	0	0	0
30	208		343	0	0	0	0	150	0	0	0	0
31	60		360		0		0	0		0		0
Sum	8,044	0	1,231	3,579	0	0	0	7,798	0	0	0	0
Current Year 1946									Period			
Month	Extreme Gage Feet		Extreme Second Feet @				Average Second Feet	Total Acre Feet	Acre Feet			
	High	Low	Day	High	Day	Low			Normal	Maximum	Minimum	
Jan.			26	519	‡ 1	0	259	15,960				
Feb.				0		0	0	0				
Mar.			31	360	‡ 1	0	39.7	2,440				
Apr.			4	456	‡ 13	0	119	7,100				
May				0		0	0	0				
June				0		0	0	0				
July				0		0	0	0				
Aug.			17	512	‡ 1	0	252	15,470				
Sept.				0		0	0	0				
Oct.				0		0	0	0				
Nov.				0		0	0	0				
Dec.				0		0	0	0				
Yearly				519		0	56.6	40,970				

@ Mean daily ‡ And other days

RIO GRANDE AT HIDALGO STATION

DESCRIPTION: Water-stage recorder on the downstream side of the United States end of the international highway bridge between Hidalgo, Texas and Reynosa, Tamaulipas, 1,084.8 river miles below the American Dam at El Paso, Texas and 156.6 river miles from the Gulf of Mexico. Zero of the gage is mean sea level, U. S. C. & G. S. datum.

RECORDS: Based upon 8 meter measurements during the year. Computations by shifting channel methods. Records available: July 1928 to December 1931; September and October 1932; peak flows in September 1933 and in 1934, also January to July and September 1935; peak flows May and October, and full record July and September 1936; full record April 26 to December 31, 1938, and January to November 1939. Complete gage height record and discharges during peaks, 1940 through 1946. For a statement of all records of discharge at this station, including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: On July 28, 1941 the zero of the gage was changed to U. S. C. & G. S. mean sea level datum. At this time it was found that the elevation previously reported (79.28 feet) in these water bulletins as the elevation of the zero of the gage, was in error, the correct figure being 79.03 feet. All previously reported gage heights should be corrected accordingly. Another gage (Weather Bureau) at this bridge has a zero elevation of 79.03 feet. When the river at this station reaches a stage of about 100.5 feet, or a flow of about 60,000 second feet, water begins to flow into two floodway inlets on the United States side, viz.: Hackney Lake Inlet about 4 miles upstream and Mission Inlet about 15 miles above this station, but the river may begin to overflow at Granjeno and Jardin de Flores at stages about 3.5 feet lower. The bottom of the river at this station is subject to considerable erosion during floods. See Water Bulletin No. 3, page 38. For chemical content of the river water, for watershed and irrigated areas and other related data see index in Water Bulletin No. 14 and later bulletins.

EXTREME FLOWS: The highest recorded stage was in 1909 when 106.92 feet on the present gage was reached. In 1910, 105.85 feet was reached. These were before the present river bridge and highway embankments were constructed at this point. In 1932 the peak stage was 104.88 and the peak flow was 83,870 second feet. See previous water bulletins and Special Flood Report, 1932, by the United States Section of this Commission.

Mean Daily Gage Height in Feet — 1946

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	82.50	82.68	80.66	80.34	82.48	96.20	86.15	79.97	86.68	87.02	83.31	81.94
2	82.42	82.63	80.72	80.19	82.12	90.56	85.24	80.05	85.31	88.00	83.15	81.34
3	82.29	82.66	81.22	80.14	81.82	87.21	84.86	80.94	83.89	86.64	83.27	81.13
4	82.20	82.56	80.64	79.76	81.86	85.45	84.97	83.05	82.64	86.30	82.80	*81.08
5	82.31	82.43	80.26	79.64	81.95	84.31	85.06	82.03	81.44	85.68	82.75	*81.07
6	82.51	82.30	80.31	79.85	83.56	83.50	84.86	80.72	80.58	85.06	82.70	*81.09
7	82.19	82.14	80.22	80.38	84.25	83.01	84.62	79.96	80.31	84.65	82.56	81.22
8	81.88	82.26	80.10	79.56	88.29	82.83	84.34	79.40	80.54	85.09	82.42	81.78
9	81.85	82.08	80.30	79.22	90.31	83.33	83.65	79.16	80.43	87.46	82.48	81.23
10	81.99	82.29	80.80	79.03	88.11	86.64	83.07	79.17	83.83	96.26	82.84	81.02
11	82.21	82.29	80.23	79.09	87.00	87.22	82.56	80.41	84.72	97.11	82.26	81.00
12	82.49	82.31	80.03	79.12	86.10	85.25	82.22	79.78	85.24	93.06	81.84	81.20
13	82.83	82.13	80.08	80.05	84.89	84.04	82.16	79.46	86.42	90.77	81.73	81.34
14	83.22	82.17	80.16	80.50	85.11	83.69	82.60	79.82	86.20	89.72	81.60	81.59
15	83.41	82.16	80.38	79.76	84.56	* 82.95	82.72	79.72	85.92	89.19	81.62	82.01
16	83.48	82.23	80.30	79.94	83.54	* 82.51	82.52	80.22	86.68	88.72	81.83	81.83
17	83.46	82.26	79.30	79.86	83.02	* 82.41	82.12	81.03	87.12	87.83	82.16	*81.61
18	83.46	81.86	80.16	79.87	83.26	* 82.36	81.98	81.08	86.93	87.10	81.63	*81.82
19	83.39	81.56	79.57	80.89	83.40	* 82.05	82.28	79.84	86.50	86.47	81.26	*82.00
20	83.53	81.37	80.18	80.90	82.68	* 81.43	82.22	* 79.29	85.99	86.11	81.36	82.23
21	83.42	81.36	79.69	80.68	81.91	* 80.89	82.38	* 79.30	85.03	85.72	81.46	82.44
22	83.26	81.32	79.43	80.11	82.08	* 81.50	81.73	* 79.30	84.88	85.43	81.43	82.37
23	83.25	81.20	80.83	79.40	84.39	* 85.80	81.45	* 79.40	85.27	85.10	81.69	82.20
24	83.33	81.65	81.16	82.40	84.18	88.71	81.47	* 79.50	85.44	84.81	82.04	81.89
25	83.29	81.42	79.96	88.66	82.53	87.81	81.53	* 79.60	88.66	84.61	81.53	81.95
26	83.20	80.98	79.16	87.15	82.08	89.21	81.34	* 79.60	90.29	84.44	81.24	81.60
27	83.39	80.83	79.20	85.74	89.19	94.94	81.19	* 79.50	87.63	84.47	81.34	81.63
28	83.33	80.69	79.14	84.70	90.82	93.14	81.66	* 80.00	86.49	83.99	81.60	81.85
29	83.23		79.39	83.32	86.98	89.40	81.41	80.44	86.78	83.72	81.28	82.02
30	83.19		80.98	82.53	85.20	87.51	80.82	87.78	86.49	83.66	81.31	81.95
31	83.03		81.45		94.75		80.36	88.49		83.48		81.69

Sum

Current Year 1946								Period		
Month	Extreme Gage Feet		Extreme Second Feet			Average Second Feet	Total Acre Feet	Acre Feet		
	High	Low	Day	High	Low			Normal	Maximum	Minimum
Mar.		79.20				17				
Mar.		79.01				27				
Apr.		78.99				10				
May	90.88		9	19,200						
May	91.90		28	25,100						
June	97.33		1	39,100						
June	95.55		27	35,100						
Aug.		79.00			10					
Sept.	90.75		26	19,100						
Oct.	97.73		11	39,800						
Yearly	97.73	78.99		39,800						

* Estimated * Partly estimated

RIO GRANDE AT LAS PALMAS STATION

DESCRIPTION: Water-stage recorder and cable with cable car, located 1,640 feet below the Retamal Canal intake, 24.2 river miles below Hidalgo, Texas and Reynosa, Tamaulipas and 1,109.0 river miles below the American Dam at El Paso, Texas. Zero of the gage is .85 foot above mean sea level, U. S. C. & G. S. datum.

RECORDS: Based upon 165 meter measurements during the year. Computations by shifting channel methods. 1946 records good. Records available: gage heights from January 13 to October 31, 1945 and daily discharges from November 1, 1945 to December 31, 1946. For a statement of all records of discharge at this station, including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: This station was constructed by the National Irrigation Commission of Mexico and is operated by the Mexican Section of the International Boundary and Water Commission. This station replaces the station at Buenos Aires which was destroyed by the flood of September 1, 1944. Gage readings began January 13, 1945. The recorder was installed October 4, 1945, and measurements began November 1, 1945. For chemical content of river water at this station, see elsewhere in this bulletin.

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,280	2,990	1,440	1,460	2,460	30,760	6,070	692	7,910	6,820	2,730	1,580
2	2,290	2,740	1,430	992	2,270	18,890	4,520	688	5,470	9,430	2,610	1,640
3	2,190	2,720	1,500	805	1,990	9,180	3,810	597	3,780	7,660	2,610	1,310
4	2,030	2,680	1,540	901	1,920	5,440	4,130	1,450	2,640	6,460	2,630	1,240
5	2,180	2,540	1,190	865	1,980	3,570	4,270	2,130	1,820	6,040	2,280	1,290
6	2,290	2,510	1,120	816	2,710	2,740	4,170	1,320	1,170	5,160	2,370	1,300
7	2,360	2,410	1,070	971	3,670	2,270	3,960	812	865	4,340	2,250	1,310
8	2,360	2,310	978	1,010	8,900	2,060	3,780	455	812	4,490	2,180	1,550
9	1,880	2,280	961	646	18,080	2,000	3,190	290	812	6,000	2,090	1,620
10	1,970	2,310	1,210	501	12,820	4,100	2,590	267	1,840	28,850	2,330	1,340
11	2,240	2,390	1,090	484	9,470	7,730	2,000	505	3,960	32,980	2,340	1,270
12	2,310	2,330	992	569	7,660	5,370	1,730	770	4,310	22,280	1,880	1,320
13	2,460	2,340	894	798	5,900	3,520	1,580	420	5,790	15,640	1,700	1,440
14	2,500	2,320	795	1,280	5,370	3,010	1,710	466	6,320	13,170	1,620	1,510
15	2,960	2,320	766	1,090	5,050	2,420	2,030	484	5,900	12,010	1,590	1,750
16	3,310	2,340	692	904	8,410	1,920	2,120	360	5,900	11,020	1,660	1,860
17	3,270	2,360	971	1,090	2,560	1,600	1,910	1,040	8,020	9,150	1,830	1,740
18	3,240	2,280	1,150	876	2,510	1,290	1,660	1,290	6,920	7,660	1,800	1,760
19	3,280	2,050	763	1,120	2,670	1,030	1,770	968	6,750	6,500	1,440	1,800
20	3,400	1,850	795	1,430	2,560	879	1,810	410	6,000	5,790	1,350	1,890
21	3,480	1,790	1,010	1,330	1,950	812	1,820	312	5,190	5,370	1,470	2,150
22	3,270	1,840	632	1,270	1,620	915	1,760	325	4,340	4,980	1,490	2,170
23	3,140	1,940	1,000	893	2,770	3,110	1,420	660	4,870	4,560	1,550	2,170
24	3,230	1,910	1,520	1,130	3,990	9,750	1,390	1,250	5,440	4,240	1,710	1,900
25	3,270	1,930	1,330	10,630	3,290	9,640	1,430	1,350	11,090	4,030	1,700	1,930
26	3,220	1,640	678	9,070	2,640	10,630	1,440	858	15,930	3,810	1,420	1,850
27	3,360	1,440	509	5,830	12,470	26,380	1,310	388	9,750	3,740	1,380	1,710
28	3,450	1,430	544	4,060	17,760	24,440	1,310	319	6,530	3,520	1,520	1,770
29	3,370		562	3,280	9,530	13,560	1,420	327	6,600	3,150	1,570	1,920
30	3,280		1,090	2,550	5,930	8,330	1,130	7,560	6,430	3,080	1,350	1,980
31	3,240		1,660		25,390		837	11,650		2,960		1,880
Sum	86,750	61,990	31,882	58,651	196,300	217,346	74,077	40,353	163,159	264,890	56,450	51,950

Month	Current Year 1946					Period 1945-1946 #			
	Extreme Gage Feet		Extreme Second Feet		Average Second Feet	Total Acre Feet	Acre Feet		
	High	Low	Day	Day			Average	Maximum	Minimum
Jan.	67.59	66.11	21	3,480	9	1,850	2,800	172,100	
Feb.	67.22	64.96	1	3,140	23	1,360	2,210	123,000	
Mar.	65.55	63.29	31	1,770	27	491	1,030	63,240	
Apr.	72.24	63.16	25	13,560	11	466	1,960	116,300	
May	79.53	65.78	31	40,610	3	1,880	6,330	389,400	
June	79.95	65.62	1	32,170	21	795	7,240	431,100	
July	71.06	65.12	1	7,130	31	742	2,390	146,900	
Aug.	72.51	64.07	31	12,400	10	246	1,300	80,400	
Sept.	74.11	64.80	26	16,810	9	703	5,440	323,600	
Oct.	80.05	67.75	11	33,760	31	2,780	8,540	525,400	
Nov.	67.78	65.75	1	2,800	30	1,280	1,880	112,000	142,500
Dec.	66.86	65.58	22	2,240	3	1,190	1,680	103,000	127,050
Yearly	80.05	65.16		40,610		246	3,570	2,586,080	

Discharge record began November 1, 1945

RIO GRANDE FLOODWAY DISCHARGES IN THE LOWER RIO GRANDE VALLEY

On The United States Side 1946

There are three floodways on the United States side of the Rio Grande Delta, which divert excess Rio Grande flood waters to the Gulf of Mexico. Such floodway discharges are measured at gaging stations known as North Floodway South of McAllen, South Floodway South of McAllen, and Rancho Viejo Floodway near Brownsville. The first two of these gaging stations are described in Water Bulletin No. 2, page 41. The third one is described in Water Bulletin No. 6, page 41. There was no flow through any of these floodways in 1946.

North Floodway Near Sebastian, Texas — 1946

The channel of the North Floodway in the vicinity of Sebastian, Texas serves as a drainage channel as well as a floodway. During 1946 an average of two meter measurements per month was made of the flow at this point. From these measurements and rainfall records, the following table of estimated drainage flow was prepared. The salt burden carried by this drainage flow will be found elsewhere in this bulletin under the heading "Chemical Analyses of Water Samples".

Mean Daily Second Feet — 1946				Acre Feet			
Month	Average	Maximum	Minimum	Total 1946	# Period 1940—1946		
					Average	Maximum	Minimum
January	57.0	165	44.2	3,510	3,205	7,450	1,400
February	45.0	53.3	34.0	2,500	2,785	6,010	1,610
March	35.0	40.0	26.1	2,150	3,295	5,380	1,880
April	28.7	92.0	7.2	1,710	3,028	5,900	1,710
May	37.2	70.0	30.5	2,290	6,615	24,200	2,290
June	60.4	175	29.4	3,590	4,700	9,090	942
July	22.0	29.2	14.4	1,350	2,747	7,170	1,060
August	14.5	68.0	1.5	889	1,656	2,600	605
September	111	400	9.6	6,610	23,745	125,700	1,400
October	117	300	70.7	7,180	3,109	7,180	136
November	63.0	69.6	57.5	3,750	2,184	3,750	861
December	59.6	67.0	48.1	3,670	3,060	4,480	1,830
Yearly	54.1	400	1.5	39,199	60,129	158,550	28,412

Record began October 1940 † Period 1941-1946

On the Mexican Side — 1946

There are several regular floodways on the Mexican side which divert excess flood waters to the Gulf of Mexico. For the year 1946, the information set out below is known concerning such flood flows.

Retamal Canal

Full information on the flows through this canal are shown elsewhere in this bulletin under the heading "Diversions from the Rio Grande into the Retamal Canal".

Floodway No. 3

This floodway was opened at noon on October 12. No information as to volume or duration of flow is available.

RIO GRANDE AT MATAMOROS STATION

DESCRIPTION: Water-stage recorder and cable with sit-down cable car and winch. The water-stage recorder is attached to the central pier of the railroad bridge over the Rio Grande between Matamoros, Tamaulipas and Brownsville, Texas about 57.6 miles upstream from the Gulf of Mexico and 1,185.8 river miles below the American Dam at El Paso, Texas. The cable and car are located 0.3 mile upstream from the bridge. Zero of the present gage is 15.26 feet above mean sea level, U. S. C. & G. S. datum.

RECORDS: Based upon 181 meter measurements during the year, 171 by the Mexican and 10 by the United States Section of this Commission. The river bottom shifts greatly at this station. Computations by shifting channel methods. 1946 records good. Records available: 1901 to 1913; 1923 to December 1946. For a statement of all records of discharge at this station, including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: In May 1924 a recorder was established 0.6 mile upstream from the bridge. In September 1925 the recorder was moved to its present location. On October 3, 1930, the zero of the gage was lowered 5 feet. Reservoirs, diversions and drainage returns modify the flow at this station. During floods, only a portion of the river flow discharges past this station through the channel of the Rio Grande, as part finds outlet to the Gulf of Mexico through flood channels in both countries, which divert from the Rio Grande within 117.4 miles above this station. For silt content of river water at this station, for watershed and irrigated areas and other related data see index in Water Bulletin No. 14 and later bulletins.

EXTREME FLOWS: The greatest flow recorded here was on June 22, 1903 when a mean daily flow of 36,200 second feet occurred with a gage height of 13.2 feet. The greatest flow since 1923 was on September 16, 1942 when 32,300 second feet passed this station with a gage height of 22.51 feet. The highest gage reading was on October 2, 1936 when a reading of 22.57 feet, present gage, was reached with a discharge of 29,600 second feet. In 1930 the river at this station was dry for a few days in March and April. On March 25, 1946 the minimum flow was 0.7 second feet with a stage of -0.92 foot. The lowest recorded gage reading was on April 30 1944 when a gage height of -1.12 was reached.

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,660	3,000	908	8.8	1,860	23,380	7,280	300	7,910	7,030	2,670	883
2	1,520	2,920	816	217	1,790	24,370	4,840	317	5,550	8,020	2,600	971
3	1,430	2,840	816	254	1,740	15,080	3,500	116	4,240	8,790	2,630	908
4	1,480	2,830	953	50.9	1,430	7,950	3,030	24.4	3,020	7,490	2,690	632
5	1,610	2,830	883	6.4	1,130	5,300	3,200	5.7	2,290	6,460	2,530	445
6	1,850	2,760	745	14.8	1,070	3,850	3,270	371	1,230	6,250	2,060	406
7	1,980	2,600	487	24.7	1,230	2,880	3,340	565	403	5,720	1,960	420
8	1,880	2,640	352	26.5	2,250	2,430	3,170	247	237	4,630	1,710	551
9	1,570	2,570	335	18.0	9,610	2,320	2,680	45.2	134	4,450	1,520	890
10	1,200	2,450	326	10.2	14,120	2,280	2,330	7.8	107	13,030	1,590	777
11	925	2,380	333	9.5	10,170	* 3,330	1,730	4.2	87.2	25,040	1,870	795
12	936	2,210	360	10.9	7,770	6,320	1,170	3.2	1,380	26,590	1,930	675
13	1,680	2,080	343	14.5	5,930	5,330	660	3.2	2,990	20,480	1,650	703
14	2,380	2,100	226	19.4	4,560	3,740	625	2.8	3,740	15,610	1,240	717
15	2,850	2,160	129	35.3	3,990	3,110	607	2.5	4,800	13,420	1,020	915
16	3,170	2,230	90.4	44.1	3,530	2,710	622	2.5	4,590	11,900	1,050	1,190
17	3,300	2,380	64.3	28.3	2,610	2,310	618	3.2	5,330	10,350	1,190	943
18	3,400	2,470	56.9	18.4	1,780	1,790	643	2.8	6,500	8,510	1,530	833
19	3,310	2,330	56.5	23.0	1,620	1,350	459	2.8	5,930	7,520	1,360	788
20	3,220	1,910	90.1	30.0	1,590	1,070	403	71.3	5,830	6,920	858	932
21	3,290	1,510	69.2	58.6	1,390	893	554	59.0	5,720	6,350	579	1,170
22	3,480	1,270	37.1	282	964	953	727	64.3	5,260	5,610	696	1,630
23	3,570	1,240	17.3	198	614	1,310	540	36.4	4,410	5,120	925	1,970
24	2,990	1,400	6.4	209	530	2,950	452	12.0	4,450	4,730	950	1,760
25	2,990	1,610	1.8	459	1,800	8,410	431	21.2	5,160	4,380	1,170	1,800
26	3,140	1,810	305	5,610	2,010	7,770	374	103	11,480	4,100	999	1,780
27	3,330	1,590	250	6,530	1,290	13,380	388	158	13,630	3,960	717	1,240
28	3,410	1,130	79.1	5,050	8,650	22,740	424	113	8,260	3,920	561	978
29	3,430		26.8	3,960	13,490	19,140	484	79.5	6,640	3,200	689	1,140
30	3,390		10.9	2,660	7,910	11,690	424	70.3	6,820	2,660	996	1,200
31	3,230		21.2		7,700		367	3,380		2,770		996
Sum	77,601	61,250	25,881.3	126,128	210,136	49,342	6,194.3	138,128.2	43,940	31,038		
Current Year 1946												
Period 1924-1946												
Month	Extreme Gage Feet		Extreme Second Feet				Average Second Feet	Total Acre Feet	Acre Feet			
	High	Low	Day	High	Day	Low			Normal	Maximum	Minimum	
Jan.	6.14	2.59	23	3,600	11	791	2,500	153,900	218,006	490,800	92,240	
Feb.	5.74	2.46	1	3,080	28	1,020	2,190	121,500	151,428	328,500	28,470	
Mar.	2.59	- .92	4	999	25	0.7	297	18,240	115,511	240,800	18,240	
Apr.	9.19	- 1.82	26	7,420	18	16.6	865	51,340	113,929	317,800	15,450	
May	13.52	1.12	10	14,660	24	396	4,070	250,200	285,323	721,100	34,630	
June	19.23	2.36	2	25,360	21	805	7,000	416,800	381,019	1,180,500	2,580	
July	11.22	1.80	1	8,690	31	319	1,590	97,870	321,926	756,600	54,420	
Aug.	9.12	- .07	31	7,910	14	2.1	200	12,290	284,221	853,700	12,290	
Sept.	13.48	.85	27	14,690	11	77.3	4,600	274,000	626,142	1,363,200	24,740	
Oct.	19.62	5.25	12	27,330	31	2,600	8,550	525,600	607,426	1,408,500	124,280	
Nov.	5.28	1.87	4	2,690	21	554	1,460	87,150	276,331	827,500	87,150	
Dec.	4.30	1.48	23	2,030	6	378	1,000	61,560	211,708	594,200	61,560	
Yearly	19.62	- .92		27,330		0.7	2,860	2,070,450	3,592,970	6,579,500	1,680,360	

* Partly estimated

RIO GRANDE AT LOWER BROWNSVILLE STATION

DESCRIPTION: Water-stage recorder and cable with stand-up cable car and winch, located about 1,000 feet below the El Jardin pumping plant, about 6.6 river miles below Brownsville, Texas and Matamoros, Tamaulipas, 50.4 miles upstream from the Gulf of Mexico and 1,191.0 river miles below the American Dam at El Paso, Texas. Zero of the gage is at mean sea level, U. S. C. & G. S. datum. An auxiliary water-stage recorder located at the El Jardin pumping plant was used during periods of low flow.

RECORDS: Based upon 73 meter measurements during the year, 54 by the United States and 19 by the Mexican Section of this Commission. Computations by shifting channel methods. 1946 records good. Records available: January 1934 to December 1946. For a statement of all records of discharge at this station, including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: Reservoirs, diversions and drainage returns, modify the river flow at this station. During floods, only a portion of the river flow discharges past this station through the channel of the Rio Grande, as part finds outlet to the Gulf of Mexico through flood channels in both countries, which divert from the Rio Grande within 124.6 miles above this station. For chemical and bacterial content of river and tributary water, for watershed and irrigated areas and for other related data, see index in Water Bulletin No. 14 and later bulletins.

