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RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATERS OF THE RIO GRANDE BASIN, TEXAS

By

H. B. Mendieta
United States Geological Survey

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ABSTRACT

The kinds and quantities of minerals dissolved in surface waters of the Rio Grande basin are related principally to the geology of the area and return flow from irrigation.

Rocks exposed in the Texas part of the basin range in age from Paleozoic to Quaternary. The upper reaches of the Rio Grande and Pecos River in Texas traverse deposits principally of Quaternary age. During periods when the flow consists principally of seepage from the Quaternary deposits and return flow from irrigation, water in the upper reach of the Rio Grande usually is slightly saline and very hard. Water in the upper reach of the Pecos River and most of its tributaries that traverse the Quaternary deposits is slightly to very saline and very hard.

Deposits of Tertiary age crop out in the upper, middle, and lower reaches of the Mexican side of the Rio Grande basin and in the lower reach of the Texas side of the basin. Water in the Rio Conchos, the principal tributary that traverses the Tertiary deposits in the Mexican side of the basin, is fresh and very hard.

Much of the middle reach of the Rio Grande basin is underlain by rocks of Cretaceous age. Water in streams that traverse these deposits usually is fresh and hard.

Inflow from the Rio Conchos and other tributaries and from springs more than compensates for the saline inflow from the Pecos River, and results in a decrease in dissolved constituents in the middle reach of the Rio Grande. Water in the middle reach of the river usually is fresh and very hard.

Water from International Falcon Reservoir on the lower Rio Grande is used for municipal supply, industry, and irrigation. Return flow from irrigation causes an increase in dissolved constituents downstream from the reservoir.

The concentrations of dissolved solids and sulfate in the Rio Grande upstream from the Rio Conchos usually exceed the limits recommended by the U.S. Public Health Service for drinking water. Water in the Pecos River and some of its tributaries is undesirable for domestic or industrial use because the water usually contains excessive concentrations of dissolved solids, sulfate, and chloride. Water in most of the other streams usually is suitable for domestic supply and many industrial uses. However, the water usually is hard or very hard and may require softening for some uses.

The principal use of surface water in the Rio Grande basin is irrigation. The sodium hazard of water in the Rio Grande usually ranges from low to medium; that of the Pecos River usually is very high. The salinity hazard of water in the Rio Grande and Pecos River usually is high or very high. Thus, the long-term use of these waters for irrigation will require special soil management, good drainage, high leaching, and selection of salt-tolerant crops.

RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATERS OF THE RIO GRANDE BASIN, TEXAS

INTRODUCTION

This investigation of the chemical quality of surface waters in the Rio Grande basin is part of a statewide reconnaissance by the U.S. Geological Survey in cooperation with the Texas Water Development Board. This report is the last in a series that summarizes the results of the study of each river basin and intervening coastal areas in Texas. (See list of references.) Figure 1 shows the area of the State covered by this report.

Selected water-quality data for the Rio Grande basin in Mexico and New Mexico are also included because the chemical characteristics of water available for use in Texas are influenced by inflow from these areas.

The purpose of this report is to present, integrate, and summarize selected chemical-quality data that will aid in the proper development, management, and use of the water resources of the basin.

Most of the water-quality data for the Rio Grande and adjoining irrigation drains have been collected by the International Boundary and Water Commission, United States and Mexico. However, the U.S. Bureau of Reclamation and the U.S. Geological Survey have maintained sampling points on the main stem for short periods. Most of the data for the Pecos River basin in Texas have been collected by the U.S. Geological Survey in cooperation with the Texas Water Development Board and its predecessors. During the extensive interagency Pecos River Joint Investigation in 1938-40 (National Resources Planning Board, 1942), the U.S. Geological Survey made the chemical-quality studies.

To supplement data available from these and other chemical-quality programs, the Geological Survey periodically collected and analyzed water from selected sites within the Texas part of the basin. Whenever possible during this reconnaissance, water-quality data were collected over a range of flows. The dissolved-solids concentrations are likely to be highest during low-flow periods and contributions by ground-water inflows, irrigation returns, and municipal and industrial discharges usually can then be more easily identified. The lower concentrations in the medium and flood flows are more representative of the water that would be stored in reservoirs. Wherever possible, the sampling sites selected were at stream-gaging stations so that the discharge-weighted averages and loads of dissolved constituents could be computed and the water quality could be related to flow conditions.

LOCATION AND EXTENT OF RIO GRANDE BASIN

The Rio Grande rises in the San Juan Mountains in southwestern Colorado and flows southward across New Mexico to the edge of Texas near El Paso. Thereafter, the river flows south and east for 1,250 miles, forming the boundary between the United States and Mexico, and enters the Gulf of Mexico south of Brownsville, Texas.

The Rio Grande basin encompasses an area of about 335,000 square miles, 135,900 square miles of which are in the United States. Included within this area—in Colorado, New Mexico, Texas, and Mexico—are large closed basins with internal drainage, and only about 89,000 square miles in the United States and 93,000 square miles in Mexico contribute runoff to the Rio Grande. The Texas part of the Rio Grande basin, the largest basin in the State, includes an area of about 48,300 square miles (Figure 1), of which about 9,500 square miles is noncontributing.

The principal tributaries that join the Rio Grande downstream from El Paso are the Pecos and Devils Rivers on the Texas side and the Rio Conchos, Rio Salado, Rio Alamo, and Rio San Juan on the Mexican side.

PHYSIOGRAPHY

The Rio Grande basin in Texas is in parts of three provinces in three major physiographic divisions—the Basin and Range province of the Intermontane Plateaus, the Great Plains province of the Interior Plains, and the Coastal Plain province of the Atlantic Plain. (Fenneman, 1931).

Figure 1.—River Basins and Coastal Areas of Texas

The area between the Rio Grande and the Pecos River subbasin, commonly referred to as the "Trans-Pecos region," is part of the Mexican Highland and Sacramento sections of the Basin and Range province. The Trans-Pecos region is characterized by block plateaus and mature block mountains of gently to strongly tilted strata and undrained desert basins known as "bolsons." A series of mountain ranges, mesas, and peaks extends from the Big Bend of the Rio Grande northwestward into New Mexico. Although these mountains are old and have been eroded severely, the altitude of their highest peaks generally is more than 7,000 feet and is about 8,750 feet at Guadalupe Peak.

The northern part of the Mexican Highland section and the Sacramento section generally are divided into three relatively mountainous areas separated by elongated desert lowlands. The Mesilla Valley is on the west. The Franklin Mountains, the Hueco bolson, the Diablo Plateau including the Hueco and Finlay Mountains, the Salt basin, and the Guadalupe-Delaware-Apache Mountain chain complete the eastward sequence. The general trend of these land features is to the south or southeast.

The mountains and high plateaus in the southern part of the Mexican Highland section are predominantly igneous and volcanic rocks that have block faulted, flexed, tilted, and strongly folded to create the irregular topography of the Big Bend. The Davis Mountains is the largest group of volcanic mountains. With peaks up to 7,835 feet, the Chisos Mountains in the Big Bend National Park are highest of the volcanic groups. The Sierra del Carmen, Santiago, and Del Norte Mountains on the eastern part of the Big Bend are the southernmost highlands in the Basin and Range province.

The Pecos River valley and the central part of the Rio Grande basin as far south as Del Rio lie either in the Pecos Valley, the Edwards Plateau, or the High Plains sections of the Great Plains province. The Pecos Valley section in Texas is an alluvium-filled valley that extends from New Mexico to near Grandfalls where a thin wedge of the High Plains section separates it from the Edwards Plateau section to the south.

The part of the Edwards Plateau west of the Pecos River is known as the Stockton Plateau. Both in the main part of the Edwards Plateau east of the Pecos River and in the Stockton Plateau to the west, the highland plain is characterized by a cap of resistant limestone. Draws that grade into deep gullies and V-shaped valleys dissect the plain, exposing the less resistant limestone. In areas of fissured limestone, recharge of the aquifers is rapid. These aquifers discharge through springs near the perimeter of the plateau.

At the edge of the Edwards Plateau, the Balcones Escarpment defines the beginning of the West Gulf Coastal Plain section of the Coastal Plain province. Here, the Texas part of the Rio Grande basin is a narrow strip of dissected coastal plain. The part of the plain farthest from the Rio Grande is rolling. Nearer the Rio Grande, the area is dissected by the valleys of the intermittent tributaries and the surface is rougher. In the Lower Rio Grande Valley, the basin is restricted to the relatively narrow flood plain or narrow terraces, generally less than 4 miles wide.

CLIMATE

The climate of the Rio Grande basin ranges from semiarid to arid (Thornthwaite, 1952). The mean annual precipitation is about 26 inches in the eastern part of the Lower Rio Grande Valley but progressively declines to 20 inches in the western part of the lower valley (Figure 2). However, in some areas adjacent to the Rio Grande in the middle part of the basin, the annual rainfall averages 18 to 20 inches.

Through the Pecos River subbasin and westward to the Big Bend, the mean annual rainfall diminishes rapidly from 20 to 8 inches. In the Trans-Pecos part of the basin, the rainfall generally increases with an increase in altitude. Rainfall in some of the high areas averages as much as 20 inches annually; but toward the internal basin or bolson, 10 inches is normal. As little as 8 inches is normal in the strip immediately adjacent to the Rio Grande.

Most of the middle and upper parts of the Rio Grande basin in Texas have a typical continental climate with wide daily temperature fluctuations. In the lower Rio Grande basin, the climate is tempered by the maritime influence of the prevailing wind. Here, the winters are mild and the summers hot. At higher altitudes, the upper basin has an alpine climate with warm days and cool nights in the summer; winters usually are cool or cold.

CULTURAL FEATURES AND ECONOMIC DEVELOPMENT

Although the Rio Grande basin contains more than 19 percent of the area of Texas, the basin contributes less than 2 percent of the total runoff from the State and has only about 9 percent of the State's total 1960 population (Figure 3). The percentages cited include the adjacent coastal area, which is almost entirely dependent on the irrigation water diverted from the Rio Grande.

The bulk of the population in the basin is concentrated in the metropolitan areas of El Paso (population 317,462 in 1970), Laredo (population 65,491 in 1970), and the McAllen, Harlingen, Brownsville area of the Lower Rio Grande Valley (population approximately 325,000). Smaller concentrations of population are centered in towns such as Pecos, Fort Stockton, Del Rio, and Eagle Pass.

Ranching is the most widespread enterprise in the Rio Grande basin. Except for small irrigated areas near El Paso and in the Lower Rio Grande Valley, many acres of arid or semiarid land are required to graze one head of cattle. Thus, the ranches usually are large and the number of cattle few. In the middle region of the basin where the Edwards Plateau is rough and rocky, sheep and goats are the principal livestock. Dryland farming within the basin usually is restricted to forage crops for use on the ranches. Hunting lease revenue is a significant source of income for most basin ranchers.

Cotton is the principal crop grown on irrigated areas within the basin. Long-staple cotton is grown in the El Paso area and to a smaller extent in the Pecos area; short-staple cotton is grown on irrigated areas along the middle basin and in the Lower Rio Grande Valley. Planting and harvesting of this crop is almost entirely mechanized so that little physical labor is required.

Alfalfa is an important crop in the El Paso area where it is the base for a diversified livestock industry which includes feedlot operations, dairying, and swine and poultry raising.

Vegetable crops are produced throughout the irrigated areas in the basin. In the El Paso area, the crops are diversified to serve the needs of an isolated trade area. In the Pecos area, the small yet intensive production of cantaloupes is a speciality. From Laredo to the Lower Rio Grande Valley, the winter vegetables and early spring crops are of national importance. In recent years, grain sorghum has become a high-yielding, profitable crop in all irrigated areas.

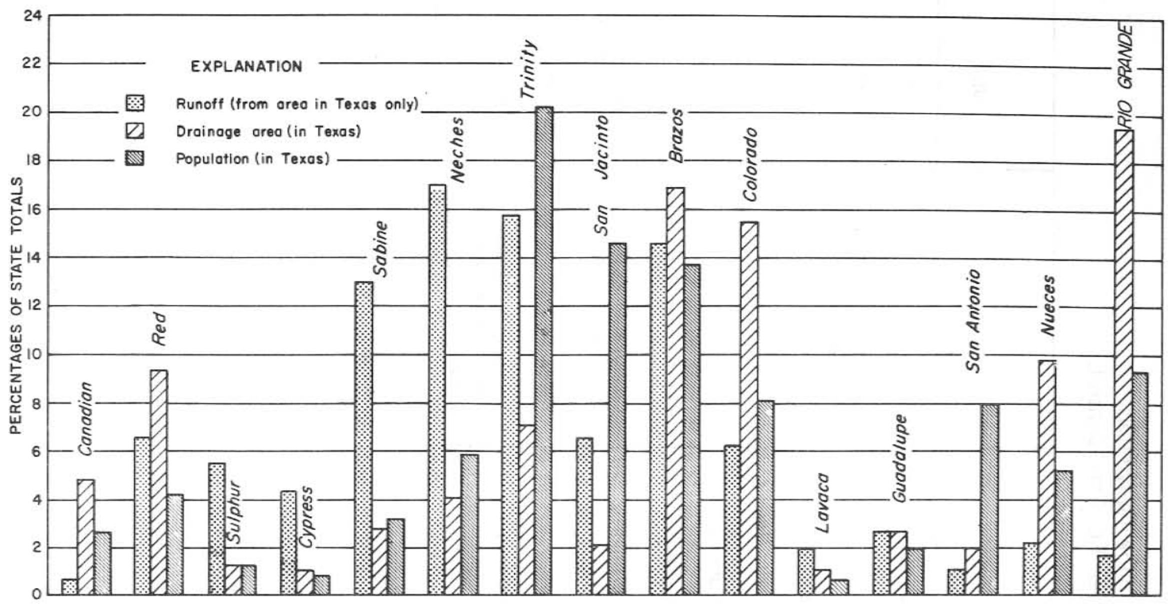

Figure 3.—Average Annual Runoff, Drainage Area, and 1960 Population of Major River Basins in Texas, as Percentage of State Totals

Oil operations are the principal source of revenue in much of the Pecos River subbasin. Most of the oil production in Webb, Zapata, and Starr Counties is just outside the Rio Grande basin, but the basin communities receive the bulk of the business from these operations.

Tourism is another important industry. Increasing numbers of people are visiting the Big Bend National Park and retired or semi-retired persons find the lower valley an annual winter retreat.

ALLOCATION OF RIO GRANDE WATERS

Two treaties between the United States and Mexico provide for the division of international waters of the Rio Grande. The Rio Grande Compact between Colorado, New Mexico, and Texas and the Pecos River Compact between New Mexico and Texas provide for the division of interstate waters (Texas Water Development Board, 1968).

The United States and Mexico signed a treaty in 1906 providing for the delivery of 60 thousand acre-feet of Rio Grande water annually by the United States to Mexico in the El Paso-Juarez valley above Fort Quitman. Deliveries are in proportionate amounts when the Rio Grande Compact has shortages. A treaty ratified by the United States and Mexico in 1945 dealt with the division of waters from the Rio Grande, the Colorado River, and the Tijuana River. The section pertaining to the Rio Grande allows for the allocation of waters from Fort Quitman to the Gulf of Mexico. The treaty also calls for as many as three major storage dams to provide for water supply, flood control, and the generation of hydroelectric power. The International Boundary and Water Commission administers the responsibilities and obligations set forth by the treaty.

The Rio Grande Compact, approved by the legislatures of Colorado, New Mexico, and Texas in 1939, allocates the uncommitted waters of the Rio Grande above Fort Quitman. Water-delivery schedules are provided from Colorado to New Mexico, from New Mexico to Texas, and to the various irrigation projects.

The waters from the drainage area of the Pecos River were allocated by the Pecos River Compact approved in 1949 by Texas and New Mexico. The Compact also provides for cooperative programs for the salvage of water used by phreatophytes and for alleviation of the excessive salinity of the Pecos River.

DEVELOPMENT OF SURFACE-WATER RESOURCES

Because rainfall, streamflow, and runoff within the Rio Grande basin are unevenly distributed, storage projects are required to provide dependable quantities of surface water for municipal supply, irrigation, and industrial use. The capacity, owner, location, and use of the principal reservoirs in the basin are listed in Table 1 (Dowell and Breeding, 1967).

Table 1.—Reservoirs With Capacities of 5,000 Acre-Feet or More in the Rio Grande Basin in Texas (From Dowell and Breeding, 1967)

The purpose for which the impounded water is used is indicated by the following symbols:
M, municipal; I, industrial; Ir, irrigation; R, recreation; P, hydroelectric power; FC, flood control.

NAME OF RESERVOIR	YEAR OPERATION BEGAN	STREAM	1/ TOTAL STORAGE CAPACITY (ACRE-FEET)	OWNER	COUNTY	USE
San Esteban Lake	1911	Alamito Creek	18,770	Mrs P. M. Robinson estate	Presidio	Ir
Red Bluff Reservoir	1937	Pecos River	310,000	Red Bluff Water Power Control District	Eddy (New Mexico), Reeves, and Loving	Ir
Lake Balmorhea	1917	Sandia Creek	6,350	Reeves County Water Improvement District No. 1	Reeves	Ir
Devils Lake 2/	1928	Devils River	9,200	Central Power & Light Co.	Val Verde	P
Lake Walk 2/	1929	Devils River	5,400	Central Power & Light Co.	Val Verde	P
International Amistad Reservoir	1968	Rio Grande	5,325,000	United States and Mexico	Coahuila, Mexico and Val Verde, Texas	M, I, FC, Ir, P, R
Casa Blanca Lake	1951	Chacon Creek	20,000	Webb County	Webb	R
International Falcon Reservoir	1953	Rio Grande	3,280,700	United States and Mexico	Tamaulipas, Mexico, and Starr and Zapata, Texas	M, I, FC, Ir, P, R

1/ Total storage capacity is that capacity below the lowest uncontrolled outlet or spillway and is based on the most recent reservoir survey available.
2/ Inundated by International Amistad Reservoir.

Throughout history, irrigation has been the dominant use of Rio Grande waters. The Indians irrigated small plots along the upper valley of the Rio Grande for centuries. Later, the Spanish colonists, who considered river water for irrigation as a commodity essential to the survival of the communities, established riparian rights to the water.

Irrigation in the Rio Grande basin was expanded greatly when the frontier forts were established by the United States. In 1853, water from San Solomon Springs and other springs in the vicinity of Balmorhea were used for irrigation of corn, alfalfa, and other produce raised for consumption in the Fort Davis community. Springflows were utilized by direct diversion until 1917 when Lake Balmorhea was completed to impound the flow diverted from Phantom Lake Springs, the Madera Diversion Dam on Toyah Creek, and San Solomon Springs.

The drainage area of Sandia Creek and the Madera Canal collecting system, which contributes inflow to the reservoir, is only 22 square miles; and the original capacity of the reservoir was 6,500 acre-feet. Nevertheless, an annual diversion of 18,000 acre-feet of water from the reservoir was authorized for the irrigation of 10,600 acres.

In the 1860's, Comanche Springs was used as a water supply for Fort Stockton. Miles of canals were constructed to irrigate several thousand acres of arid land, and shortly thereafter all the flow of the springs was being fully utilized.

Irrigation from the Pecos River in the area from Red Bluff, New Mexico to Girvin, Texas began in 1877. An era of construction of canals and small off-channel reservoirs began in 1888 and continued for more than 35 years. By 1915, 10 major irrigation projects had been started within a 125-mile reach of the Pecos River. Undependable water supply, soil and water salinity, and the lack of technology plagued the projects; and several reorganizations of projects and water districts took place. In 1934, through the efforts of seven irrigation projects, plans were made to finance and construct Red Bluff Dam, which was completed in 1936. Releases from Red Bluff Reservoir have been used to irrigate as much as 28,000 acres, but the amount used varies with the quantity and quality of the water in storage. Since 1940, ground water of fair to marginal quality has been used in Ward and Reeves Counties to supplement surface-water supplies.

San Esteban Lake on Alamito Creek, the first reservoir in the Rio Grande basin in Texas, was completed in 1911 by the St. Stephens Land and Irrigation Company. This project included the 18,770 acre-foot reservoir and 7 miles of canals. The permit from the Texas Board of Water Engineers allowed for the irrigation of 8,500 acres of land, but because of lack of runoff, the lake has been dry most of the time. Ownership has changed several times. In 1962, the Texas Water Commission reduced the water rights to 400 acre-feet to irrigate 200 acres of land.

Devils Lake and Lake Walk on the Devils River, completed in 1928 and 1929 respectively, were constructed by Central Power and Light Company for development of hydroelectric power. These two reservoirs were inundated by International Amistad Reservoir in 1968.

Casa Blanca Lake on Chacon Creek, 3 miles northeast of Laredo, was completed in 1951 by Webb County for recreation and irrigation of a golf course.

International Falcon Reservoir, 80 miles downstream from Laredo, and International Amistad Reservoir, 12 miles northwest of Del Rio, are the largest reservoirs in the Rio Grande basin. International Falcon Reservoir, which has a capacity of 3,280,700 acre-feet at the top of the spillway gates, was completed in 1953. International Amistad Reservoir, which has a capacity of 5,325,000 acre-feet at the top of the flood-control storage space, was completed in 1968. Both of these multipurpose reservoirs were constructed under the 1944 treaty between the United States and Mexico, which called for equitable distribution of the waters of the Rio Grande.

STREAMFLOW RECORDS

Streamflow records for the Rio Grande date from 1889 when the gaging station, Rio Grande at El Paso, was established by the U.S. Geological Survey (Table 6). A number of stations on the main stem downstream from El Paso were established in 1900 and were operated until 1914. Operation of these stations was suspended from 1914 to 1923, except for a few months in 1919. From 1923 to 1931, gaging stations were operated independently by the United States and Mexico. In 1932, the International Boundary and Water Commission took over the operation of most of the streamflow and water-quality stations to determine an equitable distribution of waters between the United States and Mexico. Records of these stations have been published jointly by the United States and Mexican Sections of the Commission. Figure 10 shows the location of the principal data-collection sites.

The collection of streamflow records for the Pecos River was begun in 1898 when the U.S. Geological Survey established the stream-gaging station Pecos River near Comstock. Since 1900, the International Boundary and Water Commission has maintained a gaging station at or in the vicinity of this site. The high bridge that supported the gage near Comstock was destroyed by a flood in 1954, so the flow of the Pecos River was measured upstream near Shumla until 1967 when the gaging station Pecos River near Langtry was established. The most intensive records of streamflow for the Pecos subbasin were compiled as part of the Pecos River Joint Investigation (National Resources Planning Board, 1942). In 1937, 31 recording stations were operated on the main stem, tributary streams, canals, and drains.

Streamflow at many miscellaneous sites on the Pecos River was measured during low-flow and water-delivery studies in 1964, 1965, 1967, and 1968 (Grozier and others, 1966 and 1968; Spiers and Hejl, 1970). Records of diversion from scores of sites on the Rio Grande and Pecos River have been maintained by the International Boundary and Water Commission, the U.S. Geological Survey, and the U.S. Bureau of Reclamation.

Records of discharge and stage of streams and contents and stages of lakes and reservoirs from 1897 to 1968 have been published in the annual series of U.S. Geological Survey Water-Supply Papers and by the International Boundary and Water Commission Water Bulletins. Beginning with the 1961 water year, streamflow records have been released by the Geological Survey in annual reports. (See table in list of references.) Summaries of discharge records giving monthly and annual totals have been published by the Texas Board of Water Engineers (1958) and the U.S. Geological Survey (1960, 1964a).

CHEMICAL-QUALITY RECORDS

Daily records of water quality for the Rio Grande in Texas date from August 1, 1905, when the U.S. Geological Survey began sampling at the station Rio Grande at Laredo (Table 6). Sampling at this station was discontinued after one year. The next regular sampling record dates from 1924 when the U.S. Bureau of Reclamation began collecting data on the concentrations of sediment and dissolved solids at the station Rio Grande at El Paso.

Beginning in 1928 and 1929, samples were collected at approximately weekly intervals for the determination of specific conductance and major chemical constituents on the Rio Grande at El Paso, Fabens, and Fort Quitman. Monthly or less frequent sampling and analysis were begun in the 1930's at several other stations in Texas by the U.S. Geological Survey, the United States Section of the International Boundary and Water Commission, and the U.S. Bureau of Reclamation. The samples collected by the Commission were analyzed by the U.S. Department of Agriculture at Riverside, California.

Sampling intervals at regular stations have varied widely. From one to 31 samples during a month have been collected and analyzed. At times, estimated values for constituents have been reported as representative of a month's flow. During the early years, each individual water sample collected by the International Boundary and Water Commission was analyzed. However, during the early 1930's, the system of discharge-weighted composites was adopted.

A composite sample was made for each month at each station by consolidating into a single sample an amount of each individual sample proportional to the river flow at the time the sample was taken. The results of these analyses and corresponding streamflow records were used to calculate annual discharge-weighted averages of selected constituents for each station, provided the records were considered sufficient. The International Boundary and Water Commission calculates weighted averages on a calendar-year basis. In this report, the calendar year was retained as the reporting period for stations operated by the Boundary Commission. However, annual weighted averages for stations operated on the Pecos River by the U.S. Geological Survey were calculated on a water-year (October 1-September 30) basis.

Chemical-quality records for the Rio Grande basin are summarized in Tables 7-11. Complete records are published in an annual series of the U.S. Geological Survey Water-Supply Papers, in reports of the Texas Water Development Board and its predecessor agencies, and in the International Boundary and Water Commission Water Bulletins. (See table in list of references.)

FACTORS AFFECTING CHEMICAL QUALITY OF WATER

Surface water normally contains significant amounts of dissolved or suspended materials. These and other constituents or properties such as color, taste, natural and man-made organic substances, radioactive metals, and microorganisms are factors that determine water quality. In this report, only the major chemical constituents are considered because these are the principal factors that limit the use of the water in the Rio Grande basin.

The major chemical constituents usually are dissociated into charged particles or ions. Principal cations (positively charged ions) in natural water are calcium (Ca), magnesium (Mg), sodium (Na), potassium (K), and iron (Fe). Principal anions (negatively charged ions) are carbonate (CO_3), bicarbonate (HCO_3), sulfate (SO_4), chloride (Cl), fluoride (F), and nitrate (NO_3). The source and significance of the constituents and properties commonly determined by the U.S. Geological Survey are given in Table 2.

Some of the environmental factors that affect the chemical quality of surface waters are climate, geology, patterns and characteristics of streamflow, impoundments and diversions, disposition of municipal and industrial wastes, and irrigation. In the Rio Grande basin, the principal factors that affect the chemical quality of the water are geology and return flow from irrigation.

Table 2.—Source and Significance of Dissolved-Mineral Constituents and Properties of Water

CONSTITUENT OR PROPERTY	SOURCE OR CAUSE	SIGNIFICANCE
Silica (SiO_2)	Dissolved from practically all rocks and soils, commonly less than 30 mg/l. High concentrations, as much as 100 mg/l, generally occur in highly alkaline waters.	Forms hard scale in pipes and boilers. Carried over in steam of high pressure boilers to form deposits on blades of turbines. Inhibits deterioration of zeolite-type water softeners.
Iron (Fe)	Dissolved from practically all rocks and soils. May also be derived from iron pipes, pumps, and other equipment. More than 1 or 2 mg/l of iron in surface waters generally indicates acid wastes from mine drainage or other sources.	On exposure to air, iron in ground water oxidizes to reddish-brown precipitate. More than about 0.3 mg/l stains laundry and utensils reddish-brown. Objectionable for food processing, textile processing, beverages, ice manufacture, brewing, and other processes. U.S. Public Health Service (1962) drinking-water standards state that iron should not exceed 0.3 mg/l. Larger quantities cause unpleasant taste and favor growth of iron bacteria.
Calcium (Ca) and magnesium (Mg)	Dissolved from practically all soils and rocks, but especially from limestone, dolomite, and gypsum. Calcium and magnesium are found in large quantities in some brines. Magnesium is present in large quantities in sea water.	Cause most of the hardness and scale-forming properties of water; soap consuming (see hardness). Waters low in calcium and magnesium desired in electroplating, tanning, dyeing, and in textile manufacturing.
Sodium (Na) and potassium (K)	Dissolved from practically all rocks and soils. Found also in ancient brines, sea water, industrial brines, and sewage.	Large amounts, in combination with chloride, give a salty taste. Moderate quantities have little effect on the usefulness of water for most purposes. Sodium salts may cause foaming in steam boilers and a high sodium content may limit the use of water for irrigation.
Bicarbonate (HCO_3) and carbonate (CO_3)	Action of carbon dioxide in water on carbonate rocks such as limestone and dolomite.	Bicarbonate and carbonate produce alkalinity. Bicarbonates of calcium and magnesium decompose in steam boilers and hot water facilities to form scale and release corrosive carbon dioxide gas. In combination with calcium and magnesium, cause carbonate hardness.
Sulfate (SO_4)	Dissolved from rocks and soils containing gypsum, iron sulfides, and other sulfur compounds. Commonly present in mine waters and in some industrial wastes.	Sulfate in water containing calcium forms hard scale in steam boilers. In large amounts, sulfate in combination with other ions gives bitter taste to water. Some calcium sulfate is considered beneficial in the brewing process. U.S. Public Health Service (1962) drinking-water standards recommend that the sulfate content should not exceed 250 mg/l.
Chloride (Cl)	Dissolved from rocks and soils. Present in sewage and found in large amounts in ancient brines, sea water, and industrial brines.	In large amounts in combination with sodium, gives salty taste to drinking water. In large quantities, increases the corrosiveness of water. U.S. Public Health Service (1962) drinking-water standards recommend that the chloride content should not exceed 250 mg/l.
Fluoride (F)	Dissolved in small to minute quantities from most rocks and soils. Added to many waters by fluoridation of municipal supplies.	Fluoride in drinking water reduces the incidence of tooth decay when the water is consumed during the period of enamel calcification. However, it may cause mottling of the teeth, depending on the concentration of fluoride, the age of the child, amount of drinking water consumed, and susceptbility of the individual. (Maier, 1950)
Nitrate (NO_3)	Decaying organic matter, sewage, fertilizers, and nitrates in soil.	Concentration much greater than the local average may suggest pollution. U.S. Public Health Service (1962) drinking-water standards suggest a limit of 45 mg/l. Waters of high nitrate content have been reported to be the cause of methemoglobinemia (an often fatal disease in infants) and therefore should not be used in infant feeding. Nitrate has been shown to be helpful in reducing inter-crystalline cracking of boiler steel. It encourages growth of algae and other organisms which produce undesirable tastes and odors.
Dissolved solids	Chiefly mineral consti :ents dissolved from rocks and soils. Includes some water of crystallization.	U.S. Public Health Service (1962) drinking-water standards recommend that waters containing more than 500 mg/l dissolved solids not be used if other less mineralized supplies are available. Waters containing more than 1000 mg/l dissolved solids are unsuitable for many purposes.
Hardness as $CaCO_3$	In most waters nearly all the hardness is due to calcium and magnesium. All the metallic cations other than the alkali metals also cause hardness.	Consumes soap before a lather will form. Deposits soap curd on bathtubs. Hard water forms scale in boilers, water heaters, and pipes. Hardness equivalent to the bicarbonate and carbonate is called carbonate hardness. Any hardness in excess of this is called non-carbonate hardness. Waters of hardness as much as 60 ppm are considered soft; 61 to 120 mg/l, moderately hard; 121 to 180 mg/l, hard; more than 180 mg/l, very hard.
Specific conductance (micromhos at 25°C)	Mineral content of the water.	Indicates degree of mineralization. Specific conductance is a measure of the capacity of the water to conduct an electric current. Varies with concentration and degree of ionization of the constituents.
Hydrogen ion concentration (pH)	Acids, acid-generating salts, and free carbon dioxide lower the pH. Carbonates, bicarbonates, hydroxides, and phosphates, silicates, and borates raise the pH.	A pH of 7.0 indicates neutrality of a solution. Values higher than 7.0 denote increasing alkalinity; values lower than 7.0 indicate increasing acidity. pH is a measure of the activity of the hydrogen ions. Corrosiveness of water generally increases with decreasing pH. However, excessively alkaline waters may also attack metals.

Waters usually are classified in various ways to demonstrate similarities and differences of composition. In the following discussion, which relates chemical quality of water to environmental factors, water is classified on the basis of dissolved-solids content in mg/l (milligrams per liter), principal chemical constituents, and hardness. On the basis of dissolved-solids content, waters are classified as follows:

CLASSIFICATION	DISSOLVED SOLIDS (MG/L)
Fresh	Less than 1,000
Slightly saline	1,000 to 3,000
Moderately saline	3,000 to 10,000
Very saline	10,000 to 35,000
Brine	More than 35,000

As to geochemical types, waters are classified on the basis of the predominant cations and anions in me/l (milliequivalents per liter). For example, water is classified as a sodium chloride type if the sodium and chloride ions constitute 50 percent or more of the cations and anions respectively. Waters in which one cation and one anion are not clearly predominant are recognized as mixed types and are identified by the names of all the important cations and anions.

On the basis of hardness, waters are classified as soft, moderately hard, hard, or very hard (Table 2).

Geology

The amounts and kinds of minerals dissolved in water that drains from areas where municipal and industrial influences are small depend principally on the chemical composition and physical structure of the rocks and soils traversed by the water and on the length of time the water is in contact with the rocks and soils. The amount of minerals available for solution is decreased by leaching; therefore, in areas of high rainfall, the mantle rock and residual soil contain relatively small amounts of readily soluble minerals. These rocks usually yield water of low mineralization. However, in arid or semiarid regions, most soils and rocks are incompletely leached and still contain large amounts of readily soluble material; water in contact with these rocks and soils may become highly mineralized.

The rocks exposed in the Texas part of the basin range in age from Paleozoic to Quaternary (Figure 4). The structure of the rocks and sediments of the basin varies from extremely complex arrangements of several systems in the upper part of the basin to an orderly layering of Tertiary and Quaternary sediments in the lower basin (Davis and others, 1965). The geology in Mexico is adapted from the "Carta Geológica de la República Mexicana" prepared in 1968 by the Comité de la Carta Geológica de Mexico.

Chemical analyses of surface water at selected sites in the Rio Grande basin are represented diagrammatically (Stiff, 1951) in Figure 4 to relate chemical composition to geology. The shape of each diagram indicates roughly the degree of mineralization.

The upper reaches of both the Rio Grande and Pecos River in Texas are underlain primarily by deposits of Quaternary age. In the fall and winter, when no water is being released from reservoirs in New Mexico, water in the Rio Grande at El Paso is usually slightly saline and very hard. The principal cation in the water is sodium; the principal anion usually is sulfate, but in some of the more highly mineralized water, the percentage of chloride increases (Figure 4).

Farther downstream at Fort Quitman, the quality of water in the Rio Grande is altered by irrigation return flows. Water passing the Fort Quitman station usually is slightly saline and very hard. Although the principal chemical constituents vary, highly mineralized flows usually are of the sodium chloride type (Figure 4).

In the reach between the daily chemical-quality stations Pecos River below Red Bluff Dam near Orla and at Girvin, which is underlain principally by deposits of Quaternary age, the water usually is moderately or very saline, very hard, and of the sodium chloride type. Water in most tributaries to the Pecos River that traverse rocks of Quaternary age is slightly to very saline, very hard, and of the sodium chloride or mixed sodium chloride sulfate type. However, water in Coyanosa Draw is fresh, ranges from moderately hard to hard, and is of the calcium bicarbonate type (Figure 4).

Extensive deposits of Tertiary age crop out in the upper, middle, and lower reaches of the Mexican side of the Rio Grande basin and in the lower reach of the Texas side. The Rio Conchos is the principal tributary that traverses rocks of Tertiary age on the Mexican side of the basin. Water in the Rio Conchos near Ojinaga usually is fresh, very hard, and of the sodium calcium sulfate type. Water in the Rio Grande at Johnson Ranch near Castolon, which is contributed principally by the Rio Conchos, is usually fresh and very hard. Principal chemical constituents usually are calcium, sodium, and sulfate (Figure 4).

The middle reach of the Rio Grande basin is underlain principally by rocks of Cretaceous age. Streams that traverse the Cretaceous outcrops include the Devils River and San Felipe Creek on the Texas side and Rio San Diego and Rio San Rodrigo on the Mexican side. Water in these streams usually is fresh, hard, and of the calcium bicarbonate type (Figure 4).

Streamflow

The patterns and characteristics of unregulated streamflow usually affect the chemical character of the water in streams. Water discharge, and thus the chemical quality, of any unregulated stream may vary from day to day and even from hour to hour. The variation may be large, such as for smaller streams that flow intermittently in response to storms, or small, if the river is large or if the flow is derived primarily from ground water.

The concentration of dissolved minerals usually varies inversely with the water discharge. The concentrations usually are minimum during periods of high flow because most of the water is surface runoff that has been in contact with soluble minerals of the exposed rocks and soils for a relatively short time. In arid areas, intermittent streams may have high concentrations of dissolved solids at times of high flow when an isolated rainstorm causes only enough flow to scour the streambed.

Between rainstorms, the flow of perennial streams is sustained predominantly by ground water from springs or seeps along the watercourse. This water has been in contact with the rocks and soil for sufficient time to leach appreciable quantities of soluble material and to reach equilibrium. Thus, the concentration of dissolved materials usually is maximum and is nearly constant during low-flow periods.

Through most reaches of the Rio Grande and the Pecos River, the flow is so regulated by upstream reservoirs, diversions, and drainage returns that only at medium or high flows do the normal discharge-concentration relations apply.

Irrigation

Because most of the Rio Grande basin is either arid or semiarid, and because most of the water is used for irrigation, repetitive and consumptive usage of water is greater here than in most of the major river basins of North America. Before 1900, shortages of water for irrigation began to occur. Since that time, the total acreage of irrigated lands has been restricted and irrigation rights have been reallocated to achieve the maximum use of available water (Figure 5).

Irrigation returns from surface and ground waters have a significant effect on the use and the quality of the water available throughout the entire reach of the Rio Grande and the Pecos River. The natural quality of water in these streams, which is only marginal or fair, is being seriously impaired by the return flow of water used repetitively for irrigation. The higher salinity of the irrigation return flow is caused by the salinity of the soil through which the water has percolated and by the concentration effect of high evaporation rates throughout the basin.

Oilfield Brines

Oil is produced in large areas of the Pecos River subbasin, in the middle reaches of the Rio Grande basin, and in the Lower Rio Grande Valley. The principal oil-producing areas (Figure 6) extend eastward from the middle Rio Grande basin and southward from the Lower Rio Grande Valley. Thus, oilfield brines may be transported into or out of the basin.

Improper disposal of brines from these areas has permitted salt to reach the streams. When oil production started more than fifty years ago, little effort was made to protect either surface or ground waters in the area. Unlined surface pits were usually employed to hold the brine produced with the oil. Though some of the water from the pits evaporated, the greater part probably percolated downward and contributed to the salinity of the streams. Brines from abandoned wells and unplugged, or improperly plugged, test holes may also contribute to the salinity of streams.

In recent years, the trend has been to inject the brines back into the producing formation to maintain the formation pressure. Brackish or salt water from other sources may also be injected to repressure the oil-producing formations. Though injection usually is the preferred way of brine disposal, the increased pressure may move the brine upward along fault zones or into unplugged or improperly plugged wells and eventually into surface streams.

The composition of oilfield brines varies; but the principal chemical constituents in order of the magnitude of their concentration (milligrams per liter) are usually chloride, sodium, calcium, and sulfate. Generally, an erratic variation in the ratio of the chloride ion to other major constituents in streams that drain oilfields indicates brine pollution.

Because much of the flow of the Pecos River is naturally saline, detailed studies are necessary to identify the source and quantities of brines contributed by oilfield operations.

CHEMICAL QUALITY OF SURFACE WATER

Upper Rio Grande Basin

The flow of the Rio Grande upstream from Texas is regulated by Elephant Butte and Caballo Reservoirs in New Mexico and is derived principally from snowmelt. The quality of the water released from these reservoirs is fairly constant. The discharge-weighted average of the dissolved-solids concentrations at Caballo Dam for the period of record from 1939 to 1948 was about 500 mg/l, and no monthly composite contained as much as

1,000 mg/l. Downstream at Leasburg Dam during the same period, the dissolved solids were less than 5 percent higher. However, the discharge-weighted average concentration of dissolved solids for the same period at the El Paso station was 34 percent greater than that at Leasburg Dam. Most of this increase in concentration resulted from irrigation return flows from the Mesilla Valley irrigation project.

The discharge-weighted average of the dissolved-solids concentrations at El Paso during the 1930-68 period of record was about 800 mg/l. The dissolved-solids concentrations vary seasonally. During the spring and summer when water is released from the upstream reservoirs, the concentrations at El Paso are usually about 600 or 700 mg/l, or only slightly higher than that of water released at the upstream dam.

In the fall and winter when no water is released from the reservoirs, the flow at the El Paso station is from seepage and delayed return flows and usually contains from 1,000 to 2,000 mg/l dissolved solids. At times, the dissolved solids exceed 2,000 mg/l and has been as high as 3,830 mg/l. The water is very hard (greater than 180 mg/l). The principal cation in the water is sodium; the principal anion usually is sulfate, but in some of the more highly mineralized water, the percentage of chloride increases. During the period 1930-68, the concentration of sulfate in samples from the El Paso station ranged from less than 150 mg/l to more than 1,250 mg/l; the discharge-weighted average was 263 mg/l. The chloride concentration ranged from less than 50 mg/l to more than 1,050 mg/l; the discharge-weighted average was 130 mg/l.

Most of the water passing the El Paso station is diverted by the American Canal in Texas and the Acequia-Madre in Mexico for irrigation and municipal use. Evaporation and leaching of salts from the soils increase the salinity of the water used for irrigation. Return flows and drainage from the irrigated areas cause the residual water in the river downstream from the diversion sites to become more mineralized.

In an inventory of Texas irrigation, Gillett and Janca (1965, p. 16) showed that not a single irrigated acre in El Paso County in 1958 and 1965 depended on surface water alone. Surface supplies were supplemented by wells, most of which are shallow and derive their water from the alluvium. The alluvium is supplied mostly from the percolation of excess irrigation water. Thus, the flow of the Rio Grande is recycled several times, and minerals in the water become extremely concentrated at the lower end of the El Paso Valley.

During extended periods from 1951 to 1959, no flow was recorded at the station near Acala, Texas. During these periods, any irrigation returns and seepage to the river in the reach below the station was diverted again and again until all was used before reaching the station Rio Grande at Fort Quitman. During these periods, the discharge-weighted average concentrations of dissolved solids for the Fort Quitman station reached their lowest values (375 mg/l in 1956, 294 mg/l in 1957, and 375 mg/l in 1965). These waters of low mineralization were from local storm runoff contributed by streams downstream from the irrigated valley of the Rio Grande. When a substantial part of the annual flow at Fort Quitman is from the flow passing the station near Acala or from irrigation return flow, the annual discharge-weighted average concentrations of dissolved solids usually range from 1,000 to 3,000 mg/l. Concentrations in single samples and monthly composites often greatly exceed the annual averages. The highest dissolved-solids concentration in a monthly composite was 10,700 mg/l in June 1953.

Water passing the Fort Quitman station usually is very hard, but the principal chemical constituents vary. Waters of low mineralization usually are of the calcium bicarbonate type; highly mineralized waters usually are of the sodium chloride type. The annual discharge-weighted average concentration of chloride has ranged from 21 mg/l in 1957 and 1965 to 1,640 mg/l in 1964. The discharge-weighted average concentration of sulfate has ranged from 45 mg/l in 1965 to 995 mg/l in 1961.

Since 1950, the water that has passed the station at Fort Quitman seldom has reached the upper Presidio station. Diversions, seepage into the permeable terrane, and evapotranspiration probably consume most of the water. Since 1950, most of the water at upper Presidio has been contributed by mountain creeks or arroyos that join the Rio Grande in the stretch below Fort Quitman.

Until 1945, the discharge-weighted averages of dissolved solids for the upper Presidio station were approximately the same as those for the Fort Quitman station. Since then, and especially since 1950, the flow at Fort Quitman has been small; and the annual discharge-weighted averages of dissolved solids usually have been considerably greater than those for the upper Presidio station (Figure 7).

During the period from 1950 to 1968, the annual discharge-weighted averages of dissolved solids for the Fort Quitman station ranged from 294 to 4,440 mg/l and averaged 2,120 mg/l. During this same period, the annual discharge-weighted averages of dissolved solids for the upper Presidio station ranged from 279 to 1,700 mg/l and averaged 748 mg/l.

