TEXAS WATER DEVELOPMENT BOARD

REPORT 134

# RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATERS OF THE NUECES RIVER BASIN, TEXAS



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Prepared by the U.S. Geological Survey
in cooperation with the
Texas Water Development Board

September 1971

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Published and distributed
by the
Texas Water Development Board
Post Office Box 13087
Austin, Texas 78711

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## ABSTRACT

The kinds and quantities of minerals dissolved in surface waters of the Nueces River basin are related principally to the geology of the area and to rainfall and streamflow characteristics; but industrial influences, particularly the disposal of oil-field brine, have affected the quality in some areas.

The basin lies in two physiographic sections—the Edwards Plateau of the Great Plains province and the West Gulf Coastal Plain of the Coastal Plain province. The Edwards and associated limestones and the Glen Rose Limestone of Cretaceous age are exposed on the Edwards Plateau. Rocks exposed in the West Gulf Coastal Plain range in age from Late Cretaceous to Holocene.

Separate and distinct streamflow patterns exist in the two provinces. In the Edwards Plateau section, where streamflow is partially sustained by seeps and springs, flow in the larger streams is perennial. As these streams cross the Balcones Fault Zone (Balcones Escarpment), substantial channel losses occur. Streamflow in the West Gulf Coastal Plain, which is almost entirely dependent on runoff from local precipitation, is intermittent and highly erratic.

Water in surface streams throughout the Edwards Plateau is generally consistently of good chemical quality, having a dissolved-solids content of less than 250 mg/l (milligrams per liter). The water is very hard, and the principal constituents are calcium and bicarbonate. The chemical quality of water of streams in the West Gulf Coastal Plain section varies from poor to excellent. During low flow the water generally contains high dissolved-solids concentrations, in which sodium and chloride predominate. During the short periods of high flow, dissolved-solids concentrations are low and calcium and bicarbonate are the principal constituents. Chemical quality of water in existing impoundments and of water available for storage in potential reservoirs is generally good. Dissolved-solids concentrations are less than 300 mg/l, with calcium and bicarbonate predominating.

Some streams in the southern part of the basin have been degraded from time to time by oil-field brine and by return flow from irrigation. Municipal and industrial wastes may also affect water quality during low flow. These detrimental effects are minimized in impoundments, however, because there is sufficient runoff for dilution.

Lake Corpus Christi provides water of good quality for municipal supply, irrigation, and industrial use. Potential reservoirs on the larger streams in the Nueces River basin would probably store water of similar quality.

# RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATERS OF THE NUECES RIVER BASIN, TEXAS

## INTRODUCTION

The investigation of the chemical quality of the surface waters of the Nueces River basin was made by the U.S. Geological Survey in cooperation with the Texas Water Development Board as part of a statewide reconnaissance. Reports that have been prepared are listed in the references.

The purpose of this report is to present available chemical-quality data and interpretations that will aid in the proper development, management, and use of the surface-water resources of the Nueces River basin. In the study, the following factors were considered: the nature and concentrations of mineral constituents in solution; the geologic, hydrologic, and cultural influences that determine the water quality; and the suitability of the water for domestic supply, industrial use, and irrigation.

A network of daily chemical-quality stations on principal streams in Texas is operated by the U.S. Geological Survey in cooperation with the Texas Water Development Board and with federal and local agencies. However, this network has not been adequate to inventory completely the chemical quality of surface waters in the State. To supplement the information being obtained by the network, a cooperative statewide reconnaissance by the U.S. Geological Survey and Texas Water Development Board was begun in September 1961. During this investigation, samples for chemical analysis were collected periodically at numerous sites throughout Texas so that some water-quality information would be available for locations where water-development projects are likely to be built. These data aid in the delineation of areas having water-quality problems and in the identification of probable sources of pollution, thus indicating areas in which more detailed investigations are needed.

For this reconnaissance, water-quality data were collected from the principal streams and many tributaries, the major reservoirs, and at a number of potential reservoir sites.

Other agencies that cooperated in the collection of chemical-quality and streamflow data are the Lower Nueces River Water Supply District, the Zavala and Dimmit Counties Water Improvement District No. 1, the Edwards Underground Water District, and the Texas State Department of Health.

## NUECES RIVER DRAINAGE BASIN

### General Description

The Nueces River basin is in two physiographic sections—the Edwards Plateau of the Great Plains province and the West Gulf Coastal Plain of the Coastal Plain province (Figure 1). The Balcones Escarpment, which separates these two sections, extends westward from San Antonio (about 30 miles east of the report area) across Medina, Uvalde, and Kinney Counties. The basin is bounded on the north and east by the Colorado, Guadalupe, and San Antonio River basins, and the San Antonio-Nueces coastal basin; and on the west and south by the Rio Grande basin and Nueces-Rio Grande coastal basin. The drainage area, which includes all or parts of 21 counties, is about 17,000 square miles.

The Nueces River rises in Edwards County at an elevation of about 2,400 feet and flows 315 miles southeastward to Nueces Bay on the Gulf of Mexico near Corpus Christi. The Frio River, which joins the Nueces River below Three Rivers, is the principal tributary to the Nueces River.

The Edwards Plateau and the Balcones Escarpment are partly protected from erosion by a cap of very resistant limestone. Therefore, in the northernmost part of the Nueces River basin, broad areas of the plateau are relatively undissected by stream erosion. Grass, small trees, and brush cover this part of the plateau. Southward, valleys have been cut in the plateau, and remnants of the resistant limestone caps form cliffs on the crests of the divides. Liveoak, juniper, and sparse stands of native grasses grow on the rocky hills and slopes. Pecan, cypress, sycamore, willow, and native grasses grow on the valley floors.

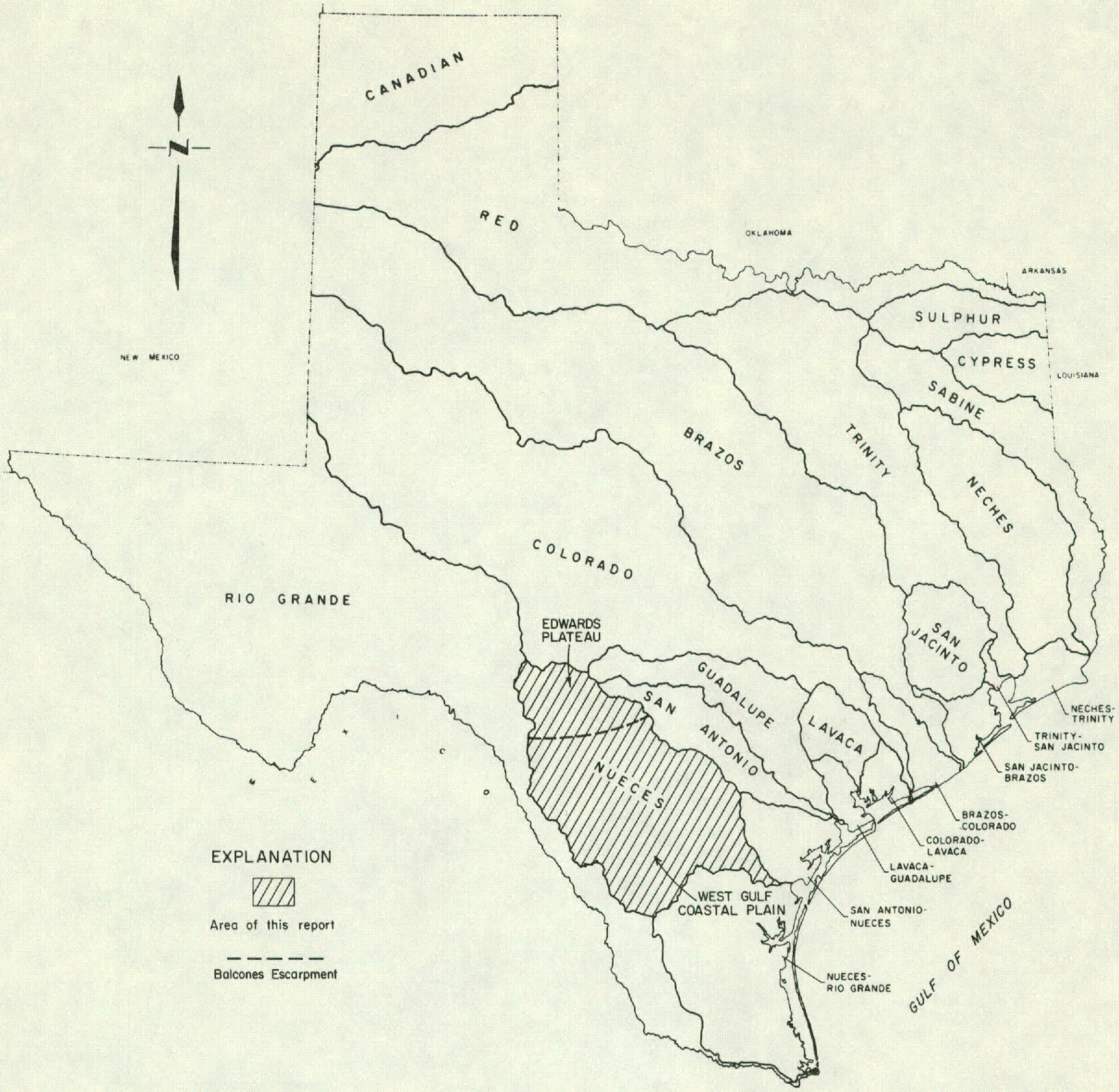


**Figure 1.—Index Map of Texas Showing River Basins and Coastal Areas**

The West Gulf Coastal Plain extends from the Balcones Escarpment to the Gulf of Mexico. The terrain is rolling to moderately hilly near the Balcones Escarpment; parallel to the coast line low ridges are formed by beds of resistant sandstone. The streams that drain the West Gulf Coastal Plain have flood plains bounded by terraces that may be several miles wide. Mesquite, several varieties of native brushes, and native grasses grow on the low divides and valley floors. Pecan and other large trees grow along the stream channels.

## Population and Economic Development

The population of the Nueces River basin in 1970 was more than 130,000. Cities with a population of more than 5,000 were Uvalde (10,403), Crystal City (8,012), Mathis (5,043), and Carrizo Springs (5,699). A small part of Corpus Christi is in the Nueces River basin; the remaining part of the city is in the Nueces-Rio Grande coastal basin.

The economy of the Nueces River basin is based chiefly on agriculture. Only a small amount of land along the streams in the Edwards Plateau area is suitable for farming; consequently, almost all of the Plateau area is devoted to ranching of goats, sheep, and cattle. Cattle ranching is extensively practiced, in the West Gulf Coastal Plain area, and where ground water is available for irrigation, truck crops, grains, cotton, and livestock feeds are grown.

Oil and gas production and oil-field supply are the major nonagrarian sources of income. The greatest concentration of oil and gas fields is in the southern half of the basin (Figure 6). Production of oil and natural gas in the basin began in 1928 with the discovery of Government Wells North Field in Duval County. Since then, oil and gas fields have been developed in many other parts of the West Gulf Coastal Plain section of the basin.

Tourism and recreation aid the economy of the entire area. Hunting is an important revenue source throughout the basin. The outdoor water-oriented recreation afforded by Lake Corpus Christi and Nueces Bay attract many visitors each year.

## SURFACE WATER

### Streamflow Records

Streamflow records in the Nueces River basin date from 1915, when the U.S. Geological Survey established streamflow stations on the Frio River near Derby and the Nueces River near Three Rivers. Since that time, other streamflow stations have been established on the Nueces, Sabinal, Frio, and Atascosa Rivers, and on Seco, Hondo, San Miguel, and San Casimiro Creeks. In 1968, the Geological Survey was operating 24 streamflow stations. During this reconnaissance, discharge was measured at other sites where water-quality samples were collected for chemical analysis.

The periods of record for all streamflow stations in the Nueces River basin are given in Table 3 and the locations of these stations are shown on Figure 8. Records of discharge and stage of streams in the Nueces River basin from 1915 to 1960 have been published in the annual series of the U.S. Geological Survey Water-Supply Papers (see table at end of list of references). Beginning with the 1961 water year, streamflow records have been released by the Geological Survey in annual reports for each state (U.S. Geological Survey, 1961-1967). Summaries of discharge records have been published giving monthly and annual totals (U.S. Geological Survey, 1960, 1964a; Texas Board of Water Engineers, 1958).

### Streamflow Occurrence

Flow of streams in the Edwards Plateau area of the Nueces River basin is sustained by springs and seeps and local precipitation. As these streams cross the Balcones Escarpment, they lose much of their flow to the subsurface. South of the Balcones Escarpment, tributary streams derive very little, if any, flow from springs, and streamflow is dependent primarily on the quantity and intensity of local precipitation.

#### Springflow

The Edwards and associated limestones are recharged primarily by precipitation on the outcrops. The water moves rapidly downward from the surface to the water table, thence laterally to areas along stream valleys where it is discharged through seeps and springs at the contacts between the Edwards and associated limestones and the underlying Glen Rose Limestone. This springflow maintains continuous flow in some of the streams in the Edwards Plateau area.

#### Precipitation

Average precipitation ranges from about 20 inches in the west to about 28 inches in the east. Mean annual precipitation in the basin; average monthly precipitation at Eagle Pass (just west of the report area), Pearsall, and Beeville (just east of the report area); and annual precipitation for the period 1931-67 at Pearsall are shown on Figure 2. Average monthly rainfall is usually at a peak in May and again in September (see average monthly precipitation data for Eagle Pass, Pearsall, and Beeville on Figure 2). Rainfall throughout the basin is relatively low and is subject to much greater variations than indicated by the annual and monthly averages. For example, during the 1931-67 period, precipitation at the three stations in Figure 2 ranged from 0.00 inch during several months to 22.62 inches at Beeville in September 1967. Precipitation that is so unevenly distributed is not conducive to sustaining streamflow; therefore, flow in most tributaries in the basin is intermittent, and long periods of no flow have occurred in the streams in the West Gulf Coast Plain area of the Nueces River basin.

#### Runoff

Runoff is defined as that part of precipitation appearing in surface streams and is the same as streamflow unaffected by artificial diversions, storage, or other works of man in or on stream channels (Langbein and Iseri, 1960). The natural runoff pattern of streams in the Nueces River basin is altered by many small diversions for irrigation and domestic supply, by the Upper Nueces Reservoir above Crystal City, and by Lake Corpus Christi near Mathis (Figure 8).

The average annual runoff for the period 1924-68 from the Nueces River at Laguna and near Three Rivers was 2.4 and 0.7 inches respectively (Figure 2). Annual runoff expressed as mean discharge in cfs (cubic feet per second) and in inches per year is shown on Figure 2 for the Nueces River at Laguna and near Three Rivers. Total runoff for the basin is less than 1 inch.

Because runoff in the Edwards Plateau area is not entirely dependent on local precipitation, streams cease to flow only after long periods of no rainfall. Streamflow records show that the Nueces River near Laguna

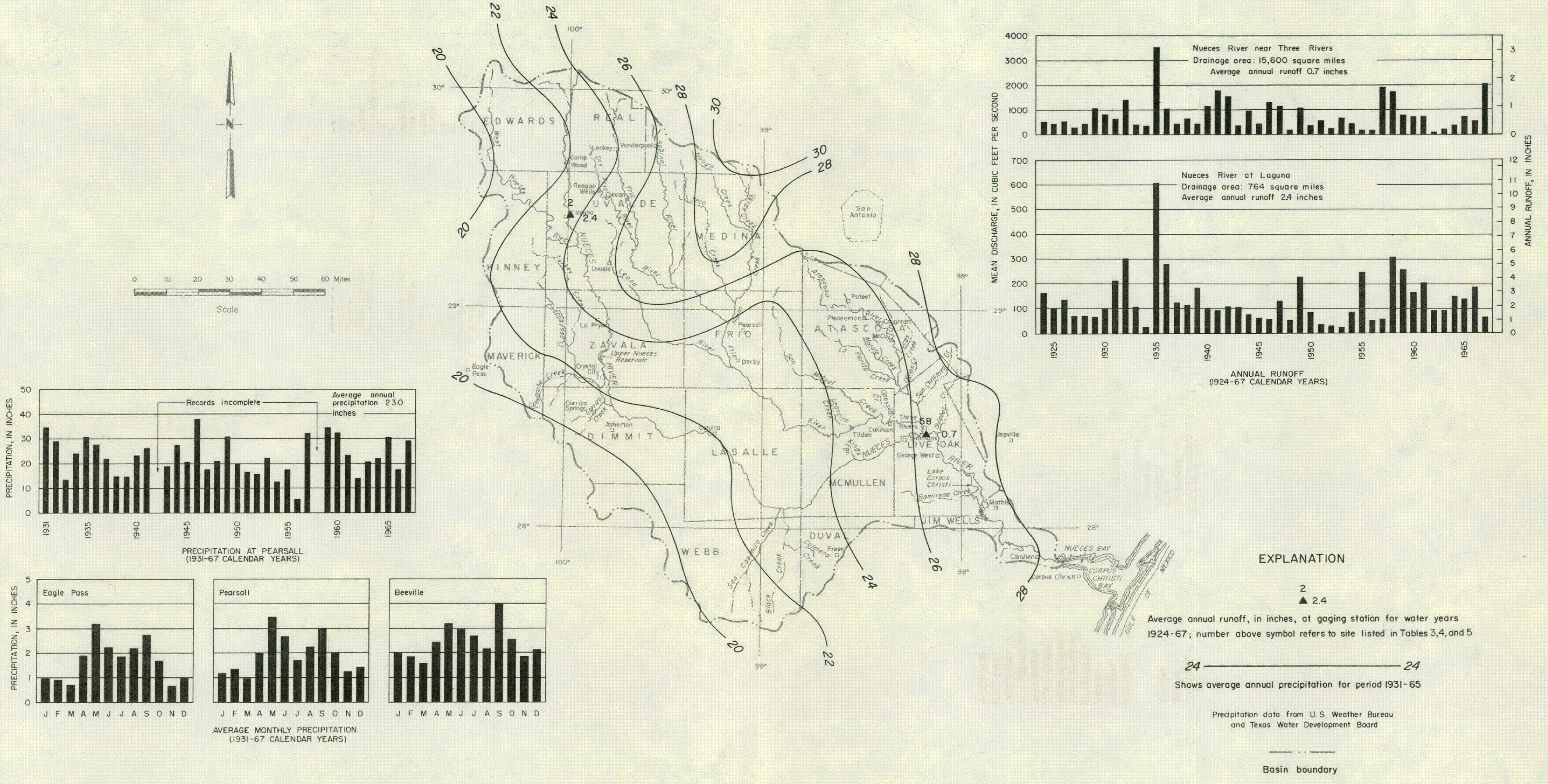


Figure 2
Precipitation and Runoff in the Nueces River Basin

Base from U.S. Geological Survey, 1:500,000 map has flowed continuously since the establishment of this station in 1923.

A contrasting situation exists in the West Gulf Coast Plain area of the Nueces River basin. Runoff is almost entirely dependent on the low, highly variable, local precipitation. Therefore, runoff in streams in this area of the basin is also highly variable. Discharge of the Nueces River near Three Rivers has ranged from no flow on many occasions to 141,000 cfs on September 23,1967.

The magnitude and frequency of high and low flows can be shown by flow-duration curves. A curve with a steep trend throughout indicates a highly variable stream whose flow is largely from direct runoff, whereas a curve with a flat trend shows surface- or ground-water storage. Flow duration curves for the Nueces River at Laguna and near Three Rivers are shown on Figure 3. The steep slope of the curve for the Nueces River near Three Rivers and the gradually decreasing trend of the curve for the Nueces River at Laguna further illustrates the runoff pattern in the two provincial areas of the Nueces River basin.

## Surface-Water Development

Because precipitation and runoff are variable in most of the Nueces River basin, storage projects are necessary to maintain dependable supplies. At present many small diversions for irrigation and domestic supply are located on streams throughout the Nueces River basin, and there are two reservoirs with capacities of over 5,000 acre-feet on the Nueces River (Figure 8). The Upper Nueces Reservoir (7,590 acre-feet capacity) above Crystal City is owned and operated by the Zavala and Dimmit Counties Water Improvement District No. 1. Water in this reservoir is used for irrigation. Lake Corpus Christi near Mathis is owned and operated by the Lower Nueces River Water Supply District. This reservoir, with a capacity of 297,800 acre-feet, supplies water for municipal supply and industrial use.

The Texas Water Plan (Texas Water Development Board, 1968) includes the provision for construction of either Choke Canyon or R&M (Reagan and McCaughan) Reservoirs, depending on local decisions as to which of the two alternatives is desired, and possible construction of Montell, Concan, and Sabinal Reservoirs in the basin (Figure 8). Choke Canyon Reservoir would be located on the Frio River above Three Rivers. R&M Reservoir, the alternative to Choke Canyon Reservoir, would be located on the Nueces River below Lake Corpus Christi. Montell, Concan, and Sabinal Reservoirs would provide flood control on the upper Nueces, Frio, and Sabinal rivers, and supplemental recharge to the Edwards and associated limestones during periods of high streamflow.

# CHEMICAL QUALITY OF THE WATER

## Chemical-Quality Records

Daily chemical-quality sampling in the Nueces River basin began in October 1941, at the station Nueces River near Three Rivers. The sampling station Nueces River at Cotulla was established in January 1942. The Cotulla station was discontinued in December 1942, and the Three Rivers station was discontinued in October 1952. The stations Nueces River near Mathis (established in October 1947) and the Frio River at Calliham (established in October 1967) were the only daily chemical-quality stations operating in the Nueces River basin in 1968. Periodic sampling was begun as early as 1930, but was sporadic until 1962 when a more intense periodic data-collection program was begun. During this reconnaissance, numerous samples were collected for chemical analyses, and discharge measurements were made at miscellaneous sites on streams throughout the basin.

Locations of the data-collection sites are shown on Figure 8, and selected chemical-quality data for the daily stations are given in Table 4. Results of all periodic analyses are given in Table 5. The complete records are published in an annual series of U.S. Geological Survey Water-Supply Papers and reports of the Texas Water Development Board (see table at end of list of references).

## Factors Affecting Chemical Quality of Water

The chemical quality of surface water depends on a number of factors. The more important ones are geology, patterns and characteristics of streamflow, and activities of man.

### Geology and Streamflow

The geology of the Nueces River basin has been described by Alexander, Myers, and Dale (1964). Rocks exposed in the basin consist of sediments that range in age from Cretaceous to Quaternary (Figure 8).