EXTREME FLOWS: On September 14, 1942 a peak discharge of 31,000 second feet was reached with a gage height of 33.24 feet. Additional data concerning flood peaks may be found in previous water bulletins. The river was dry at this station a few days in 1930, March 25-28, 1935, June 16-19, 1938, several days in 1940, several days in 1943, several days in 1944, several days in 1945, and several days in 1946.

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,400	2,920	980	3.7	1,800	18,400	7,520	181	7,300	6,620	2,350	744
2	1,300	2,810	820	165	1,590	23,500	5,110	27.9	5,550	7,050	2,300	809
3	1,240	2,710	823	170	1,630	15,400	3,630	2.1	3,940	8,540	2,300	793
4	1,370	2,680	959	53.8	1,360	8,660	2,850	.3	2,800	7,530	2,330	591
5	1,440	2,620	896	6.3	1,010	5,960	2,940	0	1,760	6,440	2,190	400
6	1,660	2,560	706	.8	948	4,430	3,030	163	939	5,810	1,860	336
7	1,820	2,440	562	.4	1,040	3,450	3,160	463	376	5,020	1,750	384
8	1,720	2,450	452	2.3	1,720	2,680	3,110	243	139	4,130	1,560	502
9	1,400	2,360	415	4.4	6,960	2,330	2,770	20.4	36.2	3,790	1,380	777
10	1,080	2,310	409	4.6	13,200	2,500	2,500	.1	34.5	9,100	1,380	668
11	906	2,290	366	1.0	10,000	2,820	1,630	.1	21.4	20,900	1,550	666
12	955	2,220	458	.9	7,790	5,920	1,020	0	741	24,500	1,550	704
13	1,400	1,970	411	2.6	5,980	5,240	617	0	2,210	20,900	1,290	672
14	2,320	1,960	253	.9	4,290	3,780	536	0	3,000	15,500	970	668
15	2,670	2,000	127	.8	3,400	3,160	433	0	4,110	12,700	837	842
16	2,890	2,070	103	.9	3,170	2,830	428	0	4,420	11,100	807	1,080
17	2,980	2,230	48.7	5.2	2,630	2,390	454	0	4,820	9,890	893	920
18	3,010	2,320	28.7	.9	1,820	1,860	493	0	5,970	8,370	1,220	797
19	3,080	2,240	10.9	4.3	1,490	1,190	410	0	5,560	7,280	1,220	736
20	3,120	1,830	59.1	8.5	1,330	802	345	3.0	5,370	6,500	776	809
21	3,160	1,470	24.8	4.5	1,220	668	405	6.8	5,230	5,870	462	1,030
22	3,170	1,250	33.4	247	986	602	571	0	4,990	5,390	467	1,430
23	3,130	1,160	4.7	112	658	862	419	0	4,110	4,870	705	1,860
24	3,110	1,280	6.1	133	456	1,780	357	0	3,950	4,480	767	1,740
25	3,000	1,460	2.9	198	1,270	7,100	323	0	4,460	4,160	938	1,600
26	3,000	1,720	128	5,890	1,990	8,350	285	29.9	10,000	3,860	960	1,690
27	3,030	1,610	208	6,620	1,390	13,400	263	112	12,900	3,750	683	1,260
28	3,030	1,230	64.0	5,390	6,000	20,700	308	49.0	8,810	3,690	550	900
29	3,030		13.0	4,120	13,000	19,900	308	3.6	6,650	3,280	581	974
30	3,000		7.0	2,830	8,590	11,700	286	8.1	6,700	2,760	798	1,080
31	2,950		3.1		6,490		279	1,710		2,510		948
Sum	71,371	58,170	25,981.8	115,208	202,364	46,790	3,023.3	126,897.1	246,290	37,424	28,410	
Current Year 1946									Period 1934-1946			
Month	Extreme Gage Feet		Extreme Second Feet				Average Second Feet	Total Acre Feet	Acre Feet			
	High	Low	Day	High	Day	Low			Normal	Maximum	Minimum	
Jan.	17.15	13.19	22	3,180	11	879	2,300	142,000	188,554	299,000	88,200	
Feb.	16.72	13.22	1	2,950	28	1,080	2,080	115,000	132,085	237,000	26,300	
Mar.	13.21	9.66	1	1,050	423	0	302	18,600	101,177	199,000	18,600	
Apr.	20.37	9.64	27	7,010	1	0	866	51,500	96,069	242,000	12,500	
May	24.84	12.08	29	14,000	24	417	3,720	229,000	279,869	717,000	29,900	
June	30.30	13.23	2	24,300	22	595	6,750	401,000	361,722	*1,161,000	1,380	
July	22.89	12.15	1	9,060	31	242	1,510	92,800	317,385	759,000	65,900	
Aug.	20.13		31	6,300	1	0	975	6,000	235,000	679,000	6,000	
Sept.	24.90		27	13,600	10	0	4,230	252,000	594,715	1,337,000	21,300	
Oct.	30.82	16.25	12	25,000	31	2,410	7,940	489,000	559,000	*1,427,000	200,000	
Nov.	16.25	12.33	1	2,410	21	396	1,250	74,200	205,800	614,000	74,200	
Dec.	15.02	11.68	23	1,900	6	318	916	56,400	163,462	341,000	56,400	
Yearly	30.82			25,000		0	2,660	1,927,500	3,234,838	6,526,000	1,662,700	

* Partly estimated † And other days

STORED WATER IN LARGE RESERVOIRS OF THE RIO GRANDE BASIN

In Thousands of Acre Feet

The data below cover all reservoirs in the Rio Grande Basin having over 15,000 acre-foot capacity. The monthly figures represent the acre feet of water in storage on the last day of each month. The capacities shown are at spillway level and any storage figures published which are greater than the capacity, indicate that the water surface was above spillway level.

The names of the reservoirs and the sources of the data are: Rio Grande, Continental, Santa Maria, Terrence, Mountain Home, and Sanchez from Colorado State Engineer, Costilla from San Luis Power and Water Company, and El Vado from New Mexico State Engineer. Bluewater data are from the Secretary of the Bluewater-Toltec Irrigation District. Elephant Butte, Caballo, Alamogordo, McMillan and Avalon data are from the United States Bureau of Reclamation. Red Bluff data are from the office of the Red Bluff Water Power Control District, Pecos, Texas. Willacy data are from the Willacy County Water Control and Improvement District No. 1.

The data for Boquilla Reservoir for 1946 are from the Compañía Agrícola y de Fuerza Eléctrica del Rio Conchos, S. A. The data for Don Martin, Centenario and San Miguel are from the Banco Nacional de Crédito Agrícola, S. A. Data for Culebron, Villa Cardenas and Palto Blanco #2 are from the National Irrigation Commission of Mexico. Regular water storage began in the new El Anacur Reservoir in March 1945. The data for storage in El Anacur are from the Lower San Juan Irrigation District of Tamaulipas, Mexico. For information on some temporary storage in El Anacur Reservoir in 1942 see Remarks under Rio San Juan Station at Santa Rosalia on page 59 of Water Bulletin No. 12.

For previous records see "Stored water" in index to Water Bulletin No. 15 and subsequent bulletins.

On the United States Side

Month	Rio Grande (Capacity 51.1)		Continental (Capacity 26.7)		Santa Maria (Capacity 43.6)		Terrence (Capacity 17.7)		Mountain Home (Capacity 20.1)		Sanchez (Capacity 103.2)		Costilla (Capacity 15.7)		El Vado (Capacity 200.3)		Bluewater (Capacity 43.5)	
	1946	#Normal 1927-1946	1946	#Normal 1928-1946	1946	#Normal 1928-1946	1946	#Normal 1928-1946	1946	#Normal 1924-1946	1946	#Normal 1922-1946	1946	#Normal 1922-1946	1946	Normal 1935-1946	1946	#Normal 1927-1946
Jan.	4.9	14.2	13.1	5.4	4.9	7.5	1.4	2.6	2.6	4.6	6.1	15.0	1.4	5.8	86.9	58.2	0	6.1
Feb.	5.9	15.5	13.1	5.4	5.8	8.2	1.6	3.0	2.9	5.0	6.5	13.1	1.6	4.1	89.4	59.2	0	7.2
Mar.	7.5	16.8	13.1	5.4	6.5	9.7	2.2	3.5	3.3	5.3	7.7	13.9	2.2	4.6	95.2	64.1	-1	11.7
Apr.	2.0	16.4	13.1	5.5	6.7	11.7	2.4	4.0	3.5	6.0	9.1	15.7	3.4	5.9	145.4	122.4	-2	15.4
May	0	25.0	10.0	7.4	6.6	16.2	2.4	7.4	3.2	8.3	7.0	21.2	2.6	8.4	144.8	174.2	-2	13.2
June	0	26.7	2.8	7.8	5.8	18.7	2.0	9.0	1.6	8.3	4.2	19.8	1.7	7.5	102.2	162.1	-2	10.4
July	0	15.8	0	6.0	2.8	12.5	1.6	5.9	.7	6.0	2.1	14.0	.9	4.3	90.4	131.1	-2	8.7
Aug.	0	6.7	0	4.9	2.0	5.1	1.6	3.0	.5	3.7	2.7	11.1	.7	2.7	93.7	94.4	-2	7.5
Sept.	0	6.2	1.5	5.1	.7	4.8	.5	2.4	.5	3.3	2.5	11.8	.8	2.3	95.1	70.4	1.5	7.3
Oct.	0	7.4	1.3	4.7	.6	5.2	.7	2.6	.5	3.4	3.9	12.6	1.3	2.6	101.6	63.3	2.1	6.5
Nov.	.6	10.9	1.3	4.8	1.9	6.1	1.6	2.1	1.0	3.8	5.0	12.4	1.7	3.0	63.4	57.8	2.0	6.7
Dec.	2.5	12.4	1.5	5.1	2.8	6.7	3.2	2.4	1.3	4.1	5.8	12.4	2.2	3.4	19.0	56.7	2.1	6.4
Avg.	2.0	14.5	5.9	5.6	3.9	9.4	1.8	4.0	1.8	5.2	5.2	14.2	1.7	4.4	94.0	92.8	.7	9.0
Max.	7.5	51.8	13.1	22.2	6.7	42.1	3.2	17.7	3.5	16.4	9.1	62.4	3.4	15.1	145.4	202.3	2.1	47.1
Min.	0	0	0	0	.6	0	.5	0	.5	0	2.1	1.6	.7	0	19.0	2.3	0	0

Month	Elephant Butte (Capacity 2,197.6)		Caballo (Capacity 346.0)		Alamogordo (Capacity 132.2)		McMillan and Avalon (Capacity 44.8)		Red Bluff (Capacity 310.0)		Willacy (Capacity 25.0)		Total in United States Reservoirs (Capacity 3,577.5)	
	1946	Normal 1915-1946	1946	Average 1938-1946	1946	Average 1937-1946	1946	Normal 1908-1946	1946	#Normal 1936-1946	1946	Average 1939-1946	1946	Estimated Normal
Jan.	1,100.6	1,061.0	227.8	210.0	25.4	68.4	7.4	32.3	57.8	159.2	16.9	14.7	1,557.2	1,661.0
Feb.	1,071.7	1,062.3	264.5	201.9	29.6	72.5	4.2	32.7	60.6	168.8	17.0	13.9	1,574.2	1,666.8
Mar.	1,030.9	1,050.7	251.0	176.1	51.0	60.6	5.3	30.8	56.5	159.8	6.2	13.2	1,518.8	1,666.2
Apr.	968.4	1,059.4	200.2	140.3	4.3	53.5	4.1	21.6	35.4	137.8	6.8	13.9	1,405.0	1,669.8
May	898.1	1,206.3	169.8	123.4	4.9	69.3	.4	25.4	28.5	157.4	17.0	13.9	1,295.5	1,877.3
June	830.0	1,258.1	120.0	97.0	7.1	58.1	.7	23.8	27.6	174.5	15.6	15.5	1,121.5	1,897.3
July	760.1	1,195.7	59.1	71.1	7.7	61.7	.8	19.9	15.0	155.2	16.6	15.8	991.8	1,725.3
Aug.	680.7	1,117.7	25.7	46.0	24.4	61.2	1.0	17.8	18.0	138.0	7.8	13.9	859.0	1,734.3
Sept.	625.4	1,072.6	59.9	40.6	14.8	58.5	13.7	20.2	29.6	131.4	15.4	15.3	862.7	1,452.2
Oct.	570.7	1,064.3	114.3	78.5	20.0	63.4	20.9	23.3	43.6	134.8	13.9	15.8	904.4	1,468.7
Nov.	544.3	1,065.0	156.9	122.4	32.9	58.4	17.1	25.1	56.2	139.5	16.0	14.8	901.9	1,530.8
Dec.	584.5	1,065.4	204.5	166.6	38.7	62.1	14.3	29.4	65.1	145.1	18.0	15.2	965.1	1,594.4
Avg.	805.4	1,106.4	154.5	122.8	30.3	62.4	7.5	25.2	41.0	146.6	13.9	14.8	1,159.6	1,640.2
Max.	1,129.1	2,302.8	280.0	346.6	38.7	156.3	20.9	85.5	63.1	327.5	18.0	22.0	1,574.2	
Min.	559.8	3.3	21.0	.1	1.7	1.7	.4	0	15.0	11.0	6.2	6.2	859.0	

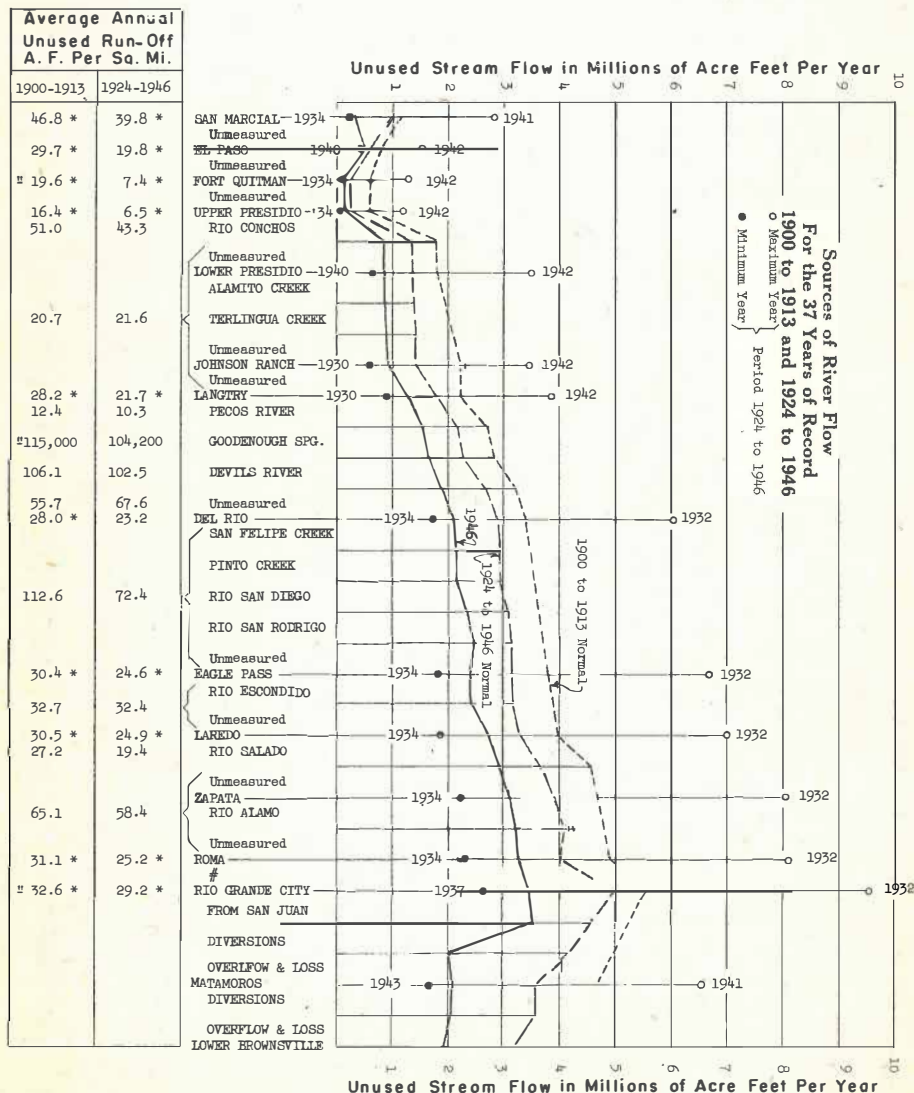
On the Mexican Side

Month	Boquilla (Capacity 2,116.0)		Centenario and San Miguel (Capacity 199)		Don Martin (Capacity 1,123.0)		El Azucar (Capacity 871.5)		Culebron (Capacity 66.5)		Palto Blanco (Capacity 178.4)		Total in Mexican Reservoirs (Capacity 4,375.3)	
	1946	Normal 1914-1946	1946	Normal 1934-1946	1946	Normal 1930-1946	1946	Estimated Normal	1946	Average 1939-1946	1946	Average 1942-1946	1946	Estimated Normal
Jan.	1,511.8	1,547.9	10.9	12.4	499.2	402.4	272.6	309	64.2	59.0	48.9	31.5	2,407.6	2,562.2
Feb.	1,461.6	1,517.4	10.2	12.1	481.5	489.1	296.7	314	61.8	59.7	50.3	29.5	2,505.5	2,272.7
Mar.	1,373.9	1,458.9	5.1	9.3	439.3	367.6	210.0	210	37.9	40.5	41.3	22.8	2,107.5	2,119.1
Apr.	1,298.0	1,408.2	5.3	7.8	439.3	354.6	238.2	162	26.0	34.0	25.3	12.4	2,032.2	1,979.0
May	1,198.4	1,345.0	12.9	9.4	438.4	343.6	380.2	99	45.8	41.1	27.8	10.9	2,043.1	1,849.0
June	1,112.3	1,294.5	11.9	9.3	437.9	345.1	335.2	210	85.5	55.8	26.6	18.7	2,095.4	1,890.2
July	1,067.0	1,295.4	8.5	7.9	489.8	349.4	310.5	288	56.3	49.7	69.4	20.4	2,001.5	1,960.8
Aug.	1,046.2	1,464.9	10.9	8.7	482.4	356.9	292.7	309	32.2	48.8	52.1	18.8	1,916.5	2,187.1
Sept.	1,259.5	1,626.7	13.7	11.4	478.7	398.0	401.3	390	91.9	58.8	53.4	22.9	2,278.5	2,467.8
Oct.	1,305.3	1,621.7	15.1	12.6	478.0	423.9	296.7	347	77.9	59.7	104.3	47.3	2,673.3	2,521.7
Nov.	1,248.5	1,585.9	11.3	11.1	606.2	438.6	604.0	334	68.9	60.1	104.6	49.0	2,643.5	2,476.7
Dec.	1,206.4	1,567.7	12.9	11.7	628.7	441.5	606.4	334	70.3	60.9	103.0	47.0	2,623.7	2,462.8
Avg.	1,255.7	1,475.1	10.7	10.2	501.0	381.6	368.8	265	59.7	52.6	61.4	27.6	2,257.4	2,212.4
Max.	1,511.8	2,224.5	15.1	20.6	628.7	1,163.4	606.4		91.9	108.2	104.6	104.6	2,673.3	
Min.	1,046.2	37.6	5.1	0.6	438.4	0.7	210.0		26.0	13.1	25.4	0.6	1,916.5	

Some months missing † Daily extreme ‡ There has been some revision of the storage figures for years prior to 1946. These revised figures have been used in making the normals and extremes shown for the period 1939-1946. § Includes Villa Cardenas * Capacity at elevation 76.30 meters; spillway completed

SOURCES OF RIVER FLOW

A distinction must be made clear between the figures in the table at the lower or left side of this page showing average annual unused run-off, and the graphical part of the page, showing average annual unused stream flow. As an illustration of this distinction, consider these two different values at Langtry. Both values are expressed as average annual amounts tributary to the station. The amount shown graphically above or to the right of the page is the water which actually flowed past this station. On the other hand, the amount shown by figures below, or to the left of the page, is the water which actually flowed past this station, and from which a certain amount of water is subtracted, and to which certain other amounts of water are added. In the case of Langtry, these subtractive and additive amounts of water are (a) Subtractive - the water which ran off the watershed into Boquilla Reservoir in years prior to 1924, and was drawn from the reservoir during the period 1924-1946. (b) Subtractive - the water impounded prior to 1924 and withdrawn from Caballo and Elephant Butte reservoirs during the period 1924-1946. (c) Additive - the water impounded since 1924 in El Vado and several small reservoirs on the Upper Rio Grande in New Mexico and Colorado, and which remained therein at the end of 1946. This additive carry-over storage in El Vado and the small reservoirs on the Rio Grande above San Marcial averaged 1,400 acre feet per year. In Caballo and Elephant Butte reservoirs, the storage loss averaged 24,580 acre feet per year subtractive. The carry-over storage in Boquilla Reservoir averaged 40,420 acre feet per year subtractive. Other carry-over storage figures are: Alamogordo, Avalon, McMillan, and Red Bluff on the Pecos River, 3,050 acre feet per year additive. Centenario and San Miguel on the Rio San Rodrigo, 560 acre feet per year additive. Don Martin on the Rio Salado, 27,160 acre feet per year additive. El Azucar on the Rio San Juan, 26,370 acre feet per year additive.



* Unused run-off at and above gaging station. # San Juan plus unmeasured. Prior to March 1943, the San Juan flowed into the Rio Grande and afterwards it was mostly retained in Azucar Reservoir.

DIVERSIONS FROM THE RIO GRANDE INTO THE AMERICAN CANAL AT EL PASO, TEXAS

DESCRIPTION: This gaging station is an open channel rating station in a concrete lined canal with water-stage recorder located 396 feet below the head gates at the American Dam near El Paso, Texas. The center of the American Dam is about .03 mile upstream from the point where the Western Land Boundary joins the River Boundary between the United States and Mexico. Measurements are made at the downstream end of the first covered section of this canal. Zero of the gage is 3,712.09 feet above mean sea level, U. S. C. & G. S. datum.

RECORDS: Based upon 48 meter measurements during the year and a stable rating curve. 1946 records excellent. Records available: June 2, 1938 to December 31, 1946. For a statement of all records of discharge at this station including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: This canal diverts water from the Rio Grande at the American Dam near El Paso, Texas, 2.1 river miles above the International Dam near Juárez, Chihuahua. This canal was constructed by the United States Section in connection with the American Dam. Operation began June 2, 1938. Water from this canal discharges into the Franklin Canal from which some is frequently returned to the Rio Grande at spillways 2.2, 2.7, and 3.6 river miles below the American Dam. At times, two small diversions are made from this canal. See lower part of following page for details concerning these two diversions. For bacterial content of this water see index in Water Bulletin No. 14 and later bulletins.

COMPARATIVE FLOWS FROM RECORDS:

		Average Flow in Second Feet		1900	
<u>Momentary Peak:</u>	Max. @ 1,840, Mar. 27, 1944.	Min.		** sometimes dry.	
<u>Daily:</u>	Max. @ 1,510, Aug. 13, 1945.	Min.		** sometimes dry.	
<u>Monthly:</u>	Max. @ 1,210, Aug. 1943.	Min.		** sometimes dry.	
<u>Yearly:</u>	Max. 748, 1943.	Min.	491, 1940.		
<u>Two Successive Years:</u>	Max. 728, 1943-1944.	Min.	508, 1940-1941.		
<u>Three Successive Years:</u>	Max. 712, 1943-1945.	Min.	528, 1939-1941.		
<u>Four Successive Years:</u>	Max. 695, 1942-1945.	Min.	557, 1939-1942.		
<u>Five Successive Years:</u>	Max. 670, 1942-1946.	Min.	595, 1939-1943.		
<u>Eight Successive Years:</u>	Max. 617, 1939-1946.				