Middle Rio Grande Basin

Because three-fourths of the flow in the Rio Grande below El Paso comes from the Mexican side, the quality of the inflows from Mexico is of major importance to the quality of water in the Rio Grande and the main stem reservoirs.

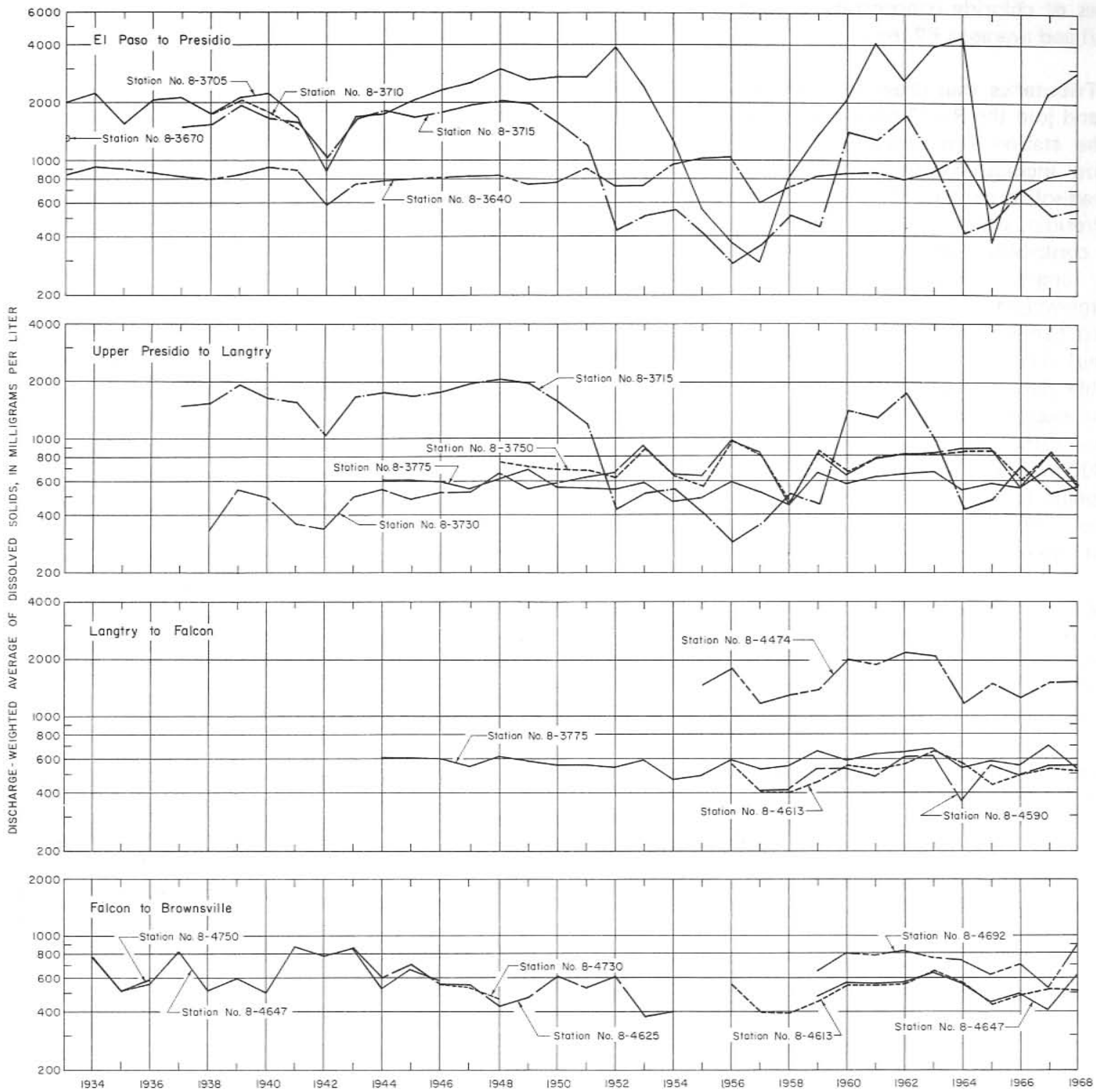

Figure 7.—Discharge-Weighted Average of Dissolved Solids for the Rio Grande and Principal Inflow Stations

Downstream from the upper Presidio station, over one-half million acre-feet of water a year is added to the flow of the Rio Grande by the Rio Conchos, the largest of the Mexican tributaries, to the middle reach of the Rio Grande. The chemical quality of water in the Rio Conchos is shown in Figure 7. Since 1850, when complete use of upper Rio Grande waters in the El Paso Valley began, the yearly discharge-weighted averages of dissolved solids of the water from the Rio Conchos near Ojinaga, Mexico, very closely paralleled and at times were almost identical to those of the Rio Grande at Johnson Ranch near Castolon, a hundred miles downstream. The discharge-weighted average concentrations of dissolved solids for the period from 1950 to 1968 for the two stations were identical, 728 mg/l. Water at both stations was very hard and usually was of the sodium sulfate or sodium calcium sulfate type.

Chemical analyses of samples from the two stations usually did not include the determination of sulfate. However, the annual discharge-weighted averages of the sulfate concentrations, as calculated from available data for the period from 1950 to 1968, ranged from 158 to 408 mg/l and averaged 291 mg/l for the station Rio Conchos near Ojinaga. The discharge-weighted averages of chloride for the station ranged from 26 to 96 mg/l and averaged 61 mg/l. During this same period, the discharge-weighted average concentrations of sulfate for the station Rio Grande at Johnson Ranch near Castolon ranged from 150 to 409 mg/l and averaged 290 mg/l, the discharge-weighted averages of chloride concentrations ranged from 24 to 91 mg/l and averaged 62 mg/l.

Tributaries that drain from the Texas side of the basin and join the Rio Grande between the Rio Conchos and the station Rio Grande at Johnson Ranch near Castolon include Alamito and Terlingua Creeks. The dissolved-solids content of samples from Alamito Creek near Presidio, which probably is fairly representative of water contributed by other mountain streams in the area, ranged from 253 to 448 mg/l. The discharge-weighted concentrations of dissolved-solids for Alamito Creek near Presidio probably average about 250 mg/l. The water usually is moderately hard or hard. Available data indicate that when the dissolved-solids content exceeds about 300 mg/l, the water is of the sodium bicarbonate type. However, water containing less than 300 mg/l dissolved solids probably is of the calcium bicarbonate type. The chloride content of samples from Alamito Creek ranged from 4.7 to 27 mg/l; the sulfate content ranged from 16 to 51 mg/l.

Water in Terlingua Creek is more mineralized than that in Alamito Creek. The dissolved-solids content of samples from Terlingua Creek near Terlingua ranged from 400 to 1,140 mg/l. Most of the samples were collected during low flow and contained more than 1,000 mg/l dissolved solids. However, the discharge-weighted concentrations of dissolved solids probably average about 500 mg/l. Water in Terlingua Creek usually is very hard and of the sodium calcium sulfate type. The chloride content of samples from Terlingua Creek ranged from 6.4 to 9.5 mg/l; the sulfate content ranged from 135 to 644 mg/l.

Although no major tributaries join the main stream between the stations Rio Grande at Johnson Ranch near Castolon and Rio Grande at Foster Ranch near Langtry, the annual inflow from small tributaries and springs in this reach averages more than 300,000 acre-feet. This inflow usually reduces the concentrations of dissolved solids and variations of chemical quality of water in the Rio Grande. At no time during the period of record has the dissolved solids in composite samples from the Rio Grande at Foster Ranch near Langtry exceeded 1,000 mg/l. During the period from 1944 to 1968, the range of annual discharge-weighted average concentrations were as follows: dissolved solids, 449-699 mg/l; chloride, 29-91 mg/l; and sulfate 161-269 mg/l. The water was very hard and usually of the sodium calcium sulfate type.

The next major contribution to the middle reach of the Rio Grande is the saline flow from the Pecos River. The dissolved-solids discharge-weighted average for the Pecos River near Langtry, just before it joins the Rio Grande, was 1,460 mg/l during the period 1955-68. During this same period, the discharge-weighted average concentration of dissolved solids upstream at the Rio Grande at Foster Ranch near Langtry was 581 mg/l. The variations in salinity of the Pecos River inflow is shown in Figure 7. The quality of the Pecos River water is considered in another section of this report.

The Devils River joins International Amistad Reservoir on the Rio Grande downstream from the Pecos River. Water from Devils River near Juno and at Pafford Crossing near Comstock, Lake Walk, and Cantu and San Felipe Springs contained less than 250 mg/l dissolved solids and were of the calcium bicarbonate type, typical of the Edwards Plateau.

The only water of poor quality collected from the Del Rio area during the reconnaissance was from Eight Mile Creek near Del Rio where concentrations of dissolved solids ranged from 820 to 2,060 mg/l. The source of the flow is a small spring and possibly a flowing well in the area that may be connected to the creek through fractured limestone. The principal constituents of this saline flow are calcium and sulfate.

Single samples from Chacon Creek near Laredo, Los Olmos Creek near Rio Grande City, and La Joya Creek near Samfordyce, which are Texas tributaries to the Rio Grande, were all saline. The concentrations of dissolved solids were 4,420, 11,500, and 5,740 mg/l, respectively. Sodium and chloride were the predominant constituents.

Tributaries that drain from the Mexican side of the basin and join the Rio Grande between International Amistad Reservoir and the station Rio Grande at Laredo include Rio San Diego and Rio San Rodrigo. Water from these streams usually contains less than 400 mg/l dissolved solids, 30 mg/l chloride, and 75 mg/l sulfate. The water is hard or very hard and of the calcium bicarbonate type.

The excellent quality of water from the Devils River and from small spring-fed streams on both sides of the Rio Grande more than compensate for the increased salinity caused by inflow from the Pecos River. The discharge-weighted average concentrations of dissolved solids, chloride, and sulfate for the Rio Grande at Laredo, Texas, during the 1956-68 period were 485 mg/l, 81 mg/l, and 148 mg/l, respectively.

The general improvement in the quality of water in this reach of the Rio Grande occurs in spite of diversions of water by Maverick Canal for powerplant cooling and for irrigation and in spite of the subsequent return of the water to the river. The amount of flow that returns to the river from the powerplant is essentially undiminished; thus, the concentration of salts by evaporation is small. Water from the Maverick Canal is used to irrigate about 35,000 acres above and below Eagle Pass. The amount of water returning to the river is large and the concentration of salts by leaching and evaporation is small. Although considerable quantities of water are diverted, the gain in flow of the Rio Grande between International Amistad Dam and Laredo averages more than 350,000 acre-feet per year.

Lower Rio Grande Basin

Flow of the Rio Grande in the lower basin is impounded in International Falcon Reservoir. The Rio Salado, in Mexico, also contributes water to International Falcon Reservoir. Although the Rio Salado at Las Tortillas has contained as much as 5,000 mg/l dissolved solids, the discharge-weighted average for the station during the period from 1955 to 1968 was 522 mg/l. During the period from 1956 to 1968, the discharge-weighted average concentrations of dissolved solids, chloride, and sulfate for the Rio Grande below International Falcon Dam were 493 mg/l, 84 mg/l, and 150 mg/l, respectively. The water is very hard and usually is of the mixed type in which no cation or anion predominates.

Releases from International Falcon Reservoir provide most of the water used for municipal supply, irrigation, and industrial use in the Lower Rio Grande Valley. However, since 1943, Marte R. Gomez Reservoir on the Rio San Juan in Mexico has provided considerable quantities of water for irrigation in the reach from Ciudad Miguel Aleman, Mexico (near Roma, Texas) to Rio Bravo, Mexico (near Mercedes, Texas). Some of the water used for irrigation drains back into the Rio San Juan before it joins the Rio Grande; but most of the return flows enter the Rio Grande through five drains—the Rancherias and Los Fresnos drains upstream from Fort Ringgold, Texas, and the Los Puerteoitos, Huizache, and Morillo drains downstream from Fort Ringgold. Water contributed to the Rio Grande by the Rio San Juan and these five drains is saline most of the time. The concentration of dissolved solids in Morillo drain averages about 10,000 mg/l, which is several times greater than the average concentration in the other drains.

Inflow of saline water from these sources has caused an increase in the dissolved-solids content of the Rio Grande. During the 1959-68 period, the discharge-weighted average concentration of dissolved solids for the station Rio Grande at Anzalduas Dam was 684 mg/l. Although this concentration would not be excessive in water used for irrigation in other areas, it may adversely affect crop production in the Lower Rio Grande Valley where the mineral content of the soil is high and where leaching of the minerals is restricted because of the high water table, tight structure of the soil, and flat topography.

As a measure to improve the quality of the water in the Lower Rio Grande Valley, the saline water from the Morillo drain has recently been diverted through a 75-mile long channel to the Gulf of Mexico. Preliminary results indicate that diversion of the saline water has caused a significant improvement of the quality of the water in the Rio Grande.

Pecos River Subbasin

Water in the Pecos River usually is very saline as it enters Texas. In a short reach of about 3 miles in the Malaga Bend of the river in southern Eddy County in New Mexico, about 420 tons of dissolved minerals, mostly sodium chloride, is added daily to the mineral load of the river. The source of the salt is a concentrated brine that percolates upward from an aquifer that underlies the area. An experimental salinity-alleviation project has been in operation at Malaga Bend since August 1963. Brine is being pumped from a well into an evaporation basin to lower the water level in the brine aquifer and thus prevent its seepage into the river. The results of the project are still being evaluated.

The Pecos River receives water of better quality from the Delaware River but the amount is too small to reduce the salinity significantly. When sampled in August 1966, the Delaware River near Red Bluff, New Mexico, contained 1,980 mg/l dissolved solids, 8.8 mg/l chloride, and 1,300 mg/l sulfate. The water was very hard and was of the calcium sulfate type.

Since 1937, the flow of the Pecos River has been impounded in Red Bluff Reservoir. The chemical quality of the outflow from the reservoir has been monitored at the daily sampling station Pecos River below Red Bluff Dam near Orla or 15 miles downstream at the gaging station, Pecos River near Orla. During some periods, the quality of the water at the station near Orla is impaired by saline inflow from Salt (Screwbean) Draw. Therefore, records for the station Pecos River below Red Bluff Dam near Orla are more representative of the chemical quality of outflow from the reservoir.

To supplement chemical-quality records for outflow from Red Bluff Reservoir and to determine the areal variations of the quality of water in the reservoir, the Geological Survey in cooperation with the Red Bluff Water Power Control District conducted a series of water-quality surveys during the period from 1965 to 1968 (Kunze and Rawson, 1970). During each of the surveys, water throughout the reservoir was saline. However, during some periods, water at the surface was much less saline than that at the bottom. For example, on October 12, 1965, the concentration of dissolved solids at a deep site near Red Bluff Dam ranged from 4,260 mg/l at the surface to 10,200 mg/l at a depth of 38 feet. Thus, selected withdrawal of the more saline water from the reservoir during non-irrigating periods would improve the quality of the water available for irrigation.

Evaporation, irrigation returns, and the inflow of highly mineralized ground water or brines from oil fields usually cause a progressive increase of dissolved solids and chloride in the Pecos River between the chemical-quality stations below Red Bluff Dam near

Orla and at Girvin (Figure 8). Inflow of ground water downstream from this reach usually results in a reduction in the concentration of dissolved solids. During the period from 1961 to 1968, the discharge-weighted average concentrations of dissolved solids for the stations Pecos River below Red Bluff Dam, at Girvin, and at Shumla (now near Langtry) were 7,770 mg/l, 14,200 mg/l, and 1,600 mg/l, respectively. The discharge-weighted average concentrations of chloride were 3,080 mg/l, 5,820 mg/l, and 572 mg/l, and those of sulfate were 1,880 mg/l, 3,370 mg/l, and 324 mg/l. Water at each of the sites was very hard and of the sodium chloride type. Water-delivery and low-flow studies (Grozier and others, 1966 and 1968; Spiers and Hejl, 1970) generally have documented the increase of dissolved solids in the Pecos River between Red Bluff Dam and Girvin and the reduction thereafter.

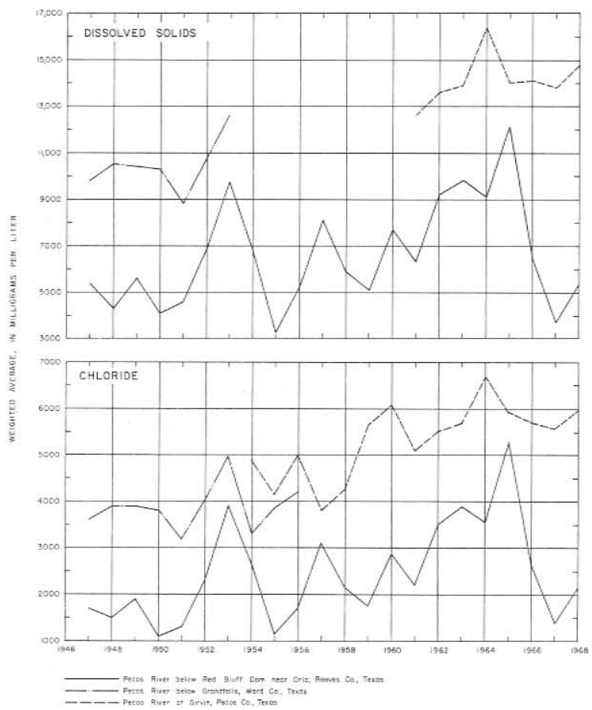

Figure 8.—Discharge-Weighted Average of Chloride and Dissolved Solids for the Pecos River Below Red Bluff Dam Near Orla, Below Grand Falls, and at Girvin

Three miles below Red Bluff Reservoir, low flows from Salt (Screwbean) Draw entering the Pecos River are very saline. When sampled in 1947 and 1948, the stream usually contained more than 15,000 mg/l dissolved solids, 7,000 mg/l chloride, and 3,000 mg/l sulfate. The water was very hard and of the sodium chloride type. Infrequent flood inflows probably are of better quality than that of the river. The usual flow of Salt (Screwbean) Draw is less than one cfs (cubic foot per second) and the stream is dry for long periods. Thus, the salt contributions to the Pecos River by Salt (Screwbean) Draw are not a major problem.

The concentration of dissolved solids in irrigation returns to the Pecos River through the Barstow drain range from about 7,000 to 9,000 mg/l. These irrigation returns are largely responsible for the progressive increase of the concentration of dissolved solids in the Pecos River between Orla and Girvin.

Water samples collected from Phantom Lake Springs and San Solomon Springs near Toyahvale and from Lake Balmorhea at Balmorhea generally contained more than 2,000 mg/l dissolved solids, 600 mg/l chloride, and 600 mg/l sulfate.

Analyses of samples from Toyah Creek near Pecos and Salt Draw near Pecos show both of these inflows to Toyah Lake to be saline, ranging from about 5,000 to 14,000 mg/l dissolved solids. However, the water of Limpia Creek above and below Fort Davis, is of excellent quality (less than 250 mg/l dissolved solids, 10 mg/l chloride, and 30 mg/l sulfate). The water at the site above Fort Davis is soft to moderately hard; below Fort Davis the water is moderately hard to hard. Water at both sites is of the calcium bicarbonate type.

Toyah Lake overflows infrequently into the Pecos River through lower Toyah Creek. These overflows are usually very saline because of the concentration of the saline inflows by evaporation.

Water from Coyanosa Draw near Fort Stockton, when sampled in 1965 and 1967, contained less than 250 mg/l dissolved solids, 5 mg/l chloride, and 30 mg/l sulfate and was moderately hard or hard. Some of the water from Coyanosa Draw is diverted for irrigation, but most of it goes to ground-water recharge. Therefore, only at times of extreme floods does flow from the draw reach the Pecos River.

Inflow to the middle Pecos River from Live Oak Creek near Old Fort Lancaster was moderately saline (4,610 mg/l dissolved solids) at the time of sampling.

RELATION OF CHEMICAL QUALITY TO USE

The early studies of the water resources of the western United States dealt heavily on the quantity and not the quality of water. Early irrigation developments on the Pecos River were to a large extent failures because the chemical quality of the water was not considered in the application of irrigation waters. However, during the last few decades, water-quality criteria for specific uses have been established, and water treatment for specific uses has become a science.

Domestic Purposes

Because of differences in individuals, the varying amounts of water they use, and other factors, definition of the safe limits of the mineral constituents in water is difficult. The criteria usually accepted in the United States are those established by the United States Public Health Service. Since 1914, these standards have been used to control the quality of the water used by interstate carriers for drinking and culinary purposes. The widespread use of the standards and technological advances since 1914 have led to a series of revisions, the latest of which was in 1962 (U.S. Public Health Service, 1962). The standards have been accepted by the American Waterworks Association and by most state departments of public health as minimum standards for all public water supplies.

The limits specified by these standards for various constituents are included in the statements under "Significance" in Table 2. Although the recommended limits for dissolved solids, chloride, and sulfate are 500 mg/l, 250 mg/l, and 250 mg/l, respectively, a considerable number of water supplies exceeding these recommended limits have been used for domestic purposes without noticeable adverse effects.

Concentrations of fluoride within a desirable concentration range is beneficial to sound teeth. However, excessive concentrations may cause mottling of teeth enamel. According to the U.S. Public Health Service Drinking Water Standards, the concentration of fluoride should not average more than the appropriate upper limit in the following table:

ANNUAL AVERAGE OF MAXIMUM DAILY AIR TEMPERATURES (°F)1/	U.S. PUBLIC HEALTH SERVICE RECOMMENDED CONTROL LIMITS (FLUORIDE CONCENTRATIONS IN MG/L)		
	LOWER	OPTIMUM	UPPER
50.0-53.7	0.9	1.2	1.7
53.8-58.3	.8	1.1	1.5
58.4-63.8	.8	1.0	1.3
63.9-70.6	.7	.9	1.2
70.7-79.2	.7	.8	1.0
79.3-90.5	.6	.7	.8

1/ Based on temperature data obtained for a minimum of 5 years.

On the basis of temperature data for El Paso, Del Rio, and Brownsville, the maximum daily air temperatures average about 77°F (25°C) in the upper Rio Grande basin and about 83°F (28°C) in the middle and lower basin. Thus, the fluoride content of drinking water should not exceed 1.0 mg/l in the upper basin and 0.8 mg/l in the middle and lower basin. The fluoride content of water in the Rio Grande and most of the principal tributaries usually is less than 0.8 mg/l. However, water from several streams or springs including Alamito, Terlingua, and Limpia Creeks, and Phantom Lake and San Solomon Springs often contain more than 1.0 mg/l fluoride.

Most surface waters in the Rio Grande basin are hard or very hard and should be softened if used for domestic purposes.

The concentrations of dissolved solids and sulfate in the Rio Grande upstream from the Rio Conchos usually exceed the limits recommended by the U.S. Public Health Service; the chloride concentration often exceeds the recommended limit. However, the inflow of less mineralized water from the Rio Conchos and other tributaries and springs in the middle reach of the basin reduces the concentrations of dissolved constituents in the main stem. Thus, the concentrations of dissolved solids, chloride, and sulfate in the lower reach of the Rio Grande usually are within the recommended limits.

Water in the Rio Conchos, though of better quality than that in the upstream reach of the Rio Grande, usually contains more than the recommended limits of dissolved solids and sulfate.

Water in the Pecos River and some of its tributaries is more saline than that in the Rio Grande and usually is undesirable for domestic use because of excessive concentrations of dissolved solids, chloride, or sulfate.

The quality of the water in other tributaries to the middle and lower reaches of the Rio Grande generally is superior to that of the Pecos River. The concentrations of dissolved solids, chloride, and sulfate in most of these streams usually are not excessive. However, low flows in Eight Mile, Chacon, Los Olmos, and La Joya Creeks contain more than the recommended limits of dissolved solids, chloride, and sulfate.

Nitrate concentrations in surface waters in the Rio Grande basin usually are considerably less than the 45 mg/l limit recommended by the U.S. Public Health Service. Surface water throughout the basin seldom contains more than 5 mg/l nitrate and often contains less than 1 mg/l.

Although iron determinations usually have not been included in chemical analyses of surface water from the Rio Grande basin, analyses of ground water in the basin (Davis and others, 1965) and analyses of surface waters at selected sites on the Rio Grande and Pecos River indicate that the concentration of iron in surface waters of the basin usually is less than the 0.3 mg/l limit recommended by the U.S. Public Health Service.

Industrial Use

The quality requirements for industrial water vary widely (See Table 3). For some purposes such as cooling,

Table 3.—Water-Quality Tolerances for Industrial Applications[1]

[Allowable Limits in Milligrams Per Liter Except as Indicated]

INDUSTRY	TURBIDITY	COLOR	COLOR $+O_2$ CONSUMED	DISSOLVED OXYGEN (ml/l)	ODOR	HARDNESS	ALKALINITY (AS $CaCO_3$)	pH	TOTAL SOLIDS	Ca	Fe	Mn	Fe+Mn	Al_2O_3	SiO_2	Cu	F	CO_3	HCO_3	OH	$CaSO_4$	Na_2SO_4 TO Na_2SO_3 RATIO	GENERAL[2]
Air Conditioning[3]	--	--	--	--	--	--	--	--	--	--	0.5	0.5	0.5	--	--	--	--	--	--	--	--	--	A,B
Baking	10	10	--	--	--	(4)	--	--	--	--	.2	.2	.2	--	--	--	--	--	--	--	--	--	C
Boiler feed:																							
0-150 psi	20	80	100	2	--	75	--	8.0+	3,000-1,000	--	--	--	--	5	40	--	--	200	50	50	--	1 to 1	--
150-250 psi	10	40	50	.2	--	40	--	8.5+	2,500-500	--	--	--	--	.5	20	--	--	100	30	40	--	2 to 1	--
250 psi and up	5	5	10	0	--	8	--	9.0+	1,500-100	--	--	--	--	.05	5	--	--	40	5	30	--	3 to 1	--
Brewing:[5]																							
Light	10	--	--	--	Low	--	75	6.5-7.0	500	100-200	.1	.1	.1	--	--	--	1	--	--	--	100-200	--	C,D
Dark	10	--	--	--	Low	--	150	7.0+	1,000	200-500	.1	.1	.1	--	--	--	1	--	--	--	200-500	--	C,D
Canning:																							
Legumes	10	--	--	--	Low	25-75	--	--	--	--	.2	.2	.2	--	--	--	--	--	--	--	--	--	C
General	10	--	--	--	Low	--	--	--	--	--	.2	.2	.2	--	--	--	1	--	--	--	--	--	C
Carbonated beverages[6]	2	10	10	--	0	250	50	--	850	--	.2	.2	.3	--	--	--	.2	--	--	--	--	--	C
Confectionary	--	--	--	--	Low	--	--	(7)	100	--	.2	.2	.2	--	--	--	--	--	--	--	--	--	--
Cooling[8]	50	--	--	--	--	50	--	--	--	--	.5	.5	.5	--	--	--	--	--	--	--	--	--	A,B
Food, general	10	--	--	--	Low	--	--	--	--	--	.2	.2	.2	--	--	--	--	--	--	--	--	--	C
Ice (raw water)[9]	1-5	5	--	--	--	--	30-50	--	300	--	.2	.2	.2	--	10	--	--	--	--	--	--	--	C
Laundering	--	--	--	--	--	50	--	--	--	--	.2	.2	.2	--	--	--	--	--	--	--	--	--	--
Plastics, clear, undercolored	2	2	--	--	--	--	--	--	200	--	.02	.02	.02	--	--	--	--	--	--	--	--	--	--
Paper and pulp:[10]																							
Groundwood	50	20	--	--	--	180	--	--	--	--	1.0	.5	1.0	--	--	--	--	--	--	--	--	--	A
Kraft pulp	25	15	--	--	--	100	--	--	300	--	.2	.1	.2	--	--	--	--	--	--	--	--	--	--
Soda and sulfite	15	10	--	--	--	100	--	--	200	--	.1	.05	.1	--	--	--	--	--	--	--	--	--	--
Light paper, HL-Grade	5	5	--	--	--	50	--	--	200	--	.1	.05	.1	--	--	--	--	--	--	--	--	--	B
Rayon (viscose) pulp:																							
Production	5	5	--	--	--	8	50	--	100	--	.05	.03	.05	<8.0	<25	<5	--	--	--	--	--	--	--
Manufacture	.3	--	--	--	--	55	--	7.8-8.3	--	--	.0	.0	.0	--	--	--	--	--	--	--	--	--	--
Tanning[11]	20	10-100	--	--	--	50-135	135	8.0	--	--	.2	.2	.2	--	--	--	--	--	--	--	--	--	--
Textiles:																							
General	5	20	--	--	--	20	--	--	--	--	.25	.25	--	--	--	--	--	--	--	--	--	--	--
Dyeing[12]	5	5-20	--	--	--	20	--	--	--	--	.25	.25	.25	--	--	--	--	--	--	--	--	--	--
Wool scouring[13]	--	70	--	--	--	20	--	--	--	--	1.0	1.0	1.0	--	--	--	--	--	--	--	--	--	--
Cotton bandage[13]	5	5	--	--	Low	20	--	--	--	--	.2	.2	.2	--	--	--	--	--	--	--	--	--	--

1/ American Water Works Association, 1950.
2/ A—No corrosiveness; B—No slime formation; C—Conformance to Federal drinking water standards necessary; D-NaCl, 275 mg/l.
3/ Waters with algae and hydrogen sulfide odors are most unsuitable for air conditioning.
4/ Some hardness desirable.
5/ Water for distilling must meet the same general requirements as for brewing (gin and spirits mashing water of light-beer quality; whiskey mashing water of dark-beer quality).
6/ Clear, odorless, sterile water for syrup and carbonization. Water consistent in character. Most high quality filtered municipal water not satisfactory for beverages.
7/ Hard candy requires pH of 7.0 or greater, as low value favors inversion of sucrose, causing sticky product.
8/ Control of corrosiveness is necessary as is also control of organisms, such as sulfur and iron bacteria, which tend to form slimes.
9/ Ca $(HCO_3)_2$ particularly troublesome. Mg$(HCO_3)_2$ tends to greenish color. CO_2 assists to prevent cracking. Sulfates and chlorides of Ca, Mg, Na should each be less than 300 mg/l (white butts).
10/ Uniformity of composition and temperature desirable. Iron objectionable as cellulose adsorbs iron from dilute solutions. Manganese very objectionable, clogs pipelines and is oxidized to permanganates by chlorine, causing reddish color.
11/ Excessive iron, manganese, or turbidity creates spots and discoloration in tanning of hides and leather goods.
12/ Constant composition; residual alumina 0.5 mg/l.
13/ Calcium, magnesium, iron, manganese, suspended matter, and soluable organic matter may be objectionable.

water of almost any quality can be used; for other purposes, such as use in high-pressure boilers, the water must exceed the quality of commercial distilled water.

Excessive hardness of water for industrial supplies is usually objectionable because it causes the formation of scale in boilers, pipes, water heaters, and cooling jackets. When excessive scale forms, heat transfer capacity is lost, flow is restricted, and eventually equipment failure occurs. However, some hardness usually is desirable because it forms a protective coating in pipes and equipment and reduces corrosion.

High dissolved-solids concentrations increase the corrosive properties of water, particularly if chloride is the predominant ion. When both magnesium and chloride concentrations are high, the corrosiveness is increased.

Most surface waters in the Rio Grande basin are hard or very hard and will require softening for some industrial applications.

During some periods, water in the Rio Grande upstream from Fort Quitman is slightly saline. Water in the Pecos River and some of its tributaries are slightly to very saline. Thus, water in these streams is of poor quality for some industrial uses. Water in most of the other streams is suitable for many industrial uses or can be made suitable with a minimum of treatment.

Irrigation

The suitability of water for irrigation depends primarily on its chemical composition. However, the extent to which chemical quality limits the suitability of a water for irrigation depends on many factors, such as: the nature, composition, and drainage of the soil and subsoil; the amount of water used and the method of application; the control of evaporation; the kind of crops grown; and the climate of the region, including the amounts and distribution of rainfall. Because these factors are highly variable, every method of classifying waters for irrigation is somewhat arbitrary.

According to the U.S. Salinity Laboratory Staff (1954, p. 69), the most important characteristics in determining the quality of irrigation water are: (1) total concentration of soluble salts, (2) relative proportions of sodium to other cations, (3) concentration of boron or other elements that may be toxic, and (4) excess of milliequivalents of bicarbonate over milliequivalents of calcium plus magnesium.

High concentrations of dissolved salts in irrigation water may cause a buildup of salts in the soil solution and may make the soil saline. The increased soil salinity may reduce crop yields drastically by decreasing the ability of the plants to take up water and essential plant nutrients from the soil solution. This tendency of irrigation water to cause a concentration of salts in the soil is called the salinity hazard of the water. The specific conductance of the water is used as an index of the salinity hazard.

High concentrations of sodium relative to the concentrations of calcium and magnesium in irrigation water can adversely affect soil structure. Cations in the soil solution become fixed on the surface of the soil particles; calcium and magnesium tend to flocculate the particles, whereas sodium tends to deflocculate them. This adverse effect on soil structure caused by high sodium concentrations in an irrigation water is called the sodium hazard of the water. An index used for predicting the sodium hazard is the sodium-adsorption ratio (SAR), which is defined by the equation:

$$SAR = \frac{Na^{+}}{\sqrt{\frac{Ca^{++} + Mg^{++}}{2}}} ,$$

where the concentration of the ions are expressed in milliequivalents per liter.

The U.S. Salinity Laboratory Staff (1954) prepared a classification for irrigation waters in terms of salinity and sodium hazards. Empirical equations were used in developing a diagram, reproduced in modified form as Figure 9, which uses SAR and specific conductance in classifying irrigation waters. This classification, although embodying both research and field observations, should be used only for general guidance because many additional factors (such as availability of water for leaching, ratio of applied water to precipitation, and crops grown) affect the suitability of water for irrigation. With respect to salinity and sodium hazards, waters are divided into four classes—low, medium, high, and very high. The classification range encompasses those waters that can be used for irrigation of most crops on most soils as well as those waters that are usually unsuitable for irrigation. Selection of class demarcation is discussed in detail in the publication by the U.S. Salinity Laboratory Staff. Interpretation of the diagram is as follows:

"*Low-Salinity Water* (C1) can be used for irrigation with most crops on most soils with little likelihood that soil salinity will develop. Some leaching is required, but this occurs under normal irrigation practices except in soils of extremely low permeability."

"*Medium-Salinity Water* (C2) can be used if a moderate amount of leaching occurs. Plants with moderate salt tolerance can be grown in most cases without special practices for salinity control."

"*High-Salinity Water* (C3) cannot be used on soils with restricted drainage. Even with adequate drainage, special management for salinity control may be required and plants with good salt tolerance should be selected."

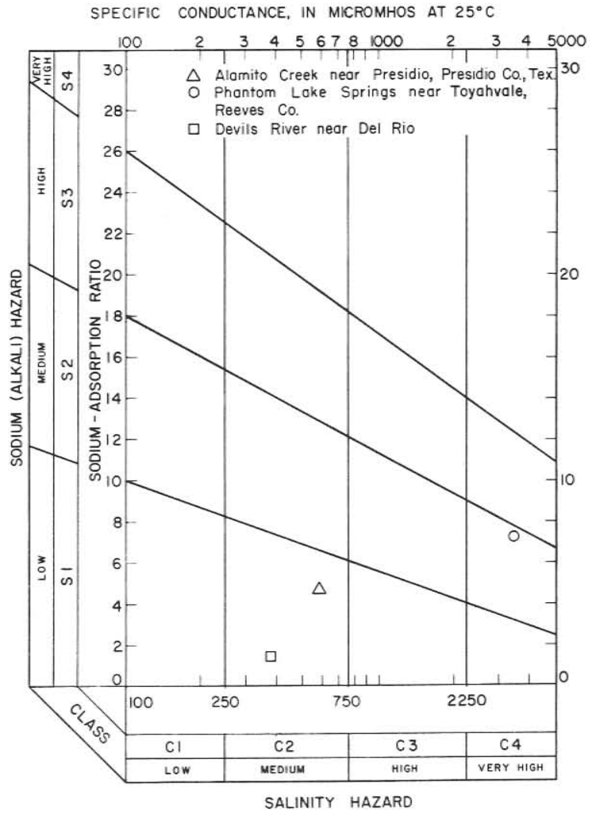

Figure 9.—Classification of Irrigation Waters

"*Very High Salinity Water* (C4) is not suitable for irrigation under ordinary conditions, but may be used occasionally under very special circumstances. The soils must be permeable, drainage must be adequate, irrigation water must be applied in excess to provide considerable leaching, and very salt-tolerant crops should be selected."

"*Low-Sodium Water* (S1) can be used for irrigation on almost all soils with little danger of the development of harmful levels of exchangeable sodium. However, sodium-sensitive crops such as stone-fruit trees may accumulate injurious concentrations of sodium."

"*Medium-Sodium Water* (S2) will present an appreciable sodium hazard in fine-textured soils having high cation-exchange capacity, especially under low-leaching conditions, unless gypsum is present in the soil. This water may be used on coarse-textured or organic soils with good permeability."

"*High-Sodium Waters* (S3) may produce harmful levels of exchangeable sodium in most soils and will require special soil management—good drainage, high leaching, and organic-matter additions. Gypsiferous soils may not develop harmful levels of exchangeable sodium from such waters. Chemical amendments may be required for replacement of exchangeable sodium, except that amendments may not be feasible with waters of very high salinity."

"*Very High Sodium Water* (S4) is generally unsatisfactory for irrigation purposes except at low and perhaps medium salinity, where the solution of calcium from the soil or use of gypsum or other amendments may make the use of these waters feasible."

To relate the quality of basin waters to the U.S. Salinity Laboratory Staff's classification for irrigation waters, the sodium and salinity hazards were calculated for key stations with concurrent records from 1960 to 1968.

Data in Table 4 show that the salinity hazard of water throughout the Rio Grande usually is high; whereas the salinity hazard of the Pecos River below Red Bluff Dam near Orla is very high.

The sodium hazard usually ranges from low to medium at the Rio Grande stations but is very high at the Pecos River below Red Bluff Dam near Orla. Thus, the long term use of water from the Rio Grande and Pecos River for irrigation will require special soil management, good drainage, high leaching, and selection of salt-tolerant crops.

Irrigation water from the Devils River near Del Rio and Alamito Creek near Presidio would be classified as having a medium salinity hazard and a low sodium hazard. Water from Phantom Lake Springs near Toyahvale would be classified as having a very high salinity hazard and a medium sodium hazard (Figure 9).

The boron concentrations in samples from the Rio Grande are less than 1 mg/l and usually are less then 0.67 mg/l (Table 5). Thus, the use of the water from the Rio Grande for irrigation presents little likelihood of boron damage. Less tolerant crops might suffer some damage from boron in the El Paso area, but the likelihood of damage in the middle and lower valley is remote because of dilution from rainfall. All samples from the Pecos River at Shumla contained less than 0.33 mg/l boron. Thus, this water can be used on most crops with little likelihood of boron damage.

SUMMARY

Surface water in the Rio Grande basin ranges from fresh to very saline. Principal factors that determine the chemical quality include geology and irrigation return flows.

The upper reaches of both the Rio Grande and the Pecos River in Texas traverse deposits of Quaternary age. During fall and winter when the flow consists principally of seepage from the Quaternary deposits and delayed return flow from irrigation, water in the Rio Grande at El Paso usually contains from 1,000 to 2,000 mg/l

Table 4.—Sodium and Salinity Hazards of Monthly Samples at Selected Sites in the Rio Grande Basin, 1960-68

STATION	PERCENTAGE OF SAMPLES: SODIUM HAZARD LOW	MEDIUM	HIGH	VERY HIGH	SALINITY HAZARD LOW	MEDIUM	HIGH	VERY HIGH
Rio Grande at El Paso, Texas	54	35	5	6	0	2	62	36
Pecos River below Red Bluff Dam near Orla, Texas	0	0	4	96	0	0	0	100
Rio Grande at Laredo, Texas	100	0	0	0	0	16	84	0
Rio Grande at Anzalduas Dam, Texas	85	15	0	0	0	4	96	0

Table 5.—Boron Concentrations in Monthly Samples at Selected Stations in the Rio Grande Basin, 1960-68

CONCENTRATION OF BORON IN MG/L	PERCENTAGE OF SAMPLES: RIO GRANDE AT EL PASO	RIO GRANDE AT ANZALDUAS DAM	PECOS RIVER AT SHUMLA
More than 0.33	68	43	99
More than 0.33; less than 0.67	26	53	1
More than 0.67; less than 1.00	6	4	0

dissolved solids. During the spring and summer when water is released from reservoirs in New Mexico, the dissolved-solids concentrations usually range from 600 to 700 mg/l. The water is very hard. The principal cation in the water is sodium; the principal anion usually is sulfate, but in some of the more highly mineralized water, the percentage of chloride increases. The discharge-weighted average concentrations of dissolved solids, chloride, and sulfate in the Rio Grande at El Paso during the 1930-68 period of record were about 800 mg/l, 130 mg/l, and 263 mg/l, respectively.

Most of the water that passes the El Paso station is diverted for irrigation and municipal use. Return flows from irrigation cause an increase in the salinity downstream from the diversion sites. When a substantial part of the annual flow of the Rio Grande at Fort Quitman is irrigation return flow, the annual discharge-weighted average concentrations of dissolved solids usually range from 1,000 to 3,000 mg/l. During 1956, 1957, and 1965 when most of the water consisted of local runoff downstream from the irrigated areas, the discharge-weighted average concentrations of dissolved solids for the Rio Grande at Fort Quitman were 375 mg/l, 294 mg/l, and 375 mg/l, respectively. Water passing the Fort Quitman station usually is very hard, but the principal chemical constituents vary. Waters of low mineralization usually are of the calcium bicarbonate type; highly mineralized waters usually are of the sodium chloride type.

Water in the upper reach of the Pecos River in Texas, which traverses deposits of Quaternary age, usually is moderately or very saline, very hard, and of the sodium chloride type. During the period from 1961 to 1968, the discharge-weighted average concentrations of dissolved solids, chloride, and sulfate for the Pecos River below Red Bluff Dam near Orla were 7,770 mg/l, 3,080 mg/l, and 1,880 mg/l, respectively. Evaporation, irrigation returns, and the inflow of highly mineralized ground water cause an increase in the concentrations of dissolved solids in the reach of the Pecos River between the stations near Orla and at Girvin. However, inflow downstream from this reach usually results in a reduction of dissolved solids and chloride. During the 1961-68 period, the discharge-weighted average concentrations of dissolved solids, chloride, and sulfate for the Pecos River at Shumla were 1,600 mg/l, 572 mg/l, and 324 mg/l, respectively.

Extensive deposits of Tertiary age crop out in the upper, middle, and lower reaches of the Mexican side of the Rio Grande basin and in the lower reach of the Texas side. Water in the Rio Conchos, the principal tributary that traverses rocks of Tertiary age on the Mexican side of the basin, usually is fresh, very hard, and of the sodium calcium sulfate type. The discharge-weighted average concentrations of dissolved solids, chloride, and sulfate for the Rio Conchos near Ojinaga during the period from 1950 to 1968 were 728 mg/l, 61 mg/l, and 291 mg/l. The Rio Conchos contributes more than one-half million acre-feet of water a year to the Rio Grande. Thus, the quality of water in the Rio Grande downstream from the Rio Conchos is very similar to that of the Rio Conchos. During the period from 1950 to 1968, the discharge-weighted average concentrations for the Rio Grande at Johnson Ranch near Castolon, 100 miles downstream from the Rio Conchos, were: dissolved solids, 728 mg/l; chloride, 62 mg/l; and sulfate, 290 mg/l.

Much of the middle reach of the Rio Grande basin is underlain by rocks of Cretaceous age. Streams that traverse these outcrops include Devils River, San Felipe Creek, Rio San Diego, and Rio San Rodrigo. Water in the streams usually is fresh, hard, and of the calcium bicarbonate type.

Water from these streams and inflow from springs reduce the concentrations of dissolved solids and variations of chemical quality of water in the middle reach of the Rio Grande. During the 1956-68 period, the discharge-weighted concentrations of dissolved solids, chloride, and sulfate for the Rio Grande at Laredo were 485 mg/l, 81 mg/l, and 148 mg/l, respectively.