The Edwards Plateau section of the basin is underlain by the Glen Rose Limestone and Edwards and associated limestones of Cretaceous age. The Glen Rose Limestone is in the Trinity Group. The Edwards and associated limestones includes the Georgetown Limestone of the Washita Group and the Kiamichi Formation, Edwards Limestone, Comanche Peak Limestone, and Walnut Clay of the Fredericksburg Group. The rocks consist largely of limestone, dolomitic limestone, marl, and shale.

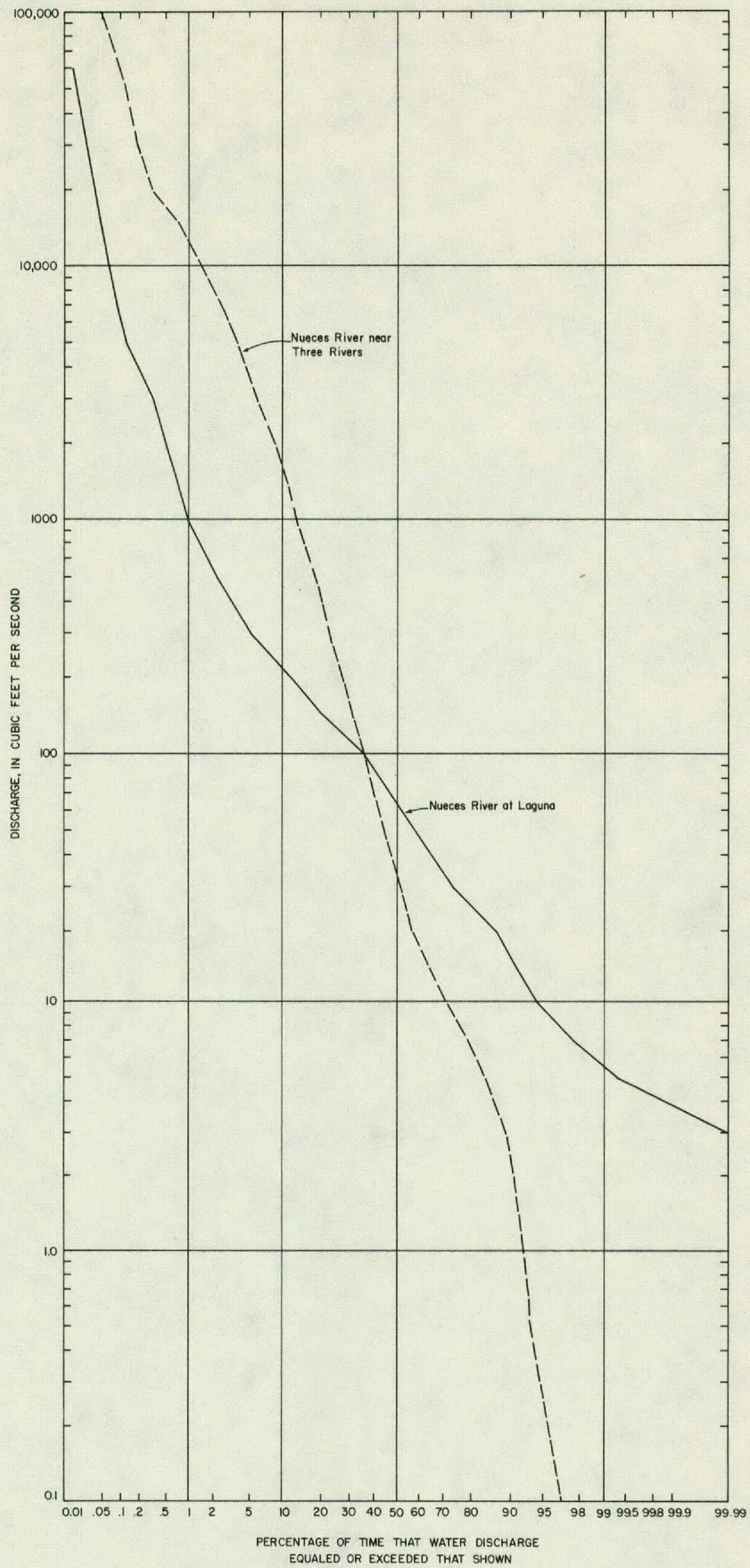


Figure 3

Duration of Flows, Nueces River at Laguna and Near Three Rivers, 1949-68

In the West Gulf Coastal Plain section of the basin, successively younger formations crop out in narrow belts that are roughly parallel to the coast of the Gulf of Mexico. Rocks from the Grayson Shale of Late Cretaceous age to the Midway Group of Paleocene age were considered as a unit by Alexander, Myers, and Dale (1964) and are mapped together on Figure 8. These rocks consist largely of clay, marl, limestone, and sandstone.

Other rocks that crop out in the upper and central parts of the West Gulf Coastal Plain section are the Wilcox, Claiborne, and Jackson Groups of Eocene age; the Frio Clay of Oligocene age; and the Catahoula Tuff and the lower part of the Fleming Formation of Miocene age. These rocks consist largely of sand, sandstone, silt, clay, and gravel.

The formations that crop out in the lower part of the Nueces River basin, in downstream order, are the upper part of the Fleming Formation of Miocene age, the Goliad Sand of Pliocene age, and the Lissie Formation and Beaumont Clay of Pleistocene age. The units are composed of clay, silt, sand, and gravel.

In streams where flow is not regulated by upstream reservoirs, the concentrations of dissolved minerals commonly vary inversely with the flow of the stream. The sustained low flow of a stream is usually predominantly water that has entered the stream as ground-water effluent. This water has been in contact with the rocks and soils for a sufficient time to dissolve part of their soluble minerals. At high flow, the water consists of surface runoff that has been in contact with the exposed rocks and soils for a short time. Therefore, the dissolved-solids concentration of a stream is usally lowest during periods of high flow. This inverse relationship between water discharge and dissolved solids is also true for streams in the Nueces River basin (Figure 4). The curve for the Nueces River near Three Rivers was prepared from the monthly weighted averages of chemical analyses and monthly mean-discharge data. The curve for the Frio River at Calliham is based on analyses of daily composite samples and mean daily discharge for the composite period. The point scatter is typical of western streams, where the intial flows of each runoff event flush out precipitated materials left by evaporation of water that remained in the drainage area after the previous runoff event.

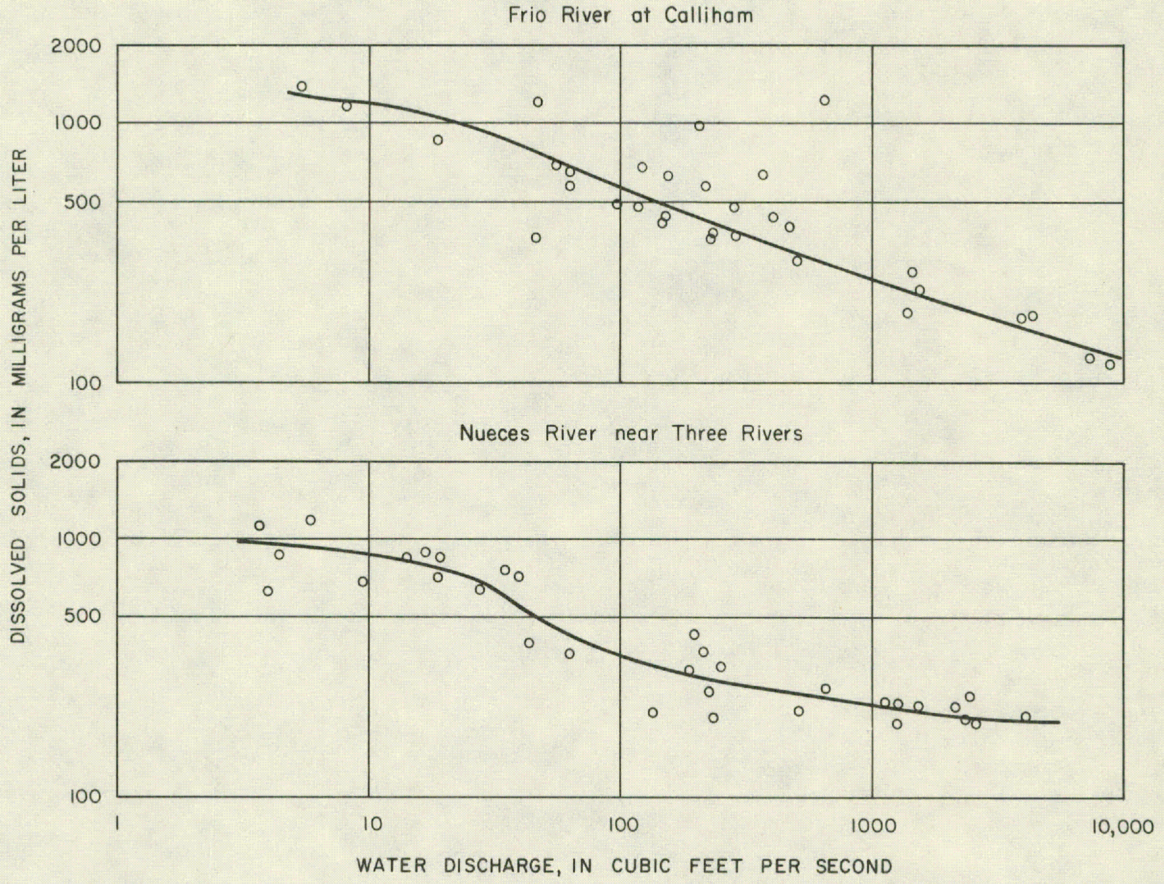


**Figure 4.—Relation of Concentration of Dissolved Solids to Water Discharge**

Streams in the Edwards Plateau area generally contain calcium bicarbonate water that is low in dissolved solids, regardless of the amount of streamflow. During periods of high flow, streams in the West Gulf Coastal Plain area contain calcium bicarbonate water that is low in dissolved solids. As streamflow diminishes, the water generally changes to a mixed type, with an increase in dissolved solids. During extreme low flow, the dissolved-solids concentrations are increased and the water generally changes to a sodium chloride type.

Chemical analyses of water from the Nueces River near Three Rivers and one typical analysis of water from the Nueces River at Laguna are shown graphically in Figure 5. The total height of each vertical bar is equivalent to the total concentration of anions (negatively charged constituents) or cations (positively charged constituents) expressed in me/l (milliequivalents per liter). The bars are divided into segments to show the concentration of the individual constituents. The analysis of the water from the Nueces River at Laguna is typical of most of the surface water throughout the Edwards Plateau, and the analyses of the water from the Nueces River near Three Rivers typify the water that is in streams in the West Gulf Coastal Plain during varied streamflow conditions.

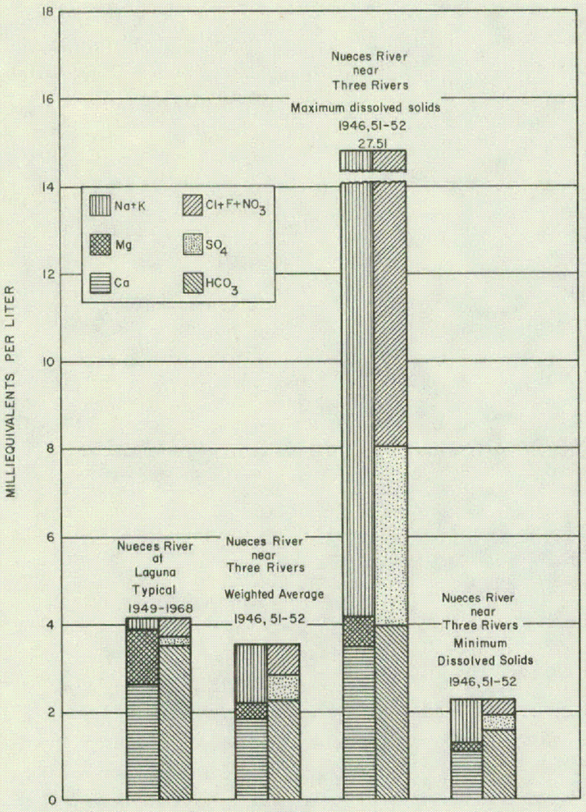


Figure 5.—Comparison of Dissolved Constituents in Water From the Nueces River at Laguna and Near Three Rivers

### Activities of Man

The activities of man often alter the chemical composition of surface streams. Depletion of flow by diversion, return flow of irrigation, disposal of municipal and industrial wastes into streams, and evaporation from water-storage projects usually increase dissolved-solids concentration of water in streams.

Many small diversions are located on streams in the Nueces River basin, but the effect on the chemical quality of total streamflow is probably negligible.

Irrigation practices often affect the water quality of streams. Where surface water is diverted for irrigation, the volume of streamflow is reduced. Where crops are irrigated with ground water, the drainage often differs in quality and type from water in the receiving stream. The return flows from irrigated lands carry minerals leached from the soil. In 1964, 507,425 acre-feet of water was used for irrigation in the Nueces River basin, primarily in the Winter Garden (Zavala and Dimmit Counties) and in Atascosa, Dimmit, and Frio Counties, (Gillett and Janca, 1965). Of this total, about 452,407 acre-feet was from ground-water supplies.

Dissolved-solids concentrations of ground water throughout the Nueces River basin range from less than 300 mg/l (milligrams per liter) to more than 11,000 mg/l (Alexander, Myers, and Dale, 1964). The average dissolved-solids concentration for the wells sampled was about 1,760 mg/l.

Municipal, industrial, and domestic wastes may cause some degradation of streams in the Nueces River basin. This problem is minimized because the basin is sparsely populated and has no large cities. The disposition of municipal and industrial wastes has caused only local changes in the quality of surface water and natural streamflow generally is adequate for dilution.

Oil is produced in the central and southern parts of the basin (Figure 6), and brine, which is produced in nearly all oil fields, may, if improperly handled, eventually reach the streams. According to an inventory by the Texas Railroad Commission in 1961 (Texas Water Commission and Texas Water Pollution Control Board, 1963), about 59 percent of the salt water produced in oil fields of the Nueces River basin was reinjected underground; the remaining brine was placed in unlined surface pits or directly into surface streams at that time. Data indicate that oil-field pollution was degrading low flows in the Frio and Atascosa Rivers, and some pollution occurred along the Nueces River. Available data do not indicate all the possible trouble areas, but the effect of oil-field pollution on the quality of the water impounded in Lake Corpus Christi is considered slight. Railroad Commission regulations no longer permit surface disposal of oil-field brine, but residual effects of past disposal practices may affect water supplies for many years.

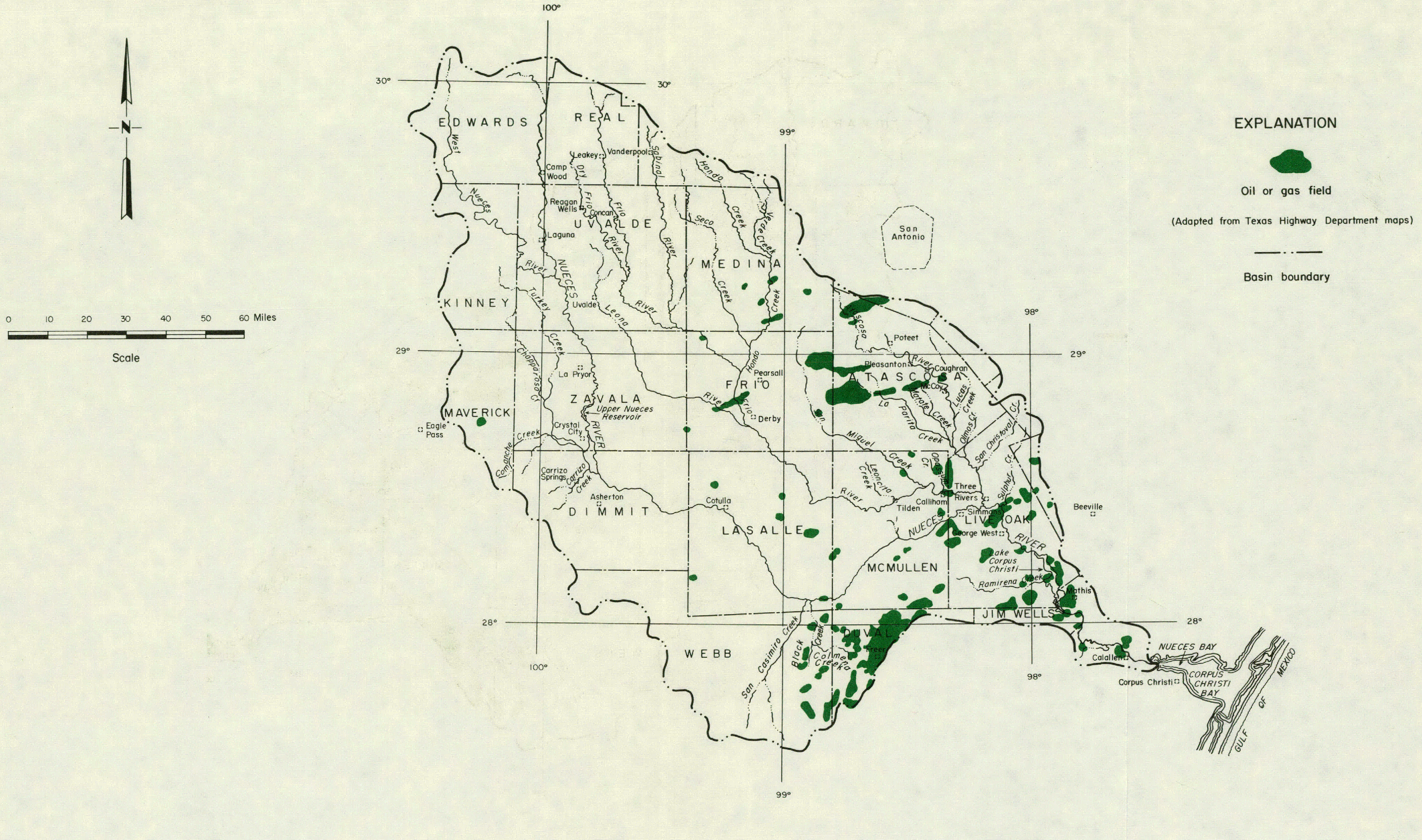


Figure 6
Oil and Gas Fields in the Nueces River Basin

Base from U.S. Geological Survey, 1:500,000 map

The Upper Nueces Reservoir and Lake Corpus Christi are the only two major reservoirs in the Nueces River basin (Figure 8). The chemical character of the Nueces River is probably affected only slightly by storage in the Upper Nueces Reservoir. Because flow in the Nueces River below Lake Corpus Christi is almost entirely regulated by the reservoir, the quality of the water is dependent largely on the quality of the stored water. U.S. Geological Survey studies have shown an increase in salinity of the Nueces River below Lake Corpus Christi and concluded that the increase was due to saline ground-water effluent and oil-field brine pollution.

## Quality of Water in Surface Streams

The principal cations in natural water are calcium, magnesium, sodium, potassium, and iron. The principal anions are carbonate, bicarbonate, sulfate, chloride, fluoride, and nitrate. Other constituents and properties are often determined to help define the chemical and physical character of water. In the following discussion, concentrations of the dissolved constituents are based on discharge-weighted averages. The discharge-weighted average approximates the chemical character of the water if all the water passing a point in the stream during a period were impounded in a reservoir and mixed with no adjustments for evaporation, rainfall, or other chemical changes that may occur during storage.

### Dissolved Solids

The discharge-weighted average concentration of dissolved solids in streamflow in the Nueces River basin is generally less than 300 mg/l. Periodic data from streams north of the Balcones Fault Zone indicate that base flow in the Edwards Plateau area usually contains less than 250 mg/l dissolved solids. During periods of high flow, this concentration would be expected to be much less than 250 mg/l.

In the West Gulf Coastal Plain area, water is also low in dissolved-solids content. Discharge-weighted average concentrations of dissolved solids in water of the Frio River at Calliham (1968), Nueces River near Three Rivers (1946, 1951-1952), and Nueces River near Mathis (1948-1968) were 258, 229, and 233 mg/l, respectively. Periodic analyses of water from tributary streams indicate that their dissolved-solids concentrations are probably in the same range of magnitude, except where local oil-field pollution has occurred (see Opossum Creek near Callaham in Table 5).

The station Nueces River near Three Rivers measures most of the water flowing into Lake Corpus Christi, and the station near Mathis measures outflow from the reservoir. Weighted averages for the period of concurrent record (1951 and 1952 water years) show about 10 percent increase in dissolved solids between the two stations. The analyses showing the maximum and minimum dissolved-solids concentrations and the annual discharge-weighted averages for the Nueces River near Tilden, Frio River at Calliham, Nueces River near Three Rivers, and Nueces River near Mathis for the periods of record are given in Table 4. Dissolved solids determined for miscellaneous sampling sites are listed in Table 5.

### Hardness

Periodic analyses of streams in the Edwards Plateau show that surface water in this section of the report area is generally hard (121-180 mg/l) or very hard (more than 180 mg/l). Streams in the plains area would generally be classed as moderately hard (61-120 mg/l) or hard. The discharge-weighted average hardness for the Frio River at Calliham, Nueces River near Three Rivers, and Nueces River near Mathis for the periods of record were 139, 112, and 122 mg/l, respectively. Data for Three Rivers and Mathis would be representative of water in Lake Corpus Christi.

### Chloride

The chloride content of waters throughout the Nueces River basin is generally less than 50 mg/l. Periodic data for the Nueces River at Laguna show the chloride content to be less than 25 mg/l. Discharge-weighted averages of chloride concentrations in the Frio River at Calliham, Nueces River near Three Rivers, and Nueces River near Mathis were 48, 23, and 28 mg/l, respectively. Chloride concentrations in tributary streams and in stored water are probably in the same range as in the major streams, except where local oil-field pollution has occurred.

### Other Constituents

Other important constituents in evaluating the chemical quality of water include silica, sodium, bicarbonate, sulfate, fluoride, and nitrate. Discharge-weighted averages of these constituents for the Nueces River near Mathis are: silica, 16 mg/l; sodium, 30 mg/l; bicarbonate, 152 mg/l; sulfate, 25 mg/l; and nitrate, 1.7 mg/l. Weighted-average fluoride is not given. However, fluoride concentrations in all streams have consistently been less than 1 mg/l.

## Water Quality in Potential Reservoirs

The quality of water may be improved or degraded by impoundment. Beneficial effects include reduction of silica, turbidity, color, and bacteria; stabilization of sharp variations in chemical quality; entrapment of sediment; and reduction in temperature extremes. Detrimental effects may include increased algae growth, reduction of dissolved oxygen, and increases in the concentration of dissolved constituents as a result of evaporation.