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.0	0	285	1,220	856	769	1,280	1,180	1,050	306	216	195
2	.8	0	223	1,170	818	756	1,050	1,200	1,010	351	214	193
3	.5	0	193	1,230	810	828	960	1,230	957	332	211	183
4	.5	0	175	1,050	722	892	930	1,070	920	327	208	187
5	.5	0	167	830	897	827	1,230	1,220	859	335	216	184
6	.5	0	162	776	1,030	882	1,240	1,310	866	665	219	182
7	.5	0	161	853	880	803	1,100	1,370	838	658	218	183
8	0	0	146	909	658	777	1,120	1,370	798	749	220	188
9	0	0	144	899	576	712	1,120	1,210	776	707	224	187
10	0	0	144	1,000	535	792	1,060	1,160	927	572	219	202
11	0	0	139	935	605	890	976	1,340	933	486	213	215
12	0	0	511	821	633	821	863	1,320	1,010	474	224	210
13	0	0	431	800	731	798	916	1,160	979	407	300	197
14	0	88.1	460	891	629	762	981	1,020	645	370	442	181
15	0	145	485	879	627	761	925	998	643	375	362	184
16	0	145	654	962	848	767	945	877	568	343	317	179
17	0	145	608	930	905	865	843	865	459	307	321	170
18	0	142	848	965	942	1,090	774	949	387	289	321	175
19	0	310	781	818	875	952	731	871	348	283	361	207
20	0	518	770	817	959	828	909	929	329	284	* 275	401
21	0	489	822	878	846	810	1,130	856	311	275	* 272	450
22	0	401	853	1,030	780	790	1,290	877	270	272	* 87.3	381
23	0	366	819	879	802	787	1,120	932	258	264	* 103	335
24	0	451	1,100	792	799	879	871	993	253	256	* 228	272
25	0	656	1,160	866	965	910	805	1,060	237	243	* 217	217
26	0	612	1,060	887	1,010	818	775	1,220	221	236	* 226	210
27	0	563	976	778	1,000	784	733	1,190	207	228	* 218	200
28	0	498	952	765	968	717	722	1,160	195	229	* 211	178
29	0		1,020	770	900	679	1,180	1,010	197	223	* 206	163
30	0		1,190	919	790	1,020	1,130	1,040	205	220	* 204	156
31	0		979		823		1,130	1,050		221		156
Sum	4.3	5,527	18,418	27,319	25,219	24,766	30,839	34,037	17,656	11,487	7,273.3	6,719
Current Year 1946									Period 1938-1946 #			
Month	Extreme Gage Feet		Extreme Second Feet				Average Second Feet	Total Acre Feet	Acre Feet			
	High	Low	Day	High	Day	Low			Average	Maximum	Minimum	
Jan.			1	1.0	8	0	.1	8.5	2,302	8,110	8.5	
Feb.	8.24		25	1.0	1	0	197	11,000	13,032	19,500	5,170	
Mar.	11.34	5.28	24	1,670	9	130	594	36,500	39,344	50,100	24,450	
Apr.	10.60	8.20	1	1,410	29	732	911	54,200	58,600	70,900	45,800	
May	9.70	7.24	6	1,140	10	486	814	50,000	52,338	69,000	39,700	
June	10.14	8.13	30	1,240	29	666	826	49,100	55,078	65,700	49,100	
July	10.51	8.16	22	1,380	27	669	995	61,200	60,367	70,700	42,600	
Aug.	10.70	8.65	6	1,420	21	828	1,100	67,500	62,744	74,500	44,000	
Sept.	9.81	5.27	12	1,140	29	182	589	35,000	46,622	65,100	35,000	
Oct.	9.40	5.41	5	986	1	193	371	22,800	26,089	39,000	13,100	
Nov.	7.33		14	448	22	3.0	242	14,400	14,421	21,000	5,630	
Dec.	7.28	5.25	21	490	31	144	217	13,300	14,930	25,500	8,440	
Yearly	11.34			1,670		0	573	415,008.5	445,867	541,610	356,622	

@ Beginning June 1938 # Estimated † And other days * Partly estimated # The average, maximum and minimum discharges for January through May are for the period 1939-1946. ** Except for seepage of less than 2.0 sec. ft.

DIVERSIONS FROM THE RIO GRANDE INTO THE ACEQUIA MADRE

Near Juarez, Chihuahua

DESCRIPTION: Water-stage recorder and bridge for meter measurements located about 260 feet below the canal intake at the International Dam at Juárez, Chihuahua which is 2.1 river miles below the American Dam at El Paso. Prior to July 29, 1944 the station was located 1 mile below the canal intake.

RECORDS: Based upon 123 meter measurements during the year, 94 by the Mexican and 29 by the United States Section of this Commission. Computations by shifting channel methods. 1946 records good. Records available: 1938-1946. For a statement of all records of discharge at this station, including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: In 1946, 55,554 acre feet were distributed to 19,010 acres of land irrigated in the first unit under the canal where the diversion duty was 2.92 acre feet per acre. The remainder of the water from this canal was used, together with drainage water (which entered the canal at the lower end of the first unit), to irrigate lands further down the canal.

COMPARATIVE FLOWS FROM RECORDS: **Momentary Peak:** Max. 480 second feet on July 21, 1944 with a gage height of 6.00 feet. Min. dry through January, February, October, November and December of each year.

	Average Flow in Second Feet	
<u>Daily:</u>	Max. 339, May 10, 1942.	Min. Dry 5 months of each year.
<u>Monthly:</u>	Max. 283, May 1938.	Min. Dry 5 months of each year.
<u>Yearly:</u>	Max. 116, 1942.	Min. 76.3 1941.
<u>Two Successive Years:</u>	Max. 100, 1942-1943.	Min. 78.4 1940-1941.
<u>Three Successive Years:</u>	Max. 95.3 1942-1944.	Min. 80.2 1939-1941.
<u>Four Successive Years:</u>	Max. 92.5 1942-1945.	Min. 80.9 1938-1941.
<u>Five Successive Years:</u>	Max. 90.7 1942-1946.	Min. 87.9 1938-1942.
<u>Nine Successive Years:</u>	 86.3, 1938-1946.	

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	0	0	11.3	93.9	155	176	157	147	158	78.8	0	0
2	0	0	24.7	109	202	168	155	160	165	0	0	0
3	0	0	21.5	108	205	174	161	163	158	0	0	0
4	0	0	22.6	106	201	167	155	172	151	0	0	0
5	0	0	22.6	109	218	159	151	158	157	0	0	0
6	0	0	24.0	109	203	163	155	162	162	0	0	0
7	0	0	24.0	107	204	155	154	165	158	0	0	0
8	0	0	24.0	109	226	163	158	164	164	0	0	0
9	0	0	24.0	116	222	165	162	159	166	0	0	0
10	0	0	24.4	113	223	167	158	154	161	0	0	0
11	0	0	24.7	109	241	156	155	158	160	0	0	0
12	0	0	30.0	108	227	159	159	150	160	0	0	0
13	0	0	29.0	104	223	160	162	148	160	0	0	0
14	0	0	26.5	109	219	161	167	149	174	0	0	0
15	0	0	30.4	99.9	223	166	163	152	166	0	0	0
16	0	0	35.3	108	230	163	162	148	157	0	0	0
17	0	0	30.4	112	227	162	162	150	146	0	0	0
18	0	0	27.9	111	222	161	158	152	149	0	0	0
19	0	0	30.0	105	224	160	158	151	164	0	0	0
20	0	0	29.3	113	240	165	165	157	* 169	0	0	0
21	0	0	27.9	119	233	174	167	148	157	0	0	0
22	0	0	27.5	117	228	161	164	158	165	0	0	0
23	0	0	28.3	115	232	168	164	160	167	0	0	0
24	0	0	34.3	119	225	162	159	159	167	0	0	0
25	0	0	39.9	133	216	155	150	161	161	0	0	0
26	0	0	33.2	126	214	154	147	152	166	0	0	0
27	0	0	26.1	122	215	151	145	160	168	0	0	0
28	0	0	30.0	121	220	152	150	160	177	0	0	0
29	0	0	29.3	123	220	161	158	161	176	0	0	0
30	0	0	33.2	120	196	159	153	156	168	0	0	0
31	0	0	28.3		180		137	154		0		
Sum	0	0	854.6	3,373.8	6,714	4,867	4,871	4,848	4,877	78.8	0	0
Month	1938-46		Current Year 1946						Period 1938-1946			
	Average Rainfall Inches		Extreme Second Feet				Average Second Feet	Total Acre Feet	Acre Feet			
			High	Low		Average			Maximum	Minimum		
			Day		Day							
Jan.	.46	.71					0	0	0	0	0	0
Feb.	.30	T					0	0	0	0	0	0
Mar.	.33	.14	24	81.6	1	0	27.6	1,700	2,454	5,540	1,000	6,040
Apr.	.24	.44	25	136	1	39.6	112	6,690	7,656	11,720	6,040	11,200
May	.41	.87	8	270	1	118	217	13,320	13,729	17,380	11,200	9,650
June	.86	.24	21	232	28	147	162	9,650	11,010	15,700	7,910	5,200
July	1.32	1.25	30	178	31	128	157	9,660	10,318	15,170	2,240	0
Aug.	1.32	.69	4	216	21	35.7	156	9,620	9,196	12,380	0	0
Sept.	1.32	1.62	14	259	17	134	163	9,670	8,056	12,380	0	0
Oct.	1.12	.66	1	178	#	0	2.5	156	122	328	0	0
Nov.	.38	.19					0	0	0	0	0	0
Dec.	.62	1.09					0	0	0	0	0	0
Yearly	8.68	7.90		270		0	83.5	60,466	62,521	83,930	55,320	
Acreage Irrigated on First Unit Only								19,010	φ 16,574	φ 19,010	φ 13,967	
Mean Acre Feet per Acre on First Unit Only								2.92	φ 3.21	φ 3.90	φ 2.80	
Average Rainfall in Inches (Entire Valley Floor above Island)								7.90	8.68	16.70	5.85	

Various days of the month * Partly estimated φ Period 1939-1946

DIVERSIONS FROM THE RIO GRANDE IN THE EL PASO VALLEY OF TEXAS

RECORDS: July 1, 1938 to December 31, 1946. For a statement of all records of diversions in this valley, including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: The diversions of water listed below were made for use on lands in the El Paso Valley of Texas, lying between the American Dam and Fort Quitman gaging stations. The diversions were measured for 71,905 acres, or 98.6% of the total area. Of this area 55,988 acres lie in El Paso County and the remainder within the Hudspeth County Conservation and Reclamation District Number One. These water-measurement and acreage records were furnished by the El Paso office of the United States Bureau of Reclamation. For 1,015 acres, (or 1.4% of the total area) lying below the Hudspeth District and above the Fort Quitman gaging station, the diversions were estimated. From two diversions (the Franklin Canal below the Leon Street Wasteway and the River-side Canal), there has been deducted the water spilled back to the river at 3 points, viz.: 9.0, 19.0, and 26.1 river miles below the American Dam at El Paso, Texas. There is considerable re-use in this area of drainage and waste water from within the area. Final drainage water returns to the Rio Grande.

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	0	0	470	1,180	888	857	1,120	1,180	905	326	224	158
2	0	0	340	1,160	830	820	1,170	1,150	1,070	342	160	162
3	0	0	302	1,230	892	844	951	1,250	939	340	240	136
4	0	0	260	1,100	763	941	848	1,120	990	339	241	128
5	0	0	176	874	793	849	1,150	1,130	1,000	355	293	183
6	0	0	129	805	901	921	1,200	1,190	972	332	307	156
7	0	0	126	835	878	832	1,140	1,240	965	279	328	36.5
8	0	0	114	905	707	763	1,020	1,330	916	324	316	68.9
9	0	0	104	920	635	689	1,090	1,210	863	411	313	133
10	0	0	97.2	1,050	565	792	1,040	1,160	867	343	308	101
11	0	0	86.1	1,000	547	871	1,050	1,260	951	287	331	31.4
12	0	25.3	310	899	537	809	1,010	1,310	990	333	265	23.3
13	0	65.8	569	849	671	756	951	1,220	819	402	268	19.2
14	0	68.9	512	874	686	707	1,020	1,110	650	374	355	24.3
15	0	53.7	526	939	639	707	980	1,030	612	365	442	44.6
16	0	80.0	658	953	684	663	986	959	601	321	299	41.5
17	0	95.2	687	933	859	739	845	813	599	310	298	35.5
18	0	135	751	933	922	994	754	872	455	260	298	86.1
19	0	298	832	985	833	862	771	971	393	321	319	162
20	0	567	822	826	875	870	800	954	349	277	268	200
21	0	577	795	968	854	844	705	820	214	293	255	357
22	0	439	861	1,030	766	872	843	879	159	300	242	378
23	0	356	730	1,030	785	782	1,010	905	245	300	225	314
24	0	327	853	832	827	902	905	972	313	264	207	136
25	0	610	978	817	824	964	801	1,020	283	242	166	31.4
26	0	646	978	998	871	873	770	1,180	281	268	159	106
27	0	567	964	798	886	727	750	1,180	203	314	139	124
28	0	627	849	716	995	723	706	1,040	186	318	223	93.2
29	0		1,080	747	930	627	803	1,020	253	260	147	81.0
30	0		1,170	924	873	762	1,170	950	282	224	165	54.7
31	0		1,160		918		1,070	1,000		222		36.5
Sum	0	5,537.9	18,289.3	28,110	24,634	24,362	29,429	33,425	18,325	9,646	7,801	3,642.1

Month	1938-46	Current Year 1946					Period 1938-1946 **			
	Average Rainfall Inches	φ	Extreme Second Feet @		Average Second Feet	Total Acre Feet	Acre Feet			
			High	Low			Average	Maximum	Minimum	
Jan.	.50	.77	0	0	0	0	323	914	0	
Feb.	.32	T	26	646	198	11,000	10,799	15,010	3,720	
Mar.	.36	.15	30	1,170	11	590	36,366	46,340	21,600	
Apr.	.26	.48	3	1,230	28	937	55,800	69,050	49,400	
May	.45	.93	28	995	12	537	795	48,900	67,100	
June	.92	.26	18	994	29	627	812	54,684	68,580	
July	1.42	1.35	6	1,200	21	705	949	58,400	48,300	
Aug.	1.43	.74	8	1,330	17	813	1,080	66,300	44,200	
Sept.	1.42	1.74	2	1,070	22	159	611	36,300	44,200	
Oct.	1.20	.70	9	411	31	222	311	19,100	22,500	
Nov.	.41	.20	15	442	27	139	260	15,500	17,800	
Dec.	.67	1.17	22	378	13	19.2	117	11,120	9,960	
Yearly	9.36	8.49		1,330	0	557	403,120	413,034	355,883	
Irrigated Acreage							72,920	69,270	72,920	
Mean Acre Feet per Acre							5.53	6.02	5.21	
Average Rainfall in Inches							8.49	9.36	6.29	

* And other days @ Mean daily # Period 1939-1946 ** January through June for the period 1939-1946, and July through December for the period 1938-1946. φ Valley floor El Paso to Fort Quitman

DIVERSIONS FROM THE RIO GRANDE BETWEEN AMERICAN DAM AND INTERNATIONAL DAM Near El Paso, Texas

Two small diversions on the American side and none on the Mexican side were made in this section in 1946, either directly from the Rio Grande, or from the American Canal. From information furnished by the American Smelting and Refining Company and the Globe Mills, Inc., and from frequent inspection, it is estimated that the Snelter diversion averaged 1 second-foot and the Globe Mill averaged .5 second-foot. Thus a total of 1,086 acre feet were diverted in 1946.

DIVERSIONS FROM THE RIO GRANDE INTO THE MAVERICK CANAL EXTENSION BELOW THE POWER PLANT

Near Eagle Pass, Texas,

DESCRIPTION: The Maverick Canal diverts water for power and irrigation from the Rio Grande into Texas at a point 17.4 river miles below the international bridge between Del Rio, Texas and Villa Acuña, Coahuila and 711.0 river miles below the American Dam at El Paso, Texas. The tail water from the hydro-electric plant (capacity 9,000 kv.-a.) returns to the river about 32.2 miles below the point of diversion. The Maverick Canal Extension begins at the hydro-electric plant about 9 miles northward from Eagle Pass, Texas. The water-stage recorder is located on a wooden pile bridge about 1 mile below the power plant. Meter measurements are from the bridge.

RECORDS: Irrigation from this canal extension first began in June 1938. Records of canal discharge began April 1, 1939 and extend to December 31, 1946. For a statement of all discharge records of this canal, including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: From this canal extension in 1946, there were 11,969 acres of land irrigated, northward and southward from Eagle Pass, as indicated in the table below. Under the Maverick Canal above the power plant, the Maverick County Water Control and Improvement District reported that in 1946 the cultivated area was 5,126 acres, all of which were irrigated. Some waste water from this canal extension reaches the river below the Eagle Pass gaging station.

COMPARATIVE FLOW FROM RECORDS:

		Average Flow in Second Feet			
Momentary Peak:	Max.	297,	Nov. 4, 1944.	Min.	sometimes dry.
Daily:	Max.	255,	Nov. 1944.	Min.	sometimes dry.
Monthly:	Max.	194,	Nov. 1945.	Min.	18.7 Mar. 1939.
Yearly:	Max.	151,	1943.	Min.	62.1 1939.
Two Successive Years:	Max.	150,	1943-1944.	Min.	68.5 1939-1940.
Three Successive Years:	Max.	149,	1942-1944.	Min.	77.8 1939-1941.
Four Successive Years:	Max.	148,	1942-1945.	Min.	95.2 1939-1942.
Five Successive Years:	Max.	148,	1942-1946.	Min.	106, 1939-1943.
Eight Successive Years:	 122, 1939-1946.				

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	186	151	156	171	122	54.4	91.4	175	132	119	161	177
2	186	169	154	134	118	57.7	107	135	128	142	163	171
3	183	200	208	139	109	78.4	116	187	132	164	168	159
4	199	172	167	134	110	95.9	121	181	132	174	168	164
5	188	172	150	128	118	104	141	173	135	181	169	171
6	217	179	162	131	78.9	120	141	173	143	185	172	171
7	193	176	151	177	53.8	137	146	182	140	178	171	171
8	195	169	157	157	55.4	136	141	184	145	152	170	171
9	191	173	154	152	54.8	129	142	179	144	123	165	171
10	180	201	215	148	50.1	122	140	173	140	121	168	171
11	160	175	166	145	48.0	117	141	181	145	134	166	171
12	162	164	169	143	51.4	120	140	166	149	129	171	170
13	196	159	182	143	50.5	120	136	166	148	136	172	170
14	167	162	171	186	51.6	107	156	172	149	139	176	170
15	152	174	160	146	52.3	129	143	171	154	144	176	170
16	144	167	145	137	52.2	169	135	168	152	145	179	170
17	127	206	216	125	52.4	150	142	174	147	146	182	170
18	127	182	178	116	56.0	136	151	175	148	144	181	170
19	137	175	162	114	58.5	128	147	166	133	145	170	170
20	158	175	149	129	85.0	119	145	166	135	148	161	170
21	140	160	145	165	98.1	62.9	173	171	146	145	166	170
22	135	155	137	115	106	63.3	173	163	151	157	166	182
23	132	160	134	68.6	109	66.6	154	167	147	164	165	179
24	139	214	159	39.4	109	63.7	175	160	143	157	178	180
25	142	168	176	43.1	97.1	60.0	175	145	129	162	171	176
26	138	164	160	73.0	57.2	65.5	175	161	132	163	169	176
27	158	160	153	123	58.0	78.2	175	160	132	181	167	175
28	138	156	129	133	57.4	85.8	175	151	147	165	176	168
29	139		122	125	56.3	92.9	175	129	150	151	166	182
30	137		131	123	55.0	94.0	175	128	130	161	163	176
31	137		192		55.3		175	127		164		159
Sum	4,983	4,836	5,010	3,863.1	2,286.3	3,062.3	4,622.4	5,109	4,238	4,719	5,096	* 5,321
	Current Year 1946											
Month	1924-46		Extreme Second Feet				Average Second Feet	Total Acre Feet	Period 1939-1946			
	Average Rainfall Inches		High		Low				Acre Feet			
	Day	Day	Day	Day	Day	Day			Average	Maximum	Minimum	
Jan.	.92	1.41	6	256	17	74.9	161	9,880	7,618	* 10,600	11,000	2,140
Feb.	.72	.24	17	244	21	83.0	173	9,590	6,611	10,600	11,000	2,120
Mar.	.88	.36	10	262	28	59.4	162	9,940	7,180	9,940	11,000	1,150
Apr.	1.63	3.83	14	241	23	28.3	129	7,660	6,898	10,300	11,000	3,430
May	3.35	5.10	2	133	16	41.8	73.8	4,530	5,952	9,690	11,000	2,840
June	2.31	5.78	20	199	1	44.1	102	6,070	6,398	9,520	11,000	3,750
July	1.75	.58	21	184	1	86.0	149	9,170	7,495	9,550	11,000	4,510
Aug.	1.71	1.00	4	211	24	79.9	165	10,100	7,154	10,100	11,000	3,480
Sept.	2.86	1.86	*15	160	8	74.6	141	8,410	6,829	8,580	11,000	4,600
Oct.	1.69	1.73	6	194	8	77.0	152	9,360	8,089	9,730	11,000	5,130
Nov.	.75	.50	*17	209	1	73.5	170	10,100	8,845	11,500	11,000	4,170
Dec.	1.18	.70	5	206	31	105	*172	* 10,600	9,005	11,700	11,000	4,280
Yearly	19.75	20.69		262		28.3	146	105,410	88,074	109,350	117,000	44,950
Irrigated Acreage								11,969	10,447	11,980	6,439	
Mean Acre Feet per Acre												
Average Rainfall in Inches								20.69	19.75	29.27	11.80	

* Estimated * Partly estimated † Period 1924-1946 ‡ And other days

DIVERSIONS FROM THE RIO GRANDE

ON THE UNITED STATES SIDE BELOW RIO GRANDE CITY STATION

Diversions from the Rio Grande for irrigation are made here almost entirely by pumping. 90% of the water diverted was measured at the diversion point. The remainder was estimated. A very small part of the measurements were made by plant efficiency and power input; otherwise, measurements were by Venturi Meters, open channel rating stations, and Deflection Meters developed by this Commission. There is some re-use within the area, of drainage water from the area. Drainage water from this area does not return to the Rio Grande. During the year 98,479 acre feet of water were diverted and used on the new Willacy County Irrigation District, where 71,324 acres were cultivated, of which 70,600 acres were irrigated. The cultivated area and water diverted to Willacy County are all included in the tables below. During the year 4,981 acres were cultivated in Starr County below Rio Grande City gaging station, of which 2,708 acres were irrigated from the Rio Grande. The cultivated areas shown here are all supplied with irrigation facilities. More than one crop per year is often grown on some of the land. The area actually irrigated this year was 88.2% of the cultivated area. For chemical content of water and other related data see index to Water Bulletin 14 and later bulletins.

COMPARATIVE FLOWS FROM RECORDS:

		Average Flow in Second Feet	
Monthly:	Max. 3,680, July 10, 1945.	Min. 0.8 Dec. 25, 1938.	
Yearly:	Max. 2,610, July 1946.	Min. 25.2 June 1930.	
Two Successive Years:	Max. 1,560, 1945-1946.	Min. 653, 1930-1931.	
Three Successive Years:	Max. 1,550, 1945-1946.	Min. 681, 1930-1931.	
Four Successive Years:	Max. 1,470, 1944-1946.	Min. 733, 1930-1932.	
Five Successive Years:	Max. 1,460, 1945-1946.	Min. 729, 1930-1935.	
Ten Successive Years:	Max. 1,460, 1942-1946.	Min. 744, 1930-1934.	
Twenty-five Successive Years:	Max. 1,230, 1937-1946.	Min. 321, 1929-1938.	
		1,010, 1922-1946.	