Flow of the lower Rio Grande is impounded in International Falcon Reservoir. Releases from International Falcon Reservoir provide most of the water for irrigation and municipal and industrial supplies in the Lower Rio Grande Valley. During the period from 1956 to 1968, the discharge-weighted average concentrations of dissolved solids, chloride, and sulfate for the Rio Grande below Falcon Dam were 493 mg/l, 84 mg/l, and 150 mg/l, respectively. Return flows from irrigation and other saline inflows have increased the concentrations of dissolved constituents in the lower Rio Grande, and during the 1959-68 period, the discharge-weighted average concentration of dissolved solids at Anzalduas Dam was 684 mg/l.

The concentrations of dissolved solids and sulfate in the Rio Grande upstream from the Rio Conchos usually exceed the U.S. Public Health Service recommended limits for drinking water. However, the inflow of less mineralized water from the Rio Conchos and other tributaries and springs in the middle reach of the basin reduces the concentrations of dissolved constituents. Thus, the concentrations of dissolved solids, chloride, and sulfate are within the recommended limits from the confluence with the Rio Conchos to the vicinity of Rio Grande City, where saline drains reach the Rio Grande.

Water in the Pecos River and some of its tributaries usually is undesirable for domestic use because of excessive concentrations of dissolved solids, chloride, and sulfate. The quality of the water in other tributaries to the middle and lower reaches of the Rio Grande generally is superior to that of the Pecos River. The concentrations of dissolved solids, chloride, and sulfate in these tributaries usually are not excessive for domestic use.

Nitrate concentrations in surface waters in the Rio Grande basin usually are considerably less than the 45 mg/l limit recommended by the U.S. Public Health Service. The fluoride content of the Rio Grande and most of the principal tributaries usually is less than 0.8 mg/l.

Most surface waters in the basin are hard or very hard and will require softening for some industrial applications. During some periods, water in the Rio Grande upstream from Fort Quitman is slightly saline. Water in the Pecos River and some of its tributaries are slightly to very saline. Thus, water in these streams is of poor quality for some industrial uses. Water in most of the other streams is suitable for many industrial uses.

The principal use of surface water in the Rio Grande basin is irrigation. The salinity hazard of water throughout the Rio Grande usually is high; that of the Pecos River below Red Bluff Dam is very high. The sodium hazard of water in the Rio Grande usually ranges from low to medium; that of the Pecos River usually is very high. Thus, the long-term use of water from the Rio Grande and Pecos River for irrigation will require special soil management, good drainage, high leaching, and selection of salt-tolerant crops.

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Quality-of-Water Records for the Rio Grande Basin Are Published in the Following Texas Water Development Board Reports (Including Reports Formerly Published by the Texas Water Commission and Texas Board of Water Engineers) and U.S. Geological Survey Water-Supply Papers:

WATER YEAR	U.S.G.S. WATER-SUPPLY PAPER NO.	T.W.D.B. REPORT NO.	WATER YEAR	U.S.G.S. WATER-SUPPLY PAPER NO.	T.W.D.B. REPORT NO.
1942	950	*1938-45	1953	1292	*1953
1943	970	*1938-45	1954	1352	*1954
1944	1022	*1938-45	1955	1402	*1955
1945	1030	*1938-45	1956	1452	Bull. 5905
1946	1050	*1946	1957	1522	Bull. 5915
1947	1102	*1947	1958	1573	Bull. 6104
1948	1133	*1948	1959	1644	Bull. 6205
1949	1163	*1949	1960	1744	Bull. 6215
1950	1188	*1950	1961	1884	Bull. 6304
1951	1199	*1951	1962	1944	Bull. 6501
1952	1252	*1952	1963	1950	Report 7

* "Chemical Composition of Texas Surface Waters" was designated only by water year from 1938 through 1955.

Table 6.--Summary index of surface-water records in the Rio Grande basin in Texas and adjacent areas of New Mexico and Mexico

Reference number	Stream and location	Drainage area	TYPE AND PERIOD OF RECORD						
			Daily or monthly chemical quality	Daily or monthly discharge	Periodic chemical quality	Periodic discharge measurements	Reservoir content	Water temperature	Gage heights only
8-3625	Rio Grande below Caballo Dam, New Mexico		1939, 1940-50	1938-68					
8-3635	Rio Grande at Leasburg Dam, New Mexico		1939, 1940-50	--		1920			
8-3639	Rio Grande near Canutillo, Texas		--	--	1967				
8-3640	Rio Grande at El Paso, Texas	29,267	1924-68	1889-1968	1962				
8-3645	Diversions from the Rio Grande-American Canal at El Paso, Texas			1938-68					
8-3650	Rio Grande below American Dam at El Paso, Texas	29,271		1938-68					
8-3655	Diversions from the Rio Grande Acequia Madre at Juarez, Chihuahua, Mexico	--		1938-68					
8-3655.5	Franklin Canal at El Paso, Texas			1943-68					
8-3656	McKelligon Canyon at El Paso, Texas	2.3		1958-68					
8-3657	Inlet to Fort Bliss sump area at El Paso, Texas	3.5		1958-61					
8-3658	Government ditch at El Paso, Texas	6.4		1958-68					
8-3660	Rio Grande at Ciudad Juarez, Chihuahua, Mexico	29,350		1938-56					
8-3664	Riverside Canal near Socorro, Texas			1928-68					
8-3665	Rio Grande-Island station near El Paso, Texas	29,951		1938-68					
8-3670	Rio Grande at Tornillo Bridge, near Fabens, Texas	--	1929-1933	1924-37	1933				
8-3680	Tornillo Drain at mouth, at Tornillo, Texas			1923-68					
8-3683	Tornillo Canal near Tornillo, Texas			1925-47					
8-3689	Hudspeth Feeder Canal near Tornillo, Texas			1947-68					
8-3695	Rio Grande-County Line station near El Paso, Texas	30,610		1938-68					
8-3700	Rio Grande at Fort Hancock, Texas	--		1900-03					
8-3705	Rio Grande at Fort Quitman, Texas	32,035	1928-68	1889-1968					
8-3708	Wildhorse Creek near Van Horn, Texas	--		--	1966	1966-1968			
8-3710	Rio Grande at La Nutria, Texas	33,672	1936, 1937-41	1935-41					
8-3715	Rio Grande above Rio Conchos near Presidio, Texas (Rio Grande at Upper Presidio)	34,988	1935, 1936-68	1889-1968 1900-14, 1919-20, 1923-1968					
8-3725	Rio Conchos at Cuchillo Parado, Chihuahua, Mexico	28,147	1946, 1947-54	1945-55					
8-3730	Rio Conchos near Ojinaga, Chihuahua, Mexico	29,267	1935, 1936-68	1896-1968					
8-3735	Rio Grande above Presidio, Texas (Lower Presidio station)	64,285		1900-15 1923-54					
8-3740	Alamito Creek near Presidio, Texas	1,504	1935, 1936	1932-68	1967, 1968				
8-3742	Rio Grande below Rio Conchos near Presidio, Texas (Presidio, Texas lower Presidio station)	66,203		1896-1968					
8-3745	Terlingua Creek near Terlingua, Texas	1,070	1935, 1947 1948-49	1932-68	1967, 1968				
8-3750	Rio Grande at Johnson Ranch near Castolon, Texas (Rio Grande at Johnson Ranch)	70,715	1948-68	1936-68	1962				
8-3755	Rio Grande at Boquillas station, Texas	75,954		1928-36					
8-3765	Rio Grande at Agua Verde station, Texas	82,232		1947-48 1950 1952-56					
8-3770	Lozier Creek near Langtry, Texas	1,728		1932-35					
8-3772	Rio Grande at Foster Ranch near Langtry, Texas (Above main stem head of Amistad Reservoir)	--		1961-68					
8-3775	Rio Grande at Langtry, Texas	84,795	1944, 1945-68	1900-14 1919-20 1924-68	1952				
8-4075	Pecos River near Red Bluff, New Mexico	19,540	1937-68	1937-68					
8-4085	Delaware River near Red Bluff, New Mexico	689		1912-15 1937-68	1947, 1966				

Table 6.--Summary index of surface-water records in the Rio Grande basin in Texas and adjacent areas of New Mexico and Mexico--Continued

Reference number	Streams and location	Drainage area	TYPE AND PERIOD OF RECORD: Daily or monthly chemical quality	Daily or monthly discharge	Periodic chemical quality	Periodic discharge measurements	Reservoir content	Water temperature	Gage heights only
8-4095	Pecos River near Angeles, Texas	20,540		1914-37					
8-4100	Red Bluff Reservoir near Orla, Texas	20,720					1937-68		
8-4101	Pecos River below Red Bluff Dam, near Orla, Texas	20,720	1953-68	--	1947-48			1953-68	1953-68
8-4115	Salt (Screwbean) Draw near Orla, Texas	464		1939-40 1943-57	1938, 1939, 1940, 1941, 1943, 1944, 1947, 1948				1957-60
8-4125	Pecos River near Orla, Texas	21,300		1937-68					
8-4140	Pecos River near Porterville (Mentone), Texas	21,600	1937-41, 1947-52	1922-26	1968				
8-4145	Reeves County Water Improvement District No. 2 Canal near Mentone, Texas (Published as "Farmers Independent Canal near Porterville" 1922-25)	--		1922-25 1939-57 1964-68					
8-4150	Ward County Water Improvement District No. 3 Canal near Barstow, Texas	--		1939-57 1964-68					
8-4165	Pecos River (above canal) above Barstow, Texas	21,800		1916-21					
8-4180	Ward County Irrigation District No. 1 Canal near Barstow, Texas (Published as "Barstow Canal near Barstow" 1922-25)	--		1922-25 1939-57 1964-68					
8-4205	Pecos River at Pecos, Texas	22,100	1939-41	1899-1907 1914-15 1922-26 1939-54	1939, 1940, 1941 1946, 1947				1898
8-4245	Madera Canyon near Toyahvale, Texas	53.8		1932-49					
8-4255	Phantom Lake Spring near Toyahvale, Texas	--		1931-33 1942-66	1950, 1967	1966-68		1948-68	
8-4270	Griffin Springs at Toyahvale, Texas	--		1931-33 1941-65		1919, 1921-25 1966-68			
8-4275	San Solomon Springs at Toyahvale, Texas	--		1931-33 1941-65	1950	1965-68		1950-68	
8-4305	Lake Balmorhea at Balmorhea, Texas				1950				
8-4310	Toyah Creek near Pecos, Texas	1,024	1939-40 1943-44	1939-40 1943-45	1939-40, 1943-44 1947	1932			
8-4315	Salt Draw near Pecos, Texas	1,882	1939-40 1943-44	1939-40 1943-45	1947				
8-4317	Limpia Creek above Fort Davis, Texas	52.4		1965-68	1966, 1967, 1968				
8-4318	Limpia Creek below Fort Davis, Texas	227		1961-68	1965, 1967			1963-65	
8-4320	Limpia Creek near Fort Davis, Texas	303		1925-32					
8-4330	Barilla Creek near Saragosa, Texas	612		1924-26 1932					
8-4340	Toyah below Toyah Lake near Pecos, Texas	3,709	1940-41	1939-51	1948, 1949				
8-4350	Grandfalls-Big Valley Canal near Barstow, Texas	--	1944	1922-25 1939-57 1964-68					
8-4355	Pecos River below Barstow, Texas	25,980		1939-41					
8-4358	Coyanosa Draw near Fort Stockton, Texas	1,182		1964-68	1965, 1967				
8-4365	Pecos County Water Improvement District No. 2 (Upper diversion) Canal near Grandfalls, Texas (Published as "Imperial High-line Canal near Grandfalls" 1922-25)	--		1922-25 1939-57 1964-68					

Table 6.--Summary index of surface-water records in the Rio Grande basin in Texas and adjacent areas of New Mexico and Mexico--Continued

Reference number	Stream and location	Drainage area	TYPE AND PERIOD OF RECORD: Daily or monthly chemical quality	Daily or monthly discharge	Periodic chemical quality	Periodic discharge measurements	Reservoir content	Water temperature	Gage heights only
8-4375	Pecos County Water Improvement District No. 2 Canal near Imperial, Texas	--		1940-57 1964-68					
8-4376	Pecos County Water Improvement District No. 3 Canal near Imperial, Texas	--		1940-57 1964-68					
8-4377	Ward County Water Improvement District No. 2 Canal near Grandfalls, Texas	--		1939-57 1964-68					
8-4381	Pecos River near Grandfalls, Texas	27,810		1916-26					
8-4415	Pecos River below Grandfalls, Texas	27,820	1939, 1940-42 1946-56	1922-26 1939-56					
8-4445	Comanche Springs at Fort Stockton, Texas	--		1935-64		1899-1935 1964-1968			
8-4465	Pecos River near Girvin, Texas	29,560	1939-41 1945-47 1953-68	1939-68				1953-59 1964-68	
8-4470	Pecos River near Sheffield, Texas	31,660	1939-41 1946-47	1921-25 1939-49					
8-4473	Pecos River near Pandale, Texas				1966				
8-4474	Pecos River near Shumla, Texas	35,162	1954-68	1954-67					
8-4474.1	Pecos River near Langtry		1967-68						
8-4475	Pecos River near Comstock, Texas	35,293	1935, 1936-54	1898 1900-54	1952				
8-4477	Pecos River at mouth near Comstock, Texas	--		1961-68					
8-4485	Goodenough Springs near Comstock, Texas	--	1946-49	1924-68	1967, 1968				
8-4490	Devils River near Juno, Texas	2,733		1925-49 1964-68	1964, 1967, 1968	1952-64		1949-68	
8-4491	Dolan Springs near Loma Alta, Texas			1966-68					
8-4493	Upper Devils River station near Comstock, Texas	3,903		1954-58					
8-4494	Devils River at Pafford Crossing near Comstock, Texas (Above head of Devils Branch, Amistad Reservoir)	--		1960-68	1967, 1968				
8-4494.8	Lake Walk near Del Rio, Texas	--		1952, 1958, 1962-63					
8-4495	Devils River near Del Rio, Texas	4,185		1900-14 1923-1957	1930-31, 1935-36, 1944				
8-4505	Devils River at mouth near Del Rio, Texas	4,305	1944-45	1954-68					
8-4509	Rio Grande below Amistad Dam, near Del Rio, Texas	126,423		1954-68					
8-4511.3	Eight Mile Creek near Del Rio, Texas			1961-68	1967, 1968				
8-4513	Cantu Spring on Cienegas Creek near Del Rio, Texas			1961-68	1967				
8-4515	Cienegas Creek near Del Rio, Texas	18		1931-35 1965-68		1962-65			
8-4520	Arroyo Las Vacas at Ciudad Acuna, Coahuila, Mexico	358		1938-68		1935-38			
8-4525	Rio Grande near Del Rio, Texas	126,940		1900-15 1919-20 1924-54 1960-68					
8-4528	San Felipe Springs at Del Rio, Texas	--		1961-68 1961-68	1967				
8-4528.3	San Felipe Creek at Moore Park, Del Rio, Texas	--		1967					
8-4530	San Felipe Creek near Del Rio, Texas	46	1948, 1949	1931-68	1967, 1968				
8-4535	Sycamore Creek near Del Rio, Texas	524		1932-35					

Table 6.--Summary index of surface-water records in the Rio Grande basin in Texas and adjacent areas of New Mexico and Mexico--Continued

Reference number	Stream and location	Drainage area	TYPE AND PERIOD OF RECORD: Daily or monthly chemical quality	Daily or monthly discharge	Periodic chemical quality	Periodic discharge measurements	Reservoir content	Water temperature	Gage heights only
8-4539	Diversions from the Rio Grande Maverick Canal at mile 13 near Quemado, Texas			1949-68					
8-4550	Pinto Creek near Del Rio, Texas	249		1928-68	1967, 1968				
8-4555	Rio San Diego at Jimenez, Coahuila, Mexico	848	1952-58	1922-68	1935, 1936				
8-4557	Rio Grande below Maverick Dam near Quemado, Texas			1965-68					
8-4565	Las Moras Creek near Eagle Pass, Texas	166		1932-35					
8-4570	Rio San Rodrigo near El Moral, Coahuila, Mexico	669	1935-36, 1950-58	1922-66					
8-4571	Rio San Rodrigo near mouth at El Moral, Coahuila, Mexico		1935, 1936	1962-68					
8-4575	Return flow to the Rio Grande at Maverick Power Plant near Eagle Pass, Texas	--		1949-68					
8-4576	Diversions from the Rio Grande Maverick Canal extension below the Power Plant near Eagle Pass, Texas			1939-68					
8-4580	Rio Grande at Eagle Pass, Texas	130,575	1938, 1939-54, 1955	1900-20 1922-68	1962 1963				
8-4581.5	Rio Escondido at Villa De Fuente, Coahuila, Mexico	1,279		1922-68					
8-4586	Return flow to the Rio Grande from Maverick Canal Eagle Pass to San Antonio Crossing, Texas	--		1959-68					
8-4587	Rio Grande at San Antonio Crossing near El Indio, Texas	132,347		1952-68					
8-4588	Rio Grande at Palafox near Laredo, Texas	--		1959-68					
8-4590	Rio Grande at Laredo, Texas	135,976	1905, 1955 1956-68	1900-13 1916-20 1922-68	1952				1914
--	Chacon Creek near Laredo, Texas				1952				
8-4595	Dolores Creek near San Ignacio, Texas	606		1932-36					
8-4597	Rio Salado at Las Tortillas, Tamaulipas, Mexico	24,877	1954-68	1953-68					
8-4600	Rio Salado at Ciudad Guerrero, Tamaulipas, Mexico	25,112	1935, 1936-53	1900-13 1923-53					
8-4605	Rio Grande near Zapata, Texas	163,327		1932-53					
8-4610	El Tigre Arroyo near Zapata, Texas	261		1932-36					
8-4612	International Falcon Reservoir, Texas	164,482					1953-68		
8-4613	Río Grande below Falcon Dam, Texas	164,482	1956-68	1958-68	1954				
8-4615	Rio Grande at Chapeno, Texas	164,538		1953-57					
8-4620	Rio Alamo at Ciudad Mier, Tamaulipas, Mexico	1,692		1923-68					
8-4625	Rio Grande at Roma, Texas	166,464	1930, 1931-33, 1943-54, 1955	1900-14 1922-54					
8-4630	Rio San Juan at Santa Rosalia, Tamaulipas, Mexico	12,013	1935, 1936-42, 1943	1900-13 1923-43					
8-4642	Rio San Juan at Camargo, Tamaulipas, Mexico	13,601		1954-68					
8-4647	Rio Grande at Fort Ringgold, Rio Grande City, Texas	180,396	1959, 1960-68	1955-68					
8-4650	Los Olmos Creek near Rio Grande City, Texas	535		1932-36	1949				
8-4655	Rio Grande at Rio Grande City, Texas	180,941	1933, 1934-46, 1947	1932-54					
--	La Joya Creek at reservoir site near Sanfordyce, Texas	--			1949				

Table 6.--Summary index of surface-water records in the Rio Grande basin in Texas and adjacent areas of New Mexico and Mexico--Continued

Reference number	Stream and location	Drainage area	TYPE AND PERIOD OF RECORD: Daily or monthly chemical quality	Daily or monthly discharge	Periodic chemical quality	Periodic discharge measurements	Reservoir content	Water temperature	Gage heights only
8-4660	Contributions from Rio San Juan below Rio Grande City, Texas	--		1953					
8-4677	Rio Grande at Mission Pumping Plant		1945-1950						
8-4678	Morillo Drain in Mexico, 8.4 miles above Anzalduas Dam, Texas	--	1962, 1963-68	1953-68					
8-4686	Diversions from the Rio Grande Anzalduas Canal near Reynosa, Tamaulipas, Mexico			1952-68					
8-4692	Rio Grande below Anzalduas Dam, Texas	182,138	1959, 1960-68	1952-68					
8-4715	Rio Grande at Hidalgo, Texas	182,159		1928-32 1935-36 1938-39 1958		1932-34; 1940-51, 1959			
8-4720	Rio Grande at Buenos Aires, Tamaulipas, Mexico	--	1943-44	1943-44					
8-4730	Rio Grande at Las Palmas, Tamaulipas, Mexico	--	1946, 1947-48	1945-49					
8-4733	Rio Grande near Progreso, Texas	182,173		1952-68					
8-4735	Rio Grande at Mercedes Bridge, Texas	--		1935-41					1910-12, 1914-37
8-4737	Rio Grande near San Benito, Texas	182,187	1938-39 1942-43	1952-68					
8-4745	Rio Grande at Matamoros, Tamaulipas, Mexico	182,211		1901-13 1923-54 1958					
8-4750	Rio Grande at Brownsville, Texas	182,215	1934, 1935-36, 1937, 1943-44	1934-68					

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-3640. RIO GRANDE AT EL PASO, TEX.																						
Water Year 1924																						
Maximum, Jan. 30, 1924	--	--		--	--	--	--	--	--	--	--	--	--	--	1300	1.77	--	--	--	--	--	--
Minimum, Feb. 16	--	--		--	--	--	--	--	--	--	--	--	--	--	300	.41	--	--	--	--	--	--
Water Year 1925																						
Maximum, Jan. 20, 1925	--	--		--	--	--	--	--	--	--	--	--	--	--	1400	1.90	--	--	--	--	--	--
Minimum, Apr. 15	--	--		--	--	--	--	--	--	--	--	--	--	--	500	.68	--	--	--	--	--	--
Water Year 1926																						
Maximum, Jan. 13, 1926	--	--		--	--	--	--	--	--	--	--	--	--	--	1400	1.90	--	--	--	--	--	--
Minimum, Aug. 25	--	--		--	--	--	--	--	--	--	--	--	--	--	700	.95	--	--	--	--	--	--
Water Year 1927																						
Maximum, Sept. 27, 1927	--	--		--	--	--	--	--	--	--	--	--	--	--	2300	3.13	--	--	--	--	--	--
Minimum, Feb. 24	--	--		--	--	--	--	--	--	--	--	--	--	--	600	.82	--	--	--	--	--	--
Water Year 1928																						
Maximum, Feb. 1, 1928	--	--		--	--	--	--	--	--	--	--	--	--	--	1200	1.63	--	--	--	--	--	--
Minimum, May 2	--	--		--	--	--	--	--	--	--	--	--	--	--	600	.82	--	--	--	--	--	--
Sept. 18	--	--		--	--	--	--	--	--	--	--	--	--	--	600	.82	--	--	--	--	--	--
Water Year 1929																						
Maximum, Jan. 16, 1929	--	--		--	--	--	--	--	--	--	--	--	--	--	1700	2.31	--	--	--	--	--	--
Minimum, Aug. 11	--	--		--	--	--	--	--	--	--	--	--	--	--	400	.54	--	--	--	--	--	--
Water Year 1930																						
Maximum, Feb. 3, 1930	--	--		126	45	357	--	336	0	412	406	--	--	--	1610	2.19	--	500	224	6.9	2310	--
Minimum, Aug. 15	--	--		90	40	103	--	216	0	230	140	--	--	--	744	1.01	--	390	212	2.3	1060	--
Sept. 4	--	--		90	15	160	--	264	0	213	140	--	--	--	744	1.01	--	286	70	4.1	1210	--
Water Year 1931																						
Maximum, Nov. 19, 1930	--	--		212	58	559	--	312	0	449	895	--	--	--	2400	3.26	--	768	513	8.8	3700	--
Minimum, Aug. 3, 1931	4210	--		81	15	111	--	192	0	202	98	--	--	--	576	.78	6550	264	106	3.0	920	--
Water Year 1932																						
Maximum, Jan. 27, 1932	114	--		130	29	379	--	366	0	394	397	--	--	--	1600	2.18	492	445	145	7.8	2430	--
Minimum, Aug. 19	1410	--		63	16	188	--	220	0	241	142	--	--	--	736	1.00	2800	222	42	5.5	1120	--
Water Year 1933																						
Maximum, Jan. 1933	192	--		127	27	316	--	278	0	409	328	--	--	--	1410	1.92	731	429	202	6.6	2140	--
Minimum, Aug.	1560	--		82	15	127	--	200	0	219	105	--	--	--	687	.93	2890	264	100	3.4	1030	--
		--																				
Water Year 1934																						
Maximum, Jan. 1934	183	--		129	31	300	--	329	0	398	302	--	--	0.21	1440	1.96	712	452	182	6.2	2060	--
Minimum, Aug.	1300	--		93	20	149	--	204	0	290	125	--	0.6	.23	842	1.14	2960	313	146	3.7	1260	--
Water Year 1935																						
Maximum, Jan. 1935	138	--		131	35	317	--	294	0	434	328	--	.6	.30	1480	2.01	551	472	231	6.3	2240	7.8
Minimum, Aug.	1560	--		80	17	110	--	178	0	232	90	--	2.5	--	663	.90	2790	268	122	2.9	994	7.8

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-3640. RIO GRANDE AT EL PASO, TEX.--Continued																						
Water Year 1936																						
Maximum, Jan. 1936	139	--		130	31	303		301	0	418	307	--	--	0.36	1410	1.92	529	454	207	6.2	2140	8.3
Minimum, Aug.	1300	--		89	19	132		199	0	260	112	--	4.3	.18	676	.92	2370	300	137	3.3	1100	7.9
Water Year 1937																						
Maximum, Jan. 1937	139	--		127	28	303		282	0	428	316	--	1.2	.36	1450	1.97	544	431	200	6.3	2170	8.3
Minimum, Sept.	1150	--		80	17	129		188	0	224	116	--	1.2	.18	721	.98	2240	270	116	3.4	1070	8.2
Water Year 1938																						
Maximum, Jan. 1938	177	--		133	31	294		299	0	410	311	--	.6	.24	1420	1.93	679	458	214	6.0	2140	7.9
Minimum, July	1270	--		81	17	126		187	0	225	108	--	1.2	.19	691	.94	2370	270	118	3.3	1070	8.0
Water Year 1939																						
Maximum, Jan. 1939	168	--		134	31	300		306	0	414	295	--	.6	.18	1400	1.91	635	461	210	6.1	2120	8.3
Minimum, Aug.	1180	--		85	18	141		198	0	251	114	--	--	.19	757	1.03	2410	286	124	3.6	1150	8.2
Water Year 1940																						
Maximum, Jan. 1940	175	--		133	32	276		304	0	422	266	--	.6	.29	1370	1.87	647	463	214	5.6	2060	8.2
Minimum, June	1150	--		86	19	144		187	0	283	122	--	.6	.18	824	1.12	2560	292	139	3.7	1220	8.3
Water Year 1941																						
Maximum, Jan. 1941	138	--		122	29	308		286	0	431	300	--	.6	.35	1430	1.94	533	423	189	6.5	2120	8.1
Minimum, Aug.	1340	--		80	18	135		189	0	249	111	--	1.2	.18	750	1.02	2710	274	112	3.6	1140	7.8
Sept.	1200	--		82	17	137		198	0	238	113	--	1.2	.18	750	1.02	2430	270	116	3.6	1140	7.8
Water Year 1942																						
Maximum, Jan. 1942	212	--		114	27	262		239	0	408	251	--	.6	.35	1260	1.72	721	393	198	5.7	1910	8.1
Minimum, June	5110	--		66	13	79		175	0	175	51	--	1.2	.12	515	.70	7110	219	76	2.3	785	7.7
Water Year 1943																						
Maximum, Jan. 1943	246	--		112	26	235		264	0	375	218	--	.6	.29	1180	1.60	784	386	170	5.2	1770	8.1
Minimum, Apr.	1320	--		78	16	108		198	0	206	93	--	1.9	.15	654	.89	2330	259	97	2.9	1000	8.1
Water Year 1944																						
Maximum, Jan. 1944	194	--		122	27	259		292	0	384	235	--	--	.32	1250	1.70	655	417	178	5.5	1870	8.1
Minimum, Apr.	1250	--		80	17	119		205	0	220	95	--	--	.16	676	.92	2280	269	101	3.2	1040	8.0
Water Year 1945																						
Maximum, Jan. 1945	185	--		122	28	286		303	0	416	263	--	--	.37	1320	1.80	659	418	170	6.2	2020	7.9
Minimum, Mar.	797	--		82	17	121		215	0	222	99	--	--	.15	669	.91	1440	274	98	3.2	1060	7.9
Water Year 1946																						
Maximum, Jan. 1946	196	--		106	27	268		261	0	402	243	--	.6	.24	1240	1.68	656	378	164	6.0	1910	8.0
Minimum, Apr.	1030	--		83	17	124		219	0	223	99	--	--	.15	713	.97	1980	276	97	3.2	1090	7.8
Water Year 1947																						
Maximum, Jan. 1947	160	--		118	26	271		303	0	400	240	--	--	.29	1280	1.74	553	402	154	5.9	1930	8.2
Minimum, Apr.	1090	--		80	18	123		193	0	233	102	--	--	.13	669	.91	1970	271	113	3.2	1100	7.9

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-3640. RIO GRANDE AT EL PASO, TEX.--Continued																						
Water Year 1948																						
Maximum, Jan. 1948.............	126	--		118	27	276	--	309	0	419	246	--	1.9	0.25	1320	1.80	449	408	154	5.9	1980	--
Minimum, July..................	1220	--		55	18	133	--	126	0	250	107	--	2.5	.21	691	.94	2280	212	109	4.0	1050	7.7
Water Year 1949																						
Maximum, Feb. 1949.............	146	--		84	27	275	--	173	0	417	245	--	--	.30	1220	1.66	481	318	176	6.7	1860	8.1
Minimum, Apr...................	961	--		58	17	125	--	148	0	216	106	--	1.2	.17	654	.89	1700	215	94	3.7	1010	7.9
Water Year 1950																						
Maximum, Jan. 1950.............	160	--		76	26	278	--	168	0	412	245	--	1.9	.29	1190	1.62	514	298	160	7.0	1840	7.8
Minimum, Mar...................	781	--		78	16	111	--	210	0	200	88	--	.6	.12	669	.91	1410	258	86	3.0	994	7.8
Apr...........................	969	--		71	17	124	--	184	0	215	103	--	1.2	.17	669	.91	1750	244	94	3.4	1040	8.0
Water Year 1951																						
Maximum, Feb. 1951.............	118	--		91	28	305	--	220	0	435	269	--	.0	.35	1320	1.80	421	342	162	7.2	2010	8.1
Minimum, July..................	740	--		69	22	144	--	176	0	252	124	--	1.9	.17	757	1.03	1510	262	118	3.9	1160	7.7
Water Year 1952																						
Maximum, Feb. 1952.............	55	--		113	30	343	--	305	0	471	308	--	.6	.41	1530	2.08	227	404	154	7.4	2280	8.1
Minimum, Aug...................	943	--		65	16	80	--	187	0	146	76	--	1.9	.11	529	.72	1350	225	72	2.3	816	7.8
Water Year 1953																						
Maximum, Feb. 1953.............	52	--		109	31	354	--	302	0	476	312	--	.6	.42	1540	2.09	216	400	153	7.7	2310	8.0
Minimum, Mar...................	568	--		71	15	98	--	183	0	171	89	--	2.5	.08	618	.84	948	240	90	2.8	905	7.8
Water Year 1954																						
Maximum, Dec. 1953.............	60	--		112	27	354	--	305	0	434	330	--	.6	.34	1530	2.08	248	392	142	7.8	2290	8.0
Jan. 1954.....................	53	--		112	27	354	--	290	0	455	337	--	.6	.34	1530	2.08	219	392	154	7.8	2310	7.7
Minimum, Aug...................	190	--		72	14	133	--	183	0	214	124	--	--	.22	684	.93	351	239	89	3.7	1090	8.3
Water Year 1955																						
Maximum, Feb. 1955.............	5.0	--		120	31	666	--	320	0	794	569	--	--	.63	2410	3.28	32.5	428	166	14	3610	8.3
Minimum, July..................	243	--		90	20	146	--	189	0	290	124	--	--	.08	801	1.09	526	308	152	3.6	1200	7.8
Water Year 1956																						
Maximum, Feb. 1956.............	37	--		166	47	877	--	323	0	1070	805	--	.6	.71	3180	4.32	318	608	342	15	4700	8.2
Minimum, July..................	161	--		92	23	168	--	187	0	339	137	--	.6	.21	927	1.26	403	326	172	4.0	1350	8.1
Water Year 1957																						
Maximum, Feb. 1957.............	2.4	--		191	36	934	--	253	0	1260	814	--	a	1.02	3450	4.69	22.4	625	418	16	4970	8.0
Minimum, Aug...................	772	--		64	10	60	--	175	0	128	44	--	a	.12	428	.58	892	202	58	1.8	661	8.2
Water Year 1958																						
Maximum, Nov. 1957.............	9.3	--		170	53	1080	--	354	0	1150	1090	--	.6	.90	3830	5.21	96.2	642	351	19	5690	8.3
Minimum, Aug. 1958.............	1070	--		84	16	102	--	186	0	237	76	--	.6	.13	657	.89	1900	274	121	2.7	979	8.0
Water Year 1959																						
Maximum, Jan. 1959.............	65	22		142	32	396	14	295	0	594	356	1.0	a	.32	1750	2.38	307	487	246	7.8	2600	7.9
Minimum, Mar...................	825	--		78	15	95	--	193	0	192	78	--	.6	.15	612	.83	1360	257	98	2.6	926	7.9

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-3640. RIO GRANDE AT EL PASO, TEX.--Continued																						
Water Year 1960																						
Maximum, Feb. 1960	66	--		138	33	369	--	313	0	573	314	--	0.6	0.37	1710	2.33	305	478	222	7.3	2470	8.2
Minimum, Mar.	825	--		78	19	116	--	181	0	237	99	--	.6	.16	667	.91	1490	272	123	3.1	1080	8.2
Water Year 1961																						
Maximum, Nov. 1960	124	--		139	31	323	--	290	0	541	273	--	a	.36	1570	2.14	526	474	236	6.4	2280	8.4
Minimum, July 1961	878	24		80	20	130	8.2	204	0	248	105	0.8	.6	.20	710	.97	1680	283	116	3.3	1130	8.0
Water Year 1962																						
Maximum, Dec. 1961	117	--		134	32	360	--	293	0	576	305	--	1.2	.41	1670	2.27	528	466	226	7.3	2400	8.2
Minimum, July 1962	1040	21		72	16	123	7.8	183	0	225	96	.8	.6	.16	679	.92	1910	247	97	3.4	1040	7.9
Water Year 1963																						
Maximum, Feb. 1963	77	--		138	27	362	--	284	0	573	317	--	a	.44	1630	2.22	339	454	222	7.4	2450	8.1
Minimum, July	782	16		81	16	124	9.0	205	0	219	107	.8	.6	.16	689	.94	1450	267	99	3.3	1070	8.1
Water Year 1964																						
Maximum, May 1964	20	--		115	30	497	--	303	0	631	425	--	1.2	.54	1920	2.61	104	409	160	11	2900	8.1
Minimum, Aug.	169	--		81	18	161	--	199	0	256	138	--	1.2	.12	808	1.10	369	276	113	4.2	1250	8.2
Water Year 1965																						
Maximum, Oct. 1964	8.1	--		126	39	702	--	281	0	879	624	--	5.0	.70	2640	3.59	57.7	474	244	14	3870	8.0
Minimum, July 1965	929	10		57	11	65	5.5	159	0	130	48	.6	.6	.10	431	.59	1080	186	56	2.1	665	8.0
Water Year 1966																						
Maximum, Feb. 1966	13	--		109	28	570	--	326	0	697	455	--	7.4	.47	2110	2.87	74.1	388	120	13	3160	7.9
Minimum, Mar.	728	--		73	14	84	--	189	0	168	68	--	1.2	.02	549	.75	1080	238	82	2.4	832	7.8
Water Year 1967																						
Maximum, Feb. 1967	--	--		127	35	422	--	323	0	600	354	--	.6	.14	1740	2.37	--	460	194	8.6	2620	8.1
Minimum, Mar.	--	--		82	17	112	--	214	0	203	94	--	.6	.02	655	.89	--	275	100	2.9	1030	7.8
Water Year 1968																						
Maximum, Dec. 1967	--	--		125	28	388	--	324	0	560	314	--	2.5	.38	1685	2.29	--	428	162	8.2	2460	8.1
Minimum, July 1968	--	13		85	17	135	8.2	217	0	256	97	.8	1.2	.20	728	.99	--	282	105	3.5	1120	8.0

a Less than 0.4 milligrams per liter.

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-3670. RIO GRANDE AT TORNILLO BRIDGE NEAR FABENS, TEX.																						
Water Year 1929																						
Maximum, June 5, 1929				--	--	--		--	--	--	--				2100	2.86		--	--	--	--	
June 16				--	--	--		--	--	--	--				2100	2.86		--	--	--	--	
Minimum, Aug. 2				--	--	--		--	--	--	--				700	.95		--	--	--	--	
Water Year 1930																						
Maximum, May 17, 1930				210	32	481		249	0	500	699				2160	2.94		656	460	8.2	3280	
Minimum, Aug. 8				126	24	150		216	0	314	168				920	1.25		414	237	3.2	1420	
Water Year 1931																						
Maximum, May 27, 1931				210	40	554		312	0	513	783				2160	2.94		690	434	9.2	3320	
Minimum, Aug. 12				111	30	192		240	0	313	210				996	1.35		401	204	4.2	1510	
Water Year 1932																						
Maximum, Oct. 22, 1931				196	53	510		317	0	519	723				2310	3.14		710	450	8.3	3390	
Minimum, Aug. 16, 1932				99	31	211		220	0	302	241				1020	1.39		376	196	4.7	1600	
Water Year 1933																						
Maximum, Nov. 18, 1932				165	39	420		244	0	505	539				1840	2.50		572	372	7.6	2740	
Minimum, Apr. 1933				104	30	244		266	0	302	269				1120	1.52		381	163	5.4	1610	

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-3705. RIO GRANDE AT FORT QUITMAN, TEX.																						
Water Year 1928																						
Maximum, Oct. 25, 1927	--	--		--	--	--	--	--	--	--	--	--	--	--	3200	4.35	--	--	--	--	--	--
Nov. 15	--	--		--	--	--	--	--	--	--	--	--	--	--	3200	4.35	--	--	--	--	--	--
Minimum, May 15, 1928	--	--		--	--	--	--	--	--	--	--	--	--	--	1400	1.90	--	--	--	--	--	--
Aug. 7	--	--		--	--	--	--	--	--	--	--	--	--	--	1400	1.90	--	--	--	--	--	--
Water Year 1929																						
Maximum, June 10, 1929	--	--		--	--	--	--	--	--	--	--	--	--	--	3800	5.17	--	--	--	--	--	--
Minimum, Aug. 20	--	--		--	--	--	--	--	--	--	--	--	--	--	1000	1.36	--	--	--	--	--	--
Water Year 1930																						
Maximum, May 26, 1930	--	--		316	92	935	--	240	0	669	1640	--	--	--	3860	5.25	--	1170	970	12	6170	--
Minimum, Aug. 15	--	--		156	37	206	--	264	0	328	308	--	--	--	1150	1.56	--	542	326	3.9	1870	--
Water Year 1931																						
Maximum, July 31, 1931	56	--		270	56	1060	--	216	0	674	1650	--	--	--	3850	5.24	582	906	728	15	5280	--
Minimum, Aug. 14	1180	--		132	30	305	--	288	0	354	363	--	--	--	1260	1.71	4010	454	218	6.2	2060	--
Water Year 1932																						
Maximum, May 9, 1932	82	--		204	62	894	--	220	0	605	1350	--	--	--	3520	4.79	779	765	585	14	5410	--
Minimum, Sept. 30	1620	--		93	23	254	--	244	0	270	284	--	--	--	1080	1.47	4720	328	128	6.1	1660	--
Water Year 1933																						
Maximum, May 1933	175	--		206	62	644	--	262	0	543	985	--	--	--	2670	3.63	1260	770	554	10	3870	--
Minimum, Oct. 28, 1932	462	--		135	23	447	--	293	0	410	525	--	--	--	1640	2.23	2050	434	194	9.3	2550	--
Water Year 1934																						
Maximum, May 1934	119	--		244	46	629	--	299	0	549	973	--	4.3	--	2720	3.70	874	796	551	9.7	4210	--
Minimum, Feb	368	--		154	53	305	--	257	0	426	447	--	--	0.28	1750	2.38	1740	604	394	5.4	2500	--
Water Year 1935																						
Maximum, May 1935	14	--		300	90	855	--	282	0	736	1410	--	--	.55	3850	5.24	146	1120	886	11	5820	8.0
Minimum, Aug	396	--		92	19	180	--	172	0	230	237	--	3.1	--	912	1.24	975	310	168	4.4	1440	8.1
Water Year 1936																						
Maximum, Apr. 1936	78	--		240	65	608	--	255	0	599	957	--	1.2	.41	2770	3.77	583	867	658	9.0	4270	8.1
Minimum, Oct. 1935	337	--		105	21	308	--	121	0	334	404	--	--	.27	1290	1.75	1170	350	250	7.1	2070	7.7
Water Year 1937																						
Maximum, Mar. 1937	70	--		248	72	633	--	255	0	622	1030	--	2.5	.44	3270	4.45	618	913	704	9.1	4510	7.9
Minimum, Sept	570	--		168	42	394	--	215	0	418	572	--	1.2	.33	1820	2.48	2800	592	416	7.1	2820	8.2
Water Year 1938																						
Maximum, Aug. 1938	139	--		205	53	554	--	203	0	535	843	--	.6	.30	2420	3.29	908	728	562	8.9	3800	8.2
Minimum, July	990	--		129	29	273	--	193	0	338	364	--	2.5	.26	1300	1.77	3470	440	282	5.7	2060	8.1
Water Year 1939																						
Maximum, June 1939	85	--		228	64	629	--	214	0	586	978	--	--	.38	2820	3.84	647	830	654	9.5	4350	8.3
Minimum, Sept	366	--		150	37	355	--	201	0	407	504	--	1.9	.27	1650	2.25	1630	528	364	6.7	2670	8.1

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/1)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-3705. RIO GRANDE AT FORT QUITMAN, TEX.--Continued																						
Water Year 1940																						
Maximum, Apr. 1940	54	--		258	76	763	--	228	0	694	1210	--	0.6	0.27	3280	4.46	478	956	770	11	5160	8.3
Minimum, June	228	--		148	36	362	--	202	0	432	509	--	1.9	--	1710	2.33	1050	515	349	7.0	2660	8.3
Water Year 1941																						
Maximum, Feb. 1941	115	--		224	55	605	--	273	0	617	900	--	1.9	.43	2680	3.65	832	788	564	9.4	4030	8.2
Minimum, Sept	1190	--		105	22	242	--	180	0	287	309	--	4.3	.22	1130	1.54	3630	353	206	5.6	1790	7.9
Water Year 1942																						
Maximum, Nov. 1941	411	--		191	47	511	--	256	0	554	714	--	1.9	.36	2320	3.15	2570	672	462	8.6	3520	7.9
Minimum, May 1942	5030	--		68	17	128	--	145	0	221	124	--	1.2	.13	691	.94	9380	241	122	3.6	1070	8.1
June	4030	--		76	17	124	--	169	0	216	124	--	1.9	.20	691	.94	7520	260	122	3.3	1090	7.8
Water Year 1943																						
Maximum, Aug. 1943	93	--		216	65	657	--	201	0	616	1020	--	--	.42	2910	3.96	731	806	642	10	4410	7.9
Minimum, Oct. 1942	1080	--		103	25	236	--	185	0	314	289	--	1.9	.21	1150	1.56	3350	358	206	5.4	1780	7.8
Water Year 1944																						
Maximum, Apr. 1944	231	--		170	47	471	--	211	0	491	681	--	--	.33	2090	2.84	1300	617	444	8.2	3230	8.0
Minimum, Sept	690	--		127	31	301	--	217	0	361	391	--	--	.30	1400	1.91	2610	444	266	6.2	2160	8.3
Water Year 1945																						
Maximum, June 1945	71	--		227	70	710	--	206	0	659	1100	--	.0	.42	3110	4.23	596	854	686	11	4730	8.2
Minimum, Apr	321	--		162	40	398	--	250	0	441	557	--	.6	.26	1820	2.48	1580	570	366	7.2	2840	8.1
Water Year 1946																						
Maximum, Aug. 1946	41	--		310	104	1050	--	225	0	929	1650	--	.6	.61	4370	5.94	484	1200	1020	13	6600	7.8
Minimum, Oct. 1945	951	--		154	37	382	--	251	0	426	515	--	.6	.32	1760	2.39	4520	539	334	7.1	2720	7.9
Water Year 1947																						
Maximum, July 1947	33	--		341	117	1150	--	229	0	1020	1840	--	.6	.64	4820	6.55	429	1330	1140	14	7360	7.9
Minimum, Oct. 1946	487	--		145	35	349	--	235	0	410	467	--	2.5	--	1620	2.20	2130	506	314	6.7	2510	7.9
Water Year 1948																						
Maximum, July 1948	63	--		323	119	1230	--	133	0	1070	1970	--	2.5	.69	5190	7.06	883	1290	1180	15	7660	7.7
Minimum, June	127	--		168	47	534	--	194	0	510	791	--	1.2	--	2210	3.01	758	614	455	9.3	3520	--
Water Year 1949																						
Maximum, May 1949	91	--		315	95	1000	--	273	0	905	1570	--	.6	.58	4240	5.76	1040	1180	954	13	6460	8.0
Minimum, Sept	501	--		144	36	375	--	198	0	420	516	--	2.5	.32	1710	2.32	2310	506	344	7.2	2660	8.1
Water Year 1950																						
Maximum, Apr. 1950	73	--		312	99	1030	--	256	0	940	1610	--	1.9	.59	4350	5.91	857	1190	977	13	6250	7.8
Minimum, July	534	--		141	34	356	--	202	0	401	495	--	3.1	.23	1650	2.24	2380	494	328	7.0	2550	7.9
Water Year 1951																						
Maximum, Apr. 1951	8.0	--		346	125	1220	--	174	0	1230	2000	--	.6	.73	5150	7.01	111	1380	1230	14	7650	7.8
Minimum, Aug	128	--		66	12	77	--	129	0	93	126	--	2.5	.12	507	.69	175	214	108	2.3	802	7.9