Construction of Choke Canyon Reservoir on the Frio River or R&M Reservoir on the Nueces below Lake Corpus Christi is under consideration. The quality of water at the stations Frio River at Calliham and Nueces River near Mathis is representative of the quality of water to be stored in the respective reservoirs. Therefore, the water stored should be of good quality. Any other potential reservoirs on almost all streams in both sections of the basin could be expected to contain good quality water.

## Suitability of the Water for Use

Quality-of-water studies usually are concerned with determining the suitability of the water—judged by the chemical, physical, and sanitary characteristics—for its proposed use. Table 1 lists the constituents and properties commonly determined by the U.S. Geological Survey and includes a resume of their sources and significance.

### Domestic Supply

The safe limits for the concentrations of mineral constituents found in water are usually based on the U.S. Public Health Service drinking water standards. These standards, originally established in 1914 to control the quality of water used for drinking and culinary purposes on interstate carriers, have been revised several times; the latest revision was in 1962 (U.S. Public Health Service, 1962). These standards have been adopted by the American Water Works Association as minimum standards for all public supplies.

According to the drinking-water standards, the limits in the following table should not be exceeded:

| CONSTITUENT | MAXIMUM CONCENTRATION (MG/L) |
|---|---|
| Sulfate | 250 |
| Chloride | 250 |
| Nitrate | 45 |
| Fluoride | a/ 1.0 |
| Dissolved solids | 500 |

a/ Based on annual average of daily maximum air temperatures at Carrizo Springs.

In the Nueces River basin, concentrations of all the foregoing constituents are generally well below the recommended limits.

### Irrigation

The chemical composition of a water is an important factor in determining its usefulness for irrigation because the quality of the water should not adversely affect the productivity of the land. The extent to which chemical quality affects the suitability of a water for irrigation depends on many factors, such as: the nature, composition, and drainage of the soil and subsoil; the amounts of water used and the methods of applying it; the kind of crops grown; and the climate of the region, including the amounts and distribution of rainfall. Because these factors are highly variable, all methods of classifying water for irrigation are somewhat arbitrary.

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

The U.S. Salinity Laboratory Staff introduced the term "sodium-adsorption ratio" (SAR) to express the relative activity of sodium ions in exchange reactions with the soil. This ratio is defined by the equation:

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

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

A system for classifying irrigation waters in terms of salinity and sodium hazards has been prepared by the U.S. Salinity Laboratory Staff. Empirical equations were used in developing a diagram that uses SAR and specific conductance in classifying irrigation waters. The diagram is reproduced in modified form as Figure 7. This classification, although embodying both research and field observations, should be used for general guidance only, because other factors 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 ranges of this classification extend from waters that can be used for the irrigation of most crops on most soils to waters that are usually unsuitable for irrigation.

The typical water-analysis data for the Nueces River at Laguna, shown on Figure 7, indicate that the sodium hazard is low and the salinity hazard is medium in the Edwards Plateau section of the Nueces River basin. In the West Gulf Coastal Plain section of the basin, the sodium hazard may range from low to high, and the salinity hazard may range from medium to very high (see Nueces River near Three Rivers in Figure 7),

## Table 1.—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 constituents 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. |

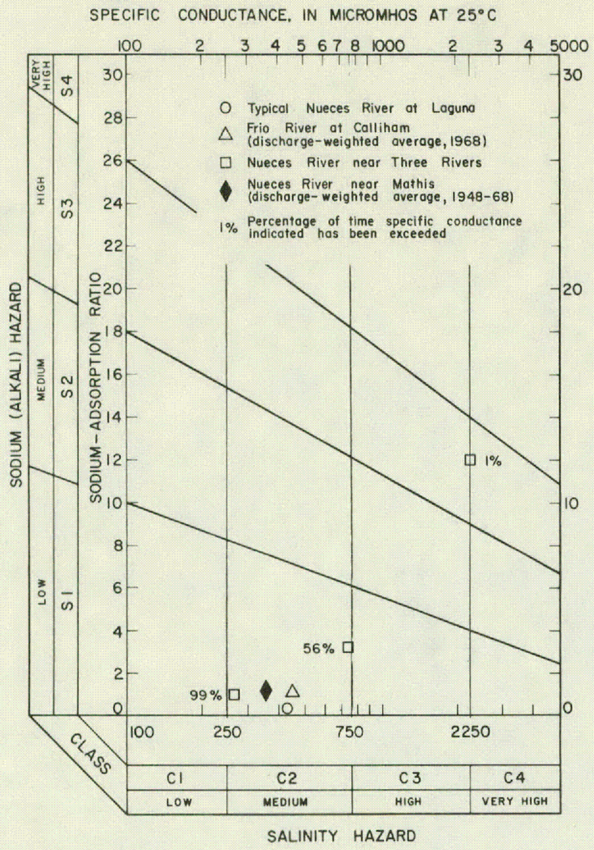


Figure 7.—Classification of Irrigation Waters

depending on streamflow conditions. The weighted averages for the Frio River at Calliham and the Nueces River near Mathis (Figure 7) probably are also representative of the water stored in Lake Corpus Christi and water to be stored in potential reservoirs on streams in the Nueces River basin. Therefore, water stored in reservoirs would have a low sodium hazard and medium salinity hazard. In the Nueces River basin, where the average annual rainfall is about 24 inches, the quality of surface water in reservoirs should be suitable for supplemental irrigation of most types of crops.

#### Industrial Use

The quality requirements for many industrial applications, as indicated by the water tolerances, are given in Table 2. One requirement of most industries is that the concentrations of the various constituents of the water remain relatively constant. When concentrations of undesirable substances in water vary, constant monitoring is required, and operating expenses are increased.

Hardness is one of the more important properties of water that affect its utility for industrial purposes (Table 1). Water in the Edwards Plateau section of the Nueces River basin is hard to very hard. Water stored in the West Gulf Coastal Plain section of the basin is moderately hard to hard. Therefore, reduction of hardness would be necessary for many industrial uses.

The corrosive property of a water receives considerable attention in industrial water supplies. A high concentration of dissolved solids in a water may be closely associated with corrosive properties, particularly if chloride is present in appreciable quantities. Water that contains a large concentration of magnesium chloride may be highly corrosive because the hydrolysis of this salt yields hydrochloric acid. The magnesium chloride and dissolved-solids concentrations in surface waters of the Edwards Plateau section of the Nueces River basin are low, but vary widely in the streams in the West Gulf Coastal Plain section, depending on streamflow conditions. Reservoirs throughout the basin can be expected to contain low concentrations of magnesium chloride and dissolved solids. Therefore, the corrosive properties of surface waters in the Nueces River basin generally should be low.

## SUMMARY AND CONCLUSIONS

This reconnaissance of the chemical quality of surface water has shown that the Nueces River basin was relatively free of major water-quality problems during the study period. Lake Corpus Christi stores water of good quality for municipal supply, irrigation, and industrial uses. Other potential reservoirs built in either the Edwards Plateau or the West Gulf Coastal Plain area of the basin might also provide supplies of good-quality water. Some streams in the southern part of the basin have been degraded from time to time by oil-field brine and by return flow from irrigation.

A continuous study of streams contributing storage to Lake Corpus Christi and potential reservoirs should be maintained. More data are needed from the many tributaries to the Nueces River so that problem areas may be isolated and preventive or corrective measures can be taken. Of special concern should be streams in or near oil fields, municipal areas, and areas of highly irrigated lands. The relationship between drainage from the Nueces River basin and water quality in Nueces and Corpus Christi Bays is being studied under a cooperative program between the U.S. Geological Survey and the Texas Water Development Board.

## Table 2.—Water-Quality Tolerances for Industrial Applications[1]

[Allowable Limits in Milligrams Per Liter Except as Indicated]

| INDUSTRY | TUR-BID-ITY | COLOR | COLOR +$O_2$ CON-SUMED | DIS-SOLVED OXYGEN (ml/l) | ODOR | HARD-NESS | ALKA-LINITY (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 | GEN-ERAL[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.

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| 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. |
|---|---|---|---|---|---|
| 1942-45 | – | *1938-45 | 1955 | 1402 | *1955 |
| 1946 | 1050 | *1946 | 1956 | 1452 | Bull. 5905 |
| 1947 | 1102 | *1947 | 1957 | 1522 | Bull. 5915 |
| 1948 | 1133 | *1948 | 1958 | 1573 | Bull. 6104 |
| 1949 | 1163 | *1949 | 1959 | 1644 | Bull. 6205 |
| 1950 | 1188 | *1950 | 1960 | 1744 | Bull. 6215 |
| 1951 | 1199 | *1951 | 1961 | 1884 | Bull. 6304 |
| 1952 | 1252 | *1952 | 1962 | 1944 | Bull. 6501 |
| 1953 | 1292 | *1953 | 1963 | 1950 | Rept. 7 |
| 1954 | 1352 | *1954 | 1964 | 1957 | – |
| | | | 1965 | 1964 | – |

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

The following U.S. Geological Survey Water-Supply Papers contain results of stream measurements in the Nueces River basin, Texas, 1915-1960:

| YEAR | WATER-SUPPLY PAPER NO. | YEAR | WATER-SUPPLY PAPER NO. | YEAR | WATER-SUPPLY PAPER NO. |
|---|---|---|---|---|---|
| 1915 | 408 | 1930 | 703 | 1945 | 1038 |
| 1916 | 438 | 1931 | 718 | 1946 | 1058 |
| 1917 | 458 | 1932 | 733 | 1947 | 1088 |
| 1918 | 478 | 1933 | 748 | 1948 | 1118 |
| 1919 | 508 | 1934 | 763 | 1949 | 1148 |
| 1920 | 508 | 1935 | 788 | 1950 | 1178 |
| 1921 | 528 | 1936 | 808 | 1951 | 1212 |
| 1922 | 548 | 1937 | 828 | 1952 | 1242 |
| 1923 | 568 | 1938 | 858 | 1953 | 1282 |
| 1924 | 588 | 1939 | 878 | 1954 | 1342 |
| 1925 | 608 | 1940 | 898 | 1955 | 1392 |
| 1926 | 628 | 1941 | 928 | 1956 | 1442 |
| 1927 | 648 | 1942 | 958 | 1957 | 1512 |
| 1928 | 668 | 1943 | 978 | 1958 | 1562 |
| 1929 | 688 | 1944 | 1008 | 1959 | 1632 |
| | | | | 1960 | 1712 |

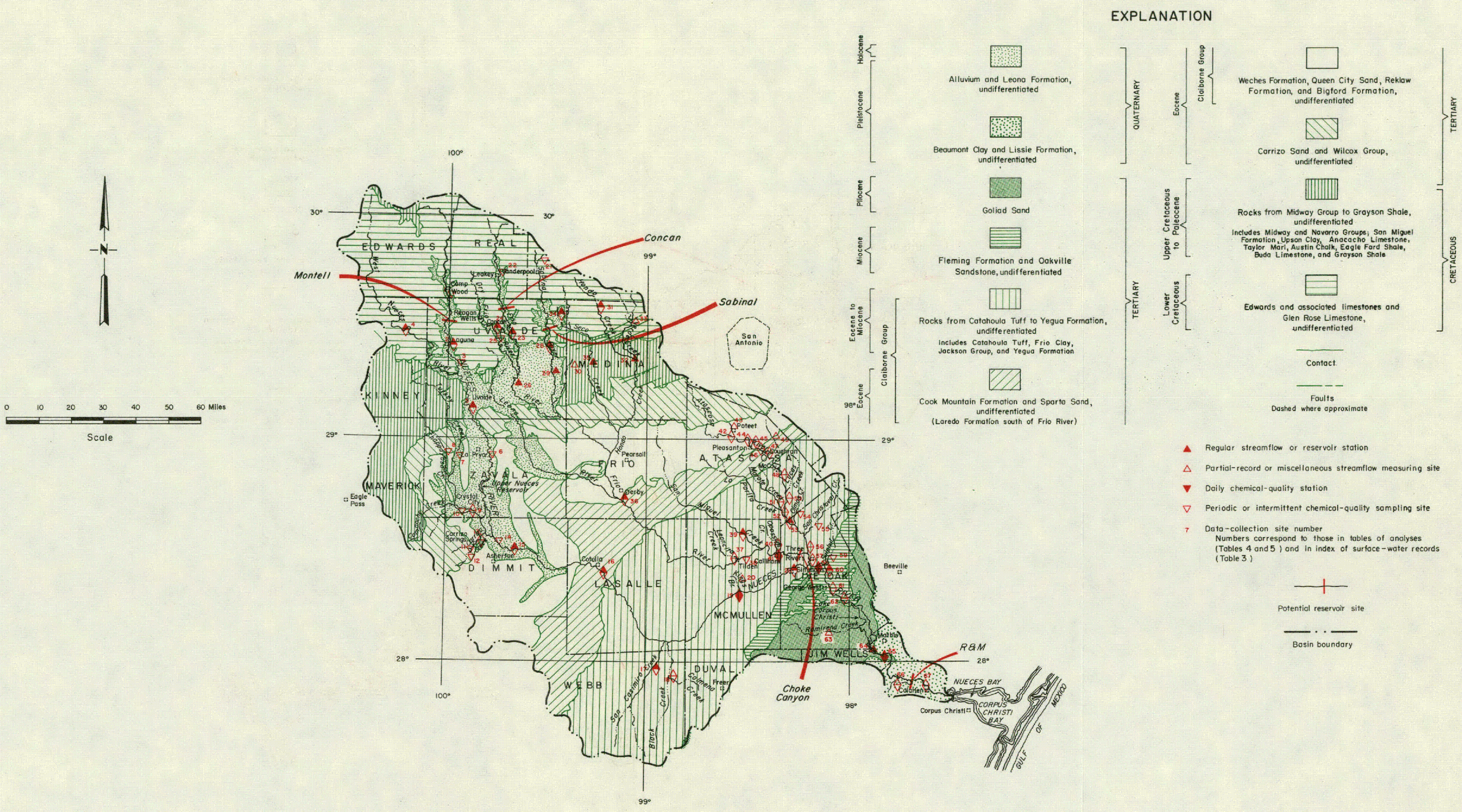


Figure 8

Hydrogeologic Map Showing Location of Streamflow and Chemical-Quality Data-Collection Sites

Base from U.S. Geological Survey, 1:500,000 map

Geology modified from Alexander, Myers, and Dale, 1964

Table 3.--Index of Surface-Water Records for the Nueces River Basin

| Reference no. | Stream and location | Drainage area (sq. mi.) | Type and period of record: Daily chemical quality | Discharge | Periodic chemical quality | Periodic discharge measurements | Reservoir content | Water temperature |
|---|---|---|---|---|---|---|---|---|
| 1 | Nueces River near Camp Wood | -- | | | 1952 | | | |
| 2 | Nueces River at Laguna | 764 | | 1923-68 | 1949, 1952, 1954, 1966-68 | | | |
| 3 | Nueces River above Uvalde | -- | | | 1930 | | | |
| 4 | West Nueces River near Brackettville | 700 | | 1939-50 1956-68 | 1952 | | | |
| 5 | Nueces River below Uvalde | 1947 | | 1927-68 | 1930, 1962-68 | | | |
| 6 | Nueces River near La Pryor | -- | | | 1930 | | | |
| 7 | Turkey Creek west of La Pryor | -- | | | 1930 | | | |
| 8 | Chaparosa Creek west of La Pryor | -- | | | 1930 | | | |
| 9 | Turkey Creek near Crystal City | -- | | | 1964-68 | 1962, 1964-68 | | |
| 10 | Pendencia Creek northwest of Carrizo Springs | -- | | | 1930 | | | |
| 11 | North Fork Carrizo Creek southwest of Carrizo Springs | -- | | | 1930 | | | |
| 12 | South Fork Carrizo Creek southwest of Carrizo Springs | -- | | | 1930 | | | |
| 13 | Carrizo Creek at Carrizo Springs | -- | | | 1930 | 1930 | | |
| 14 | Nueces River east of Carrizo Springs | -- | | | 1930 | | | |
| 15 | Nueces River near Asherton | 4082 | | 1939-68 | 1964-68 | | | |
| 16 | Nueces River at Cotulla | 5260 | 1942 | 1923-68 | 1962-68 | | | 1942 |
| 17 | San Casimiro Creek near Freer | 469 | | 1962-68 | 1965-68 | | | |
| 18 | Colmena Creek near Freer | -- | | | 1959 | 1959 | | |
| 19 | Nueces River near Tilden | 8192 | 1950-51 | 1942-68 | 1949, 1959, 1967-68 | | | 1950-51 |
| 20 | Plant Creek near Tilden | -- | | | | 1966-68 | | |
| 21 | Nueces River at Simmons | 8561 | | 1965-68 | 1965-68 | | | |
| 22 | Frio River near Leakey | -- | | | 1952 | | | |
| 23 | Frio River at Concan | 405 | | 1923-68 | 1952, 1964-68 | | | |
| 24 | Dry Frio River near Reagan Wells | 117 | | 1952-68 | 1966-68 | | | |
| 25 | Dry Frio River near Concan | -- | | | 1952 | | | |
| 26 | Frio River below Dry Frio River near Uvalde | 661 | | 1952-68 | | | | |
| 27 | Brushy Creek northwest of Vanderpool | -- | | | 1947 | | | |
| 28 | Sabinal River near Sabinal | 206 | | 1942-68 | 1964-68 | | | |
| 29 | Sabinal River at Sabinal | 247 | | 1952-68 | | | | |
| 30 | East Elm Creek near Sabinal | -- | | | | 1967-68 | | |
| 31 | Hondo Creek near Tarpley | 86 | | 1952-68 | 1966-68 | | | |
| 32 | Hondo Creek at King Waterhole near Hondo | 142 | | 1960-68 | | | | |
| 33 | Bone Creek near Hondo | -- | | | | 1967 | | |
| 34 | Seco Creek at Miller Ranch near Utopia | 43 | | 1961-68 | 1965-67 | | | |
| 35 | Seco Creek at Crook Ranch near D'Hanis | 168 | | 1960-68 | | | | |
| 36 | Frio River near Derby | 3493 | | 1915-68 | 1962-68 | | | |
| 37 | Leoncita Creek at Tilden | -- | | | 1967 | 1967 | | |
| 38 | Frio River at Tilden | -- | | | 1959 | | | |
| 39 | San Miguel Creek near Tilden | 793 | | 1964-68 | 1959, 1965-68 | | | |
| 40 | Opossum Creek near Calliham | -- | | | 1967 | 1967 | | |

Table 3.--Index of Surface-Water Records for the Nueces River Basin--Continued

| Reference no. | Stream and location | Drainage area (sq. mi.) | Type and period of record | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Daily chemical quality | Discharge | Periodic chemical quality | Periodic discharge measurements | Reservoir content | Water temperature |
| 41 | Frio River at Calliham | 5491 | 1968 | 1924-26 1932-68 | 1942, 1948-49, 1952-53, 1959, 1962-67 | | | 1968 |
| 42 | Atascosa River 3 miles southwest of Poteet | -- | | | 1951 | 1951 | | |
| 43 | Rutledge Hollow Creek at Poteet | -- | | | | 1967-68 | | |
| 44 | Atascosa River 1.3 miles south of Poteet | -- | | | 1951 | 1951 | | |
| 45 | Atascosa River 3 miles northwest of Pleasanton | -- | | | 1951 | 1951 | | |
| 46 | Atascosa River at Pleasanton | -- | | | 1951, 1959 | 1951 | | |
| 47 | Atascosa River at Coughran | -- | | | 1951 | 1951 | | |
| 48 | Atascosa River near McCoy | -- | | | 1951 | 1951 | | |
| 49 | Lucas Creek near Pleasanton | -- | | | | 1967-68 | | |
| 50 | Atascosa River at Campbellton | -- | | | 1942, 1945, 1951, 1959 | 1951 | | |
| 51 | Matate Creek southwest of Campbellton | -- | | | 1951 | 1951 | | |
| 52 | La Parita Creek southwest of Campbellton | -- | | | 1951 | 1951 | | |
| 53 | Atascosa River at Whitsett | 1171 | | | 1942, 1951, 1962, 1964-68 | 1924-26, 1932-68 | | |
| 54 | Olmos Creek near Whitsett | -- | | | 1959 | | | |
| 55 | San Christoval Creek near Whitsett | -- | | | 1959 | | | |
| 56 | Atascosa River near Three Rivers | -- | | | 1942, 1949, 1951, 1967 | 1949, 1951, 1967 | | |
| 57 | Frio River at Three Rivers | -- | | | 1942, 1967 | 1967 | | |
| 58 | Nueces River near Three Rivers | 15600 | 1945-52 | 1915-68 | | | | 1945-52 |
| 59 | Sulphur Creek at Oakville | -- | | | 1951 | 1951 | | |
| 60 | Nueces River below Sulphur Creek near Oakville | -- | | | 1951 | 1951 | | |
| 61 | Nueces River near George West | -- | | | 1951, 1959 | 1951 | | |
| 62 | Nueces River near Mikeska | -- | | | 1951 | 1951 | | |
| 63 | Ramirena Creek near George West | -- | | 1968 | | | | |
| 64 | Lake Corpus Christi near Mathis | 16656 | | | | | 1948-68 | |
| 65 | Nueces River near Mathis | 16660 | 1947-68 | 1939-68 | | | | 1947-68 |
| 66 | Cayamon Creek at Farm Road 666 near Bluntzer | -- | | | 1963, 1966 | 1963, 1966 | | |
| 67 | Nueces River at Calallen Dam above Calallen | 16772 | | 1966-67 | 1962, 1963, 1966 | | | |

Table 4.--Summary of Chemical Analyses at Daily Stations on Streams in the Nueces River Basin

(Analyses listed as maximum and minimum were classified on the basis of the values for dissolved solids only; values of other constituents may not be extreme. Results in milligrams per liter except as indicated. Calculated values for sodium plus potassium are centered between the two columns.)