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,590	445	1,740	2,770	1,450	631	2,510	2,470	2,130	16.9	1,240	1,260
2	1,550	354	1,450	2,750	1,220	398	2,640	2,440	2,950	242	1,160	2,240
3	1,500	138	792	2,410	1,410	365	2,320	2,290	2,770	289	572	2,350
4	1,270	335	2,020	2,230	1,440	680	2,160	2,050	2,710	291	1,560	2,250
5	1,040	324	2,140	2,140	1,240	721	2,360	2,920	2,600	286	1,690	2,080
6	858	371	2,220	1,630	1,840	652	1,920	2,840	2,550	26.0	1,640	2,000
7	1,590	454	2,430	1,490	2,040	779	1,430	2,730	2,260	565	1,830	1,510
8	1,790	405	2,290	2,350	1,790	349	2,820	2,490	1,690	642	1,850	1,070
9	1,840	309	2,080	2,460	2,300	193	2,560	2,200	2,260	651	1,510	2,180
10	1,750	97.5	1,640	2,150	2,300	634	2,860	1,660	2,460	517	810	2,200
11	1,670	633	2,210	1,990	1,960	537	3,050	629	2,190	386	2,080	1,930
12	850	645	2,530	1,700	1,610	626	2,970	2,330	1,830	429	2,210	1,770
13	7.3	976	2,560	822	2,560	624	2,570	2,230	2,270	222	2,230	1,630
14	3.9	469	2,260	1,550	2,770	484	2,250	1,720	1,780	413	2,320	1,070
15	25.6	429	2,350	2,660	2,860	609	3,110	1,770	1,120	69.9	2,210	1,020
16	200	391	1,710	2,340	2,720	186	3,120	896	1,640	296	1,670	1,770
17	223	126	1,700	2,310	2,600	542	3,110	776	1,670	276	1,400	1,540
18	230	984	2,560	2,550	2,240	1,350	3,140	1,190	1,890	550	2,160	1,740
19	500	1,190	2,350	2,400	2,010	1,150	3,200	2,560	1,590	377	2,230	1,390
20	244	1,450	2,020	2,050	2,670	939	2,970	2,220	1,140	75.7	2,270	1,200
21	250	1,370	2,440	1,900	2,740	770	2,480	2,010	321	640	2,170	781
22	40.2	1,400	2,180	2,550	2,760	414	3,110	1,550	457	654	2,110	446
23	152	956	988	2,480	2,970	149	2,690	517	915	953	1,870	1,060
24	286	359	1,180	1,230	2,920	1,430	2,540	795	349	586	1,360	648
25	391	884	2,840	1,920	2,320	1,780	2,610	1,330	330	636	2,270	440
26	237	1,290	2,830	2,080	1,720	1,940	2,510	2,420	166	571	2,330	1,480
27	106	1,710	2,430	1,800	2,940	2,270	2,010	2,240	280	159	2,190	1,340
28	249	1,760	2,080	1,290	3,290	2,140	1,540	2,050	117	1,140	1,570	1,130
29	204		1,330	2,750	3,010	1,320	2,490	1,890	167	1,390	2,280	961
30	277		809	2,230	1,740	942	2,680	2,210	250	1,370	1,890	1,420
31	213		1,470		844		2,720	3,000		1,270		1,060
Sum	20,254.8		62,962		25,604		80,950		44,852		15,989.5	
	21,137.0		61,629		68,264		80,950		44,852		15,989.5	

Month	1922-46		Current Year 1946						Period 1922-1946			
	Average Rainfall Inches **		# Extreme Second Feet				Average Second Feet	Total Acre Feet	Acre Feet			
			High		Low				Normal	Maximum	Minimum	
			Day		Day							
Jan.	1.62	3.29	9	1,840	14	3.9	682	41,900	37,532	71,000	7,700	
Feb.	.98	.78	28	1,760	10	97.8	723	40,200	61,124	134,000	6,960	
Mar.	1.24	.16	25	2,840	3	792	1,990	122,000	87,473	156,000	14,100	
Apr.	1.30	1.99	1	2,770	13	822	2,100	125,000	73,829	125,000	29,300	
May	3.41	2.67	28	3,290	31	844	2,200	135,000	67,244	135,000	4,510	
June	2.87	3.41	27	2,270	23	149	853	50,800	58,228	129,000	1,500	
July	1.94	.31	19	3,200	7	1,430	2,610	161,000	65,111	161,000	10,000	
Aug.	1.98	1.33	31	3,000	23	517	1,950	120,000	76,014	132,000	19,100	
Sept.	4.76	6.31	2	2,950	28	117	1,500	89,000	51,360	110,000	8,020	
Oct.	2.20	3.34	29	1,390	1	16.9	516	31,700	55,844	102,000	21,400	
Nov.	1.28	.45	26	2,330	3	572	1,810	108,000	57,117	128,000	11,500	
Dec.	1.85	.34	3	2,350	25	440	1,460	89,800	43,204	110,000	10,400	
Yearly	25.43	24.38		3,290		3.9	1,540	1,114,400	734,080	1,130,700	472,500	
Average Acreage Cultivated below Rio Grande City								600,735	381,951	600,735	216,300	
Mean Acre Feet per Acre								1.86	1.92	2.68	1.03	
Average Rainfall in Inches								24.38	25.43	38.84	16.68	

** Lower Rio Grande Valley area on the United States side, Rio Grande City to the Gulf

Mean daily ϕ Period 1938-1946

DIVERSIONS FROM THE RIO GRANDE INTO THE RETAMAL CANAL

Near Rio Bravo, Tamaulipas

DESCRIPTION: Water-stage recorder and cable with car located .87 mile below canal head gate. Zero of the gage is .35 feet above mean sea level U. S. C. & G. S. datum. The head gate is about 1,000 feet from the Rio Grande. This canal diverts from the Rio Grande at a point about 24 river miles below the Hidalgo-Reynosa Bridge near Hidalgo, Texas and 1,108.8 river miles below the American Dam at El Paso, Texas.

RECORDS: Based upon 150 meter measurements during the year. Computations by shifting channel methods. 1946 records good. Records available: September 1939 to December 1946. For a statement of all records of discharge at this station, including those authenticated by this Commission, see last pages of this bulletin.

REMARKS: Retamal Canal has a capacity of about 7,000 second feet. It empties into Culebron Reservoir, which in turn discharges into Villa Cárdenas Reservoir from which a canal leads to Palito Blanco reservoirs nos. 1, 2 and 3. These reservoirs are used for irrigation purposes. During Rio Grande floods, flood water may escape from Villa Cárdenas via floodway no. 1 to the Gulf of Mexico, but in 1946 there was no such escape. In 1946, 123,552 acres with irrigation facilities were cultivated under Retamal Canal, of which 26,687 acres were irrigated with 55,355 acre-feet of water, and 96,865 acres were dry farmed. For silt content and other related data, see index in Water Bulletin No. 14 and later bulletins.

COMPARATIVE FLOWS FROM RECORDS: Monetary Peak: Max. 6,990 second feet on September 12, 1944, with a gage height of 76.31 feet. Min. sometimes dry.

		Average Flow in Second Feet			
<u>Daily:</u>		Max. 6,920, Sept. 12, 1944.	Min.		sometimes dry.
<u>Monthly:</u>		Max. 3,280, Sept. 1944.	Min.		sometimes dry.
<u>Yearly:</u>		Max. 700, 1944.	Min.	232, 1943.	
<u>Two Successive Years:</u>		Max. 547, 1944-1945.	Min.	308, 1942-1943.	
<u>Three Successive Years:</u>		Max. 562, 1944-1946.	Min.	315, 1941-1943.	
<u>Four Successive Years:</u>		Max. 479, 1943-1946.	Min.	315, 1940-1943.	
<u>Five Successive Years:</u>		Max. 460, 1942-1946.	Min.	392, 1940-1944.	
<u>Seven Successive Years:</u>		 421, 1940-1946.			

Mean Daily Discharge in Second Feet 1946 — Annual and Period Summary

Day	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.		
1	154	231	70.6	55.4	417	5,650	1,289	184	1,381	1,296	632	350		
2	147	200	70.6	9.2	374	3,471	1,035	181	1,063	1,737	607	374		
3	135	206	70.6	0	312	1,826	946	164	809	1,487	597	252		
4	111	206	119	3.9	307	1,257	961	417	632	1,338	600	197		
5	133	186	95.7	0	324	922	961	519	434	1,240	533	231		
6	151	182	83.0	7.4	427	717	950	334	273	1,081	551	276		
7	169	177	77.7	22.2	629	611	918	189	203	929	512	272		
8	123	171	74.9	37.8	671	569	908	126	194	953	484	315		
9	104	176	68.5	7.8	38.5	561	752	96.4	205	1,243	466	339		
10	105	177	63.9	0	0	936	572	90.4	441	4,202	509	259		
11	120	194	69.6	0	0	1,656	491	124	879	5,580	516	233		
12	146	200	24.0	0	0	1,123	438	199	971	4,344	427	247		
13	192	203	0	11.3	0	791	413	128	1,268	3,154	388	282		
14	241	184	0	85.3	0	692	427	134	1,360	2,521	374	307		
15	281	164	0	81.9	0	583	487	150	1,247	2,366	371	364		
16	294	164	0	43.1	208	491	484	151	1,218	2,228	378	395		
17	302	168	30.7	57.2	540	427	438	266	1,635	2,055	413	374		
18	305	161	45.9	31.4	530	364	410	302	1,458	1,907	413	371		
19	298	136	23.3	56.1	554	299	434	237	1,423	1,526	331	385		
20	302	114	23.0	133	537	285	431	113	1,282	1,257	300	403		
21	306	96.8	35.7	96.8	410	287	424	83.0	1,134	1,074	318	441		
22	293	90.4	17.3	77.0	333	288	403	98.2	964	1,074	326	452		
23	276	85.5	30.0	30.7	533	675	346	184	1,074	1,063	333	452		
24	266	96.8	74.5	65.7	777	1,843	323	324	1,222	989	360	424		
25	249	114	57.2	1,635	664	1,469	330	332	1,918	943	364	417		
26	252	72.0	19.1	1,572	540	985	315	221	2,493	876	301	371		
27	275	48.4	0	1,109	2,168	4,379	285	114	1,836	840	272	335		
28	293	62.1	0	798	2,882	4,096	302	96.8	1,289	777	310	347		
29	285	0	558	1,699	2,581	348	348	94.3	1,293	717	335	381		
30	276	23.7	431	1,084	1,709	207	1,377	1,261	710	294	399	399		
31	271	65.7		3,602		211	1,861		678		385			
Sum	6,855	4,266.0		7,014.2		20,560.5	41,543		8,890.1		52,185	10,630		
				1,334.2			17,239		32,860		12,615			
Month	Current Year 1946													
	1922-46													
	Extreme Second Feet													
	Average Rainfall in Inches													
			High		Low		Average Second Feet	Total Acre Feet	Acre Feet			Average	Maximum	Minimum
	Average Rainfall in Inches		Day		Day				Period 1939-1946					
Jan.	1.62	3.29	21	319	9	102	221	13,600	13,513	25,080	2,090			
Feb.	.98	.78	1	254	28	57.6	152	8,460	6,996	14,860	85.1			
Mar.	1.24	.16	4	130	#	0	43.0	2,650	6,544	20,100	0			
Apr.	1.50	1.99	25	1,980	#	0	234	13,910	8,961	28,590	0			
May	3.41	2.67	31	5,350	#	0	663	40,780	20,749	40,780	4,490			
June	2.87	3.41	1	5,850	26	89.0	1,380	82,400	27,267	82,400	1,590			
July	1.94	.31	1	1,490	31	185	556	34,190	19,456	48,580	360			
Aug.	1.98	1.33	30	2,520	21	80.9	287	17,650	24,365	96,180	138			
Sept.	4.76	6.31	26	2,660	10	170	1,100	65,180	62,676	195,100	0			
Oct.	2.20	3.34	11	5,580	31	650	1,680	103,510	70,306	124,600	28,620			
Nov.	1.28	.45	1	639	27	278	420	25,020	16,026	25,020	3,370			
Dec.	1.85	.34	22	456	4	189	343	21,080	12,812	21,080	3,070			
Yearly	25.43	24.38		5,830		0	592	428,410	289,671	508,160	168,290			
Water Used for Irrigation								55,335	± 34,677	± 55,335	± 21,078			
Acreage Cultivated								123,552	± 99,576	± 123,552	± 47,417			
Mean Acre Feet per Acre Cultivated								.45	± .35	± .68	± .20			
Average Rainfall in Inches								24.38	± 25.43	± 38.84	± 16.68			

• Record began September 1, 1939 ± Period 1943-1946 ± Period 1922-1946

MUNICIPAL WATER USES

Tabulated below are yearly and monthly amounts of water pumped into the municipal distribution systems of several towns along the Rio Grande. The municipal and industrial water supply for the El Paso area in Texas and Juarez in Chihuahua came from wells (See Outfalls from Wells, page 11, hereof) prior to November 7, 1943, when the city of El Paso began diverting some water from the Rio Grande for municipal use as shown in the table below. The Del Rio water comes from San Felipe Springs, the Eagle Pass water comes from infiltration wells in or adjacent to the bed of the Rio Grande, the Guerrero water comes from the Rio Salado, the others from the Rio Grande. Because of changing conditions, the period records are limited here to the past ten years. For earlier records see index to Water Bulletin No. 14 and subsequent water bulletins.

On the United States Side In Acre Feet

Month	El Paso (Pop. 110,000 ***)				Del Rio (Pop. 15,500 ***)			
	1946	Period 1943-1946			1946	Period 1937-1946		
		Average	Maximum	Minimum		Normal	Maximum	Minimum
Jan.	0	23.5	70.6	0	88.0	79.6	115.7	45.5
Feb.	0	9.2	27.7	0	90.0	83.2	121.6	52.9
Mar.	63.4	211.8	371.2	63.4	140.0	115.4	158.0	75.5
Apr.	471.6	445.1	500.1	363.6	135.0	128.3	176.9	87.1
May	523.8	502.2	552.6	430.3	200.0	149.1	212.4	95.0
June	746.9	614.1	746.9	536.3	200.0	170.6	225.5	119.0
July	728.0	645.8	728.0	538.1	220.0	190.3	267.7	128.7
Aug.	540.4	547.8	588.5	514.4	239.0	176.2	254.0	79.8
Sept.	207.7	423.6	638.9	207.7	210.0	145.9	210.2	93.1
Oct.	292.4	300.2	454.8	193.4	110.0	104.3	125.9	76.4
Nov.	233.4	268.8	404.1	176.8	90.0	86.7	125.9	59.3
Dec.	281.9	221.6	281.9	139.8	89.0	78.3	107.4	51.9
Yearly	4,049.5	4,213.7	4,364.0	4,049.5	1,811.0	1,507.9	1,902.1	1,016.5

Month	Eagle Pass (Pop. 9,700 ***)				Laredo (Pop. 45,000 ***)			
	1946	Period 1937-1946			1946	Period 1937-1946		
		Normal	Maximum	Minimum		Normal	Maximum	Minimum
Jan.	54.7	49.9	63.5	38.9	310.5	232.4	370.1	147.8
Feb.	59.8	52.1	62.7	44.0	332.6	242.9	334.5	175.6
Mar.	76.6	61.7	72.3	48.5	465.9	301.7	473.8	162.4
Apr.	65.3	68.8	79.4	60.3	443.6	335.9	500.2	145.5
May	55.0	68.6	86.9	55.0	384.8	360.8	605.0	194.6
June	40.0	79.3	108.0	40.0	413.8	385.6	622.5	199.7
July	97.2	94.7	113.3	77.3	624.4	419.0	633.9	209.1
Aug.	98.2	93.6	112.4	73.9	625.6	446.1	626.0	285.3
Sept.	65.2	76.8	90.5	49.6	426.4	354.6	572.3	256.9
Oct.	50.9	64.0	92.1	41.0	407.1	320.2	482.0	207.6
Nov.	52.7	59.4	99.9	47.9	417.8	301.1	417.8	182.6
Dec.	55.9	53.8	68.1	42.1	385.4	259.0	385.4	147.5
Yearly	771.5	822.8	905.0	756.1	5,237.9	3,959.3	5,874.9	2,450.6

Month	Roma (Pop. 1,414 **)				Rio Grande City (Pop. 2,500 **)				Brownsville (Pop. 29,000 ***)			
	1946	Period 1937-1946			1946	Period 1937-1946			1946	Period 1942-1946		
		Normal	Maximum	Minimum		Normal	Maximum	Minimum		Normal	Maximum	Minimum
Jan.	5.0	7.0	14.3	2.4	21.5	20.3	36.7	14.7	223.6	116.5	223.6	60.3
Feb.	6.6	6.9	12.9	2.4	20.2	19.3	29.5	14.8	167.9	115.1	171.9	57.3
Mar.	8.1	6.3	9.5	2.0	27.3	25.1	35.4	19.5	216.5	138.2	216.5	66.2
Apr.	8.0	6.4	9.2	2.7	31.5	27.6	36.2	18.8	212.8	144.7	212.8	81.5
May	6.8	8.2	14.3	2.2	31.5	30.4	38.4	21.1	228.3	145.4	228.3	80.4
June	8.0	8.2	13.8	2.2	27.4	28.6	31.9	19.4	239.3	150.5	239.3	95.4
July	11.1	8.8	14.3	3.0	49.7	32.9	49.7	17.1	310.0	176.4	310.0	88.7
Aug.	10.3	8.6	14.3	3.5	54.0	34.5	54.0	18.5	330.7	188.4	330.7	101.7
Sept.	8.0	7.7	13.8	2.5	40.7	28.2	40.7	17.1	323.8	151.0	323.8	84.8
Oct.	6.3	6.0	9.5	2.9	37.9	26.1	37.9	19.0	298.5	146.8	298.5	90.3
Nov.	7.4	5.9	9.2	2.6	35.4	22.4	35.4	15.9	280.4	140.3	280.4	86.7
Dec.	6.4	5.6	9.5	2.3	22.8	20.5	36.0	13.9	272.0	136.1	272.0	62.8
Yearly	92.0	85.6	135.5	44.3	399.9	315.9	402.2	218.0	3,103.8	1,749.4	3,103.8	1,020.1

On The Mexican Side

Month	Nuevo Laredo (Pop. 28,872 **)				Guerrero (Pop. 1,786 **)				Matamoros (Pop. 15,699 **)			
	1946	Period 1937-1946			1946	Period 1943-1946			1946	Period 1942-1946		
		Normal	Maximum	Minimum		Average	Maximum	Minimum		Average	Maximum	Minimum
Jan.	190.4	118.5	190.4	95.8	4.5	5.0	5.5	4.5	72.1	74.5	80.2	68.4
Feb.	203.3	119.0	203.3	89.0	4.5	4.6	4.7	4.5	64.0	70.4	75.6	64.0
Mar.	276.2	149.3	276.2	105.6	5.5	5.5	6.3	5.0	81.4	80.3	88.4	68.5
Apr.	269.5	169.3	269.5	126.8	6.3	6.8	7.3	6.1	82.5	78.5	86.8	68.4
May	271.3	179.8	271.3	122.8	7.1	7.5	8.0	7.1	92.4	82.3	92.4	68.4
June	278.7	183.3	278.7	129.6	8.0	8.2	8.5	8.0	92.7	81.8	92.7	68.5
July	367.7	203.8	367.7	115.2	9.1	9.2	10.1	8.8	101.0	87.0	101.0	68.4
Aug.	355.3	209.8	355.3	117.9	10.8	10.7	11.3	10.1	102.7	88.8	104.8	68.4
Sept.	277.9	177.2	277.9	113.0	9.0	8.3	9.0	7.3	95.5	84.1	95.5	68.5
Oct.	263.7	169.6	272.1	105.8	8.8	7.7	8.8	6.5	92.7	83.2	92.7	68.4
Nov.	260.4	150.6	260.4	99.3	7.3	6.2	7.3	4.9	88.0	79.7	88.0	66.8
Dec.	247.9	137.0	247.9	96.3	6.3	5.6	6.3	5.0	89.9	78.3	89.9	70.0
Yearly	3,262.3	1,967.2	3,262.3	1,504.7	87.2	85.3	87.5	82.4	1,054.9	968.9	1,054.9	* 821.1

Record began November 1943 † Period 1944-1946 ** 1940 census *** 1947 estimate † Estimated
 * Partly estimated † Based on pump operators' estimate and rainfall.

SUSPENDED SILT IN THE RIO GRANDE AND SOME TRIBUTARIES AND DIVERSIONS

The gravimetric percentages of dried silt reported here were determined from numerous water samples taken in small necked bottles. Two methods of sampling were used.

- By lowering one open bottle into the water at one or more verticals in the stream cross section, being careful to approach but not to strike bottom and thus to secure an integrated sample at all depths.
- By sampling in three bottles each at the surface of the stream, one bottle at the mid-point and one bottle at each side, one-sixth of the width from the water's edge. Numerous experiments have shown that the mean of three samples so taken gives 0.908 of the mean suspended silt in the stream cross section within reasonable limits of accuracy. (See Tech. Bull. No. 382, 1933, U. S. Department of Agriculture.)

The gravimetric percentages of dried silt were determined from the samples by two methods:

- By determining the silt in a single monthly composite which was composed by using from each individual sample an amount proportional to the river flow represented by that sample. (One filtering, drying, and weighing each month.)
- By determining the silt in each sample bottle. (One filtering, drying, and weighing for each bottle.)

For visualization and comparison the assumption is indulged here that 1,452 tons of silt would occupy one acre foot in a reservoir bottom, which is equivalent to saying that one cubic foot of silt thus situated would weigh 66.7 pounds. See second page hereafter for data as to the average density of Rio Grande silt in Elephant Butte Reservoir.

Samples at San Marcial for the first half of the year and at Langtry and Pecos River for the entire year were collected by the U. S. Section, Method A, analyzed by the U. S. Section, Method 1. Samples at San Marcial were collected and analyzed by the United States Geological Survey for the last half of the year.

Samples at Eagle Pass and Roma were collected by the Mexican Section, Method A, analyzed by the U. S. Section, Method 1.

Samples at Ouchillo Parado, Rio Alamo, Retamal Canal, and Las Palmas were collected by the Mexican Section, Method B, analyzed by the Mexican Section, Method 2.

For previous records see "Silt" in index to Water Bulletin 14 and subsequent bulletins.