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-3705. RIO GRANDE AT FORT QUITMAN, TEX.--Continued																						
Water Year 1952																						
Maximum, Mar. 1952	5.4	--		508	168	1550	--	257	0	1290	2690	--	0.0	0.77	6850	9.32	99.9	1960	1750	15	9840	7.8
Minimum, Aug.	3.0	--		140	32	270	--	202	0	295	434	--	.6	.40	1320	1.80	10.7	483	318	5.3	2080	7.8
Water Year 1953																						
Maximum, June 1953	1.6	--		872	293	2440	--	135	0	1710	4820	--	.6	.9	10700	14.6	46.2	3380	3270	18	15200	8.0
Minimum, July	240	--		105	24	230	--	156	0	240	347	--	5.6	.23	1100	1.50	713	359	232	5.3	1790	7.8
Water Year 1954																						
Maximum, Oct. 1953	.8	--		794	254	1900	--	159	0	1420	3950	--	--	.68	9120	12.4	19.7	3020	2900	15	12800	7.8
Minimum, Aug. 1954	139	--		60	14	125	--	171	0	137	144	--	2.5	.23	603	.82	226	207	67	3.8	1010	8.1
Water Year 1955																						
Maximum, Mar. 1955	.16	--		831	281	1970	--	131	0	1430	4190	--	.6	.72	9150	12.4	3.95	3230	3120	15	13300	7.8
June	.06	--		831	281	1970	--	131	0	1430	4190	--	--	--	9150	12.4	1.48	3230	3120	15	13300	--
Minimum, July	24	--		59	8.5	37	--	201	0	70	20	--	1.2	.13	338	.46	--	182	18	1.2	505	8.0
Water Year 1956																						
Maximum, Nov. 1955	.39	--		775	256	1930	--	247	0	1490	3880	--	[illegible]	.55	9340	12.7	9.84	2980	2780	15	12800	7.8
Minimum, Aug. 1956	91	--		58	9.5	33	--	232	0	51	11	--	.6	.17	294	.40	72.2	184	0	1.1	472	8.1
Water Year 1958																						
Maximum, Sept. 1958	324	--		78	9.7	58	--	131	0	195	35	--	3.1	.06	491	.67	430	234	126	1.6	720	7.8
Minimum, Oct. 1957	19	--		32	4.0	59	--	163	0	59	20	--	2.5	.19	256	.35	13.1	96	0	2.6	425	8.0
Water Year 1959																						
Maximum, Feb. 1959	.21	--		694	188	1490	--	256	0	1220	3030	--	1.2	.54	7550	10.3	4.28	2510	2300	13	10600	7.9
Minimum, July	20	12		165	8.6	6.7	6.6	140	0	340	4.6	0.8	.6	.03	657	.89	35.5	448	333	.1	840	7.8
Water Year 1960																						
Maximum, Mar. 1960	1.1	--		715	224	2130	--	250	0	1750	3780	--	1.2	1.0	9640	13.1	28.6	2700	2500	18	13300	7.9
Minimum, Oct. 1959	17	--		121	26	292	--	198	0	409	330	--	1.2	.40	1350	1.69	61.8	410	248	6.3	2080	7.8
Water Year 1961																						
Maximum, July 1961	1.6	30		541	191	2020	12	241	0	1750	3220	1.0	1.2	1.1	8310	11.3	35.9	2140	1940	19	12000	7.8
Minimum, Aug.	.27	--		73	9.2	65	--	177	0	93	87	--	.6	.14	499	.68	.36	220	75	1.9	747	7.8
Water Year 1962																						
Maximum, Mar. 1962	6.5	--		626	213	2140	--	247	0	1810	3590	--	.6	1.0	8930	12.1	157	2440	2240	19	12500	7.9
Minimum, Sept.	484	--		171	34	380	--	273	0	469	497	--	1.9	.29	1790	2.43	2340	568	344	6.9	2680	7.9
Water Year 1963																						
Maximum, June 1963	7.7	--		624	241	2270	--	247	0	1890	3790	--	.6	1.1	9340	12.7	194	2550	2350	20	13000	7.9
Minimum, Aug.	38	--		136	15	196	--	303	0	203	268	--	1.2	.27	1050	1.43	108	399	150	4.3	1650	7.9
Water Year 1964																						
Maximum, Apr. 1964	2.3	--		482	292	2060	--	232	0	1810	3420	--	1.2	1.1	8740	11.9	54.3	2400	2210	18	12400	7.8
Minimum, Sept.	4.2	--		69	7.5	43	--	250	0	63	19	--	1.2	.06	357	.49	4.05	204	0	1.3	570	8.1

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-3705. RIO GRANDE AT FORT QUITMAN, TEX.--Continued																						
Water Year 1965																						
Maximum, Sept. 1965............	1.1	--		83	13	38	--	329	0	62	12	--	0.6	0.02	417	0.57	1.24	260	0	1.0	638	7.9
Minimum, Aug....................	2.1	--		60	5.4	29	--	232	0	30	11	--	1.2	.14	310	.42	1.76	172	0	1.0	455	7.7
Water Year 1966																						
Maximum, Sept. 1966............	176	--		136	29	298	--	226	0	361	399	--	1.9	.23	1420	1.93	674	458	272	6.1	2220	8.0
Minimum, July...................	13.9	11		66	4.4	57	4.7	177	0	106	35	0.9	6.2	.04	403	.55	15.1	183	38	1.8	611	7.8
Water Year 1967																						
Maximum, May 1967..............	--	--		660	235	2390	--	217	0	2020	3950	--	1.2	1.18	9940	13.5	--	2620	2440	20	13800	7.8
Minimum, June...................	--	--		91	12	53	--	207	0	148	51	--	7.4	.21	521	.71	--	276	106	1.4	770	7.8
Water Year 1968																						
Maximum, May 1968..............	--	--		577	209	2220	--	174	0	1920	3560	--	.6	.92	8860	12.0	--	2300	2160	20	12800	7.6
Minimum, July...................	--	16		123	21	191	9.0	284	0	292	197	.8	1.9	.21	1000	1.36	--	393	160	4.2	1550	8.3
8-3710. RIO GRANDE AT LA NUTRIA, TEX.																						
Period, Jan. - Aug. 1936																						
Maximum, Apr. 29, 1936.........	20			248	63	697		161	0	702	1080		1.9	0.42	3090	4.20	167	880	748	10	14800	7.6
Minimum, Aug. 31................	276			66	8.8	75		166	0	102	91		4.3	.14	465	.63	347	201	65	2.3	677	7.4
Water Year 1937																						
Maximum, Apr. 30, 1937..........	83			285	81	833		176	0	778	1350		35	.54	3750	5.10	840	1040	900	11	5570	7.4
Minimum, Sept...................	594			133	27	281		200	0	346	378		1.9	--	1370	1.87	2200	444	280	5.8	2120	8.2
Water Year 1938																						
Maximum, Oct., Nov., Dec. 1937..	413			187	49	484		215	0	526	687		.6	.39	2180	2.96	2430	670	493	8.1	3390	8.1
Minimum, Sept. 1938............	1210			97	22	206		169	0	264	246		2.5	.19	963	1.31	3150	330	192	4.9	1540	7.9
Water Year 1939																						
Maximum, Apr. 1939.............	77			228	64	643		182	0	671	975		.6	.42	2860	3.89	595	833	684	9.7	4330	8.2
Minimum, July...................	117			142	29	343		148	0	377	509		--	--	1570	2.13	496	473	352	6.9	2520	8.2
Water Year 1940																						
Maximum, Apr. 1940.............	25			248	65	638		177	0	711	989		.6	.54	2890	3.93	195	888	743	9.3	4490	8.3
Minimum, Aug....................	454			68	12	154		143	0	197	157		6.8	--	721	.98	884	218	100	4.5	1150	8.3
Water Year 1941																						
Maximum, Nov. 1940.............	174			194	52	574		188	0	600	822		--	--	2490	3.39	1170	699	545	9.4	3770	7.9
Minimum, Sept. 1941............	1780			78	15	169		141	0	209	198		8.1	.16	809	1.10	3890	256	140	4.6	1290	7.8

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-3715. RIO GRANDE AT UPPER PRESIDIO, TEX.																						
Period, Feb. 28 - Sept. 27, 1935																						
Maximum, Mar. 28, 1935..........	1.5			409	96	721		132	0	945	1360		0.0	0.63	4030	5.48	16.3	1420	1310	8.3	5750	7.2
Minimum, June 29................	74			43	8.4	56		171	0	61	51		.6	.22	344	.47	68.7	142	2	2.0	525	7.3
Water Year 1936																						
Maximum, Apr. 18, 1936..........	2.4			350	78	595		212	0	755	1080		1.9	.37	3190	4.34	20.7	1190	1020	7.5	4840	7.8
Minimum, July 28................	123			74	14	142		148	0	159	189		1.2	.15	695	.95	231	242	120	4.0	1140	7.5
Water Year 1937																						
Maximum, May 1937...............	2.2			337	78	600		179	0	739	1090		8.7	.46	3240	4.41	19.2	1160	1020	7.7	4660	7.7
Minimum, Aug....................	159			59	13	72		206	0	113	48		3.7	--	426	.58	183	201	32	2.2	646	8.3
Water Year 1938																						
Maximum, May 1938...............	79			209	52	503		171	0	567	774		1.2	.24	2390	3.25	510	735	594	8.0	3600	8.2
Minimum, Sept...................	995			89	18	168		154	0	227	204		2.5	.14	831	1.13	2230	295	109	4.3	1340	7.8
Water Year 1939																						
Maximum, Apr. 1939..............	25			351	75	664		232	0	805	1140		.6	.47	3420	4.65	231	1180	994	8.4	5020	8.3
Minimum, Aug....................	451			98	17	205		145	0	268	263		--	--	993	1.35	1210	316	197	5.0	1600	8.1
Water Year 1940																						
Maximum, Apr. 1940..............	11			315	72	618		182	0	753	1060		.6	--	3110	4.23	92.4	1080	934	8.2	4710	8.3
Minimum, June...................	155			109	13	138		118	0	265	174		1.9	--	831	1.13	348	328	231	3.3	1280	8.1
Water Year 1941																						
Maximum, Mar. 1941..............	68			293	70	662		226	0	774	1080		.6	--	3220	4.38	591	1020	834	9.0	4610	8.2
Minimum, July...................	694			82	14	181		138	0	224	218		2.5	.16	853	1.16	1600	260	147	4.9	1350	7.8
Water Year 1942																						
Maximum, Nov. 1941..............	580			219	54	552		231	0	616	816		.6	.42	2520	3.43	3950	768	578	8.7	3850	7.9
Minimum, Sept. 1942.............	2530			90	19	158		195	0	240	175		1.2	.21	868	1.18	5930	302	142	4.0	1310	8.0
Water Year 1943																						
Maximum, Aug. 1943..............	45.3			286	65	580		237	0	708	928		--	.44	2960	4.03	360	978	784	8.1	4290	8.3
Minimum, Oct. 1942..............	1290			113	24	235		198	0	320	287		.6	.25	1160	1.58	4040	381	219	5.2	1800	7.8
Water Year 1944																						
Maximum, May 1944...............	127			205	55	565		184	0	634	825		--	.42	2510	3.42	861	736	586	9.0	3880	8.3
Minimum, July...................	359			122	25	287		169	0	346	385		.6	.25	1330	1.81	1290	408	270	6.2	2040	8.0
Water Year 1945																						
Maximum, Aug. 1945..............	18			311	68	646		230	0	803	1030		.0	.49	3230	4.39	157	1060	867	8.7	4660	7.9
Minimum, July...................	521			77	13	142		145	0	214	152		1.9	.14	743	1.01	1050	245	126	3.9	1120	--
Water Year 1946																						
Maximum, Apr. 1946..............	15			398	92	764		201	0	1000	1310		--	.57	3920	5.33	159	1370	1200	8.9	5700	7.9
Minimum, Sept...................	350			61	12	137		91	0	178	173		3.1	.20	647	.88	611	202	127	4.2	1010	7.8

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-3715. RIO GRANDE AT UPPER PRESIDIO, TEX.--Continued																						
Water Year 1947																						
Maximum, July 1947	0.21			618	98	926		574	0	1570	1360		12	--	5230	7.11	2.97	1950	1480	9.1	8100	7.9
Minimum, Sept.	125			78	18	190		93	0	254	243		1.9	0.25	882	1.20	298	266	190	5.1	1330	7.9
Water Year 1948																						
Maximum, May 1948	.06			586	144	1100		116	0	1510	1970		1.2	.75	5820	7.92	.94	2060	1960	11	8040	7.9
Minimum, Aug.	41.4			30	4.9	67		76	0	77	73		1.9	--	309	.42	34.5	95	33	3.0	505	8.0
Water Year 1949																						
Maximum, Apr. 1949	5.2			407	92	760		160	0	1030	1330		.6	.56	4010	5.45	56.3	1400	1260	8.8	5720	7.6
Minimum, July	44			64	8.3	107		85	0	164	137		1.9	--	566	.77	67.2	194	124	3.3	889	7.7
Water Year 1950																						
Maximum, Apr. 1950	1.2			364	96	880		182	0	1060	1410		.6	--	4210	5.73	13.6	1300	1150	11	6160	--
Minimum, Aug.	197			80	16	210		195	0	210	242		3.7	.15	963	1.31	512	267	108	5.6	1480	8.0
Water Year 1951																						
Maximum, Mar. 1951	1.5			498	116	955		215	0	1230	1680		.6	.59	4890	6.65	19.8	1720	1540	10	6960	7.7
Minimum, Aug.	28			45	6.2	56		157	0	103	17		2.5	.10	353	.48	26.7	138	9	2.1	507	7.8
Water Year 1952																						
Maximum, Apr. 1952	4.3			95	14	106		116	0	260	115		2.5	.10	728	.99	8.45	296	200	2.7	1070	7.8
Minimum, July	162			48	8.0	63		153	0	104	43		6.2	.08	382	.52	167	152	28	2.2	569	7.7
Water Year 1953																						
Maximum, June 1953	5.8			--	--	93		165	0	--	43		--	--	721	.98	11.3	298	162	2.3	989	--
Minimum, Aug.	52			--	--	75		165	0	--	71		--	--	485	.66	68.1	202	67	2.3	729	8.0
Water Year 1954																						
Maximum, Sept. 1954	67			--	--	236		207	0	--	393		--	--	1330	1.81	241	542	372	4.4	2100	--
Minimum, Apr.	4.8			55	4.1	53		168	0	80	35		4.3	.03	353	.48	4.58	155	18	1.8	550	8.0
Water Year 1955																						
Maximum, Nov. 1954	.01			--	--	589		165	0	--	962		--	--	2850	3.88	.08	975	840	8.2	4290	--
Minimum, Aug. 1955	66			--	--	53		146	0	--	39		--	--	346	.47	61.7	149	29	1.9	531	--
Water Year 1956																						
Maximum, Nov. 1955	.08			--	--	801		168	0	--	1420		--	--	4550	6.19	.98	1650	1510	8.6	6220	--
Minimum, Aug. 1956	38			--	--	38		140	0	--	20		--	--	279	.38	28.6	--	--	--	455	--
Water Year 1957																						
Maximum, June 1957	27			--	--	46		141	0	--	23		--	--	544	.74	39.7	288	172	1.2	751	--
Minimum, May	18			--	--	25		168	0	--	14		--	--	250	.34	12.2	136	0	.9	377	--
Water Year 1958																						
Maximum, May 1958	.06			--	--	--		--	0	--	--		--	--	817	1.11	.13	446	381	.8	1010	--
Minimum, Oct. 1957	40			--	--	--		--	0	--	--		--	--	296	.40	32.0	156	53	1.3	471	--

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-3715. RIO GRANDE AT UPPER PRESIDIO, TEX.--Continued																						
Water Year 1959																						
Maximum, Dec. 1958.............	0.59			--	--	1150		232	0	--	2110		--	--	6490	8.83	10.3	2320	2130	10	8680	--
Minimum, June 1959.............	20			--	--	59		171	0	--	23		--	--	386	.52	20.8	174	34	1.9	595	--
Water Year 1960																						
Maximum, Aug. 1960.............	148			--	--	192		169	0	--	239		--	--	1010	1.37	404	350	212	4.5	1570	--
Minimum, Oct. 1959.............	12			--	--	46		149	0	--	34		--	--	343	.47	11.1	172	49	1.5	542	--
Water Year 1961																						
Maximum, Feb. 1961.............	21			--	--	808		212	0	--	1130		--	--	3510	4.77	199	960	787	11	5210	--
Minimum, May...................	47.7			--	--	60		131	0	--	41		--	--	462	.63	59.5	216	108	1.8	711	--
Water Year 1962																						
Maximum, Sept. 1962............	199			--	--	206		236	0	--	234		--	--	1030	1.40	553	343	150	4.8	1570	--
Minimum, Oct. 1961.............	12			--	--	40		145	0	--	27		--	--	479	.65	15.5	242	124	1.1	645	--
Water Year 1963																						
Maximum, Feb. 1963.............	1.9			--	--	858		273	0	--	1210		--	--	3680	5.00	18.9	1050	824	12	5480	--
Minimum, May...................	5.2			--	--	66		168	0	--	52		--	--	490	.67	6.88	229	92	1.9	757	--
Water Year 1964																						
Maximum, Dec. 1963.............	5.9			--	--	711		262	0	--	961		--	--	3140	4.27	50.0	828	613	11	4620	--
Minimum, June 1964.............	1.2			--	--	40		70	0	--	19		--	--	307	.42	.99	127	70	1.6	435	--
Water Year 1965																						
Maximum, Sept. 1965............	35			--	--	55		137	0	--	21		--	--	475	.65	44.9	220	108	1.6	680	--
Minimum, Aug...................	4.6			--	--	51		137	0	--	19		--	--	463	.63	5.75	214	102	1.5	645	--
Water Year 1966																						
Maximum, Sept. 1966............	413			--	--	104		166	0	--	115		--	--	622	.85	694	256	120	2.8	986	--
Minimum, Aug...................	91			--	--	49		162	0	--	28		--	--	412	.56	101	204	72	1.5	634	--
Water Year 1967																						
Maximum, Jan. 1967.............	--	8		733	162	1370	21	134	0	2070	2320	0.9	0.6	0.75	7150	9.72	--	2500	2390	12	9460	7.7
Minimum, Aug...................	--			--	--	62		140	0	--	28		--	--	438	.60	--	208	93	1.9	702	--
Water Year 1968																						
Maximum, Feb. 1968.............	--			--	--	251		156	0	--	214		--	--	1280	1.74	--	414	286	5.4	1870	--
Minimum, Sept..................	--			--	--	66		194	0	--	28		--	--	486	.66	--	226	66	1.9	715	--
8-3740. ALAMITO CREEK NEAR PRESIDIO, TEX.																						
Period, Feb. 1935 - Jan. 1936																						
Maximum, Apr. 28, 1935.........	2.0			35	4.7	107		327	0	44	22		3.1	0.26	484	0.66	2.61	108	0	4.5	628	7.6
Minimum, June 11...............	594			23	6.6	23		141	0	14	6.4		.0	.11	155	.21	249	84	0	1.1	259	7.5

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-3745. TERLINGUA CREEK NEAR TERLINGUA, TEX.																						
Period, Mar. 1 - Dec. 31, 1935																						
Maximum, May 1, 1935	0.80			135	23	245		192	0	749	25		13	0.22	1360	1.84	2.94	433	276	5.1	1770	7.8
Minimum, June 11	4270			50	3.2	85		249	0	113	5.0		1.2	.19	421	.57	4850	138	0	3.1	612	7.3
Period, June 1 - Sept. 30, 1947																						
Maximum, Sept. 1947	3.90			103	12	171		245	0	436	18		4.3	.19	963	1.31	10.1	304	104	4.3	1320	7.8
Minimum, Aug.	57			52	5.8	86		124	0	220	8.9		4.3	.19	485	.66	74.6	153	52	3.0	662	7.8
Water Year 1948																						
Maximum, Jan. 1948	3.50			113	18	185		193	0	565	14		5.6	.16	1050	1.43	9.92	355	196	4.3	1410	--
Minimum, July	196			32	3.5	60		136	0	98	6.7		3.7	--	324	.44	171	95	0	2.7	436	7.8
Water Year 1949																						
Maximum, May 1949	3.30			93	11	231		286	0	501	19		6.8	--	1100	1.49	9.80	277	42	6.0	1530	8.0
Minimum, July	180			40	3.6	83		156	0	156	7.8		5.0	--	419	.57	204	116	0	3.4	606	8.0

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-3750. RIO GRANDE AT JOHNSON RANCH, TEX.																						
Water Year 1948																						
Maximum, Jan. 1948	677	--		100	20	160	--	204	0	319	139	--	0.6	0.22	904	1.23	1650	332	164	3.8	1360	--
Minimum, July	700	--		69	8.5	96	--	158	0	211	50	--	5.6	.14	581	.79	1100	208	78	2.9	849	7.8
Water Year 1949																						
Maximum, Apr. 1949	402	--		148	16	194	--	159	0	617	74	--	1.9	.21	1220	1.66	1320	432	302	4.1	1640	7.7
Minimum, Aug.	2930	--		78	7.7	57	--	143	0	182	28	--	3.7	.10	500	.68	3960	225	108	1.7	694	7.9
Water Year 1950																						
Maximum, Jan. 1950	1030	--		85	19	160	--	153	0	284	155	--	2.5	.19	853	1.16	2370	291	166	4.1	1300	8.0
Minimum, Aug.	1880	--		72	9.0	77	--	165	0	174	51	--	2.5	.11	522	.71	2650	217	82	2.3	765	7.8
Water Year 1951																						
Maximum, Dec. 1950	772	--		109	21	188	--	193	0	327	196	--	1.9	.27	1010	1.37	2110	360	202	4.3	1530	8.0
Minimum, June 1951	703	--		70	8.9	85	--	168	0	181	41	--	1.9	.16	515	.70	978	212	74	2.5	748	7.9
Water Year 1952																						
Maximum, Mar. 1952	165	--		--	--	169	--	184	0	--	105	--	--	--	993	1.35	442	342	191	4.0	1370	--
Minimum, July	4880	--		76	7.8	49	--	140	0	181	21	--	3.7	.10	471	.64	6210	222	108	1.4	652	7.8
Water Year 1953																						
Maximum, Apr. 1953	7.7	--		--	--	186	--	159	0	--	133	--	--	--	1090	1.48	22.7	384	254	4.1	1580	--
Minimum, Aug.	199	--		--	--	87	--	153	0	--	48	--	--	--	654	.89	351	288	173	2.2	933	7.8
Water Year 1954																						
Maximum, Dec. 1953	155	--		--	--	180	--	189	0	--	131	--	--	--	1100	1.49	460	388	233	4.0	1540	--
Mar. 1954	72	--		--	--	195	--	160	0	--	131	--	--	--	1100	1.49	214	388	256	4.3	1570	--
Minimum, June	718	--		--	--	61	--	195	0	--	21	--	--	--	537	.73	1040	244	84	1.7	751	--
Water Year 1955																						
Maximum, Jan. 1955	244	--		122	22	193	--	160	0	480	138	--	.6	.36	1110	1.51	731	397	266	4.2	1580	8.2
Minimum, Aug.	2810	--		--	--	49	--	146	0	--	43	--	--	--	419	.57	3180	209	89	1.5	626	--
Water Year 1956																						
Maximum, May 1956	125	--		--	--	204	--	169	0	--	144	--	--	--	1180	1.60	398	428	289	4.3	1660	--
Minimum, Oct. 1955	2470	--		--	--	58	--	163	0	--	34	--	--	--	456	.62	3040	204	70	1.8	665	--
Water Year 1957																						
Maximum, Dec. 1956	339	--		--	--	175	--	198	0	--	101	--	--	--	1060	1.44	970	387	224	3.9	1470	--
Minimum, July 1957	229	17		116	9.8	71	5.5	211	0	277	23	0.8	1.2	.17	624	.85	386	330	158	1.7	908	8.0
Water Year 1958																						
Maximum, Apr. 1958	28	--		--	--	233	--	154	0	--	168	--	--	--	1360	1.84	103	458	331	4.7	1880	--
Minimum, May	63	--		--	--	60	--	178	0	--	12	--	--	--	374	.51	63.6	147	2	2.2	539	--
Water Year 1959																						
Maximum, Mar. 1959	345	--		--	--	229	--	153	0	--	172	--	--	--	1380	1.88	1290	488	362	4.5	1890	--
Minimum, Sept.	2360	--		--	--	76	--	183	0	--	46	--	--	--	544	.74	3470	239	89	2.1	799	--

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Cal-cium (Ca)	Mag-ne-sium (Mg)	Sodium (Na)	Po-tas-sium (K)	Bi-car-bon-ate (HCO_3)	Car-bon-ate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluo-ride (F)	Ni-trate (NO_3)	Bo-ron (B)	Dissolved solids: Milli-grams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Cal-cium, Mag-ne-sium	Hardness as $CaCO_3$: Non-car-bon-ate	So-dium ad-sorp-tion ratio	Specific con-duct-ance (micro-mhos at 25°C)	pH
8-3750. RIO GRANDE AT JOHNSON RANCH, TEX.--Continued																						
Water Year 1960																						
Maximum, May 1960	233	--		--	--	214	--	134	0	--	145	--	--	--	1160	1.58	730	381	271	4.8	1670	--
Minimum, Aug.	3580	--		--	--	60	--	180	0	--	28	--	--	--	477	.65	4610	225	78	1.7	690	--
Water Year 1961																						
Maximum, Apr. 1961	198	--		--	--	206	--	153	0	--	126	--	--	--	1160	1.58	620	391	266	4.5	1640	--
Minimum, June	1140	--		--	--	88	--	149	0	--	44	--	--	--	627	.85	1930	276	154	2.3	929	--
Water Year 1962																						
Maximum, May 1962	112	--		--	--	219	--	143	0	--	140	--	--	--	1170	1.59	354	379	262	4.9	1680	--
Minimum, July	1400	24		87	7.5	90	6.3	175	0	248	36	1.1	1.2	.19	619	.84	2340	248	105	2.5	877	7.7
Water Year 1963																						
Maximum, Mar. 1963	276	--		--	--	204	--	166	0	--	124	--	--	--	1130	1.54	842	368	232	4.6	1580	--
Minimum, Sept.	1700	--		--	--	80	--	176	0	--	37	--	--	--	665	.90	3050	299	155	2.0	902	--
Water Year 1964																						
Maximum, Apr. 1964	174	--		--	--	215	--	165	0	--	145	--	--	--	1140	1.55	536	376	241	4.8	1640	--
Minimum, Sept.	1230	--		--	--	92	--	186	0	--	44	--	--	--	614	.84	2040	257	104	2.5	886	--
Water Year 1965																						
Maximum, Apr. 1965	159	--		--	--	221	--	156	0	--	134	--	--	--	1200	1.63	515	366	238	5.0	1640	--
Minimum, Sept.	1280	--		--	--	89	--	189	0	--	41	--	--	--	628	.85	2170	281	126	2.3	918	--
Water Year 1966																						
Maximum, Apr. 1966	70	--		--	--	243	--	165	0	--	157	--	--	--	1300	1.77	246	430	294	5.1	1850	--
Minimum, Sept.	10300	--		--	--	42	--	165	0	--	28	--	--	--	412	.56	11500	217	82	1.2	615	--
Water Year 1967																						
Maximum, May 1967	--	--		--	--	242	--	159	0	--	147	--	--	--	1270	1.73	--	390	260	5.3	1770	--
Minimum, Sept.	--	--		--	--	87	--	189	0	--	37	--	--	--	633	.86	--	267	112	2.3	887	--
Water Year 1968																						
Maximum, Mar. 1968	--	--		--	--	237	--	174	0	--	174	--	--	--	1360	1.85	--	473	330	4.7	1920	--
Minimum, Sept.	--	--		--	--	56	--	187	0	--	20	--	--	--	439	.60	--	208	54	1.7	640	--

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-3775. RIO GRANDE AT LANGTRY, TEX.																						
Period, Apr. 1 - Sept. 30, 1944																						
Maximum, July 1944	1090	--		95	15	144	--	200	0	256	131	--	1.9	--	816	1.11	2400	300	136	3.6	1220	8.1
Minimum, Sept	7030	--		49	7.1	57	--	134	0	104	41	--	1.9	--	368	.50	6990	151	41	2.0	545	7.9
Water Year 1945																						
Maximum, Dec. 1944	1170	--		103	25	176	--	199	0	305	187	--	1.9	--	971	1.32	3070	359	196	4.0	1470	7.9
Minimum, July 1945	6120	--		66	7.8	55	--	145	0	152	31	--	2.5	0.08	449	.61	7420	197	78	1.7	634	7.7
Water Year 1946																						
Maximum, Jan. 1946	1290	--		88	25	196	--	169	0	317	201	--	1.9	.26	985	1.34	3430	324	186	4.7	1510	7.9
Minimum, Sept	4620	--		57	8.0	56	--	146	0	137	24	--	8.1	.19	404	.55	5040	174	54	1.8	596	7.5
Water Year 1947																						
Maximum, Jan. 1947	1410	--		85	22	157	--	183	0	269	148	--	2.5	.22	838	1.14	3190	302	152	3.9	1280	8.0
Minimum, Sept	4480	--		60	7.2	46	--	147	0	128	22	--	3.7	.17	368	.50	4450	180	60	1.5	569	7.7
Water Year 1948																						
Maximum, Jan. 1948	917	--		84	21	116	--	201	0	244	97	--	1.9	--	721	.98	1790	294	129	2.9	1080	--
Minimum, May	623	--		59	16	66	--	180	0	135	50	--	4.3	.13	478	.65	804	212	64	2.0	719	8.1
Water Year 1949																						
Maximum, Jan. 1949	885	--		83	23	139	--	174	0	268	132	--	2.5	.20	801	1.09	1910	301	158	3.5	1210	8.0
Minimum, Apr	1030	--		51	10	47	--	143	0	100	37	--	3.7	.09	368	.50	1020	170	52	1.6	561	8.0
Water Year 1950																						
Maximum, Dec. 1949	1260	--		75	21	135	--	145	0	250	133	--	5.6	.19	779	1.06	2650	274	156	3.6	1150	8.2
Minimum, Sept. 1950	3410	--		58	6.3	41	--	132	0	119	21	--	5.6	.09	353	.48	3250	170	61	1.4	526	7.8
Water Year 1951																						
Maximum, Nov. 1950	1150	--		82	20	138	--	157	0	255	135	--	1.9	.20	779	1.06	2420	286	158	3.5	1170	7.8
Minimum, May 1951	1360	--		57	11	59	--	153	0	133	39	--	3.7	.08	434	.59	1590	187	62	1.9	635	7.9
Water Year 1952																						
Maximum, Aug. 1952	668	--		91	21	92	--	156	0	270	76	--	3.7	.11	713	.97	1290	312	185	2.3	1020	7.7
Minimum, July	5280	--		82	7.9	49	--	143	0	194	23	--	3.7	.11	478	.65	6810	238	120	1.4	694	7.8
Water Year 1953																						
Maximum, Oct. 1952	485	--		93	20	88	--	138	0	278	73	--	3.1	.07	691	.94	905	314	200	--	995	7.9
Mar. 1953	475	--		80	23	102	--	178	0	252	78	--	3.1	.21	691	.94	886	296	150	2.6	1010	8.0
Minimum, May	263	--		56	22	59	--	165	0	146	53	--	3.1	.18	441	.60	313	232	96	1.9	697	8.0
Water Year 1954																						
Maximum, Feb. 1954	450	--		77	23	104	--	177	0	255	73	--	1.9	.21	676	.92	821	286	141	2.7	1000	8.0
Minimum, Apr	1880	--		40	7.5	47	--	85	0	109	38	--	--	--	316	.43	1600	130	61	1.8	436	--
Water Year 1955																						
Maximum, Feb. 1955	517	--		85	22	115	--	177	0	290	79	--	.6	.17	721	.98	1010	304	158	2.0	1050	8.2
Minimum, June	1260	--		67	9.4	27	--	187	0	86	18	--	2.5	.09	338	.46	1150	206	52	.5	509	7.9

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-3775. RIO GRANDE AT LANGTRY, TEX.--Continued																						
Water Year 1956																						
Maximum, Feb. 1956	648	--		94	23	120	--	183	0	303	85	--	1.2	0.21	758	1.03	1330	328	178	2.9	1110	8.0
Minimum, May	456	--		63	14	44	--	184	0	110	35	--	1.2	.16	382	.52	470	216	66	1.3	605	8.1
Water Year 1957																						
Maximum, Aug. 1957	922	--		137	17	81	--	192	0	371	48	--	1.9	.18	802	1.09	2000	411	254	1.7	1100	8.2
Minimum, Apr.	1500	--		53	8.8	24	--	153	0	60	18	--	2.5	.06	265	.36	1070	168	42	.8	420	8.2
Water Year 1958																						
Maximum, Dec. 1957	653	--		94	22	126	--	177	0	334	81	--	2.5	.26	822	1.12	1450	326	181	3.0	1170	7.9
Minimum, Sept. 1958	8620	--		78	8.9	46	--	168	0	154	23	--	4.3	.14	438	.60	10200	230	93	1.3	636	7.8
Water Year 1959																						
Maximum, Dec. 1958	1360	--		121	22	138	--	186	0	398	101	--	4.3	.30	943	1.28	3460	394	242	3.0	1320	7.8
Minimum, Oct.	21700	--		68	6.6	37	--	153	0	123	17	--	4.3	.11	363	.49	21300	196	72	1.2	561	7.8
Water Year 1960																						
Maximum, Dec. 1959	802	--		98	21	126	--	189	0	329	82	--	1.9	.23	808	1.10	1750	330	175	3.0	1170	7.9
Minimum, Sept. 1960	3160	--		75	8.4	57	--	193	0	142	30	--	3.7	.08	451	.61	3850	221	62	1.7	676	8.0
Water Year 1961																						
Maximum, Nov. 1960	1350	--		99	18	131	--	183	0	310	99	--	3.1	.26	829	1.13	3020	322	172	3.2	1190	8.1
Minimum, June 1961	2570	--		77	9.1	50	--	174	0	151	30	--	1.2	.12	427	.58	2960	228	86	1.4	671	7.8
Water Year 1962																						
Maximum, Dec. 1961	813	--		85	19	128	--	192	0	301	73	--	3.7	.33	767	1.04	1680	290	132	3.3	1100	8.1
Minimum, June 1962	1010	--		71	8.8	70	--	165	0	177	41	--	1.9	.14	515	.70	1400	214	78	2.1	744	7.8
Water Year 1963																						
Maximum, Jan. 1963	821	26		100	21	150	6.3	206	0	318	115	1.5	3.7	.24	897	1.22	1990	334	166	3.6	1310	7.9
Minimum, June	1250	--		91	9.7	42	--	192	0	158	28	--	a	.10	449	.61	1520	267	110	1.1	676	8.1
Water Year 1964																						
Maximum, Dec. 1963	811	--		94	18	126	--	205	0	308	74	--	3.1	.22	783	1.06	1710	311	143	3.1	1130	7.8
Minimum, Sept. 1964	4670	--		73	5.6	20	--	207	0	54	14	--	1.2	.06	286	.39	3610	204	34	.6	465	8.0
Water Year 1965																						
Maximum, Jan. 1965	828	20		83	20	131	6.3	179	0	311	69	1.7	5.0	.32	735	1.08	1780	290	144	3.3	1100	8.1
Minimum, June	2940	--		80	5.7	31	--	217	0	86	18	--	1.9	.08	346	.47	2750	222	44	.9	553	8.0
Water Year 1966																						
Maximum, Jan. 1966	660	23		94	19	130	4.7	189	0	324	73	1.7	3.7	.30	804	1.09	1430	312	158	3.2	1170	8.0
Minimum, Apr.	786	--		72	9.0	40	--	195	0	95	30	--	2.5	.12	372	.51	789	216	56	1.2	591	7.8
Water Year 1967																						
Maximum, Nov. 1966	--	--		107	21	153	--	186	0	387	98	--	3.1	.33	933	1.27	--	352	200	3.5	1330	7.8
Minimum, Sept. 1967	--	--		79	7.5	66	--	201	0	160	28	--	3.1	.17	497	.68	--	228	55	1.9	722	7.9
Water Year 1968																						
Maximum, Jan 1968	--	24		83	19	134	5.5	177	0	322	73	1.5	3.7	.18	783	1.06	--	286	140	3.4	1130	7.8
Minimum, Sept.	--	--		75	5.8	54	--	210	0	125	19	--	3.7	.10	436	.59	--	210	38	1.6	648	8.2

a Less than 0.4 milligrams per liter.