| Date of collection | Mean discharge (cfs) | Silica ($SiO_2$) | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) a/ | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | Dissolved solids (sum): Milligrams per liter (mg/l) | Dissolved solids (sum): Tons per acre-foot | Dissolved solids (sum): Tons per day | Hardness as $CaCO_3$: Calcium, Magnesium | Hardness as $CaCO_3$: Noncarbonate | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **19. NUECES RIVER NEAR TILDEN** | | | | | | | | | | | | | | | | | | | |
| Water year 1950 | | | | | | | | | | | | | | | | | | | |
| Maximum, Jan. 21-31, 1950 | 0.61 | 13 | 79 | 10 | 102 | | 238 | 59 | 144 | | 0.8 | b551 | 0.75 | 0.9 | 238 | 43 | 2.9 | 918 | 8.0 |
| Minimum, May 28-31 | 1876 | 14 | 30 | 3.4 | 26 | | 122 | 16 | 20 | | 2.0 | 181 | .25 | 917 | 89 | 0 | 1.2 | 278 | 7.6 |
| Weighted average | 275 | 21 | 38 | 3.9 | 30 | | 144 | 23 | 22 | | 2.3 | 223 | .30 | 166 | 111 | 0 | 1.2 | 346 | -- |
| **41. FRIO RIVER AT CALLIHAM** | | | | | | | | | | | | | | | | | | | |
| Water year 1968 c/ | | | | | | | | | | | | | | | | | | | |
| Maximum, Sept. 1-4, 1968 | 5.4 | 28 | 148 | 24 | 310 | | 252 | 272 | 460 | 0.4 | 3.8 | 1370 | 1.86 | 20 | 468 | 262 | 6.2 | 2460 | 7.7 |
| Minimum, Jan. 20-23 | 8560 | 8.2 | 25 | 2.3 | 14 | | 81 | 18 | 12 | -- | 1.0 | 120 | .16 | 2770 | 72 | 5 | .7 | 214 | 7.5 |
| Weighted average | 420 | 11 | 46 | 6.0 | 36 | | 128 | 46 | 48 | -- | 2.3 | 258 | .35 | 293 | 139 | 35 | 1.3 | 455 | 7.5 |
| **58. NUECES RIVER NEAR THREE RIVERS** | | | | | | | | | | | | | | | | | | | |
| Water year 1946 | | | | | | | | | | | | | | | | | | | |
| Maximum, Mar. 18-20, 1946 | 71.8 | -- | 72 | 8.3 | 392 | | 205 | 64 | 588 | | 2.5 | 1230 | 1.67 | 238 | 214 | 46 | 12 | 2250 | -- |
| Minimum, Sept. 29-30 | 8510 | -- | -- | -- | -- | | 74 | 20 | 6 | | 1.5 | 105 | .14 | 2410 | -- | -- | -- | 155 | -- |
| Weighted average | 1281 | -- | 41 | 4.2 | 27 | | 144 | 25 | 22 | | 1.6 | 229 | .31 | 792 | 120 | 2 | 1.1 | 341 | -- |
| Water year 1951 | | | | | | | | | | | | | | | | | | | |
| Maximum, Feb. 1-10, 1951 | 4.66 | 10 | 46 | 13 | 431 | | 562 | 165 | 335 | | 1.5 | 1280 | 1.74 | 16 | 160 | 0 | 15 | 2130 | 8.4 |
| Minimum, May 21-23, 24, 25-26, 27 | 4831 | 21 | 34 | 3.4 | 15 | | 124 | 15 | 7.2 | | 6.1 | 185 | .25 | 2410 | 99 | 0 | .7 | 269 | 7.9 |
| Weighted average | 561 | 22 | 34 | 3.4 | 29 | | 121 | 30 | 19 | | 3.6 | 214 | .29 | 324 | 99 | 0 | 1.3 | 326 | -- |
| Water year 1952 | | | | | | | | | | | | | | | | | | | |
| Maximum, April 10, 1952 | 1096 | 30 | 70 | 8.3 | 537 | | 242 | 196 | 685 | | 8.8 | b1610 | 2.19 | 4760 | 208 | 24 | 16 | 2830 | 8.5 |
| Minimum, July 19-23 | 584 | 21 | 22 | 2.2 | 23 | | 96 | 17 | 10 | | 4.8 | b168 | .23 | 265 | 64 | 0 | 1.3 | 243 | 7.8 |
| Weighted average | 228 | 21 | 35 | 3.7 | 48 | | 143 | 38 | 35 | | 2.6 | 270 | .37 | 166 | 102 | 0 | 2.1 | 425 | -- |
| **65. NUECES RIVER NEAR MATHIS** | | | | | | | | | | | | | | | | | | | |
| Water year 1948 | | | | | | | | | | | | | | | | | | | |
| Maximum, June 1-30, 1948 | 43.7 | 20 | 61 | 8.1 | 122 | | 218 | 61 | 147 | -- | 0.8 | 548 | 0.75 | 65 | 186 | 7 | 3.9 | 940 | -- |
| Minimum, July 7-31 | 1132 | 22 | 41 | 5.2 | 43 | | 162 | 29 | 38 | -- | 1.2 | 244 | .33 | 746 | 124 | 0 | 1.7 | 429 | -- |
| Weighted average | 148 | -- | 46 | 6.8 | 62 | | 174 | 38 | 66 | -- | 1.0 | 325 | .44 | 130 | 143 | 0 | 2.3 | 554 | -- |
| Water year 1949 | | | | | | | | | | | | | | | | | | | |
| Maximum, Feb. 1-28, 1949 | 48.7 | 15 | 42 | 5.4 | 46 | | 168 | 29 | 41 | -- | .5 | 288 | .39 | 38 | 127 | 0 | -- | 445 | -- |
| Minimum, April 27-30 | 19450 | 12 | 28 | 3.6 | 24 | | 108 | 22 | 17 | -- | 2.2 | 175 | .24 | 9190 | 85 | 0 | -- | 261 | -- |
| Weighted average | 1225 | 18 | 41 | 4.9 | 29 | | 151 | 22 | 26 | -- | 1.4 | 231 | .31 | 764 | 122 | 0 | -- | 366 | -- |
| Water year 1950 | | | | | | | | | | | | | | | | | | | |
| Maximum, May 1-31, 1950 | 652 | 18 | 53 | 6.3 | 74 | | 186 | 54 | 78 | -- | .2 | 375 | .51 | 660 | 156 | 6 | -- | 637 | 7.8 |
| Minimum, June 1-30 | 1955 | 24 | 40 | 4.6 | 32 | | 159 | 21 | 24 | -- | 1.8 | 243 | .33 | 1280 | 119 | 0 | -- | 381 | 8.0 |
| Weighted average | 340 | 22 | 44 | 5.3 | 42 | | 168 | 31 | 39 | 0.2 | 1.3 | 280 | .38 | 257 | 132 | 0 | -- | 452 | -- |
| Water year 1951 | | | | | | | | | | | | | | | | | | | |
| Maximum, May 1-24, 1951 | 324 | 22 | 69 | 7.0 | 93 | | 250 | 50 | 104 | -- | .5 | 468 | .64 | 409 | 201 | 0 | -- | 803 | 7.8 |
| Minimum, Sept. 13-30 | 5167 | 19 | 32 | 3.3 | 30 | | 124 | 26 | 20 | .4 | 1.0 | 207 | .28 | 2890 | 93 | 0 | -- | 322 | 8.0 |
| Weighted average | 583 | 21 | 37 | 4.2 | 34 | | 141 | 27 | 27 | -- | 1.4 | 231 | .31 | 364 | 110 | 0 | -- | 369 | -- |

See footnotes at end of table.

Table 4.--Summary of Chemical Analyses at Daily Stations on Streams in the Nueces River Basin--Continued

(Analyses listed as maximum and minimum were classified on the basis of the values for dissolved solids only; values of other constituents may not be extreme. Results in milligrams per liter except as indicated. Calculated values for sodium plus potassium are centered between the two columns.)

| Date of collection | Mean discharge (cfs) | Silica ($SiO_2$) | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) a/ | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | Dissolved solids (sum) Milligrams per liter (mg/l) | Dissolved solids (sum) Tons per acre-foot | Dissolved solids (sum) Tons per day | Hardness as $CaCO_3$ Calcium, Magnesium | Hardness as $CaCO_3$ Noncarbonate | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **65. NUECES RIVER NEAR MATHIS--Continued** | | | | | | | | | | | | | | | | | | | |
| Water year 1952 | | | | | | | | | | | | | | | | | | | |
| Maximum, April 1-30, 1952 | 157 | 18 | 57 | 8.9 | 93 | | 224 | 57 | 97 | 0.3 | 0.5 | b478 | 0.65 | 203 | 178 | 0 | 3.0 | 772 | 8.2 |
| Minimum, Oct. 1-31, 1951 | 313 | 22 | 40 | 3.6 | 35 | 7.6 | 142 | 34 | 30 | .3 | 3.0 | b251 | .34 | 212 | 115 | 0 | 1.4 | 383 | 7.6 |
| Weighted average | 244 | 25 | 44 | 4.6 | 54 | | 172 | 37 | 45 | .3 | 1.2 | 308 | .42 | 203 | 129 | 0 | 2.1 | 492 | -- |
| Water year 1953 | | | | | | | | | | | | | | | | | | | |
| Maximum, May 1-20, 1953 | 531 | 22 | 48 | 5.9 | 120 | 7.6 | 247 | 58 | 112 | .4 | 1.0 | b530 | .72 | 760 | 144 | 0 | 4.3 | 880 | 8.2 |
| Minimum, Sept. 1-30 | 6725 | 20 | 40 | 4.0 | 18 | 3.5 | 148 | 20 | 10 | .3 | 2.0 | b207 | .28 | 3760 | 116 | 0 | .7 | 311 | 8.0 |
| Weighted average | 741 | 21 | 40 | 4.1 | 29 | 4.2 | 156 | 25 | 21 | .3 | 2.0 | 240 | .33 | 480 | 117 | 0 | 1.2 | 368 | -- |
| Water year 1954 | | | | | | | | | | | | | | | | | | | |
| Maximum, May 1-31, 1954 | 60.4 | 32 | 59 | 5.2 | 100 | | 254 | 50 | 96 | .5 | 3.5 | 478 | .65 | 78 | 168 | 0 | 3.4 | 801 | 8.5 |
| Minimum, Nov. 1-30, 1953 | 687 | 23 | 38 | 3.1 | 27 | 5.1 | 143 | 25 | 18 | .5 | 1.0 | 211 | .29 | 391 | 108 | 0 | 1.1 | 335 | 8.0 |
| Weighted average | 465 | 26 | 46 | 4.3 | 38 | 6.4 | 178 | 29 | 31 | .4 | 2.0 | 275 | .37 | 345 | 132 | 0 | 1.4 | 437 | -- |
| Water year 1955 | | | | | | | | | | | | | | | | | | | |
| Maximum, May 1-31, 1955 | 281 | 20 | 52 | 4.5 | 83 | 8.8 | 229 | 46 | 73 | .5 | 4.0 | 419 | .57 | 318 | 148 | 0 | 3.0 | 682 | 7.8 |
| Minimum, Sept. 1-30 | 385 | 23 | 44 | 3.0 | 53 | 6.5 | 176 | 35 | 42 | .2 | 2.8 | 297 | .40 | 309 | 122 | 0 | 2.1 | 484 | 7.9 |
| Weighted average | 135 | 23 | 48 | 4.1 | 63 | 7.6 | 201 | 38 | 52 | .3 | 3.1 | 343 | .47 | 125 | 137 | 0 | 2.3 | 559 | -- |
| Water year 1956 | | | | | | | | | | | | | | | | | | | |
| Maximum, April 1-30, 1956 | 49.0 | 21 | 60 | 6.2 | 73 | 9.1 | 259 | 36 | 62 | .5 | 1.8 | 410 | .56 | 54.2 | 175 | 0 | 2.4 | 666 | 7.9 |
| Minimum, Sept. 1-30 | 740 | 17 | 35 | 3.2 | 40 | 7.5 | 137 | 32 | 34 | .5 | 4.5 | 254 | .35 | 507 | 100 | 0 | 1.7 | 406 | 7.8 |
| Weighted average | 184 | 20 | 44 | 3.9 | 48 | 7.9 | 179 | 31 | 41 | .6 | 3.5 | 296 | .40 | 147 | 126 | 0 | 1.9 | 480 | -- |
| Water year 1957 | | | | | | | | | | | | | | | | | | | |
| Maximum, Sept. 1-30, 1957 | 1735 | 17 | 53 | 6.1 | 48 | | 200 | 31 | 44 | .4 | 2.5 | 322 | .44 | 1510 | 157 | 0 | 1.7 | 509 | 8.0 |
| Minimum, May 1-31 | 9482 | 14 | 20 | 10 | 18 | 6.6 | 117 | 20 | 15 | -- | 3.0 | 177 | .24 | 4530 | 92 | 0 | .8 | 283 | 7.2 |
| Weighted average | 1962 | 14 | 33 | 6.3 | 22 | 7.2 | 140 | 20 | 20 | -- | 3.4 | 208 | .28 | 1100 | 108 | 0 | .9 | 333 | -- |
| Water year 1958 | | | | | | | | | | | | | | | | | | | |
| Maximum, May 1-31, 1958 | 83.5 | 15 | 57 | 9.7 | 69 | 7.1 | 184 | 68 | 85 | -- | 4.0 | 415 | .56 | 93.6 | 182 | 31 | 2.2 | 691 | 7.4 |
| Minimum, Jan. 11-31 | 5519 | 12 | 32 | 2.5 | 27 | 5.2 | 107 | 26 | 24 | .5 | 4.0 | 186 | .25 | 2770 | 90 | 3 | 1.2 | 306 | 7.5 |
| Weighted average | 1538 | 15 | 40 | 3.7 | 31 | 5.9 | 139 | 30 | 31 | -- | 3.5 | 233 | .32 | 968 | 115 | 1 | 1.3 | 380 | -- |
| Water year 1959 | | | | | | | | | | | | | | | | | | | |
| Maximum, Aug. 1-31, 1959 | 132 | 16 | 53 | 9.0 | 60 | 8.7 | 189 | 42 | 77 | -- | 2.0 | 362 | .49 | 129 | 169 | 14 | 2.0 | 602 | 7.8 |
| Minimum, Nov. 1-30, 1958 | 3372 | 16 | 46 | 5.0 | 22 | 6.4 | 168 | 21 | 24 | -- | 1.8 | 237 | .32 | 2160 | 136 | 0 | .8 | 386 | 7.7 |
| Weighted average | 829 | 17 | 50 | 5.7 | 29 | 7.4 | 181 | 25 | 33 | -- | 1.6 | 274 | .37 | 613 | 148 | 0 | 1.0 | 439 | -- |
| Water year 1960 | | | | | | | | | | | | | | | | | | | |
| Maximum, Oct. 1-18, 1959 | 3922 | 23 | 52 | 8.9 | 53 | 9.2 | 197 | 38 | 66 | .2 | 2.0 | 351 | .48 | 3750 | 166 | 4 | 1.8 | 592 | 7.1 |
| Minimum, Dec. 1-31 | 107 | 20 | 49 | 5.3 | 16 | 7.7 | 186 | 16 | 14 | -- | 1.5 | 224 | .30 | 64.7 | 144 | 0 | .6 | 359 | 8.0 |
| Weighted average | 602 | 21 | 48 | 7.1 | 41 | | 185 | 27 | 41 | -- | 1.4 | 288 | .39 | 468 | 149 | 0 | 1.5 | 469 | -- |
| Water year 1961 | | | | | | | | | | | | | | | | | | | |
| Maximum, June 1-30, 1961 | 1369 | 12 | 54 | 6.6 | 55 | | 174 | 40 | 68 | -- | 1.2 | 332 | .45 | 1230 | 162 | 19 | 1.9 | 561 | 7.6 |
| Minimum, Dec. 11-20, 1960 | 1407 | 17 | 38 | 4.1 | 26 | | 135 | 25 | 22 | -- | 1.8 | 200 | .27 | 760 | 112 | 2 | 1.1 | 350 | 7.1 |
| Weighted average | 847 | 15 | 43 | 5.3 | 41 | | 157 | 30 | 41 | -- | 1.0 | 266 | .36 | 608 | 130 | 1 | 1.6 | 438 | -- |

See footnotes at end of table.

Table 4.--Summary of Chemical Analyses at Daily Stations on Streams in the Nueces River Basin--Continued

(Analyses listed as maximum and minimum were classified on the basis of the values for dissolved solids only; values of other constituents may not be extreme. Results in milligrams per liter except as indicated. Calculated values for sodium plus potassium are centered between the two columns.)

| Date of collection | Mean discharge (cfs) | Silica ($SiO_2$) | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) a/ | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | Dissolved solids (sum): Milligrams per liter (mg/l) | Dissolved solids (sum): Tons per acre-foot | Dissolved solids (sum): Tons per day | Hardness as $CaCO_3$: Calcium, Magnesium | Hardness as $CaCO_3$: Noncarbonate | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **65. NUECES RIVER NEAR MATHIS--Continued** | | | | | | | | | | | | | | | | | | | |
| Water year 1962 | | | | | | | | | | | | | | | | | | | |
| Maximum, July 1-31, 1962 | 133 | 19 | 50 | 7.6 | 66 | | 185 | 40 | 75 | 0.3 | 0.8 | 378 | 0.51 | 136 | 156 | 5 | 2.3 | 616 | 7.4 |
| Minimum, Nov. 1-30, 1961 | 105 | 18 | 60 | 7.2 | 45 | | 209 | 32 | 50 | .3 | .8 | 328 | .45 | 93.0 | 179 | 8 | 1.5 | 540 | 7.6 |
| Weighted average | 111 | 19 | 56 | 7.3 | 57 | | 200 | 37 | 64 | .3 | .8 | 355 | .48 | 106 | 170 | 7 | 1.9 | 583 | 7.5 |
| Water year 1963 | | | | | | | | | | | | | | | | | | | |
| Maximum, June 1-30, 1963 | 128 | 19 | 46 | 8.0 | 101 | | 196 | 46 | 111 | .3 | 1.0 | 428 | .58 | 148 | 148 | 0 | 3.6 | 730 | 7.5 |
| Minimum, Oct. 1-31, 1962 | 107 | 17 | 46 | 7.5 | 68 | | 179 | 38 | 76 | .3 | .8 | 344 | .47 | 99.4 | 146 | 0 | 2.4 | 599 | 7.7 |
| Weighted average | 109 | 16 | 49 | 7.6 | 80 | | 198 | 41 | 87 | .3 | .7 | 382 | .52 | 113 | 153 | 0 | 2.8 | 657 | 7.5 |
| Water year 1964 | | | | | | | | | | | | | | | | | | | |
| Maximum, Sept. 1-30, 1964 | 116 | 23 | 39 | 6.4 | 93 | | 208 | 33 | 84 | .4 | 1.2 | 382 | .52 | 120 | 124 | 0 | 3.6 | 634 | 7.7 |
| Minimum, June 1-30 | 133 | 17 | 42 | 7.5 | 74 | | 198 | 33 | 69 | .8 | 1.0 | 341 | .46 | 122 | 136 | 0 | 2.8 | 596 | 7.3 |
| Weighted average | 104 | 18 | 45 | 7.4 | 74 | | 211 | 34 | 72 | .5 | .8 | 358 | .49 | 100 | 144 | 0 | 2.7 | 619 | 7.7 |
| Water year 1965 | | | | | | | | | | | | | | | | | | | |
| Maximum, Oct. 1-7, 1964 | 3942 | 21 | 41 | 7.2 | 63 | 8.8 | 194 | 30 | 60 | .4 | 2.2 | 329 | .45 | 2610 | 132 | 0 | 2.4 | 552 | 7.6 |
| Minimum, Nov. 1-30 | 384 | 12 | 47 | 4.3 | 22 | | 176 | 16 | 15 | .3 | .8 | 204 | .28 | 212 | 135 | 0 | .8 | 354 | 7.6 |
| Weighted average | 787 | 15 | 49 | 4.8 | 30 | | 188 | 19 | 24 | .3 | .8 | 238 | .32 | 505 | 142 | 0 | 1.1 | 405 | 7.2 |
| Water year 1966 | | | | | | | | | | | | | | | | | | | |
| Maximum, April 1-30, 1966 | 131 | 17 | 60 | 5.6 | 43 | 7.6 | 225 | 30 | 41 | .3 | .2 | 316 | .43 | 112 | 173 | 0 | 1.4 | 536 | 7.9 |
| Minimum, June 1-30 | 896 | 18 | 46 | 3.2 | 30 | 6.7 | 167 | 20 | 27 | .3 | 3.8 | 238 | .32 | 576 | 128 | 0 | 1.2 | 403 | 7.2 |
| Weighted average | 452 | 16 | 48 | 4.8 | 33 | 7.3 | 181 | 24 | 33 | .2 | .8 | 259 | .35 | 316 | 141 | 0 | 1.2 | 443 | 7.5 |
| Water year 1967 | | | | | | | | | | | | | | | | | | | |
| Maximum, Aug. 1-31, 1967 | 152 | 19 | 66 | 5.2 | 53 | 9.2 | 238 | 37 | 54 | .3 | .8 | 362 | .49 | 149 | 186 | 0 | 1.7 | 601 | 8.1 |
| Minimum, Sept. 24-27 | 111300 | 12 | 28 | 1.2 | 8.4 | 4.9 | 91 | 13 | 6.6 | .4 | .5 | 120 | .16 | 36060 | 75 | 0 | .4 | 185 | -- |
| Weighted average | 2167 | 12 | 32 | 1.6 | 12 | 5.2 | 108 | 14 | 9.7 | .3 | .5 | 141 | .19 | 824 | 86 | 0 | .5 | 224 | 7.7 |
| Water year 1968 | | | | | | | | | | | | | | | | | | | |
| Maximum, Jan. 21, 1968 | 3200 | 14 | 58 | 5.2 | 38 | 5.1 | 182 | 35 | 46 | .2 | .2 | 291 | .40 | 2510 | 166 | 17 | 1.3 | 508 | 8.0 |
| Minimum, Oct. 1-31, 1967 | 3418 | 14 | 39 | 2.4 | 16 | 7.3 | 142 | 14 | 12 | .2 | .2 | 175 | .24 | 1620 | 108 | 0 | .7 | 285 | 7.4 |
| Weighted average | 1232 | 13 | 46 | 4.2 | 29 | | 149 | 30 | 32 | .2 | .5 | 228 | .31 | 758 | 132 | 10 | 1.1 | 396 | 7.5 |

a/ Includes the equivalent of any carbonate ($CO_3$) present.

b/ Residue on evaporation at 180°C.

c/ Period of record began November 10, 1967.