Month	1946						Period of Record		
	Tons		Number of Samples	Gravimetric Percentages			Acre-Feet at 1.452 Tons Per Acre Foot		
	Water	Silt		Average	Maximum Sample	Minimum Sample	Average	Maximum	Minimum

Rio Grande at San Marcial Station

Period 1925-1946

Jan.	56,197,000	132,625	31	.236			91.3	169.1	374.4	27.8
Feb.	46,296,000	78,240	27	.169			53.9	241.6	1,027.0	23.3
Mar.	43,521,000	87,912	29	.202			60.5	275.3	1,012.0	19.2
Apr.	5,557,000	4,393	30	.082			3.0	695.7	3,780.0	3.0
May	6,922,000	18,136	19	.262			12.5	1,399.6	5,610.4	5.8
June	44,000	6	8	.014			T	1,091.5	9,322.0	T
July	685,000	18,290	11	2.67	8.70	.03	12.6	919.7	6,672.0	0
Aug.	21,622,000	1,219,481	31	5.64	9.36	.03	839.9	1,651.6	11,710.0	83.4
Sept.	9,305,000	201,918	27	2.17	5.25	.15	139.1	2,104.7	17,470.0	24.4
Oct.	13,879,000	481,601	31	3.47	7.49	.09	351.7	747.0	6,520.0	7.2
Nov.	63,210,000	651,882	30	1.02	2.83	.35	449.0	149.1	604.8	7.2
Dec.	125,641,000	1,017,692	27	.81	1.36	.27	700.9	180.0	700.9	30.3
Yearly	393,379,000	3,912,176	301	.994			2,694.4	9,624.9	41,317.6	1,844.4

Rio Conchos Station at Cuchillo Parado, Chihuahua

Period 1945-1946

Jan.	55,155,000	0	14	0	0	0	0	0	0	0
Feb.	47,771,000	0	12	0	0	0	0	0	0	0
Mar.	53,883,000	0	13	0	0	0	0	0	0	0
Apr.	39,575,000	0	13	0	0	0	0	0	0	0
May	21,675,000	0	14	0	0	0	0	0	0	0
June	33,220,000	183,081	14	.5511	2.5512	0	126.1	69.0	126.1	0
July	62,828,000	116,295	15	.1851	.7557	0	80.1	485.0	889.8	80.1
Aug.	32,211,000	61,910	14	.1922	.7526	0	42.6	23.7	42.6	4.8
Sept.	290,055,000	1,726,117	24	.5951	1.7559	0	1,188.8	594.6	1,188.8	3
Oct.	197,822,000	598,214	19	.3024	.9243	0	412.0	704.5	997.0	412.0
Nov.	68,468,000	0	13	0	0	0	0	0	0	0
Dec.	54,115,000	0	13	0	0	0	0	0	0	0
Yearly	956,777,000	2,685,617	178	.2808	2.5512	0	1,849.6	1,870.8	1,891.9	1,849.6

Rio Grande at Langtry Station

Period April 1944-1946

Jan.	107,797,000	16,601	6	.0154			11.4	11.0	11.4	10.5
Feb.	91,238,000	8,941	6	.0098			6.2	7.6	8.9	6.2
Mar.	88,495,000	8,318	6	.0094			5.7	6.0	6.4	5.7
Apr.	75,701,000	26,874	7	.0355			18.5	29.4	66.4	3.3
May	99,380,000	649,945	9	.6540			447.6	155.5	447.6	3.7
June	106,624,000	1,348,794	7	1.2650			928.9	340.6	928.9	2.8
July	113,558,000	439,469	7	.3870			302.7	1,788.4	4,483.4	302.7
Aug.	45,948,000	6,800	5	.0148			4.7	374.3	951.5	4.7
Sept.	374,079,000	4,762,026	9	1.2730			3,279.6	2,169.4	3,279.6	123.5
Oct.	396,185,000	2,531,609	8	.6390			1,743.5	2,116.1	3,260.7	1,344.0
Nov.	119,421,000	19,943	5	.0167			13.7	14.4	16.9	12.6
Dec.	106,071,000	67,885	6	.0640			46.8	21.3	46.8	5.7
Yearly	1,724,495,000	9,887,205	81	.5733			6,809.3	7,034.0	8,155.6	6,809.3

↓ Period 1945-1946

Pecos River Station

Period June 1943-1946

Jan.	23,313,000	907	14	.00389			.62	.58	.74	.37
Feb.	22,452,000	864	14	.00385			.60	.63	.86	.42
Mar.	24,769,000	879	16	.00355			.61	.77	1.03	.61
Apr.	22,137,000	1,581	16	.00714			1.09	.59	1.09	.19
May	26,317,000	5,421	16	.02060			3.73	1.82	3.73	.64
June	28,774,000	22,847	15	.07940			15.73	4.72	15.73	.62
July	15,947,000	281	16	.00176			.19	20.51	67.14	.19
Aug.	13,722,000	255	15	.00186			.18	.45	.83	.18
Sept.	19,394,000	219	16	.00113			.15	2.56	8.46	.15
Oct.	122,682,000	255,424	17	.20820			175.91	57.36	175.91	.39
Nov.	21,797,000	390	15	.00179			.27	.49	1.25	.08
Dec.	21,918,000	408	14	.00186			.28	.59	1.34	.28
Yearly	363,222,000	289,476	184	.07969			199.36	91.01	199.36	17.09

↓ Period 1944-1946

SUSPENDED SILT IN THE RIO GRANDE AND SOME TRIBUTARIES AND DIVERSIONS

Month	1946						Period of Record		
	Tons		Number of Samples	Gravimetric Percentages			Acre-Feet at 1,452 Tons Per Acre Foot		
	Water	Silt		Average	Maximum Sample	Minimum Sample	Average	Maximum	Minimum

Eagle Pass Station

Period 1934-1946

Jan.	186,117,000	32,012	25	.0172			22.0	25.7	124.0	0.1
Feb.	150,302,000	23,147	22	.0154			15.9	16.2	32.1	2.6
Mar.	148,414,000	10,983	29	.0074			7.6	28.9	187.9	4.7
Apr.	187,735,000	193,367	29	.1030			133.2	58.2	204.3	3.0
May	272,636,000	730,664	28	.2680			205.2	605.4	4,217.8	17.7
June	469,136,000	896,090	30	.1910			617.1	947.8	3,821.0	4.3
July	251,411,000	221,493	27	.0881			152.5	1,323.6	7,835.8	69.2
Aug.	117,453,000	25,840	30	.0220			17.8	1,159.0	5,306.9	14.8
Sept.	426,066,000	1,976,946	28	.4640			1,361.5	3,176.7	10,802.8	13.0
Oct.	632,518,000	2,814,705	28	.4450			1,938.5	1,355.7	5,816.7	190.0
Nov.	213,410,000	30,518	29	.0143			21.0	99.0	305.5	12.3
Dec.	188,437,000	21,859	29	.0116			15.1	25.3	84.1	1.1
Yearly	3,243,635,000	6,977,584	334	.2151			4,805.4	8,899.5	20,842.8	1,768.3

Rio Alamo Station

Period 1934-1946

Jan.	1,334,000	0	7	0	0	0	0	3.6	21.8	0
Feb.	856,000	0	7	0	0	0	0	.05	.6	0
Mar.	786,000	0	8	0	0	0	0	5.6	45.4	0
Apr.	2,534,000	623	8	.0246	.0448	0	.4	28.4	227.4	0
May	20,732,000	103,328	8	.4984	.6892	0	71.2	47.5	229.7	2.2
June	20,507,000	139,345	8	.6795	1.0133	0	96.0	69.3	471.0	0
July	1,626,000	0	8	0	0	0	0	25.1	82.8	0
Aug.	19,917,000	228,090	11	1.1450	1.4537	0	157.1	199.1	1,607.8	0
Sept.	30,753,000	204,692	12	.6656	1.0671	0	141.0	120.3	362.9	1.5
Oct.	37,552,000	428,543	10	1.1412	1.3763	0	295.1	114.2	557.9	0
Nov.	1,333,000	0	8	0	0	0	0	1.0	5.2	0
Dec.	1,964,000	0	8	0	0	0	0	1.7	16.1	0
Yearly	139,904,000	1,104,581	103	.7895	1.4537	0	760.8	615.85	1,990.8	154.5

Roma Station

Period March 1929-1946

Jan.	196,447,000	20,823	31	.0106			14.3	44.7	168.7	.4
Feb.	161,278,000	17,095	27	.0106			11.8	26.4	121.0	.8
Mar.	145,721,000	9,629	28	.0061			6.6	141.7	1,825.3	1.3
Apr.	245,720,000	525,841	29	.2140			362.1	273.3	1,345.0	.7
May	727,936,000	2,962,700	31	.4070			2,040.4	1,343.0	5,232.4	15.4
June	591,902,000	1,876,329	28	.3170			1,292.2	1,233.4	7,216.0	10.6
July	290,004,000	321,904	30	.1110			221.7	1,404.2	9,070.0	19.3
Aug.	233,557,000	663,302	29	.2840			456.8	1,368.2	3,723.0	34.7
Sept.	553,497,000	2,800,695	28	.5060			1,928.9	3,970.8	17,998.0	13.4
Oct.	841,265,000	3,232,696	29	.6220			3,603.8	2,379.8	9,241.0	133.0
Nov.	235,552,000	66,661	30	.0283			45.9	162.5	659.7	4.8
Dec.	206,156,000	11,132	31	.0054			7.7	58.9	319.8	1.0
Yearly	4,427,033,000	14,508,767	351	.3277			9,992.2	12,402.9	30,839.0	2,314.0

Retamal Canal Station

Period 1943-1946

Jan.	18,488,000	14,624	5	.0791	.1389	.0285	10.1	4.8	10.1	1.8
Feb.	11,505,000	4,061	10	.0353	.1192	.0053	2.8	1.4	2.8	.2
Mar.	3,598,000	273	8	.0076	.0088	.0056	.2	1.8	5.9	.1
Apr.	18,917,000	41,353	8	.2186	.3163	.0069	28.5	35.4	113.0	0
May	55,451,000	205,446	12	.3705	.7749	.0356	141.5	93.0	183.8	1.1
June	112,040,000	555,494	14	.4958	1.0878	.0106	382.6	126.2	382.6	.3
July	46,493,000	46,539	14	.1001	.1770	.0173	32.1	108.4	285.8	12.1
Aug.	23,976,000	38,769	14	.1617	.5065	.0134	26.7	164.3	615.1	2.6
Sept.	88,622,000	620,177	14	.6998	1.3248	.1062	427.1	277.4	699.4	0
Oct.	140,714,000	1,052,320	15	.7477	1.6311	.0636	724.7	604.3	1,529.7	54.2
Nov.	34,022,000	12,928	13	.0380	.0821	.0076	8.9	6.0	8.9	3.6
Dec.	28,669,000	3,226	13	.0123	.0201	.0011	2.4	2.8	5.9	.7
Yearly	582,522,000	2,595,510	140	.4456	1.6311	.0011	1,787.6	1,425.8	1,946.1	326.54

Las Palmas Station

Silt analyses began
January 1, 1946

Jan.	233,961,000	216,414	5	.0925	.1604	.0302	149.0			
Feb.	167,185,000	66,707	10	.0399	.1470	.0044	45.9			
Mar.	85,984,000	9,630	13	.0112	.0200	.0023	6.6			
Apr.	158,179,000	350,841	14	.2218	.5698	.0075	241.6			
May	529,413,000	2,912,301	16	.5501	2.6758	.0347	2,005.7			
June	586,173,000	3,310,705	14	.5648	1.3116	.0118	2,280.1			
July	199,783,000	206,576	14	.1033	.1978	.0187	142.1			
Aug.	108,830,000	269,572	14	.2477	.6349	.0069	185.7			
Sept.	440,033,000	3,070,550	14	.6978	1.4917	.0889	2,114.7			
Oct.	714,398,000	7,696,210	15	1.0773	2.3132	.0756	5,300.4			
Nov.	152,243,000	66,987	13	.0440	.1066	.0069	46.1			
Dec.	140,107,000	16,593	13	.0117	.0221	.0013	11.3			
Yearly	3,516,289,000	18,192,686	155	.5174	2.6758	.0013	12,529.2			

CHEMICAL ANALYSES OF WATER SAMPLES FROM RIO GRANDE AND TRIBUTARIES 1946

The chemical analyses reported here were made by the United States Department of Agriculture at Riverside, California. All analyses were from composites made up periodically from independent water samples composed by taking from each sample an amount of water proportional to the acre footage of river flow represented by that sample. This compositing and the determination of the specific electrical conductances of the independent water samples was done by the United States Section of the International Boundary and Water Commission.

Water samples from the San Marcial station were collected by the United States Geological Survey after July 1, 1946. Water samples from the stations at Caballo Dam and Leasburg Dam were gathered by the United States Bureau of Reclamation. Water samples from the stations at Cuchillo Parado, Eagle Pass, Rio Salado, Roma and for the period January 1, to April 30, 1946, at Las Palmas, were gathered by the Mexican Section of this Commission. All others were gathered by the United States Section of this Commission. The samples reported here as Las Palmas samples after June 1, 1947 were in fact collected by the U. S. Section from the Rio Grande at Mercedes pumps 13.1 river miles below the Las Palmas station.

To convert "Milligram Equivalents" to parts per million by weight, multiply each ion by its appropriate conversion factor. These factors are ($\text{HCO}_3 + \text{CO}_3$, 30.5; Cl , 35.5; SO_4 , 48; Ca , 20; Mg , 12.16; Na , 23; NO_3 , 62. To convert tons per acre foot to parts per million, multiply tons per acre foot by 735.5.

Conductance, reported in the tables as ($\text{K} \times 10^5$ at 25°C), is a relative measure of the total salt concentration in the water samples. (See Circular No. 232 U.S. Dept. Agr., July 1932.) It is a definite statement of an important physical property of the water solution.

Descriptions of the sampling stations will be found in the forward part of this bulletin where the stream discharges are reported for these same stations.

For previous records see "Chemical Analyses" in index to Water Bulletin 14 and subsequent bulletins.

Month	No. of Samples	Total Tons of		Mean Kx10 ⁵ @25°C	Boron p.p.m.	pH	% Na **	% Cl ***	Mean Milligram Equivalents per Liter						
		Per Acre Foot	Dissolved Solids						Ca	Mg	Na	CO ₃ HCO ₃	SO ₄	Cl *	NO ₃
Water Samples from Rio Grande at San Marcial Station															
Jan.	31	.68	28,100	75.7	.12	8.3	44	19	3.25	1.05	3.38	3.28	3.05	1.45	.01
Feb.	29	.69	23,500	75.8	.07	8.0	45	18	3.18	1.02	3.38	3.26	3.03	1.42	.01
Mar.	33	.69	22,100	78.3	.15	8.3	46	19	3.14	1.06	3.61	3.17	3.18	1.50	.03
Apr.	30	1.00	3,940	114	.19	7.9	54	27	3.84	1.32	6.14	3.79	4.61	3.13	.01
May	19	.99	5,040	107	.20	8.2	52	23	3.84	1.38	5.73	3.84	4.66	2.49	.03
June	8	1.11	36.3	126		8.0	64	33	3.04	1.37	7.80	3.27	5.06	4.11	.04
July	12	1.40	706	150			47	23	6.10	2.17	7.43	3.80	8.22	3.68	.01
Aug.	31	1.72	27,300	176			40	11	8.95	3.14	8.18	4.72	13.24	2.31	.01
Sept.	28	.94	6,430	108			43	17	4.96	1.64	4.98	4.15	5.40	2.02	.01
Oct.	31	1.29	13,200	134			43	11	6.59	2.13	6.52	3.88	9.59	1.74	.03
Nov.	30	.63	29,600	73.3			38	11	3.74	1.17	3.05	3.56	3.46	.91	.03
Dec.	25	.49	45,300	58.7			32	12	3.17	.99	2.00	2.88	2.54	.71	.03
Mean @	307 ϕ	.71	205,252.3 ϕ	79.7			40	15	3.78	1.23	3.41	3.32	3.87	1.24	.023
Period Average	.650	.650	650,000	72.8			42	17	3.13	1.06	3.08	2.58	3.47	1.20	
Tons of Constituents, 1946								29,800		5,880	30,800	39,800	73,100	17,300	
Average Tons Period 1933-1946								83,400		17,200	94,200	104,000	221,000	56,700	

Water Samples from Rio Grande at Caballo Dam

Jan.	31	1.00	253	118	.16	8.0	57	24	3.43	1.80	6.92	5.35	3.99	2.96	.01
Feb.	28	.67	12,200	77.1	.12	8.0	45	19	3.08	1.11	3.49	3.15	3.18	1.48	.01
Mar.	31	.63	51,800	72.1	.05	7.9	43	19	3.08	1.04	3.09	2.85	3.09	1.35	T
Apr.	30	.63	75,000	72.4	.12	8.0	42	18	3.14	1.05	2.98	2.79	3.11	1.30	T
May	31	.63	61,200	72.7	.15	7.9	42	19	3.11	1.06	3.05	2.90	3.06	1.36	T
June	30	.64	76,800	73.3	.12	7.9	44	18	2.99	1.08	3.16	2.84	3.15	1.34	.01
July	31	.65	89,700	74.2	.11	7.9	44	19	3.03	1.07	3.21	2.88	3.17	1.41	.02
Aug.		.65	84,500	74.5	.15	7.9	44	19	3.08	1.09	3.27	2.96	3.19	1.41	.02
Sept.	30	.67	23,100	76.5	.11	7.8	44	20	3.23	1.10	3.34	3.08	3.13	1.59	.02
Oct.	31	.68	7,410	76.5	.12	8.1	44	21	3.15	1.10	3.38	2.96	3.16	1.64	.01
Nov.	30	.70	5,270	79.5	.10	7.8	44	21	3.29	1.16	3.55	3.14	3.29	1.67	.03
Dec.	31	.76	4,550	87.7	.12	7.9	48	21	3.29	1.31	4.29	3.65	3.43	1.89	T
Mean @		.644	491,783	73.8	.119	7.92	44	19	3.08	1.07	3.17	2.90	3.14	1.39	.010
Period Average		.711	604,000	78.2			44	18	3.35	1.17	3.50	2.75	3.88	1.43	
Tons of Constituents, 1946									64,100	13,500	75,700	91,900	157,000	52,200	
Average Tons Period 1931-1946									77,400	16,400	93,000	97,000	215,000	58,600	

Water Samples from Rio Grande at Leasburg Dam

Jan.	4	1.14	3,080	124	.16	7.8	44	23	5.39	1.75	5.65	3.97	6.00	2.96	.01
Feb.	4	.75	12,600	84.7	.19		41	18	3.85	1.45	3.72	3.67	3.72	1.61	.02
Mar.	28	.66	45,400	75.5	.08	7.9	43	19	3.22	1.06	3.21	2.89	3.30	1.48	T
Apr.	28	.72	80,900	81.8	.08	8.1	44	20	3.41	1.21	3.67	2.83	3.80	1.70	.03
May	27	.66	60,400	76.8	.12	8.2	44	19	3.14	1.09	3.28	2.82	3.38	1.48	T
June	26	.68	73,800	77.6	.11	7.9	45	20	3.13	1.11	3.42	2.84	3.37	1.53	.11
July	31	.68	83,300	76.8	.14	7.9	46	20	3.05	1.00	3.42	2.82	3.37	1.52	.07
Aug.	31	.69	87,100	76.6	.11	7.9	46	20	3.01	1.14	3.47	2.78	3.39	1.56	.03
Sept.	30	.75	31,800	82.3	.07	7.8	44	21	3.52	1.16	3.62	3.07	3.60	1.75	.04
Oct.	31	.77	14,000	84.7	.15	7.9	45	22	3.48	1.15	3.82	2.89	3.77	1.85	.04
Nov.	30	.87	8,520	95.8	.15	7.8	45	22	3.98	1.38	4.37	3.31	4.40	2.13	.01
Dec.	31	.91	6,820	100	.12	7.9	45	22	4.25	1.44	4.57	3.53	4.60	2.24	.02
Mean @	.4301	.698 ϕ	512,720	78.9	.120		45	20	3.23	1.12	3.49	2.88	3.50	1.59	.042
Period Average	.768	.768	627,000	83.8			44	20	3.61	1.25	3.84	2.89	4.13	1.74	
Tons of Constituents, 1946									64,700	13,600	80,200	87,800	168,000	56,300	
Average Tons Period 1931-1946									80,200	16,800	98,000	97,600	220,000	68,400	

** Percent of total cations ϕ Weighted mean *** Percent of total anions ϕ Total

CHEMICAL ANALYSES OF WATER SAMPLES FROM RIO GRANDE AND TRIBUTARIES 1946

Month	No. of Samples	Total Tons of		Mean Kx10 ³ @25°C	Boron p.p.m.	pH	% Na **	% Cl ***	Mean Milligram Equivalents per Liter						
		Per Acre Foot	Dissolved Solids						Ca	Mg	Na	CO ₃ + HCO ₃	SO ₄	Cl	NO ₃

Water Samples from Rio Grande at El Paso Station

Jan.	31	1.68	20,200	191	.24	8.0	61	35	5.31	2.25	11.67	4.28	8.38	6.85	.01
Feb.	27	1.38	21,000	154	.24	8.2	37	32	4.78	1.83	8.82	3.98	6.74	5.00	.03
Mar.	31	.97	37,200	116	.18	7.9	55	29	3.38	1.44	6.00	2.72	5.18	3.20	.04
Apr.	30	.97	59,600	109	.15	7.8	49	25	4.13	1.40	5.38	3.59	4.64	2.80	T
May	31	1.01	64,100	113	.15	8.1	50	26	4.30	1.46	5.71	3.76	4.82	2.98	.01
June	30	1.03	60,900	116	.14	8.1	52	26	4.16	1.42	5.96	3.64	5.00	3.10	.01
July	31	1.01	71,800	114	.16	7.9	52	27	4.07	1.30	5.87	3.58	4.95	3.08	.01
Aug.	31	1.02	79,300	115	.11	7.8	51	26	4.21	1.48	5.90	3.71	4.95	3.11	.01
Sept.	30	1.24	55,900	137	.25	7.9	54	30	4.73	1.71	7.46	4.32	5.85	4.18	.02
Oct.	31	1.39	35,000	152	.79	56	32	4.95	1.81	8.63	4.11	6.61	4.96	.05	
Nov.	25	1.61	24,900	178	.25	8.0	57	32	5.71	2.09	10.54	4.84	7.69	5.92	.01
Dec.	31	1.61	22,500	178	.12	7.9	57	33	5.75	2.07	10.45	4.79	7.61	6.05	.01
Mean @	359	1.11	552,000	125		7.94	53	28	4.34	1.53	6.60	3.74	5.38	3.56	.014
Period Average		1.11	659,000	122			52	30	4.47	1.62	6.61	3.55	5.45	3.80	
Tons of Constituents, 1946									58,900	12,600	103,000	77,200	175,000	85,500	
Average Tons Period 1930-1946									72,500	15,900	123,000	87,000	212,000	109,000	

Water Samples from Rio Grande at Fort Quitman Station

Jan.	7	2.88	50,700	324	.34	7.9	60	53	9.59	3.66	20.25	5.03	10.94	17.70	.04
Feb.	6	3.01	34,000	347	.32	7.9	63	56	8.89	3.87	21.81	3.95	11.44	19.60	.04
Mar.	5	3.25	28,000	389	.39	8.2	65	60	8.69	4.43	24.69	2.63	12.60	22.95	.01
Apr.	5	4.28	21,000	483	.45	7.9	64	63	11.69	6.04	31.47	3.65	14.44	31.42	T
May	6	3.43	41,200	390	.33	8.1	64	61	9.51	4.72	25.35	3.29	12.14	24.37	.01
June	6	5.34	23,000	613	.55	7.9	65	66	14.18	7.87	41.55	3.48	17.88	42.27	.01
July	6	5.32	17,200	619	.55	7.9	65	66	14.68	7.90	42.08	3.82	17.74	42.82	.02
Aug.	6	5.94	14,800	660	.61	7.8	65	67	15.48	8.57	45.60	3.69	19.34	46.66	.01
Sept.	7	3.57	46,400	408	.48	7.9	64	61	10.20	4.72	26.38	3.57	12.85	25.34	.01
Oct.	9	2.20	65,800	251	.19	7.9	60	51	7.24	2.89	15.17	3.85	8.54	13.17	.04
Nov.	6	3.15	33,700	356	.35	8.0	62	55	9.97	4.06	22.50	4.71	11.69	20.23	.03
Dec.	7	2.94	40,000	332	.35	8.0	61	54	9.53	3.71	20.73	4.87	10.98	18.34	.04
Mean @	76	3.15	415,800	360		7.95	63	58	9.47	4.21	22.92	4.01	11.58	21.25	.028
Period Average		2.22	574,000	252			61	54	7.25	2.89	15.55	3.51	8.28	14.01	
Tons of Constituents, 1946									33,900	9,150	94,200	21,900	99,400	135,000	
Average Tons Period 1930-1946									51,200	12,400	126,000	37,700	140,000	175,000	

Water Samples from Rio Grande at Upper Presidio Station

Jan.	5	2.98	59,300	333	.34	7.9	62	54	9.33	3.83	21.05	4.26	11.45	18.62	.03
Feb.	5	3.25	39,000	366	.40	8.2	63	57	9.56	4.22	25.41	3.60	12.76	21.35	.05
Mar.	5	3.44	27,700	389	.41	8.2	62	57	10.46	4.61	24.35	3.36	13.85	22.95	.01
Apr.	5	5.33	4,770	570	.57	7.9	55	60	19.85	7.54	33.22	3.30	20.83	36.99	T
May	5	3.06	8,080	348		8.1	58	57	10.42	3.96	20.04	2.89	11.95	19.85	
June	5	4.65	2,070	529		8.1	58	57	15.80	5.97	30.47	4.38	18.16	30.18	.04
July	6	1.47	10,300	171	.17	7.8	59	46	5.44	1.45	9.74	2.64	6.28	7.78	.06
Aug.	5	4.87	623	513	.46	7.7	52	58	19.86	6.70	28.39	2.60	20.70	32.07	.02
Sept.	5	.88	18,400	101	.20	7.8	60	48	3.05	.98	5.95	1.49	3.71	4.89	
Oct.	5	2.09	81,600	238		7.8	60	48	7.19	2.31	14.02	3.51	8.75	11.52	.05
Nov.	5	3.28	33,100	371	.40	8.1	64	58	9.47	4.22	24.09	3.37	12.56	21.94	.01
Dec.	5	3.07	38,100	345	.41	8.0	63	56	9.13	3.90	22.19	3.85	11.87	19.67	.02
Mean @	61	2.42	323,043	274		7.92	61	53	7.72	2.97	16.89	3.27	9.67	14.89	.037
Period Average		1.91	530,000	216			59	50	6.50	2.42	12.80	3.11	7.68	11.00	
Tons of Constituents, 1946									28,100	6,550	70,500	18,100	84,300	95,800	
Average Tons Period 1935-1946									49,100	11,100	111,000	35,800	139,000	147,000	