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4101. PECOS RIVER BELOW RED BLUFF DAM NEAR ORLA, TEX.																						
Water Year 1953																						
Maximum, Sept. 17-30, 1953......	9.2	23		776	367	4480	--	112	0	3020	7050		--		15700	21.2	390	3430	3250	33	22500	7.6
Minimum, Mar. 19-31............	10	9.0		572	234	1800	--	123	0	2080	2850		--		7590	10.3	205	2390	2290	16	11100	7.8
Weighted average...............	15	13		690	318	2350	--	122	0	2490	3890		--		9820	13.3	398	3030	2930	19	14300	--
Water Year 1954																						
Maximum, Oct. 1-16, 1953.......	12	15		792	362	4330	--	111	0	3010	6850		--		15300	20.7	496	3460	3280	32	21900	7.4
Minimum, Sept. 1-30, 1954.......	148	14		356	91	1040	--	106	0	1100	1620		8.0		4280	5.82	1710	1260	1180	13	6620	7.4
Weighted average...............	88	11		498	167	1700	--	106	0	1720	2650		--		6790	9.25	1610	1930	1840	17	10000	--
Water Year 1955																						
Maximum, Oct. 4-8, 1954.........	15	13		470	207	3240	--	97	0	1800	5050		--		10900	14.7	441	2020	1940	31	16200	7.4
Minimum, Apr. 1-30, 1955........	399	10		268	69	593	--	134	0	826	900		1.8		2730	3.71	2940	952	842	8.4	4280	7.5
Weighted average...............	217	13		317	84	743	--	132	0	978	1150		--		3350	4.56	1960	1140	1030	9.6	5160	--
Water Year 1956																						
Maximum, Sept. 1-30, 1956.......	79	17		642	175	1700	--	119	0	2130	2620		--		7340	9.98	1570	2320	2220	15	10200	7.9
Minimum, Feb. 1-8..............	32	14		450	93	650	--	125	0	1350	1000		1.5		3620	4.92	313	1510	1400	7.3	5090	8.0
Weighted average...............	125	13		531	131	1090	--	112	0	1680	1690		--		5190	7.06	1750	1860	1770	11	7340	--
Water Year 1957																						
Maximum, Aug. 1-13, 1957........	12	15		656	285	3680	--	88	0	2440	5800		--		12900	17.4	418	2810	2740	30	18200	7.6
Minimum, Sept. 12-23...........	131	6.4		442	81	836	--	68	0	1310	1300		1.6		4010	5.45	1420	1440	1380	9.6	5920	7.6
Weighted average...............	61	8.5		612	197	2000	--	107	0	2070	3140		--		8080	10.9	1330	2340	2250	18	11600	--
Water Year 1958																						
Maximum, May 1-31, 1958.........	42	10		576	216	2310	--	130	0	2010	3650		--		8840	12.0	1000	2330	2220	21	12900	7.2
Minimum, July 1-31.............	216	15		455	116	1000	--	119	0	1500	1510		3.0		4660	6.34	2720	1610	1510	11	6740	7.4
Weighted average...............	73	11		491	147	1390	--	120	0	1640	2160		--		5900	8.02	1160	1830	1730	14	8620	--
Water Year 1959																						
Maximum, Oct. 1-31, 1958........	3.2	18		400	135	1670	--	175	0	1310	2600		--		6220	8.46	53.6	1550	1410	18	9670	7.2
Minimum, Nov. 23-30............	3.4	15		418	116	893	--	143	0	1340	1280		4.0		4240	5.77	38.9	1520	1400	10	6280	7.2
Weighted average...............	84	14		463	135	1150	--	136	0	1550	1760		2.2		5140	6.99	1170	1710	1600	12	7280	--
Water Year 1960																						
Maximum, July 8-18, 1960........	9.7	14		600	286	3640	--	126	0	2380	5680		--		12700	17.3	333	2670	2570	31	18000	7.3
Minimum, Nov. 1-30, 1959........	1.3	17		530	180	1500	48	138	0	1860	2320		--		6480	8.81	22.7	2060	1950	14	9300	7.7
Weighted average...............	62	12		568	202	1910	--	134	0	2050	2930		--		7730	10.5	1290	2250	2140	17	11000	--
Water Year 1961																						
Maximum, Sept. 1-31, 1961.......	198	16		585	196	1780	--	124	0	2000	2800		--		7440	10.1	3980	2270	2160	16	10400	7.6
Minimum, Nov. 17-30, 1960.......	3.8	13		470	157	1100	--	107	0	1500	1820		3.0		5120	6.96	52.5	1820	1730	11	7630	7.2
Weighted average...............	125	14		533	174	1420	--	123	0	1840	2230		--		6270	8.53	2120	2050	1940	14	8950	--
Water Year 1962																						
Maximum, Sept. 1-30, 1962.......	69	9.9		675	270	2550	--	115	0	2550	3950		--		10000	13.7	1860	2800	2700	21	13400	7.0
Minimum, Jan. 1-31.............	1.7	17		640	203	1740	--	151	0	2180	2700	1.2	--		7560	10.3	34.7	2430	2310	15	10600	7.4
Weighted average...............	61	8.3		669	249	2270	--	119	0	2440	3540		--		9240	12.4	1520	2690	2590	19	12900	7.1

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4101. PECOS RIVER BELOW RED BLUFF DAM NEAR ORLA, TEX.--Continued																						
Water Year 1963																						
Maximum, Oct. 1-31, 1962........	101	12		690	265	2680	--	119	0	2560	4200		--		10500	14.2	2860	2810	2710	22	14000	7.2
Nov. 1-30....................	212	12		700	276	2670	--	134	0	2540	4200		--		10500	14.2	6010	2880	2770	22	14300	7.0
Minimum, July 1-31, 1963........	71	8.1		655	211	1940	57	95	0	2270	3120		--		8310	11.3	1590	2500	2420	17	11400	6.5
Weighted average................	54	9.8		677	258	2480	--	117	0	2440	3910		--		9850	13.3	1440	2750	2650	21	13400	6.8
Water Year 1964																						
Maximum, Sept. 20-30, 1964......	4.7	17		640	283	3820	--	124	0	2410	6000		--		13200	18.0	168	2760	2660	32	18600	6.8
Minimum, Dec. 1-31, 1963........	12	11		550	206	1830	--	108	0	1940	2900		--		7490	10.2	243	2220	2130	17	10800	7.5
Weighted average................	--	11		644	244	2270	--	116	0	2330	3570		--		9130	12.4	784	2610	2510	19	12600	6.8
Water Year 1965																						
Maximum, May 1-31, 1965.........	1.2	3.1		770	328	4040	--	108	0	2850	6450		--		14400	19.8	47.1	3280	3160	31	21800	6.8
Minimum, Oct. 1-31, 1964........	2.7	14		600	221	2250	67	89	0	2100	3720		--		9020	12.2	65.4	2400	2330	20	12900	6.4
Weighted average................	--	8.8		686	276	3370	--	145	0	2420	5340		--		12200	16.5	298	2850	2730	27	18300	6.8
Water Year 1966																						
Maximum, Nov. 12-30, 1965.......	4.7	10		520	238	3790	--	124	0	2010	5900		--		12500	17.0	159	2280	2180	34	19000	6.8
Minimum, Sept. 1-30, 1966.......	56	8.2		430	86	1200	44	109	0	1260	1900		2.5		4980	6.77	754	1430	1340	14	7560	7.0
Weighted average................	--	6.8		461	120	1660	54	112	0	1440	2650		--		6440	8.77	503	1640	1550	18	9900	6.8
Water Year 1967																						
Maximum, July 3-10, 1967........	197	8.3		380	106	1480	54	137	0	1170	2400		--		5670	7.71	3020	1380	1270	17	8890	7.0
Minimum, Apr. 1-30..............	492	5.7		260	53	540	21	127	0	720	870		1.2		2530	3.44	3360	866	762	8.0	3980	7.6
Weighted average................	--	7.1		294	64	788	28	132	0	863	1260		1.6	3	3380	4.59	1930	1010	906	11	5270	7.5
Water Year 1968																						
Maximum, July 8-14, 1968........	--	8.2		452	150	2300	--	116	0	1580	3550		--		8100	--	--	1740	1650	--	12200	7.6
Minimum, Nov. 1-6, 1967.........	--	8.8		348	84	980	--	124	0	1030	1500		6.1		4020	--	--	1210	1110	--	6010	6.9
Weighted average................	--	7.8		402	115	1360	--	125	--	1300	2120		--		5380	--	--	1480	1370	--	8250	7.6

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4125. PECOS RIVER NEAR ORLA, TEX.																						
Period, July - Sept. 1937																						
Maximum, Aug. 21-31, 1937.......	637	20	0.04	506	113	626	12	118	0	1560	980	--	1.7	0.06	3870	5.26	6660	1730	1630	4.4	5330	--
Minimum, July 1-10..............	244	11	.08	442	78	351	11	82	3	1340	525	--	2.6	.07	2810	3.82	1850	1420	1350	2.9	3790	--
Water Year 1938																						
Maximum, Sept. 11, 13-20, 1938..	169	17	.06	540	130	711	21	108	0	1690	1120	--	1.0	.17	4290	5.83	1960	1880	1790	4.7	5980	--
Minimum, Oct. 1-10, 1937........	162	18	.04	487	100	454	7.6	116	0	1460	712	--	1.2	.04	3300	4.49	1440	1630	1530	3.4	4420	--
Weighted average................	301	15	.06	520	116	557	16	110	0	1610	868	--	1.4	--	3760	5.11	3060	1770	1680	3.9	5080	--
Water Year 1939																						
Maximum, Sept. 21-30, 1939......	226	16	.06	618	183	883	24	114	0	2000	1460	0.8	1.5	.07	5250	7.14	3200	2300	2200	5.3	7230	--
Minimum, June 21-22.............	592	11	--	371	60	301	--	90	0	1020	485	--	3.0	--	2300	3.13	3670	1170	1100	2.7	3250	--
Weighted average................	256	13	.07	583	161	773	21	109	0	1890	1240	.7	1.7	.13	4740	6.45	3280	2120	2030	4.9	6460	--
Water Year 1940																						
Maximum, Aug. 17, 1940..........	11	--	--	--	--	--	--	--	--	--	3630	--	--	--	9580	13.0	283	--	--	--	13600	--
Minimum, June 29-30.............	280	--	--	--	--	--	--	--	--	--	382	--	--	--	1700	2.31	1290	--	--	--	--	--
Weighted average................	152	15	.07	592	200	1050	20	121	--	2020	1670	1.0	1.8	.29	5640	7.67	2320	2300	2200	6.1	7860	--
Water Year 1941																						
Maximum, Mar. 11-20, 1941.......	3.7	12	.07	738	275	1640	13	110	5	2540	2700	.6	.8	--	7980	10.9	80	2970	2880	--	10900	--
Minimum, May 26-31..............	1060	8.0	.08	303	54	188	15	87	0	849	318	.0	1.2	.09	1780	2.42	5080	978	906	1.9	2520	--
Weighted average................	1280	18	.08	364	72	280	11	121	--	1070	434	.2	3.0	--	2310	3.14	8000	1200	1110	2.5	3150	--
Water Year 1947																						
Maximum, Sept. 1-10, 1947.......	50	--	--	668	263	2200	--	117	0	2400	3500	--	--	--	9090	12.4	1230	2750	2650	18	12900	--
Minimum, Oct. 1-10, 1946........	31	--	--	408	66	528	--	73	0	1090	880	--	1.0	--	3010	4.09	252	1290	1230	6.4	4330	--
Weighted average................	125	--	--	554	185	1050	--	116	0	1840	1720	--	3.1	--	5410	7.36	1830	2140	2050	9.9	7640	--
Water Year 1948																						
Maximum, Oct. 21-31, 1947.......	.65	14	--	692	317	2300	--	78	0	2820	3550	--	--	--	9700	13.2	17.0	3030	2970	18	13500	--
Minimum, June 1-2, 1948.........	187	19	--	215	16	108	--	56	0	547	155	--	2.8	--	1090	1.48	550	602	556	1.9	1640	--
Weighted average................	114	--	--	376	135	946	--	113	0	1280	1510	--	--	--	4310	5.86	1330	1490	1400	11	6520	--
Water Year 1949																						
Maximum, Oct. 21-31, 1948.......	6.8	12	--	549	231	1790	--	103	0	1970	2870	--	--	--	7480	10.2	137	2320	2270	16	11200	--
Minimum, June 12-13, 1949.......	24	18	--	256	73	457	--	53	0	830	725	--	2.2	--	2390	3.25	155	939	896	6.5	3730	--
Weighted average................	88	15	--	485	184	1210	--	114	0	1750	1900	--	--	--	5590	7.60	1330	1970	1870	12	8220	--
Water Year 1950																						
Maximum, Oct. 11-20, 1949.......	6.2	13	--	530	206	1340	--	101	0	1880	2160	--	--	--	6180	8.40	104	2170	2090	13	8900	7.7
Minimum, Sept. 26-30, 1950......	12	9.9	--	240	34	282	--	81	0	635	440	--	5.0	--	1690	2.30	54.8	739	672	4.5	2580	7.8
Weighted average................	195	19	--	474	153	702	--	117	0	1610	1110	--	3.0	--	4130	5.60	2170	1810	1720	7.2	5800	--
Water Year 1951																						
Maximum, Sept. 1-30, 1951.......	20	23	--	590	219	1500	--	96	0	2120	2380	--	--	--	6880	9.36	372	2370	2290	13	10100	7.2
Minimum, Oct. 1-4, 1950.........	83	11	--	241	34	270	--	70	0	635	430	--	4.5	--	1660	2.26	372	742	684	4.3	2560	7.3
Weighted average................	152	21	--	505	164	813	--	109	0	1750	1260	--	1.4	--	4580	6.23	1880	1930	1840	8.0	6420	--
Water Year 1952																						
Maximum, June 1-30, 1952........	72	28	--	632	252	1830	--	106	0	2370	2850	--	--	--	8010	10.9	1560	2610	2520	16	11300	7.0
Minimum, Apr. 16-19.............	386	16	--	510	101	637	--	122	0	1430	1050	--	5.5	--	3810	5.18	3970	1690	1590	6.6	5440	7.8
Weighted average................	68	21	--	601	212	1460	--	106	0	2120	2310	--	--	--	6780	9.22	1240	2370	2280	13	9690	--

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Milligrams per liter (mg/l)	Tons per acre-foot	Tons per day	Calcium, Magnesium	Non-carbonate			
8-4415. PECOS RIVER BELOW GRANDFALLS, TEX.																						
Period, Mar. 27 - Sept. 30, 1939																						
Maximum, June 11-20, 1939	--	--	--	796	325	2010	--	96	0	2950	3220	--	--		10000	13.7	--	3320	3240	15	13200	--
Minimum, July 11-19	--	30	0.08	652	227	1256	--	106	0	2300	1990	--	2.0		7510	10.2	--	2560	2470	11	9120	--
Water Year 1940																						
Maximum, Mar. 21-31, 1940	69	13	.08	770	365	2720	23	179	0	2950	4350	2.0	2.0		11300	15.2	2110	3420	3270	20	16000	--
Minimum, Aug. 10	483	--	--	506	73	373	--	98	0	1440	564	--	3.5		3010	4.09	3930	1560	1480	4.1	3950	--
Weighted average	53	21	.05	725	308	2030	25	168	0	2670	3240	2.0	2.6		9110	12.4	1300	3070	2940	4.1	12800	--
Water Year 1941																						
Maximum, Feb. 1-10, 1941	63	19	.03	783	394	2960	22	202	0	2980	4800	1.3	1.0		12100	16.3	2060	3570	3400	21	17300	--
Minimum, May 27	911	10	.07	123	30	92	13	80	0	312	175	.0	3.0		798	1.09	1960	430	365	1.9	1290	--
Weighted average	556	20	.08	429	112	585	14	119	0	1340	924	.6	3.4		3490	4.75	5240	1480	1390	--	4890	--
Water Year 1942																						
Maximum, Apr. 11-20, 1942	50	38	.05	748	359	2250	30	204	0	2850	3640	2.0	4.5		10000	13.6	1350	3340	3180	17	14200	--
Minimum, Oct. 1-10, 1941	12400	24	.08	366	71	294	13	136	0	1070	428	.2	3.5		2340	3.18	78300	1210	1090	3.7	3190	--
Weighted average	1540	24	.07	429	111	519	14	143	0	1340	811	--	2.3		3320	4.52	13800	1530	1410	--	4620	--
Water Year 1947																						
Maximum, Mar. 1-10, 1947	54	--	--	779	390	2850	--	125	0	3020	4600	--	--		11700	15.8	1710	3540	3440	21	16500	--
Minimum, June 5	445	--	--	98	23	112	--	106	0	171	225	--	1.0		776	1.06	932	339	252	2.6	1480	--
Weighted average	28	--	--	712	337	2300	--	135	0	2780	3640	--	--		9840	13.3	744	3160	3050	18	13800	--
Water Year 1948																						
Maximum, Mar. 21-31, 1948	18	30	--	789	403	2690	--	97	0	3280	4250	--	--		11500	15.5	559	3630	3550	20	15800	--
Minimum, Sept. 21-30	15	37	--	736	342	2210	--	144	0	2910	3470	--	--		9780	13.2	396	3240	3120	17	13600	--
Weighted average	20	--	--	734	371	2480	--	123	0	3020	3920	--	--		10600	14.3	572	3360	3260	19	14900	--
Water Year 1949																						
Maximum, Jan. 11-20, 1949	46	17	--	750	366	2820	--	190	0	2930	4470	--	--		11400	15.6	1420	3380	3220	21	16400	--
Minimum, May 1-10	23	18	--	644	322	2070	--	119	0	2640	3250	--	--		9000	12.2	559	2930	2830	17	13000	--
Weighted average	26	19	--	730	353	2470	--	160	0	2890	3900	--	--		10500	14.1	737	3280	3140	19	14700	--
Water Year 1950																						
Maximum, Dec. 1-31, 1949	28	19	--	748	373	2800	--	192	0	2940	4450	--	--		11400	15.5	862	3400	3240	21	15600	7.6
Feb. 1-28, 1950	27	14	--	746	372	2820	--	172	0	2960	4470	--	--		11500	15.5	838	3390	3250	21	16500	7.7
Minimum, Oct. 1-31, 1949	28	30	--	630	307	2000	--	147	0	2540	3130	--	--		8700	11.8	858	2830	2710	16	12200	7.9
Weighted average	25	22	--	719	356	2430	--	155	0	2860	3860	--	--		10400	14.0	702	3260	3130	18	14400	--
Water Year 1951																						
Maximum, May 1-5, 1951	19	16	--	804	437	3200	--	190	0	3410	5000	--	--		13000	17.5	667	3810	3650	23	18200	7.9
Minimum, Oct. 1-4, 7, 1950	145	18	--	268	157	696	--	104	0	994	1210	--	2.0		3400	4.62	1330	1310	1230	8.4	5310	7.7
Weighted average	31	20	--	646	293	2070	--	152	0	2520	3250	--	--		8860	12.0	742	2820	2700	17	12500	--
Water Year 1952																						
Maximum, Mar. 1-31, 1952	26	13	--	822	409	2970	--	139	0	3300	4700	--	--		12300	16.6	863	3740	3620	21	16800	7.6
Minimum, Apr. 2-4	15	44	--	82	27	213	--	219	0	303	195	--	12		984	1.34	39.9	316	136	5.2	1590	8.1
Weighted average	19	19	--	742	371	2540	--	147	0	2960	4030	--	--		10800	14.6	554	3380	3260	19	15000	--

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4415. PECOS RIVER BELOW GRANDFALLS, TEX.--Continued																						
Water Year 1953																						
Maximum, Feb. 9-10, 14-15, 18-20, 1953..................	19	14		894	522	7890	--	190	0	3340	12700	--	--		25500	34.1	1310	4380	4230	51	36100	7.8
Minimum, Oct. 1-31, 1952........	14	23		782	391	2430	--	135	0	3090	3920	--	--		10700	14.4	404	3560	3450	18	15100	7.4
Weighted average...............	13	17		805	419	3110	--	150	0	3230	5000	--	--		12700	17.1	446	3730	3610	22	17600	--
Water Year 1954																						
Maximum, May 1-31, 1954.........	9.1	7.9		--	--	2930	--	128	0	3170	4800	--	--		--	--	--	3520	3420	21	17100	8.0
Minimum, June 14................	360	--		--	--	--	--	130	0	--	129	--	--		--	--	--	246	139	--	904	8.1
Weighted average...............	15	--		--	--	2120	--	148	0	2380	3290	--	--		--	--		2570	2450	18	12100	--
Water Year 1955																						
Maximum, Jan. 1-31, 1955........	18	--		--	--	3170	--	187	0	3040	5180	--	--		--	--	--	3620	3460	23	17600	7.6
Minimum, Oct. 7, 1954...........	58	15		--	--	703	--	85	0	677	1180	--	4.0		3150	--	493	840	770	11	4760	7.9
Weighted average...............	18	--		--	--	2380	--	140	0	2500	3860	--	--		--	--	--	2930	2820	19	13800	--
Water Year 1956																						
Maximum, July 1-31, 1956........	8.0	--		--	--	3250	--	93	0	3310	5280	--	--		--	--	--	3810	3730	23	17700	7.5
Minimum, Oct. 6-13, 1955........	71	--		--	--	928	--	111	0	1780	1520	--	--		--	--	--	2000	1910	9.0	7070	7.6
Weighted average...............	20	--		--	--	2580	--	144	0	2750	4160	--	--		--	--	--	3200	3080	20	14800	--

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4465. PECOS RIVER NEAR GIRVIN, TEX.																						
Water Year 1940																						
Maximum, Apr. 21-30, 1940.......	40	13	0.04	822	497	3350	31	171	0	3700	5260	2.6	0.3		14500	19.7	1570	4090	--	--	19100	--
Minimum, Aug. 12-15.............	145	--	--	548	135	769	--	120	0	1760	1180	--	3.0		4450	6.05	1740	1920	--	--	6200	--
Weighted average................	71	19	.05	741	394	2620	29	155	0	3080	4150	2.3	1.2		11100	15.1	2130	--	--	--	--	--
Period, Oct. 1, 1940 - June 30, 1941																						
Maximum, Apr. 11-20, 1941.......	52	--	--	778	486	3510	--	130	0	3490	5550	--	.0		13900	18.9	1950	3950	3830	--	19000	--
Minimum, May 29.................	910	--	--	--	--	--	--	108	0	384	206	--	--		1060	1.44	2600	--	--	--	1480	--
Weighted average................	490	--	--	444	135	814	--	127	0	1500	1240	--	1.6		4210	5.73	5570	--	--	--	5910	--
Water Year 1945																						
Maximum, May 1945...............	--	--	--	836	473	2950	--	152	0	3490	4790	--	.6		13600	18.6	--	4030	3910	26	17600	7.8
Minimum, July...................	--	--	--	620	309	1880	--	196	0	2510	2980	--	.6		8860	12.0	--	2820	2660	--	11900	7.3
Water Year 1947																						
Maximum, Aug. 11-20, 1947.......	22	--	--	836	544	3520	--	88	0	3970	5500	--	--		14400	19.4	855	4320	4250	23	19400	--
Minimum, June 10-15.............	45	--	--	334	179	1150	--	80	0	1390	1810	--	1.5		4900	6.7	595	1570	1500	13	7500	--
Weighted average................	48	--	--	751	462	3110	--	137	0	3420	4870	--	--		12700	17.1	1650	3770	3660	--	17400	--
Water Year 1954																						
Maximum, Sept. 1-30, 1954.......	6.9	--	--	--	--	4070	--	57	0	4210	6300	--	--		--	--	--	4400	4350	27	21500	6.8
Minimum, June 16-18.............	186	--	--	--	--	310	--	154	0	491	570	--	--		--	--	--	640	514	5.3	2870	7.9
Weighted average................	23	--	--	--	--	3170	--	110	0	3160	4910	--	--		--	--	--	3360	3270	24	17000	--
Water Year 1955																						
Maximum, May 1-31, 1955.........	18	--	--	--	--	3980	--	105	0	4010	6200	--	--		--	--	--	4300	4220	26	20800	7.4
Minimum, Oct. 6-8, 1954.........	658	--	--	--	--	82	--	75	0	1200	108	--	--		--	--	--	1240	1180	10	2260	7.2
Weighted average................	32	--	--	--	--	2650	--	109	0	2930	4170	--	--		--	--	--	3200	3110	20	14800	--
Water Year 1956																						
Maximum, July 23-31, 1956........	13	--	--	--	--	4660	--	64	0	4690	7380	--	--		--	--	--	5080	5030	28	23800	7.2
Minimum, Oct. 1-31, 1955........	41	--	--	--	--	1860	--	49	0	2340	2900	--	--		--	--	--	2540	2500	16	11200	7.1
Weighted average................	26	--	--	--	--	3180	--	102	0	3350	5010	--	--		--	--	--	3670	3580	23	17200	--
Water Year 1957																						
Maximum, Sept. 1-20, 1957.......	14	--	--	--	--	4620	--	70	0	4670	7150	--	--		--	--	--	4880	4820	29	23400	7.5
Minimum, Apr. 25-26, 28.........	964	--	--	--	--	36	--	82	0	332	51	--	--		--	--	--	411	344	.8	924	7.5
Weighted average................	38	--	--	--	--	2430	--	107	0	2520	3800	--	--		--	--	--	2770	2680	20	13300	--
Water Year 1958																						
Maximum, Aug. 1-31, 1958........	10	--	--	--	--	4990	--	86	0	4470	7800	--	--		--	--	--	5000	4930	31	24700	7.2
Minimum, Sept. 27-28............	1650	13	--	132	12	57	9.6	70	0	330	75	--	2.0		--	--	--	379	322	1.3	988	8.0
Weighted average................	38	--	--	--	--	2760	--	117	0	2720	4290	--	--		--	--	--	3000	2910	22	14700	--

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4465. PECOS RIVER NEAR GIRVIN, TEX.--Continued																						
Water Year 1959																						
Maximum, Sept. 1-30, 1959.......	10	--		--	--	5020	--	63	0	4650	8000	--	--		--	--	--	5000	4950	31	23900	7.2
Minimum, July 18-24.............	43	1.9		460	186	1390	--	80	0	1830	2150	--	--		--	--	--	1910	1850	14	8640	8.0
Weighted average................	26	--		--	--	3650	--	139	0	3400	5690	--	--		--	--	--	3700	3590	26	18900	--
Water Year 1960																						
Maximum, May 1-31, 1960.........	11	--		--	--	5300	--	59	0	4930	8100	--	--		--	--	--	4960	4910	32	25300	6.8
Minimum, July 1-31..............	35	--		--	--	2480	--	85	0	2280	3850	--	--		--	--	--	2360	2290	22	13300	6.7
Weighted average................	24	--		--	--	3930	--	121	0	3490	6180	--	--		--	--	--	3810	3710	28	19900	--
Water Year 1961																						
Maximum, June 1-23, 1961........	39	14		900	650	4940	--	84	0	4410	7600	--	--		18500	25.2	1950	4920	4850	30	24200	6.7
Minimum, Mar. 28-29.............	334	11		125	35	319	--	108	0	392	470	--	3.8		1410	1.92	1270	456	368	6.5	2350	7.8
Weighted average................	34	8.9		656	405	3370	--	121	0	3070	5150	--	--		12700	17.1	1170	3300	3200	25	17200	--
Water Year 1962																						
Maximum, Sept. 1-30, 1962.......	17	9.2		940	645	5020	--	64	0	4540	7900	--	--		19000	25.9	872	5000	4940	31	24200	7.3
Minimum, May 20-31..............	81	9.6		410	185	1580	--	67	0	1550	2520	--	--		6290	8.55	1380	1780	1730	16	9350	7.0
Weighted average................	28	10		742	438	3570	--	118	0	3330	5560	--	--		13700	18.4	1040	3660	3560	25	18400	6.9
Water Year 1963																						
Maximum, May 1-31, 1963.........	11	8.7		940	698	5380	--	75	0	4800	8400	--	--		20300	27.6	603	5220	5160	32	24800	7.3
Minimum, Nov. 1-30, 1962........	184	9.5		745	305	2870	--	107	0	2730	4550	--	--		11300	15.3	5610	3110	3030	22	15000	7.4
Weighted average................	37	10		797	428	3640	--	117	0	3340	5740	--	--		14000	18.9	1400	3750	3660	26	18100	7.0
Water Year 1964																						
Maximum, Sept. 1-19, 1964.......	7.3	4.1		1180	1020	8020	--	75	0	6690	12400	--	--		28800	40.0	568	7150	7090	41	34600	6.4
Minimum, Sept. 24-25............	104	8.8		480	193	1430	--	78	0	1790	2250	--	--		6190	8.42	1740	1990	1930	14	8980	7.1
Weighted average................	18	9.0		841	549	4340	--	149	0	3930	6790	--	--		16600	22.3	807	4360	4240	28	21400	6.8
Water Year 1965																						
Maximum, June 13, 1965..........	466			--	--	5680	--	140	0	3870	9300	--	--		20500	27.8	25800	4900	4790	35	28700	6.9
Minimum, June 14-16.............	189	6.1		162	46	412	--	146	0	460	630	--	2.2		1790	2.43	913	593	473	7.4	3010	7.7
Weighted average................	23	5.7		672	504	3710	--	143	0	3250	5920	--	--		14100	19.0	876	3750	3630	25	19300	6.9
Water Year 1966																						
Maximum, June 1-7, 1966.........	9.7	.9		910	715	5430	76	130	0	4950	8300	--	--		20400	27.7	534	5210	5100	32	26900	6.8
Minimum, Sept. 1-2..............	106	14		308	45	359	15	114	0	848	542	--	2.0		2190	2.98	627	954	860	5.1	3230	7.8
Weighted average................	21	3.7		712	478	3660	59	132	0	3380	5820	--	--		14200	19.3	805	3740	3630	25	20100	7.0
Water Year 1967																						
Maximum, Apr. 1-12, 1967........	18	.5		845	576	4580	51	141	0	4060	7200	--	--		17400	23.6	846	4480	4370	30	24700	7.6
Minimum, May 29-30..............	54	4.4		285	102	808	18	70	0	1060	1280	--	1.5		3590	4.88	523	1130	1070	10	5510	7.7
Weighted average................	18	2.6		736	458	3520	45	104	0	3440	5560	--	--		13800	18.8	671	3720	3630	25	19600	6.9
Water Year 1968																						
Maximum, July 1-20, 1968........	--	4.5		980	620	4580	53	52	0	4490	7320	--	--		18100	24.6	--	5000	4950	28	23700	7.4
Minimum, July 21-31.............	--	5.0		720	404	3050	--	44	0	3160	4800	--	--		12200	16.6	--	3460	3420	23	16800	7.3

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

8-4474. PECOS RIVER NEAR SHUMLA, TEX.

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
Water Year 1955																						
Maximum, Mar. 1955	187			178	85	497		159	0	544	845		1.9	0.26	2290	3.12	1160	796	666	7.7	3700	7.9
Minimum, July	485			80	22	122		140	0	130	209		4.3	.17	706	.96	925	288	174	3.1	1140	7.9
Water Year 1956																						
Maximum, Mar. 1956	163			186	89	531		156	0	569	901		1.2	.26	2490	3.39	1100	828	701	8.0	3890	8.1
Minimum, Oct. 1955	299			116	49	253		174	0	282	429		5.6	.20	1280	1.74	1030	489	346	5.0	2100	8.0
Water Year 1957																						
Maximum, Mar. 1957	164			215	107	706		149	0	717	1180		1.2	.32	3210	4.36	1420	975	852	9.8	4890	7.9
Minimum, May	2810			84	20	122		140	0	160	199		.6	.08	733	1.00	5560	292	176	3.1	1160	8.0
Water Year 1958																						
Maximum, Mar. 1958	211			182	88	558		181	0	548	938		2.5	.21	2600	3.53	1480	818	670	8.5	4030	8.2
Minimum, Sept.	1330			58	10	49		149	0	55	82		2.5	.05	366	.50	1310	188	66	1.5	616	7.8
Water Year 1959																						
Maximum, Mar. 1959	187			175	82	517		174	0	496	878		2.5	.27	2480	3.37	1250	772	629	8.1	3800	7.9
Minimum, Sept.	433			82	26	149		160	0	144	248		2.5	.10	803	1.09	939	308	177	3.7	1310	8.0
Water Year 1960																						
Maximum, Apr. 1960	198			165	78	499		165	0	473	851		2.5	.24	2320	3.16	1240	732	596	8.0	3640	7.7
Minimum, Oct. 1959	1640			87	28	154		159	0	172	252		6.2	.11	842	1.15	3730	330	200	3.7	1380	7.7
Water Year 1961																						
Maximum, Apr. 1961	160			211	122	781		136	0	740	1320		.6	.33	3450	4.69	1490	1030	916	11	5320	7.9
Minimum, June	750			106	44	275		162	0	268	446		3.7	.18	1300	1.77	2630	444	312	5.7	2140	7.9
Water Year 1962																						
Maximum, Mar. 1962	148			189	87	578		156	0	570	984		1.9	.26	2660	3.62	1060	830	702	8.7	4150	7.9
Minimum, Sept.	236			100	31	228		164	0	206	369		3.1	.13	1080	1.47	688	378	244	5.1	1750	8.0
Water Year 1963																						
Maximum, Dec. 1962	188			258	102	801		176	0	768	1330		7.4	.29	3570	4.86	1810	1060	920	11	5370	7.7
Minimum, Oct.	496			97	25	178		179	0	159	295		5.6	.11	950	1.29	1270	344	196	4.2	1450	7.7
Water Year 1964																						
Maximum, Mar. 1964	121			183	90	630		146	0	574	1060		1.2	.24	2730	3.71	892	830	710	9.5	4380	7.5
Minimum, Sept.	2990			83	13	91		186	0	92	152		3.7	.12	572	.78	4620	263	110	2.4	945	8.2
Water Year 1965																						
Maximum, Apr. 1965	186			158	74	499		165	0	453	851		1.9	.31	2290	3.11	1150	698	562	8.2	3570	7.8
Minimum, May	381			93	30	204		159	0	184	339		3.1	.12	1040	1.41	1070	356	226	4.7	1650	8.0
Water Year 1966																						
Maximum, Mar. 1966	125			144	71	467		153	0	421	784		1.2	.18	2050	2.79	692	652	527	7.9	3350	8.0
Minimum, Apr.	462			78	18	123		146	0	118	206		3.7	--	659	.90	822	270	150	3.2	1100	8.0
Water Year 1967																						
Maximum, Mar. 1967	--			141	68	439		177	0	411	720		.0	.12	1970	2.68	--	631	486	7.6	3200	8.0
Minimum, July	--	12		89	35	221		165	0	200	356	0.8	2.5	.12	1080	1.47	--	367	232	5.0	1760	7.7
Water Year 1968																						
Maximum, Apr. 1968	--			161	79	538		153	0	494	890		.6	.21	2360	3.21	--	726	601	8.7	3760	8.1
Minimum, Aug.	--			71	23	138		153	0	128	225		3.1	.07	719	.98	--	272	146	3.6	1190	8.1

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4475. PECOS RIVER NEAR COMSTOCK, TEX.																						
Period, Feb. 15 - Sept. 17, 1935																						
Maximum, Apr. 11, 1935	216			438	265	1770		207	0	1890	2790		1.9	0.67	7840	10.7	4570	2180	2010	16	11100	7.7
Minimum, May 28	11200			113	35	226		381	0	115	355		--	.11	1140	1.55	34500	429	117	4.7	1860	7.3
Water Year 1936																						
Maximum, Jan. 10, 1936	333			235	99	562		192	0	781	881		4.3	.26	2900	3.94	2610	992	836	7.8	4230	7.8
Minimum, Sept. 27	18800			84	14	94		139	0	163	129		11	.04	617	.84	31300	266	152	2.5	940	7.4
Water Year 1937																						
Maximum, Apr. 7, 1937	227			261	141	893		159	0	967	1430		4.3	.32	4010	5.45	2460	1230	1100	11	6050	8.2
Minimum, May 12	278			57	21	114		69	0	149	183		6.8	.07	632	.86	474	227	170	3.3	1030	8.5
Water Year 1938																						
Maximum, Mar. 1938	310			310	135	850		125	0	1120	1320		1.9	.30	4100	5.57	3430	1330	1230	10	5930	8.1
Minimum, July	1370			114	39	227		138	0	312	357		8.7	--	1270	1.73	4700	444	332	4.7	1930	8.1
Water Year 1939																						
Maximum, Mar. 1939	261			240	120	757		166	0	884	1190		2.5	.35	3570	4.86	2520	1090	958	10	5240	7.9
Minimum, May	534			120	49	283		142	0	364	434		3.7	.17	1430	1.95	2060	500	383	5.5	2240	8.0
Water Year 1940																						
Maximum, Mar. 1940	261			288	149	969		145	0	1100	1520		.6	.40	4370	5.95	3080	1330	1210	12	6490	7.9
Minimum, June	603			114	45	292		115	0	350	462		2.5	.18	1440	1.96	2340	470	376	5.9	2280	8.3
Water Year 1941																						
Maximum, Jan. 1941	283			277	148	981		170	0	1040	1580		.6	.40	4400	5.98	3360	1300	1160	12	6180	7.6
Minimum, Apr. and May	720			141	62	406		149	0	447	640		3.1	.22	1860	2.53	3620	604	482	7.2	2970	7.6
Water Year 1942																						
Maximum, Mar. 1942	761			392	208	1260		104	0	1620	2000		1.2	.48	5920	8.05	12200	1830	1750	13	8220	7.5
Minimum, Oct. 1941	7800			386	73	329		130	0	1140	494		.6	.22	2710	3.68	57100	1260	1160	4.0	3470	7.8
Water Year 1943																						
Maximum, Mar. 1943	363			276	157	956		70	0	1190	1520		2.5	.40	4460	6.06	4370	1340	1280	11	6390	7.7
Minimum, July	322			205	110	690		115	0	812	1080		1.9	.33	3150	4.29	2740	965	870	9.7	4730	7.8
Water Year 1944																						
Maximum, Mar. 1944	293			294	162	1060		112	0	1230	1670		--	.40	4800	6.53	3800	1400	1310	12	6850	7.9
Minimum, Sept.	536			152	64	391		128	0	519	603		1.9	.19	1960	2.66	2840	640	536	6.7	2920	8.1
Water Year 1945																						
Maximum, Dec. 1944	291			296	151	988		154	0	1160	1550		.6	--	4510	6.13	3540	1360	1240	12	6470	--
Minimum, July 1945	737			138	54	329		107	0	459	510		1.9	.16	1710	2.32	3400	567	479	6.0	2560	7.4
Water Year 1946																						
Maximum, Mar. 1946	296			307	171	1130		88	0	1280	1810		1.9	.44	5040	6.86	4030	1470	1400	13	7310	7.9
Minimum, June	356			103	45	288		124	0	329	444		6.8	--	1400	1.91	1350	442	340	6.0	2210	7.9

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4475. PECOS RIVER NEAR COMSTOCK, TEX.--Continued																						
Water Year 1947																						
Maximum, Mar. 1947	235			212	122	774		107	0	867	1230		3.1	0.31	3470	4.72	2200	1030	942	10	5270	7.7
Minimum, Oct. 1946	1470			70	24	139		117	0	164	214		8.7	--	735	1.00	2910	274	178	3.7	1210	7.8
Water Year 1948																						
Maximum, Jan. 1948	215			219	113	698		171	0	802	1120		2.5	.26	3230	4.39	1880	1010	869	9.6	4880	--
Minimum, July	685			56	17	93		120	0	108	145		11	--	537	.73	993	208	110	2.8	865	7.8
Water Year 1949																						
Maximum, Jan. 1949	220			204	110	686		135	0	769	1110		3.7	.27	3200	4.35	1900	962	852	9.6	4800	7.8
Minimum, July	848			93	32	186		163	0	213	290		4.3	--	985	1.34	2260	362	228	4.3	1540	--
Water Year 1950																						
Maximum, Apr. 1950	203			184	100	633		129	0	677	1020		3.7	.27	2850	3.87	1560	869	764	10	4410	7.8
Minimum, July	574			73	22	126		135	0	142	195		6.8	.08	699	.95	1080	274	163	3.3	1140	7.8
Water Year 1951																						
Maximum, Feb. 1951	258			228	119	755		154	0	828	1230		2.5	.32	3400	4.63	2370	1060	936	10	5190	7.8
Minimum, May	326			97	41	257		125	0	280	417		2.5	.14	1230	1.67	1080	412	309	5.5	2000	7.7
Water Year 1952																						
Maximum, Apr. 1952	155			205	107	684		153	0	737	1100		2.5	.23	3120	4.25	1310	953	828	9.6	4720	7.8
Minimum, July	141			117	60	340		146	0	374	551		3.1	.26	1580	2.15	602	537	417	6.4	2590	7.7
Water Year 1953																						
Maximum, Mar. 1953	161			208	114	694		157	0	735	1140		1.9	.32	3110	4.23	1350	990	861	9.6	4880	7.8
Minimum, Aug.	270			76	24	121		141	0	151	195		11	.13	676	.92	493	288	173	3.1	1140	7.8
Water Year 1954																						
Maximum, Mar. 1954	142			157	83	478		128	0	521	808		.6	.18	2280	3.10	874	734	630	7.6	3540	7.9
Minimum, June	29500			66	6.7	28		156	0	53	50		3.7	.11	324	.44	25800	192	65	.9	518	8.2

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4485. GOODENOUGH SPRINGS NEAR COMSTOCK, TEX.																						
Water Year 1946																						
Maximum, Jan. 1946	110			31	14	15		134	0	29	16		6.8	0.05	228	0.31	67.7	137	27	0.6	438	7.9
Minimum, Apr.	103			24	10	13		102	0	23	13		3.7	.03	169	.23	47.0	102	18	.6	280	7.9
Aug.	208			24	10	12		104	0	21	12		7.4	.09	169	.23	94.9	100	15	.5	253	7.7
Water Year 1947																						
Maximum, Oct. 1946	193			68	9.1	9.4		224	0	20	10		8.1	--	257	.35	134	206	22	.3	421	7.9
Minimum, May 1947	183			19	11	12		82	0	23	11		6.2	.02	154	.21	76.1	94	27	.5	246	8.1
Water Year 1948																						
Maximum, Mar. 1948	125			62	14	16		228	0	30	17		5.6	.05	301	.41	102	212	25	.5	453	8.0
Apr., May, June	120			69	13	14		250	0	25	16		6.8	--	301	.41	97.5	226	22	.4	489	8.2
July	128			73	13	13		250	0	27	14		6.8	--	301	.41	104	234	29	.4	481	7.8
Minimum, Sept.	119			37	13	12		149	0	25	14		8.1	--	191	.26	61.4	148	26	.4	338	8.1
Water Year 1949																						
Maximum, Nov. 1948	132			73	12	11		251	0	24	14		8.7	.05	287	.39	102	232	26	.3	476	7.9
Jan. 1949	112			65	13	14		230	0	29	15		6.8	--	287	.39	86.8	215	26	.4	466	8.1
Minimum, Sept.	140			43	11	9.9		159	0	23	11		6.2	.06	228	.31	86.2	153	23	.4	334	8.2
8-4530. SAN FELIPE CREEK NEAR DEL RIO, TEX.																						
Period, Jan. 1 - Sept. 30, 1948																						
Maximum, Apr. 1948	13			81	13	19		261	0	37	27		9.3	.05	353	.48	12.4	253	39	0.6	572	8.0
Minimum, Jan.	45			48	9.0	11		164	0	14	15		8.7	--	206	.28	25.0	156	22	.4	351	--
Water Year 1949																						
Maximum, Nov. 1948	66			80	9.1	9.7		260	0	15	16		9.9	.04	309	.42	55.1	236	23	.3	492	7.8
Mar. 1949	78			75	8.8	14		225	0	33	22		12	.09	309	.42	65.1	223	38	.4	503	8.1
Minimum, Feb.	155			58	6.8	11		175	0	25	17		12	.09	243	.33	102	173	30	.4	391	8.1

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4580. RIO GRANDE AT EAGLE PASS, TEX.																						
Period, Jan. - Sept. 1938																						
Maximum, May 1938	1660			117	40	212		162	0	317	326		11	0.17	1180	1.60	5290	456	323	4.3	1790	8.0
Minimum, July	20400			53	9.2	43		132	0	82	40		4.3	.08	331	.45	18200	171	63	1.4	510	8.0
Water Year 1939																						
Maximum, Jan. 1939	2530			113	34	190		181	0	278	253		2.5	.15	1040	1.41	7100	420	272	4.0	1610	8.2
Minimum, Aug.	6190			57	14	80		145	0	135	62		.6	.14	485	.66	8110	200	81	2.5	714	8.3
Water Year 1940																						
Maximum, Feb. 1940	2120			104	34	194		189	0	275	259		1.9	.17	1040	1.42	5950	398	243	4.2	1630	8.0
Minimum, June	3100			65	16	77		143	0	126	100		3.7	--	485	.66	4060	228	111	2.2	804	8.3
Water Year 1941																						
Maximum, June 1941	6040			213	38	212		143	0	592	297		2.5	.22	1560	2.12	25400	688	570	3.5	2190	8.1
Minimum, May	6230			79	15	86		149	0	168	98		3.1	.12	632	.86	10600	259	137	2.3	898	7.7
Water Year 1942																						
Maximum, Jan. 1942	3670			194	67	367		160	0	622	555		3.1	.23	2020	2.75	20000	758	627	5.8	2990	7.6
Minimum, Sept	25900			79	15	94		140	0	193	106		2.5	--	640	.87	44800	261	146	2.5	954	7.9
Water Year 1943																						
Maximum, Jan. 1943	3200			126	43	233		112	0	440	321		3.1	.25	1320	1.80	11400	492	400	4.6	1990	8.0
Minimum, July	5300			72	15	117		143	0	187	136		3.7	.14	662	.90	9470	242	125	3.3	1030	8.0
Water Year 1944																						
Maximum, Mar. 1944	2050			90	36	224		133	0	308	303		1.9	.25	1110	1.51	6140	372	263	5.0	1750	8.0
Minimum, Sept	8940			67	11	72		151	0	130	77		3.7	.06	493	.67	11900	212	88	2.2	753	8.0
Water Year 1945																						
Maximum, Dec. 1944	2150			91	33	204		143	0	291	276		1.9	.12	1030	1.40	5980	360	244	4.7	1630	7.9
Minimum, July 1945	6630			73	14	98		133	0	182	111		3.7	.09	618	.84	11100	240	132	2.8	930	8.1
Water Year 1946																						
Maximum, Mar. 1946	1780			90	40	251		101	0	351	347		2.5	.23	1210	1.64	5820	388	305	5.5	1920	7.8
Minimum, June	5200			49	10	48		140	0	72	57		4.3	.08	346	.47	4860	164	50	1.6	557	7.8
Water Year 1947																						
Maximum, Jan. 1947	2630			83	27	157		161	0	244	196		2.5	.20	853	1.16	6060	320	188	3.8	1340	8.0
Minimum, Sept	5970			64	11	57		154	0	129	48		6.2	.16	441	.60	7110	205	78	1.7	650	7.9
Water Year 1948																						
Maximum, Jan. 1948	1560			84	28	150		174	0	234	190		3.7	.15	838	1.14	3530	324	182	3.6	1330	8.0
Minimum, June	15400			32	5.3	23		87	0	40	26		3.7	.12	184	.25	7650	102	32	1,0	301	--
Water Year 1949																						
Maximum, Jan. 1949	1850			73	27	139		137	0	217	131		5.0	.18	779	1.06	3890	292	180	3.5	1230	7.9
Minimum, Aug.	8440			66	8.6	45		143	0	116	43		8.1	.11	412	.56	9390	200	83	1.4	607	8.0

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4580. RIO GRANDE AT EAGLE PASS, TEX.--Continued																						
Water Year 1950																						
Maximum, Jan. 1950	2730			71	23	122		146	0	195	151		5.6	0.18	699	0.95	5150	272	152	3.2	1110	7.9
Minimum, Oct. 1949	5060			64	13	69		151	0	122	77		5.6	.15	463	.63	6330	212	89	2.1	742	8.0
Water Year 1951																						
Maximum, Feb. 1951	1610			83	28	153		159	0	250	192		4.3	.17	846	1.15	3680	325	195	3.7	1340	7.8
Minimum, June	2630			75	12	60		175	0	115	67		1.9	.10	449	.61	3190	234	91	1.7	712	8.0
Water Year 1952																						
Maximum, Feb. 1952	857			--	--	141		183	0	--	190		--	--	875	1.19	2020	353	203	3.3	1340	--
Minimum, May	2200			--	--	51		159	0	--	69		--	--	412	.56	2450	206	76	1.5	652	--
Water Year 1953																						
Maximum, Feb. 1953	600			--	--	140		169	0	--	188		--	--	838	1.14	1360	326	187	3.4	1300	--
Minimum, Aug.	1200			--	--	37		165	0	--	43		--	--	360	.49	1460	204	68	1.1	566	8.0
Water Year 1954																						
Maximum, Mar. 1954	439			--	--	124		169		--	156		--	--	728	.99	863	298	160	3.1	1150	--
Minimum, June	47000			--	--	--		--	--	--	--		--	--	272	.37	34500	--	--	--	422	--
Period, Oct. 1954 - June 1955																						
Maximum, Feb. 1955	1070			--	--	135		153	0	--	181		--	--	824	1.12	2380	343	218	3.2	1270	--
Minimum, June	1740			--	--	74		171	0	--	110		--	--	522	.71	2450	251	110	2.0	827	--