Table 5.--Chemical Analyses of Water From Streams in the Nueces River Basin for Locations Other Than Daily Stations

(Results in milligrams per liter except as indicated.
Calculated values for sodium plus potassium are centered between the two columns.)

| Date of collection | Discharge (cfs) | Silica ($SiO_2$) | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) a/ | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | Dissolved solids (sum): Milligrams per liter (mg/l) | Dissolved solids (sum): Tons per acre-foot | Dissolved solids (sum): Tons per day | Hardness as $CaCO_3$: Calcium, Magnesium | Hardness as $CaCO_3$: Noncarbonate | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. NUECES RIVER NEAR CAMP WOOD | | | | | | | | | | | | | | | | | | | |
| June 17, 1952 | | 13 | 43 | 16 | 7.1 | | 190 | 7.7 | 13 | 0.3 | 4.0 | 197 | 0.27 | | 173 | 17 | 0.2 | 357 | 8.4 |
| 2. NUECES RIVER AT LAGUNA | | | | | | | | | | | | | | | | | | | |
| May 27, 1949 | 131 | 13 | 58 | 15 | 7.8 | | 234 | 9.3 | 13 | -- | 4.5 | b236 | 0.32 | | 206 | 15 | 0.2 | 432 | 7.9 |
| June 16, 1952 | -- | 13 | 53 | 15 | 6.3 | | 215 | 9.5 | 13 | 0.2 | 4.0 | b230 | .31 | | 194 | 18 | .2 | 391 | 8.2 |
| Sept. 21, 1964 | 7550 | 10 | 64 | 6.9 | 3.3 | 2.0 | 200 | 9.2 | 7.3 | .3 | 18 | 219 | .30 | | 188 | 24 | .1 | 371 | 7.1 |
| Jan. 5, 1966 | 84.3 | 11 | 55 | 15 | 7.6 | 1.0 | 220 | 14 | 13 | .2 | 4.5 | 229 | .31 | | 199 | 19 | .2 | 405 | 7.4 |
| Mar. 15 | 60.2 | 11 | 61 | 14 | 7.4 | 1.3 | 222 | 14 | 13 | .2 | 5.0 | 236 | .32 | | 210 | 28 | .2 | 415 | 7.9 |
| Apr. 26 | 4.6 | -- | -- | -- | -- | -- | 209 | -- | 11 | -- | 2.8 | -- | -- | | 191 | 20 | -- | 387 | 7.4 |
| May 26 | 74.0 | 11 | 31 | 14 | 6.7 | 1.0 | 140 | 13 | 12 | .0 | 3.2 | 161 | .22 | | 135 | 20 | .3 | 292 | 7.8 |
| Oct. 12 | 157 | 13 | 54 | 14 | 6.5 | .9 | 211 | 12 | 12 | .2 | 6.9 | 224 | .30 | | 192 | 19 | .2 | 390 | 7.6 |
| Jan. 25, 1967 | 74.5 | 11 | 60 | 14 | 6.7 | .8 | 224 | 14 | 13 | .1 | 6.0 | 236 | .32 | | 207 | 24 | .2 | 415 | 7.6 |
| May 10 | 39.6 | 11 | 58 | 13 | 6.8 | 1.0 | 220 | 14 | 13 | .1 | 4.0 | 229 | .31 | | 198 | 18 | .2 | 403 | 7.7 |
| June 14 | 34.7 | 13 | 58 | 13 | 6.7 | 1.1 | 212 | 16 | 13 | .3 | 4.5 | 231 | .31 | | 202 | 29 | .2 | 394 | 7.6 |
| Aug. 23 | 26.0 | 13 | 50 | 14 | 7.0 | 1.0 | 198 | 13 | 13 | .2 | 5.4 | 214 | .29 | | 182 | 20 | .2 | 369 | 7.8 |
| May 29, 1968 | 216 | -- | 46 | 15 | -- | -- | 180 | -- | 13 | -- | -- | -- | -- | | 176 | 29 | -- | 357 | 7.5 |
| July 3 | 114 | -- | -- | -- | -- | -- | 204 | -- | 15 | -- | -- | -- | -- | | 194 | 27 | -- | 398 | 7.4 |
| Aug. 8 | 121 | -- | -- | -- | -- | -- | 204 | -- | 15 | -- | -- | -- | -- | | 192 | 25 | -- | 394 | 7.5 |
| 3. NUECES RIVER ABOVE UVALDE | | | | | | | | | | | | | | | | | | | |
| May 31, 1930 | | 16 | 50 | 15 | 5.0 | 1.4 | 208 | 10 | 10 | | 1.8 | b203 | 0.28 | | 186 | 16 | 0.2 | | |
| 4. WEST NUECES RIVER NEAR BRACKETTVILLE | | | | | | | | | | | | | | | | | | | |
| June 16, 1952 | | 12 | | 7.1 | 4.8 | | | 5.6 | 9.8 | 0.2 | 5.8 | | | | | | | | 8.1 |
| 5. NUECES RIVER BELOW UVALDE | | | | | | | | | | | | | | | | | | | |
| May 20, 1930 | -- | 19 | 46 | 13 | 6.3 | 1.7 | 176 | 21 | 11 | -- | 0.5 | b201 | 0.29 | | 168 | 24 | 0.2 | -- | -- |
| May 22 | -- | 15 | 57 | 13 | 7.0 | 1.6 | 208 | 22 | 12 | -- | .5 | b221 | .30 | | 196 | 25 | .2 | -- | -- |
| Nov. 26 | -- | -- | 76 | 14 | 3.8 | | 267 | 15 | 10 | -- | 8.6 | 259 | .35 | | 247 | 28 | .1 | -- | -- |
| Nov. 5, 1962 | 11.2 | 13 | 56 | 11 | 10 | | 184 | 22 | 22 | 0.3 | 2.0 | 226 | .31 | | 185 | 34 | .3 | 398 | 6.9 |
| Jan. 16, 1963 | 13.5 | 12 | 64 | 12 | 9.7 | .7 | 208 | 23 | 22 | .2 | 3.5 | b268 | .36 | | 209 | 39 | .3 | 436 | 6.9 |
| Mar. 27 | 13.3 | 13 | 56 | 11 | 11 | | 181 | 22 | 24 | .2 | 3.2 | b242 | .33 | | 185 | 37 | .4 | 398 | 7.2 |
| June 5 | 25.4 | 11 | 56 | 11 | 7.8 | 1.1 | 190 | 18 | 17 | .2 | 3.8 | 219 | .30 | | 185 | 29 | .2 | 375 | 7.0 |
| Aug. 12 | 9.97 | 16 | 44 | 12 | 9.2 | 1.1 | 162 | 20 | 18 | .3 | .8 | 201 | .27 | | 159 | 26 | .3 | 339 | 7.3 |
| Nov. 26 | 6.84 | 12 | 57 | 11 | 12 | | 192 | 24 | 20 | .2 | 2.5 | 233 | .32 | | 187 | 30 | .4 | 408 | 7.2 |
| Mar. 10, 1964 | 3.77 | 10 | 51 | 12 | 9.4 | 1.1 | 176 | 26 | 17 | .2 | 1.8 | 216 | .29 | | 177 | 32 | .3 | 383 | 7.5 |
| May 21 | 3.55 | 13 | 43 | 11 | 11 | | 154 | 24 | 17 | .2 | .0 | 195 | .27 | | 153 | 26 | .4 | 340 | 7.3 |
| July 28 | 1.23 | 22 | 38 | 13 | 13 | | 147 | 26 | 20 | .2 | .0 | 204 | .28 | | 148 | 28 | .5 | 347 | 7.0 |
| Sept. 21 | 23700 | 10 | 70 | 5.9 | 3.4 | 3.8 | 204 | 15 | 8.4 | .2 | 20 | 237 | .32 | | 199 | 32 | .1 | 396 | 7.0 |
| Sept. 24 | 1860 | 11 | 56 | 8.8 | 4.9 | 1.7 | 174 | 12 | 10 | .3 | 23 | 214 | .29 | | 176 | 33 | .2 | 356 | 7.8 |
| Oct. 6 | 265 | 12 | 65 | 11 | 7.2 | 1.4 | 219 | 15 | 14 | .3 | 17 | 251 | .34 | | 207 | 28 | .2 | 422 | 7.7 |
| Nov. 9 | 41.9 | 13 | 70 | 12 | 7.4 | 1.3 | 235 | 19 | 14 | .0 | 14 | 267 | .36 | | 224 | 31 | .2 | 454 | 7.7 |
| May 3, 1965 | 13.3 | 8.8 | 49 | 12 | 7.6 | 1.9 | 173 | 25 | 13 | .0 | 4.0 | 206 | .28 | | 172 | 30 | .3 | 372 | 6.8 |
| May 21 | c8 | 11 | 48 | 12 | 12 | | 165 | 34 | 15 | .2 | 4.8 | 218 | .30 | | 169 | 34 | .4 | 376 | 7.7 |
| July 13 | 49.8 | 12 | 53 | 11 | 7.7 | 1.3 | 182 | 19 | 13 | .2 | 7.6 | 214 | .29 | | 178 | 28 | .3 | 378 | 7.0 |
| Jan. 6, 1966 | 11.9 | 11 | 60 | 12 | 8.1 | 1.2 | 208 | 23 | 14 | .2 | 7.0 | 238 | .32 | | 198 | 28 | .2 | 402 | 7.6 |

See footnotes at end of table.

Table 5.--Chemical Analyses of Water From Streams in the Nueces River Basin for Locations Other Than Daily Stations--Continued

(Results in milligrams per liter except as indicated.
Calculated values for sodium plus potassium are centered between the two columns.)

| Date of collection | Discharge (cfs) | Silica ($SiO_2$) | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) a/ | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | Dissolved solids (sum) | | | 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 | | | |
| **5. NUECES RIVER BELOW UVALDE--Continued** | | | | | | | | | | | | | | | | | | | |
| Apr. 21, 1966 | 8.6 | -- | -- | -- | -- | -- | 182 | -- | 15 | -- | 2.5 | -- | -- | | 179 | 30 | -- | 381 | 7.3 |
| May 27 | 11.2 | 12 | 52 | 11 | 8.0 | 0.9 | 181 | 22 | 15 | 0.1 | 2.2 | 212 | .29 | | 175 | 27 | 0.3 | 377 | 7.3 |
| June 29 | 7.7 | 13 | 47 | 11 | 9.1 | 1.1 | 168 | 22 | 16 | .3 | 1.0 | 204 | .28 | | 162 | 25 | .3 | 353 | 7.8 |
| Sept. 13 | 520 | 14 | 63 | 11 | 6.3 | 1.6 | 220 | 14 | 10 | .2 | 6.0 | 234 | .32 | | 202 | 22 | .2 | 414 | 7.5 |
| Oct. 13 | 65.2 | 12 | 60 | 11 | 6.8 | 1.0 | 206 | 16 | 12 | .3 | 5.9 | 226 | .31 | | 195 | 26 | .2 | 392 | 7.5 |
| Jan. 26, 1967 | 17.9 | 11 | 56 | 11 | 7.7 | 1.2 | 194 | 19 | 12 | .2 | 5.3 | 218 | .30 | | 185 | 26 | .2 | 383 | 7.6 |
| May 11 | 9.7 | 12 | 46 | 10 | 8.1 | 1.3 | 164 | 20 | 12 | .1 | 1.5 | 192 | .26 | | 156 | 22 | .3 | 338 | 7.6 |
| June 13 | 6.8 | 15 | 42 | 11 | 8.6 | 1.2 | 155 | 21 | 14 | .3 | .5 | 190 | .26 | | 150 | 23 | .3 | 326 | 7.9 |
| Aug. 22 | 4.0 | 17 | 38 | 12 | 9.1 | 1.3 | 140 | 25 | 16 | .2 | .2 | 188 | .26 | | 144 | 29 | .3 | 307 | 8.0 |
| May 27, 1968 | 156 | -- | 46 | 11 | -- | -- | 164 | -- | 12 | -- | -- | -- | -- | | 160 | 26 | -- | 330 | 7.4 |
| July 1 | 50.6 | -- | -- | -- | -- | -- | 172 | -- | 14 | -- | -- | -- | -- | | 166 | 25 | -- | 350 | 7.5 |
| **6. NUECES RIVER NEAR LA PRYOR** | | | | | | | | | | | | | | | | | | | |
| Nov. 30, 1930 | | | 84 | 17 | 11 | | 314 | 22 | 12 | | 9.0 | 310 | 0.42 | | 280 | 22 | 0.3 | | |
| Dec. 1 | | | 84 | 16 | 6.4 | | 304 | 15 | 10 | | 13 | 294 | .40 | | 276 | 10 | .2 | | |
| **7. TURKEY CREEK RESERVOIR WEST OF LA PRYOR** | | | | | | | | | | | | | | | | | | | |
| Oct. 18, 1930 | | | 55 | 8.1 | 8.3 | | 152 | 48 | 8.0 | | 3.5 | 206 | 0.28 | | 171 | 46 | 0.3 | | |
| **8. CHAPAROSA CREEK WEST OF LA PRYOR** | | | | | | | | | | | | | | | | | | | |
| Oct. 7, 1930 | | | 23 | | 12 | | 81 | 12 | 3.0 | | 2.4 | 92 | 0.13 | | 59 | 0 | 0.7 | | |
| **9. TURKEY CREEK NEAR CRYSTAL CITY** | | | | | | | | | | | | | | | | | | | |
| May 12, 1964 | 29.3 | 6.3 | 34 | 2.2 | 16 | | 116 | 18 | 10 | 0.2 | 1.0 | 145 | 0.20 | | 94 | 0 | 0.7 | 258 | 6.8 |
| Sept. 16 | c.6 | 9.0 | 38 | 3.0 | 12 | | 130 | 20 | 3.2 | .3 | .2 | 150 | .20 | | 107 | 1 | .5 | 254 | 7.0 |
| Sept. 23 | 2610 | 6.6 | 27 | 1.6 | 1.6 | 4.4 | 91 | 5.2 | 1.3 | .5 | 1.8 | 95 | .13 | | 74 | 0 | .1 | 167 | 6.8 |
| May 26, 1965 | 7.26 | 8.5 | 52 | 4.9 | 13 | | 178 | 18 | 8.4 | .2 | .5 | 194 | .26 | | 150 | 4 | .5 | 340 | 6.8 |
| May 3, 1966 | 219 | 4.8 | 30 | 2.1 | 3.4 | 5.9 | 100 | 7.0 | 3.3 | .1 | 1.2 | 107 | .15 | | 84 | 2 | .2 | 194 | 6.6 |
| Aug. 15 | 15.1 | 9.9 | 38 | 3.3 | 13 | 8.6 | 124 | 26 | 11 | .2 | 1.0 | 172 | .23 | | 108 | 7 | .5 | 287 | 6.8 |
| Sept. 4, 1967 | 4.86 | 7.3 | 33 | 2.7 | 12 | 5.2 | 123 | 14 | 6.1 | .3 | 1.0 | 142 | .19 | | 93 | 0 | .5 | 244 | 6.9 |
| Jan. 29, 1968 | .65 | -- | 45 | 3.5 | -- | -- | 160 | -- | 3.5 | -- | -- | -- | -- | | 137 | 6 | -- | 282 | 7.5 |
| May 14 | 2.69 | -- | 37 | 2.6 | -- | -- | 124 | -- | 3.8 | -- | -- | -- | -- | | 103 | 1 | -- | 230 | 7.4 |
| **10. PENDENCIA CREEK NORTHWEST OF CARRIZO SPRINGS** | | | | | | | | | | | | | | | | | | | |
| Nov. 12, 1930 | | | 18 | | 5.3 | | 56 | 12 | 2.0 | | 0.3 | 67 | 0.09 | | 50 | 4 | 0.3 | | |
| **11. NORTH FORK CARRIZO CREEK SOUTHWEST OF CARRIZO SPRINGS** | | | | | | | | | | | | | | | | | | | |
| Nov. 12, 1930 | | | 12 | | 13 | | 52 | 15 | 2.0 | | 0.5 | b68 | 0.09 | | 34 | 0 | 1.0 | | |
| **12. SOUTH FORK CARRIZO CREEK SOUTHWEST OF CARRIZO SPRINGS** | | | | | | | | | | | | | | | | | | | |
| Nov. 12, 1930 | | | 21 | | 5.4 | | 59 | 15 | 3.0 | | 0.6 | 76 | 0.10 | | 57 | 9 | 0.3 | | |
| **13. CARRIZO CREEK AT CARRIZO SPRINGS** | | | | | | | | | | | | | | | | | | | |
| April 7, 1930 | c0.07 | 27 | 91 | 17 | 99 | 9.0 | 242 | 73 | 178 | | 0.1 | b632 | 0.89 | | 297 | 99 | 2.5 | | |

See footnotes at end of table.

Table 5.--Chemical Analyses of Water From Streams in the Nueces River Basin for Locations Other Than Daily Stations--Continued

(Results in milligrams per liter except as indicated.
Calculated values for sodium plus potassium are centered between the two columns.)

| Date of collection | Discharge (cfs) | Silica ($SiO_2$) | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) a/ | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | Dissolved solids (sum): Milligrams per liter (mg/l) | Dissolved solids (sum): Tons per acre-foot | Dissolved solids (sum): Tons per day | Hardness as $CaCO_3$: Calcium, Magnesium | Hardness as $CaCO_3$: Noncarbonate | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **14. NUECES RIVER EAST OF CARRIZO SPRINGS** | | | | | | | | | | | | | | | | | | | |
| Nov. 12, 1930..... | | | 54 | 8.3 | 8.3 | | 150 | 46 | 6.0 | | 9.6 | 206 | 0.28 | | 169 | 46 | 0.3 | | |
| **15. NUECES RIVER NEAR ASHERTON** | | | | | | | | | | | | | | | | | | | |
| Nov. 23,1964...... | 2.47 | 9.1 | 57 | 17 | 37 | | 139 | 61 | 79 | 0.1 | 4.8 | 333 | 0.45 | | 212 | 98 | 1.1 | 600 | 7.9 |
| Dec. 28.......... | .06 | 8.9 | 189 | 39 | 149 | | 384 | 222 | 290 | .3 | .8 | 1090 | 1.48 | | 632 | 318 | 2.6 | 1740 | 7.7 |
| May 19, 1965...... | 3660 | 7.2 | 33 | 3.1 | 1.1 | | 115 | 14 | 6.0 | .2 | .5 | 132 | .18 | | 95 | 1 | .5 | 232 | 6.7 |
| May 3, 1966...... | 3650 | -- | -- | -- | -- | | 136 | 9.8 | 4.9 | -- | -- | -- | -- | | 107 | 0 | -- | 249 | 7.9 |
| May 5.......... | 3920 | 7.5 | 36 | 1.8 | 4.7 | 6.1 | 121 | 8.0 | 3.7 | .1 | .8 | 129 | .18 | | 97 | 0 | .2 | 228 | 6.7 |
| May 7.......... | 623 | 7.8 | 50 | 2.5 | 6.8 | 6.4 | 166 | 10 | 5.5 | .1 | .8 | 172 | .23 | | 135 | 0 | .3 | 300 | 7.3 |
| June 6.......... | 5.8 | 7.2 | 45 | 3.8 | 13 | 7.4 | 168 | 12 | 11 | .2 | .2 | 183 | .25 | | 128 | 0 | .5 | 319 | 7.5 |
| Sept. 19.......... | 233 | 12 | 58 | 9.7 | 8.3 | 2.6 | 194 | 18 | 14 | .2 | 6.2 | 224 | .30 | | 185 | 26 | .3 | 393 | 7.2 |
| Sept. 4, 1967..... | 1730 | 6.5 | 41 | 2.5 | 5.6 | 5.4 | 133 | 15 | 3.0 | .3 | 2.0 | 146 | .20 | | 113 | 4 | .2 | 250 | 7.2 |
| Dec. 18.......... | .57 | 4.1 | 72 | 12 | 41 | | 200 | 60 | 65 | .3 | .2 | 353 | .48 | | 229 | 65 | 1.2 | 616 | 8.1 |
| May 6, 1968...... | 171 | -- | -- | -- | -- | | 181 | -- | 42 | -- | -- | -- | -- | | 204 | 56 | -- | 477 | 7.6 |
| May 14.......... | 5.5 | -- | 34 | 2.3 | -- | | 114 | -- | 3.8 | -- | -- | -- | -- | | 94 | 1 | -- | 210 | 7.4 |
| May 17.......... | 7020 | -- | -- | -- | -- | | 118 | -- | 4.3 | -- | -- | -- | -- | | 92 | 0 | -- | 207 | 8.7 |
| **16. NUECES RIVER AT COTULLA** | | | | | | | | | | | | | | | | | | | |
| Jan. 1-10, 1942... | -- | -- | 30 | 6.2 | 227 | | 345 | 119 | 133 | -- | 0.3 | 711 | -- | | 100 | -- | -- | 1190 | -- |
| Jan. 11-19....... | -- | -- | 23 | 7.5 | 255 | | 382 | 129 | 139 | -- | .2 | 773 | -- | | 88 | -- | -- | 1280 | -- |
| Jan. 21-31....... | -- | -- | 22 | 6.4 | 295 | | 418 | 148 | 159 | -- | .4 | 866 | -- | | 82 | -- | -- | 1410 | -- |
| Mar. 21-31....... | -- | -- | 18 | 10 | 379 | | 504 | 179 | 220 | -- | .0 | 1054 | -- | | 86 | -- | -- | 1780 | -- |
| July 21-22, 24-29, 31.......... | -- | -- | 47 | 6.6 | 42 | | 189 | 32 | 33 | -- | .8 | 295 | -- | | 144 | -- | -- | 460 | -- |
| Sept. 11-16,18-20. | -- | -- | 45 | 4.7 | 7.6 | | 156 | 12 | 5.0 | -- | 1.0 | 193 | -- | | 132 | -- | -- | 295 | -- |
| Sept. 21-28, 30... | -- | -- | 54 | 7.4 | 19 | | 198 | 20 | 15 | -- | 2.0 | 249 | -- | | 165 | -- | -- | 388 | -- |
| Oct. 21-31....... | -- | -- | 57 | 9.6 | 11 | | 201 | 18 | 14 | -- | 3.2 | 250 | -- | | 182 | -- | -- | 402 | -- |
| Nov. 1-10........ | -- | -- | 61 | 12 | 16 | | 235 | 18 | 15 | -- | 2.5 | 279 | -- | | 202 | -- | -- | 428 | -- |
| Nov. 11-20....... | -- | -- | 58 | 12 | 29 | | 218 | 33 | 30 | -- | 1.5 | 288 | -- | | 194 | -- | -- | 481 | -- |
| Nov. 21-24, 27-30. | -- | -- | 59 | 13 | 61 | | 250 | 48 | 55 | -- | .5 | 387 | -- | | 200 | -- | -- | 655 | -- |
| Dec. 11-20....... | -- | -- | 66 | 21 | 141 | | 289 | 119 | 138 | -- | 1.5 | 651 | -- | | 251 | -- | -- | 1110 | -- |
| Dec. 21-31....... | -- | -- | 50 | 15 | 165 | | 322 | 100 | 125 | -- | 2.0 | 634 | -- | | 186 | -- | -- | 1070 | -- |
| April 26, 1962.... | 0.79 | 5.7 | 54 | 13 | 49 | | 175 | 53 | 66 | 0.3 | 1.2 | b328 | 0.45 | | 188 | 44 | 1.6 | 584 | 7.1 |
| May 14, 1963...... | 809 | 14 | 51 | 4.6 | 14 | | 158 | 20 | 17 | .3 | 1.2 | 200 | .27 | | 146 | 17 | .5 | 336 | 6.6 |
| June 1, 1964...... | 21.1 | 7.7 | 37 | 4.3 | 18 | | 137 | 18 | 12 | .2 | 1.5 | 166 | .23 | | 110 | 0 | .7 | 292 | 6.8 |
| Aug. 25.......... | 6090 | 6.6 | 40 | 3.5 | 13 | | 134 | 22 | 5.9 | .3 | .0 | 157 | .21 | | 114 | 4 | .5 | 273 | 6.5 |
| Sept. 14.......... | c.18 | 12 | 58 | 7.1 | 29 | | 206 | 31 | 24 | .4 | .2 | 263 | .36 | | 174 | 5 | 1.0 | 450 | 7.4 |
| Sept. 17.......... | 39700 | 5.2 | 39 | 3.8 | 12 | | 140 | 17 | 4.0 | .3 | .5 | 151 | .21 | | 113 | 0 | .5 | 249 | 7.2 |
| Sept. 18.......... | 36900 | 5.3 | 32 | 3.2 | 4.8 | 4.5 | 111 | 11 | 3.9 | .2 | 2.5 | 122 | .17 | | 93 | 2 | .2 | 214 | 6.9 |
| Sept. 19.......... | 10200 | 5.4 | 28 | 2.0 | 5.4 | 4.2 | 98 | 10 | 3.1 | .2 | 1.0 | 107 | .15 | | 78 | 0 | .3 | 189 | 6.9 |
| Oct. 21.......... | 101 | 9.6 | 76 | 12 | 24 | | 235 | 39 | 37 | .2 | 8.2 | 322 | .44 | | 239 | 46 | .7 | 556 | 7.2 |
| Nov. 23.......... | 7.26 | 8.0 | 91 | 17 | 54 | | 251 | 79 | 88 | .3 | 2.2 | 462 | .63 | | 297 | 92 | 1.4 | 788 | 7.4 |
| Dec. 28.......... | c.02 | 3.4 | 101 | 26 | 95 | | 246 | 134 | 158 | .2 | .0 | 639 | .87 | | 359 | 158 | 2.2 | 1090 | 7.4 |
| May 19, 1965...... | 2190 | 8.1 | 38 | 3.2 | 14 | | 136 | 14 | 8.0 | .2 | .8 | 153 | .21 | | 108 | 0 | .6 | 265 | 7.0 |
| Oct. 4.......... | 36.7 | 9.6 | 45 | 4.8 | 23 | | 150 | 41 | 11 | .3 | .5 | 209 | .28 | | 132 | 9 | .9 | 379 | 6.8 |
| Jan. 17, 1966..... | .1 | 3.2 | 79 | 18 | 136 | 4.8 | 270 | 159 | 140 | .3 | .0 | 673 | .92 | | 272 | 50 | 3.6 | 1120 | 7.5 |
| May 2.......... | 150 | 11 | 50 | 4.8 | 18 | 7.6 | 168 | 26 | 19 | .2 | .2 | 220 | .30 | | 144 | 7 | .7 | 379 | 7.3 |
| May 5.......... | 2820 | -- | -- | -- | -- | -- | 145 | 15 | 11 | -- | -- | -- | -- | | 118 | 0 | -- | 300 | 7.1 |
| May 7.......... | 4030 | 8.9 | 40 | 2.7 | 6.7 | 6.8 | 136 | 11 | 5.8 | .1 | .2 | 149 | .20 | | 111 | 0 | .3 | 263 | 7.2 |
| June 6.......... | 21.3 | 7.9 | 51 | 4.8 | 18 | 8.0 | 178 | 22 | 19 | .2 | .2 | 219 | .30 | | 147 | 1 | .6 | 383 | 7.2 |
| Sept. 19.......... | 342 | 12 | 60 | 7.4 | 12 | 4.2 | 202 | 22 | 16 | .2 | 2.0 | 235 | .32 | | 180 | 15 | .4 | 413 | 7.1 |
| Apr. 19, 1967..... | 383 | 12 | 46 | 5.2 | 16 | 7.2 | 160 | 25 | 14 | .2 | .8 | 205 | .28 | | 136 | 5 | .6 | 346 | 7.4 |
| Apr. 20.......... | 798 | 7.8 | 52 | 4.0 | 8.4 | 5.4 | 176 | 14 | 6.6 | .4 | .4 | 186 | .25 | | 146 | 2 | .3 | 319 | 7.2 |
| Sept. 5.......... | 2390 | 7.2 | 35 | 2.6 | 5.4 | 5.0 | 119 | 12 | 2.8 | .2 | .2 | 129 | .18 | | 98 | 0 | .2 | 223 | 7.1 |
| Dec. 19.......... | .5 | 5.0 | 63 | 8.0 | 40 | | 194 | 52 | 45 | .2 | .5 | 309 | .42 | | 190 | 31 | 1.3 | 552 | 7.5 |
| Jan. 30, 1968..... | 380 | -- | 44 | 8.7 | -- | | 138 | -- | 29 | -- | -- | -- | -- | | 146 | 32 | -- | 373 | 7.9 |
| May 17.......... | 2490 | -- | -- | -- | -- | | 147 | -- | 11 | -- | -- | -- | -- | | 127 | 7 | -- | 296 | 7.3 |