Water Samples from Rio Conchos at Cuchillo Parado Station

Jan.	5	.83	33,700	98.6	.23	7.9	55	15	2.78	1.23	4.84	1.88	5.81	1.34	
Feb.	5	.80	28,100	94.9		7.9	55	15	2.68	1.19	4.66	1.80	5.60	1.29	.02
Mar.	13	.72	28,500	76.9	.20	8.1	50	15	2.76	1.06	3.76	1.91	4.54	1.15	.01
Apr.	13	.75	21,800	80.0	.20	7.8	55	19	2.42	1.03	4.21	1.55	4.79	1.48	.01
May	14	.90	14,300	95.5	.18	7.7	55	21	2.97	1.11	5.02	1.54	5.78	1.94	.03
June	13	.83	20,300	86.1	.22	7.9	47	17	3.45	.98	3.94	1.99	5.10	1.44	.06
July	16	.76	35,100	79.8	.13	7.7	37	12	4.23	.90	2.98	2.76	4.46	.95	.05
Aug.	17	.94	22,300	95.3	.15	7.7	40	15	4.74	1.02	3.91	1.96	6.38	1.42	.03
Sept.	22	.45	96,000	48.1	.10	7.8	36	7	2.58	.51	1.71	2.31	2.15	.35	.04
Oct.	17	.65	94,600	66.7	.14	7.8	33	8	3.78	.77	2.22	2.55	3.74	.56	.04
Nov.	11	.78	39,300	83.5	.15	7.9	41	12	4.01	1.08	3.50	3.28	4.38	1.02	.03
Dec.	13	.90	35,800	95.8	.19	7.9	45	13	4.24	1.19	4.48	3.70	5.04	1.28	.03
Mean @	156	.668	469,800	71.4	.150	7.83	42	12	3.27	.844	2.96	2.39	3.91	.839	.034
Period Average															
Tons of Constituents, 1946									62,700	9,820	65,100	69,800	180,000	28,500	
Average Tons Period															

** Percent of total cations † Weighted mean ‡ Estimated
*** Percent of total anions ‡ Total

1946

[illegible]

January	February	March	May	June	July	August	September	September	October	December
12 108	23 105	30 88.0	5 91.0	6 119	1 88.4	5 102	2 38.3	23 49.7	30 61.0	2 97.2
27 109	27 99.0	6 April 1	12 109	9 111	18 79.9	10 86.0	2 38.6	30 68.4	30 November	8 99.7
31 102	28 102	13 91.7	19 106	19 112	18 79.9	17 85.0	7 October	30 65.3	30 65.3	8 99.7
February	2 90.8	15 104	26 115	23 113	20 79.9	27 108	14 62.8	11 84.4	23 86.7	23 86.7
2 102	9 94.4	20 78.1	30 105	30 78.5	28 86.5	31 122	21 82.2	14 62.8	18 81.3	30 98.9
18 105	16 87.6	24 85.4					21 82.5	21 82.7	25 86.6	
16 111	24 102	28 86.7								

January	February	March	April	May	June	July	August	September	October	November	December
1 1352	12 1358	19 116	30 101	22 82.1	10 75.5	16 73.9	16 73.9	12 71.3	18 84.7	26 121	
4 156	18 120	27 116	2 May	24 95.6	24 96.3	14 76.7	12 45.6	6 42.1	20 92.5	27 121	
7 143	17 130	April 1	8 89.1	June, 1	2 96.5	16 72.0	12 45.6	6 41.5	27 99.0	December	
10 159	26 135	5 119	5 86.2	8 109	2 97.1	20 72.0	16 45.6	7 63.9	November	1 122	
13 159	March 15	4 119	4 91.0	11 97.5	10 87.5	18 72.0	12 45.6	7 63.9	3 122	11 117	
28 164	5 123	10 103	7 95.8	12 95.2	15 95.9	September 19	63.3	9 94.9	10 110	11 117	
February	-7 137	18 84.9	8 84.9	23 32.1	18 77.0	3 93.4	27 21.7	9 25.5	18 106	15 124	
1 134	13 152	18 95.7	10 89.2	24 84.5	22 64.0	7 65.5	29 52.4	18 28.2	18 106	17 119	
4 156	19 120	27 116	30 101	22 82.1	10 75.5	16 73.9	16 73.9	12 71.3	18 84.7	26 121	

	January	February	March	April	May	June	July	August	September	October	November
2	615	7 706	13 838	16 599	16 569	19 410	23 387	26 411	27 412	27 371	30 422
4	622	9 701	15 801	18 571	18 403	21 470	25 363	28 392	29 390	29 358	December
6	619	11 608	17 782	20 254	20 388	23 775	27 414	30 389	30 390	31 374	2 413
8	628	13 701	19 882	22 327	22 412	25 839	29 387	32 395	32 395	33 375	4 414
10	626	15 697	21 722	22 229	24 414	27 213	31 389	3 397	3 354	2 382	8 420
12	626	17 672	23 690	24 276	26 386	29 298	33 387	1 397	5 210	4 380	10 451
14	624	19 658	25 718	26 285	28 387	31 387	35 387	3 397	6 210	5 388	12 467
16	626	21 639	27 722	28 361	30 427	33 389	4 362	5 286	6 312	8 393	14 417
18	668	23 671	29 669	30 474	June	3 358	6 383	7 478	7 887	10 497	16 504
20	676	25 643	31 643	May	1 366	5 376	8 398	9 398	9 354	12 397	18 556
22	668	27 668	33 647	2 366	3 358	5 376	10 398	11 398	12 354	13 397	20 560
24	676	March	2 616	4 360	5 363	9 400	12 396	13 393	13 304	16 393	22 465
26	707	4 661	4 603	6 163	7 673	11 411	14 400	15 366	15 374	18 398	24 414
28	712	6 669	6 609	7 669	8 677	11 616	14 396	15 366	16 366	19 398	26 416
30	February	5 666	8 613	9 307	11 561	15 408	18 383	19 363	20 316	22 409	28 414
1	679	7 701	10 568	10 119	13 595	17 392	20 392	21 392	21 319	24 419	30 465
2	701	9 580	12 593	12 275	15 431	19 398	22 379	23 388	23 311	26 418	
3	711	11 783	14 565	14 270	17 432	21 394	24 395	25 404	25 310	28 437	

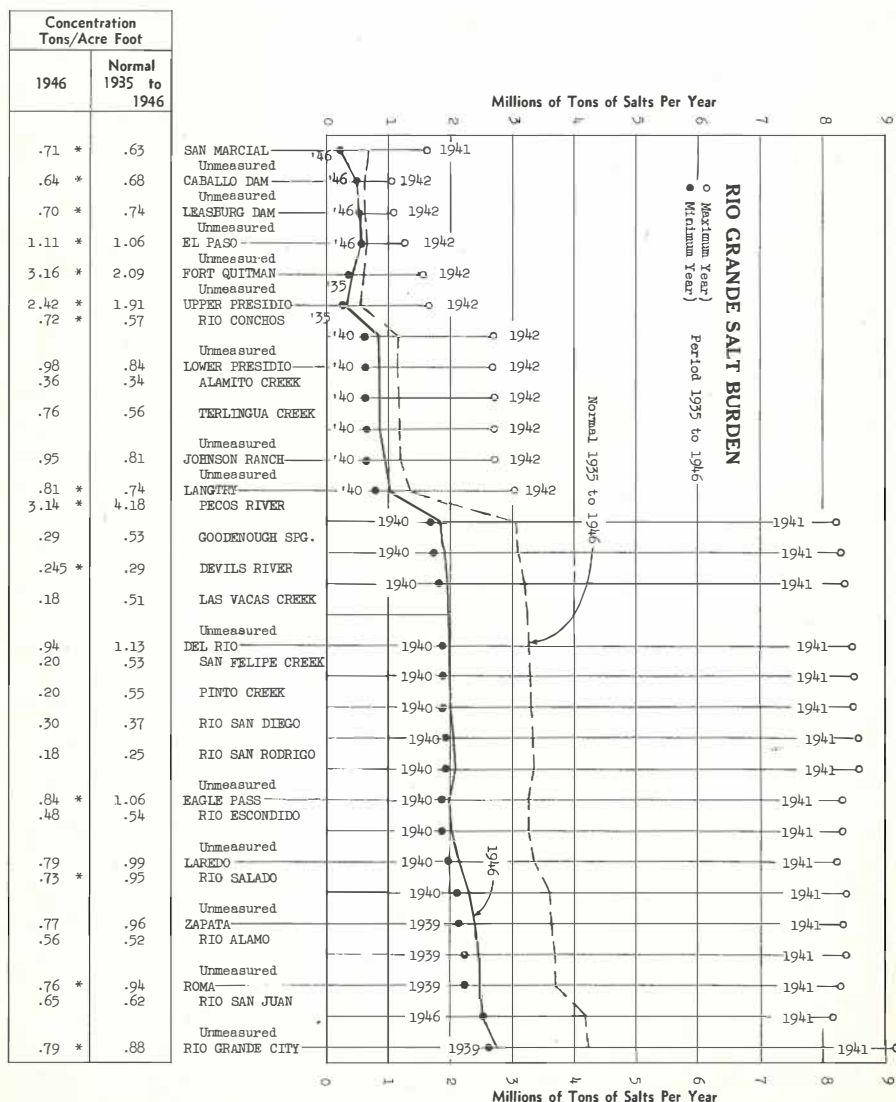
January	March	May	June	July	July	* August	September	October	November	December
18 46.4	18 37.6	16 59.9	10 45.8	1 21.4	12 40.2	7 23.9	30 30.8	26 54.4	18 43.0	9 36.1
18 41.2	18 32.0	16 35.5	30 21.4	1 27.5	19 43.2	7 24.5	28 59.9	30 44.6	18 45.8	9 38.5
February	April	June	July	August	September	October	November	December		
14 42.1	15 27.9	10 46.5	30 27.5	12 41.5	19 28.1	22 24.9	15 38.7	22 41.0		
14 42.1	15 28.2	10 46.5	30 21.5	12 40.1	19 28.1	22 23.7	26 54.4	22 46.6		

January	February	March	April	May	June	July	August	October	November	December
1 186	7 181	18 204	19 153	23 97.1	23 35.6	26 72.6	29 92.9	1 68.3	1 104	2 119
2 184	8 182	19 201	20 175	24 95.0	24 37.3	29 75.6	30 92.2	2 69.4	3 110	3 110
3 185	9 183	20 202	21 176	25 95.1	25 37.4	30 75.7	31 92.3	3 70.2	4 111	4 114
4 184	10 184	21 193	22 61.5	26 102	26 50.4	31 70.6	September	4 69.6	5 110	5 121
5 181	11 189	22 196	23 49.8	27 101	27 50.4	August	1 87.4	5 42.8	6 114	6 125
6 182	12 188	23 197	24 50.0	28 101	28 50.4	2 71.7	2 87.4	6 74.8	7 115	7 126
10 175	14 182	24 190	25 79.1	29 40.7	29 55.4	3 71.7	3 95.6	9 60.2	8 114	8 129
11 175	15 180	25 190	26 76.6	30 78.6	30 55.4	4 95.7	4 105	10 52.0	9 116	9 129
12 180	16 182	26 191	27 91.7	31 78.6	31 55.4	5 87.4	5 105	11 52.0	10 115	10 129
14 196	17 183	27 192	28 130	June	1 56.4	6 87.4	6 87.4	12 52.0	11 113	11 131
15 187	18 184	28 167	29 130	2 90.2	2 56.6	7 87.4	7 87.4	13 52.0	12 114	12 131
16 187	19 183	29 173	30 113	3 97.5	3 56.6	8 87.4	8 87.4	14 52.0	1 115	1 131
17 184	20 173	30 174	May	4 97.5	4 56.6	9 76.5	9 61.2	15 71.9	2 117	2 137
18 188	21 173	31 183	1 107	5 109	5 76.5	10 61.2	10 61.2	16 71.9	3 118	3 137
19 187	22 198	April	2 111.9	6 109	6 70.6	11 61.7	11 45.3	17 78.8	4 116	4 135
20 184	23 198	1 184	3 44.2	7 120	8 69.8	11 83.2	14 51.8	18 93.5	5 107	5 135
21 184	24 198	2 175	4 70.5	8 120	9 69.8	12 83.2	15 51.8	19 93.5	6 106	6 135
22 178	25 175	3 178	5 70.5	9 122	10 74.2	13 77.2	16 63.4	20 93.2	7 108	7 135
23 194	26 172	4 171	6 71.6	10 119	11 86.5	14 103	17 64.9	21 95.7	8 107	8 138
24 188	27 181	5 176	7 75.3	11 119	12 86.5	15 103	18 64.9	22 95.7	9 110	9 138
27 183	5 193	7 168	11 92.9	11 109	13 82.6	16 98.1	19 77.4	24 96.9	10 112	10 141
28 185	6 196	8 170	12 92.1	12 109	15 75.6	17 97.3	20 71.3	25 96.5	11 106	11 135
29 189	7 196	9 170	13 92.1	13 109	16 75.6	18 97.3	21 71.3	26 96.5	12 104	12 135
30 190	8 189	10 169	14 68.4	14 129	17 78.7	19 85.4	22 83.2	27 95.2	13 112	13 142
31 199	10 201	11 162	15 64.3	15 120	18 91.6	20 81.6	23 85.2	28 95.2	14 119	14 143
1 February	11 200	12 162	16 64.3	16 120	19 91.6	21 81.6	24 85.2	29 95.2	15 112	15 143
1 191	12 216	13 176	17 77.7	17 111	20 79.4	23 93.5	25 79.6	30 108	16 121	16 141
2 186	13 215	14 170	18 180	18 115	21 75.6	24 94.0	26 72.4	31 105	17 123	17 140
3 187	14 207	15 172	19 182	19 115	22 75.6	25 94.0	27 72.4	1 108	18 120	1 140
4 185	15 209	16 179	20 123	20 58.1	23 88.7	26 100	28 61.2	2 108	19 121	2 141
5 187	16 202	17 168	21 114	21 47.0	24 77.6	27 91.1	29 56.7	3 108	20 122	3 141
6 186	17 201	18 166	22 111	22 47.0	25 77.6	28 91.1	30 56.7	4 108</		

January	February	March	April	May	June	July	August	September	October	December
1 142	8 202	20 350	26 504	26 73.6	21 57.8	26 90.2	29 55.7	26 82.1	31 61.3	1 101
2 141	11 214	22 359	27 138	24 113	29 90.7	30 27.9	30 27.9	27 56.6	29 61.7	2 105
3 141	13 221	25 363	30 506	27 73.7	29 90.7	31 36.9	31 36.9	28 56.1	30 61.4	3 106
4 141	15 228	28 367	31 May	28 74.1	28 76.4	31 105	31 105	October	6 64.6	6 115
9 138	18 23	29 426	1 367	30 25.3	30 60.2	2 86.6	31 105	1 38.3	8 63.2	9 118
11 140	20 236	31 451	1 451	31 26.7	July	2 86.6	September	2 40.2	11 64.9	11 118
21 141	24 241	1 458	4 518	3 35.0	3 35.0	8 78.1	2 51.7	3 67.3	13 67.3	13 118
16 154	25 246	1 459	4 54.6	1 51.4	3 35.6	8 78.5	2 51.7	9 65.6	15 69.1	16 115
18 161	27 252	3 444	6 74.8	3 37.5	5 55.2	12 80.0	4 50.7	9 44.1	18 77.3	18 115
23 175	28 257	3 445	7 75.1	3 37.5	8 54.6	14 78.8	5 50.7	9 44.1	20 77.3	20 117
25 175	30 267	8 469	10 74.3	7 50.2	8 54.4	16 78.1	9 38.7	11 59.1	22 89.4	23 124
28 180	1 267	10 475	13 75.0	9 49.1	10 55.2	19 77.4	11 59.1	14 59.1	25 91.0	25 135
30 184	4 286	12 518	15 72.1	9 46.5	11 56.4	21 77.3	12 59.1	17 59.1	27 93.5	27 132
31 185	6 289	13 523	17 72.7	10 47.9	12 56.4	23 77.3	13 59.1	18 59.1	29 93.5	29 132
February	8 156	17 115	20 77.1	12 62.1	17 66.6	26 76.6	18 27.7	23 24.5	30 98.6	31 190
1 186	11 341	19 225	21 74.4	14 25.4	19 73.8	28 90.5	20 32.4	25 73.0		
6 192	14 349	22 231	22 75.3	15 26.3	20 73.8	29 90.5	21 32.4	26 73.0		
6 192	16 369	24 457	24 65.5	19 25.4	24 77.0	29 56.8	25 56.5	30 63.0		

RIO GRANDE SALT BURDEN

In what follows the terms "salt" and "salts" mean total dissolved solids in the water of the Rio Grande and tributaries. The graphical and tabular results below are based upon the chemical analyses shown on the preceding pages as well as upon similar data in previous Water Bulletins. For some tributaries, the results are based upon curves showing the approximate relationship between salt concentration and amount of stream flow. For other stations and stream contributions, the results are arrived at by secondary deductions. At stations carrying the sign * the results are based upon the analysis of water samples. Similar graphs will be found in previous Water Bulletins.



SANITARY ASPECTS OF WATER QUALITY

The sanitary water sampling and assay program along the Rio Grande is a joint undertaking of the Texas State Health Department, the Federal Department of Public Health of Mexico, and the American and Mexican Sections of this Commission. Some co-operation was rendered by the Pan-American Sanitary Bureau and the United States Public Health Service. Analyses of samples were made in the El Paso City-County Health Laboratory, the El Paso Water Plant Laboratory, the laboratory of the Central Power and Light Company Water Plant at Laredo, and the Cameron County Health Unit Laboratory. All analyses were made under the "Rules of Laboratory Procedure" set out on page 75 of Water Bulletin No. 13. The "Most Probable Numbers" (M. P. N.) of coliform organisms per 100 c.c. of sample water were obtained from the analyses by means of the M. P. N. table shown on pages 75 and 76 of Water Bulletin No. 13. Some analyses were made for Biological Oxygen Demand (B. O. D.) and for Dissolved Oxygen (D. O.). The results of all of these analyses for 1946 are tabulated below for each of the sampling points.

Analysis of the records published in these Water Bulletins since 1932 for Nuevo Laredo, since October 1942 for Laredo, and since 1937 for El Paso show that the monthly average coliform density in Rio Grande water at these points correlates quite well with surface washings of the tributary watershed as indicated by rainfall or surface inflow to the river.

This together with the fact that a high coliform density was found in the storm flow of three tributary arroyos draining normally dry desert areas, some with no human habitation, (see page 72 Water Bulletin No. 15) indicate that proportionally large coliform contaminations in the Rio Grande come from the surface wash of the Rio Grande watershed even from uninhabited desert areas. These facts also indicate that coliform concentrations in the Rio Grande do not reliably show sewage contamination.

For records of previous years see "Sanitary" in index to Water Bulletin No. 14 and subsequent bulletins.

Date 1946	D. O. Percent Saturation	B. O. D. Parts Per Million	Coliform Organisms per 100 c.c.	Date 1946	D. O. Percent Saturation	B. O. D. Parts Per Million	Coliform Organisms per 100 c.c.	Date 1946	Coliform Organisms per 100 c.c.	Date 1946	Coliform Organisms per 100 c.c.
FRANKLIN CANAL AT WATER PLANT				RIO GRANDE AT YSIETA-ZARAGOZA BRIDGE				RIO GRANDE AT LAREDO WATER PLANT			
Feb. 21	88.1	2.8	6,200	Jan. 2	75.9	6.6	3,800,000	Jan. 1	0	July 9	620
27	89.1	3.0	1,100	9	60.8	7.2	3,800,000	4	2-6	12	1,100
Mar. 20			3,600	16	60.9	12.7	7,000,000	8	36	16	2,400
27	93.5	3.2	1,100	23	53.4	13.4	3,800,000	11	0	19	930
Apr. 3			3,600	30	52.2	10.9	620,000	15	230	23	2,300
10		0.9	1,600	Feb. 6	61.7	7.2	360,000	18	0	26	940
17	84.2	2.2	2,300	13	67.8	15.8	360,000	22	0	30	360
24	83.5	1.3	1,600	20	60.3	13.0	360,000	25	23	Aug. 6	210
1	81.2	1.1	3,600	27	68.6	7.8	360,000	29	62	8	230
8	82.5	1.3	2,300	Mar. 6	56.1	13.0	1,300,000	Feb. 1	0	9	620
15	83.0	1.0	1,600	13	63.1	9.5	36,000	5	62	13	230
22	84.1	1.8	2,300	20	62.3	8.0	1,100,000	8	23	16	160
29	82.3	1.0	620	27	76.7	9.0	360,000	12	36	20	210
June 5	87.5	1.2	3,600	Apr. 3	80.7	11.9	620,000	15	0	23	210
12	91.6	1.1	940	10	65.8	4.2	270,000	19	16	27	36
19	85.7	1.6	6,200	17	59.5	5.3	360,000	22	0	30	180
26	87.1	1.4	5,500	24	68.1	4.2	360,000	26	36	Sept. 3	1,100
July 3		1.9	620	May. 1	59.7	4.8	340,000	Mar. 1	0	6	1,300
10	89.6	2.5	2,300	8	60.0	4.4	1,600,000	5	110	10	16,000
17	88.3	1.9	5,500	15	54.5	6.4	2,200,000	8	2-6	13	6,200
24	88.8	1.8	620	22	68.1	3.0	340,000	12	62	17	38,000
31	90.9	2.0	6,200	29	68.1	3.4	620,000	15	6	20	3,600
Aug. 7	92.6	2.3	3,600	June 5	65.6	3.8	620,000	19	62	24	38,000
15	95.1	2.3	11,000	12	54.9	5.8	3,800,000	22	0	27	13,000
22	89.6	2.3	16,000	19	63.3	3.2	360,000	26	160	Oct. 1	11,000
29	89.5	2.1	24,000	26	66.9	4.4	2,400,000	29	91	4	590
Sept. 5	89.2	2.2	11,000	July 3	64.5	7.6	620,000	Apr. 2	34	8	24,000
12	90.5	2.2	6,200	10	65.7	5.7	1,100,000	2	110	11	3,600
19	90.0	1.4	2,300	17	65.7	2.4	340,000	9	93	15	2,000
26	87.9	1.2	24,000	24	70.6	3.6	360,000	12	36	18	3,800
Oct. 3	97.0	1.5	70,000	31	76.8	3.0	230,000	16	13	22	6,200
10	86.8	1.6	1,100	Aug. 7	74.3	5.6	620,000	19	16	25	7,000
17	86.8	1.2	3,400	15	77.9	6.0	360,000	23	1,100	29	360
24	84.9	1.5	6,200	22	75.8	4.4	1,100,000	26	47	Nov. 1	210
31	86.8	1.2	70,000	29	75.2	8.0	360,000	30	230	5	93
Nov. 7	89.6	1.9	2,300	Sept. 5	70.6	4.4	620,000	May 3	160	8	41
14	85.7	3.3	6,200	12	72.5		230,000	7	11,000	12	7-7
27		0.8	1,600	19	60.8	6.4	7,000,000	10	2,400	15	6
Dec. 5	98.5	2.0	1,100	26	53.9	3.7	360,000	14	75	19	93
12	85.7	2.0	1,100	Oct. 3	46.1	6.4	7,000,000	17	2,200	22	7-7
18	89.1	2.1	620	10		6.6	7,000,000	21	38,000	26	230
24	84.8	3.0	360	17	62.2	8.4	1,600,000	24	2,400	29	0
28			2,300	24	69.0	13.4	360,000	28	1,600	Dec. 3	56
Total Average	3,261.1	73.1	326,980	31	7	66.8	24,000,000	31	9,400	0	0
	88.1	1.8	7,600	Nov. 7		7.2	620,000	June 4	620	10	110
				14	53.8	8.0	1,100,000	7	62	13	0
				21	57.9	4.0	1,600,000	11	230	17	62
				27	31.9	25.2	6,200,000	14	36	20	0
				Dec. 5	48.0	15.0	2,000,000	18	360	24	110
				12	59.1	6.0	1,600,000	21	22,000	27	2-3
				18	56.4	2.8	3,600,000	25	16,000	31	2-3
				24	64.7	6.0	620,000	28	2,400		
				Total Average	3,175.2	368.7	107,746,000	July 5	2,400	Total Average	303,099.2
					63.5	7.4	2,070,000	7	1,600		2,890

Date 1946	Coliform Organisms per 100 c.c.	Date 1946	Coliform Organisms per 100 c.c.	Date 1946	Coliform Organisms per 100 c.c.	Date 1946	Coliform Organisms per 100 c.c.	Date 1946	Coliform Organisms per 100 c.c.	Date 1946	Coliform Organisms per 100 c.c.
RIO GRANDE 9-1 MILES BELOW LAREDO R.R. BRIDGE											
Jan. 8	9	Mar. 12	9	May 14	16,000	July 9	6,200	Sept. 17	24,000	Dec. 3	16
15	9	19	12	21	160	16	37	Oct. 1	24,000	10	21
29	4-5	26	28	28	170	Aug. 5	7,000	8	22,000	17	11
Feb. 5	49	Apr. 2	7,000	June 3	80	13	16,000	22	480	24	31
12	9		5,500	11	14,000	20	3,400	29	7,000		
19	9	23	110	18	14,000	27	11,000	Nov. 5	110		
26	9	30	24	25	38,000	Sept. 5	3,500	19	18	Total Average	229,455.5
Mar. 5	200	May 7	670	July 2	6,200	10	2,100	25	270		5,210

IN INCHES—1946

In Water Bulletin No. 10 will be found an index, by years, to rainfall stations and their records. This index covers all available records for stations in the Rio Grande Basin on the United States side and a fringe adjacent thereto below Las Cruces, New Mexico, for the years 1850 to 1940. It also covers a similar area on the Mexican side for the years 1894 to 1940.