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4590. RIO GRANDE AT LAREDO, TEX.																						
Water Year 1956																						
Maximum, Mar. 1956	803	--		--	--	146	--	156	0	--	183	--	--	--	816	1.11	1770	330	202	--	1300	--
Minimum, Sept.	1700	--		--	--	59	--	143	0	--	103	--	--	--	427	.58	1960	216	99	--	695	--
Water Year 1957																						
Maximum, Mar. 1957	1120	--		--	--	145	--	169	0	--	181	--	--	--	835	1.14	2530	321	182	3.5	1300	--
Minimum, May	22000	--		--	--	28	--	140	0	--	37	--	--	--	281	.38	16700	162	48	1.0	450	--
Water Year 1958																						
Maximum, Apr. 1958	1100	--		--	--	135	--	156	0	--	192	--	--	--	774	1.05	2300	312	184	3.3	1220	--
Minimum, Sept.	14400	--		--	--	27	--	149	0	--	25	--	--	--	296	.40	11500	172	50	.9	462	--
Water Year 1959																						
Maximum, Mar. 1959	2470	--		--	--	115	--	161	0	--	104	--	--	--	662	.90	4410	284	152	3.0	1020	--
Minimum, Oct. 1958	29600	--		--	--	39	--	153	0	--	27	--	--	--	379	.52	30300	202	78	1.2	570	--
Water Year 1960																						
Maximum, Jan. 1960	2600	24		82	21	104	4.3	177	0	195	122	0.8	5.0	0.18	692	.94	4860	292	148	2.6	1060	8.1
Minimum, Oct. 1959	6370	--		--	--	48	--	156	0	--	59	--	--	--	387	.53	6660	207	80	1.5	614	--
Water Year 1961																						
Maximum, Apr. 1961	1290	--		--	--	124	--	143	0	--	162	--	--	--	717	.98	2500	287	170	3.2	1150	--
Minimum, June	10900	--		--	--	30	--	140	0	--	33	--	--	--	299	.41	8800	167	52	1.0	474	--
Water Year 1962																						
Maximum, Mar. 1962	1240	--		--	--	121	--	138	0	--	151	--	--	--	678	.92	2270	270	156	3.2	1110	--
Minimum, Sept.	2960	--		--	--	71	--	148	0	---	55	--	--	--	508	.69	4060	223	102	2.1	753	--
Water Year 1963																						
Maximum, Dec. 1962	1810	--		--	--	190	--	162	0	--	243	--	--	--	978	1.33	4780	356	224	4.4	1560	--
Minimum, Oct.	4350	--		--	--	77	--	157	0	--	66	--	--	--	515	.70	6050	218	89	2.3	758	--
Water Year 1964																						
Maximum, Mar. 1964	1260	--		--	--	132	--	159	0	--	138	--	--	--	749	1.02	2550	286	156	3.4	1160	--
Minimum, Sept.	28100	--		--	--	16	--	110	0	--	16	--	--	--	184	.25	14000	121	30	.6	309	--
Water Year 1965																						
Maximum, Feb. 1965	2100	--		--	--	110	--	128	0	--	121	--	--	--	780	1.06	4420	240	135	3.1	1010	--
Minimum, June	6140	--		--	--	51	--	166	0	--	63	--	--	--	388	.53	6430	198	62	1.6	635	--
Water Year 1966																						
Maximum, Feb. 1966	1390	--		--	--	117	--	165	0	--	124	--	--	--	704	.96	2640	279	144	3.1	1070	--
Minimum, May	5170	--		--	--	48	--	137	0	--	61	--	--	--	359	.49	5010	176	64	1.6	576	--
Water Year 1967																						
Maximum, Mar. 1967	1460	--		--	--	128	--	159	0	--	206	--	--	--	747	1.02	2940	283	153	3.3	1140	--
Minimum, Sept.	7800	--		--	--	47	--	143	0	--	41	--	--	--	367	.50	7730	172	54	1.6	557	--
Water Year 1968																						
Maximum, Jan. 1968	--	28		72	20	110	3.9	177	0	207	101	.9	3.7	.15	671	.91	--	262	116	3.0	1010	7.8
Minimum, July	--	22		61	12	54	3.9	156	0	108	55	.6	3.7	.09	412	.56	--	200	73	1.7	633	8.0

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4613. RIO GRANDE BELOW FALCON DAM, TEX.																						
Water Year 1956																						
Maximum, Aug. 1956	421	--		84	24	128	--	147	0	228	160	--	a	0.26	735	1.00	835	308	188	3.2	1170	8.0
Minimum, Oct. 1955	1850	--		64	14	61	--	137	0	132	72	--	1.9	.10	412	.60	2060	210	102	1.8	703	8.0
Water Year 1957																						
Maximum, Apr. 1957	328	--		85	25	138	--	159	0	246	163	--	a	.22	786	1.07	696	316	186	3.4	1220	--
Minimum, June	2770	--		51	9.4	39	--	122	0	69	53	--	1.2	.05	311	.42	2330	165	65	1.3	506	7.9
Water Year 1958																						
Maximum, May 1958	4230	--		63	13	68	--	143	0	123	85	--	a	.15	473	.64	5400	213	96	2.0	740	7.9
Minimum, Oct. 1957	3220	--		55	10	52	--	140	0	87	64	--	a	.13	370	.50	3220	179	64	1.7	602	8.0
Water Year 1959																						
Maximum, Aug. 1959	1950	--		66	16	72	--	125	0	171	82	--	.6	.15	510	.69	2690	231	128	2.1	784	7.9
Minimum, Nov. 1958	19000	--		60	8.9	40	--	137	0	98	39	--	2.5	.10	347	.47	17800	186	73	1.3	551	8.0
Water Year 1960																						
Maximum, July 1960	3120	12		67	21	92	4.7	132	0	193	103	0.8	a	.22	596	.81	5020	253	144	2.5	918	7.8
Minimum, Oct. 1959	1580	--		65	17	74	--	126	0	168	82	--	1.2	.16	503	.68	2150	232	128	2.1	796	7.7
Water Year 1961																						
Maximum, Nov. 1960	701	--		67	16	87	--	131	0	188	90	--	.6	.22	575	.78	1090	234	126	2.5	870	8.0
Minimum, Sept. 1961	3310	--		60	15	80	--	128	0	149	89	--	.6	.21	509	.69	4550	212	107	2.4	815	7.8
Water Year 1962																						
Maximum, Sept. 1962	612	--		65	17	103	--	132	0	195	108	--	.6	.11	595	.81	983	230	122	2.9	912	7.7
Minimum, Jan.	4570	13		66	16	80	5.1	135	0	173	82	1.0	.6	.16	513	.70	6330	230	120	2.3	831	7.9
Water Year 1963																						
Maximum, May 1963	951	--		86	18	123	--	145	0	224	146	--	6.2	.25	706	.96	1810	286	167	3.2	1110	7.9
Minimum, Nov. 1962	839	--		69	17	97	--	134	0	198	103	--	.6	.19	578	.79	1310	240	130	2.7	925	7.8
Water Year 1964																						
Maximum, Oct. 1963	1000	--		69	17	105	--	128	0	208	107	--	.6	.17	649	.88	1750	241	136	2.9	953	7.8
Minimum, Feb. 1964	739	--		72	15	99	--	140	0	206	102	--	.6	.14	579	.79	1160	243	128	2.8	933	7.9
Water Year 1965																						
Maximum, July 1965	3740	10		60	12	69	4.7	137	0	130	76	.6	.6	.19	455	.62	4590	200	87	2.1	725	7.8
Aug.	1360	--		56	13	70	--	137	0	125	78	--	--	.13	455	.62	1670	193	80	2.2	720	7.8
Minimum, Nov. 1964	1720	--		52	9.7	51	--	128	0	101	53	--	2.5	.15	364	.50	1690	170	65	1.7	579	7.8
Water Year 1966																						
Maximum, Apr. 1966	1600	--		66	16	84	--	146	0	158	92	--	1.2	.18	519	.71	2240	230	110	2.4	829	7.8
Minimum, Nov. 1965	851	--		60	15	76	--	137	0	141	85	--	.6	.16	472	.64	1080	210	98	2.3	767	7.8
Water Year 1967																						
Maximum, July 1967	2280	19		65	16	96	5.5	131	0	191	97	.8	.0	.13	582	.79	3580	228	121	2.8	897	7.7
Minimum, Oct. 1966	1270	--		59	12	76	--	128	0	146	80	--	.0	.18	470	.64	1610	195	90	2.4	749	7.7
Water Year 1968																						
Maximum, Aug. 1968		--		64	16	87	--	131	0	176	89	--		.17	550	.75		224	116	2.5	841	8.0
Minimum, Dec. 1967	1000	--		63	12	70	--	134	0	149	66	--	1.9	.13	456	.62	1230	206	96	2.1	735	7.7

a Less than 0.4 milligrams per liter.

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4625. RIO GRANDE AT ROMA, TEX.																						
Period, Mar. 4 - Sept. 5, 1930																						
Maximum, Apr. 8, 1930	--			99	28	141		144	0	246	210		--	--	864	1.18	--	363	245	3.2	1260	--
Minimum, Sept. 5	--			63	13	61		144	0	123	70		--	--	400	.54	--	211	93	1.8	640	--
Water Year 1931																						
Maximum, Mar. 4, 1931	3110			111	30	138		168	0	257	210		--	--	895	1.22	7520	401	264	3.0	1250	--
Minimum, Oct. 6, 1930	--			51	6.1	76		120	0	96	84		--	--	355	.48	--	152	54	2.7	570	--
Water Year 1932																						
Maximum, Feb. 11, 1932	2520			114	29	214		171	0	317	284		--	--	1100	1.50	7480	405	265	4.6	1700	--
Minimum, May 5	2950			42	11	76		171	0	91	57		--	--	356	.48	2840	150	10	2.7	510	--
Water Year 1933																						
Maximum, Jan. 6, 1933	5940			130	33	220		195	0	323	312		--	--	1120	1.52	18000	459	299	4.5	1840	--
Minimum, Sept. 2	5400	15		72	18	98		168	0	176	112		3.7	--	636	.86	9270	252	115	2.7	940	--
Water Year 1943																						
Maximum, Nov. 20-27, 1942	4970			156	44	245		154	0	483	335		1.5	--	1360	1.85	18200	570	444	4.5	2130	--
Minimum, Nov. 11-13	5900			62	14	62		143	0	106	82		3.8	--	444	.60	7070	212	95	1.9	707	--
Water Year 1944																						
Maximum, Apr. 1944	1540			91	37	223		131	0	323	310		--	0.26	1120	1.52	4660	378	272	5.0	1780	8.0
Minimum, Aug.	14200			50	8.1	48		121	0	86	51		1.9	.12	338	.46	13000	158	58	1.7	542	7.9
Water Year 1945																						
Maximum, Jan. 1945	2760			92	34	203		134	0	307	274		2.5	.20	1040	1.41	7750	367	258	4.6	1650	7.7
Feb.	2590			93	33	200		148	0	302	262		1.9	.15	1040	1.41	7270	366	244	4.5	1620	7.9
Minimum, Oct. 1944	6490			80	17	102		165	0	178	122		2.5	.08	632	.86	11100	268	134	2.7	994	7.9
Water Year 1946																						
Maximum, Mar. 1946	1720			97	41	262		125	0	369	357		.6	.24	1300	1.77	6040	414	311	5.6	2010	7.8
Minimum, June	7320			50	10	55		124	0	90	67		3.7	.11	382	.52	7550	168	66	1.8	607	7.9
Water Year 1947																						
Maximum, Apr. 1947	1400			78	31	171		120	0	266	236		5.6	.22	875	1.19	3310	323	225	4.1	1460	7.8
Minimum, Aug.	7930			50	8.8	52		120	0	106	49		3.7	.11	368	.50	7880	160	62	1.8	570	7.9
Water Year 1948																						
Maximum, Feb. 1948	1860			78	29	159		143	0	260	197		2.5	.17	868	1.18	4360	312	194	3.9	1350	7.9
Minimum, June	11500			41	7.4	32		112	0	62	32		6.2	--	265	.36	8230	132	40	1.2	400	--
Sept.	13800			42	6.8	31		112	0	62	34		2.5	--	265	.36	9870	133	42	1.2	404	--
Water Year 1949																						
Maximum, Jan. 1949	1950			82	30	145		153	0	247	191		3.7	.22	846	1.15	4450	327	202	3.5	1330	7.8
Minimum, Apr.	14400			41	7.7	53		102	0	89	55		3.7	.13	331	.45	12900	135	52	2.0	535	7.9
Water Year 1950																						
Maximum, Feb. 1950	2460			69	24	126		134	0	205	154		5.6	.15	728	.99	4840	272	162	3.3	1120	7.9
Minimum, Oct. 1949	5650			69	13	76		151	0	142	87		5.6	.15	507	.69	7730	226	103	2.2	809	7.7

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4625. RIO GRANDE AT ROMA, TEX.--Continued																						
Water Year 1951																						
Maximum, Feb. 1951	1490			79	30	165		134	0	261	216		2.5	0.18	875	1.19	3520	322	212	4.0	1400	7.9
Minimum, June	4970			59	13	42		143	0	98	48		6.8	.09	397	.54	5330	202	84	1.3	578	7.8
Water Year 1952																						
Maximum, Apr. 1952	704			80	33	171		146	0	265	223		1.2	.13	919	1.25	1750	336	216	4.1	1450	7.8
Minimum, Oct. 1951	2340			60	12	63		142	0	119	71		3.7	.13	441	.60	2790	198	82	1.9	689	7.8
June 1952	1960			74	9.7	47		138	0	158	38		--	--	441	.60	2330	224	110	1.4	650	--
Water Year 1953																						
Maximum, Feb. 1953	607			82	34	156		159	0	255	209		1.9	.23	868	1.18	1420	346	216	3.7	1360	7.8
Minimum, Sept	4390			51	6.7	20		131	0	52	21		9.3	.08	243	.33	2880	156	48	.7	376	7.9
Water Year 1954																						
Maximum, May 1954	4940			73	13	75		162	0	134	92		2.5	.19	537	.73	7160	236	103	2.1	803	8.0
Minimum, Oct. 1953	3070			52	5.5	23		128	0	56	25		7.4	.06	265	.36	2200	152	47	.8	405	7.9
Period, Oct. 1, 1954 - Jan. 31, 1955																						
Maximum, Jan. 1955	--			71	11	48		171	0	102	58		1.9	.12	412	.56	--	220	80	1.4	646	8.1
Minimum, Dec. 1954	1730			45	11	46		98	0	89	67		--	.05	324	.44	1510	158	78	1.6	525	8.3

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4647. RIO GRANDE AT FORT RINGGOLD, RIO GRANDE CITY, TEX.																						
Period, Jan. 1 - Sept. 30, 1959																						
Maximum, Aug. 1959	2130			72	16	86		146	0	169	99		1.9	0.21	553	0.75	3180	246	126	2.4	876	8.1
Minimum, Feb.	6560			62	15	45		160	0	113	45		5.0	.07	399	.54	7070	215	84	1.3	621	8.0
Water Year 1960																						
Maximum, Nov. 1959	862			74	18	109		140	0	191	131		1.2	.21	633	.86	1470	262	146	2.9	1010	8.1
Minimum, Sept. 1960	1220			65	13	83		136	0	155	91		3.7	.23	503	.68	1660	216	104	2.5	818	7.8
Water Year 1961																						
Maximum, Dec. 1960	587			71	22	137		163	0	225	142		.6	.26	725	.99	1150	267	134	3.7	1150	7.9
Minimum, Sept. 1961	4100			61	15	80		123	0	156	87		.6	.20	488	.66	5400	211	110	2.4	796	7.8
Water Year 1962																						
Maximum, July 1962	1170	12		68	19	119	5.1	138	0	208	129	0.8	.6	.27	661	.90	2090	246	132	3.3	1040	7.8
Minimum, Sept.	1550			70	4.9	78		146	0	130	78		1.9	.10	476	.65	1990	196	76	2.5	729	7.7
Water Year 1963																						
Maximum, Aug. 1963	2100			70	18	118		139	0	206	128		.6	.27	680	.92	3860	252	138	3.2	1030	7.8
Minimum, Sept.	863			67	15	107		135	0	177	122		.6	.21	606	.82	1410	229	118	3.1	955	7.9
Water Year 1964																						
Maximum, Feb. 1964	769			72	19	123		149	0	222	132		.6	.23	681	.93	1410	255	133	3.4	1090	7.8
Minimum, Sept.	1910			64	9.2	78		134	0	143	80		1.2	.24	459	.62	2370	197	87	2.4	748	7.9
Water Year 1965																						
Maximum, Aug. 1965	1490			60	14	82		143	0	135	96		1.2	.06	507	.69	2040	206	88	2.5	802	7.8
Minimum, Oct. 1964	2510			55	8.5	51		140	0	96	55		1.9	.16	361	.49	2450	173	58	1.7	585	7.8
Water Year 1966																						
Maximum, Mar. 1966	821			70	17	112		153	0	183	125		.6	.22	629	.86	1390	244	120	3.1	995	7.9
Minimum, Aug.	3850			62	13	75		156	0	117	84		.6	.18	444	.60	4620	206	78	2.3	758	7.9
Water Year 1967																						
Maximum, June 1967	3180			73	17	110		159	0	205	113		.6	.08	645	.88	5540	252	122	3.0	988	7.6
Minimum, Sept.	45600			54	5.6	34		128	0	73	39		3.7	.12	276	.38	34000	158	52	1.2	473	7.8
Water Year 1968																						
Maximum, Sept. 1968	--			78	20	109		126	0	223	129		2.5	.26	681	.93	--	276	174	2.9	1050	8.0
Minimum, Oct. 1967	13400			69	11	61		156	0	125	71		5.0	.14	447	.61	16200	216	88	1.8	717	7.9

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4655. RIO GRANDE AT RIO GRANDE CITY, TEX.																						
Period, Feb. 3 - Sept. 13, 1933																						
Maximum, Apr. 6, 1933	6120			99	37	197		189	0	292	263		6.8	--	1040	1.41	17200	401	246	4.3	1580	--
Minimum, Sept. 13	20500			73	19	37		186	0	105	49		8.7	--	420	.57	23200	259	106	1.0	620	--
Water Year 1934																						
Maximum, June 1934	4640			133	59	209		168	0	172	495		44	0.27	1400	1.90	17500	574	436	3.8	2180	--
Minimum, Oct. 3, 1933	43800			54	8.0	29		171	0	35	30		3.1	--	396	.54	46800	167	27	1.0	430	--
Water Year 1935																						
Maximum, Mar. 1935	2160			98	39	171		157	0	341	219		2.5	.25	1030	1.40	5980	406	278	3.7	1550	8.1
Minimum, Sept	29600			74	15	40		176	0	104	50		3.1	.09	382	.52	30500	247	102	1.1	637	7.6
Water Year 1936																						
Maximum, Feb. 1936	3090			100	34	139		193	0	267	182		8.7	.17	882	1.20	7360	388	230	3.1	1340	8.0
Minimum, Sept	20400			39	12	37		115	0	73	35		1.9	.12	338	.46	18600	147	53	1.3	506	8.4
Water Year 1937																						
Maximum, Apr. 1937	1990			95	38	190		142	0	309	254		1.9	--	1030	1.40	5530	392	276	4.2	1630	7.8
Minimum, Oct. 1936	10800			58	19	86		104	0	168	99		--	--	441	.60	12900	222	138	2.5	797	8.3
Water Year 1938																						
Maximum, Mar. 1938	2940			100	37	203		134	0	334	271		1.9	.20	1100	1.49	8730	402	292	4.4	1700	7.9
Minimum, Sept	25600			57	10	43		151	0	84	36		6.8	.13	346	.47	23900	185	62	1.4	538	7.8
Water Year 1939																						
Maximum, Jan. 1939	3230			96	30	158		165	0	246	206		1.2	.18	897	1.22	7820	364	229	3.6	1380	8.2
Minimum, Sept	4770			66	13	74		138	0	134	80		2.5	.13	471	.64	6070	220	106	2.2	747	8.0
Water Year 1940																						
Maximum, Jan. 1940	2440			96	34	180		175	0	268	232		2.5	--	963	1.31	6340	380	237	4.0	1510	8.0
Minimum, June	11000			51	6.9	46		118	0	88	43		2.5	.13	324	.44	9620	154	58	1.6	525	8.3
Water Year 1941																						
Maximum, July 1941	9250			137	27	157		149	0	357	214		8.7	.15	1060	1.44	26500	452	330	3.2	1570	7.8
Minimum, Oct. 1940	7670			55	9.6	61		132	0	109	57		1.9	.15	382	.52	7910	176	68	2.0	619	7.8
Water Year 1942																						
Maximum, Dec. 1941	6190			179	63	344		154	0	580	514		3.1	.25	1900	2.59	31800	705	579	5.6	2820	7.8
Minimum, Sept. 1942	30600			61	9.5	58		149	0	110	60		3.1	.11	419	.57	34600	192	70	1.8	656	7.8
Water Year 1943																						
Maximum, Feb. 1943	3380			121	42	230		131	0	413	313		3.1	.25	1270	1.73	11600	474	368	4.6	1940	7.9
Minimum, Oct. 1942	15600			76	14	78		158	0	158	90		3.1	.13	551	.75	23200	247	118	2.2	850	7.8
Water Year 1944																						
Maximum, Apr. 1944	1640			89	38	227		124	0	313	314		--	.22	1120	1.53	4960	376	274	5.1	1790	8.2
Minimum, Aug	20600			49	7.9	47		118	0	94	45		1.9	.11	338	.46	18800	156	60	1.6	527	7.8

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4655. RIO GRANDE AT RIO GRANDE CITY, TEX.--Continued																						
Water Year 1945																						
Maximum, Dec. 1944	2950			100	32	191		174	0	282	256		1.9	0.20	1010	1.38	8040	380	238	4.3	1590	7.9
Minimum, Oct.	12300			73	14	75		160	0	143	86		1.9	.12	515	.70	17100	242	110	2.1	815	7.9
Water Year 1946																						
Maximum, Mar. 1946	1870			98	41	257		123	0	366	349		4.3	.25	1250	1.70	6310	415	314	5.5	1960	7.9
Minimum, June	7600			51	8.9	59		126	0	95	68		5.6	.09	397	.54	8150	163	60	2.0	621	7.9
Period, Oct. 1, 1946 - June 30, 1947																						
Maximum, Apr. 1947	1550			78	29	174		123	0	260	233		6.2	.28	971	1.32	4060	312	211	4.3	1440	7.9
Minimum, June	6470			51	11	62		113	0	100	74		3.7	.09	412	.56	7200	172	78	2.1	640	8.1
8-4692. RIO GRANDE BELOW ANZALDUAS DAM, TEX.																						
Period, Mar. 1 - Sept. 30, 1959																						
Maximum, Aug. 1959	15	--		80	12	143	--	138	0	206	194	--	0.6	0.34	765	1.04	31.0	286	173	3.7	1230	8.0
Minimum, Mar.	3830	21		73	13	71	5.1	154	0	134	87	0.6	3.7	.15	520	.71	5380	234	108	2.0	796	7.8
Water Year 1960																						
Maximum, Mar. 1960	912	--		119	36	274	--	181	0	324	394	--	.6	.62	1290	1.75	3180	442	294	5.7	2090	7.9
Minimum, Jan.	2140	8		63	22	98	5.9	137	0	185	117	.6	.6	.17	613	.83	3540	250	138	2.7	960	8.0
Water Year 1961																						
Maximum, Nov. 1960	679	--		116	34	272	--	183	0	317	394	--	a	.67	1310	1.78	2400	430	280	5.7	2080	8.0
Minimum, Sept. 1961	2990	--		67	20	120	--	128	0	180	153	--	a	.32	632	.86	5100	249	144	3.3	1040	8.0
Water Year 1962																						
Maximum, July 1962	974	16		100	33	283	5.5	151	0	336	383	.8	.6	.64	1280	1.74	3370	383	260	6.3	2060	7.9
Minimum, Jan.	2060	13		72	18	111	4.7	137	0	195	131	.8	--	.17	633	.86	3520	255	142	3.0	1020	7.8
Water Year 1963																						
Maximum, July 1963	653	14		99	29	234	6.6	151	0	304	311	1.0	3.1	.49	1110	1.51	1960	369	245	5.3	1760	7.8
Minimum, June	3050	--		83	17	121	--	156	0	203	145	--	a	.22	662	.90	5450	275	147	3.2	1080	8.0
Water Year 1964																						
Maximum, Aug. 1964	671	--		81	27	209	--	131	0	298	255	--	a	.35	990	1.35	1790	315	208	5.1	1570	8.1
Minimum, May	1630	--		74	17	119	--	146	0	203	135	--	.6	.07	663	.90	2920	256	136	3.2	1060	7.8
Water Year 1965																						
Maximum, Mar. 1965	1100	--		81	19	163	--	165	0	191	218	--	.6	.41	790	1.07	2350	280	145	4.2	1280	7.8
Minimum, Oct. 1964	1660	--		54	10	74	--	128	0	111	85	--	1.2	.19	442	.60	1980	177	72	2.4	715	7.8
Water Year 1966																						
Maximum, Feb. 1966	909	--		93	25	218	--	159	0	261	291	--	a	.55	1040	1.41	2550	336	206	5.2	1670	7.8
Minimum, Sept.	8500	--		61	15	93	--	134	0	156	106	--	.6	.17	535	.73	12300	216	106	2.8	861	8.1
Water Year 1967																						
Maximum, Oct. 1966	899	--		91	26	244	--	156	0	288	322	--	.6	.65	1100	1.50	2670	333	206	5.8	1770	7.8
Minimum, Sept. 1967	31300	--		53	6.1	40	--	131	0	81	41	--	1.9	.22	295	.40	24900	156	49	1.4	501	8.0
Water Year 1968																						
Maximum, Nov. 1967	3880	--		119	27	219	--	186	0	268	324	--	5.0	.48	1130	1.54	11800	406	254	4.7	1800	7.7
Minimum, Oct.	17000	--		74	11	84	--	159	0	134	106	--	5.6	.18	534	.73	24500	230	100	2.4	869	7.8

a Less than 0.4 milligram per liter

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
RIO GRANDE AT MISSION PUMPING PLANT, NEAR MISSION, TEX.																						
Water Year 1947																						
Maximum, May 9-11, 1947		--		167	62	225		110	0	669	265		1.8		1440	--		672	582	3.8	2170	--
Minimum, June 21-30		--		54	10	35		124	0	74	50		4.0		333	--		176	74	1.1	522	--
Water Year 1948																						
Maximum, Mar. 11-20, 1948		31		96	34	181		165	0	304	225		4.0		956	1.30		380	244	4.0	1550	--
Minimum, June 28-30		20		33	3.1	35		134	0	29	19		4.2		209	.28		95	0	1.6	319	--
Water Year 1949																						
Maximum, Feb. 20-25, 1949		21		98	32	205		178	0	295	258		4.8		1000	1.36		376	230	4.6	1640	--
Minimum, Mar 1-5		13		46	8.5	44		112	0	73	53		4.2	0.48	315	.43		150	58	1.6	501	8.0
Water Year 1950																						
Maximum, May 1-13, 1950		22		86	37	249		143	0	290	345		2.8		1100	1.50		366	250	5.7	1870	7.6
Minimum, May 28-31		13		52	13	66		124	0	114	73		4.4		396	.54		183	82	2.1	678	7.9
8-4720. RIO GRANDE AT BUENOS AIRES, TAMAULIPAS																						
Period, May - Sept. 1943																						
Maximum, May 1943	2890			82	28	161		115	0	254	224		2.5	.20	875	1.19	6830	321	226	3.9	1390	7.9
Minimum, June	5100			65	15	91		124	0	153	114		2.5	.12	551	.75	7590	224	122	2.6	879	8.1
Period, Oct. 1943 - Aug. 1944																						
Maximum, Apr. 1944	771			90	35	218		131	0	319	296		--	.23	1100	1.49	2290	368	261	4.9	1740	8.0
Minimum, Aug	12200			55	9.7	51		137	0	100	49		1.9	.09	375	.51	12400	176	64	1.7	580	7.9
8-4730. RIO GRANDE AT LAS PALMAS, TAMAULIPAS																						
Period, Nov. 1945 - Sept. 1946																						
Maximum, Mar. 1946	1030			108	38	229		170	0	342	309		1.9	.21	1200	1.63	3340	426	288	4.8	1900	7.9
Minimum, June	7240			52	7.8	52		131	0	85	57		4.3	.10	360	.49	7040	160	54	1.8	574	7.9
Water Year 1947																						
Maximum, Apr. 1947	970			74	27	170		113	0	251	224		3.7	.26	882	1.20	2310	296	203	4.3	1390	7.8
Minimum, Aug	7590			50	9.1	51		119	0	102	51		3.1	.13	360	.49	7380	162	64	1.7	568	7.8
Water Year 1948																						
Maximum, Feb. 1948	1740			83	28	160		154	0	255	203		2.5	.20	875	1.19	4110	323	196	3.9	1380	8.1
Minimum, Sept	13100			49	8.6	46		122	0	88	44		3.7	.19	324	.44	11500	157	57	1.6	537	8.0

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4737. RIO GRANDE NEAR SAN BENITO, TEX.																						
Water Year 1938																						
Maximum, May 13, 1938..........				104	29	158		119	0	283	234		--		--			381	--	3.5	--	
Minimum, July 28...............				52	8.9	21		146	0	45	30		4.7		--			168	--	.7	--	
Water Year 1939																						
Maximum, May 6, 1939...........				176	49	242		146	0	599	300		--		1440			640	--	1.5	--	
Minimum, May 16................				59	9.2	46		134	0	74	70		--		324			186	--	1.5	--	
Water Year 1942																						
Maximum, Feb. 27, 1942.........				188	72	356		162	0	625	535		1.0		1860			765	632	5.6	2950	
Minimum, May 3.................				110	43	258		184	0	365	340		1.2		1210			452	300	5.3	1940	
Water Year 1943																						
Maximum, May 16-17, 1943.......				241	91	391		142	0	1030	450		4.0		2280			976	860	5.4	3240	
Minimum, May 28-31.............				58	15	67		126	0	123	83		3.0		411			206	102	2.0	734	

Table 7.--Summary of chemical analyses of Texas streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4750. RIO GRANDE AT BROWNSVILLE, TEX.																						
Period, Jan. - Sept. 1934																						
Maximum, July 1934	938			133	44	211		141	0	490	247		3.1	--	1300	1.77	3290	515	400	4.1	1870	--
Minimum, Sept.	838			--	--	--		--	--	--	--		--	--	574	.78	1300	--	--	--	--	--
Water Year 1935																						
Maximum, Mar. 1935	483			100	36	161		178	0	304	210		5.6	0.22	985	1.34	1280	400	254	3.5	1520	7.8
Minimum, June	19500			63	9.7	35		178	0	73	32		8.7	--	338	.46	17800	198	52	1.1	532	7.7
Water Year 1936																						
Maximum, Mar. 1936	2360			100	29	140		176	0	262	181		6.8	.22	897	1.22	5720	371	226	3.2	1360	7.9
Minimum, July	9550			31	12	50		76	0	100	52		.6	--	419	.57	10800	130	67	1.9	651	8.6
Period, Oct. - May 1937																						
Maximum, May 1937	1790			111	36	184		145	0	350	231		.0	--	1040	1.42	5030	424	306	3.9	1620	7.8
Minimum, Oct. 1936	9540			40	11	56		82	0	114	57		.6	.12	441	.60	11400	145	78	2.0	694	8.6
Water Year 1943																						
Maximum, May 21-28, 1943	--			171	61	273		220	0	584	340		3.5	--	--	--	--	678	498	4.6	2420	--
Minimum, May 29-31	--			59	16	78		135	0	135	91		4.0	--	--	--	--	213	102	2.0	795	--
Water Year 1944																						
Maximum, Jan. 11-20, 1944	--			98	33	206		168	0	308	260		3.8	--	--	--	--	380	242	4.6	1650	--
Minimum, Nov. 15-18, 1943	--			54	16	75		124	0	126	92		1.2	--	--	--	--	201	100	2.3	722	--

Table 8.--Summary of chemical analyses at selected sites on the Rio Grande in New Mexico

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-3625. RIO GRANDE BELOW CABALLO DAM, NEW MEXICO																						
Period, Jan. 1 - Sept. 30, 1939																						
Maximum, Apr. 1939	1780			69	14	83		154	0	187	60		0.6	0.11	537	0.73	--	231	104	2.4	814	7.9
Minimum, Jan.	3.3			64	15	70		141	0	180	41		.6	.11	478	.65	--	221	106	2.0	722	8.0
Water Year 1940																						
Maximum, Jan. 1940	2.3			86	20	158		315	0	237	113		2.5	.21	809	1.10	5.02	297	38	4.0	1260	8.3
Minimum, Oct. 1939	314			66	14	91		170	0	181	54		--	.14	522	.71	442	224	84	2.6	796	7.9
Water Year 1941																						
Maximum, Jan. 1941	1.5			73	20	173		302	0	215	117		.6	.24	779	1.06	3.15	263	16	4.6	1260	7.9
Minimum, Aug.	1800			62	12	89		155	0	183	50		1.9	.21	507	.69	2460	205	78	2.7	773	7.8
Water Year 1942																						
Maximum, Nov. 1941	95.1			60	11	72		157	0	155	48		1.2	.09	449	.61	115	196	68	2.2	707	7.3
Minimum, Aug. 1942	2910			54	11	52		145	0	128	30		.6	.07	375	.51	2950	178	60	1.7	590	7.7
Water Year 1943																						
Maximum, Jan. 1943	79			63	13	71		182	0	149	48		.6	.08	471	.64	100	212	62	2.1	733	7.8
Minimum, Mar.	2010			59	11	57		164	0	126	38		.6	.13	404	.55	2190	193	58	1.8	637	8.1
Apr.	1550			61	11	58		164	0	133	39		.6	.09	404	.55	1690	198	63	1.8	647	8.0
May	2330			60	11	56		164	0	129	39		.6	.08	404	.55	2540	194	60	1.7	639	7.9
Water Year 1944																						
Maximum, Jan. 1944	5.0			68	20	133		298	0	179	85		.6	.22	669	.91	9.03	251	6	3.6	1060	8.0
Minimum, Nov. 1943	202			62	12	60		172	0	131	43		--	.14	426	.58	232	202	61	1.8	645	8.0
Mar. 1944	1450			59	12	66		160	0	145	43		--	.12	426	.58	1670	196	66	2.1	688	7.7
Water Year 1945																						
Maximum, Nov. 1944	4.7			68	20	140		299	0	175	93		--	.17	669	.91	8.49	250	5	3.8	1080	8.2
Minimum, Oct.	261			56	10	57		153	0	120	45		.6	.10	404	.55	285	183	58	1.8	617	8.1
Water Year 1946																						
Maximum, Jan. 1946	4.1			69	22	159		326	0	192	105		.6	.16	735	1.00	8.14	262	0	4.3	1180	8.0
Minimum, Mar.	1340			62	13	71		174	0	148	48		--	.05	463	.63	1680	206	64	2.2	721	7.9
Apr.	1990			63	13	69		170	0	149	46		--	.12	463	.63	2490	210	70	2.1	724	8.0
May	1580			62	13	70		177	0	147	48		--	.15	463	.63	1980	208	64	2.1	727	7.9
Water Year 1947																						
Maximum, Jan. 1947	10			66	18	106		237	0	172	69		.6	.10	581	.79	15.7	238	43	3.0	918	7.9
Minimum, Oct. 1946	177			63	13	78		181	0	152	58		.6	.12	500	.68	239	212	64	2.3	765	8.1
Water Year 1948																						
Maximum, Oct. 1947	1.8			72	28	231		423	0	225	159		.6	.24	971	1.32	4.72	294	0	5.9	1540	7.7
Minimum, Aug. 1948	2360			57	11	61		171	0	123	43		.6	.14	441	.60	2810	188	48	1.9	645	7.8
Water Year 1949																						
Maximum, Oct. 1948	120			86	26	203		427	0	210	138		4.3	.18	912	1.24	295	322	0	4.9	1440	8.1
Minimum, Sept. 1949	532			58	11	59		169	0	115	46		1.2	.10	419	.57	602	190	52	1.9	630	8.0
Water Year 1950																						
Maximum, Dec. 1949	39			63	18	116		287	0	147	72		.6	.15	603	.82	63.5	230	0	3.3	941	8.0
Minimum, July 1950	1590			60	12	60		178	0	127	42		--	.11	426	.58	1830	196	50	1.9	654	7.9

Table 8.--Summary of chemical analyses at selected sites on the Rio Grande in New Mexico--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-3635. RIO GRANDE AT LEASBURG DAM, NEW MEXICO																						
Period, Jan. - Sept. 1939																						
Maximum, Jan. 1939				119	22	140		208	0	294	126		0.6	0.18	868	1.18		386	215	3.1	1300	8.2
Minimum, July				63	15	83		164	0	178	51		--	.12	522	.71		216	82	2.5	801	8.1
Water Year 1940																						
Maximum, Jan. 1940				108	19	286		278	0	266	360		.6	.28	1260	1.71		346	118	6.7	2090	8.0
Minimum, Apr				75	17	98		173	0	219	69		--	.15	618	.84		257	115	2.7	932	8.0
June				75	17	100		177	0	222	67		.6	.18	618	.84		258	113	2.7	941	8.3
Water Year 1941																						
Maximum, Dec. 1940				117	24	155		228	0	329	133		.6	.19	949	1.29		388	202	3.4	1380	7.9
Minimum, Sept. 1941				64	13	77		155	0	168	55		1.9	.16	507	.69		213	86	2.3	761	7.9
Water Year 1942																						
Maximum, Jan. 1942				96	18	129		220	0	241	117		.6	--	772	1.05		314	134	3.2	1160	7.8
Minimum, July				59	11	58		150	0	144	34		.6	.07	419	.57		191	68	1.8	647	7.8
Aug				58	11	56		157	0	138	36		.6	.06	419	.57		190	61	1.8	636	7.9
Sept				59	11	59		160	0	137	38		.6	.10	419	.57		193	62	1.8	644	8.0
Water Year 1943																						
Maximum, Jan. 1943				99	19	110		228	0	248	89		.6	.13	743	1.01		326	138	2.7	1100	7.8
Minimum, July				62	11	64		167	0	139	48		1.9	.09	441	.60		200	64	2.0	696	8.0
Water Year 1944																						
Maximum, Jan. 1944				102	19	131		229	0	266	118		.6	.17	816	1.11		333	146	3.1	1220	7.9
Minimum, Mar				66	13	73		178	0	158	51		--	.14	485	.66		221	76	2.1	749	7.8
Apr				67	13	74		178	0	161	50		--	.13	485	.66		221	76	2.2	758	7.8
Water Year 1945																						
Maximum, Jan. 1945				100	21	134		217	0	297	110		.6	.20	831	1.13		338	160	3.2	1230	7.8
Minimum, Mar				67	13	73		179	0	159	50		--	.08	485	.66		220	73	2.1	752	7.8
Water Year 1946																						
Maximum, Jan. 1946				108	21	130		242	0	288	106		.6	.16	838	1.14		357	158	3.0	1240	7.8
Minimum, Mar				65	13	74		176	0	159	52		--	.18	485	.66		212	70	2.2	755	8.2
May				63	13	75		172	0	162	52		--	.12	485	.66		214	70	2.2	768	7.9
Water Year 1947																						
Maximum, Jan. 1947				109	23	138		245	0	303	111		.6	.08	875	1.19		366	164	3.1	1290	7.8
Minimum, Apr				67	15	88		181	0	185	62		--	.04	559	.76		228	80	2.5	837	7.9
June				65	16	89		174	0	193	64		.6	.16	559	.76		228	84	2.6	861	7.9
Water Year 1948																						
Maximum, Feb. 1948				107	24	147		223	0	330	129		1.2	.16	919	1.25		366	184	3.3	1350	7.9
Minimum, Sept				66	14	74		180	0	159	63		1.9	.11	507	.69		224	76	2.1	752	7.9

Table 8.--Summary of chemical analyses at selected sites on the Rio Grande in New Mexico--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-3635. RIO GRANDE AT LEASBURG DAM, NEW MEXICO--Continued																						
Water Year 1949																						
Maximum, Feb. 1949				88	23	135		166	0	308	116		--	0.17	868	1.18		316	180	3.3	1210	7.8
Minimum, June				50	13	71		149	0	146	48		1.9	.12	449	.61		178	55	2.3	687	7.6
July				52	13	71		150	0	144	47		2.5	.12	449	.61		182	58	2.3	687	8.2
Water Year 1950																						
Maximum, Jan. 1950				100	24	137		214	0	308	113		.6	.19	868	1.18		348	173	3.2	1270	8.1
Minimum, July				60	11	68		159	0	144	44		2.5	.12	463	.63		194	63	2.1	684	8.2

Table 9.--Summary of chemical analyses at selected sites on Mexican streams in the Rio Grande basin.