See footnotes at end of table.

Table 5.--Chemical Analyses of Water From Streams in the Nueces River Basin for Locations Other Than Daily Stations--Continued

(Results in milligrams per liter except as indicated.
Calculated values for sodium plus potassium are centered between the two columns.)

| Date of collection | Discharge (cfs) | Silica ($SiO_2$) | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) a/ | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | Dissolved solids (sum) | | | 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 | | | |
| **17. SAN CASIMIRO CREEK NEAR FREER** | | | | | | | | | | | | | | | | | | | |
| Nov. 8, 1965 | 103 | 15 | 42 | 1.0 | 29 | | 159 | 21 | 13 | 0.4 | 1.8 | 201 | 0.27 | | 109 | 0 | 1.2 | 346 | 7.1 |
| Dec. 13 | .1 | 12 | 36 | 1.4 | 34 | 3.2 | 144 | 13 | 28 | .2 | .5 | 199 | .27 | | 96 | 0 | 1.5 | 355 | 6.8 |
| May 2, 1966 | 619 | 10 | 47 | .4 | 25 | 2.9 | 165 | 18 | 14 | .3 | .8 | 199 | .27 | | 119 | 0 | 1.0 | 345 | 7.1 |
| May 3 | 1680 | -- | -- | -- | -- | -- | 131 | 16 | 12 | -- | -- | -- | -- | | 93 | 0 | -- | 284 | 7.5 |
| May 7 | 1190 | 13 | 35 | .7 | 21 | 3.4 | 128 | 12 | 15 | .2 | .8 | 164 | .22 | | 90 | 0 | 1.0 | 278 | 7.5 |
| June 6 | .2 | 15 | 139 | 6.9 | 236 | 8.6 | 180 | 59 | 478 | .2 | 1.2 | 1030 | 1.40 | | 376 | 228 | 5.3 | 1920 | 7.1 |
| Sept. 21 | 1.0 | -- | -- | -- | -- | -- | 116 | -- | 450 | -- | -- | -- | -- | | 328 | 233 | -- | 1690 | 6.9 |
| Apr. 14, 1967 | 41.3 | 13 | 45 | 1.3 | 41 | 3.3 | 165 | 32 | 24 | .5 | 2.5 | 244 | .33 | | 118 | 0 | 1.6 | 402 | 7.1 |
| Aug. 29 | 203 | 15 | 41 | 1.3 | 38 | 3.3 | 159 | 23 | 27 | .4 | 2.5 | 230 | .31 | | 108 | 0 | 1.6 | 376 | 7.6 |
| Sept. 13 | 1.2 | 12 | 56 | 2.5 | 62 | 5.9 | 188 | 21 | 80 | .3 | 1.2 | 333 | .45 | | 150 | 0 | 2.2 | 590 | 7.5 |
| Sept. 27 | 382 | 19 | 59 | 2.3 | 42 | 5.5 | 184 | 20 | 56 | .2 | 1.2 | 295 | .40 | | 156 | 6 | 1.5 | 494 | 7.2 |
| Sept. 28 | 700 | 12 | 44 | 1.2 | 33 | 3.6 | 135 | 20 | 39 | .2 | 2.2 | 221 | .30 | | 115 | 4 | 1.3 | 383 | 7.4 |
| Oct. 4 | 16.2 | 16 | 166 | 8.3 | 271 | | 218 | 70 | 555 | .3 | 3.7 | 1200 | 1.63 | | 448 | 270 | 5.6 | 2210 | 7.4 |
| **18. COLMENA CREEK NEAR FREER** | | | | | | | | | | | | | | | | | | | |
| Mar. 30, 1959 | cl | 60 | 20 | 7.8 | 381 | | 683 | 127 | 149 | 3.4 | 0.2 | 1080 | 1.47 | | 82 | 0 | 18 | 1680 | 8.9 |
| **19. NUECES RIVER NEAR TILDEN** | | | | | | | | | | | | | | | | | | | |
| Aug. 17, 1949 | 838 | -- | -- | -- | -- | -- | 166 | 38 | 18 | -- | -- | -- | -- | | -- | -- | -- | 384 | 8.3 |
| Feb. 16, 1959 | 85 | 2.3 | 72 | 14 | 65 | | 199 | 52 | 110 | 0.2 | 7.7 | b443 | 0.60 | | 237 | 74 | 1.8 | 769 | 8.0 |
| Mar. 30 | 7.2 | 4.6 | 67 | 15 | 107 | | 196 | 67 | 164 | -- | 1.5 | 522 | .71 | | 228 | 68 | 3.1 | 962 | 8.1 |
| Apr. 20, 1967 | 83 | 20 | 48 | 4.0 | 3.2 | 8.8 | 188 | 28 | 21 | .4 | .2 | 254 | .35 | | 136 | 0 | 1.2 | 409 | 7.4 |
| May 22 | 634 | 13 | 52 | 2.6 | 29 | 5.8 | 178 | 36 | 19 | .5 | 2.2 | 248 | .34 | | 140 | 0 | 1.1 | 412 | 7.1 |
| May 23 | 346 | 13 | 46 | 2.2 | 32 | 5.6 | 160 | 35 | 21 | .5 | 1.8 | 236 | .32 | | 124 | 0 | 1.2 | 391 | 7.1 |
| Aug. 22 | 892 | 9.9 | 40 | 2.8 | 24 | 5.2 | 136 | 33 | 14 | .3 | 2.0 | 198 | .27 | | 111 | 0 | 1.0 | 317 | 7.6 |
| Sept. 5 | 1420 | 14 | 44 | 2.1 | 28 | 5.3 | 158 | 27 | 20 | .4 | 1.5 | 220 | .30 | | 118 | 0 | 1.1 | 366 | 7.3 |
| May 7, 1968 | 146 | -- | 63 | 10 | -- | -- | 190 | -- | 55 | -- | -- | -- | -- | | 198 | 42 | -- | 539 | 7.5 |
| **21. NUECES RIVER AT SIMMONS** | | | | | | | | | | | | | | | | | | | |
| May 21, 1965 | 3770 | 15 | 36 | 2.0 | 26 | | 134 | 20 | 15 | 0.4 | 1.0 | 181 | 0.25 | | 98 | 0 | 1.1 | 304 | 7.0 |
| May 22 | 3240 | 13 | 36 | 2.2 | 26 | | 135 | 21 | 16 | .2 | .5 | 181 | .25 | | 99 | 0 | 1.1 | 308 | 6.7 |
| May 25 | 4960 | 17 | 43 | 3.1 | 27 | | 163 | 22 | 15 | .3 | .8 | 208 | .28 | | 120 | 0 | 1.1 | 348 | 6.7 |
| Mar. 29, 1966 | .1 | 4.2 | 66 | 5.8 | 145 | 7.4 | 240 | 46 | 188 | .4 | .0 | 581 | .79 | | 188 | 0 | 4.6 | 1080 | 7.4 |
| Apr. 21 | 542 | -- | -- | -- | -- | -- | 197 | -- | 32 | -- | 1.2 | -- | -- | | 134 | 0 | -- | 445 | 7.2 |
| Apr. 27 | 1100 | 13 | 55 | 1.5 | 25 | 5.2 | 194 | 24 | 13 | .2 | .2 | 232 | .32 | | 143 | 0 | .9 | 396 | 7.0 |
| Sept. 26 | 207 | 12 | 62 | 6.9 | 19 | 5.1 | 205 | 26 | 26 | .2 | .8 | 259 | .35 | | 183 | 15 | .6 | 457 | 7.1 |
| Aug. 25, 1967 | 1090 | 14 | 46 | 2.6 | 26 | 5.4 | 146 | 38 | 16 | .3 | 3.8 | 224 | .30 | | 125 | 6 | 1.0 | 349 | 7.4 |
| Sept. 1 | 946 | 15 | 41 | 2.3 | 27 | 5.5 | 150 | 26 | 17 | .4 | 1.2 | 209 | .28 | | 112 | 0 | 1.1 | 342 | 7.8 |
| Sept. 6 | 1430 | 14 | 36 | 1.9 | 25 | 5.4 | 127 | 25 | 17 | .3 | 1.8 | 188 | .26 | | 98 | 0 | 1.1 | 312 | 7.7 |
| Sept. 7 | 1560 | 14 | 37 | 1.9 | 24 | 5.2 | 135 | 25 | 14 | .3 | 1.2 | 189 | .26 | | 100 | 0 | 1.0 | 310 | 7.7 |
| Sept. 11 | 2050 | 19 | 42 | 2.5 | 19 | 7.3 | 164 | 17 | 9.5 | .3 | .8 | 198 | .27 | | 115 | 0 | .8 | 319 | 7.4 |
| Jan. 22, 1968 | 696 | -- | -- | 1.2 | -- | -- | -- | -- | 21 | -- | -- | -- | -- | | -- | -- | -- | -- | -- |
| Jan. 23 | 793 | -- | 84 | 5.6 | -- | -- | 128 | -- | 217 | -- | -- | -- | -- | | 232 | 128 | -- | 1020 | 7.4 |
| Jan. 24 | 532 | -- | 66 | 5.0 | -- | -- | 143 | -- | 136 | -- | -- | -- | -- | | 185 | 68 | -- | 762 | 7.7 |
| Jan. 25 | 314 | -- | 91 | 7.3 | -- | -- | 164 | -- | 239 | -- | -- | -- | -- | | 257 | 122 | -- | 1130 | 8.0 |
| Jan. 30 | 8.68 | 7.0 | 76 | 10 | 51 | | 204 | 63 | 75 | .2 | 2.6 | 385 | .52 | | 230 | 64 | 1.5 | 677 | 7.4 |
| Feb. 20 | 161 | -- | 55 | 10 | -- | -- | 184 | -- | 41 | -- | -- | -- | -- | | 178 | 28 | -- | 485 | 7.8 |
| May 18 | 486 | -- | 54 | 9.6 | -- | -- | 179 | -- | 39 | -- | -- | -- | -- | | 174 | 28 | -- | 451 | 7.9 |

See footnotes at end of table.

Table 5.--Chemical Analyses of Water From Streams in the Nueces River Basin for Locations Other Than Daily Stations--Continued

(Results in milligrams per liter except as indicated.
Calculated values for sodium plus potassium are centered between the two columns.)

| Date of collection | Discharge (cfs) | Silica ($SiO_2$) | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) a/ | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | Dissolved solids (sum): Milligrams per liter (mg/l) | Dissolved solids (sum): Tons per acre-foot | Dissolved solids (sum): Tons per day | Hardness as $CaCO_3$: Calcium, Magnesium | Hardness as $CaCO_3$: Noncarbonate | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **22. FRIO RIVER NEAR LEAKEY** | | | | | | | | | | | | | | | | | | | |
| June 17, 1952 | | 11 | 58 | 18 | 5.7 | | 246 | 0.7 | 12 | 0.2 | 6.1 | b240 | 0.33 | | 219 | 17 | 0.2 | 423 | 8.2 |
| **23. FRIO RIVER AT CONCAN** | | | | | | | | | | | | | | | | | | | |
| June 16, 1952 | -- | 13 | 47 | 16 | 6.6 | | 200 | 12 | 14 | 0.2 | 1.0 | b210 | 0.29 | | 183 | 19 | 0.2 | 372 | 8.0 |
| Dec. 16, 1964 | 56.2 | 10 | 54 | 16 | 6.4 | 0.9 | 221 | 15 | 13 | .2 | 3.8 | 228 | .31 | | 201 | 19 | .2 | 407 | 7.5 |
| May 4, 1965 | 58.2 | 11 | 56 | 17 | 6.8 | .8 | 226 | 18 | 12 | .2 | 1.8 | 235 | .32 | | 210 | 24 | .2 | 421 | 7.4 |
| July 15 | 70.1 | 12 | 55 | 16 | 7.0 | 1.0 | 220 | 17 | 13 | .2 | 2.8 | 232 | .32 | | 203 | 23 | .2 | 413 | 7.1 |
| Jan. 3, 1966 | 58.9 | 10 | 57 | 16 | 7.5 | .9 | 234 | 15 | 13 | .2 | 3.8 | 238 | .32 | | 208 | 16 | .2 | 416 | 7.6 |
| Mar. 14 | 52.6 | 10 | 61 | 14 | 6.3 | .8 | 227 | 17 | 12 | .2 | 2.8 | 236 | .32 | | 210 | 24 | .2 | 430 | 7.6 |
| Apr. 25 | 743 | 13 | 60 | 15 | 6.0 | 1.6 | 234 | 14 | 12 | .3 | 2.0 | 239 | .33 | | 211 | 20 | .2 | 429 | 7.5 |
| Apr. 26 | -- | 10 | 52 | 11 | 4.5 | 1.7 | 196 | 12 | 9.0 | .2 | 3.5 | 200 | .27 | | 175 | 14 | .1 | 362 | 7.3 |
| Aug. 13 | 39000 | 10 | 69 | 4.9 | 3.2 | 3.0 | 232 | 4.0 | 3.2 | .1 | .5 | 212 | .29 | | 192 | 2 | .1 | 375 | 7.0 |
| Aug. 13 | 6820 | 8.9 | 56 | 4.7 | 1.8 | 2.8 | 176 | 8.4 | 4.5 | .2 | 8.2 | 182 | .25 | | 159 | 15 | .1 | 319 | 7.2 |
| Aug. 14 | 2660 | 10 | 52 | 7.6 | 4.5 | 2.5 | 170 | 11 | 8.2 | .1 | 11 | 191 | .26 | | 161 | 22 | .2 | 329 | 7.3 |
| Sept. 7 | 180 | -- | 66 | 14 | -- | -- | 236 | -- | 12 | -- | -- | -- | -- | | 222 | 29 | -- | 439 | 7.4 |
| Jan. 27, 1967 | 62.4 | 10 | 62 | 15 | 7.0 | .8 | 230 | 16 | 14 | .1 | 6.2 | 244 | .33 | | 216 | 28 | .2 | 431 | 7.6 |
| May 9 | 40.0 | 11 | 52 | 14 | 7.2 | 1.0 | 203 | 15 | 13 | .1 | 1.8 | 215 | .29 | | 187 | 21 | .2 | 383 | 7.7 |
| June 15 | 17.1 | 13 | 50 | 15 | 7.2 | 1.0 | 197 | 17 | 14 | .3 | .5 | 215 | .29 | | 186 | 25 | .2 | 377 | 7.6 |
| May 28, 1968 | 215 | -- | 64 | 14 | -- | -- | 228 | -- | 16 | -- | -- | -- | -- | | 217 | 30 | -- | 439 | 7.6 |
| Aug. 7 | 109 | -- | -- | -- | -- | -- | 217 | -- | 15 | -- | -- | -- | -- | | 212 | 34 | -- | 413 | 7.9 |
| **24. DRY FRIO RIVER NEAR REAGAN WELLS** | | | | | | | | | | | | | | | | | | | |
| Jan. 3, 1966 | 14.0 | 8.4 | 65 | 13 | 8.3 | 0.7 | 238 | 19 | 12 | 0.2 | 4.7 | 248 | 0.34 | | 216 | 21 | 0.2 | 433 | 7.5 |
| May 25 | 7.9 | 11 | 62 | 13 | 6.4 | .4 | 222 | 17 | 13 | .1 | .5 | 232 | .32 | | 208 | 26 | .2 | 408 | 7.5 |
| June 27 | 3.1 | 12 | 59 | 13 | 6.7 | 1.8 | 224 | 14 | 14 | .1 | .2 | 231 | .31 | | 201 | 17 | .2 | 404 | 7.7 |
| July 8 | 66.5 | -- | -- | -- | -- | -- | 174 | -- | 10 | -- | -- | -- | -- | | 166 | 23 | -- | 340 | 7.6 |
| Aug. 14 | 834 | 9.7 | 62 | 8.2 | 4.4 | 1.6 | 189 | 14 | 11 | .0 | 14 | 218 | .30 | | 188 | 34 | .1 | 383 | 7.3 |
| Oct. 14 | 32.7 | 10 | 74 | 14 | 7.1 | .6 | 258 | 18 | 15 | .3 | 5.4 | 271 | .37 | | 242 | 30 | .2 | 471 | 7.6 |
| Jan. 27, 1967 | 11.2 | 8.4 | 62 | 13 | 6.7 | .6 | 215 | 18 | 14 | .0 | 5.8 | 234 | .32 | | 208 | 32 | .2 | 415 | 7.7 |
| June 15 | 2.27 | 11 | 62 | 13 | 7.3 | 1.0 | 225 | 16 | 14 | .3 | .5 | 236 | .32 | | 208 | 24 | .2 | 412 | 7.6 |
| Nov. 3 | -- | 8.0 | 58 | 13 | 7.1 | | 202 | 18 | 13 | .2 | 13 | 229 | .31 | | 198 | 33 | .2 | 405 | 7.4 |
| May 28, 1968 | 55.8 | -- | 60 | 13 | -- | -- | 228 | -- | 15 | -- | -- | -- | -- | | 203 | 16 | -- | 436 | 7.7 |
| Aug. 7 | 37.9 | -- | -- | -- | -- | -- | 212 | -- | 14 | -- | -- | -- | -- | | 202 | 28 | -- | 410 | 7.5 |
| **25. DRY FRIO RIVER NEAR CONCAN** | | | | | | | | | | | | | | | | | | | |
| June 16, 1952 | | 10 | 58 | 15 | 7.1 | | 219 | 16 | 16 | 0.3 | 0.8 | b240 | 0.33 | | 206 | 27 | 0.2 | 407 | 8.1 |
| **27. BRUSHY CREEK NORTHWEST OF VANDERPOOL** | | | | | | | | | | | | | | | | | | | |
| Aug. 10, 1947 | | | | | | | 240 | 10 | 12 | | | | | | 237 | 40 | | 447 | |

See footnotes at end of table.