In Water Bulletin No. 14 will be found an index, by months, to all stations with available records, longer than eleven months, for the years 1938 to 1944, inclusive. It covers the same area on the United States side as the former index.

Madden Arroyo Highway (U. S. 80) Bridge, Texas																I. B. & V. C.			
Recording page																			
Jan.		.06	.29	.30		.02	.08		.30					.24			1.17	.36	
Feb.			.14														0	.16	
Mar.									.06					.18			.35	.10	
Apr.															.11	.02	.51	.35	
May		.07	.56														.62	.35	
June						.37											.82	.75	
July				.52	.04		.22	.06		.30			.10	.03	.08		.05	.97	
Aug.										.24							.05	1.20	
Sept.	.58								.24	.02	.12		.23		.02		1.44	1.56	
Oct.	.30	1.05							.09	.09			.21				1.59	2.01	
Nov.																	0	.24	
Dec.						.20	.44	.06									.72	.74	
Period 1941-1946																	Total 1946	8.17	9.25

Some months missing

RAINFALL ON THE UNITED STATES SIDE OF RIO GRANDE WATERSHED

INCHES—1946

	Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total Inches	Total Average																				
Standard gage																																			West Small, Texas										E. E. Chandler									
Jan.						.65									.10																		.75	.40																				
Feb.																																	0	.42																				
Mar.																																	0	.88																				
Apr.			.10			.80																.20		.22									.42	.62																				
May																																	.90	.90																				
June																																	0	.98																				
July													No daily record available																							2.00	1.86																	
Aug.													No daily record available																							1.50	1.50																	
Sep.											.60		.15		1.50			.15		.55									.70				3.65	2.02																				
Oct.					.50	2.00																											5.00	2.57																				
Nov.																																		.15	1.35																			
Dec.											.60	.75																						1.35	.84																			
Moved 5 miles W. W. Aug. 28, 1946																																			# Period 1940-1946	Total 1946	15.07	12.74																
Recording gage																																			Guayuco Arroyo Highway (U. S. 80) Bridge, Texas										T. B. & V. C.									
Jan.						.10	.30	.48	.05	.08										.30													1.31	.41																				
Feb.						.16																											0	.20																				
Mar.																																	.21	.18																				
Apr.																				.07		.05										.14	.27																					
May						.06	.40																										.46	.40																				
June													.15						.06													.21	.61																					
July						.30	.56	.25		.08	.25		.10	.02					.15	.40	.66		.57							.09		2.28	1.24																					
Aug.						.25																									.21		1.34	1.35																				
Sep.					.09	.18	.17								.08	.12			.36	1.15		.12																																

= Estimated * Partly estimated ‡ Some months missing

RAINFALL ON THE UNITED STATES SIDE OF RIO GRANDE WATERSHED

INCHES—1946

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total Inches	Normal Average
Standard gage																																	
McCracken Ranch																																	
Jan.								.86								.58				.09	.19											1.72	.66
Feb.																																	.13
Mar.																																	.09
Apr.																					.08		.48	.13	.03							.72	.48
May						.12			.31		.09																					.43	1.16
June																											.26					1.41	1.45
July						.14															.14		.49									1.45	2.71
Aug.																																.25	2.33
Sept.																					.05	.07		.29		.26	.25			.10		.98	2.35
Oct.			.13		.65		.08	1.10				.18		.05																		2.05	1.09
Nov.																																	.45
Dec.																																	.80
# Period 1941-1946																																	
H. M. Greenwood (Cienega Ranch)																																	
Jan.								1.32								.48			.10													1.90	.40
Feb.																																	.16
Mar.																																	.08
Apr.																																	.87
May																																	.30
June																																	

Some months missing

** 1945 January .24, February .08, Apr11 .22

Period	1931-1946	Total 1946	12.34	13.24
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RAINFALL ON THE UNITED STATES SIDE OF RIO GRANDE WATERSHED

INCHES—1946

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total Inches	Normal Ave re	gs
Standard gauge																																		
Red Bluff Dam No. 2																																		
Jan.																																		
Feb.																																		
Mar.																																		
Apr.																																		
May																																		
June																																		
July																																		
Aug.																																		
Sep.																																		
Oct.																																		
Nov.																																		
Dec.																																		
# Perio d 1939-1946																																Total Inches	Normal Ave re	gs
																																11.32	12.46	

Standard gear		Reid Bros. Ranch												S. C. S.					
Jan.																5.02	1.56		
Feb.																.41	.29		
Mar.																0	.23		
Apr.																.41	1.23		
May																2.10	2.04		
June																2.63	2.12		
July																2.30	2.40		
Aug.																1.42	3.04		
Sept.																6.30	3.97		
Oct.																2.13	1.78		
Nov.																.18	.50		
Dec.																.69	1.03		
														#	Period	1931-1946	Total 1946	23.40	20.28

[illegible]

Standard gage												Stone Ranch 1945												S. C. S.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
Jan.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								

Stone Ranch 1946												Σ E Σ	
1946 days open													
Jan.												5.77	1.33
Feb.												0	.27
Mar.												0	.10
Apr.												0	.43
May		.35	.35									.68	.76
June					2.00		1.30					3.30	2.35
July							1.10						
Aug.						.75					.69	1.79	1.48
Sept.				.95								0	2.59
Oct.		.30	.50						.54			2.04	2.56
Nov.		.16					.60					1.42	.76
Dec.				.35								.16	.76
												.35	.80
													.47
													15.57
												# Period	1941-1946
												total 1946	15.47

Standard gauge						J. O. Kingston Ranch 1945	S. C. S.
July						No daily record available	14.40
Aug.			1.90				1.00
Sept.			.50				.50
Oct.							
Nov.							

Standard gage										J. O. Kingston Ranch 1946										B. C. 3	
Jan.																		3.65	1.92		
Feb.																		7	.08		
Mar.																		0	.10		
Apr.																		0	.06		
May																		1.00	1.27		
June																			2.66		
No daily record available																					
July																			4.21		
Aug.																			1.58		
Sept.																			4.59		
Oct.																					
Nov.																					
Dec.																					
																		# Period 1941-1946			

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RAINFALL ON THE UNITED STATES SIDE OF RIO GRANDE WATERSHED

INCHES—1946

[illegible]

INCHES --1946

[illegible]

IN INCHES

Pecos River Watershed Sheffield to Pecos River Station

United States Side Below Rio Grande CityWatershed Fort Quitman to Upper Presidio[illegible]

INCHES—1946

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total Inches	Normal Average
-------	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----------------	-------------------

[illegible][illegible][illegible]

Standard eggs										Balleza, Chih.										Hector, Serv. of Mex.	
Jan.									.08										.71	.98	
Feb.																		0	.54		
Mar.																		.24	.66		
Apr.									.80									.59	.79		
May																		T	.16		
June																		.7	.59		
July																					
Aug.	.20	.27	.71		.80	.16			.08	T	T	.59							2.60	4.34	
Sep.			.59							T			.79	.39				4.09	4.66		
Oct.	1.46	.08								T	.95	.16						.79	3.86		
Nov.													.08	.16	.27	.31		.59	1.06		
Dec.																		T	.79		
								.23										.35	.20		
																		# Period	1903-1946	Total 1946	17.12

Standard gaug.													Parral, Chih.													Meteor. Serv. of Mex.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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[illegible][illegible]

Some months missing

RAINFALL ON THE MEXICAN SIDE OF RIO GRANDE WATERSHED

INCHES—1946

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total Inches	Normal Average					
Las Virgenes, Chih.																																						
Standard gauge																Net 1". Irrig. Can																						
Jan.- Feb. Mar. Apr.- May June					T		.42	.06				.01		.06	.06	T		T	.14														.75 0	.32 .06				
July Aug. Sept. Oct. Nov. Dec.			.01									.13																						.15 .07 .01 .12 .46	.04 .15 .07 .12 1.86			
Jan.- Feb. Mar. Apr.- May June					T	.15	.16	T	.15	.16	.15						.08	.02	.06														.14 .48	2.99 1.66				
July Aug. Sept. Oct. Nov. Dec.	.14	T		.12	.51			.39	T								.09			.92	T						.01	.12	.19	.48	1.11	2.88	.19	1.49				
Jan.- Feb. Mar. Apr.- May June																						.02												.94 .69				
July Aug. Sept. Oct. Nov. Dec.												.37	.08																					.69				
# Period 1943-1946																															Total		10.65	9.74				

[illegible][illegible][illegible]

Maclovio Herrera (Falomir), Chih.																Meteor. Serv. of Mex.						
Standard gage																						
Jan.		.06	.12	.51		.22	.51		.06							1.48	.51					
Feb.																0	.19					
Mar.																0	.56					
Apr.										.35	.18	.04				.57	.59					
May			.18													.18	.69					
June	.49											2.36	.55		.07	3.45	2.25					
July		.63	.28	.04	.47	.51		.08								1.86	4.10					
Aug.		.22														1.37	6.23					
Sept.		.56	.18		.29	.50				.16		.09	.45	.18	.30	2.34	8.14					
Oct.		.75													.78	.75	1.04					
Nov.																0	.10					
Dec.						.24										2.16	.26					
																#	Period	1924-1946	Total	1946	12.30	26.68

[illegible]

Palestina, Coah.															Met's, Trile, Cos.	
Jan.																1.15
Feb.																0
Mar.																0
Apr.																0
May																0
June																0
July																0
Aug.																0
Sept.																0
Oct.																0
Nov.																0
Dec.																0
1.57 .79 .12 .43 .12 1.18 2.09 .20 1.93 .16 .51 .51 .16 .16 .18 .27															1.15	
.16 T .51 .32 .23 .28 1.06 T T T .59 T .35 .31 .80 .28 T															1.15	
1.57 .79 .12 .43 .12 1.18 2.09 .20 1.93 .16 .51 .51 .16 .16 .18 .27															1.15	
.16 T .51 .32 .23 .28 1.06 T T T .59 T .35 .31 .80 .28 T															1.15	
1.57 .79 .12 .43 .12 1.18 2.09 .20 1.93 .16 .51 .51 .16 .16 .18 .27															1.15	
.16 T .51 .32 .23 .28 1.06 T T T .59 T .35 .31 .80 .28 T															1.15	
1.57 .79 .12 .43 .12 1.18 2.09 .20 1.93 .16 .51 .51 .16 .16 .18 .27															1.15	
.16 T .51 .32 .23 .28 1.06 T T T .59 T .35 .31 .80 .28 T															1.15	
1.57 .79 .12 .43 .12 1.18 2.09 .20 1.93 .16 .51 .51 .16 .16 .18 .27															1.15	
.16 T .51 .32 .23 .28 1.06 T T T .59 T .35 .31 .80 .28 T															1.15	
1.57 .79 .12 .43 .12 1.18 2.09 .20 1.93 .16 .51 .51 .16 .16 .18 .27															1.15	
.16 T .51 .32 .23 .28 1.06 T T T .59 T .35 .31 .80 .28 T															1.15	
1.57 .79 .12 .43 .12 1.18 2.09 .20 1.93 .16 .51 .51 .16 .16 .18 .27															1.15	
.16 T .51 .32 .23 .28 1.06 T T T .59 T .35 .31 .80 .28 T															1.15	
1.57 .79 .12 .43 .12 1.18 2.09 .20 1.93 .16 .51 .51 .16 .16 .18 .27															1.15	
.16 T .51 .32 .23 .28 1.06 T T T .59 T .35 .31 .80 .28 T															1.15	
1.57 .79 .12 .43 .12 1.18 2.09 .20 1.93 .16 .51 .51 .16 .16 .18 .27															1.15	
.16 T .51 .32 .23 .28 1.06 T T T .59 T .35 .31 .80 .28 T															1.15	
1.57 .79 .12 .43 .12 1.18 2.09 .20 1.93 .16 .51 .51 .16 .16 .18 .27															1.15	
.16 T .51 .32 .23 .28 1.06 T T T .59 T .35 .31 .80 .28 T															1.15	
1.57 .79 .12 .43 .12 1.18 2.09 .20 1.93 .16 .51 .51 .16 .16 .18 .27															1.15	
.16 T .51 .32 .23 .28 1.06 T T T .59 T .35 .31 .80 .28 T															1.15	
1.57 .79 .12 .43 .12 1.18 2.09 .20 1.93 .16 .51 .51 .16 .16 .18 .27															1.15	
.16 T .51 .32 .23 .28 1.06 T T T .59 T .35 .31 .80 .28 T															1.15	
1.57 .79 .12 .43 .12 1.18 2.09 .20 1.93 .16 .51 .51 .16 .16 .18 .27															1.15	
.16 T .51 .32 .23 .28 1.06 T T T .59 T .35 .31 .80 .28 T															1.15	
1.57 .79 .12 .43 .12 1.18 2.09 .20 1.93 .16 .51 .51 .16 .16 .18 .27															1.15	
.16 T .51 .32 .23 .28 1.06 T T T .59 T .35 .31 .80 .28 T															1.15	
1.57 .79 .12 .43 .12 1.18 2.09 .20 1.93 .16 .51 .51 .16 .16 .18 .27															1.15	
.16 T .51 .32 .23 .28 1.06 T T T .59 T .35 .31 .80 .28 T															1.15	
1.57 .79 .12 .43 .12 1.18 2.09 .20 1.93 .16 .51 .51 .16 .16 .18 .27															1.15	
.16 T .51 .32 .23 .28 1.06 T T T .59 T .35 .31 .80 .28 T															1.15	
1.57 .79 .12 .43 .12 1.18 2.09 .20 1.93 .16 .51 .51 .16 .16 .18 .27															1.15	
.16 T .51 .32 .23 .28 1.06 T T T .59 T .35 .31 .80 .28 T															1.15	
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INCHES—1946

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RAINFALL ON THE MEXICAN SIDE OF RIO GRANDE WATERSHED

INCHES—1946

[illegible]

Don Martin, Coah.																Net l. Irr.g. Com		
Standard gauge																		
Jan.	T	T		.35	T	.98	T	.23	.04		.01	.01	T			1.90		
Feb.			T										T			.98		
Mar.																.57		
Apr.						.38	.45					.10	.02	.16		1.12		
May	.01	.39	1.15		.74	T			.01							2.19		
June						.11					.99	.16			.09	1.26		
July				.32												1.92		
Aug.													.13			.89		
Sep't.																1.65		
Oct.	T			.29	.10	.08	.21	T		.35	.02			.55	.38	2.02		
Nov.																1.38		
Dec.																.54		
Total	T	T	T			.08	T				.08	T	T			16.31		
																# Period 1927-1946	Total 1946 11-91	16.31

[illegible][illegible][illegible]

Standard gauges															Guerrero, Tamps.										Meteor. Serv. of Mex.	
Jan.																					91	.95				
Feb.																					.84	.60				
Mar.	.04																				.47	1.08				
Apr.																					1.42	.96				
May																					6.18	5.17				
June																					3.40					
July																										
Aug.																										
Sept.																										
Oct.																										
Nov.																										
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INCHES—1946

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INCHES—1946

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INCHES—1946

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INCHES—1946

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IN INCHES

[Faint, illegible handwritten notes]

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398	2399	2400	2401	2402	2403
Totals and normals for the 47 years 1900-1946																																																																																																																																																																																																																																																																																																																																																																																																																																																																						

1. Circular land pan 4 feet in diameter and 10 inches deep, made of 22 gage galvanized iron, set on

- The exposure to wind of the water in these pans is very different with respect to the rim of the pan.

The United States Weather Bureau furnished the records for Elephant Butte, Caballo Dam, Jornada, New

The latitude, longitude, and elevation of all older stations are shown either in Water Bulletin No. 12,

The latitude, longitude, and elevation of all older stations are shown either in Water Bulletin No. 12, page 94, or Water Bulletin No. 13, page 93. The new stations at Del Rio and Laredo have the following locations: Del Rio, Lat. $29^{\circ} 20'$, Long. $100^{\circ} 53'$, Elev. 1,018 feet; Laredo, Lat. $27^{\circ} 32'$, Long. $99^{\circ} 29'$, Elev. 470 feet.

DRAINAGE BASIN AND IRRIGATED AREAS

Along the Rio Grande and Tributaries—1946

The drainage basin areas tabulated below are taken from the best available sources, including topographic maps. The total area within the outer rim of the Rio Grande Basin is about 335,500 square miles. But, in many places, and particularly along the southwestern side of the basin, large areas yield no run-off to the Rio Grande. Such non-yielding areas constitute about 48.0% of the total area encompassed by the outer rim of the basin leaving 171,887 square miles of productive watershed. Only the productive watershed areas are listed below.

The irrigated areas listed hereunder include only areas below San Marcial gaging station on the Rio Grande and below Girvin gaging station on the Pecos River. These figures are from the most reliable sources and are the best figures available. Below Laredo the figures are for cultivated acreages, all of which have irrigation facilities, but a small part of which is farmed without irrigation in favorable seasons.

For drainage basin and irrigated areas in previous years, see the heading of each gaging station in Water Bulletins Nos. 1 to 8, and see table in Water Bulletins No. 9, page 90, No. 10, page 102, No. 11, page 81, No. 12, pages 96 to 98, No. 13, pages 94 and 95, No. 14, pages 96 and 97, and No. 15, pages 93 and 94.

DESIGNATIONS OF AREAS AND GAGING STATIONS (See note below)	Drainage Basin—Square Miles			Irrigated Areas—Acres				
	In		Total	In			Total	
	United States	Mexico		United States	Mexico			
					Primary	Secondary		
Above San Marcial Station	24,717	0	24,717					
San Marcial to Elephant Butte Dam	1,747	0	1,747	0	0	0	0	
Above Elephant Butte Dam	26,464	0	26,464	0	0	0	0	
Elephant Butte Dam to Caballo Dam	1,290	0	1,290	82	0	0	82	
Above Caballo Dam	27,754	0	27,754	82	0	0	82	
Caballo Dam to El Paso Station	1,513	0	1,513	101,472	0	0	101,472	
Above El Paso Station	29,267	0	29,267	101,554	0	0	101,554	
El Paso Station to American Dam	4	0	4	0	0	0	0	
Above American Dam	29,271	0	29,271	101,554	0	0	101,554	
American Dam to Juarez	41	47	88					
Above Juarez Station	29,312	47	29,359					
Juarez to Island	146	472	618					
Above Island Station	29,458	519	29,977					
Island to County Line	485	186	671					
Above County Line Station	29,943	705	30,648	157,542				
Guayuco Arroyo, above U. S. 80 Highway Bridge	162	0	162					
County Line to Fort Quitman, excluding Guayuco Arroyo	501	679	1,180					
County Line to Fort Quitman, including Guayuco Arroyo	663	679	1,342					
El Paso Station to Fort Quitman Station - total	1,339	1,384	2,723	72,920	53,370	0	126,290	
Above Fort Quitman Station	30,606	1,384	31,990	174,474	53,370	0	227,844	
Quitman Arroyo (I.B. & W.C. name) above measuring point near its mouth	36	0	36					
Quitman Arroyo (I.B. & W.C. name) above rocky canyon	18	0	18					
Red Light Arroyo (I.B. & W.C. name) (Quitman Arroyo on U.S.G.S. Maps) above measuring point near its mouth	260	0	260					
Van Horn Creek, above measuring point near its mouth	117	0	117					
Fort Quitman to La Nutria, excluding Quitman Arroyo, Red Light Arroyo, and Van Horn Creek	628	886	1,514					
Fort Quitman to La Nutria - total	1,041	886	1,927	1,019	4,700	0	5,719	
Above La Nutria Station	31,647	2,270	33,917	175,493	58,070	0	233,563	
Capote Creek, above measuring point near its mouth	93	0	93					
La Nutria to Upper Presidio - total	580	503	1,083	1,210	9,140	0	10,350	
Above Upper Presidio Station	32,227	2,773	35,000	176,703	67,210	0	243,913	
Rio Conchos, above Boquilla Dam	0	7,322	7,322	0	2,960	0	2,960	
Rio Conchos, below Boquilla Dam	0	17,419	17,419	0	172,730	12,110	184,840	
Rio Conchos - total	0	24,741	24,741	0	175,690	12,110	187,800	
Upper to Lower Presidio, excluding Rio Conchos	21	5	26	120	0	0	120	
Upper Presidio to Lower Presidio - total	21	24,746	24,767	120	175,690	12,110	187,920	
Above Lower Presidio Station	32,248	27,519	59,767	176,823	242,900	12,110	431,833	
Alamito Creek, above gaging station	1,504	0	1,504	805	0	0	805	
Terlingua Creek, above gaging station	1,070	0	1,070	288	0	0	288	
Lower Presidio to Johnson Ranch, excluding Alamito and Terlingua	1,439	2,671	4,110	2,401	3,460	1,980	7,841	
Lower Presidio to Johnson Ranch - total	4,013	2,671	6,684	3,494	3,460	1,980	8,934	
Above Johnson Ranch Station	36,261	30,190	66,451	180,317	246,360	14,090	440,767	
Johnson Ranch to Boquillas	471	3,735	4,206	0	0	0	0	
Above Boquillas Station	36,732	33,925	70,657	180,317	246,360	14,090	440,767	
Maravillas Creek, above proposed gaging station	2,192	0	2,192	0	0	0	0	
Lozier Creek, above gaging station	1,806	0	1,806	0	0	0	0	
Boquillas to Langtry, excluding Maravillas and Lozier	2,125	2,595	4,720	0	0	0	0	
Boquillas to Langtry - total	6,123	2,595	8,718	0	0	0	0	
Johnson Ranch to Langtry, excluding Maravillas and Lozier	2,596	6,330	8,926	0	0	0	0	
Johnson Ranch to Langtry - total	6,594	6,330	12,924	0	0	0	0	
Above Langtry Station	42,855	36,520	79,375	180,317	246,360	14,090	440,767	

Note: The sequence of listing of irrigated areas depends upon the downstream sequence of points of diversion of their irrigation water.