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-3725. RIO CONCHOS AT CUCHILLO PARADO, CHIHUAHUA																						
Period, Jan. - Sept. 1946																						
Maximum, Aug. 1946				95	12	90		120	0	306	50		1.9	0.15	691	0.94		288	190	2.3	953	7.7
Minimum, Sept.				52	6.2	39		141	0	103	12		2.5	.10	331	.45		154	39	1.4	481	7.8
Water Year 1947																						
Maximum, July 1947				111	16	121		144	0	379	75		1.9	.21	860	1.17		342	224	2.8	1200	7.8
Minimum, Sept.				56	7.2	40		146	0	110	16		2.5	--	382	.52		168	48	1.3	502	7.9
Water Year 1948																						
Maximum, Apr. 1948				79	14	127		162	0	274	83		1.9	.19	735	1.00		257	124	3.4	1080	8.0
Minimum, Nov. 1947				79	13	69		188	0	204	30		1.9	.17	544	.74		249	95	1.9	784	7.8
Mar. 1948				74	24	74		180	0	194	35		1.9	.14	544	.74		285	138	1.9	775	7.9
Water Year 1949																						
Maximum, May 1949				101	12	100		113	0	349	54		1.9	.25	743	1.01		302	210	2.5	1040	7.8
June				78	15	122		135	0	317	64		1.9	.28	743	1.01		258	148	3.3	1060	7.8
Minimum, Feb.				61	9.6	57		164	0	148	27		1.9	.16	449	.61		191	56	1.8	640	7.9
Mar.				54	9.5	62		146	0	145	34		2.5	.10	449	.61		172	52	2.1	640	8.3
Water Year 1950																						
Maximum, Aug. 1950				124	10	66		129	0	335	30		4.3	.10	706	.96		352	246	1.5	946	7.9
Minimum, July				71	7.9	46		148	0	149	21		3.1	.08	441	.60		210	88	1.4	602	8.1
Water Year 1951																						
Maximum, Apr. 1951				72	15	116		147	0	270	61		3.1	.17	676	.92		240	120	3.3	981	7.9
Minimum, June				60	11	83		145	0	185	38		1.2	.22	522	.71		196	78	2.6	726	8.0
Water Year 1952																						
Maximum, Apr. 1952				--	--	173		162	0	--	131		--	--	985	1.34		314	182	4.2	1420	--
Minimum, July				88	11	44		149	0	213	25		3.7	.10	537	.73		266	144	1.2	722	7.8
Water Year 1953																						
Maximum, Apr. 1953				--	--	285		162	0	--	294		--	--	1270	1.73		374	242	6.4	1980	--
Minimum, Sept.				--	--	76		168	0	--	44		--	--	618	.84		284	146	2.0	871	--
Water Year 1954																						
Maximum, Apr. 1954				--	--	232		165	0	--	225		--	--	1260	1.71		428	293	4.9	1860	--
Minimum, Aug.				--	--	41		159	0	--	21		--	--	515	.70		288	158	1.0	720	--

Table 9.--Summary of chemical analyses at selected sites on Mexican streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Cal-cium (Ca)	Mag-ne-sium (Mg)	Sodium (Na)	Po-tas-sium (K)	Bi-car-bon-ate (HCO_3)	Car-bon-ate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluo-ride (F)	Ni-trate (NO_3)	Bo-ron (B)	Dissolved solids: Milli-grams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Cal-cium, Mag-ne-sium	Hardness as $CaCO_3$: Non-car-bon-ate	So-dium ad-sorp-tion ratio	Specific con-duct-ance (micro-mhos at 25°C)	pH
8-3730. RIO CONCHOS NEAR OJINAGA, CHIHUAHUA																						
Period, Feb. - Sept. 1935																						
Maximum, May 1935				88	18	159		156	0	310	142		--	0.31	866	1.18		294	166	4.0	1270	7.6
Minimum, Sept				38	3.9	21		115	0	50	6.7		4.3	.03	232	.32		110	16	.9	317	7.7
Water Year 1936																						
Maximum, May 16, 1936				112	19	119		161	0	335	93		--	.31	860	1.17		356	224	2.7	1210	7.8
Minimum, Oct. 31, 1935				70	10	43		166	0	154	17		--	.14	409	.56		216	80	1.3	596	7.8
Water Year 1937																						
Maximum, Aug. 15, 1937				104	18	143		197	0	299	110		.6	.24	904	1.23		334	172	3.4	1230	8.0
Minimum, June 12				48	8.8	49		131	0	96	40		.6	.11	353	.48		157	50	1.7	614	8.0
Water Year 1938																						
Maximum, May 1938				88	17	130		178	0	286	92		6.8	.18	765	1.04		290	145	3.3	1130	8.1
Minimum, Sept				44	6.9	36		129	0	61	27		1.9	.05	279	.38		140	34	1.3	424	7.8
Water Year 1939																						
Maximum, June 1939				96	16	105		157	0	294	66		.6	.16	757	1.03		306	177	2.6	1030	8.3
Minimum, Aug				70	9.4	54		154	0	146	25		--	--	426	.58		213	86	1.6	615	8.1
Water Year 1940																						
Maximum, Apr. 1940				81	17	124		176	0	272	80		.6	.26	713	.97		274	129	3.3	1060	8.3
Minimum, Aug				55	8.5	46		146	0	111	21		1.9	.13	360	.49		172	52	1.5	535	8.3
Water Year 1941																						
Maximum, Apr. and May 1941				141	11	71		140	0	373	36		1.9	.17	772	1.05		400	286	1.5	1020	7.8
Minimum, Sept				51	6.1	30		127	0	89	14		2.5	--	294	.40		153	49	1.1	432	7.8
Water Year 1942																						
Maximum, May 1942				100	17	124		175	0	317	87		.6	--	787	1.07		318	175	3.0	1160	7.9
Minimum, Sept				41	5.5	21		137	0	45	7.1		1.9	.08	235	.32		126	14	.8	335	7.9
Water Year 1943																						
Maximum, May 1943				85	14	98		167	0	241	65		.6	.20	669	.91		270	132	2.6	959	8.0
Minimum, Oct. 1942				59	7.4	38		164	0	99	16		1.2	.08	353	.48		177	42	1.2	514	7.8
Water Year 1944																						
Maximum, Jan. 1944				88	16	123		208	0	238	95		.6	.19	721	.98		286	116	3.2	1080	7.9
Minimum, Sept				56	6.9	45		127	0	117	30		1.9	.09	375	.51		167	63	1.5	542	7.9
Water Year 1945																						
Maximum, May 1945				102	17	134		180	0	319	104		--	.19	838	1.14		326	178	3.2	1220	8.1
Minimum, July				65	8.1	47		149	0	137	24		1.9	.05	412	.56		196	74	1.5	589	7.9
Water Year 1946																						
Maximum, Dec. 1945				95	15	113		218	0	265	71		1.9	.13	743	1.01		301	122	2.8	1070	7.7
Minimum, Oct				54	7.1	44		148	0	108	18		.6	.07	346	.47		164	44	1.5	514	7.9

Table 9.--Summary of chemical analyses at selected sites on Mexican streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-3730. RIO CONCHOS NEAR OJINAGA, CHIHUAHUA--Continued																						
Water Year 1947																						
Maximum, July 1947				112	18	131		153	0	374	96		1.2	0.26	890	1.21		354	228	3.0	1270	8.0
Minimum, Sept.				53	7.4	43		142	0	105	22		2.5	--	360	.49		162	46	1.5	507	7.8
Water Year 1948																						
Maximum, May 1948				91	16	122		151	0	320	74		.6	.20	787	1.07		290	166	3.1	1120	8.0
Minimum, Nov. 1947				80	13	72		184	0	204	37		1.2	.19	544	.74		250	100	2.0	807	7.8
Water Year 1949																						
Maximum, May 1949				128	15	119		156	0	402	74		1.2	.24	897	1.22		382	255	2.6	1240	7.9
Minimum, Mar.				57	7.7	63		153	0	148	32		1.9	.13	434	.59		173	48	2.1	652	8.0
Water Year 1950																						
Maximum, Aug. 1950				131	11	67		141	0	340	37		3.7	.14	713	.97		372	256	1.5	982	7.7
Minimum, Mar.				61	10	63		156	0	156	34		2.5	.11	441	.60		194	66	2.0	668	8.1
Water Year 1951																						
Maximum, Apr. 1951				82	16	126		184	0	284	71		1.2	.28	757	1.03		270	119	3.3	1070	7.9
Minimum, Mar.				61	13	84		153	0	187	48		1.9	.16	559	.76		204	78	2.6	787	7.9
Water Year 1952																						
Maximum, Apr. 1952				--	--	167		186	0	--	135		--	--	1000	1.36		376	224	3.7	1440	--
Minimum, July				82	10	44		141	0	180	27		6.8	.10	471	.64		246	130	1.2	666	7.7
Water Year 1953																						
Maximum, May 1953				--	--	185		146	0	--	204		--	--	1210	1.64		476	356	3.7	1760	--
Minimum, Sept.				--	--	87		183	0	--	60		--	--	699	.95		319	169	2.1	976	--
Water Year 1954																						
Maximum, June 1954				--	--	181		140	0	--	174		--	--	1190	1.62		470	354	3.6	1680	--
Minimum, Aug.				--	--	56		148	0	--	32		--	--	426	.58		198	76	1.7	624	--
Water Year 1955																						
Maximum, June 1955				--	--	236		156	0	--	238		--	--	1300	1.77		448	320	4.8	1910	--
Minimum, Aug.				--	--	52		165	0	--	46		--	--	544	.74		268	134	1.4	764	--
Water Year 1956																						
Maximum, Apr. 1956				--	--	202		196	0	--	156		--	--	1230	1.67		475	314	4.0	1730	--
Minimum, Oct. 1955				--	--	56		153	0	--	29		--	--	478	.65		229	104	1.6	683	--
Water Year 1957																						
Maximum, Dec. 1956				--	--	174		210	0	--	97		--	--	1060	1.44		383	210	3.9	1470	--
Minimum, Aug. 1957				--	--	105		171	0	--	55		--	--	750	1.02		317	177	2.6	1050	--
Water Year 1958																						
Maximum, July 1958				173	24	182		165	0	570	149		.6	.22	1290	1.75		528	394	3.4	1760	8.1
Minimum, Sept.				--	--	39		156	0	--	16		--	--	375	.51		194	66	1.2	553	--

Table 9.--Summary of chemical analyses at selected sites on Mexican streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

8-3730. RIO CONCHOS NEAR OJINAGA, CHIHUAHUA--Continued

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
Water Year 1959																						
Maximum, Mar. 1959.............						209		204	0		138				1300	1.77		475	308	4.2	1770	
Minimum, Oct. 1958.............						36		143	0		16				360	.49		194	76	1.1	544	
Water Year 1960																						
Maximum, Oct. 1959.............						197		171	0		119				1110	1.51		380	240	4.4	1560	
Minimum, Aug. 1960.............						58		169	0		31				485	.66		227	88	1.7	686	
Water Year 1961																						
Maximum, Apr. 1961.............						184		183	0		119				1040	1.41		353	203	4.3	1490	
Minimum, July..................				83	11	104		159	0	264	55		1.9	0.13	618	.84		252	122	2.8	946	7.9
Water Year 1962																						
Maximum, May 1962..............						219		168	0		140				1100	1.49		336	198	5.2	1620	
Minimum, Sept..................						90		134	0		38				654	.89		277	167	2.3	914	
Water Year 1963																						
Maximum, Mar. 1963.............						186		168	0		110				1030	1.40		334	196	4.4	1470	
Minimum, Sept..................						97		198	0		48				699	.95		291	129	2.5	957	
Water Year 1964																						
Maximum, Apr. 1964.............						203		201	0		118				1080	1.47		358	193	4.7	1540	
Minimum, Sept..................						118		186	0		59				713	.97		274	122	3.1	1020	
Water Year 1965																						
Maximum, May 1965..............						223		180	0		124				1120	1.52		332	184	5.3	1580	
Minimum, Sept..................						113		198	0		53				699	.95		258	96	3.1	1000	
Water Year 1966																						
Maximum, Apr. 1966.............						213		204	0		130				1150	1.57		384	216	4.7	1630	
Minimum, Sept..................						40		162	0		21				382	.52		194	62	1.2	567	

Table 9.--Summary of chemical analyses at selected sites on Mexican streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4555. RIO SAN DIEGO AT JIMENEZ, COAHUILA																						
Period, Jan. - Sept. 1951																						
Maximum, Apr. 1951				59	10	25		173	0	61	28		1.9	0.11	346	0.47		188	46	0.8	478	8.0
Minimum, Aug.				39	10	16		115	0	42	26		1.2	.07	235	.32		138	44	.6	328	8.3
Water Year 1952																						
Maximum, Feb. 1952				--	--	20		210	0	--	23		--	--	346	.47		228	56	.6	506	--
Minimum, Oct. 1951				55	12	20		168	0	45	30		2.5	.09	272	.37		186	49	.6	425	8.1
Dec.				56	9.8	15		165	0	46	21		2.5	.07	272	.37		181	46	.5	414	8.0
Water Year 1953																						
Maximum, Nov. 1952				--	--	22		200	0	--	28		--	--	375	.51		236	72	.6	538	--
Dec.				--	--	19		209	0	--	24		--	--	375	.51		236	64	.5	532	--
Minimum, Aug. 1953				--	--	13		174	0	--	12		--	--	272	.37		183	40	.4	402	7.8
Water Year 1954																						
Maximum, Nov. 1953				--	--	14		229	0	--	18		--	--	331	.45		224	36	.4	488	--
Dec.				--	--	13		212	0	--	18		--	--	331	.45		223	50	.4	474	--
Minimum, Aug. 1954				--	--	9.9		104	0	--	12		--	--	154	.21		124	40	.4	280	--
Water Year 1955																						
Maximum, July 1955				70	11	18		193	0	54	30		1.2	.10	338	.46		222	63	.5	505	8.0
Minimum, Oct. 1954				--	--	11		117	0	--	11		--	--	176	.24		122	27	.4	292	--
Water Year 1956																						
Maximum, Apr. 1956				--	--	17		223	0	--	23		--	--	331	.45		232	50	.5	515	--
Minimum, Oct. 1955				--	--	15		183	0	--	18		--	--	272	.37		189	39	.5	436	--
Dec.				--	--	14		192	0	--	19		--	--	272	.37		196	38	.4	441	--
Water Year 1957																						
Maximum, Nov. 1956				--	--	17		241	0	--	27		--	--	353	.48		252	55	.5	561	--
Minimum, Apr. 1957				--	--	4.8		145	0	--	8.9		--	--	169	.23		132	14	.2	276	--
Water Year 1958																						
Maximum, Aug. 1958				--	--	17		190	0	--	22		--	--	324	.44		220	64	.5	510	--
Minimum, July				57	6.1	9.9		160	0	41	8.9		.6	.05	243	.33		168	36	.3	373	7.8
Period, Mar. 1935 - Jan. 1936																						
Maximum, Mar. 13, 1935	39			92	13	42		216	0	116	49		2.5	.14	444	.60	46.8	283	106	1.1	669	7.4
Minimum, Oct. 28	434			67	8.3	6.0		196	0	29	17		3.2	.09	230	.31	270	202	40	.2	408	7.7
8-4570. RIO SAN RODRIGO NEAR EL MORAL, COAHUILA																						
Period, Feb. 1935 - Jan. 1936																						
Maximum, Apr. 17, 1935	6.8			68	7.7	19		237	0	32	19		0.6	.05	350	.48	6.43	201	7	.6	457	7.5
Minimum, May 17	2150			34	4.1	5.3		117	0	7.2	3.2		2.5	.07	109	.15	633	102	6	.2	197	7.4

Table 9.--Summary of chemical analyses at selected sites on Mexican streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4570. RIO SAN RODRIGO NEAR EL MORAL, COAHUILA--Continued																						
Period, Jan. - Sept. 1950																						
Maximum, Apr. 1950				59	16	21		195	0	49	24	4.3	0.10		331	0.45		212	52	0.6	481	8.0
Sept.				67	9.8	20		193	0	62	24	3.7	.05		331	.45		208	49	.6	503	8.0
Minimum, June				45	6.2	11		145	0	24	12	1.9	.03		199	.27		138	19	.4	312	7.8
Water Year 1951																						
Maximum, Dec. 1950				65	11	23		178	0	64	27	5.6	.14		331	.45		207	62	.7	494	7.9
Minimum, Feb. 1951				54	7.5	9.9		179	0	24	8.5	1.9	.05		228	.31		165	18	.3	351	7.8
Sept.				54	9.5	9.0		172	0	23	12	2.5	.08		228	.31		174	32	.3	347	8.0
Water Year 1952																						
Maximum, Mar. 1952				--	--	18		203	0	--	21	--	--		331	.45		226	59	.5	497	--
Minimum, May				--	--	6.7		159	0	--	8.9	--	--		199	.27		152	22	.2	305	--
Water Year 1953																						
Maximum, Jan. 1953				71	7.1	10		174	0	68	11	3.7	.03		301	.41		206	63	.3	442	8.1
Minimum, Mar				--	--	10		140	0	--	11	--	--		235	.32		163	48	.3	357	--
Water Year 1954																						
Maximum, Sept. 1954				--	--	32		101	0	--	43	--	--		331	.45		179	96	1.0	505	--
Minimum, June				--	--	5.1		113	0	--	5.3	--	--		154	.21		104	12	.2	228	--
Water Year 1955																						
Maximum, Jan. 1955				71	8.4	20		180	0	61	28	6.2	.09		338	.46		212	65	.6	508	8.2
Feb.				--	--	23		171	0	--	32	--	--		338	.46		212	72	.7	515	--
Minimum, Oct. 1954				--	--	6.7		115	0	--	7.1	--	--		147	.20		104	9.5	.3	225	--
Water Year 1956																						
Maximum, Feb. 1956				--	--	18		235	0	--	27	--	--		331	.45		236	43	.5	525	--
Minimum, Apr.				--	--	7.8		153	0	--	8.9	--	--		199	.27		155	30	.3	323	--
Water Year 1957																						
Maximum, Mar. 1957				--	--	10		177	0	--	12	--	--		235	.32		181	36	.3	385	--
Minimum, Apr.				--	--	3.9		134	0	--	5.3	--	--		169	.23		126	16	.2	260	--
Water Year 1958																						
Maximum, Oct. 1957				--	--	21		192	0	--	25	--	--		331	.45		215	58	.6	500	--
Minimum, June 1958				--	--	5.7		153	0	--	11	--	--		199	.27		146	21	.2	313	--
Aug.				--	--	8.3		143	0	--	11	--	--		199	.27		135	18	.3	307	--

Table 9.--Summary of chemical analyses at selected sites on Mexican streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4597. RIO SALADO AT LAS TORTILLAS, TAMAULIPAS																						
Water Year 1954																						
Maximum, Jan. 1954				156	42	199		125	0	478	282		1.9	0.41	1360	1.85		562	460	3.6	1960	7.8
Minimum, July				47	6.7	38		104	0	73	46		1.9	.14	294	.40		144	59	1.4	466	7.8
Water Year 1955																						
Maximum, July 1955				133	26	130		126	0	412	142		1.2	.49	985	1.34		438	336	2.7	1360	8.0
Minimum, Aug.				--	--	21		174	0	--	35		--	--	287	.39		184	42	.7	455	--
Water Year 1956																						
Maximum, Dec. 1955 and Jan. 1956				--	--	382		79	0	--	459		--	--	2220	3.02		826	761	5.8	3070	--
Minimum, Aug.				--	--	15		149	0	--	12		--	--	228	.31		158	36	.5	370	--
Water Year 1957																						
Maximum, Oct. 1956				--	--	53		119	0	--	62		--	--	397	.54		182	85	1.7	610	--
Minimum, Mar. 1957				--	--	25		104	0	--	32		--	--	235	.32		138	53	.9	372	--
Water Year 1958																						
Maximum, Mar. 1958				--	--	347		183	0	--	518		--	--	1810	2.46		470	320	7.0	2500	--
Minimum, Sept.				--	--	16		140	0	--	15		--	--	243	.33		162	48	.6	382	--
Water Year 1959																						
Maximum, May 1959				--	--	294		162	0	--	306		--	--	2030	2.76		839	706	4.4	2680	--
Minimum, Oct. 1958				--	--	17		159	0	--	21		--	--	257	.35		176	46	.6	426	--
Water Year 1960																						
Maximum, Apr. and May 1960				--	--	459		116	0	--	585		--	--	3720	5.06		1490	1400	5.2	4610	--
Minimum, Sept.				--	--	103		140	0	--	104		--	--	787	1.07		372	257	2.3	1160	--
Water Year 1961																						
Maximum, Apr. 1961				--	--	781		110	0	--	798		--	--	4950	6.73		1870	1780	7.9	5900	--
Minimum, Sept.				--	--	61		146	0	--	62		--	--	500	.68		256	136	1.7	787	--
Water Year 1962																						
Maximum, Jan. 1962				418	201	717		159	0	2220	680		36	2.07	4720	6.42		1870	1740	7.2	5620	7.8
Minimum, Sept.				--	--	56		161	0	--	57		--	--	456	.62		245	113	1.6	710	--
Water Year 1963																						
Maximum, Feb. 1963				--	--	810		134	0	--	835		--	--	5230	7.11		2000	1890	7.9	6130	--
Minimum, Apr.				--	--	22		165	0	--	18		--	--	265	.36		165	30	.7	400	--
Water Year 1964																						
Maximum, Jan. 1964				147	57	271		99	0	662	307		3.1	.51	1600	2.17		601	520	4.8	2250	7.6
Minimum, Aug.				--	--	17		165	0	--	7.1		--	--	176	.24		140	5	.6	290	--
Water Year 1965																						
Maximum, Aug. 1965				--	--	316		129	0	--	331		--	--	1990	2.71		744	638	5.0	2620	--
Minimum, Sept.				--	--	16		168	0	--	15		--	--	235	.32		161	24	.6	396	--
Water Year 1966																						
Maximum, Mar. 1966				--	--	401		98	0	--	441		--	--	2360	3.21		935	855	5.7	3240	--
Minimum, Apr.				--	--	37		134	0	--	35		--	--	309	.42		160	50	1.3	491	--

Table 9.--Summary of chemical analyses at selected sites on Mexican streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4600. RIO SALADO AT CIUDAD GUERRERO, TAMAULIPAS																						
Period, Mar. - Sept. 1935																						
Maximum, Mar. 7, 1935				287	93	403		132	0	1200	430		13	1.2	2720	3.70		1100	989	5.3	3460	7.3
Minimum, July 24				45	4.5	41		106	0	92	39		2.5	.11	313	.43		131	44	1.6	461	7.5
Water Year 1936																						
Maximum, Aug. 21, 1936				290	108	451		112	0	1400	429		1.2	1.35	3000	4.08		1170	1080	5.7	3600	7.7
Minimum, July 23				74	13	63		112	0	181	72		.6	.21	513	.70		239	148	1.8	755	7.7
Water Year 1937																						
Maximum, Apr. 15, 1937				356	125	504		134	0	1570	524		27	1.59	3400	4.63		1400	1290	5.8	4210	8.1
Minimum, Aug. 19				46	6.6	32		92	0	90	31		.6	.10	279	.38		141	66	1.2	449	8.4
Water Year 1938																						
Maximum, Feb. 1938				365	131	561		131	0	1650	585		18	1.73	3650	4.97		1450	1340	6.4	4570	7.8
Minimum, Sept.				63	10	37		113	0	109	41		4.3	.19	353	.48		199	106	1.1	562	7.7
Water Year 1939																						
Maximum, Mar. 1939				314	110	439		117	0	1300	534		2.5	.86	2850	3.87		1230	1140	5.4	3810	8.2
Minimum, Sept.				56	7.7	29		120	0	73	33		6.8	.15	288	.39		171	73	1.0	458	7.9
Water Year 1940																						
Maximum, May 1940				66	15	70		117	0	161	80		3.7	.22	500	.68		226	130	2.0	778	8.0
Minimum, Nov. 1939				38	7.2	25		126	0	40	22		3.7	.07	206	.28		124	20	1.0	353	7.9
Water Year 1941																						
Maximum, Mar. 1941				238	89	408		100	0	1040	498		.6	1.26	2520	3.43		962	880	5.7	3290	7.7
Minimum, June				58	7.1	32		132	0	77	35		2.5	.13	309	.42		172	64	1.1	493	8.0
Water Year 1942																						
Maximum, Apr. 1942				225	81	375		104	0	969	445		1.2	1.10	2300	3.13		894	809	5.4	3140	7.8
Minimum, June				48	7.8	36		109	0	86	37		1.9	.17	301	.41		151	62	1.3	476	7.4
Water Year 1943																						
Maximum, Apr. 1943				433	182	719		100	0	2190	741		--	2.09	4650	6.33		1830	1750	7.3	5550	7.8
Minimum, June				65	12	63		118	0	158	59		3.7	.25	463	.63		212	115	1.9	714	8.3
Water Year 1944																						
Maximum, Apr. 1944				375	147	599		106	0	1870	611		--	1.70	3930	5.35		1540	1450	6.6	4790	8.0
Minimum, Aug.				46	6.1	22		127	0	57	19		2.5	.11	243	.33		141	37	.8	383	7.7
Water Year 1945																						
Maximum, Aug. 1945				248	97	400		94	0	1230	390		.6	1.35	2590	3.52		1020	942	5.4	3310	7.7
Minimum, Oct. 1944				81	17	67		163	0	154	85		9.3	.18	529	.72		272	138	1.8	835	7.9
Water Year 1946																						
Maximum, Apr. 1946				298	126	501		113	0	1470	516		1.9	1.36	3230	4.39		1260	1170	6.1	4020	7.8
Minimum, Sept.				55	9.1	40		114	0	116	36		2.5	.20	353	.48		175	82	1.3	540	7.7

Table 9.--Summary of chemical analyses at selected sites on Mexican streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4600. RIO SALADO AT CIUDAD GUERRERO, TAMAULIPAS--Continued																						
Water Year 1947																						
Maximum, Apr. 1947				386	162	613		123	0	1950	602		1.9	1.88	4110	5.59		1630	1530	6.6	4960	7.7
Minimum, June				53	7.4	33		125	0	89	30		5.0	.14	324	.44		163	60	1.1	487	7.8
Water Year 1948																						
Maximum, Feb. 1948				302	128	458		142	0	1490	453		3.1	1.13	3160	4.30		1280	1160	5.6	3950	7.8
Minimum, Sept				49	7.7	28		107	0	87	28		3.7	.15	265	.36		154	67	1.0	455	7.8
Water Year 1949																						
Maximum, Mar. 1949				325	140	509		149	0	1590	528		9.9	1.54	3410	4.64		1390	1260	6.0	4300	7.6
Minimum, Apr				53	11	48		85	0	141	47		3.7	.17	382	.52		177	107	1.6	592	7.6
Water Year 1950																						
Maximum, Mar. 1950				375	164	572		133	0	1860	562		3.7	1.54	3810	5.18		1610	1500	6.2	4670	7.7
Minimum, June				71	13	57		124	0	173	53		6.8	.19	485	.66		232	130	1.6	727	7.8
Water Year 1951																						
Maximum, Mar. 1951				356	162	560		137	0	1790	564		3.1	1.45	3790	5.16		1560	1440	6.2	4620	7.8
Minimum, Sept				50	7.8	26		116	0	81	25		2.5	--	301	.41		158	62	.9	434	8.0
Water Year 1952																						
Maximum, Feb. 1952				--	--	198		132	0	--	234		--	--	1470	2.00		626	517	3.4	2020	--
Minimum, Oct. 1951				35	6.8	23		98	0	47	25		6.8	.10	221	.30		115	35	.9	344	7.9
Water Year 1953																						
Maximum, Apr. 1953				--	--	70		113	0	--	82		--	--	537	.73		253	160	1.9	818	--
Minimum, Aug				--	--	14		153	0	--	14		--	--	228	.31		170	44	.5	374	8.0

Table 9.--Summary of chemical analyses at selected sites on Mexican streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4630. RIO SAN JUAN AT SANTA ROSALIA, TAMAULIPAS																						
Period, Mar. - Sept. 1935																						
Maximum, Mar. 8, 1935				160	77	317		168	0	742	342		8.7	0.66	1880	2.56		717	580	5.1	2550	7.6
Minimum, Sept. 26				61	11	22		169	0	72	19		8.7	.09	295	.40		198	60	.7	456	7.6
Water Year 1936																						
Maximum, Jan. 23, 1936				92	30	80		170	0	252	81		22	.18	898	1.22		354	215	1.8	992	7.8
Minimum, July 27				69	12	33		151	0	115	27		8.7	.07	365	.50		220	97	1.0	525	7.9
Water Year 1937																						
Maximum, May 17, 1937				95	47	247		69	0	487	301		4.3	.41	1270	1.73		430	373	5.2	1940	8.5
Minimum, July 18				52	11	29		114	0	98	22		1.2	.12	324	.44		176	82	1.0	510	7.9
Water Year 1938																						
Maximum, Oct. 18, 1937				118	49	202		135	0	514	197		1.9	.48	1260	1.72		494	384	4.0	1760	8.0
Minimum, Aug. 1938				57	7.7	26		132	0	82	25		1.9	.09	294	.40		172	64	.9	465	8.0
Water Year 1939																						
Maximum, Aug. 1939				122	22	105		113	0	371	101		2.5	--	809	1.10		394	302	2.3	1180	7.9
Minimum, June				61	13	57		113	0	143	57		1.9	--	419	.57		206	113	1.7	666	8.1
Sept.				66	12	60		138	0	139	51		1.9	.17	419	.57		214	100	1.8	642	7.9
Water Year 1940																						
Maximum, Apr. 1940				95	31	126		143	0	352	110		1.9	.28	875	1.19		365	248	2.9	1260	8.2
May				83	29	159		114	0	326	165		1.9	.33	875	1.19		325	232	3.8	1350	7.8
Minimum, Oct. 1939				55	10	31		138	0	68	26		3.7	--	324	.44		180	67	1.0	437	8.2
Water Year 1941																						
Maximum, Mar. 1941				98	30	92		170	0	291	89		1.9	.24	750	1.02		368	228	2.1	1060	7.8
Minimum, Nov. 1940				52	11	30		117	0	100	21		1.9	--	294	.40		176	80	1.0	448	7.9
Dec.				49	9.2	29		105	0	96	21		1.9	--	294	.40		160	74	1.0	459	7.7
Water Year 1942																						
Maximum, Dec. 1941				98	33	88		167	0	298	84		8.7	.29	779	1.06		379	242	2.0	1080	7.8
Minimum, July 1942				66	13	38		151	0	111	35		8.1	.15	390	.53		220	96	1.1	585	7.9
Period, Sept. 1942 - Mar. 1943																						
Maximum, Mar. 1943				87	34	114		118	0	360	97		3.7	.25	831	1.13		356	258	2.6	1190	7.7
Minimum, Oct. 1942				75	13	37		152	0	148	30		4.3	.10	426	.58		241	116	1.0	637	7.8
8-4678. MORILLO DRAIN IN MEXICO, 8.4 RIVER MILES ABOVE ANZALDUAS DAM, TEX.																						
Period, Jan. - Sept. 1962																						
Maximum, July 1962				535	274	3390		177	0	2550	5100		.6	8.7	12500	17.0		2460	2320	30	17500	7.7
Minimum, June				394	171	2090		232	0	1630	3160		1.9	5.4	7940	10.8		1690	1500	22	11600	7.8
Water Year 1963																						
Maximum, Aug. 1963				619	366	3940		237	0	3100	5910		.6	9.4	14700	20.0		3050	2850	31	20200	7.8
Minimum, Sept.				447	237	2570		222	0	2000	3850		2.5	6.2	9710	13.2		2090	1910	24	13300	7.8
Water Year 1964																						
Maximum, Oct. 1963				558	278	3540		197	0	2480	5320		.6	8.4	12800	17.4		2540	2370	31	18000	8.2
Minimum, May 1964				329	118	1560		232	0	1320	2240		1.2	5.8	5900	8.02		1310	1120	19	8850	7.9
Water Year 1965																						
Maximum, Mar. 1965				461	211	2940		140	0	2280	4240		2.5	8.2	10500	14.3		2020	1900	28	15000	7.9
Minimum, Oct. 1964				313	131	1700		201	0	1370	2450		--	4.6	6330	8.61		1320	1150	20	9200	7.9
Water Year 1966																						
Maximum, Mar. 1966				530	263	3350		195	0	2470	4910		.6	8.8	12000	16.3		2400	2240	30	16800	7.9
Minimum, June				298	118	1520		165	0	1290	2220		.6	4.3	5780	7.86		1230	1090	19	8680	7.9

Table 10--Summary of chemical analyses at miscellaneous sites on streams in the Rio Grande basin

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-3639. RIO GRANDE NEAR CANUTILLO, TEX.																						
Oct. 24, 1967		26		136	28	278	15	306	0	468	245	0.7	2.0		1350			454	204	5.7	2040	7.8
8-3708. WILDHORSE CREEK NEAR VAN HORN, TEX.																						
Aug. 25, 1966	200	19		49	4.6	8.6	8.5	184	0	9.4	2.4	0.4	0.5		192	0.26	104	141	0	0.3	317	7.5
CAPOTE CREEK NEAR CANDELARIA, TEX.																						
Mar. 30, 1961	a0.17	29		19	0.6	183		350	0	117	27		0.0		549	0.75		50	0	11	867	7.9
8-3740. ALAMITO CREEK NEAR PRESIDIO, TEX.																						
Jan. 3, 1967	1.8	62		24	2.2	100	3.0	262	0	43	18	1.5	1.8		384	0.52	1.85	69	0	5.2	553	7.7
Mar. 6	--	61		42	2.7	104	2.8	312	0	47	23	1.5	1.5		438	.60	--	116	0	4.2	633	8.0
June 1	.6	63		35	2.6	113	3.3	307	0	51	27	1.9	.2		448	.61	.71	98	0	5.0	650	7.8
June 26	--	32		46	2.8	36	4.2	224	0	16	4.7	.8	.2		253	.34	--	126	41	1.4	380	7.2
Aug. 4	--	27		48	.8	40	3.9	222	0	18	5.4	.8	2.5		255	.35	--	123	0	1.6	385	7.3
Oct. 12	--	64		36	2.3	100	3.0	306	0	39	16	1.8	.0		412	--	--	100	0	4.4	590	7.6
Jan. 23, 1968	--	--		--	--	--	--	296	0	--	14	--	--		--	--	--	97	0	--	571	7.6
Mar. 29	--	--		--	--	--	--	312	0	--	14	--	--		--	--	--	102	0	--	590	7.7
8-3745. TERLINGUA CREEK NEAR TERLINGUA, TEX.																						
Jan. 3, 1967		26		142	17	172	5.6	218	0	584	8.4	1.3	3.8		1070	1.46		424	246	3.6	1430	7.8
Mar. 3		25		144	18	176	5.8	214	0	600	9.5	1.3	2.8		1090	1.48		434	258	3.7	1600	7.6
June 1		24		149	19	183	5.8	206	0	644	8.6	1.6	3.5		1140	1.55		450	281	3.8	1520	7.6
June 27		21		56	3.7	74	3.2	200	0	135	7.2	1.1	.8		400	.54		154	0	2.6	606	7.3
July 20	550	17		142	8.3	138	5.2	242	0	468	6.4	1.9	.2		906	1.23	1350	388	190	3.0	1210	7.4
Oct. 10		30		129	18	177	5.6	158	0	616	8.0	1.4	2.8		1070	--		396	266	3.9	1430	7.3
Jan. 22, 1968		--		--	--	--	--	150	0	--	7.6	--	--		--	--		402	279	--	1430	7.2
Apr. 1		--		--	--	--	--	185	0	--	6.8	--	--		--	--		354	202	--	1250	7.3
8-3750. RIO GRANDE AT JOHNSON RANCH NEAR CASTOLON, TEX.																						
Apr. 30, 1962		20	0.01	102	21	240		139	0	540	128	2.1	0.0		1120	1.52		341	227	5.6	1630	7.2

a Field Estimate

Table 10.--Summary of chemical analyses at miscellaneous sites on streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
											8-3775. RIO GRANDE AT LANGTRY, TEX.											
June 17, 1952	1180	20	0.01	168	24	108	2.4	188	0	537	19	0.7	2.5	0.25	1010	1.37		518	364	2.1	1280	7.3
											8-4085. DELAWARE RIVER NEAR RED BLUFF, NEW MEXICO											
Oct. 15, 1947				669	86	131		77	0	1960	145		0.8		3030			2020		1.3	3440	
Aug. 24, 1966		11		570	7.8	7.7	4.9	136	0	1300	8.8	0.2	.0		1980			1450	1340	.1	2160	6.9
											8-4115. SALT (SCREWBEAN) DRAW NEAR ORLA, TEX.											
Mar. 10, 15, 20, 25, 1947				1080	615	6120		107	0	3730	10300				21900			5240		37	30000	
Mar. 31				1140	598	5940		115	0	3800	10000				21600			5290		36	29500	
Apr. 4, 9, 14, 19, 24, 29				1080	575	5690		131	0	3650	9600				20700			5080		35	28600	
May 4, 9, 14, 19, 24, 29				1070	570	5800		136	0	3680	9690				20800			5020		36	28600	
June 4, 9, 14				1070	559	5600		120	0	3720	9350				20400			4980		35	28300	
July 3, 8, 13, 18, 23, 28				--	--	--		--	--	--	9410				--			--		--	29600	
Aug. 3, 8, 13, 18, 23, 28				--	--	--		--	--	--	--				--			--		--	28600	
Sept. 3, 8, 13, 18, 23, 28				--	--	--		--	--	--	--				--			--		--	27800	
Oct. 3				--	--	--		--	--	--	--				--			--		--	27200	
Oct. 8				--	--	--		--	--	--	--				--			--		--	26900	
Oct. 13				--	--	--		--	--	--	--				--			--		--	26900	
Oct. 18				--	--	--		--	--	--	--				--			--		--	26100	
Oct. 23				--	--	--		--	--	--	--				--			--		--	26100	
Oct. 28				--	--	--		--	--	--	--				--			--		--	25500	
Nov. 2				--	--	--		--	--	--	--				--			--		--	25500	
Nov. 10				--	--	--		--	--	--	8000				--			--		--	25300	
Nov. 15				--	--	--		--	--	--	--				--			--		--	12100	
Nov. 20				--	--	--		--	--	--	--				--			--		--	11800	
Nov. 25				--	--	--		--	--	--	3100				--			--		--	11800	
Dec. 20				--	--	--		--	--	--	7400				--			--		--	24100	
Dec. 25				--	--	--		--	--	--	7800				--			--		--	24700	
Dec. 30				--	--	--		--	--	--	2650				--			--		--	11000	
Jan. 5, 1948				--	--	--		--	--	--	7400				--			--		--	23500	
Jan. 10				--	--	--		--	--	--	2600				--			--		--	10700	
Jan. 15				--	--	--		--	--	--	7600				--			--		--	23500	
Jan. 20				--	--	--		--	--	--	7500				--			--		--	23900	
Jan. 25				--	--	--		--	--	--	7400				--			--		--	23700	
Jan. 30				--	--	--		--	--	--	7400				--			--		--	23200	
Feb. 5				--	--	--		--	--	--	7400				--			--		--	23400	
Feb. 10				--	--	--		--	--	--	7400				--			--		--	23400	
Feb. 15				--	--	--		--	--	--	7500				--			--		--	23500	
Feb. 20				--	--	--		--	--	--	7400				--			--		--	23500	
Feb. 25				--	--	--		--	--	--	2150				--			--		--	9840	

Table 10.--Summary of chemical analyses at miscellaneous sites on streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4115. SALT (SCREWBEAN) DRAW NEAR ORLA, TEX.--Continued																						
Mar. 1, 1948				--	--	--		--	--	--	7400				--			--		--	23400	
Mar. 5				--	--	--		--	--	--	7400				--			--		--	23400	
Mar. 10				--	--	--		--	--	--	7300				--			--		--	23400	
Mar. 15				--	--	--		--	--	--	7400				--			--		--	23700	
Mar. 20				--	--	--		--	--	--	7400				--			--		--	23700	
Mar. 25				--	--	--		--	--	--	7500				--			--		--	23900	
Mar. 30				--	--	--		--	--	--	7700				--			--		--	24300	
Apr. 5				--	--	--		--	--	--	7700				--			--		--	24700	
Apr. 10				--	--	--		--	--	--	7600				--			--		--	24700	
Apr. 15				--	--	--		--	--	--	8100				--			--		--	25300	
Apr. 20				--	--	--		--	--	--	8000				--			--		--	25300	
Apr. 25				--	--	--		--	--	--	8000				--			--		--	25300	
May 1				--	--	--		--	--	--	2850				--			--		--	11500	
May 6				--	--	--		--	--	--	7700				--			--		--	24700	
May 11				--	--	--		--	--	--	7900				--			--		--	24700	
May 16				--	--	--		--	--	--	7800				--			--		--	24700	
8-4140. PECOS RIVER NEAR MENTONE, TEX.																						
Sept. 25, 1968		8.0		320	50	595		64	0	922	910	0.4	2.2		2840			1000	952	8.2	4230	7.5
BARSTOW IRRIGATION CANAL AT HIGHWAY 80 CROSSING EAST OF BARSTOW, TEX.																						
Mar. 13, 1947				692	254	1480		145	0	2420	2380		1.5		7300			2770		12	9990	
8-4205. PECOS RIVER AT PECOS, TEX.																						
Oct. 9, 1946				552	227	1240		112	0	1940	2050				6060			2310		11	8620	
Mar. 13, 1947				682	283	1490		209	0	2320	2500				7380			2870		12	10100	
Oct. 16				782	357	1840		133	0	2760	3140				8950			3420		14	12300	
BARSTOW DRAIN NO. 1 NEAR BARSTOW, TEX.																						
Oct. 9, 1946				733	299	1920		134	0	2790	2980				8790	11.9		3060		15	11900	
Feb. 27, 1947				774	327	2000		232	0	2820	3180				9210	12.5		3280		15	12700	
Mar. 13				805	347	1980		234	0	2840	3250				9340	12.6		3430		15	12700	
May 15				756	309	1730		68	0	2740	2840		8.4		8410	11.4		3160		13	11500	
Oct. 16				742	327	2020		133	0	2870	3170				9210	--		3190		16	12500	

Table 10.--Summary of chemical analyses at miscellaneous sites on streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
BARSTOW DRAIN NO. 2 NEAR BARSTOW, TEX.																						
Oct. 9, 1946				668	217	1250		113	0	2170	2070		--		6430			2560		11	8970	
Feb. 27, 1947				784	271	1300		78	0	2630	2200		1.5		7220			3070		10	9780	
Mar. 13				770	315	1610		232	0	2720	2620		--		8150			3220		12	10800	
May 15				748	259	1280		84	0	2440	2200		5.0		6970			2930		10	9630	
Oct. 16				756	257	1300		121	0	2510	2170		--		7050			2940		10	9570	
BARSTOW DRAIN NO. 2-B NEAR BARSTOW, TEX.																						
Mar. 13, 1947				732	259	1550		144	0	2550	2480				7640			2890		13	10300	
BARSTOW DRAIN NO. 3 NEAR BARSTOW, TEX.																						
Oct. 9, 1946				702	258	1390		104	0	2580	2170				7150			2810		11	9680	
Mar. 15, 1947				730	291	1450		82	0	2650	2370		7.5		7540			3020		11	10400	
Oct. 16				774	305	1490		150	0	2730	2450				7820			3190		11	10500	
Oct. 16				742	294	1550		144	0	2740	2450				7850			3060		12	10600	
8-4255. PHANTOM LAKE SPRINGS NEAR TOYAHVALE, TEX.																						
Jan. 28, 1950	--	16		187	95	473	--	282	0	695	660		0.2		2260	3.07	--	857	626	7.0	3410	7.4
Feb. 15, 1967	7.31	18		190	83	470	21	280	0	684	655		1.0		2260	3.07	44.5	816	586	7.2	3500	7.5
Mar. 22	7.20	18		188	78	470	20	284	0	696	650		2.0		2260	3.07	43.8	790	558	7.3	3500	7.2
Sept. 14	6.39	17		198	82	465	21	284	0	688	660		.5		2270	3.09	39.1	832	599	7.0	3440	7.6
Oct. 18	--	16		180	82	493	--	236	0	692	670		.5		2250	--	--	786	593	7.6	3430	7.7
8-4275. SAN SOLOMON SPRINGS AT TOYAHVALE, TEX.																						
Jan. 28, 1950		19		179	90	421		273	0	635	600		1.5		2080	2.83		816	593	6.4	3180	8.1
8-4305. LAKE BALMORHEA AT BALMORHEA, TEX.																						
Jan. 28, 1950		11		184	92	464		245	0	689	650		1.2		2230	3.03		838	636	7.0	3330	7.8
June 3								153	0	1000	680							736			3620	8.2
8-4310. TOYAH CREEK NEAR PECOS, TEX.																						
Aug. 16, 1939				366	193	1010		256	0	1600	1430				5000						7020	
Aug. 18				--	--	--		--	--	--	1520				--						7080	
Aug. 19				--	--	--		--	--	--	1550				--						7280	
Aug. 23				--	--	--		--	--	--	1550				--						7210	
Aug. 25				--	--	--		--	--	--	1530				--						7140	
Aug. 30				--	--	--		--	--	--	1610				--						7490	
Sept. 2				--	--	--		--	--	--	1600				--						7350	
Sept. 5				--	--	--		--	--	--	1600				--						7490	

Table 10.--Summary of chemical analyses at miscellaneous sites on streams in the Rio Grande basin--Continued

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8-4310. TOYAH CREEK NEAR PECOS, TEX.--Continued																						
Sept. 6, 1939				--	--	--		--	--	--	1630							--			7640	
Sept. 9				--	--	--		--	--	--	1680							--			7590	
Sept. 11				--	--	--		--	--	--	1680							--			7520	
Sept. 15				--	--	--		--	--	--	1620							--			7450	
Sept. 20				--	--	--		--	--	--	1600							--			7390	
Sept. 27-30				348	244	1420		183	0	1950	1980						8.19	1870	1720		8860	
Mar. 13, 1947				652	557	3550		318	0	4250	4930				14100			3920		25	18400	
8-4315. SALT DRAW NEAR PECOS, TEX.																						
Mar. 13, 1947				462	290	1670		376	0	2040	2520				7170			2350		15	10400	
Oct. 16				366	251	1460		190	0	1820	2170				6160			1950		14	9100	
8-4317. LIMPIA CREEK ABOVE FORT DAVIS, TEX.																						
Sept. 2, 1966	143	--		11	1.5	2.9	--	39	0	5.2	1.6	--	0.2		--	--		34	2	0.2	84	7.1
Sept. 13	7.6	--		27	3.9	10	3.7	82	0	23	11	0.6	.8		--	--		83	16	.5	218	7.4
Aug. 1, 1967	--	36		28	3.2	7.9	3.2	82	0	27	5.6	.4	.2		152	0.21		83	16	.4	208	6.8
Sept. 14	--	34		26	3.6	8.1	1.7	84	0	20	5.2	.6	.6		140	.19		80	11	.4	195	7.1
July 25, 1968	--	27		16	2.3	4.9	--	48	0	11	2.6	.6	4.8		93	--		49	10	.3	126	7.5
Sept. 5	--	33		22	3.2	8.5	--	71	0	19	4.7	.5	.6		126	--		68	10	.4	177	7.3
8-4318. LIMPIA CREEK BELOW FORT DAVIS, TEX.																						
May 14, 1965	38.6	18		22	4.2	13	--	98	0	11	3.4	0.6	1.8		122	0.17		72	0	0.7	317	7.1
Feb. 15, 1967	--	30		44	5.7	17	3.0	165	0	22	9.2	.9	.2		213	.29		133	0	.6	332	7.5
Mar. 22	.9	32		45	5.9	18	3.6	169	0	21	9.1	1.8	.2		220	.30	0.52	137	0	.7	337	7.5
Sept. 14	--	35		48	5.3	18	4.6	180	0	20	8.4	1.3	.2		230	.31		142	0	.7	341	7.5
Oct. 18	--	32		48	6.1	21	--	184	0	23	9.0	1.3	.3		231	--		145	0	.8	351	7.6
8-4340. TOYAH CREEK BELOW TOYAH LAKE NEAR PECOS, TEX.																						
July 24-27, 1948		9.2		628	86	1000		43	0	2370	1130		2.0		5250			1920		9.9	6900	
July 28-30		8.0		754	116	1520		51	0	3050	1740		1.5		7210			2360		14	9320	
July 31 - Aug. 1		11		408	37	218		38	0	1190	265		2.0		2150			1170		2.8	2780	
Aug. 2-4		8.1		632	80	808		38	0	2160	980		2.0		4690			1910		8.0	6020	
May 3-11, 1949	280	8.4		808	234	1850		53	0	2710	2920		--		8550	11.6		2980	2930	15	12000	7.5
8-4358. COYANOSA DRAW NEAR FORT STOCKTON, TEX.																						
May 13, 1965	0.10	19		38	4.2	16		164	0	7.8	2.1	0.3	1.5		170	0.23		112	0	0.7	315	7.5
June 16, 1967		24		58	3.3	7.0	6.9	172	0	29	4.0	.6	.8		219	.30		158	17	.2	337	7.3