Table 5.--Chemical Analyses of Water From Streams in the Nueces River Basin for Locations Other Than Daily Stations--Continued

(Results in milligrams per liter except as indicated.
Calculated values for sodium plus potassium are centered between the two columns.)

| Date of collection | Discharge (cfs) | Silica ($SiO_2$) | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) a/ | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | Dissolved solids (sum) Milligrams per liter (mg/l) | Dissolved solids (sum) Tons per acre-foot | Dissolved solids (sum) Tons per day | Hardness as $CaCO_3$ Calcium, Magnesium | Hardness as $CaCO_3$ Noncarbonate | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **28. SABINAL RIVER NEAR SABINAL** | | | | | | | | | | | | | | | | | | | |
| Nov. 10, 1964 | 25.3 | 11 | 74 | 16 | 12 | | 246 | 44 | 18 | 0.2 | 4.0 | 300 | 0.41 | | 250 | 49 | 0.3 | 504 | 7.7 |
| Dec. 16 | 20.4 | 12 | 78 | 17 | 7.7 | 1.3 | 256 | 47 | 16 | .0 | 4.2 | 309 | .42 | | 264 | 54 | .2 | 518 | 7.8 |
| July 13, 1965 | 14.4 | 14 | 48 | 15 | 10 | | 172 | 38 | 16 | .2 | .8 | 227 | .31 | | 181 | 40 | .3 | 444 | 7.4 |
| Nov. 29 | 19.7 | 13 | 77 | 13 | 7.5 | 1.3 | 245 | 37 | 14 | .2 | 3.0 | 286 | .39 | | 246 | 45 | .2 | 495 | 7.2 |
| Mar. 14, 1966 | 23.2 | 12 | 75 | 14 | 7.2 | 1.1 | 231 | 38 | 14 | .3 | 3.8 | 279 | .38 | | 244 | 55 | .2 | 489 | 7.5 |
| May 23 | 35.7 | 12 | 58 | 14 | 6.9 | .9 | 196 | 36 | 13 | .2 | 1.8 | 239 | .33 | | 202 | 42 | .2 | 579 | 7.6 |
| Aug. 13 | 378 | 12 | 62 | 13 | 7.7 | 1.2 | 210 | 32 | 15 | .2 | .2 | 246 | .33 | | 208 | 36 | .2 | 434 | 7.8 |
| Aug. 13 | 2140 | 13 | 64 | 9.8 | 4.3 | 2.4 | 202 | 31 | 8.7 | .2 | 2.8 | 235 | .32 | | 200 | 34 | .1 | 401 | 7.4 |
| Oct. 11 | 96.0 | 13 | 66 | 14 | 7.7 | .9 | 219 | 30 | 14 | .3 | 7.8 | 262 | .36 | | 222 | 43 | .2 | 448 | 7.5 |
| Jan. 24, 1967 | 22.4 | 10 | 71 | 15 | 7.8 | .9 | 232 | 36 | 15 | .2 | 6.9 | 277 | .38 | | 238 | 48 | .2 | 477 | 7.5 |
| Apr. 19 | 489 | 7.3 | 60 | 6.5 | 2.9 | 3.3 | 188 | 13 | 6.4 | .4 | 7.7 | 200 | .27 | | 176 | 22 | .1 | 343 | 7.2 |
| Sept. 15 | 5470 | 8.5 | 38 | 1.4 | .8 | 2.9 | 118 | 7.0 | 1.7 | .3 | .0 | 119 | .16 | | 101 | 4 | .0 | 177 | 7.8 |
| Oct. 2 | 35.9 | 11 | 62 | 14 | 7.5 | 1.2 | 203 | 31 | 15 | .1 | 5.8 | 248 | .34 | | 212 | 46 | .2 | 426 | 7.5 |
| May 11, 1968 | 2800 | -- | -- | -- | -- | -- | -- | 6.4 | 3.5 | -- | -- | -- | -- | | -- | -- | -- | 263 | -- |
| June 28 | 108 | -- | -- | -- | -- | -- | 200 | -- | 17 | -- | -- | -- | -- | | 206 | 42 | -- | 424 | 7.4 |
| Aug. 5 | 74.4 | -- | -- | -- | -- | -- | 220 | -- | 17 | -- | -- | -- | -- | | 223 | 43 | -- | 452 | 7.5 |
| **31. HONDO CREEK NEAR TARPLEY** | | | | | | | | | | | | | | | | | | | |
| Oct. 13, 1966 | 20.1 | 11 | 61 | 11 | 6.3 | 0.9 | 189 | 34 | 12 | 0.3 | 3.8 | 233 | 0.32 | | 197 | 43 | 0.2 | 396 | 7.6 |
| Apr. 5, 1967 | 2.08 | 10 | 54 | 12 | 7.4 | 1.1 | 145 | 61 | 15 | .3 | .2 | 232 | .32 | | 184 | 65 | .2 | 396 | 7.2 |
| Dec. 7 | -- | 10 | 56 | 11 | 8.3 | | 164 | 39 | 14 | .2 | 9.7 | 229 | .31 | | 185 | 51 | .3 | 392 | 7.5 |
| Feb. 15, 1968 | 71.1 | -- | 57 | 11 | -- | -- | 163 | -- | 16 | -- | -- | -- | -- | | 187 | 54 | -- | 393 | 7.6 |
| **34. SECO CREEK AT MILLER RANCH NEAR UTOPIA** | | | | | | | | | | | | | | | | | | | |
| Nov. 29, 1965 | 5.1 | 10 | 67 | 8.0 | 7.8 | 1.1 | 184 | 37 | 14 | 0.2 | 6.2 | 241 | 0.33 | | 200 | 49 | 0.2 | 449 | 7.4 |
| Apr. 19, 1966 | 5.0 | 9.6 | 57 | 11 | 7.7 | 1.0 | 173 | 41 | 15 | .1 | 3.5 | 231 | .31 | | 187 | 46 | .2 | 410 | 7.4 |
| June 29 | 3.5 | 12 | 54 | 11 | 7.2 | 1.0 | 174 | 27 | 14 | .3 | 3.8 | 216 | .29 | | 180 | 37 | .2 | 371 | 7.8 |
| Aug. 14 | 142 | 9.7 | 49 | 7.4 | 3.4 | 1.8 | 157 | 18 | 6.4 | .1 | 6.0 | 179 | .24 | | 153 | 24 | .1 | 315 | 7.3 |
| Apr. 4, 1967 | 1.4 | 9.2 | 40 | 11 | 8.0 | 1.3 | 124 | 39 | 16 | .0 | .2 | 186 | .25 | | 145 | 43 | .3 | 323 | 7.4 |
| July 17 | .28 | 14 | 37 | 12 | 10 | 1.6 | 116 | 36 | 22 | .4 | .2 | 190 | .26 | | 142 | 47 | .4 | 330 | 7.6 |
| **36. FRIO RIVER NEAR DERBY** | | | | | | | | | | | | | | | | | | | |
| Apr. 26, 1962 | 41.1 | 11 | 51 | 4.5 | 14 | | 137 | 21 | 28 | 0.2 | 2.2 | 199 | 0.27 | | 146 | 34 | 0.5 | 356 | 6.8 |
| May 14, 1963 | 12.5 | 12 | 52 | 4.9 | 11 | | 154 | 22 | 17 | .3 | .8 | 196 | .27 | | 150 | 24 | .4 | 326 | 7.1 |
| Mar. 21, 1964 | 66.3 | 9.9 | 44 | 2.5 | 1.6 | 6.5 | 146 | 3.4 | 4.7 | .1 | 2.0 | 147 | .20 | | 120 | 0 | .1 | 251 | 7.0 |
| Mar. 23 | 30.5 | 9.8 | 45 | 2.6 | 2.8 | 7.8 | 144 | 9.2 | 4.5 | .2 | 3.8 | 157 | .21 | | 123 | 5 | .1 | 267 | 6.8 |
| Oct. 2 | 339 | 12 | 47 | 4.3 | 2.3 | 7.6 | 165 | 11 | 3.2 | .2 | 1.2 | 170 | .23 | | 135 | 0 | .1 | 275 | 6.9 |
| Apr. 1, 1965 | 270 | 10 | 62 | 2.7 | 4.5 | 4.8 | 202 | 5.6 | 7.5 | .2 | .2 | 196 | .27 | | 166 | 0 | .2 | 350 | 7.1 |
| Apr. 5 | 19.4 | 9.9 | 44 | 3.9 | 12 | | 154 | 12 | 7.8 | .3 | 2.2 | 168 | .23 | | 126 | 0 | .5 | 300 | 7.1 |
| Apr. 12 | 5.03 | 10 | 36 | 1.5 | 2.5 | 6.8 | 122 | .6 | 4.7 | .2 | 1.5 | 124 | .17 | | 96 | 0 | .1 | 219 | 6.9 |
| May 18 | 138 | 9.5 | 46 | 2.5 | 2.8 | 7.3 | 152 | 7.4 | 4.4 | .6 | 2.2 | 158 | .21 | | 125 | 0 | .1 | 274 | 7.1 |
| Dec. 5 | 151 | 8.8 | 56 | 2.2 | 9.7 | 5.2 | 172 | 12 | 12 | .2 | 4.0 | 195 | .27 | | 149 | 8 | .3 | 350 | 6.9 |
| Dec. 14 | .4 | 7.8 | 36 | 2.2 | 6.6 | 5.1 | 120 | 12 | 6.8 | .2 | 1.0 | 137 | .19 | | 99 | 0 | .3 | 243 | 7.1 |
| Apr. 28, 1966 | 131 | 11 | 50 | 3.4 | 7.0 | 11 | 161 | 19 | 9.5 | .2 | .8 | 191 | .26 | | 139 | 7 | .3 | 336 | 7.0 |
| May 4 | 9.8 | 10 | 42 | 3.0 | 5.5 | 9.2 | 140 | 10 | 9.0 | .2 | .2 | 158 | .21 | | 117 | 2 | .2 | 276 | 7.4 |
| Aug. 15 | 4170 | -- | 65 | 4.6 | -- | -- | 202 | -- | 4.0 | -- | -- | -- | -- | | 181 | 16 | -- | 354 | 7.1 |
| Aug. 16 | 5990 | 10 | 57 | 4.6 | 2.6 | 4.7 | 186 | 6.8 | 4.6 | .0 | 6.1 | 187 | .25 | | 161 | 9 | .1 | 329 | 7.2 |

See footnotes at end of table.

Table 5.--Chemical Analyses of Water From Streams in the Nueces River Basin for Locations Other Than Daily Stations--Continued

(Results in milligrams per liter except as indicated.
Calculated values for sodium plus potassium are centered between the two columns.)

| Date of collection | Discharge (cfs) | Silica ($SiO_2$) | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) a/ | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | Dissolved solids (sum) Milligrams per liter (mg/l | Dissolved solids (sum) Tons per acre-foot | Dissolved solids (sum) Tons per day | Hardness as $CaCO_3$ Calcium, Magnesium | Hardness as $CaCO_3$ Noncarbonate | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **36. FRIO RIVER NEAR DERBY--Continued** | | | | | | | | | | | | | | | | | | | |
| Aug. 17, 1966..... | 1250 | 11 | 60 | 5.6 | 2.4 | 4.7 | 192 | 9.6 | 6.2 | 0.0 | 6.3 | 200 | 0.27 | | 173 | 15 | 0.1 | 354 | 7.1 |
| Aug. 17........... | 861 | -- | 63 | 5.8 | -- | -- | 196 | -- | 6.4 | -- | -- | -- | -- | | 181 | 20 | -- | 358 | 7.1 |
| Aug. 18........... | 473 | -- | 57 | 6.4 | -- | -- | 180 | -- | 7.1 | -- | -- | -- | -- | | 168 | 21 | -- | 341 | 7.8 |
| Sept. 19.......... | 260 | -- | 80 | 6.7 | -- | -- | 192 | -- | 56 | -- | -- | -- | -- | | 227 | 70 | -- | 630 | 6.9 |
| Sept. 4, 1967..... | 292 | 8.7 | 61 | 3.3 | 2.0 | 4.4 | 200 | 4.2 | 1.4 | .2 | 1.8 | 185 | .25 | | 166 | 2 | .1 | 319 | 7.3 |
| Dec. 18........... | 11.5 | 8.3 | 44 | 14 | 14 | | 130 | 29 | 40 | .2 | 6.0 | 220 | .30 | | 167 | 61 | .5 | 405 | 7.7 |
| May 6, 1968....... | 9.4 | -- | 50 | 12 | -- | -- | 136 | -- | 51 | -- | -- | -- | -- | | 174 | 63 | -- | 427 | 7.6 |
| **37. LEONCITA CREEK AT TILDEN** | | | | | | | | | | | | | | | | | | | |
| Dec. 19, 1967..... | 0.11 | 17 | 20 | 3.4 | 563 | 6.4 | 1380 | 23 | 96 | 1.6 | 1.5 | 1410 | | | 64 | 0 | 31 | 2210 | 8.2 |
| **38. FRIO RIVER AT TILDEN** | | | | | | | | | | | | | | | | | | | |
| Feb. 16, 1959..... | | 2.1 | 56 | 23 | 288 | | 300 | 138 | 330 | 0.6 | 3.5 | 989 | 1.35 | | 234 | 0 | 8.2 | 1760 | 8.2 |
| Mar. 30........... | | 4.6 | 40 | 25 | 567 | | 526 | 212 | 555 | | 1.0 | 1660 | 2.26 | | 203 | 0 | 17 | 2860 | 8.2 |
| **39. SAN MIGUEL CREEK NEAR TILDEN** | | | | | | | | | | | | | | | | | | | |
| Feb. 16, 1959..... | -- | 4.4 | 107 | 21 | 89 | | 285 | 156 | 106 | 0.3 | 0.0 | b635 | 0.86 | | 354 | 120 | 2.0 | 1040 | 8.0 |
| Dec. 16, 1965..... | 11.4 | 9.3 | 25 | 2.6 | 18 | 5.3 | 84 | 30 | 14 | .2 | .5 | 146 | .20 | | 73 | 4 | .9 | 254 | 6.4 |
| May 5, 1966....... | 146 | 10 | 46 | 4.3 | 24 | 6.0 | 115 | 53 | 26 | .2 | 2.2 | 229 | .31 | | 132 | 38 | .9 | 390 | 7.0 |
| June 9............ | 3.1 | 13 | 138 | 20 | 134 | 9.8 | 328 | 199 | 177 | .1 | .2 | 852 | 1.16 | | 427 | 158 | 2.8 | 1410 | 7.7 |
| July 14........... | 3.1 | 16 | 96 | 12 | 90 | 8.2 | 254 | 128 | 108 | .3 | .2 | 584 | .79 | | 289 | 81 | 2.3 | 948 | 7.6 |
| Sept. 8........... | 133 | -- | 44 | 3.5 | -- | -- | 108 | -- | 25 | -- | -- | -- | -- | | 124 | 36 | -- | 381 | 6.6 |
| Oct. 25........... | .13 | 13 | 68 | 7.4 | 50 | 8.6 | 199 | 80 | 52 | .1 | .8 | 378 | .51 | | 200 | 37 | 1.5 | 640 | 7.1 |
| Apr. 19, 1967..... | 1.9 | 13 | 46 | 7.3 | 36 | 9.0 | 195 | 27 | 30 | .2 | 1.5 | 266 | .36 | | 145 | 0 | 1.3 | 460 | 7.0 |
| May 22............ | -- | 7.3 | 26 | 3.0 | 21 | 5.4 | 79 | 36 | 16 | .3 | 2.8 | 157 | .21 | | 77 | 12 | 1.0 | 266 | 6.6 |
| Dec. 19........... | 8.7 | 18 | 224 | 36 | 222 | 10 | 310 | 452 | 330 | .3 | 9.2 | 1450 | 1.96 | | 707 | 453 | 3.6 | 2210 | 7.8 |
| Jan. 30, 1968..... | 44.8 | -- | 157 | 35 | -- | -- | 256 | -- | 256 | -- | -- | -- | -- | | 536 | 326 | -- | 1740 | 7.6 |
| May 7............. | 11.7 | -- | 116 | 26 | -- | -- | 216 | -- | 210 | -- | -- | -- | -- | | 396 | 220 | -- | 1450 | 7.4 |
| **40. OPOSSUM CREEK NEAR CALLIHAM** | | | | | | | | | | | | | | | | | | | |
| Dec. 20, 1967..... | 0.04 | 3.9 | 768 | 49 | 2750 | 32 | 188 | 1350 | 4680 | -- | -- | 9720 | 13.1 | | 2120 | 1960 | -- | 15300 | 7.3 |
| **41. FRIO RIVER AT CALLIHAM** | | | | | | | | | | | | | | | | | | | |
| Mar. 20, 1942..... | -- | -- | 70 | 16 | 202 | | 293 | 84 | 249 | -- | 0.5 | b778 | 1.06 | | 240 | -- | 5.7 | 1380 | -- |
| July 19, 1948..... | -- | 13 | 138 | 44 | 5260 | | 186 | 239 | 8200 | -- | -- | 14000 | 19.0 | | 526 | -- | -- | 23300 | -- |
| July 5, 1949...... | -- | -- | -- | -- | -- | | -- | -- | 67 | -- | -- | -- | -- | | 170 | -- | -- | 626 | -- |
| Aug. 16........... | 89 | -- | -- | -- | -- | | 144 | 40 | 50 | -- | -- | -- | -- | | -- | -- | -- | 437 | 8.2 |
| Dec. 17, 1952 and Jan. 1-2, 1953.. | -- | 21 | 128 | 19 | 3210 | | 339 | 240 | 4880 | -- | -- | 8660 | 11.8 | | 398 | 120 | -- | 14500 | 7.8 |
| Jan. 30, Feb. 1-6, 1959.. | -- | 7.8 | 94 | 19 | 220 | | 253 | 129 | 315 | -- | 6.1 | b928 | 1.26 | | 312 | 105 | 5.4 | 1580 | 8.1 |
| Apr. 25, 1962..... | 1.40 | 4.3 | 55 | 19 | 374 | | 306 | 163 | 430 | 0.7 | .0 | 1200 | 1.63 | | 215 | 0 | 11 | 2060 | 7.2 |
| July 2............ | 4.07 | 12 | 42 | 5.5 | 96 | | 186 | 49 | 93 | .4 | .0 | b391 | .53 | | 128 | 0 | 3.7 | 703 | 6.7 |
| Sept. 13.......... | 3.75 | 13 | 40 | 6.6 | 246 | | 350 | 104 | 188 | -- | 2.5 | 772 | 1.05 | | 127 | 0 | 9.5 | 1320 | 7.3 |
| Dec. 28........... | c.02 | 9.9 | 84 | 8.3 | 797 | | 160 | 172 | 1180 | -- | 1.5 | 2330 | 3.17 | | 244 | 112 | 22 | 4100 | 6.8 |

See footnotes at end of table.