DRAINAGE BASIN AND IRRIGATED AREAS

Along the Rio Grande and Tributaries—1946

DESIGNATIONS OF AREAS AND GAGING STATIONS (See note below)	Drainage Basin—Square Miles			Irrigated Areas—Acres			
	In		Total	In			Total
	United States	Mexico		United States	Primary	Secondary	
Pecos River, above Girvin	29,562	0	29,562	0	0	0	0
Pecos River, Girvin to I.B. & W.C. gaging station	5,731	0	5,731	419	0	0	419
Pecos River, above I.B. & W.C. gaging station	35,293	0	35,293	419	0	0	419
Goodenough Spring, above gaging station	1	0	1	0	0	0	0
Devils River, above Juno gaging station	2,947	0	2,947	0	0	0	0
Devils River, below gaging station near Juno to I.B. & W.C. gaging station	1,238	0	1,238	0	0	0	0
Devils River, above I.B. & W.C. gaging station	4,185	0	4,185	0	0	0	0
Las Vacas Arroyo, above gaging station	0	146	146	0	741	494	1,235
Langtry to Del Rio, excluding above tributaries	416	2,495	2,911	3	0	0	3
Langtry to Del Rio - total	39,895	2,641	42,536	422	741	494	1,657
Above Del Rio Station	82,750	39,161	121,911	180,739	247,101	14,584	442,424
San Felipe Creek, above gaging station	62	0	62	646	0	0	646
Sycamore Creek, above gaging station	515	0	515	0	0	0	0
Pinto Creek, above gaging station	229	0	229	50	0	0	50
Rio San Diego, above gaging station	0	931	931	0	16,560	0	16,560
Las Moras Creek, above gaging station	162	0	162	486	0	0	486
Rio San Rodrigo, above gaging station	0	586	586	0	3,710	3,210	6,920
Del Rio to Eagle Pass, excluding above tributaries	527	581	1,108	17,670	6,180	4,940	28,790
Del Rio to Eagle Pass - total	1,495	2,098	3,593	**18,852	26,450	8,150	53,452
Above Eagle Pass Station **	84,245	41,259	125,504	199,591	273,551	22,734	495,876
Rio Escondido, above gaging station	0	1,130	1,130	0	6,180	8,650	14,830
Arroyo Amole - total	0	482	482	0	0	0	0
Eagle Pass to El Jardin, excluding above tributaries	736	1,191	1,927	1,616	247	0	1,863
Eagle Pass to El Jardin - total	736	2,803	3,539	1,616	6,427	8,650	16,693
Above El Jardin Dam Site	84,981	44,062	129,043	201,207	279,978	31,384	512,569
Santa Isabella Arroyo, above river road	350	0	350	0	0	0	0
El Jardin to Laredo, excluding Santa Isabella	387	1,079	1,466	4,605	1,240	0	5,845
El Jardin to Laredo - total	737	1,079	1,816	4,605	1,240	0	5,845
Eagle Pass to Laredo, excluding above tributaries	1,123	2,270	3,393	6,221	1,487	0	7,708
Eagle Pass to Laredo - total	1,473	3,882	5,355	6,221	7,667	8,650	22,538
Above Laredo Station	85,718	45,141	130,859	205,812	281,218	31,384	518,414
Dolores Creek, above gaging station	606	0	606	0	0	0	0
Rio Salado, above Don Martin Dam	0	13,819	13,819	0	54,360	8,900	63,260
Rio Salado, below Don Martin Dam	0	7,709	7,709	0	50,410	10,130	60,540
Rio Salado, above gaging station	0	21,528	21,528	0	104,770	19,030	123,800
Laredo to Zapata, excluding above tributaries	491	942	1,433	0	14,114	988	15,102
Laredo to Zapata, including Dolores, and excluding Salado	1,097	942	2,039	0	14,114	988	15,102
Laredo to Zapata - total	1,097	22,470	23,567	0	14,114	105,758	138,902
Above Zapata Station	86,815	67,611	154,426	219,926	386,976	50,414	657,316
El Tigre Arroyo, above gaging station	261	0	261	0	0	0	0
Rio Alamo, above gaging station	0	1,675	1,675	0	4,940	5,440	10,380
Zapata to Roma, excluding above tributaries	771	315	1,086	0	4,448	0	4,448
Zapata to Roma, including El Tigre and excluding Alamo	1,032	315	1,347	0	4,448	0	4,448
Zapata to Roma - total	1,032	1,990	3,022	0	4,448	5,440	14,828
Above Roma Station	87,847	69,601	157,448	224,374	391,916	55,854	672,144
Rio San Juan, above Azucar Dam	0	12,473	12,473	0	102,550	67,210	169,760
Los Olmos Creek, above gaging station	535	0	535	0	0	0	0
Mexican Side, below Azucar Dam and San Pedro de Roma and above Rio Grande City	0	817	817	0	21,180	0	21,180
Roma to Rio Grande City, excluding above tributaries	143	387	530	#	3,590	0	3,590
U.S. Side, Roma to Rio Grande City, including Los Olmos	678	0	678	#	3,590	0	3,590
Roma to Rio Grande City - total	678	12,860	13,538	#	3,590	0	3,590
Above Rio Grande City Station	88,525	82,461	170,986	227,964			
Rio Grande City to Hidalgo	415	430	845				
Above Hidalgo Station	88,940	82,891	171,831		515,646	123,064	
Hidalgo to Mercedes Bridge Station	15	15	30		26,690	96,865	
Above Mercedes Bridge Station	88,955	82,906	171,861		542,336	219,929	
Mercedes Bridge to Matamoros Station	11	11	22				
Above Matamoros Station	88,966	82,917	171,883		542,336	219,929	
Matamoros to Lower Brownsville Station	2	2	4				
Rio Grande City to Lower Brownsville Station	443	458	901	*600,735			***
Above Lower Brownsville Station	88,968	82,919	171,887	542,336	3219,929	1,590,964	

Note: The sequence of listing of irrigated areas depends upon the downstream sequence of points of diversion of their irrigation water. # Includes 2,370 acres of dry farmed land. * Dry farmed in 1946. * Includes 66,260 acres of dry farmed land. ** Includes all areas under Maverick Canal, some of which are below Eagle Pass but the canal diverts from the Rio Grande above Eagle Pass Station. *** Includes 167,735 acres of dry farmed land. # Includes 1,084 acres of dry farmed land. † Includes 96,865 acres of dry farmed land. ‡ Includes 1,156 acres of dry farmed land. § Includes 70,870 acres of dry farmed land.

AUTHENTICATED AND OTHER DISCHARGES

The tabulation below shows publications in which may be found the discharges at gaging stations on the Rio Grande and on tributaries and outfalls near their confluence with the Rio Grande as well as on floodways and diversions leading from the Rio Grande, from San Marcial, New Mexico, to the Gulf of Mexico. The table shows which discharges are authenticated by this Commission as well as other discharges.

All Rio Grande and tributary discharges authenticated by this Commission, including the latest revisions, are segregated from the other discharges in the following listing. Listed among the OTHER discharges are those not yet authenticated and those superseded.

In the following table B means Water Bulletins, of various numbers, published by this Commission. P means Water Supply Papers of various numbers published by the United States Geological Survey. A number in parenthesis such as (15) indicates the Water Bulletin in which a revision has been made.

- * Indicates daily and monthly discharges.
- # Indicates monthly discharges.
- ## Indicates period discharges.
- ⊕ Indicates annual discharges.
- ⊙ Indicates daily gage heights.

Within the Period	Where Published	Within the Period	Where Published	Within the Period	Where Published
San Marcial		Tornillo Bridge		Alamito Creek	
AUTHENTICATED D		AUTHENTICATED		AUTHENTICATED	
1895 - 1943	B. 15 #	1924 - 1927	B. 5 *	1932 - 1946	B. 2 * 16, 6 #
1895 - 1896	B. 7 #, 12 #	1924 - 1937	B. 13 #	OTHER	
1924 - 1935	B. 6 #	1931 - 1937	B. 1 * 7	Aug., Dec. 1934	B. 4 (13)
1931 - 1946	B. * 16	OTHER		Jan. 1937	B. 7 (13)
Seepage 1936 - 1937	B. 7 *	1927 - 1931	P. * 668, 688, 703, 718	Terlingua Creek	
OTHER		County Line		AUTHENTICATED	
Feb. 1895, Apr. 1896	B. 12 (13), P. * 358	AUTHENTICATED		AUTHENTICATED	
1897 - 1931	P. * 358, 388, 408, 438 458, 478, 508, 528, 628 668, 688, 703, 718, 733 B. 2 (6) (13), P. * 733	1938 - 1946	B. 8 * 16, 13 #	OTHER	
Mar., Apr. 1932	P. * 748, 763, 788, 808	Near Fort Hancock		1932 - 1946	B. 2 * 16, 6 #
1933 - 1945	828, 858, 878, 898, 928 958, 978, 1,008, 1,038 P. # 828	AUTHENTICATED		OTHER	
Seepage 1936 - 1937	P. # 828	1900 - 1903	B. 13 #	June, Sept. 1937	B. 7 (8)
Below Elephant Butte Dam		OTHER		Johnson Ranch	
AUTHENTICATED D		1900 - 1903	P. * 358	AUTHENTICATED	
1915 - 1943	B. 12 #, 13 #	Fort Quitman		1936 - 1946	
1915 - 1916	B. 10 *	AUTHENTICATED		Boquillas	
1938 - 1946	B. 8 * 16	1889 - 1943	B. 13 #	AUTHENTICATED	
OTHER		1889 - 1923	B. 12 #	1924 - 1935	B. 5 #, 6 #
June 1915	B. 10 (13)	1924 - 1935	B. 6 #	1931 - 1936	B. 1 * 6
1916 - 1945	P. * 458, 478, 508, 528 548, 568, 588, 608, 628 648, 668, 688, 703, 733 748, 763, 788, 808, 828 858, 878, 898, 928, 958 978, 1,008, 1,038	1931 - 1946	B. 1 * 16	OTHER	
Below Caballo Dam		OTHER		1928 - 1931	P. * 668, 688, 703, 718
AUTHENTICATED		July 1924, June 1928	B. 6 (13)	Lozier Creek	
1938 - 1946	B. 8 * 16, 13 #	1923 - 1931	P. * 568, 588, 608, 628 648, 668, 688, 703, 718	AUTHENTICATED D	
OTHER		La Nutria		1932 - 1935	B. 2 * 5, 6 #
1938 - 1945	P. * 878, 898, 928, 958 978, 1,008, 1,038	1935 - 1941	B. 5 * 11, 6 #, 13 #	Langtry	
El Paso		Upper Presidio		AUTHENTICATED	
AUTHENTICATED D		1889 - 1943	B. 13 #	1900 - 1913	B. 7 #, 9 *
1889 - 1943	B. 13 #	1889 - 1900	B. 12 #	1924 - 1927	B. 6 #
1889, 1895 - 1896	B. 7 #, 12 #	1900 - 1913	B. 7 #	1924 - 1935	B. 6 #
Jan. 1898	B. 12 *	1914 - 1926	B. 12 #	1931 - 1946	B. 1 * 16
April - July 1914	B. 7 *	Sept. 1919, Aug. 1932	B. 8 *	OTHER	
Dec. 1915	B. 7 #, 12 #	June 1927, July 1932	B. 9 #	1900 - 1914	P. * 358, 388, 408
1924 - 1935	B. 6 #	1927 - 1930	B. 3 *, 4 *	1904, 1906, 1908	B. 7 (9), 7 (14)
1931 - 1946	B. 1 * 16	1928 - 1931, 1933-1935	B. 6 #	1919, 1920	P. * 508
OTHER		July 1937	B. 10 #	1924 - 1931	P. * 568, 608, 628, 648 668, 688, 703, 718
1889 - 1893	P. * 358	1931 - 1946	B. 1 * 16	Pecos River	
1897 - 1915	P. * 358, 388, 408, 568	OTHER		AUTHENTICATED D	
Jan., Feb. 1895	B. 12 (15)	1900 - 1914	P. * 358, 388	1900 - 1913	B. 7 #
Jan., Aug. 1930	B. 6 (13)	1919 - 1920	P. * 508	1924 - 1935	B. 6 #
1916 - 1931	P. * 568, 588, 608, 628 648, 668, 688, 703, 718	1923 - 1926	P. * 568, 588, 608, 628	1931 - 1946	B. 1 * 16
American Canal		1926, June 1927	B. 4 (12), 4 (9)	OTHER	
AUTHENTICATED		1924 - 1927, 1932	B. 6 (12)	March - Dec., 1898	P. * 358
1938 - 1946	B. 8 * 16, 13 #	July, August 1932	B. 2 (8), 2 (9)	1900 - 1931	P. * 358, 388, 408, 438 458, 478, 508, 528, 548 568, 588, 608, 628, 648 668, 688, 703, 718
Below American Dam		June, July 1935	B. 3 (4)	Sept. 1940	B. 10 (15)
AUTHENTICATED		Annual 1931	B. 1 (6)	Goodenough Spring	
1938 - 1946	B. 8 * 16, 13 #	July 1937	B. 7 (10)	AUTHENTICATED	
Acequia Madre		Rio Conchos at Cuchillo Parado		1924 - 1929	B. 5 #
AUTHENTICATED D		1945 - 1946	B. 13 * 16	1924 - 1935	B. 6 #, 6 #
1938 - 1946	B. 8 * 16, 13 #	Rio Conchos at Ojinaga, Chih.		1931 - 1946	B. 1 * 16
Diversions in the El Paso Valley		AUTHENTICATED		OTHER	
AUTHENTICATED D		1896 - 1943	B. 13 #	1929 - 1931	P. * 688, 703, 718
1938 - 1946	B. 8 * 16	1896 - 1900	B. 12 #	Sept. 1932	B. 2 (15)
Outfalls Near El Paso		1900 - 1913	B. 7 #	Devils River	
AUTHENTICATED		1924 - 1926	B. 12 #	AUTHENTICATED D	
1938 - 1946	B. 8 * 16, 13 #	1927 - 1935	B. 5 #, 6 #	1900 - 1913	B. 7 #
Juarez		1933 - 1937	B. 7 #	Jan., Feb., Mar., 1914	P. * 388
AUTHENTICATED		1936 - 1946	B. 6 # 16	1924 - 1935	B. 6 #
1938 - 1946	B. 8 * 16, 13 #	OTHER		1931 - 1946	B. 1 * 16
Island		1924 - 1926	B. 6 (13)	OTHER	
AUTHENTICATED		1924 - 1932	B. 7 (13)	1871 - 1939	B. 9 (Graph)
1938 - 1946	B. 8 * 16, 13 #	1924 - 1932	B. 7 (13)	1900 - 1913	P. * 358, 388
		1924 - 1932	B. 7 (13)	Nov. 1922	B. 7 (11)
		1924 - 1932	B. 7 (13)	1923 - 1931	P. * 568, 608, 628, 648 668, 688, 703, 718
		1924 - 1932	B. 7 (13)	June 1932	B. 2 (6)
		1924 - 1932	B. 7 (13)	May 1925, Feb. 1929	B. 6 (13)
		1924 - 1932	B. 7 (13)	Jan. 1936	B. 6 (10)
		1924 - 1932	B. 7 (13)	Mar. - June 1937	B. 7 (13)
		1924 - 1932	B. 7 (13)	Cienegas Creek	
		1924 - 1932	B. 7 (13)	AUTHENTICATED D	
		1924 - 1932	B. 7 (13)	1931 - 1935	B. 1 * 5, 6 #

AUTHENTICATED AND OTHER DISCHARGES

Within the Period	Where Published	Within the Period	Where Published	Within the Period	Where Published
Arroyo Las Vacas		Laredo		Contributions from Rio San Juan Above Rio Grande City **	
AUTHENTICATED		AUTHENTICATED		AUTHENTICATED	
1935 - 1946	B. 6 ± 16	June 1899, Apr. 1900	B. 15 Peak discharge	1943 - 1946	B. 13 ± 16
OTHER		1900 - 1913	B. 7 #	OTHER	
1938, 1939, 1940	B. 8 (14), 9(14), 10(14)	May, Sept. 1900	B. 15 *	1944	B. 14 (15)
Del Rio		June 1903, Sept. 1904	B. 15 *	Los Olmos Creek	
AUTHENTICATED		June, July 1905	B. 15 *	AUTHENTICATED	
1900 - 1913	B. 7 #	Aug., Sept. 1906	B. 15 *	1932 - 1936	B. 2 ± 6, 6 #
1924 - 1935	B. 6 #	Sept. 1910, June 1912	B. 15 *	Rio Grande City	
July 1905	B. 15 *	May, June, Oct. 1914	B. 15 *	AUTHENTICATED	
1931 - 1946	B. 1 ± 16	Sept. 1916, Sept. 1917	B. 15 *	May, June, Oct. 1914	B. 15 *
OTHER		Oct. 1917, Oct. 1918	B. 15 *	Sept. 1916, Sept. 1917	B. 15 *
1900 - 1915	P. * 358, 388, 408	Sept., Oct. 1919	B. 15 *	Oct. 1917, Oct. 1918	B. 15 *
1919 - 1920	P. * 508	Aug., Sept. 1920	B. 15 *	Sept., Oct. 1919	B. 15 *
1923 - 1931	P. * 588, 608, 628, 648	June 1922, Sept. 1923	B. 15 *	Aug., Sept. 1920	B. 15 *
May 1925	B. 6 (13)	1924 - 1930	B. 3 #, 4 *	June 1922, Sept. 1923	B. 15 *
July 1925	B. 6 (15)	1924 - 1935	B. 6 #	1924 - 1935	B. 5 #, 6 #
San Felipe Creek		May, June, July 1925	B. 15 *	April 1926	B. 15 *
AUTHENTICATED		Aug. 1925, April 1926	B. 15 *	1932 - 1946	B. 2 ± 16
1931 - 1935	B. 6 #	1931 - 1946	B. 1 ± 16	OTHER	
1931 - 1946	B. 1 ± 16	Aug., Sept., Oct. 1932	B. 15 *	April 1926	B. 5 (15), 6 (15)
OTHER		Sept. 1934	B. 4 (9), 6 (9)	Aug. 1932	B. 1 (10)
June 1935	B. 5 (10)	Dolores Creek		Sept. 1937	B. 7 (11)
Sycamore Creek		AUTHENTICATED		Contributions from Rio San Juan Below Rio Grande City	
AUTHENTICATED		1932 - 1935	B. 2 ± 6, 6 #	AUTHENTICATED	
1932 - 1935	B. 2 ± 5, 6 #	Rio Salado		1946	B. 16 *
Maverick Canal		AUTHENTICATED		U. S. Diversion below Rio Grande City	
AUTHENTICATED		1900 - 1913	B. 7 #	AUTHENTICATED	
1939 - 1946	B. 9 ± 16	1924 - 1935	B. 5 #, 6 #	1922 - 1937	B. 7 #
Pinto Creek		1929	B. 15 *	1938 - 1946	B. 2 ± 16
AUTHENTICATED		1924, 1926 - 1930	B. 3 #, 5 *	North Floodway South of McAllen	
1928 - 1935	B. 6 #	1931 - 1946	B. 1 ± 16	1925 - 1935	B. 2 ± 5
1931 - 1946	B. 1 ± 16	OTHER		1938 - 1946	B. 8 ± 16
OTHER		1900 - 1913	P. * 358	South Floodway South of McAllen	
1932 - 1935	P. * 628, 705, 718	Nov. 1924	B. 5 (14), 6 (14)	AUTHENTICATED	
Rio San Diego		1925	B. 5 (15), 6 (15)	1926 - 1935	B. 2 ± 5
AUTHENTICATED		Zapala		1938 - 1946	B. 8 ± 16
1932 - 1935	B. 6 #	AUTHENTICATED		North Floodway South of Sebastian	
1932 - 1946	B. 2 ± 16	1932 - 1935	B. 6 #	AUTHENTICATED	
Los Mares Creek		1932 - 1946	B. 2 ± 16	1940 - 1946	B. 10 ± 16
AUTHENTICATED		OTHER		Hidalgo	
1932 - 1935	B. 2 ± 5, 6 #	Sept. 1938	B. 8 (10)	AUTHENTICATED	
OTHER		Sept. 1941	B. 41 (15)	1928 - 1931	B. 6 #
Oct. - Dec. 1934	B. 4 (5), 6 (5)	El Tigre Creek		1931 - 1936	B. 1 ± 6
Rio San Rodrigo		AUTHENTICATED		1938 - 1939	B. 8 ± 9
AUTHENTICATED		1932 - 1936	B. 2 ± 6, 6 #	1940 - 1946	B. 10 ± 16
1932 - 1935	B. 6 #	Rio A lamo		OTHER	
1932 - 1946	B. 2 ± 16	AUTHENTICATED		1928 - 1931	P. * 668, 688, 705, 718
OTHER		1924 - 1946	B. 1 ± 16, 6 #	Buenos Aires	
1941	B. 11 (13)	Roma		AUTHENTICATED	
Eagle Pass		AUTHENTICATED		1943 - 1944	B. 15 ± 14
AUTHENTICATED		June 1899, Apr. 1900	B. 15 Peak discharge	Retamal Canal	
1900 - 1913	B. 7 #	1900 - 1913	B. 7 #	AUTHENTICATED	
May, Sept. 1900	B. 15 *	May 1900, June 1905	B. 15 *	1939 - 1946	B. 9 ± 16
June 1903, Sept. 1904	B. 15 *	Sept. 1904, July 1905	B. 15 *	Las Palmas	
June, July 1905	B. 15 *	July, Aug. 1909	B. 15 *	AUTHENTICATED	
Aug., Sept. 1906	B. 15 *	Sept. 1910, Oct. 1911	B. 15 *	1945 - 1946	B. 15 ± 16
Sept. 1910, June 1912	B. 15 *	June 1912, Oct. 1913	B. 15 *	Mercedes Bridge	
May, June, Oct. 1914	B. 15 *	Oct. 1914	B. 15 *	AUTHENTICATED	
Sept. 1916, Sept. 1917	B. 15 *	Sept., Oct. 1917	B. 15 *	1932, 1935 - 1937	B. 2 *, 5 ± 7
Oct. 1917, Oct. 1918	B. 15 *	Sept., Oct. 1919	B. 15 *	1938 - 1941	B. 8 # 11
Sept., Oct. 1919	B. 15 *	Aug., Sept. 1920	B. 15 *	Rancho Viejo Floodway	
Aug., Sept. 1920	B. 15 *	June 1922, Sept. 1923	B. 15 *	AUTHENTICATED	
June 1922, Sept. 1923	B. 15 *	1924 - 1935	B. 4 #, 6 #	1935 - 1936	B. 5 *, 6 *
1924 - 1926	B. 4 *	May, Oct. 1925, Apr. 1926	B. 15 *	1938 - 1946	B. 8 ± 16
1924 - 1935	B. 6 #	1931 - 1946	B. 1 ± 16	Matamoros	
Sept. 1928	B. 15 *	OTHER		AUTHENTICATED	
1931 - 1946	B. 1 ± 16	1900 - 1914	P. * 358, 388	1900 - 1913	B. 7 #
OTHER		May 1900, Sept. 1904	B. 7 (15)	1926 - 1930	B. 3 #, 5 *
1900 - 1916	P. * 358, 388, 408, 438	Aug. 1909, Sept. 1910	B. 7 (15)	1924 - 1935	B. 6 #
May, Sept. 1900	B. 7 (15)	Oct. 1913	B. 7 (15)	1931 - 1946	B. 1 ± 16
June 1903, Sept. 1904	B. 7 (15)	1922 - 1925	P. * 568, 588, 608	OTHER	
June, July 1905	B. 7 (15)	June 22, 22; June 1, 25	B. 1 (15)	1900 - 1914	P. * 358, 388
Aug., Sept. 1906	B. 7 (15)	May, June, July 1925	B. 5 (15), 6 (15)	1922 - 1926	P. * 568, 588, 608, 628
Sept. 1910, June 1912	B. 7 (15)	Sept., Oct. 1925	B. 5 (15), 6 (15)	Lower Brownsville	
1923 - 1931	P. * 588, 608, 628, 648	Sept., Oct. 1925	B. 5 (15), 6 (15)	AUTHENTICATED	
May, July - Oct. 1925	B. 4 (12), 6 (15)	April 1926	B. 5 (15), 6 (15)	1934 - 1935	B. 6 #
Sept. 1928	B. 6 (15)	1929 - 1931	P. * 668, 705, 718	1934 - 1946	B. 4 ± 16
Aug., Sept., Oct. 1932	B. 2 (15), 6 (15)	Sept., Oct. 1932	B. 2 (15)		
Rio Escondido		Rio San Juan at Santa Rosalia, Tamps.			
AUTHENTICATED		AUTHENTICATED			
1932 - 1935	B. 6 #	1900 - 1913	B. 7 #		
1932 - 1946	B. 2 ± 16	1924 - 1930	B. 3 #, 5 *		
		1924 - 1935	B. 6 #		
		1931 - 1945	B. 1 ± 13		
		OTHER			
		1900 - 1913	P. * 358		
		Sept. 1932	B. 2 (16)		

** In Water Bulletins 13, 14 and 15 this station was called "Rio San Juan Below Asucar Dam"