Table 10.--Summary of chemical analyses at miscellaneous sites on streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
PECOS RIVER 6 MILES SOUTH OF McCAMEY, TEX.																						
June 3, 1950								98	0	2200	3500							2640			13500	7.7
LIVE OAK CREEK NORTH OF U.S. HIGHWAY 290 NEAR OLD FORT LANCASTER, TEX.																						
Dec. 7, 1959	a10	20		365	98	1230	218	338	0	2450					4610	6.27		1310	1140	15	7800	7.2
8-4473. PECOS RIVER NEAR PANDALE, TEX.																						
Dec. 1, 1966	145										725										2980	
8-4475. PECOS RIVER NEAR COMSTOCK, TEX.																						
June 17, 1952	114	9.0	0.02	165	103	583	2.4	138	0	627	930	0.9	1.0	0.39	b2490	3.39		835	722	8.8	4110	7.6
8-4485. GOODENOUGH SPRINGS NEAR COMSTOCK, TEX.																						
Jan. 11, 1967		16		72	13	9.5	1.6	251	0	25	11	0.5	6.3		278	0.38		233	28	0.3	472	7.5
Mar. 1		15		72	13	11	1.6	250	0	26	12	.8	7.2		282	.38		233	28	.3	466	7.6
May 3		15		73	12	7.2	1.7	246	0	24	10	.6	3.8		268	.36		232	30	.2	454	7.7
July 5		15		72	13	9.9	1.5	252	0	25	10	.3	6.8		278	.38		233	26	.3	460	7.8
Sept. 7		13		74	13	9.9	1.7	252	0	26	11	.5	6.4		280	.38		238	32	.3	465	7.4
Nov. 8		13		30	10	8.3	--	115	0	20	8.8	.4	6.9		154	--		116	22	.3	260	7.8
Jan. 3, 1968		14		60	11	9.9	--	215	0	21	8.6	.4	6.4		237	--		195	19	.3	408	7.4
Mar. 6		--		--	--	--	--	216	0	--	9.3	--	--		--	--		203	26	--	416	7.4
8-4490. DEVILS RIVER NEAR JUNO, TEX.																						
July 16, 1964	23.4	16		48	14	17	--	222	0	10	13	0.4	2.2		230	0.31	--	177	0	0.6	387	7.3
Jan. 26, 1967	44.9	16		61	15	8.3	1.7	237	0	10	13	.4	9.6		252	.34	30.5	214	20	.2	432	7.6
Mar. 16	40.3	16		61	15	8.2	1.2	236	0	11	13	.1	8.2		250	.34	27.1	214	20	.2	432	7.4
Apr. 25	33.9	17		56	15	7.2	1.5	222	0	10	12	.5	7.3		236	.32	21.5	201	19	.2	411	7.4
July 5	27.8	17		50	15	8.7	1.7	207	0	10	13	.4	4.2		222	.30	16.6	186	17	.3	375	7.8
Aug. 10	31.5	17		57	15	8.7	1.8	226	0	11	13	.5	5.3		240	.33	20.3	204	19	.3	404	7.5
Oct. 30	--	15		60	15	8.4	1.6	236	0	11	13	.1	7.4		248	--	--	211	18	.3	432	7.6
Dec. 4	--	15		32	15	11	--	153	0	11	14	.2	9.3		182	--	--	142	16	.4	319	7.6
Feb. 8, 1968	--	--		--	--	--	--	210	0	--	14	--	--		--	--	--	192	20	--	401	7.5
Apr. 22	--	--		--	--	--	--	217	0	--	14	--	--		--	--	--	200	22	--	401	7.4
July 3	--	--		--	--	--	--	222	0	--	12	--	--		--	--	--	197	15	--	400	7.6

a Field Estimate
b Residue on evaporation at 180°C

Table 10.--Summary of chemical analyses at miscellaneous sites on streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4494. DEVILS RIVER AT PAFFORD CROSSING NEAR COMSTOCK, TEX.																						
Jan. 10, 1967		12		57	13	6.8	1.2	219	0	8.0	10	0.2	10		226	0.31		196	16	0.2	398	7.6
Mar. 14		12		48	13	6.8	1.1	194	0	8.2	11	.1	7.6		203	.28		173	14	.2	362	7.3
May 2		12		44	13	7.2	1.2	186	0	8.0	11	.4	5.8		194	.26		163	11	.2	342	7.6
July 18		16		40	14	7.6	1.5	177	0	8.0	11	.3	4.8		190	.26		157	12	.3	324	7.6
Sept. 6		14		52	12	6.7	1.5	205	0	7.6	10	.4	6.2		211	.29		179	11	.2	363	7.3
Nov. 14		9.8		50	13	7.1	--	199	0	8.2	11	.4	6.9		204	--		178	15	.2	362	7.6
Jan. 10, 1968		9.9		54	14	7.9	--	217	0	8.8	11	.5	7.0		220	--		192	14	.2	394	7.5
Mar. 19		--		--	--	--	--	183	0	--	11	--	--		--	--		166	16	--	343	7.5
8-4494.8. LAKE WALK NEAR DEL RIO, TEX.																						
June 17, 1952		13	0.04	46	10	6.0	0.4	180	0	6.6	9.5	0.3	5.0	0.36	203	0.28		156	8	0.2	340	7.6
Oct. 20, 1958		12	.03	54	8.2	7.2		194	0	6.4	7.8	.2	8.7		206	--	0.28	168	9	.2	333	7.8
Feb. 19, 1962		12	.01	55	12	5.5		208	0	6.8	9.8	.3	8.0		b 232	.32		187	16	.2	381	7.3
Jan. 17, 1963		12	.02	57	12	9.8		218	0	7.6	14	.3	7.1		241	.33		192	13	.3	388	7.4
8-4495. DEVILS RIVER NEAR DEL RIO, TEX.																						
Mar. 19, 1930	--			60	12	--		192	0	10	14		--	--	232	0.32		200	43	--	320	--
Apr. 22	--			45	9.0	27		192	0	10	28		--	--	300	.41		150	0	1.0	440	--
May 5	--			57	19	--		168	0	16	14		--	--	200	.27		220	83	--	360	--
June 2	--			48	12	3.4		193	0	--	14		--	--	256	.35		170	12	.1	330	--
July 1	--			39	7.1	19		168	0	10	14		--	--	185	.25		126	0	.7	320	--
Sept. 2	--			51	6.0			144	0	--	--		--	--	180	.24		152	34	--	370	--
Oct. 1	--			42	4.0	42		216	0	15	14		--	--	214	.29		122	0	1.7	370	--
Nov. 28	--			81	5.0	--		240	0	16	--		--	--	270	.37		223	26	--	490	--
Feb. 16, 1931	598			52	4.0	41		264	0	--	14		--	--	278	.38		146	0	1.5	410	--
June 18	588			57	6.0	26		240	0	8.2	14		--	--	192	.26		167	0	.9	370	--
Mar. 5, 1935	254			53	13	11		204	0	6.7	14		8.7	0.05	225	.31		184	17	.4	368	7.3
Apr. 12	158			42	9.7	12		171	0	7.2	14		3.7	.05	266	.36		144	4	.4	350	7.6
May 30	4720			31	4.6	6.7		111	0	1.4	3.2		6.8	.03	162	.22		97	6	.3	182	7.6
June 6	1180			35	3.0	4.6		117	0	--	4.6		18	.05	142	.19		100	4	.2	195	7.4
July 24	471			50	9.8	12		209	0	7.2	17		4.3	.03	256	.35		166	0	.4	354	7.7
Aug. 26	429			46	13	13		196	0	9.6	13		11	.05	219	.30		166	4	.4	347	8.2
Sept. 9	20400			39	2.7	5.1		121	0	3.8	5.0		8.7	.03	148	.20		108	8	.2	203	7.6
Oct. 2	896			51	10	7.4		196	0	5.3	10		6.8	.05	223	.30		168	7	.2	347	7.4
Dec. 3	560			58	11	10		223	0	4.3	12		11	.08	235	.32		192	9	.3	390	7.8
Dec. 2, 1936	479			58	10	13		222	0	5.3	13		13	.06	263	.36		186	4	.4	389	8.1
Mar. 1944	310			39	14	14		171	0	12	19		--	--	213	.29		155	14	.5	354	--
Apr.	270			36	13	13		160	0	12	18		1.9	.06	199	.27		145	14	.5	329	8.3
May	315			28	10	10		124	0	9.1	14		--	--	154	.21		113	11	.4	256	--
June	282			35	12	11		157	0	11	15		--	--	191	.26		138	9	.4	316	--
July	235			34	12	11		156	0	11	15		1.9	.07	184	.25		136	8	.4	304	7.9
Aug.	266			33	12	11		147	0	10	14		--	--	176	.24		129	8	.4	292	--
Sept.	1050			38	5.1	6.9		123	0	7.7	7.1		--	--	162	.22		115	14	.3	246	--

Table 10.--Summary of chemical analyses at miscellaneous sites on streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4511.3. EIGHT MILE CREEK NEAR DEL RIO, TEX.																						
Jan. 20, 1967		3.3		475	39	12	3.6	102	0	1210	17	0.4	0.2		1810	2.46		1350	1260	0.1	2020	7.2
Mar. 1		5.7		532	41	13	3.1	78	0	1410	19	.2	.0		2060	2.80		1500	1430	.1	2220	7.0
Sept. 7		8.8		222	15	7.1	4.1	122	0	478	12	.5	13		820	1.12		616	516	.1	1050	7.3
Nov. 8		5.3		328	25	11	--	96	0	812	14	.5	1.8		1240	--		922	843	.2	1500	7.5
Mar. 13, 1968		--		--	--	--	--	77	0	--	10	--	--		--	--		880	817	--	1400	7.1
8-4513. CANTU SPRINGS ON CINEGAS CREEK NEAR DEL RIO, TEX.																						
Jan. 11, 1967		13		87	7.6	8.8	1.1	271	0	16	14	0.1	7.4		288	0.39		248	26	0.2	498	7.4
Mar. 1		12		86	7.7	9.8	1.2	273	0	16	16	.5	7.2		290	.39		246	22	.3	493	7.4
May 3		13		86	7.3	8.7	1.2	273	0	13	14	.3	5.7		283	.38		244	21	.2	491	7.3
July 6		13		87	7.2	9.1	1.2	273	0	14	15	.3	6.7		288	.39		246	23	.3	483	7.7
Sept. 7		12		98	8.2	14	1.3	274	0	32	28	.3	7.8		337	.46		278	54	.4	563	7.7
Nov. 8		7.6		90	7.8	10	--	283	0	16	17	.3	6.0		294	--		256	24	.3	514	7.5
8-4528.3. SAN FELIPE CREEK AT MOORE PARK, DEL RIO, TEX.																						
Jan. 10, 1967		12		78	6.9	4.9	1.1	253	0	7.2	8.7	0.2	9.0		252	0.34		223	16	0.1	439	7.5
Mar. 7		12		78	6.9	5.4	.7	246	0	8.2	9.8	.0	9.4		251	.34		223	21	.2	437	7.3
May 2		12		77	7.0	4.8	1.1	243	0	8.4	9.6	.3	6.6		246	.33		221	22	.1	428	7.7
July 5		12		77	6.7	6.3	.9	243	0	9.4	10	.2	8.0		250	.34		220	20	.2	423	7.7

b Residue on evaporation at 180°C

Table 10.--Summary of chemical analyses at miscellaneous sites on streams in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4530. SAN FELIPE CREEK NEAR DEL RIO, TEX.																						
Jan. 10, 1967		13		80	7.7	7.9	1.1	250	0	14	12	0.1	13		272	0.37		231	26	0.2	471	7.3
Mar. 7		12		81	8.2	9.1	1.3	251	0	19	14	.6	11		279	.38		236	30	.3	473	7.3
May 2		13		80	7.6	9.0	1.2	244	0	17	13	.3	13		274	.37		231	31	.3	467	7.4
July 10		13		80	8.2	10	1.4	250	0	20	14	.3	9.8		280	.38		233	28	.3	470	7.3
Sept. 6		11		86	8.5	10	1.6	262	0	22	16	.2	7.9		292	.40		250	35	.3	491	7.2
Nov. 7		11		82	8.6	9.0	--	255	0	20	15	.3	9.2		280	--		240	31	.3	485	7.2
Jan. 11, 1968		11		80	8.9	9.2	--	250	0	20	14	.5	11		278	--		236	31	.3	469	8.0
Mar. 5		--		--	--	--	--	244	0	--	13	--	--		--	--		228	28	--	461	7.5
8-4550. PINTO CREEK NEAR DEL RIO, TEX.																						
Jan. 5, 1967		7.9		162	9.7	73	2.1	144	0	114	262	0.1	12		714	0.97		444	326	1.5	1270	7.3
Mar. 8		6.0		155	9.1	76	1.8	128	0	122	255	.0	9.5		697	.95		424	319	1.6	1240	7.4
May 17		18		152	10	82	2.9	114	0	112	280	.3	1.2		714	.97		420	326	1.7	1280	7.0
July 19		30		190	14	108	3.5	86	0	144	390	.3	2.2		924	1.26		532	461	2.0	1600	7.2
Sept. 13		13		106	6.9	52	3.8	93	0	67	186	.2	.8		482	.66		293	217	1.3	877	7.0
Nov. 15		6.4		120	6.8	47	--	151	0	70	165	.2	1.3		491	--		328	204	1.1	890	7.4
Jan. 9, 1968		--		--	--	--	--	116	0	--	250	--	--		--	--		412	317	--	1180	6.9
Mar. 6		--		--	--	--	--	127	0	--	241	--	--		--	--		408	304	--	1150	7.0
May 15		--		--	--	--	--	128	0	--	273	--	--		--	--		452	347	--	1260	--
8-4580. RIO GRANDE AT EAGLE PASS, TEX.																						
Mar. 5, 1962		13	0.01	78	23	115		184	0	182	136	0.9	3.8		b 679	0.92		289	138	2.9	1070	7.3
Feb. 19, 1963		17	.01	83	23	136		182	0	210	160	1.0	3.0		730	.99		302	152	3.4	1170	7.2
CHACON CREEK NEAR LAREDO, TEX.																						
May 27, 1949		7.2		248	143	1090		327	0	1630	1140		0.0		4420	6.01		1210	939	14	6430	7.7
8-4650. LOS OLMOS CREEK NEAR RIO GRANDE CITY, TEX.																						
May 27, 1949	10	23		684	89	3560		106	0	1070	6100				11500	15.6		2080	1990	34	18700	7.5
LA JOYA CREEK AT RESERVOIR SITE NEAR SAMFORDYCE, TEX.																						
May 27, 1949		58		124	78	1870		222	0	1150	2350				5740	7.81		630	448	32	9340	7.8

b Residue on evaporation at 180°C

Table 11.--Discharge-weighted average of chemical constituents at selected sites in the Rio Grande basin

(Results in milligrams per liter except as indicated)

CALENDAR YEAR	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-3640. RIO GRANDE AT EL PASO, TEX.																						
1933	841			--	--	--		--	--	--	--		--	--	846	1.15	1920	--	--	--	--	--
1934	702			--	--	--		--	--	--	--		--	--	926	1.26	1760	--	--	--	--	--
1935	635			--	--	--		--	--	--	--		--	--	912	1.24	1560	--	--	--	--	--
1936	653			99	21	160		217	0	292	141		3.1	--	868	1.18	1530	332	155	3.8	1300	7.8
1937	741			91	21	154		207	0	268	139		1.2	--	831	1.13	1660	311	142	3.8	1260	8.2
1938	766			89	19	149		206	0	256	132		1.2	0.17	801	1.09	1660	303	134	3.7	1230	8.0
1939	707			93	20	156		215	0	276	138		1.2	.20	846	1.15	1610	316	140	3.8	1290	8.1
1940	625			96	22	172		220	0	302	152		.6	--	919	1.25	1550	332	152	4.1	1390	8.2
1941	706			92	21	169		212	0	295	143		1.2	.24	890	1.21	1700	314	140	4.1	1340	7.9
1942	2150			71	14	93		182	0	189	69		.6	.13	581	.79	3380	234	86	2.6	876	--
1943	873			86	18	133		218	0	233	116		.6	.18	750	1.02	1770	289	110	3.4	1150	8.0
1944	843			86	18	145		218	0	252	123		--	.17	787	1.07	1790	289	110	3.7	1190	8.1
1945	786			89	19	146		232	0	254	122		.6	.18	801	1.09	1700	300	110	3.7	1210	8.0
1946	688			87	19	152		228	0	258	126		.6	--	816	1.11	1520	294	106	3.9	1250	7.9
1947	634			87	20	155		223	0	269	130		.6	.20	824	1.12	1410	300	118	3.9	1260	8.0
1948	595			75	20	160		180	0	282	133		2.5	--	838	1.14	1350	272	124	4.2	1250	--
1949	640			69	18	147		174	0	247	125		.6	.20	750	1.02	1300	246	104	4.1	1160	7.9
1950	653			78	18	144		202	0	244	123		.6	.18	772	1.05	1360	268	102	3.8	1170	7.8
1951	348			80	22	182		195	0	292	161		1.2	.22	904	1.23	849	290	130	4.6	1380	7.9
1952	391			79	19	134		206	0	220	125		1.2	.19	735	1.00	776	273	104	3.5	1130	7.8
1953	365			82	18	135		214	0	223	119		1.2	.18	743	1.01	732	278	102	3.5	1130	7.9
1954	129			87	20	197		198	0	308	184		--	.22	956	1.30	333	301	138	4.9	1470	8.0
1955	93			110	24	192		184	0	392	169		1.2	.19	1010	1.38	254	375	224	4.3	1520	7.9
1956	79			111	25	194		198	0	404	160		.6	.23	1050	1.43	224	380	218	4.3	1540	8.0
1957	193			72	14	105		181	0	192	89		--	.16	596	.81	311	239	91	3.0	927	8.0
1958	543			88	17	116		186	0	260	86		--	.17	721	.98	1060	288	135	3.0	1070	7.9
1959	533			93	19	149		217	0	269	130		--	.16	831	1.13	1200	310	132	3.7	1260	8.0
1960	521			96	21	154		222	0	299	127		.6	.18	860	1.17	1210	325	143	3.7	1300	8.0
1961	415			91	21	166		221	0	299	133		--	.22	868	1.18	973	311	130	4.1	1320	8.1
1962	520			87	18	151		210	0	272	124		.6	.19	801	1.09	1120	290	118	3.9	1230	7.9
1963	714			93	18	164		226	0	280	141		.6	.23	875	1.19	1690	308	122	4.1	1320	8.0
1964	89			96	22	224		229	0	340	199		1.2	.22	1060	1.44	255	330	142	5.4	1620	7.9
1965	280			67	13	97		179	0	174	78		1.2	.11	566	.77	428	218	71	2.9	866	7.9
1966	427			85	15	119		217	0	224	93		.6	.14	691	.94	797	274	96	3.1	1050	7.9
1967	321			89	18	151		226	0	271	120		1.2	.11	816	1.11	--	296	111	3.8	1240	8.0
1968	--			97	19	168		225	0	310	132		.6	.18	890	1.21	--	322	138	4.1	1340	7.9
8-3670. RIO GRANDE AT TORNILLO BRIDGE NEAR FABENS, TEX.																						
1933	280														1310	1.78	990					

Table 11.--Discharge-weighted average of chemical constituents at selected sites in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

CALENDAR YEAR	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-3705. RIO GRANDE AT FORT QUITMAN, TEX.																						
1933	295			--	--	--		--	--	--	--		--	--	2000	2.72	5190	--	--	--	--	--
1934	141			--	--	--		--	--	--	--		--	--	2240	3.05	853	--	--	--	--	--
1935	201			--	--	--		--	--	--	--		--	--	1560	2.12	847	--	--	--	--	--
1936	206			191	46	455		245	0	488	672		3.7	--	2090	2.84	1160	664	464	7.7	3320	7.9
1937	246			184	48	461		220	0	485	678		1.2	--	2120	2.88	1410	654	474	7.8	3270	8.1
1938	382			163	38	382		221	0	426	538		1.9	0.27	1760	2.39	1820	563	382	7.0	2750	8.0
1939	210			187	44	471		242	0	500	681		1.2	--	2140	2.91	1210	648	450	8.1	3340	8.2
1940	171			194	48	504		241	0	529	731		1.2	--	2260	3.07	1040	682	484	8.4	3510	8.2
1941	457			147	35	368		211	0	413	507		2.5	.29	1690	2.29	2070	510	337	7.1	2610	7.9
1942	1750			89	20	170		179	0	254	192		1.9	.18	882	1.20	4170	304	158	4.2	1370	7.9
1943	322			146	37	369		226	0	424	496		1.2	.30	1700	2.31	1480	517	332	7.0	2620	8.0
1944	374			151	37	392		229	0	438	532		.6	.31	1770	2.41	1790	532	344	7.4	2720	8.1
1945	287			175	45	460		251	0	497	644		.6	.33	2070	2.82	1600	620	414	8.0	3200	8.0
1946	181			190	51	527		245	0	556	753		1.9	--	2320	3.16	1130	684	484	8.7	3600	8.0
1947	125			207	56	583		254	0	602	846		1.9	.38	2590	3.52	874	750	541	9.3	3950	8.0
1948	104			229	67	706		228	0	693	1060		1.2	--	3040	4.14	854	846	660	11	4670	--
1949	185			208	57	601		242	0	614	874		2.5	.43	2630	3.58	1310	750	552	9.6	4030	7.9
1950	171			207	60	635		215	0	639	936		1.9	.41	2740	3.73	1270	762	586	10	4190	7.9
1951	36			211	62	616		177	0	596	971		1.2	.41	2730	3.71	265	784	638	9.5	4110	7.9
1952	15			302	89	874		254	0	824	1400		--	--	3860	5.25	156	1120	912	11	5770	--
1953	28			204	57	530		173	0	480	900		.6	.36	2420	3.29	183	746	604	8.4	3670	7.8
1954	21			119	29	261		170	0	245	426		1.9	.24	1270	1.73	72	418	279	5.6	1970	8.0
1955	8.1			46	11	126		165	0	137	113		--	--	559	.76	12	162	27	4.3	845	--
1956	8.3			61	11	54		228	0	68	43		--	--	375	.51	8.4	198	12	1.7	582	--
1957	6.7			42	4.4	55		162	0	76	21		2.5	--	294	.40	5.3	124	9	2.1	471	--
1958	50			91	16	139		160	0	218	168		--	--	801	1.09	108	292	161	3.5	1210	--
1959	18			133	29	286		213	0	406	348		--	--	1380	1.88	67	451	276	5.9	2060	--
1960	70			191	43	443		258	0	562	588		1.2	.39	2090	2.84	395	654	442	7.5	3130	8.0
1961	24			317	88	949		309	0	995	1380		1.9	.60	4110	5.59	266	1150	898	12	6030	8.1
1962	102			237	54	591		287	0	673	842		1.9	.40	2690	3.66	741	812	577	9.0	3970	7.9
1963	32			313	84	913		301	0	895	1390		1.9	.62	3990	5.43	345	1130	882	12	5810	7.9
1964	4.3			334	106	1030		250	0	957	1640		--	--	4440	6.04	52	1270	1060	13	6350	--
1965	2.3			76	10	34		283	0	45	21		--	.13	375	.51	2.3	232	0	1.0	575	7.8
1966	44			116	22	225		217	0	279	292		--	--	1100	1.50	131	381	203	5.0	1690	--
1967	4.9			194	52	494		218	0	508	763		4.3	.33	2240	3.05	--	696	518	8.2	3310	7.9
1968	--			241	60	668		287	0	700	950		1.9	.38	2900	3.94	--	846	610	10	4390	8.0

Table 11.--Discharge-weighted average of chemical constituents at selected sites in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

CALENDAR YEAR	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-3710. RIO GRANDE AT LA NUTRIA, TEX.																						
1938	359			148	36	378		192	0	421	526		1.9		1700	2.31	1650	520	363	7.2	2670	8.0
1939	194			169	43	459		177	0	499	666		1.2		2050	2.79	1070	598	453	8.2	3220	8.2
1940	182			145	35	392		178	0	436	538		2.5		1740	2.37	855	506	360	7.6	2720	8.1
1941	608			126	29	314		167	0	370	421		3.1		1440	1.96	2360	431	294	6.6	2240	7.8
8-3715. RIO GRANDE ABOVE RIO CONCHOS NEAR PRESIDIO, TEX.																						
1937	211			138	32	320		185	0	371	437		1.2	--	1490	2.03	849	478	326	6.4	2320	8.0
1938	309			138	31	326		176	0	381	450		1.9	0.25	1510	2.05	1260	472	328	6.5	2360	8.0
1939	157			165	39	414		181	0	471	590		.6	--	1900	2.58	805	572	424	7.5	2940	8.2
1940	156			145	33	355		168	0	410	496		.6	--	1620	2.21	682	498	361	6.9	2540	8.1
1941	641			142	31	332		179	0	387	467		1.9	--	1550	2.11	2680	482	336	6.6	2410	7.9
1942	1630			103	22	199		198	0	288	232		1.2	--	1010	1.38	4450	349	187	4.6	1570	8.0
1943	313			145	35	364		199	0	439	485		1.2	--	1670	2.27	1410	506	344	7.0	2580	8.0
1944	335			148	36	395		195	0	460	531		.2	.31	1770	2.41	1600	520	361	7.5	2720	8.0
1945	261			145	35	367		196	0	439	492		1.2	.28	1680	2.28	1180	504	343	7.1	2590	7.9
1946	184			155	36	388		200	0	464	528		2.5	--	1780	2.42	884	534	371	7.3	2740	7.9
1947	76			170	40	427		206	0	513	582		2.5	--	1950	2.65	400	586	418	7.7	2970	7.9
1948	44			162	42	455		183	0	508	637		1.9	--	2010	2.74	239	576	426	8.2	3110	--
1949	150			163	38	433		181	0	496	603		2.5	--	1940	2.64	786	564	416	7.9	3010	7.8
1950	140			133	30	330		160	0	407	445		2.5	--	1520	2.07	575	454	322	6.7	2360	--
1951	24			109	25	246		154	0	296	342		2.5	.23	1190	1.62	77.1	376	249	5.5	1790	7.9
1952	18			--	--	63		152	0	--	43		--	--	426	.58	20.7	180	56	2.0	625	--
1953	12			--	--	81		160	0	--	62		--	--	515	.70	16.7	197	66	2.5	761	--
1954	68			--	--	74		165	0	--	67		--	--	544	.74	99.9	261	126	2.0	833	--
1955	34			--	--	56		144	0	--	32		--	--	404	.55	37.1	186	68	1.8	613	--
1956	3.5			--	--	39		142	0	--	20		--	--	279	.38	2.64	146	30	1.4	460	--
1957	8.6			--	--	37		145	0	--	19		--	--	353	.48	8.20	186	67	1.2	525	--
1958	52			--	--	75		137	0	--	64		--	--	515	.70	72.3	223	111	2.2	786	--
1959	10			--	--	64		159	0	--	34		--	--	456	.62	12.3	202	71	2.0	674	--
1960	46			--	--	283		187	0	--	361		--	--	1400	1.90	174	452	299	5.8	2110	--
1961	22			--	--	256		165	0	--	315		--	--	1280	1.74	76.0	424	289	5.4	1890	--
1962	49			--	--	364		228	0	--	459		--	--	1700	2.31	225	514	326	7.0	2520	--
1963	25			--	--	165		169	0	--	180		--	--	941	1.28	63.5	327	188	4.0	1360	--
1964	1.3			--	--	47		160	0	--	22		--	--	419	.57	1.47	211	80	1.4	618	--
1965	3.3			--	--	55		137	0	--	21		--	--	478	.65	4.26	220	107	1.6	676	--
1966	49			--	--	121		164	0	--	142		--	--	713	.97	94.3	287	153	3.1	1110	--
1967	4.7			--	--	64		130	0	--	38		--	--	515	.70	--	248	142	1.8	773	--
1968	--			84	5.2	91		155	0	201	68		.6	.10	559	.76	--	230	103	2.6	862	7.8

Table 11.--Discharge-weighted average of chemical constituents at selected sites in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

CALENDAR YEAR	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids			Hardness as $CaCO_3$		Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
															Milligrams per liter (mg/l)	Tons per acre-foot	Tons per day	Calcium, Magnesium	Noncarbonate			
8-3750. RIO GRANDE AT JOHNSON RANCH NEAR CASTOLON, TEX.																						
1948	574			86	15	122		161	0	280	89		2.5		743	1.01	1150	276	144	3.2	1090	--
1949	1250			92	13	109		162	0	256	87		3.1		706	.96	2380	281	148	2.8	1030	7.9
1950	1280			89	12	103		159	0	253	76		2.5		684	.93	2360	274	144	2.7	991	7.8
1951	574			81	13	109		173	0	250	65		1.9	0.20	676	.92	1050	256	114	3.0	966	8.0
1952	647			--	--	78		151	0	--	43		--		618	.84	1080	270	146	2.1	860	--
1953	167			--	--	131		159	0	--	83		--		868	1.18	391	336	206	3.1	1220	--
1954	626			--	--	83		184	0	--	46		--		640	.87	1080	302	152	2.1	931	--
1955	933			--	--	74		161	0	--	48		--		559	.76	1410	258	126	2.0	817	--
1956	289			--	--	154		168	0	--	91		--		949	1.29	741	358	220	3.5	1330	--
1957	503			--	--	120		173	0	--	65		--		809	1.10	1100	327	186	2.9	1140	--
1958	2840			--	--	54		164	0	--	24		--		449	.61	3440	208	74	1.6	638	--
1959	850			--	--	129		171	0	--	81		--		853	1.16	1960	342	202	3.0	1200	--
1960	1300			--	--	97		172	0	--	60		--		654	.89	2300	270	129	2.6	945	--
1961	808			--	--	126		180	0	--	72		--		779	1.06	1700	300	152	3.2	1130	--
1962	735			--	--	131		176	0	--	76		--		816	1.11	1620	303	159	3.3	1140	--
1963	708			--	--	120		176	0	--	63		--		809	1.10	1550	322	178	2.9	1120	--
1964	583			--	--	138		190	0	--	70		--		838	1.14	1320	309	154	3.4	1170	--
1965	526			--	--	144		192	0	--	73		--		846	1.15	1200	310	153	3.6	1200	--
1966	1720			--	--	79		184	0	--	45		--		596	.81	2770	274	124	2.1	862	--
1967	833			--	--	132		189	0	--	67		--		846	1.15	--	318	164	3.2	1170	--
1968	--			--	--	74		184	0	--	33		--		551	.75	--	248	97	2.0	793	--
8-3775. RIO GRANDE AT LANGTRY, TEX.																						
1944	1840			74	13	103		174	0.	185	91		1.9	--	610	0.83	3020	238	95	2.9	920	8.0
1945	1830			72	14	100		149	0	205	88		1.9	0.15	610	.83	3010	238	116	2.8	921	7.8
1946	1750			70	14	97		147	0	202	80		5.6	.17	596	.81	2820	231	110	2.8	893	7.8
1947	1360			69	14	86		153	0	195	65		3.1	--	551	.75	2020	230	104	2.5	838	7.8
1948	873			77	17	92		181	0	211	69		3.1	--	618	.84	1460	261	112	2.5	911	--
1949	1830			80	13	83		154	0	206	67		3.7	--	588	.80	2910	250	124	2.3	869	8.0
1950	1680			73	13	86		156	0	191	68		3.7	.14	559	.76	2540	233	106	2.5	844	7.9
1951	978			71	15	83		170	0	193	55		3.1	.15	559	.76	1480	238	99	2.3	820	7.9
1952	911			80	14	66		156	0	211	43		--	--	544	.74	1340	258	130	1.8	798	--
1953	450			75	19	80		179	0	200	58		4.3	.17	588	.80	714	264	116	2.1	851	8.0
1954	1390			81	9.8	54		174	0	162	37		--	--	471	.64	1770	242	98	1.5	698	--
1955	1490			84	12	56		168	0	189	36		2.5	.12	493	.67	1980	258	120	1.5	730	8.0
1956	633			79	17	86		176	0	222	57		1.9	.18	596	.81	1020	267	123	2.3	875	8.0
1957	1110			83	13	63		174	0	195	39		1.9	.12	522	.71	1560	258	116	1.7	767	8.0
1958	3270			76	9.2	52		163	0	161	29		3.7	.24	449	.61	3960	228	94	1.5	672	7.8
1959	1350			92	15	93		178	0	256	60		1.9	.19	662	.90	2410	291	145	2.4	956	7.9
1960	1810			82	13	80		179	0	211	50		2.5	.19	581	.79	2840	256	110	2.2	850	7.9
1961	1330			85	15	94		179	0	249	55		1.2	.20	632	.86	2270	274	128	2.5	942	7.9
1962	1110			88	13	98		183	0	245	62		2.5	.20	654	.89	1960	272	122	2.6	951	7.8
1963	1060			96	13	95		203	0	249	54		1.9	.20	669	.91	1910	292	125	2.4	956	7.9
1964	1260			84	12	73		201	0	186	44		3.1	.16	537	.73	1830	258	93	2.0	800	8.0
1965	1110			85	12	82		203	0	207	46		3.1	.17	581	.79	1740	264	97	2.2	855	7.9
1966	2160			92	9.0	69		201	0	196	36		3.7	.13	551	.75	3210	266	100	1.8	803	8.0
1967	1310			95	13	101		198	0	269	55		3.7	.17	699	.95	--	292	130	2.6	992	7.9
1968	--			86	9.8	68		190	0	192	35		3.1	.11	537	.73	--	254	98	1.9	782	8.0

Table 11.--Discharge-weighted average of chemical constituents at selected sites in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

CALENDAR YEAR	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4474. PECOS RIVER NEAR SHUMLA, TEX.																						
1955	286			125	53	292		157	0	320	502		3.7	0.19	1440	1.96	1110	528	400	5.5	2330	8.0
1956	158			138	63	361		148	0	388	613		1.9	.17	1740	2.37	742	602	481	6.4	2770	7.9
1957	540			105	37	225		150	0	255	371		1.2	.14	1160	1.58	1690	416	292	4.8	1850	8.0
1958	372			111	44	251		161	0	269	424		3.1	--	1290	1.75	1300	457	325	5.1	2030	--
1959	405			114	46	283		162	0	284	470		3.7	.16	1380	1.87	1510	474	341	5.7	2220	7.9
1960	204			144	66	414		157	0	398	704		3.1	.23	1950	2.65	1070	628	500	7.2	3100	7.9
1961	236			131	64	399		148	0	384	669		2.5	.21	1840	2.50	1170	589	468	7.1	2960	7.9
1962	186			159	65	457		164	0	437	767		3.1	.21	2120	2.88	1060	664	530	7.7	3280	7.8
1963	148			151	65	446		165	0	420	749		1.9	.22	2050	2.79	819	644	508	7.6	3230	7.8
1964	439			109	35	230		182	0	221	386		3.1	.16	1150	1.57	1360	415	266	4.9	1860	8.0
1965	233			116	48	318		170	0	288	530		2.5	.17	1490	2.03	937	486	346	6.3	2400	7.9
1966	263			104	39	258		171	0	240	426		2.5	.13	1230	1.67	873	421	281	5.5	2010	8.0
a/ 1967	--			112	51	318		171	0	298	521		1.9	.16	1470	2.00	--	488	348	6.3	2420	7.9
a/ 1968	--			114	50	324		170	0	301	532		1.2	.17	1490	2.03	--	492	352	6.4	2430	7.9
8-4590. RIO GRANDE AT LAREDO, TEX.																						
1956	1080					91		156	0		115				588	0.80	1710	264	136	2.4	928	
1957	4450					54		147	0		65				404	.55	4850	200	80	1.7	637	
1958	6310					50		156	0		51				419	.57	7140	214	86	1.5	647	
1959	3490					76		162	0		85				529	.72	4980	248	115	2.1	825	
1960	3250					75		163	0		80				529	.72	4640	244	110	2.1	825	
1961	3290					70		152	0		77				485	.66	4310	226	101	2.0	770	
1962	1950					99		153	0		107				603	.82	3170	250	125	2.7	945	
1963	1790					98		156	0		102				625	.85	3020	256	128	2.7	952	
1964	4310					49		135	0		51				360	.49	4190	182	72	1.6	580	
1965	2440					84		156	0		93				551	.75	3630	232	104	2.4	848	
1966	3640					71		155	0		65				493	.67	4850	220	94	2.1	754	
1967	2460					82		161	0		78				544	.74	--	234	102	2.3	829	
1968	--					81		164	0		79				551	.75	--	236	102	2.3	834	
8-4613. RIO GRANDE BELOW FALCON DAM, TEX.																						
1956	2610			73	17	82		154	0	169	95		1.2	0.14	544	0.74	3830	254	127	2.2	856	8.0
1957	2060			58	12	56		141	0	99	69		--	.11	397	.54	2210	193	78	1.8	639	--
1958	6930			59	10	52		138	0	107	57		1.9	.14	390	.53	7300	191	78	1.6	620	7.9
1959	3530			69	13	57		150	0	138	62		3.1	.13	456	.62	4350	228	105	1.6	709	7.9
1960	2860			68	18	83		137	0	181	92		.6	.17	551	.75	4250	243	131	2.3	870	7.9
1961	3060			67	17	86		137	0	180	91		.6	.17	544	.74	4490	239	126	2.4	875	7.9
1962	2930			67	16	89		138	0	183	94		--	.17	559	.76	4420	233	120	2.5	877	7.9
1963	2210			77	16	109		141	0	210	117		.6	.18	647	.88	3860	258	143	3.0	1010	7.7
1964	2000			67	16	94		137	0	184	97		--	.17	559	.76	3020	232	120	2.7	885	7.9
1965	3200			60	12	62		146	0	119	69		1.2	.15	434	.59	3750	198	78	1.9	685	7.8
1966	2460			60	14	80		134	0	150	86		--	.16	485	.66	3220	208	98	2.4	783	7.8
1967	2850			63	14	84		135	0	173	83		1.2	--	522	.71	--	216	106	2.5	825	--
1968	--			66	14	80		139	0	166	80		.6	.17	515	.70	--	223	109	2.3	812	7.9

a/ Samples collected near Langtry, 3.5 miles downstream after July 1, 1967.

Table 11.--Discharge-weighted average of chemical constituents at selected sites in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

CALENDAR YEAR	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4625. RIO GRANDE AT ROMA, TEX.																						
1943	3740			--	--	--		--	--	--	--		--	--	853	1.16	8610	--	--	--	--	--
1944	5140			68	17	101		138	0	163	125		1.9	0.15	596	.81	8270	237	124	2.8	937	8.0
1945	3620			75	21	125		135	0	204	157		1.9	.15	699	.95	6830	271	160	3.3	1110	7.9
1946	4500			63	15	94		129	0	157	111		5.6	.14	559	.76	6790	220	114	2.9	880	7.8
1947	3550			62	16	90		135	0	158	103		4.3	--	544	.74	5210	222	112	2.6	858	7.9
1948	4570			55	13	62		130	0	115	71		5.0	--	426	.58	5260	190	84	2.0	657	--
1949	5960			61	13	70		131	0	132	82		4.3	--	471	.64	7580	204	98	2.1	742	7.9
1950	3080			75	17	95		149	0	183	110		4.3	.15	603	.82	5010	258	136	2.6	949	7.8
1951	2550			66	15	80		148	0	147	91		3.1	.13	529	.72	3640	227	106	2.3	814	7.7
1952	1410			79	18	85		156	0	190	96		--	--	603	.82	2300	273	145	2.2	922	--
1953	1610			57	11	48		136	0	92	56		6.8	.12	375	.51	1630	185	74	1.5	576	7.9
1954	2930			61	11	52		153	0	98	63		2.5	.14	397	.54	3140	197	72	1.6	633	8.0
8-4647. RIO GRANDE AT FORT RINGGOLD, RIO GRANDE CITY, TEX.																						
1959	3720			71	14	64		156	0	143	71		3.7	0.12	478	0.65	4800	236	108	1.8	752	7.9
1960	3040			70	18	87		140	0	181	97		.6	.19	559	.76	4590	246	130	2.4	886	7.9
1961	3250			67	18	90		139	0	182	97		.6	.19	559	.76	4910	240	126	2.5	892	7.9
1962	3090			69	15	92		141	0	183	99		--	.20	574	.78	4790	236	120	2.6	894	7.9
1963	2420			76	16	109		147	0	203	118		.6	.21	640	.87	4180	258	137	3.0	1000	7.8
1964	2260			69	15	93		143	0	179	97		.6	.18	559	.76	3410	232	115	2.7	886	8.0
1965	3280			61	12	67		148	0	122	73		1.2	.15	449	.61	3980	201	80	2.1	711	7.8
1966	2890			63	13	83		142	0	146	89		1.2	.17	500	.68	3900	211	95	2.5	799	7.8
1967	8240			62	9.6	58		140	0	119	63		3.1	.14	412	.56	--	194	80	1.8	657	7.9
1968	--			76	17	99		147	0	189	113		1.9	.22	618	.84	--	259	138	2.7	963	7.8
8-4655. RIO GRANDE AT RIO GRANDE CITY, TEX.																						
1934	4160			--	--	--		--	--	--	--		--	--	767	1.04	8610	--	--	--	--	--
1935	9320			--	--	--		--	--	--	--		--	--	516	.70	13000	--	--	--	--	--
1936	7030			58	20	83		117	0	160	102		1.9	--	559	.76	10600	228	132	2.4	876	8.3
1937	3650			92	25	129		156	0	246	160		2.5	--	816	1.11	8040	332	205	3.1	1260	7.9
1938	8460			70	15	78		148	0	143	90		4.3	.13	515	.70	11800	236	114	2.2	807	7.9
1939	4400			74	18	99		143	0	173	120		3.1	--	596	.81	7080	260	142	2.7	947	8.0
1940	5520			64	14	80		135	0	135	96		2.5	--	500	.68	7450	216	106	2.4	791	8.0
1941	10600			111	23	131		139	0	288	172		3.7	.17	875	1.19	25000	372	258	2.9	1300	7.8
1942	9600			85	23	133		135	0	235	170		3.1	.16	779	1.06	20200	305	194	3.3	1200	7.8
1943	3880			86	25	152		134	0	250	196		2.5	.19	846	1.15	8860	318	208	3.7	1320	7.9
1944	7660			65	15	84		138	0	145	100		1.9	.13	522	.71	10800	223	110	2.4	826	7.9
1945	4410			74	19	114		137	0	195	140		2.5	.16	662	.90	7880	262	150	3.1	1040	7.9
1946	4810			64	16	100		132	0	163	118		5.0	.14	581	.79	7550	224	116	2.9	912	7.9

Table 11.--Discharge-weighted average of chemical constituents at selected sites in the Rio Grande basin--Continued

(Results in milligrams per liter except as indicated)

CALENDAR YEAR	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Milligrams per liter (mg/l)	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
8-4692. RIO GRANDE BELOW ANZALDUAS DAM, TEX.																						
1959	1500			78	17	107		156	0	178	132		3.1	--	647	0.88	2620	264	137	2.9	1020	--
1960	1390			83	23	150		149	0	226	196		.6	0.33	801	1.09	3010	302	180	3.8	1290	7.9
1961	1690			78	23	153		142	0	227	194		--	.35	787	1.07	3590	289	172	3.9	1280	8.0
1962	1460			81	22	160		143	0	236	202		--	.35	831	1.13	3280	291	174	4.1	1320	7.8
1963	1120			82	20	144		146	0	230	174		.6	.29	772	1.05	2330	286	166	3.7	1230	7.9
1964	1090			73	19	143		138	0	214	173		.6	.30	735	1.00	2160	260	147	3.9	1180	7.9
1965	1460			68	16	112		148	0	160	139		.6	.28	625	.85	2460	234	112	3.2	988	7.8
1966	1990			72	18	135		145	0	189	169		.6	.29	699	.95	3760	252	134	3.7	1130	7.9
1967	6000			69	12	89		148	0	140	110		3.1	.25	529	.72	--	222	100	2.6	858	7.9
1968	--			90	23	169		145	0	249	223		2.5	.38	890	1.21	--	321	202	4.1	1410	7.9
8-4730. RIO GRANDE AT LAS PALMAS, TEX.																						
1946	3570			63	14	91		133	0	151	105		3.7	0.13	544	0.74	5240	216	106	2.7	861	7.9
1947	2730			63	15	87		134	0	154	100		4.3		537	.73	3960	221	111	2.5	842	7.9
1948	3660			59	13	69		138	0	123	81		4.3		463	.63	4580	204	90	2.1	730	--
8-4750. RIO GRANDE AT BROWNSVILLE, TEX.																						
1934	3390			--	--	--		--	--	--	--		--		757	1.03	6930	--	--	--	--	--
1935	6740			--	--	--		--	--	--	--		--		507	.69	9230	--	--	--	--	--
1936	5510			65	16	87		129	0	166	100		3.1		581	.79	8640	228	123	2.5	924	8.2