Table 5.--Chemical Analyses of Water From Streams in the Nueces River Basin for Locations Other Than Daily Stations--Continued

(Results in milligrams per liter except as indicated.
Calculated values for sodium plus potassium are centered between the two columns.)

| Date of collection | Discharge (cfs) | Silica ($SiO_2$) | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) a/ | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | Dissolved solids (sum): Milligrams per liter (mg/l) | Dissolved solids (sum): Tons per acre-foot | Dissolved solids (sum): Tons per day | Hardness as $CaCO_3$: Calcium, Magnesium | Hardness as $CaCO_3$: Noncarbonate | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **41. FRIO RIVER AT CALLIHAM--Continued** | | | | | | | | | | | | | | | | | | | |
| Jan. 30, 1963.... | 0.81 | 10 | 87 | 9.5 | 570 | | 256 | 95 | 840 | 0.5 | 0.0 | 1740 | 2.37 | | 256 | 46 | 16 | 3060 | 7.2 |
| Mar. 6.......... | .70 | 8.3 | 28 | 2.8 | 101 | | 138 | 48 | 96 | .3 | .5 | b370 | .50 | | 82 | 0 | 4.8 | 625 | 6.6 |
| May 15.......... | 143 | 12 | 45 | 5.7 | 60 | | 188 | 36 | 51 | .3 | 3.2 | 305 | .41 | | 136 | 0 | 2.2 | 513 | 6.8 |
| Nov. 5.......... | 1.48 | 6.7 | 30 | 3.0 | 11 | | 91 | 31 | 36 | .2 | 2.5 | 165 | .22 | | 87 | 13 | .5 | 338 | 6.4 |
| Jan. 14, 1964.... | .17 | 5.7 | 29 | 2.8 | 296 | | 246 | 57 | 330 | .4 | 1.0 | 843 | 1.15 | | 84 | 0 | 14 | 1530 | 7.3 |
| Feb. 19.......... | .2 | 6.1 | 44 | 3.9 | 380 | | 280 | 85 | 448 | .7 | .8 | 1110 | 1.51 | | 126 | 0 | 15 | 1980 | 7.3 |
| Mar. 26.......... | 13.7 | 9.3 | 43 | 5.5 | 80 | | 166 | 51 | 80 | .4 | 2.0 | 353 | .48 | | 130 | 0 | 3.0 | 617 | 6.9 |
| June 4.......... | 9.26 | 12 | 14 | 2.7 | 351 | | 382 | 81 | 290 | 1.0 | .0 | 940 | 1.28 | | 46 | 0 | 22 | 1620 | 7.4 |
| May 12.......... | 83.0 | 12 | 54 | 2.5 | 31 | | 177 | 47 | 13 | .3 | .2 | 247 | .34 | | 145 | 0 | 1.1 | 415 | 7.0 |
| Sept. 14.......... | c.06 | 15 | 36 | 2.2 | 44 | | 135 | 46 | 25 | .4 | .2 | 235 | .32 | | 99 | 0 | 1.9 | 386 | 7.1 |
| Oct. 19.......... | 2.15 | 11 | 43 | 5.0 | 72 | | 194 | 20 | 74 | .3 | .2 | 320 | .44 | | 128 | 0 | 2.8 | 565 | 8.1 |
| Nov. 25.......... | 3.81 | 11 | 66 | 8.1 | 93 | | 210 | 55 | 120 | .2 | .0 | 456 | .62 | | 198 | 26 | 2.9 | 799 | 6.9 |
| Dec. 30.......... | .67 | 8.6 | 95 | 14 | 211 | | 233 | 101 | 322 | .3 | 4.0 | 871 | 1.18 | | 294 | 104 | 5.4 | 1530 | 7.0 |
| Feb. 3, 1965..... | 5.82 | 7.9 | 28 | 4.9 | 365 | | 456 | 107 | 280 | 1.0 | 1.5 | 1020 | 1.39 | | 90 | 0 | 17 | 1680 | 8.6 |
| Mar. 9.......... | 1.53 | 8.8 | 45 | 5.2 | 127 | | 204 | 44 | 139 | .2 | .2 | 470 | .64 | | 134 | 0 | 4.8 | 845 | 6.9 |
| Apr. 14.......... | 39.6 | 9.6 | 44 | 5.9 | 53 | | 162 | 28 | 60 | .3 | 2.0 | 283 | .38 | | 134 | 1 | 2.0 | 498 | 7.6 |
| May 20.......... | 6390 | 9.2 | 44 | 1.5 | 16 | | 147 | 19 | 6.5 | .3 | .2 | 169 | .23 | | 116 | 0 | .6 | 292 | 7.0 |
| May 20.......... | 6530 | 9.2 | 36 | 2.0 | 16 | | 127 | 18 | 6.0 | .3 | .8 | 150 | .20 | | 98 | 0 | .7 | 259 | 7.1 |
| May 21.......... | 7000 | 9.5 | 31 | 2.3 | 16 | | 116 | 16 | 6.3 | .2 | .5 | 139 | .19 | | 87 | 0 | .7 | 234 | 6.9 |
| Nov. 10.......... | 26.9 | 8.7 | 38 | 3.6 | 180 | | 257 | 55 | 165 | .4 | .5 | 577 | .78 | | 110 | 0 | 7.5 | 1060 | 7.1 |
| Dec. 16.......... | 175 | 12 | 42 | 2.0 | 45 | 3.8 | 158 | 34 | 34 | .3 | 1.0 | 252 | .34 | | 113 | 0 | 1.8 | 441 | 6.9 |
| Mar. 31, 1966.... | 5.9 | 5.8 | 46 | 3.8 | 304 | 7.7 | 410 | 80 | 272 | .7 | .8 | 923 | 1.26 | | 130 | 0 | 12 | 1640 | 7.8 |
| Apr. 26.......... | 3610 | 7.2 | 26 | 1.7 | 9.4 | 5.2 | 84 | 18 | 6.2 | .1 | .8 | 116 | .16 | | 72 | 3 | .5 | 202 | 6.5 |
| May 3.......... | 904 | 8.9 | 48 | 3.4 | 25 | 6.2 | 155 | 27 | 25 | .2 | 2.5 | 222 | .30 | | 134 | 7 | .9 | 391 | 7.0 |
| July 14.......... | 3.6 | 11 | 42 | 4.0 | 51 | 5.9 | 132 | 34 | 67 | .1 | .2 | 280 | .38 | | 121 | 13 | 2.0 | 493 | 7.5 |
| Sept. 26.......... | 610 | 12 | 56 | 8.2 | 27 | 5.3 | 210 | 21 | 29 | .2 | .5 | 262 | .36 | | 173 | 1 | .9 | 466 | 7.1 |
| Oct. 20.......... | .10 | 14 | 55 | 7.1 | 90 | 7.3 | 206 | 35 | 120 | .4 | .2 | 430 | .58 | | 166 | 0 | 3.0 | 763 | 7.3 |
| Aug. 31, 1967.... | 166 | 15 | 40 | 2.2 | 25 | 6.2 | 146 | 28 | 14 | .3 | 1.8 | 204 | .28 | | 109 | 0 | 1.0 | 320 | 7.6 |
| Sept. 7.......... | 2820 | 11 | 36 | 1.6 | 18 | 5.4 | 124 | 23 | 9.0 | .4 | 1.5 | 167 | .22 | | 96 | 0 | .8 | 272 | 8.0 |
| Sept. 8.......... | 1060 | 12 | 36 | 2.0 | 18 | 5.9 | 135 | 17 | 9.8 | .3 | 2.0 | 169 | .23 | | 98 | 0 | .8 | 271 | 7.6 |
| Sept. 27.......... | 6158 | 11 | 41 | 2.4 | 9.0 | 6.1 | 124 | 23 | 7.5 | .1 | .8 | 162 | .22 | | 112 | 11 | .4 | 263 | 6.9 |
| Dec. 20.......... | 29.4 | 14 | 103 | 22 | 179 | 6.1 | 210 | 183 | 260 | .3 | 5.0 | 875 | -- | | 348 | 176 | 4.2 | 1490 | 7.7 |
| **42. ATASCOSA RIVER 3 MILES SOUTHWEST OF POTEET** | | | | | | | | | | | | | | | | | | | |
| Jan. 23, 1951.... | 0 | 14 | 60 | 14 | 57 | | 152 | 82 | 85 | | 0.0 | b388 | 0.53 | | 207 | 82 | 1.7 | 678 | 7.3 |
| **44. ATASCOSA RIVER 1.3 MILES SOUTH OF POTEET** | | | | | | | | | | | | | | | | | | | |
| Jan. 23, 1951.... | 0.96 | | | | 81 | | 169 | 109 | 135 | | 0.0 | | | | 266 | 128 | 2.2 | 899 | 7.8 |
| **45. ATASCOSA RIVER 3 MILES NORTHWEST OF PLEASANTON** | | | | | | | | | | | | | | | | | | | |
| Jan. 23, 1951.... | 2.3 | | | | 72 | | 171 | 119 | 101 | | 0.0 | | | | 250 | 110 | 2.0 | 810 | 7.9 |
| **46. ATASCOSA RIVER AT PLEASANTON** | | | | | | | | | | | | | | | | | | | |
| Jan. 23, 1951.... | 3.35 | -- | -- | -- | 91 | | 200 | 140 | 120 | -- | 0.0 | -- | -- | | 280 | 116 | 2.4 | 937 | 7.7 |
| Feb. 16, 1959.... | -- | 12 | 130 | 42 | 178 | | 287 | 298 | 240 | 0.4 | .0 | 1040 | 1.41 | | 497 | 262 | 3.5 | 1740 | 8.1 |

See footnotes at end of table.

Table 5.--Chemical Analyses of Water From Streams in the Nueces River Basin for Locations Other Than Daily Stations--Continued

(Results in milligrams per liter except as indicated.
Calculated values for sodium plus potassium are centered between the two columns.)

| Date of collection | Discharge (cfs) | Silica ($SiO_2$) | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) a/ | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | Dissolved solids (sum) Milligrams per liter (mg/l) | Dissolved solids (sum) Tons per acre-foot | Dissolved solids (sum) Tons per day | Hardness as $CaCO_3$ Calcium, Magnesium | Hardness as $CaCO_3$ Noncarbonate | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **47. ATASCOSA RIVER AT COUGHRAN** | | | | | | | | | | | | | | | | | | | |
| Jan. 24, 1951..... | 3.82 | | | | 99 | | 211 | 137 | 122 | | 0.0 | | | | 273 | 100 | 2.6 | 962 | 7.9 |
| **48. ATASCOSA RIVER NEAR McCOY** | | | | | | | | | | | | | | | | | | | |
| Jan. 24, 1951..... | 3.84 | | | | 144 | | 265 | 145 | 149 | | 0.0 | | | | 266 | 49 | 3.8 | 1120 | 8.1 |
| **50. ATASCOSA RIVER AT CAMPBELLTON** | | | | | | | | | | | | | | | | | | | |
| Mar. 20, 1942..... | -- | -- | 88 | 28 | 188 | | 274 | 228 | 199 | -- | 0.5 | 867 | 1.18 | | 334 | -- | 4.5 | 1440 | -- |
| Aug. 14, 1945..... | -- | 16 | 46 | 21 | 283 | 26 | 294 | 223 | 265 | 1.0 | .5 | b1040 | 1.41 | | 202 | -- | 8.7 | 1760 | -- |
| Jan. 24, 1951..... | 4.38 | 3.6 | 51 | 18 | 208 | | 287 | 156 | 181 | -- | .0 | b775 | 1.05 | | 201 | 0 | 6.2 | 1310 | 8.3 |
| July 19, 1959..... | -- | 15 | 54 | 20 | 293 | | 334 | 171 | 285 | -- | .5 | 1000 | 1.36 | | 216 | 0 | 8.7 | 1720 | 7.1 |
| **51. MATATE CREEK SOUTHWEST OF CAMPBELLTON** | | | | | | | | | | | | | | | | | | | |
| Jan. 24, 1951..... | 0.44 | 5.0 | 10 | 6.1 | 1290 | | 1390 | 297 | 995 | | 2.8 | 3290 | 4.47 | | 50 | 0 | 79 | 5260 | 8.9 |
| **52. LA PARITA CREEK SOUTHWEST OF CAMPBELLTON** | | | | | | | | | | | | | | | | | | | |
| Jan. 23, 1951..... | 0.39 | 18 | 9.0 | 2.4 | 215 | | 420 | 83 | 48 | | 1.8 | 584 | 0.79 | | 32 | 0 | 17 | 951 | 7.8 |
| **53. ATASCOSA RIVER AT WHITSETT** | | | | | | | | | | | | | | | | | | | |
| Mar. 20, 1942..... | -- | -- | 92 | 28 | 231 | | 337 | 226 | 238 | -- | 0.2 | b998 | 1.36 | | 344 | -- | 5.4 | 1630 | -- |
| Jan. 25, 1951..... | 4.7 | 5.2 | 42 | 14 | 380 | | 522 | 151 | 285 | -- | .5 | 1130 | 1.54 | | 162 | 0 | 13 | 1870 | 8.5 |
| Apr. 25, 1962..... | 15.9 | 21 | 80 | 21 | 335 | | 495 | 186 | 292 | 0.8 | 1.8 | 1180 | 1.60 | | 286 | 0 | 8.6 | 1920 | 7.4 |
| Jan. 14, 1964..... | 4.87 | 9.6 | 56 | 13 | 281 | | 472 | 114 | 210 | .6 | .8 | 917 | 1.25 | | 193 | 0 | 8.8 | 1560 | 7.9 |
| Feb. 19.......... | 3.72 | 11 | 54 | 15 | 311 | | 420 | 146 | 265 | .8 | 1.2 | 1010 | 1.37 | | 196 | 0 | 9.7 | 1710 | 7.7 |
| Mar. 26.......... | 8.82 | 13 | 66 | 10 | 182 | | 293 | 130 | 158 | .5 | .5 | 704 | .96 | | 206 | 0 | 5.5 | 1190 | 7.3 |
| Aug. 12.......... | 23.8 | 18 | 30 | 4.1 | 104 | | 210 | 54 | 63 | .5 | .2 | 377 | .51 | | 92 | 0 | 4.7 | 635 | 6.8 |
| Sept. 14......... | .86 | 17 | 31 | 7.4 | 273 | | 508 | 76 | 144 | .7 | .2 | 799 | 1.09 | | 108 | 0 | 11 | 1320 | 8.1 |
| Nov. 25.......... | 3.70 | 17 | 16 | 6.8 | 290 | | 429 | 83 | 182 | 1.0 | .0 | 807 | 1.10 | | 68 | 0 | 15 | 1340 | 8.4 |
| Feb. 3, 1965..... | 3.73 | 11 | 36 | 10 | 366 | | 490 | 125 | 279 | .8 | .2 | 1070 | 1.46 | | 131 | 0 | 14 | 1780 | 7.4 |
| Apr. 16.......... | 5.22 | 16 | 45 | 10 | 263 | | 463 | 74 | 188 | .9 | 1.8 | 826 | 1.12 | | 154 | 0 | 9.2 | 1390 | 7.4 |
| May 20........... | 4360 | 14 | 12 | 2.0 | 10 | | 48 | 12 | 5.1 | .3 | .5 | 80 | .11 | | 38 | 0 | .7 | 130 | 6.0 |
| May 21........... | 5160 | 11 | 14 | 2.2 | 4.8 | 7.3 | 57 | 11 | 3.8 | .2 | .2 | 82 | .11 | | 44 | 0 | .3 | 130 | 6.2 |
| May 24........... | 143 | 17 | 54 | 11 | 61 | | 206 | 65 | 53 | .2 | .8 | 363 | .49 | | 180 | 10 | 2.0 | 631 | 7.0 |
| Oct. 8........... | 3.8 | 17 | 20 | 4.4 | 276 | | 406 | 59 | 192 | .9 | .8 | 770 | 1.05 | | 68 | 0 | 15 | 1330 | 7.3 |
| Dec. 17.......... | 82.9 | 14 | 20 | 2.6 | 67 | 6.0 | 134 | 37 | 44 | .4 | .5 | 258 | .35 | | 61 | 0 | 3.7 | 443 | 6.7 |
| Mar. 31, 1966.... | 5.1 | 9.0 | 70 | 22 | 463 | 11 | 592 | 220 | 395 | 1.1 | .8 | 1480 | 2.01 | | 265 | 0 | 12 | 2490 | 7.7 |
| Apr. 27.......... | 1620 | 13 | 20 | 2.3 | 23 | 8.7 | 80 | 24 | 18 | .1 | .2 | 148 | .20 | | 59 | 0 | 1.3 | 251 | 6.7 |
| Sept. 27......... | 2.5 | 20 | 54 | 8.4 | 200 | 13 | 372 | 75 | 158 | .6 | 4.5 | 716 | .97 | | 169 | 0 | 6.7 | 1240 | 7.3 |
| Oct. 20.......... | 1.0 | 20 | 34 | 5.2 | 281 | 12 | 506 | 70 | 170 | .8 | .8 | 843 | 1.15 | | 106 | 0 | 12 | 1390 | 8.2 |
| Mar. 9, 1967..... | 4.5 | 5.9 | 64 | 17 | 381 | 10 | 564 | 154 | 317 | 1.0 | .0 | 1230 | 1.67 | | 230 | 0 | 11 | 2080 | 7.9 |
| Aug. 23.......... | 34.1 | 19 | 32 | 3.8 | 91 | 8.8 | 184 | 63 | 60 | .6 | 2.0 | 370 | .50 | | 96 | 0 | 4.0 | 608 | 7.7 |
| Aug. 25.......... | 257 | 13 | 18 | 2.3 | 23 | 6.8 | 81 | 24 | 12 | .3 | 4.0 | 143 | .19 | | 54 | 0 | 1.4 | 220 | 7.1 |
| Aug. 31.......... | 9.2 | 23 | 46 | 6.4 | 144 | 9.5 | 274 | 85 | 105 | .8 | 1.8 | 556 | .76 | | 142 | 0 | 5.3 | 895 | 7.8 |
| Sept. 6.......... | 17.0 | 17 | 29 | 3.8 | 141 | 7.6 | 213 | 61 | 117 | .7 | 2.0 | 484 | .66 | | 88 | 0 | 6.5 | 817 | 7.8 |
| Oct. 10.......... | 67.5 | 21 | 87 | 16 | 132 | 8.9 | 246 | 147 | 158 | .3 | 2.0 | 693 | .94 | | 283 | 82 | 3.4 | 1150 | 8.1 |
| Jan. 21, 1968.... | 23900 | 8.9 | 12 | 2.3 | 7.0 | | 41 | 13 | 4.2 | .5 | .3 | 68 | .09 | | 39 | 6 | .5 | 112 | 6.5 |
| Jan. 22.......... | 17800 | -- | 14 | 2.0 | -- | | 42 | -- | 4.0 | -- | -- | -- | -- | | 43 | 9 | -- | 120 | 6.9 |
| Jan. 29.......... | 131 | 21 | 123 | 22 | 157 | | 282 | 225 | 193 | .4 | 2.4 | 883 | 1.20 | | 398 | 166 | 3.4 | 1430 | 7.4 |
| Feb. 21.......... | 422 | -- | 36 | 7.0 | -- | | 106 | -- | 52 | -- | -- | -- | -- | | 119 | 32 | -- | 482 | 7.2 |

See footnotes at end of table.

Table 5.--Chemical Analyses of Water From Streams in the Nueces River Basin for Locations Other Than Daily Stations--Continued

(Results in milligrams per liter except as indicated.
Calculated values for sodium plus potassium are centered between the two columns.)

| Date of collection | Discharge (cfs) | Silica ($SiO_2$) | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) a/ | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | Dissolved solids (sum): Milligrams per liter (mg/l) | Dissolved solids (sum): Tons per acre-foot | Dissolved solids (sum): Tons per day | Hardness as $CaCO_3$: Calcium, Magnesium | Hardness as $CaCO_3$: Noncarbonate | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **54. OLMOS CREEK NEAR WHITSETT** | | | | | | | | | | | | | | | | | | | |
| Apr. 19, 1959..... | | 16 | 68 | 2.4 | 78 | | 141 | 145 | 56 | 0.5 | 1.0 | 436 | 0.59 | | 180 | 64 | 2.5 | 695 | 7.7 |
| **55. SAN CHRISTOVAL CREEK NEAR WHITSETT** | | | | | | | | | | | | | | | | | | | |
| Apr. 19, 1959..... | | 20 | 37 | 1.8 | 20 | | 124 | 34 | 4.2 | 0.3 | 0.2 | 178 | 0.24 | | 100 | 0 | 0.9 | 294 | 6.4 |
| **56. ATASCOSA RIVER NEAR THREE RIVERS** | | | | | | | | | | | | | | | | | | | |
| Mar. 20, 1942..... | -- | -- | 102 | 24 | 231 | | 364 | 220 | 232 | -- | 0.5 | 989 | 1.34 | | 353 | -- | 5.3 | 1650 | -- |
| Aug. 16, 1949..... | 35 | -- | -- | -- | -- | | 157 | 226 | 175 | -- | -- | -- | -- | | -- | -- | -- | 1480 | 8.2 |
| Jan. 25, 1951..... | 4.32 | -- | -- | -- | 376 | | 510 | 168 | 295 | -- | .8 | -- | -- | | 192 | 0 | 12 | 1910 | 8.2 |
| Dec. 21, 1967..... | 24.5 | 23 | 139 | 35 | 333 | 10 | 364 | 356 | 388 | 0.6 | 2.2 | 1470 | 2.00 | | 491 | 192 | 6.5 | 2340 | 7.9 |
| **57. FRIO RIVER AT THREE RIVERS** | | | | | | | | | | | | | | | | | | | |
| Mar. 20, 1942..... | -- | -- | 89 | 20 | 216 | | 337 | 139 | 251 | -- | 0.2 | b903 | 1.23 | | 304 | -- | 5.4 | 1540 | -- |
| Dec. 21, 1967..... | 54.6 | 20 | 120 | 26 | 240 | 7.7 | 290 | 235 | 312 | 0.4 | 4.2 | 1110 | 1.51 | | 406 | 169 | 5.2 | 1850 | 7.8 |
| **59. SULPHUR CREEK AT OAKVILLE** | | | | | | | | | | | | | | | | | | | |
| Apr. 19, 1959..... | | 17 | 94 | 14 | 239 | | 376 | 97 | 285 | 0.5 | 0.0 | 932 | 1.27 | | 292 | 0 | 6.1 | 1640 | 7.3 |
| **60. NUECES RIVER BELOW SULPHUR CREEK NEAR OAKVILLE** | | | | | | | | | | | | | | | | | | | |
| Jan. 25, 1951..... | 4.34 | | | | 434 | | 569 | 183 | 362 | | 1.0 | | | | 224 | | 13 | 2210 | 8.1 |
| **61. NUECES RIVER NEAR GEORGE WEST** | | | | | | | | | | | | | | | | | | | |
| Jan. 25, 1951..... | 5.49 | -- | -- | -- | 465 | | 529 | 150 | 500 | -- | 0.0 | -- | -- | | 284 | -- | 12 | 2550 | 8.2 |
| Apr. 19, 1959..... | -- | 17 | 102 | 19 | 269 | | 323 | 162 | 342 | 0.4 | 1.8 | 1070 | 1.46 | | 332 | 68 | 6.4 | 1860 | 7.3 |
| **62. NUECES RIVER NEAR MIKESKA** | | | | | | | | | | | | | | | | | | | |
| Jan. 25, 1951..... | 5.29 | | | | 358 | | 413 | 139 | 450 | | 0.0 | | | | 340 | 2 | 8.4 | 2420 | 7.9 |
| **66. CAYAMON CREEK AT FARM ROAD 666 NEAR BLUNTZER** | | | | | | | | | | | | | | | | | | | |
| Aug. 30, 1963..... | 0.22 | 46 | 79 | 54 | 638 | | 208 | 348 | 900 | 1.2 | 0.0 | 2170 | 2.95 | | 419 | 248 | 14 | 3680 | 7.0 |
| Feb. 23, 1966..... | c1.0 | 40 | 178 | 70 | 865 | 12 | 280 | 466 | 1320 | -- | 6.5 | 3100 | 4.22 | | 730 | 500 | 14 | 5210 | 7.4 |
| Aug. 18.......... | c1.8 | 55 | 90 | 38 | 459 | 12 | 234 | 248 | 680 | .9 | .8 | 1700 | 2.31 | | 381 | 189 | 10 | 2910 | 7.6 |
| **67. NUECES RIVER AT CALALLEN DAM ABOVE CALALLEN** | | | | | | | | | | | | | | | | | | | |
| Jan. 31, 1962..... | -- | 15 | 42 | 8.3 | 62 | 7.9 | 122 | 45 | 96 | 0.4 | 0.0 | b348 | 0.47 | | 139 | 39 | 2.3 | 597 | 7.6 |
| Aug. 31, 1963..... | -- | 14 | 55 | 7.5 | 83 | | 190 | 46 | 101 | .5 | .0 | 400 | .54 | | 168 | 12 | 2.8 | 705 | 7.0 |
| Feb. 15, 1966..... | 148 | 18 | 59 | 5.5 | 38 | 6.4 | 220 | 27 | 39 | .2 | .2 | 301 | .41 | | 170 | 0 | 1.3 | 526 | 7.5 |
| Feb. 24.......... | -- | 18 | 68 | 7.4 | 52 | 7.5 | 230 | 36 | 72 | .3 | .2 | 374 | .51 | | 200 | 12 | 1.6 | 665 | 7.3 |
| Aug. 18.......... | -- | 23 | 56 | 5.0 | 49 | 8.5 | 183 | 31 | 67 | .4 | .0 | 331 | .45 | | 160 | 10 | 1.7 | 573 | 7.6 |

a/ Includes equivalent of any carbonate ($CO_3$) present.

b/ Residue on evaporation at 180°C.

c/ Estimated.